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Groundwater Impact Assessment

BYLONG COAL PROJECT
Environmental Impact Statement

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Australasian
Groundwater
and Environmental
Consultants Pty Ltd
(AGE)

Report on

Bylong Coal Project
Groundwater Impact Assessment

Prepared for

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Australasian Groundwater and Environmental Consultants Pty Ltd

Executive Summary

This report describes the hydrogeological regime within Authorisations A287 and Authorisation 342, and the surrounding region, and assesses the impact of KEPCO Bylong Australia Pty Ltd the proposed Bylong Coal Project on this regime. An extensive monitoring groundwater network has been installed including 62 monitoring bores, and 13 vibrating wire piezometer sites. Monitoring of groundwater levels and quality in the network commenced in 2011 and over three years of baseline data has been collected from the early bores.

Australasian Groundwater and Environmental Consultants (AGE) and Douglas Partners (DP) conducted a groundwater study, which included extensive field investigations and developing a numerical groundwater model.

The prime aquifer system within the Project area is a shallow alluvial groundwater system, which meets the definition of highly productive groundwater, being capable of supplying groundwater at a rate of greater than 5 L/s with a salinity of less than 1,500 mg/L . This relatively thin aquifer system is highly connected to surface water systems, including the Bylong and Goulburn Rivers. The data indicates the alluvium along Dry Creek does not meet the definition of highly productive groundwater.

A perched basalt groundwater system exists above the proposed longwall area, however this aquifer system is not extensive, groundwater occurs only in patches and it is not directly connected to the regional groundwater system. The Permian groundwater system which occurs across the Project area is a relatively low yield, poor quality aquitard unit, although an extensive weathering profile has the ability to transmit water more readily through the unsaturated zone.

The Water Sharing Plan report card for the Bylong River water source indicates the area has a total groundwater entitlement of 5,843 ML/year (100% used for irrigation purposes). There are 23 groundwater licences in the area and the groundwater is primarily extracted from the Quaternary alluvium for agricultural purposes. KEPCO Bylong Australia Pty Ltd have purchased 2,535 units from the Bylong River water source and may acquire additional water licenses with the purchase of other properties as the Project progresses.

A conceptual model of the hydrogeological regime was gradually built-up over the exploration phase using data from the field investigations and information gathered by other investigators in the region. This conceptual understanding of the structure and behaviour of the aquifer systems in the area was used as the basis for a numerical groundwater model. The purpose of the model was to simulate the historical groundwater trends and to predict the effect of mining on the surrounding groundwater regimes.

The assessment utilised a regional numerical flow model to simulate the behaviour of the groundwater systems. The model was calibrated to historical water level fluctuations in monitoring bores recorded between 2011 and 2014. The model then simulated the impact of the Project on the groundwater regime over a 25-year period. This model predicted changes to the groundwater levels and pressures as the Project develops.

The model predicted the groundwater seepage into the proposed mining areas will average 1,248 ML/yr over the life of the Project, with a maximum annual seepage rate of 2,093 ML/yr in Year 18.

The Project will reduce the water pressure (depressurise) in the bedrock around the proposed open cut mining areas. The depressurisation is predicted to be greatest adjacent to the proposed mining areas, and gradually reduces with distance. The model predicts the depressurisation will reduce water levels by less than 2 m at private bores, which is below the minimal harm criteria in the Aquifer Interference Policy.

The model predicts the reduced pressure in the bedrock will reduce the rate of flow of groundwater from the bedrock, into the overlying alluvium. This effectively reduces the rate of recharge to the alluvium. The model predicts the rate of groundwater flow from the bedrock into the overlying alluvial formations will reduce by an average of 153 ML/year over the life of the Project with a peak of 295 ML/year. Groundwater may also need to be pumped directly from the alluvial aquifer by a bore field designed to obtain 'make up' water to cover a potential shortfall required for the washing of the coal product. The model contained 15 wells to supply the make-up water which peaks at 1172 ML/year during year 4, then reducing as inflows to the underground mine increase over time. KEPCO Bylong Australia Pty Ltd has secured 2,535 units of water allocation from the Bylong Water Source under the Hunter Unregulated Water Sharing Plan and therefore hold holds entitlements to account for its groundwater take even if the available water determination (AWD) reduces to less than 80%.

Post mining, the backfilled open cut mining areas will fill with rainfall seepage and groundwater, and the predicted flow rate from the Permian to the overlying alluvium increases and returns to pre-mining rates over time. This will mean there is no long-term zone of depressurisation generated around the mining areas. A salt balance suggests that there is potential for the Project to slightly increase the salt load to the alluvial aquifer and the connected surface water, however the beneficial use of the water that is suitable for agriculture will not change.

A program for groundwater monitoring during and post mining was developed. The monitoring program includes routine testing of water levels, quality and flows to determine the influence of the mining on the groundwater regime. The monitoring data will be used to verify the predictions of the numerical model at regular intervals over time. If the observations diverge from the predictions made during the EIS, the model will be recalibrated and updated forecasts provided.

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Report on

Bylong Coal Project

Groundwater Impact Assessment

1 Introduction

KEPCO Bylong Australia Pty Ltd (KEPCO) is planning to develop an open cut and underground coal mine in the Bylong Valley (the Project), which is located in Mid-Western Region of New South Wales (NSW).

Hansen Bailey Pty Ltd (Hansen Bailey) engaged Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) to assess groundwater issues for the Project on behalf of their client Worley Parsons Services Pty Ltd (WorleyParsons). The Project has been subject to two levels of assessment, according to the NSW Regulatory Regime. The first was an initial groundwater assessment addressing the requirements of the NSW Gateway Certificate Assessment process. This included a field investigation program and developing a simple numerical groundwater flow model (AGE, 2013). The Mining and Petroleum Gateway Panel (Gateway Panel) recommended further investigative work during the EIS to reduce uncertainties in the Project impacts.

This report represents the second stage of work and outlines the groundwater impact assessment prepared for the Environmental Impact Statement (EIS). It documents further field investigations and a more detailed numerical model developed to assess the impacts of the Project, and also includes relevant information collected during the Gateway Certificate Assessment process.

2 Project description

2.1 Background

In December 2010 KEPCO Bylong Australia Pty Ltd (KEPCO) acquired Authorisations

(A) 287 and 342. Since this time, extensive exploration and mine planning work has been undertaken to determine the most socially responsible and economically viable mine plan to recover the known coal resources within the two Authorisations.

In August 2014 KEPCO commissioned WorleyParsons Services Pty Ltd (WorleyParsons) to manage the Project exploration activities, mine feasibility study planning, environmental approvals and ongoing environmental monitoring for the Bylong Coal Project (the Project).

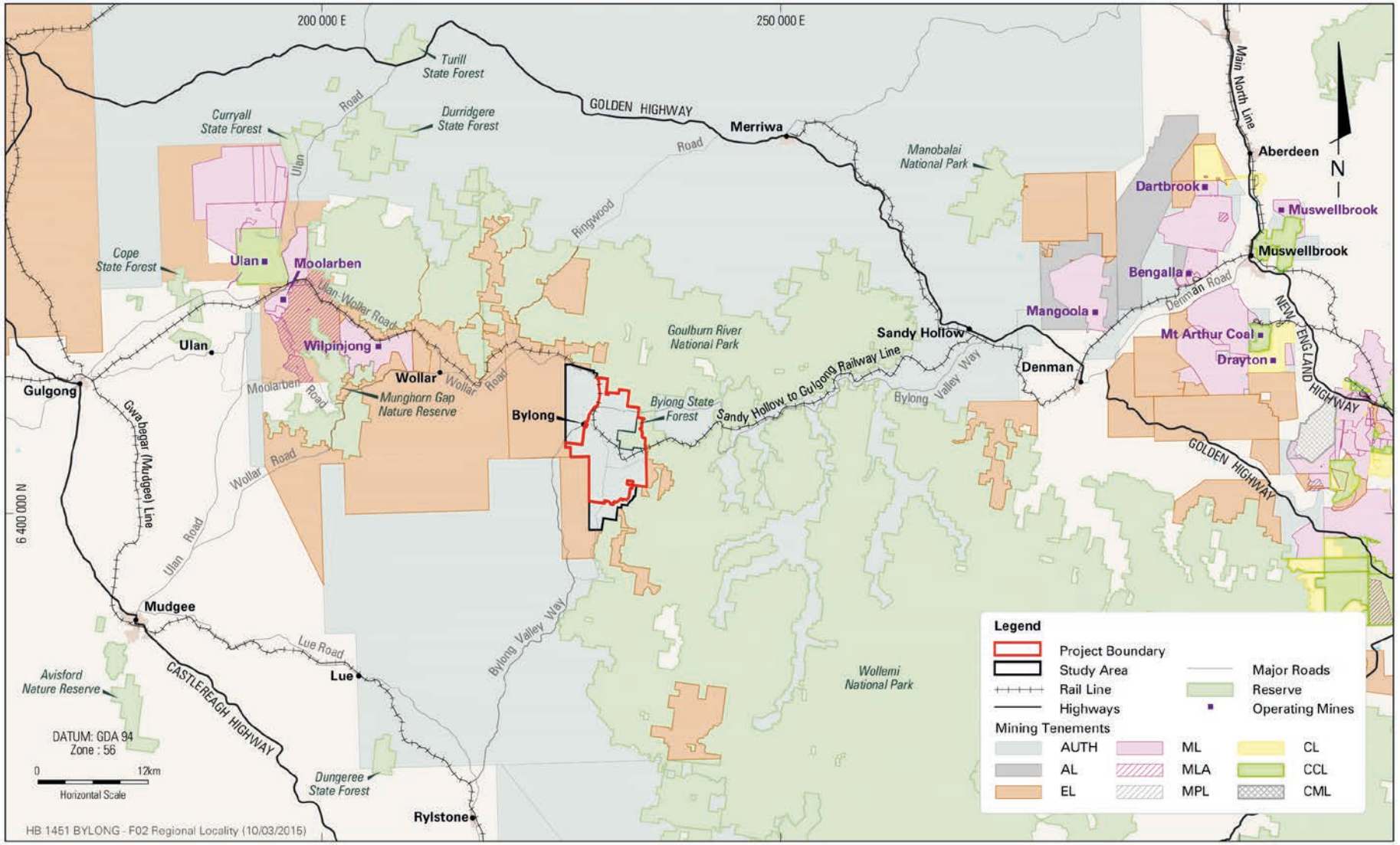
The Project is located wholly within A287 and A342 which are located within the Mid-Western Regional Council (MWRC) Local Government Area (LGA). The closest regional centre is Mudgee, located approximately 55 km south-west of the Project Boundary. The Project is approximately 230 km by rail from the Port of Newcastle. Figure 2-1 illustrates the locality of the Project within New South Wales (NSW). Figure 2-1 shows the regional locality of the Project in relation to the neighbouring town centres, mining authorities, major transport routes and reserves.

KEPCO is seeking State Significant Development Consent under Division 4.1 of Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the development and operation of the Project. The State Significant Development Application will be supported by an Environmental Impact Statement (EIS) which is being prepared by Hansen Bailey.

BYLONG COAL PROJECT

Locality Plan

Figure 2.1



BYLONG COAL PROJECT

Regional Localilty

Figure 2.2

2.2 Project description

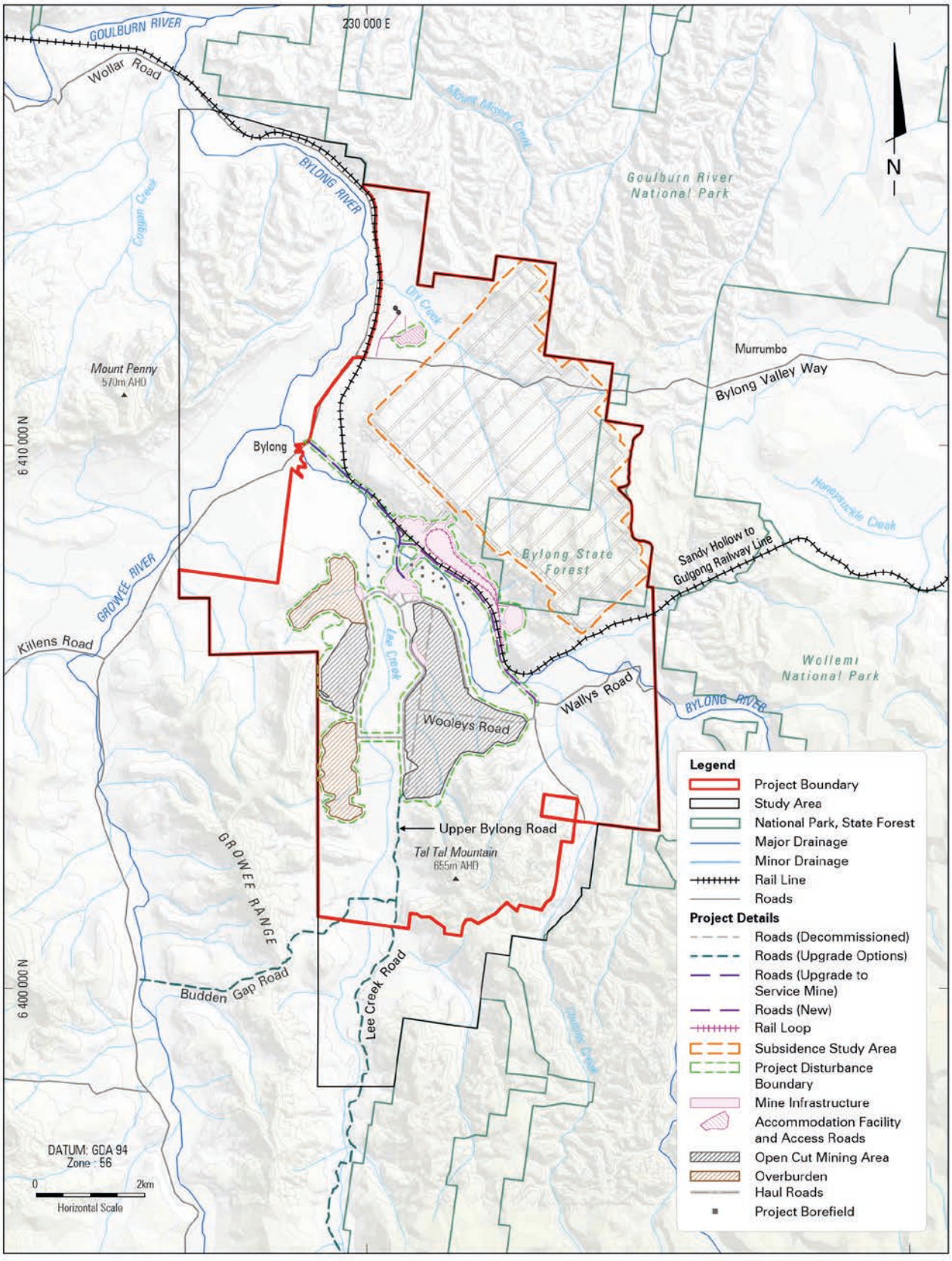
The Project life is anticipated to be approximately 25 years, comprising a two year construction period and a 23 year operational period, with underground mining operations commencing in Year 7. Various rehabilitation and decommissioning activities will be undertaken during both the course of, and following the 25 years of the Project. It is noted that further mineable coal resources exist within both A287 and A342.

The Project is to be developed on land within the Project Boundary as illustrated on Figure 2-3. Key features of the Project are conceptually shown on Figure 2-3 and include:

- the initial development of two open cut mining areas with associated haul roads and Overburden Emplacement Areas (OEAs), utilising a mining fleet of excavators and trucks and supporting ancillary equipment;
- the two open cut mining areas will be developed and operated 24 hours a day;
- 7 days a week over an approximate 10 year period and will ultimately provide for the storage of coal processing reject materials from the longer term underground mining activities;
- construction and operation of administration, workshop, bathhouse, explosives magazine and other open cut mining related facilities;
- construction and operation of an underground coal mine operating 24 hours a day, 7 days a week for a 20 year period, commencing mining in around year 7 of the Project;
- a combined maximum extraction rate of up to 6.5 Million tonnes per annum (Mtpa) Run of Mine (ROM) coal;
- a workforce of up to approximately 800 during the initial construction phase and a peak of 470 full-time equivalent operations employees at full production;
- underground mining operations utilising longwall mining techniques with primary access provided via drifts constructed adjacent to the rail loop and Coal Handling and Preparation Plant (CHPP);
- the construction and operation of facilities to support underground mining operations including personnel and materials access to the underground mining area, ventilation shafts, workshop, offices and employee amenities, fuel and gas management facilities;
- construction and operation of a CHPP with a designed throughput of approximately 6 Mtpa of ROM coal, with capacity for peak fluctuations beyond this;
- the dewatering of fine reject materials through belt press filters within the CHPP and the co-disposal of dewatered fine and coarse reject materials within OEAs and final open cut voids (avoiding the need for a tailings dam);
- construction and operation of a rail loop and associated rail load out facility and connection to the Sandy Hollow to Gulgong Railway Line to facilitate the transport of product coal;
- the construction and operation of surface and groundwater management and water reticulation infrastructure including diversion drains, dams (clean, dirty and raw water), pipelines and pumping stations;
- the installation of communications and electricity reticulation infrastructure;
- construction and operation of a Workforce Accommodation Facility (WAF) and associated access road from the Bylong Valley Way;

- the upgrade of Upper Bylong Road and the construction and operation of a Mine Access Road to provide access to the site facilities;
- relocation of sections of some existing public roads to enable alternate access routes for private landholders surrounding the Project; and
- infilling of mining voids, progressive rehabilitation of disturbed areas, decommissioning of Project infrastructure and rehabilitation of the land progressively following mining operations.

Figure 2-3 illustrates the conceptual project layout.



BYLONG COAL PROJECT

Conceptual Project Layout

Figure 2.3

3 Objectives and scope of work

The objective of the Groundwater Impact Assessment was to address:

- requirements provided by the Gateway Panel and government departments during the process for seeking Gateway Certificate for the Project;
- NSW and Federal Government policy; and
- The Department of Planning and Environment (DP&E) Secretary's Environmental Assessment Requirements (SEARs).

Appendix A contains tables that present the requirements for the groundwater study from each government department, and shows where each requirement was addressed within this report. The following government agencies provided requirements for the groundwater study:

- Section A1.1 Secretary's Environmental Assessment Requirements:
  - Section A1.1.1 Department of Planning and Environment;
  - Section A1.1.2 NSW Office of Water (NOW);
  - Section A1.1.3 NSW Office of Resources and Energy;
  - Section A1.1.4 NSW Environment Protection Authority (EPA); and
  - Section A1.1.5 NSW Office of Environment and Heritage.
- Section A1.2 Gateway Panel requirements:
  - Section A1.2.1 Gateway Panel Certificate;
  - Section A1.2.2 NSW Office of Water; and
  - Section A1.2.3 Independent Expert Scientific Committee (IESC).
- Section A1.3 Local government:
  - Section A1.3.1 Mid-Western Regional Council.
- Section A1.4 Federal Government:
  - Section A1.4.1 Department of the Environment; and
  - Section A1.4.2 Independent Expert Scientific Committee (IESC).

4 Legislation, policy and guidelines

The Project will need to consider the requirements of the following NSW legislation, policy and guidelines for groundwater:

- Water Act 1912;
- Water Management Act 2000 (WM Act);
- Water Sharing Plan for Hunter Unregulated and Alluvial Water Sources;
- Groundwater Quality Protection Policy;
- Groundwater Dependent Ecosystems Policy;
- Groundwater Quantity Management Policy;
- Aquifer Interference Policy (AIP);
- Strategic Regional Landuse Policy (SRLU Policy); and
- Strategic Regional Landuse Plan – Upper Hunter.

Sections below summarise the intent of the above legislation, policy and guidelines and how they apply to the Project.

4.1 Water Act 1912

The NSW Water Act 1912 regulates water sources including rivers, lakes and groundwater aquifers across the State. It also manages the trade of water licences and allocations. However, the Water Act 1912 does not apply to any part of the State to which is covered by a Water Sharing Plan (WSP) and the equivalent parts of the Water Management Act 2000 applies (see sections 27A and 129A).

The Water Management Act 2000 is progressively replacing the Water Act 1912 in NSW. The Water Management Act 2000 has replaced the Water Act 1912 for the alluvial water sources and surface water regime, but remains in place outside the alluvial zones.

Seepage of groundwater to the proposed mining areas from the Permian and Triassic groundwater regime requires an aquifer access licence under Part 5 of the Water Act 1912.

4.2 Water Management Act 2000

The NSW Water Management Act 2000 is an Act to provide for the *"protection, conservation and ecologically sustainable development of the water sources of the State"*. The Water Management Act 2000 provides clear arrangements for controlling land based activities that affect the quality and quantity of the State's water resources. It provides for three primary types of approval in Part 3:

- water use approval – which authorise the use of water at a specified location for a particular purpose, for up to 10 years;
- water management work approval; and
- controlled activity approval which includes an aquifer interference activity approval – which authorises the holder to conduct activities that affect an aquifer such as approval for activities that intersect groundwater, other than water supply bores and may be issued for up to 10 years.

Section 9 of the Water Management Act 2000 provides that the Act must be administered so as to *"promote the water management principles"* of the Act. The Water Management Principles (set out in Section 5 of the Act) incorporate that in relation to controlled activities:

a) the carrying out of controlled activities must avoid or minimise land degradation, including soil erosion, compaction, geomorphic instability, contamination, acidity, waterlogging, decline of native vegetation or, where appropriate, salinity and, where possible, land must be rehabilitated; and

b) the impacts of the carrying out of controlled activities on other water users must be avoided or minimised.

4.3 Water sharing plans

NSW Water Sharing Plans (WSPs) establish rules for sharing water between the environmental needs of the river or aquifer and water users, and between different types of water use such as town supply, rural domestic supply, stock watering, industry and irrigation.

NOW are progressively developing WSPs for rivers and groundwater systems across NSW following the introduction of the Water Management Act 2000. The purposes of these plans are to protect the health of rivers and groundwater, while also providing water users with perpetual access licences, equitable conditions, and increased opportunities to trade water through separation of land and water.

One WSP applies to the area of aquifers and surface waters which are affected by the Project. This is the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 (Hunter Unregulated WSP). The Hunter Unregulated WSP includes the unregulated rivers and creeks within the Hunter River catchment, the highly connected alluvial groundwater (above the tidal limit), and the tidal pool areas. In total there are 39 water sources covered by the Hunter Unregulated WSP and nine of these are further sub-divided into management zones. The Project is located within the Goulburn Extraction Management Unit within the Bylong River management zone.

4.4 State Groundwater Policy

4.4.1 Aquifer Interference Policy

The Water Management Act 2000 defines an aquifer interference activity as that which involves any of the following:

- penetration of an aquifer;
- interference with water in an aquifer;
- obstruction of the flow of water in an aquifer;
- taking of water from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations; and
- disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

Examples of aquifer interference activities include mining, coal seam gas extraction, injection of water, and commercial, industrial, agricultural and residential activities that intercept the water table or interfere with aquifers.

The Aquifer Interference Policy (AIP) (Department of Primary Industries (2012) states that "*all water taken by aquifer interference activities, regardless of quality, needs to be accounted for within the extraction limits defined by the water sharing plans. A water licence is required under the WM Act (unless an exemption applies or water is being taken under a basic landholder right) where any act by a person carrying out an aquifer interference activity causes:*

- *the removal of water from a water source; or*
- *the movement of water from one part of an aquifer to another part of an aquifer; or*
- *the movement of water from one water source to another water source, such as:*
    - *from an aquifer to an adjacent aquifer; or*
    - *from an aquifer to a river/lake; or*
    - *from a river/lake to an aquifer. "*

Predictions need to be carried out to assess the likely volume of water taken from a water source(s) as a result of an aquifer interference activity. These predictions need to occur prior to Development Consent approval. After Development Consent approval and during operations, these volumes need to be measured and reported in the Annual Review. The water access licence must hold sufficient share component and water allocation to account for the take of water from the relevant water source at all times.

The AIP states that a water licence is required for the aquifer interference activity regardless of whether water is taken directly for consumptive use or incidentally. Activities may induce flow from adjacent groundwater sources or connected surface water. Flows induced from other water sources also constitute take of water. In all cases, separate access licences are required to account for the take from all individual water sources.

In addition to the volumetric water licensing considerations, the AIP requires details of potential:

- *"water level, quality or pressure drawdown impacts on nearby water users who are exercising their right to take water under a basic landholder right;*
- *water level, quality or pressure drawdown impacts on nearby licensed water users in connected groundwater and surface water sources;*
- *water level, quality or pressure drawdown impacts on groundwater dependent ecosystems;*
- *increased saline or contaminated water inflows to aquifers and highly connected river systems;*
- *to cause or enhance hydraulic connection between aquifers; and*
- *for river bank instability, or high wall instability or failure to occur."*

In particular, the AIP describes minimal impact considerations for aquifer interference activities based upon whether the water source is highly productive or less productive and whether the water source is alluvial or porous / fractured rock in nature. In general, the AIP applies a predicted 2 m drawdown maximum limit at existing groundwater users accessing sub-artesian groundwater.

4.4.2 Groundwater quality protection

The NSW Groundwater Quality Protection Policy (1998), states that the objectives of the policy will be achieved by applying the management principles listed below:

- *"All groundwater systems should be managed such that their most sensitive identified beneficial use (or environmental value) is maintained.*
- *Town water supplies should be afforded special protection against contamination.*
- *Groundwater pollution should be prevented so that future remediation is not required.*
- *For new developments, the scale and scope of work required to demonstrate adequate groundwater protection shall be commensurate with the risk the development poses to a groundwater system and the value of the groundwater resource.*
- *A groundwater pumper shall bear the responsibility for environmental damage or degradation caused by using groundwaters that are incompatible with soil, vegetation and receiving waters.*
- *Groundwater dependent ecosystems will be afforded protection.*
- *Groundwater quality protection should be integrated with the management of groundwater quality.*
- *The cumulative impacts of developments on groundwater quality should be recognised by all those who manage, use, or impact on the resource.*
- *Where possible and practical, environmentally degraded areas should be rehabilitated and their ecosystem support functions restored."*

4.4.3 Groundwater dependent ecosystems

The NSW Groundwater Dependent Ecosystems Policy (DLWC 2002) is specifically designed to protect valuable ecosystems which rely on groundwater for survival so that, wherever possible, the ecological processes and biodiversity of these dependent ecosystems are maintained or restored for the benefit of present and future generations. The policy defines Groundwater Dependent Ecosystems (GDEs) as "*communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater*".

Five management principles establish a framework by which groundwater is managed in ways that ensure, whenever possible, that ecological processes in dependent ecosystems are maintained or restored. A summary of the principles follows:

- GDEs can have important values. Threats should be identified and action taken to protect them;
- groundwater extractions should be managed within the sustainable yield of aquifers;
- priority should be given to GDEs, such that sufficient groundwater is available at all times to meet their needs;
- where scientific knowledge is lacking, the precautionary principle should be applied to protect GDEs; and
- planning, approval and management of developments should aim to minimise adverse effects on groundwater by maintaining natural patterns, not polluting or causing changes to groundwater quality and rehabilitating degraded groundwater ecosystems where necessary.

4.4.4 Groundwater quantity management

The objectives of managing groundwater quantity in NSW are to (NOW 2012a):

- *"achieve the efficient, equitable and sustainable use of the State's groundwater;*
- *prevent, halt and reverse degradation of the State's groundwater and their dependent ecosystems;*
- *provide opportunities for development which generate the most cultural, social and economic benefits to the community, region, state and nation, within the context of environmental sustainability; and*
- *involve the community in the management of groundwater resources."*

5 Regional setting

5.1 Location

The Project is located wholly within the A287 and A342 in the western coalfield of NSW. The closest regional centre is Mudgee, located approximately 55 km southwest of the Project Boundary. The small settlement of Bylong Village is located to the northwest of the Project Boundary. Figure 2-1 shows the Project and the regional centres, with Figure 5-5 providing the Project layout and locations of the proposed mining areas.

5.2 Landuse

The major industries in the region are agriculture, mining and tourism. A number of operational coal mines exist in the Western Coalfields which target the same coal seams as the Project. Active mines in the region are Moolarben, Ulan and Wilpinjong Mines. These mines are located west of the Project and despatch coal via the Sandy Hollow to Gulgong Railway and then onto the Main Northern Railway Line at Muswellbrook to the Port of Newcastle.

5.3 Climate

The climate in the Bylong valley region is typical of temperate areas and is characterised by hot dry summers dominated by thunderstorms and cold winters with frequent frosts. Two long standing Bureau of Meteorology (BOM) rainfall gauges are located in proximity to the Project, one in the township of Wollar about 16 km to the west, and a second at Nullo Mountain 28 km south southwest.

The Wollar Station (BOM Station No. 62032) has the longest record of daily rainfall commencing in 1901. The average total annual rainfall for this station is 588.9 mm. Most rainfall occurs in summer with the lowest rainfall during winter. The Nullo Mountain Station (Station No. 062100) is located at an elevation of 1130 m and commenced recording in 1998. The mean rainfall over this period is significant higher than Wollar at 946.5 mm. Table 5.1 summarises the monthly mean rainfall for both recording stations.

Table 5.1 Mean monthly rainfall

Month	Wollar Station	Nullo Mountain Station
January	66.1	92.3
February	62.8	108.9
March	52.6	89.1
April	38.9	56.8
May	37.8	58.4
June	44.2	77.5
July	42.6	62
August	41.2	57.2
September	40.6	65.6
October	51.2	71
November	55.7	104.2
December	59	90.6
Annual	**588.9**	**946.5**

In order to place recent rainfall years into an historical context, the Cumulative Rainfall Departure (CRD) was calculated. This is a summation of the monthly departures of rainfall from the long-term average monthly rainfall. A positive slope in the CRD plot indicates periods of above average rainfall, whilst a negative slope indicates periods when rainfall is below average. Figure 5-1 shows the calculated CRD for Wollar Station.

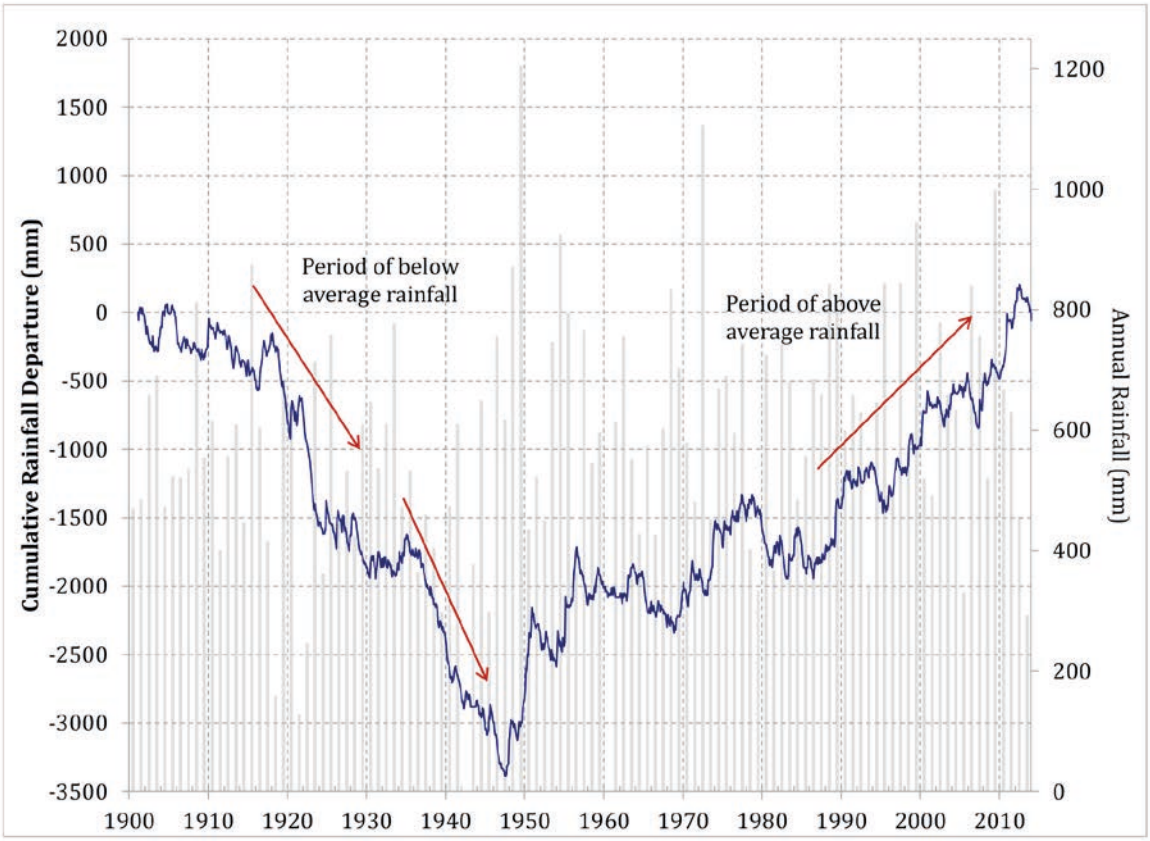
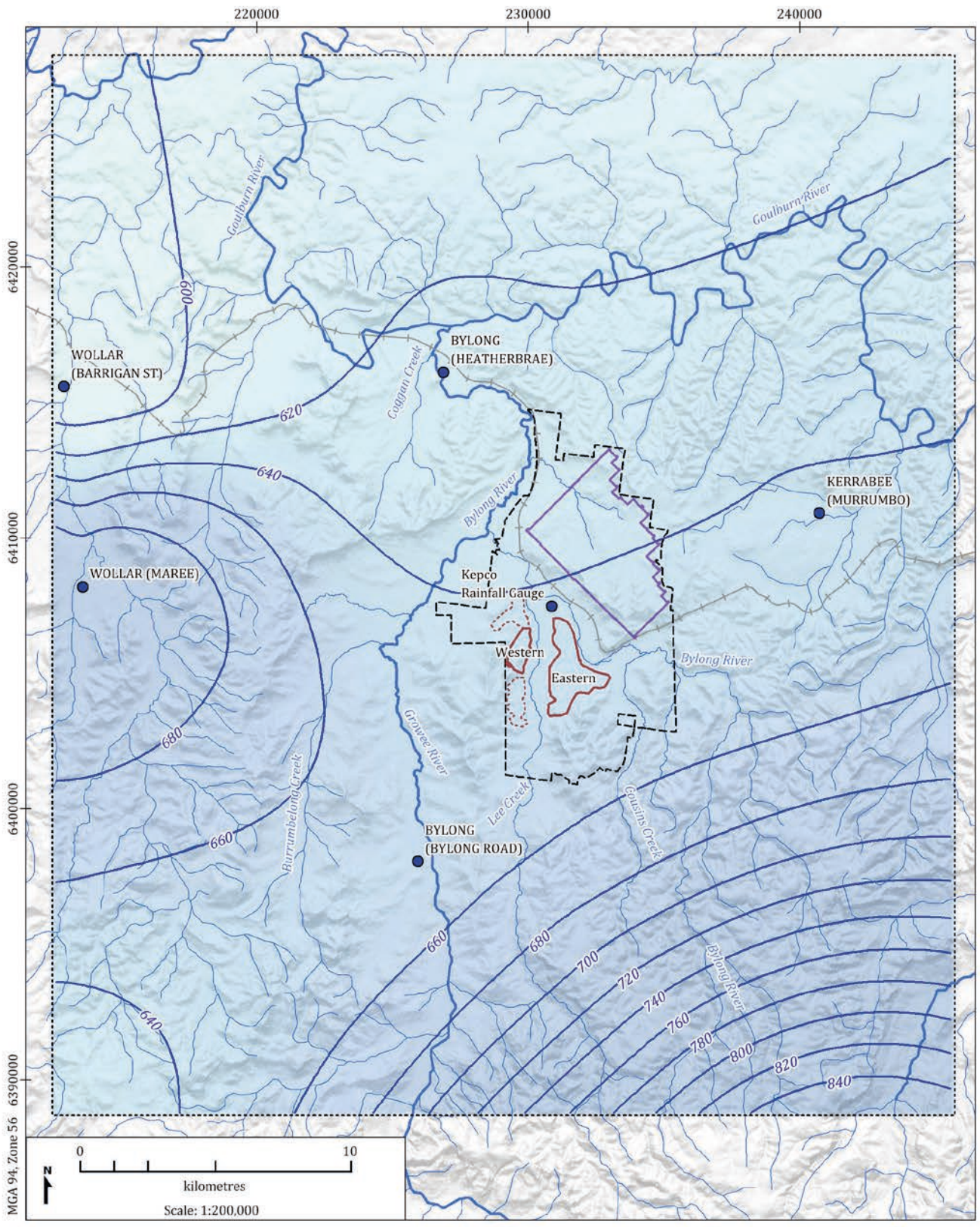


Figure 5-1 Cumulative rainfall departure – Wollar Station No. 62032

The CRD chart for the Wollar Station is unique in that it indicates an extended period of above average rainfall from the 1950s onwards as observed by the overall positive slope during this period. This extended period of above average rainfall is interspersed with short periods of below average rainfall as shown by a declining to static CRD. The general trend over the preceding 50 years, prior to the 1950's, was characterised by below average rainfall.

Figure 5-2 shows interpolated average annual rainfall across the Project region. The figure shows the higher average rainfall in the elevated country to the southeast, reducing to the north and northwest.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Model boundary
- Rainfall station
- Rainfall contour (mm/a)
- Major drainage
- Minor drainage
- Railway

Bylong Coal Project (G1606)

Annual average rainfall distribution

DATE: 10/2/2015

FIGURE No: **5.2**

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Local scale rainfall data is available for a rain gauge installed within the Project Boundary in November 2011. Figure 5-3 shows the rainfall records and infilled data from surrounding rainfall gauges when records are missing. The available data highlights the heavy rainfall during late 2011 to mid-2012, and generally drier conditions since this time (~500 mm/year).

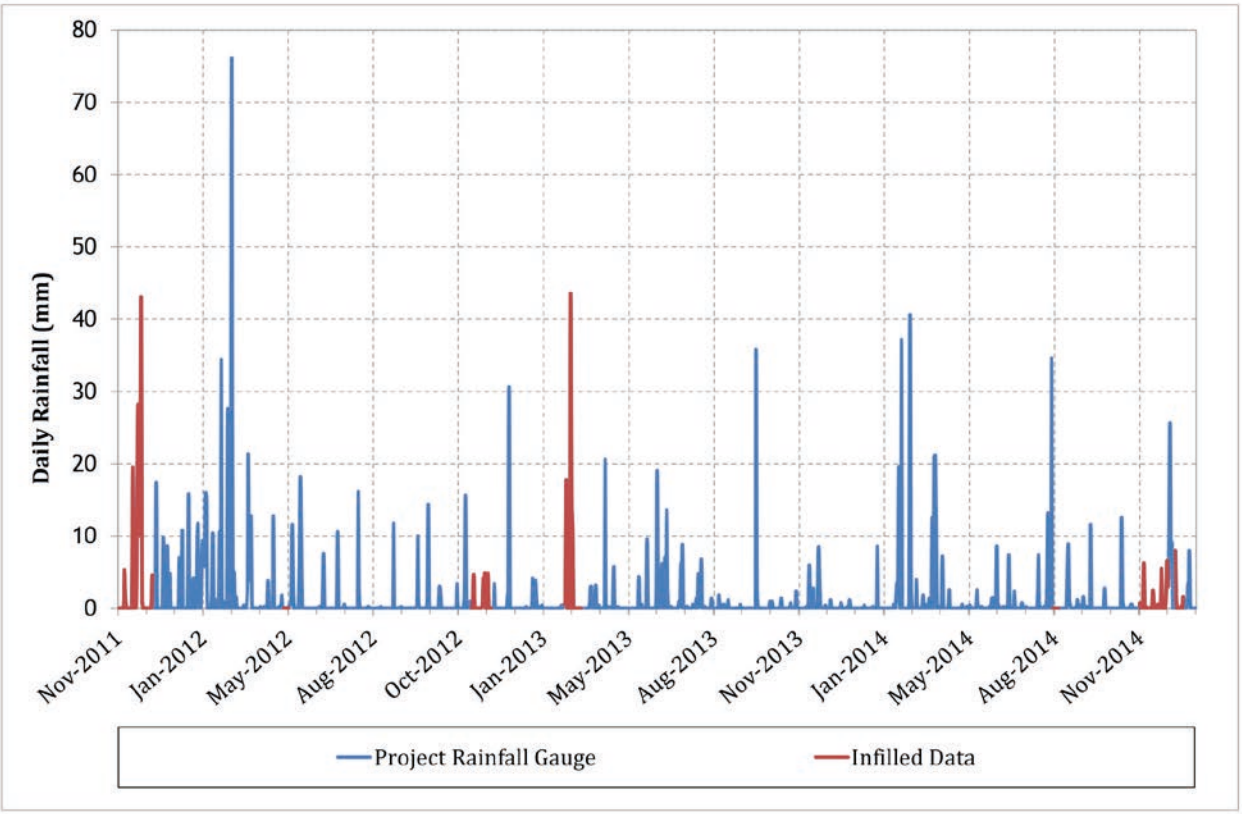


Figure 5-3 Daily rainfall for Project site

Evaporation in the Project Boundary is generally higher than rainfall. The actual pan evaporation[1] is in the order of 1,700 mm/year with the annual average evapotranspiration[2] some 500 mm/year. Figure 5-4 shows that annual areal potential evapotranspiration[3] varies between 1,280 mm/year to 1,340 mm/year.

5.4 Topography and drainage

Figure 5-6 presents the drainage lines and regional topography, which is based on LIDAR[4] information collected within the Authorisations and 30 m SRTM[5] Digital Elevation data outside.

The topography within the Authorisations is characterised by rugged ridges, sandstone escarpments, plateaus and steep hills, incised by thin gently sloping valleys. The escarpments can reach 940 mAHD, with the gently sloping valleys falling from 440 mAHD down to 240 mAHD over the northern portion of the Authorisations. The watercourses drain to the northeast to the Goulburn River.

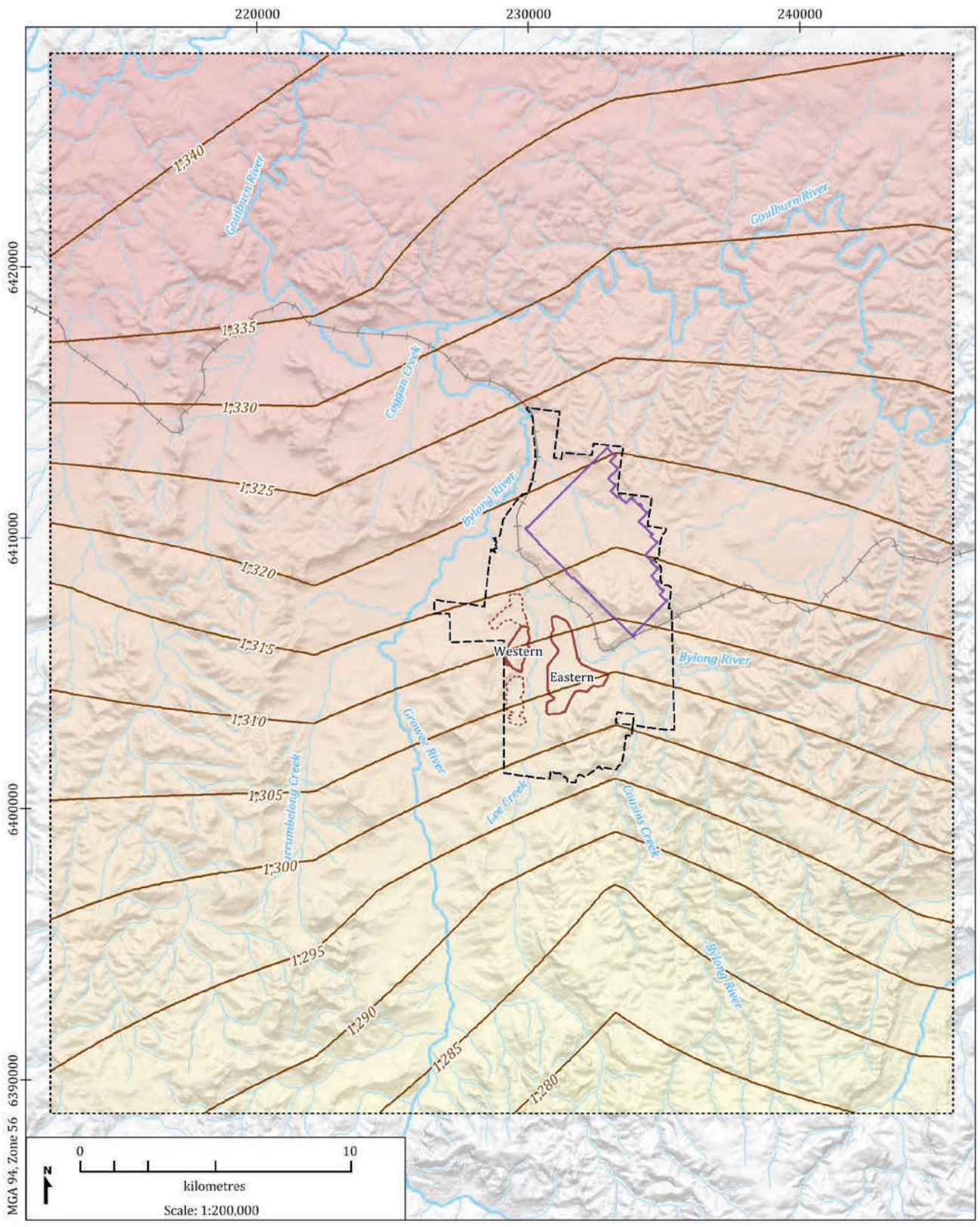
[1] http://www.bom.gov.au/jsp/ncc/climate_averages/evaporation/index.jsp

[2] http://www.bom.gov.au/jsp/ncc/climate_averages/evapotranspiration/index.jsp

[3] Areal Potential ET is the ET that would take place, under the condition of unlimited water supply, from an area so large that the effects of any upwind boundary transitions are negligible and local variations are integrated to an areal average".

[4] Light Detection and Ranging

[5] Shuttle Radar Topography Mission



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Model boundary
- Potential evapotranspiration contour (mm/a)
- Major drainage
- Minor drainage
- Railway

Bylong Coal Project (G1606)

Areal potential evapotranspiration

DATE: 10/2/2015

FIGURE No: **5.4**

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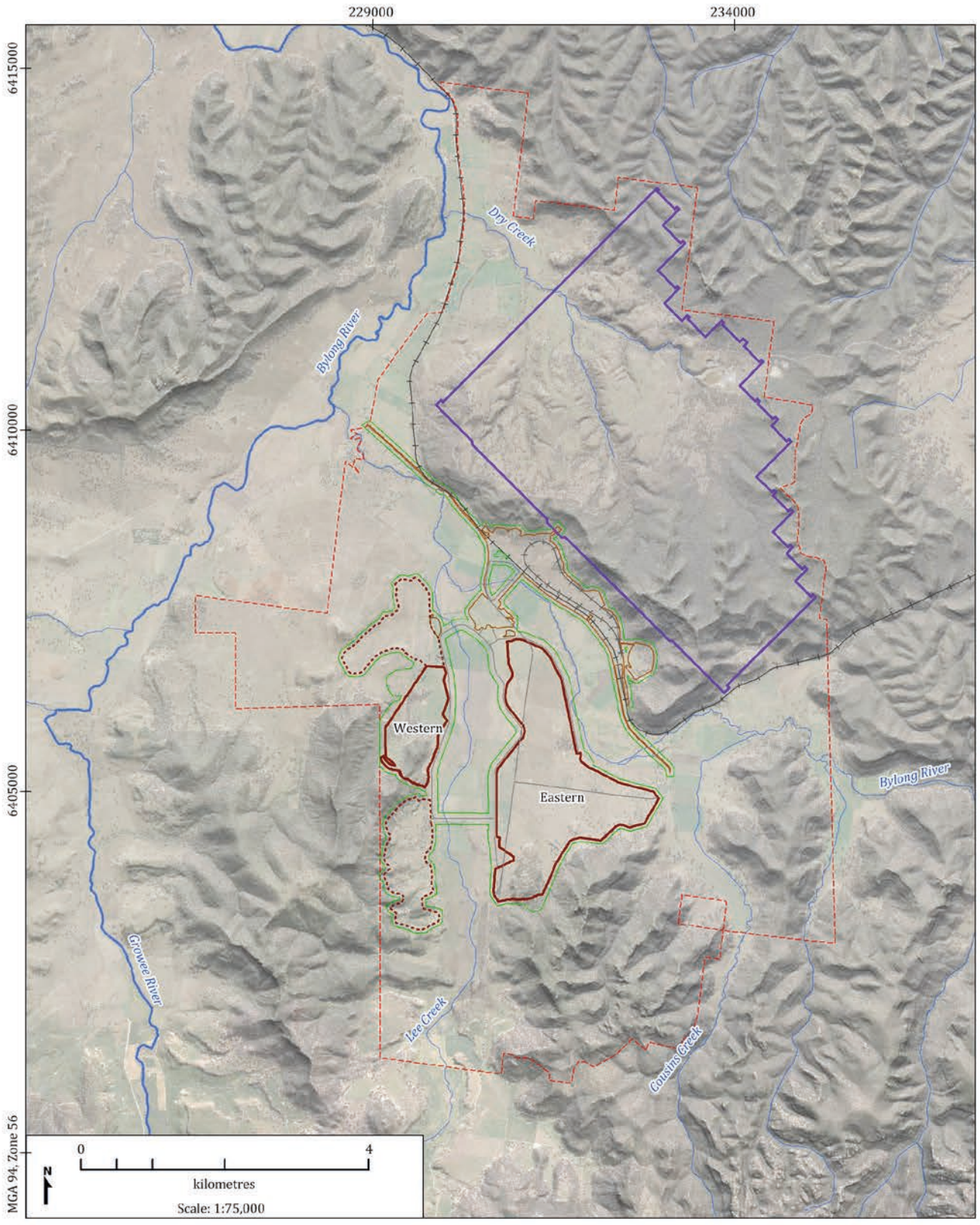

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage

Bylong Coal Project (G1606)

Project layout

DATE: 11/5/2015

FIGURE No: **5.5**

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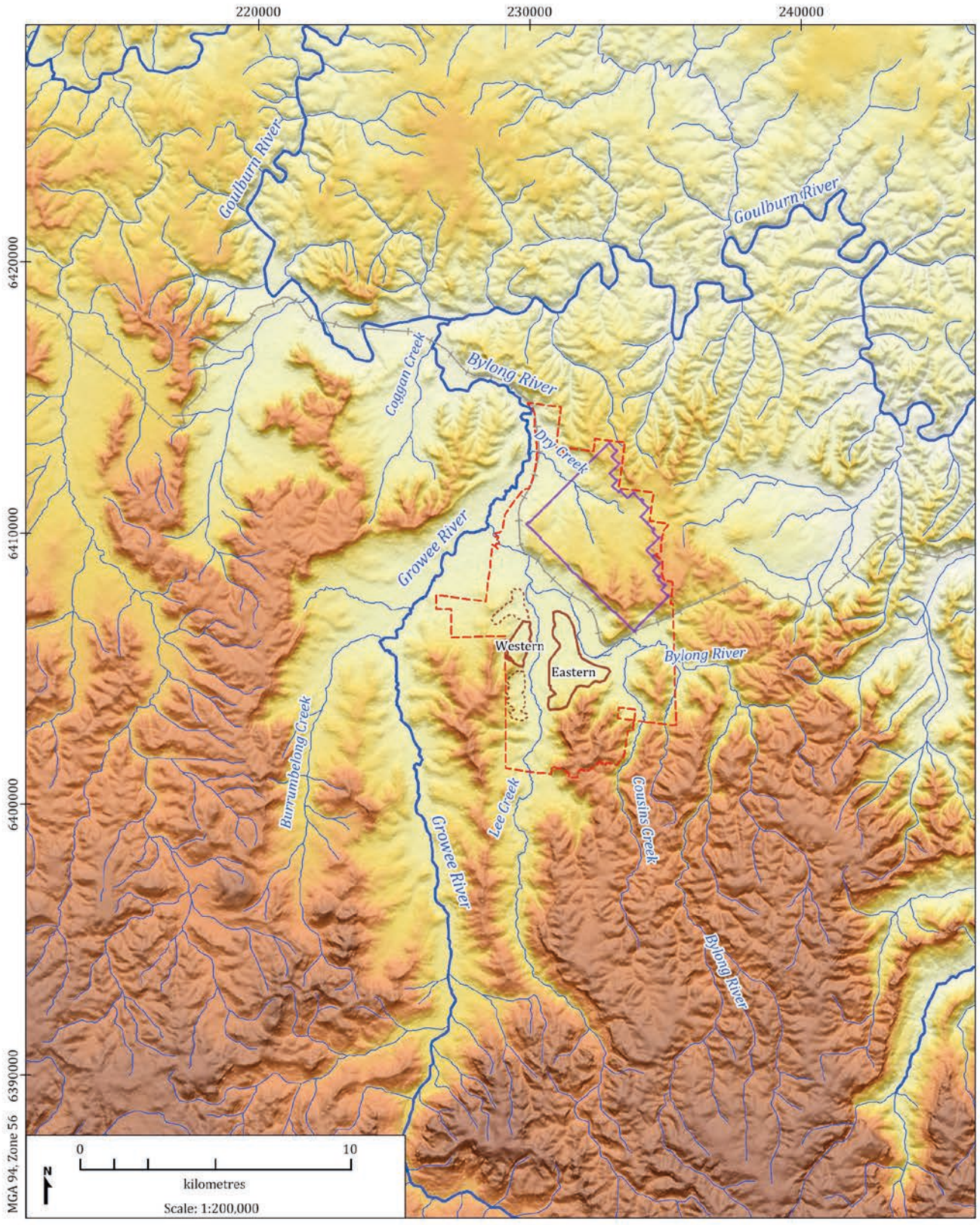

LEGEND:

- Project boundary
- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Major drainage
- Minor drainage
- Railway

Elevation (mAHD)

- 1,250
- 800
- 500
- 400
- 300
- 150

Bylong Coal Project (G1606)

Terrain and drainage

DATE: 10/2/2015

FIGURE No: **5.6**

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The Project is located within a northerly draining Bylong River catchment, which flows towards the Goulburn River. The Goulburn River is a major perennial feature and flows to the east, north of A287 and A342. Figure 5-7 shows the Goulburn River north of Bylong, which is characterised by, incised, meandering streambeds.

Figure 5-7 Goulburn River immediately north of the Authorisations (23 August 2012)

The Bylong River catchment covers an area of approximately 700 km^2 and comprises agricultural properties on lower valley areas grazing livestock and cropping, and native forest in steeper rugged regions. The river flows from south to north through the Project area meeting the Goulburn River about 8 km north of the township of Bylong. There are several ephemeral minor creeks and streams in the exploration lease, including Crow's Nest Creek, Cousins Creek, Lee Creek, Growee River and Dry Creek.

Figure 5-8 shows the upper reaches of the Bylong River beside groundwater monitoring bore A20 and surface water monitoring location SW8. The Bylong River at this location is non-flowing, shallow at less than one metre deep, and is used as a water supply by the local landholder.

Figure 5-9 shows the crossing of Bylong River on Upper Bylong Road, looking upstream. This site is about 350 m upstream of the confluence with Lee Creek.

Figure 5-8 Pool in Bylong River headwaters looking northwest (23 August 2012)

Figure 5-9 Bylong River crossing along Upper Bylong Road looking upstream (23 August 2012)

Figure 5-10 shows the headwaters of Lee Creek on the southern portion of the Project Boundary. A minor flow was noted at the time of the photograph, but the watercourse is often dry in the lower sections.

Figure 5-10 Lee Creek headwaters looking north downstream (23 August 2012)

Figure 5-11 shows the central section of Growee River. This section of the Growee River is completely dry and is characterised by a very shallow and poorly defined drainage line across the floodplain.

Figure 5-11 Growee River looking north downstream (23 August 2012)

Figure 5-12 shows the upper section of Dry Creek. The majority of this section is completely dry and temporarily flows (> 1 day) after high rainfall events. There are no users extracting water from the river, or the weathered strata surrounding the creek line.

Figure 5-12 Upper reaches of Dry Creek – 16 December 2014

5.5 River and stream flows

Douglas Partners Pty Ltd (DP) installed three stream gauges to monitor key sub-catchments located as follows:

- SW4 – Bylong River downstream of the confluence with Growee River;
- SW8 - Bylong River downstream from the proposed Eastern Open Cut Mining Area and adjacent to the proposed underground extraction area; and
- SW9 - Lee Creek upstream of the proposed Open Cut Mining Areas.

Figure 6-1 shows the locations of the gauges. Douglas Partners (2013b, 2014a, 2014b) present graphs of water levels and flow rates recorded at each of the gauges since July 2012. Figure 5-13 also summarises this data. The data from the three stream gauges show that the river systems within the Project Boundary are ephemeral. The below average rainfall in 2013/2014 is also evident as gauges have not recorded flow in the rivers at SW4 and SW8 since late 2013. SW9 has only recorded flow following rainfall events with no baseflow. Interestingly the flow at the downstream gauge SW4 on the Bylong River does not report any increase in flow, compared to the upstream gauge SW8, suggesting subsurface flow through the alluvium increases downstream.

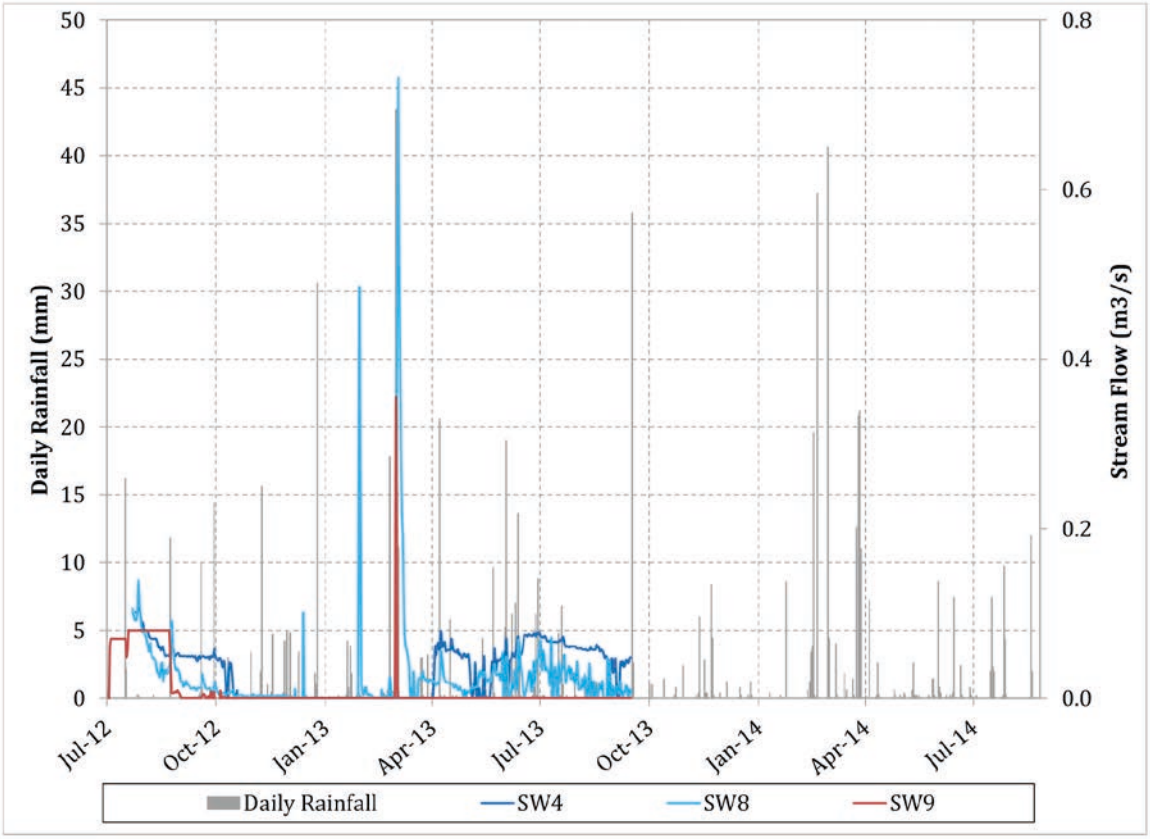


Figure 5-13 Stream flow and site rainfall

5.6 Geology

The Project is located within the Western Coalfields of the Sydney-Gunnedah Basin. Figure 5-14 summarises the stratigraphy of the area whilst Figure 5-15 presents the Singleton geological map showing the regional geology units that outcrop within the Authorisations.

5.6.1 Regional geology

The Late Permian Shoalhaven Group forms the sedimentary basement within the Authorisations consisting primarily of conglomerate, pebbly sandstone and sandstone. The Shoalhaven Group outcrops along the lower slopes of the Growee River catchment and in the upper reaches of Lee Creek.

The Permian Illawarra Coal Measures (ICM) overlies the Shoalhaven Group and contains the economic seams proposed to be mined. The dominant lithologies include mudstone, laminated siltstone, medium-grained quartz-lithic sandstone, lenses of polymictic conglomerate, coal, carbonaceous mudstone, rhyolitic tuff and sporadic torbanite. Thickness of the ICM varies across the Authorisations from 100 m to 200 m, thickening toward the east into the Sydney Basin trough. The ICM dip approximately 2° to the east and include (but not limited to) the following seams:

- Farmers Creek Seam;
- State Mine Creek Seam;
- Goulburn Seam;
- Glen Davis Seam;
- Irondale Seam;
- Ulan Seam; and
- Coggan Seam.

Overlying the ICM is a Triassic sequence consisting of the Narrabeen Group and the Hawkesbury Sandstone. The Hawkesbury Sandstone is overlain by the Wianamatta Group to the south, and the Digby and Napperby Formations in the north.

5.6.2 Local geology

Quaternary and Tertiary age alluvial sediments associated with local rivers and creeks infill the valley floors within and surrounding the Authorisations. Investigative drilling has shown that these sediments consist of an upper sand/silt/clay layer with a basal layer of gravelly sand. DP assessed the extent of colluvium and Quaternary alluvium using LIDAR digital elevation data, stereoscopic images and Cone Penetration Testing (CPT). Figure 5-16 shows the mapped extent of alluvium/colluvium.

Triassic igneous intrusions and Tertiary volcanic flows have been intersected within the exploration lease. The largest igneous intrusion in the area is the Coggan Sill, which covers an area of approximately 12 km in the southwest of the Authorisations.

The main economic coal seam within the Project Boundary is the Coggan Seam. Less than 10 m of interburden separates the Coggan Seam from the overlying Ulan Seam. The Coggan Seam consists predominantly of dull coal with minor bright bands and average ash content 9% to 30%. While the dip of the seam is gentle, the depth to the Coggan Seam varies across the lease from 0 m at outcrop, to 360 m due to the irregular topography. In the valleys around Dry Creek and the Bylong River, the depth to the Coggan Seam is less than 60 m. The thickness of the Coggan Seam varies from 2 m on the western margin of the lease, to 5 m near the eastern boundary.

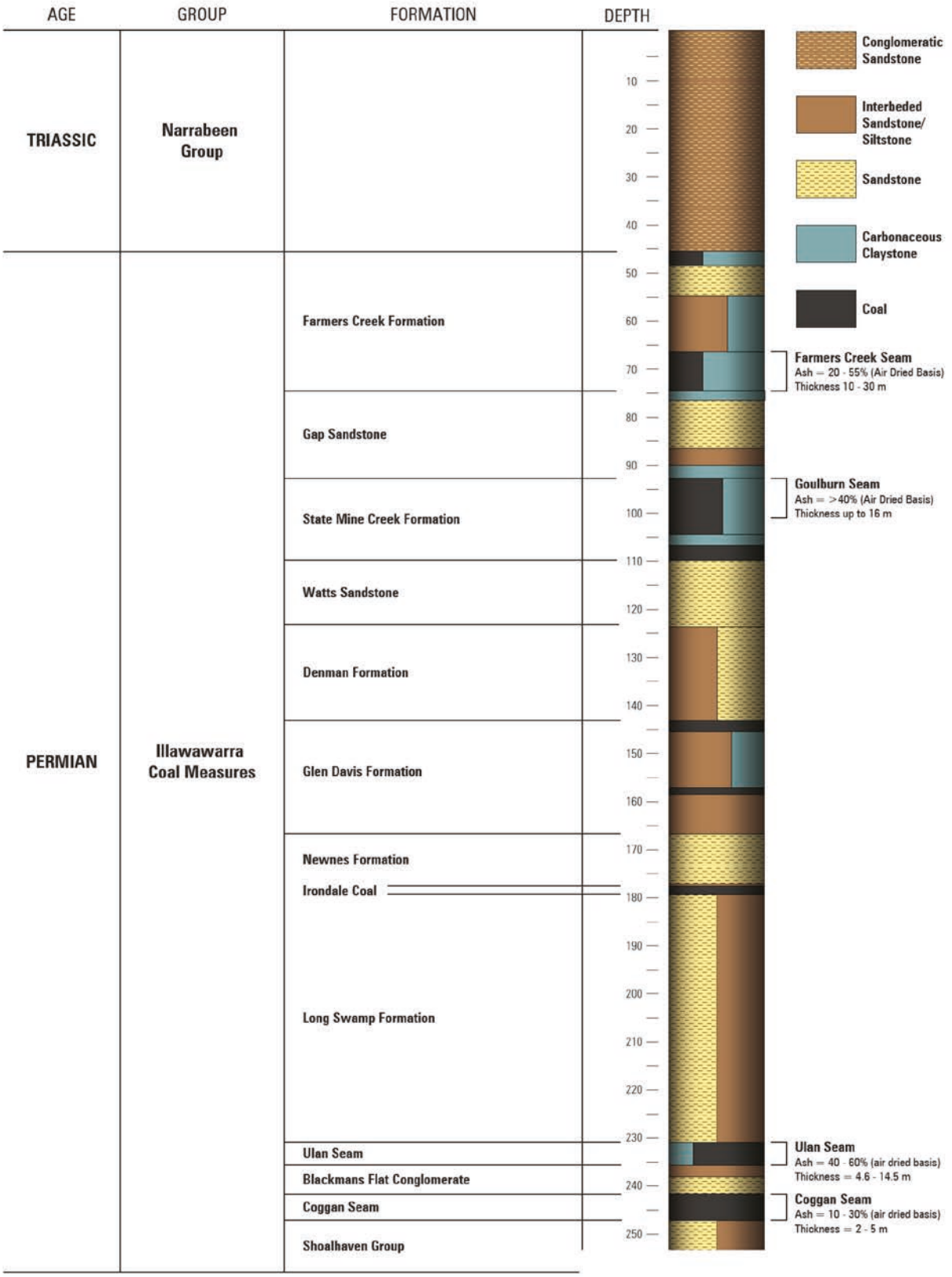
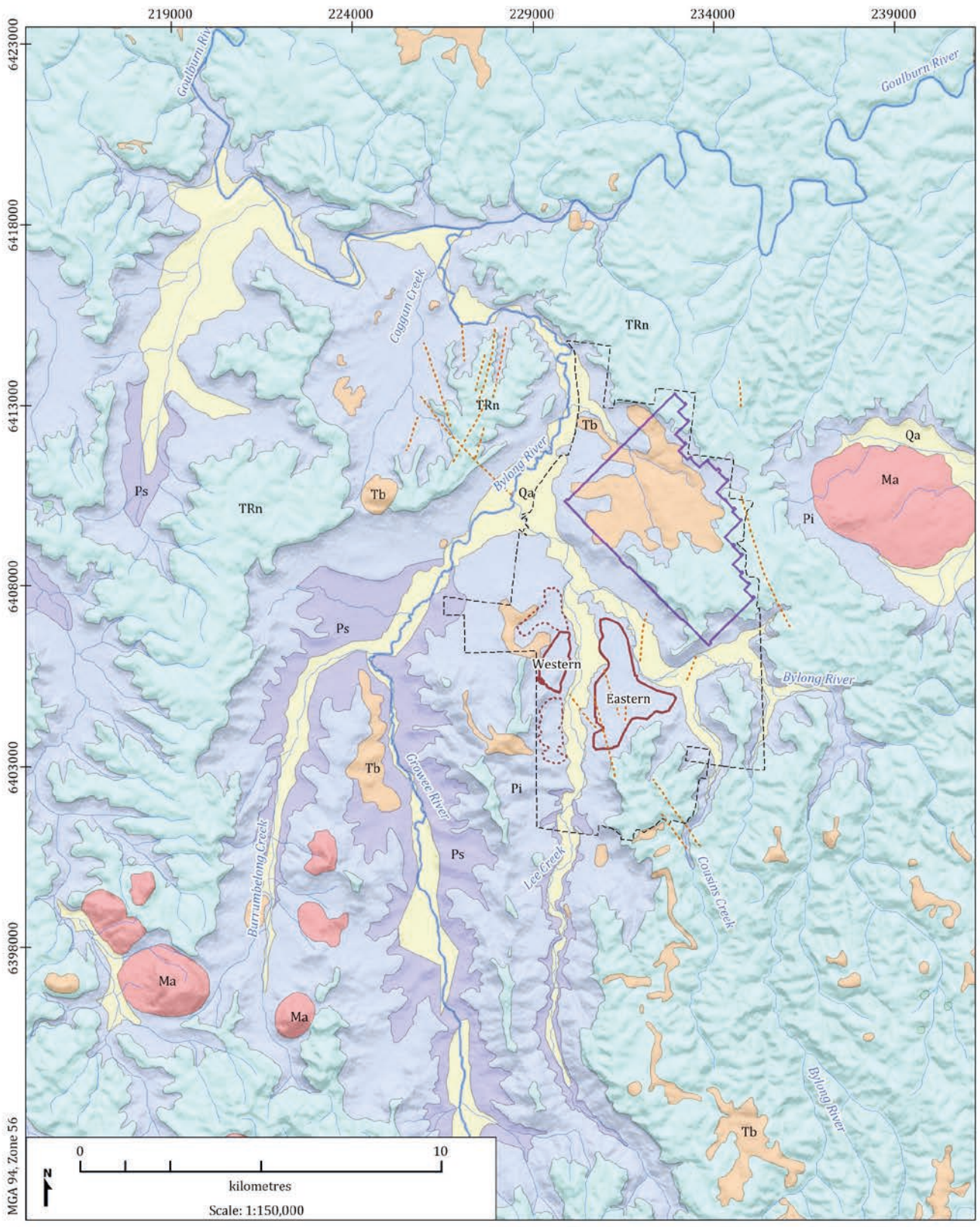


Figure 5-14 Stratigraphic Column (source: Hansen Bailey)



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Dyke
- Major drainage
- Minor drainage

Geology

- Qa - Quaternary - alluvium
- Tb - Tertiary - basalt
- Ma - Triassic - phonolite intrusion
- Mt - Triassic - tschenite intrusion
- TRn - Triassic - Narrabeen group
- Pi - Permian - Illawarra Coal Measures
- Ps - Permian - Shoalhaven group

* Geology - Western Coalfield (north) Regional 1:100 000 Geology Map, Geological Survey of New South Wales, Sydney; Updated using data sourced from Douglas Partners Alluvium Mapping 2014

Bylong Coal Project (G1606)

Geological map

DATE: 10/2/2015

FIGURE No: **5.15**

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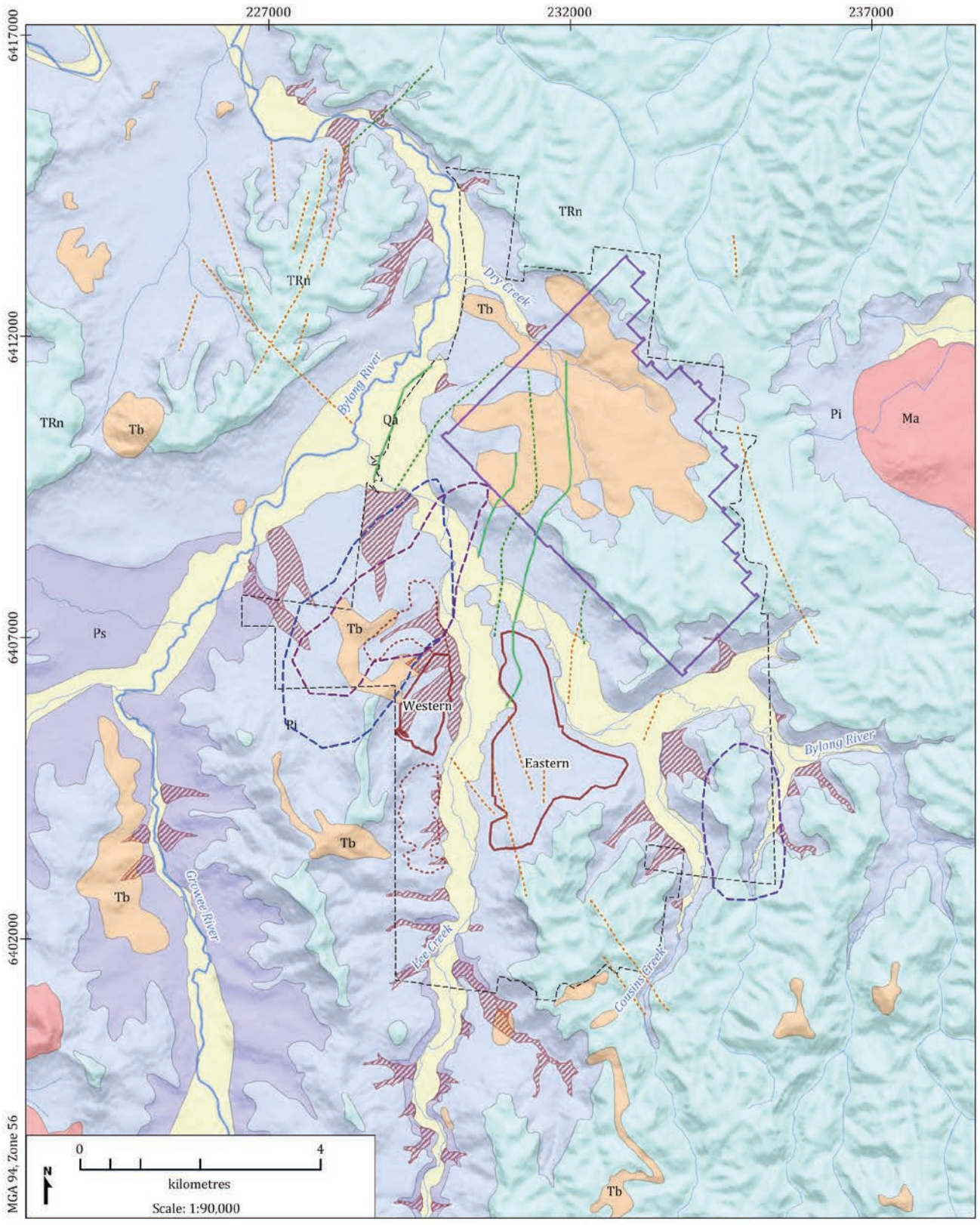

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Dyke
- Syncline
- Anticline
- Major drainage
- Minor drainage
- Glendavis sill
- Coggan sill
- Ulan sill

Geology

- Qa - Quaternary - alluvium
- Tb - Tertiary - basalt
- Ma - Triassic - phonolite intrusion
- Mt - Triassic - tschenite intrusion
- TRn - Triassic - Narrabeen group
- Pi - Permian - Illawarra Coal Measures
- Ps - Permian - Shoalhaven group
- Mapped colluvium

* Geology - Western Coalfield (north) Regional 1:100 000 Geology Map, Geological Survey of New South Wales, Sydney; Updated using data sourced from Douglas Partners Alluvium Mapping 2014

Bylong Coal Project (G1606)

Geological map - local scale

DATE: 10/2/2015

FIGURE No: **5.16**

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5.6.3 Geological structures and constraints to mining

Three geological constraints to mining are recognised for the Project, these are:

- folds, faults and other structural zones;
- igneous bodies including:
  - basalt capping;
  - dykes; and
  - sills.

Folds

Drilling completed by KEPCO identified gentle folding through the Project area. The folding runs north/south with displacements of 3-12 m over a 100 m zone. Figure 5-16 shows the axes of the anticlines and synclines created by the folding. Figure 5-17 shows a section from the geological model indicating the gentle nature of the folding.

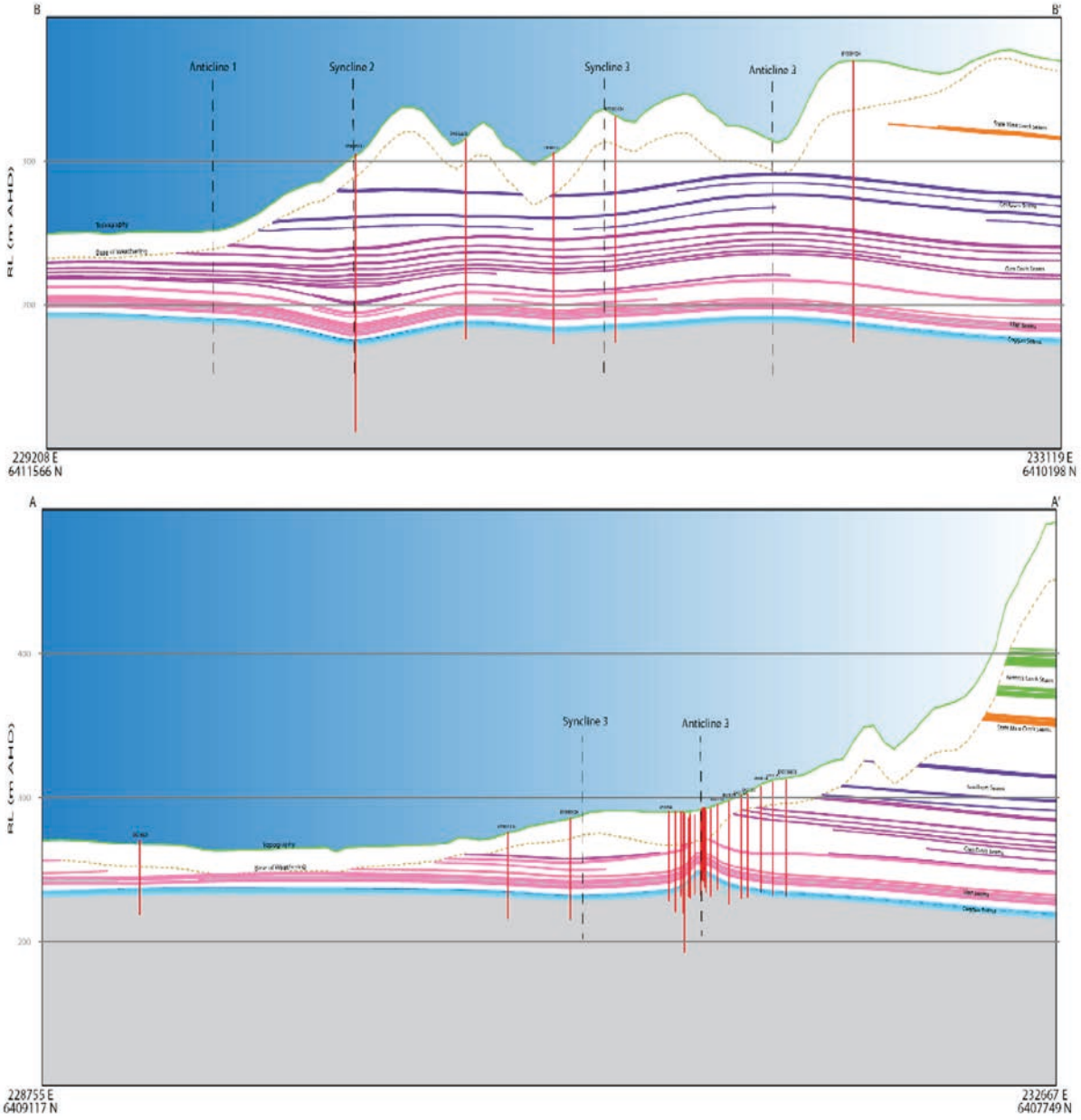


Figure 5-17 Sections showing folding within coal measures

Faults

Faults and structural zones disrupt the continuity of the coal seams and can produce zones of poor ground conditions. The faults can act as conduits for groundwater flow, as barriers to flow, or have no influence on groundwater flow. Drill hole and seismic data identified only minor faulting with a displacement being less than 5 m being less than the seam thickness. Some enhanced jointing was identified with the folding deformation zones, but this also appears minor. Figure 5-18 and Figure 5-19 show the structures identified in drill core collected at the anticline/syncline features.

Figure 5-18 Minor jointing associated with anticline/syncline features

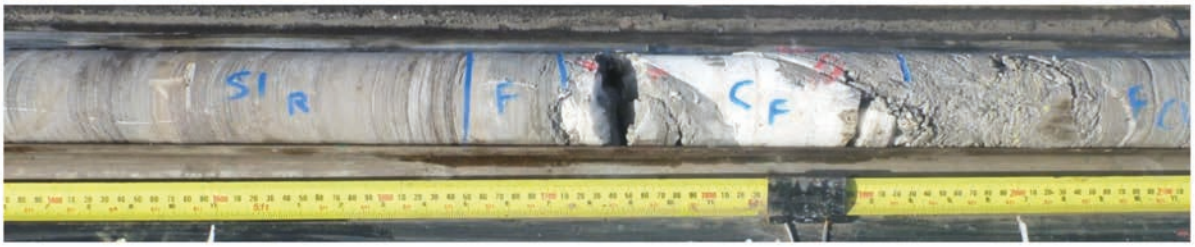


Figure 5-19 Calcite infill and crushed zone associated with anticline/syncline features

Igneous bodies – Dykes and sills

Igneous intrusions can impact both underground and open cut mining by replacing coal seams, affecting the quality of adjacent resources and reducing productivity in operations. They can also control the movement of groundwater. There are a number of intrusive and extrusive igneous bodies present within the Authorisations.

Drilling has identified extensive sills within the Ulan, Coggan and Glen Davis coal seams. Figure 5-16 shows the extent of these features. The Coggan and the Ulan sill are irregular in nature, and are not continuous features vertically or horizontally, however they are connected in places. Drill core samples indicate the sills are typically solid with little jointing evident indicating they act as aquitards. Figure 5-20 shows a sample of drill core intruded with a sill.

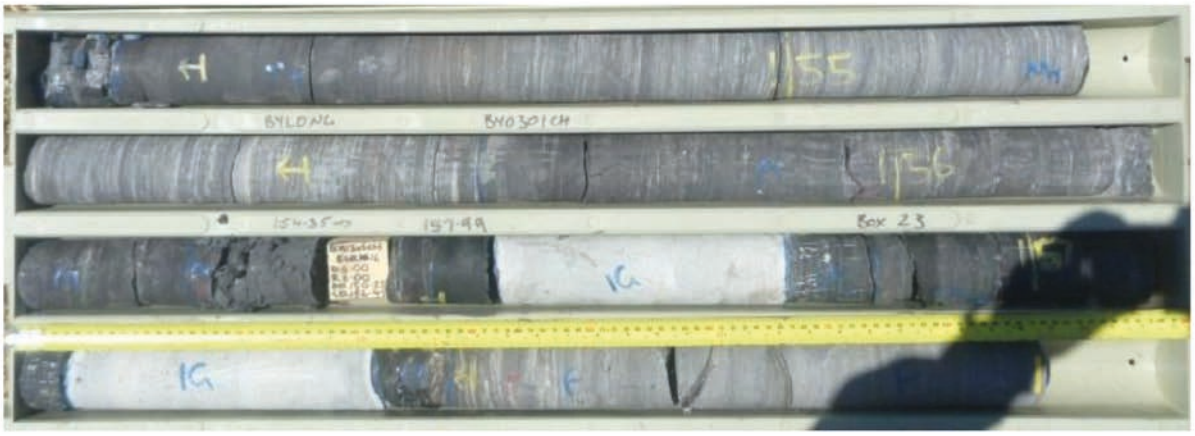


Figure 5-20 Example of sill within coal seam

Field mapping has identified a number of dolerite dykes to the northwest and south of the Authorisations. The dykes are comprised of basalt and range from 1 m to 2 m in thickness. The dykes trend from northwest to north with the average orientation being north northwest. One dyke was measured trending northeast and dipping 80° in outcrop. Figure 5-16 shows the alignment of the mapped dykes. Given the basaltic composition of the dykes they are not expected to act as barriers to groundwater flow.

Igneous bodies – Basalt flows

An extensive basalt flow caps the plateau area where longwall mining is proposed. The basalt cover is typically overlain by a thin layer of soil or alluvium. The thickness of the basalt varies from 10 m to 40 m and it can be blocky and highly fractured (Figure 5-21). Calcite commonly infills fractures, whilst open joints are pervasively oxidised, both indicating water flow.

Figure 5-21 Example of basalt cover showing blocky/jointed nature

5.7 Previous investigations in the region

A number of groundwater investigations have been carried out as part of the EIS processes for surrounding projects, all of which are located to the northwest of the Project Boundary and include existing and proposed mine developments.

5.7.1 Mt Penny Project

The former Mt Penny Coal Project (MPCP), was located directly to the northwest of the Project. Mt Penny Coal released a preliminary environmental assessment in February 2011 outlining the Project. Mount Penny Coal engaged Hydroilex Pty Ltd to evaluate existing groundwater resources of the area. Hydroilex installed 21 piezometers within the Project area to evaluate groundwater resources. The piezometers were located to provide a geographic spread of monitoring sites across the Project area and to collect hydrogeological data on the Goulburn River, Ulan and Coggan coal seam intervals, as well as the inter-burden and underburden sediments.

Testing in the sedimentary rock formations revealed that the only significant permeability occurs in the Ulan Lower Seam. The Marrangaroo Formation has low permeability, which contrasts with areas further to the west where it is known to be porous and forms a productive aquifer. At the confluence of the Bylong and Coggan Creeks, the alluvials have high permeability. Elsewhere, the Coggan Creek alluvials are dry. Groundwater levels from screened intervals in the Ulan Lower Seam range from around 300 mAHD near the southern end of the resource area to approximately 230 mAHD at its northern end. Coincidentally the hydraulic gradients and potentiometric surface are similar to the seam structure and topography, which dips to the north and northeast, at comparable grade (Wells Environmental Services, 2011).

In 2014, the NSW government cancelled the exploration lease and the planning approvals application was removed from the DP&E register and therefore there will not result in any cumulative impacts with the Project.

5.7.2 Wilpinjong mine

Wilpinjong coal mine is 25 km northwest of Bylong and commenced production in 2006. GeoTerra carried out a baseline groundwater investigation in 2004 prior to mining. The studies collated available groundwater data and provided preliminary assessment of the hydrogeological regime within the lease area. Test bores were drilled, pumping tests undertaken and the data interpreted to provide hydraulic parameters. Analysis of the hydraulic tests indicated similar hydraulic conductivity in the Ulan Seam and underlying Marrangaroo Sandstone.

AGE developed a conceptual groundwater model of the area in 2005, based on the results of a site visit and review of available geological, hydrogeological and other data relevant to the site and the environment. The conceptual hydrogeological model was used to develop a numerical groundwater model of the area to simulate mine dewatering and a groundwater supply borefield. The mine has not needed to proceed with a borefield and a number of updates to the model have been undertaken.

Wilpinjong Coal are currently in the process of preparing an application for the extension of mining operations (Peabody Energy 2014). Given the Project is some 24 km from the Wilpinjong Mine a cumulative impact will not occur.

5.7.3 Moolarben mine

Moolarben Coal, located 7 km northwest of the Wilpinjong Project (24 km from Bylong), started open cut production in May 2010. As part of the EIS process, a groundwater model was developed. A network of 42 piezometers was installed across the study area, establishing a geographic spread of monitoring points in the major hydrogeological units. An on-going baseline monitoring program was implemented, comprising monthly measurements of water levels and three-monthly sampling of groundwater for laboratory analysis from all piezometers. Four test production bores were constructed, and extended pumping tests carried out to determine aquifer hydraulic properties. Short pumping tests were also carried out on the piezometers.

A number of permeability tests were conducted on existing monitoring and production bores to estimate the hydraulic properties of the key hydrostratigraphic layers. The only significant permeability occurs in the Ulan Seam and some parts of the overburden coal measures sediments within the Permian, and the Tertiary palaeochannel alluvium.

5.7.4 Ulan mine

Mining of coal at Ulan Coal Mines Limited (UCML) has been conducted since the early 1920s. Current open cut and underground mining operations commenced in 1982 and 1986 respectively. Open cut mining ceased in 2008 due to approved coal reserves being exhausted. The Ulan Continued Operations Project was granted approval in 2010 for future open cut operations.

UCML is seeking approval to modify currently approved mining operations from five additional longwall panels within an area known as North 1. It is also proposing to modify the footprint of a number of panels in both the Underground 3 and Ulan West areas.

6 Field investigation program

DP began hydrogeological field investigations in the Authorisations in December 2011. As part of the conditions of A287 and A342, DP prepared a *Preliminary Hydrogeological Assessment and Water Monitoring Plan* (WMP) (Douglas Partners, 2013) which outlines the groundwater and surface water monitoring program to be undertaken throughout the exploration phase and provides a conceptualisation of the groundwater regime within the Project Boundary. DP consulted with NOW when preparing the document and it has been continually updated in consultation with NOW since its initial development in 2011. Douglas Partners (2013a) present the latest version of the water monitoring plan. Work to date has included the following:

- mapping of alluvial extents based examination of stereo-pair photos and LIDAR survey data;
- testing rock strata permeability with packers within coal exploration bores;
- installing standpipe piezometers in exploration bores;
- drilling, soil logging and installing twin nested standpipe piezometers in alluvium;
- CPT to confirm the extent and depth of alluvium at selected locations;
- rising head hydraulic testing within installed standpipe piezometers;
- automated logging of piezometric head and electrical conductivity (EC) in selected locations;
- monitoring of piezometric levels;
- multi-level pore water pressure measurements (piezometric levels) through vibrating wire piezometer (VWP) installations;
- surface water and groundwater sampling and chemical analyses at selected locations; and
- automated logging of surface water flow velocity at three locations.

DP integrated the groundwater field investigation program with the coal resource drilling, with the monitoring network being installed over several campaigns. During the first campaign Douglas Partners supervised the installation of 31 monitoring sites between August 2011 to July 2012 comprising 25 sites within the alluvium and 6 within the Coggan Seam. The monitoring bores were constructed with 50 mm diameter Class 18 PVC with machine slotted 3m to 5m screens and 2mm to 5mm washed graded filter pack. A second phase of drilling was undertaken between July and December 2012. The drilling program included installing six multilevel groundwater monitoring bores, two multilevel Vibrating Wire Piezometers (VWP's), within the alluvium and the Coggan Seam. A further four vibrating wire piezometers and 11 groundwater monitoring bores were installed throughout 2013.

The monitoring bore network now comprises:

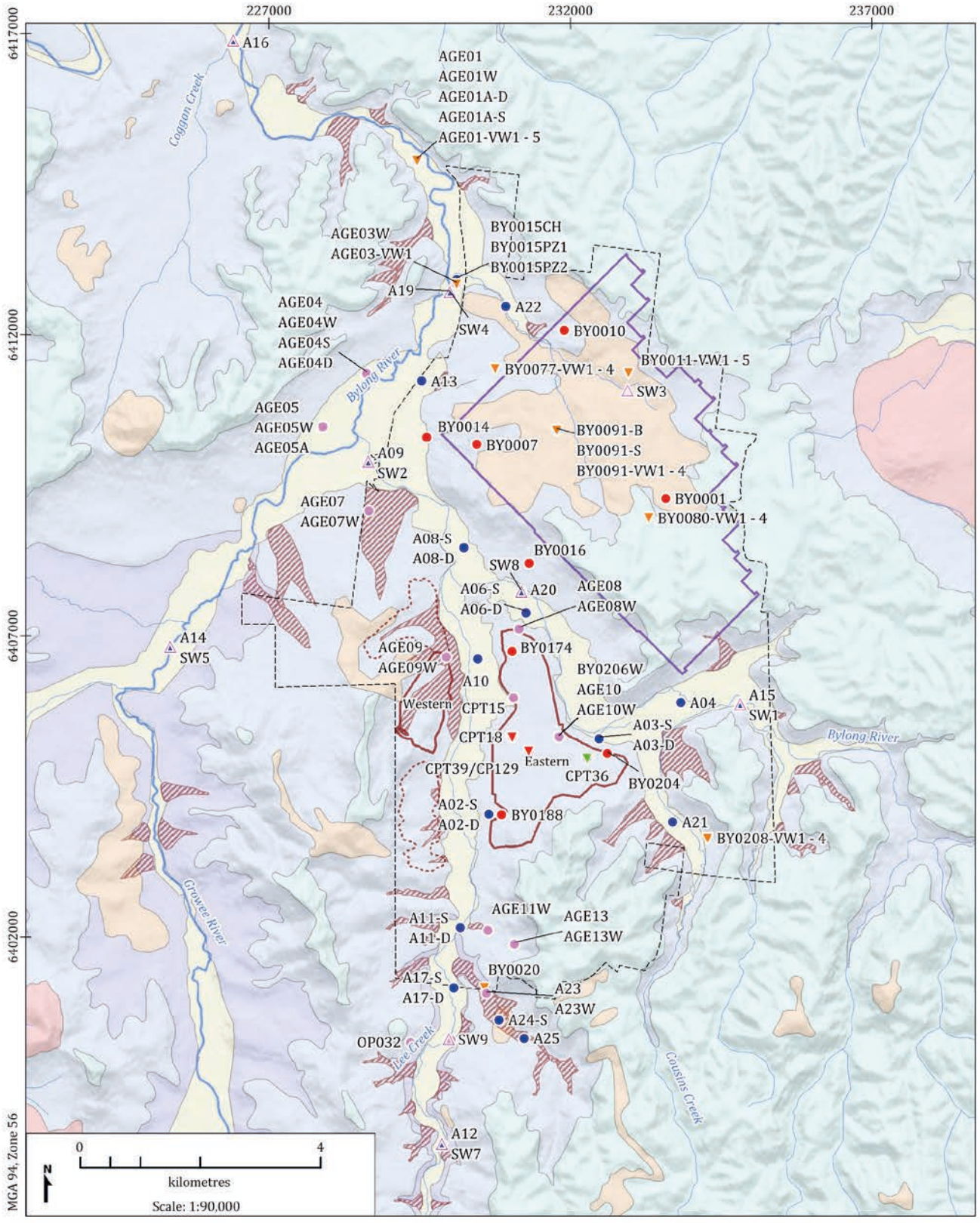
- 35 bores screened with alluvium;
- 10 bores screened within the weathered zone;
- one bore screened within basalt;
- three bores screened within sandstone strata; and
- 13 bores screened within the Coggan and Ulan coal seams.

In addition to the monitoring bores there are 13 VWPs, 10 of which have automatic data loggers.

The Gateway Report prepared by AGE (2013) included as an appendix the report on the field investigations prepared by Douglas Partners (2013b) Appendix B contains two subsequent addendum reports prepared by Douglas Partners (2014a) and Douglas Partners (2014b) that summarise additional fieldwork since the Gateway application. The raw data detailed in the DP reports has not been replicated in this report, but is summarised and discussed throughout.

6.1 Monitoring network

Figure 6-1 shows the location of installed monitoring bores, VWPs and surface water gauges. Table 6.1 provides monitoring network details.



LEGEND:

- Surface Water Sampling Point
- Monitoring bore - alluvium
- Monitoring bore - basalt
- Monitoring bore - weathered Permian
- VWP - Permian interburden
- VWP - Ulan coal seam
- Monitoring bore - Coggan Seam
- VWP - Coggan Seam
- Monitoring bore - Marangaroo sandstone
- VWP - Marangaroo sandstone
- Project boundary
- Mapped colluvium
- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area

Geology

- Qa - Quaternary - alluvium
- Tb - Tertiary - basalt
- Ma - Triassic - phonolite intrusion
- Mt - Triassic - tschenite intrusion
- TRn - Triassic - Narrabeen group
- Pi - Permian - Illawarra Coal Measures
- Ps - Permian - Shoalhaven group

Bylong Coal Project (G1606)

Groundwater bores and stream gauge locations

DATE: 10/2/2015

FIGURE No: **6.1**

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Table 6.1 Groundwater bore, VWP location and target formation

Bore	Easting (m) GDA94 Z56	Northing (m) GDA94 Z56	Elevation (mRL)	Total depth (mbgl)	Stickup (magl)	Screened interval (mbgl)	Bore type	Unit	Lithology	Date installed
A01-D	230111	6412947	247.2	20.6	0.7	15.6 - 18.6	MB	Alluvium - Lower	Gravel/Sand and Residual Clay	26/08/2011
A01-S	230111	6412947	247.2	8.5	0.7	1.9 - 7.9	MB	Alluvium - Upper	Clay and Gravel/Sand	26/08/2011
A02-D	230645	6404074	299.5	8.5	0.8	5.5 - 8.5	MB	Alluvium - Lower	Soil/Sandy Clay	28/02/2012
A02-S	230645	6404074	299.5	3.8	0.8	0.8 - 3.8	MB	Alluvium - Upper	Silty Clay/ Clayey Silt	28/02/2012
A03-D	232473	6405319	288.0	9.4	0.8	6.4 - 9.4	MB	Alluvium - Lower	Clay/Silty Clay/Clayey Silt	30/05/2012
A03-S	232475	6405320	288.0	3.5	0.8	0.5 - 3.5	MB	Alluvium - Upper	Sandy Clay/Clayey Sand	30/05/2012
A04	233828	6405926	294.8	5.2	0.8	0.2 - 5.2	MB	Alluvium - Upper	Sand	16/05/2012
A06-D	231260	6407410	275.3	10.0	0.7	7.0 - 10.0	MB	Alluvium - Lower	Sandy Clay and Gravelly Clay	28/02/2012
A06-S	231260	6407410	275.3	4.5	0.7	1.5 - 4.5	MB	Alluvium - Upper	Silty Clay and Silty Sand and Sand	28/02/2012
A08-D	230231	6408492	267.4	8.6	0.6	5.6 - 8.6	MB	Alluvium - Lower	Clay/Sand	23/05/2012
A08-S	230229	6408492	267.4	5.0	0.6	2.0 - 5.0	MB	Alluvium - Upper	Clay/Sand	23/05/2012
A09	228646	6409921	255.4	6.6	0.6	0.6 - 6.6	MB	Alluvium - Upper	Alluvium	26/07/2012
A10	230457	6406650	278.3	9.0	0.6	3.0 - 9.0	MB	Alluvium - Upper	Sand/ Clay/ Sandy Clay	24/05/2012
A11-D	230167	6402188	312.8	12.2	0.6	0.9 - 3.9	MB	Alluvium - Lower	Sand and Sandy Clay/Clayey Sand	1/03/2012
A11-S	230167	6402188	312.8	3.9	0.6	6.2 - 12.2	MB	Alluvium - Upper	Silty Clay and Sand and Sandy Gravel	1/03/2012
A12	229867	6398595	341.5	6.2	0.6	0.9 - 3.9	MB	Alluvium - Upper	Sand and Sandy Clay/Clayey Sand	17/05/2012

Bore	Easting (m) GDA94 Z56	Northing (m) GDA94 Z56	Elevation (mRL)	Total depth (mbgl)	Stickup (magl)	Screened interval (mbgl)	Bore type	Unit	Lithology	Date installed
A13	229527	6411267	251.8	7.6	0.8	1.2 - 7.2	MB	Alluvium - Upper	Clay and Sand and Sand/Gravel	26/08/2011
A14	225363	6406840	280.2	8.3	0.6	2.1 - 8.3	MB	Alluvium - Upper	Alluvium	27/07/2012
A15	234816	6405886	299.8	6.3	0.6	0.3 - 6.3	MB	Alluvium - Upper	Alluvium	16/05/2012
A16	226404	6416905	219.5	1.3	0.6	0.2 - 1.3	MB	Alluvium - Upper	Alluvium	26/07/2012
A17-D	230062	6401194	321.3	11.3	0.7	7.3 - 11.3	MB	Alluvium - Lower	Alluvium	28/02/2012
A17-S	230062	6401194	321.3	4.2	0.7	1.2 - 4.2	MB	Alluvium - Upper	Alluvium	28/02/2012
A18	229979	6400329	327.5	6.2	0.6	0.2 - 6.2	MB	Alluvium - Upper	Sandy Silt/Gravelly Sand	21/05/2012
A19	229995	6412730	246.3	5.2	0.6	2.2 - 5.2	MB	Alluvium - Upper	Clay /Clayey Sand/ Gravelly Sand	24/07/2012
A20	231188	6407756	273.5	7.2	0.6	1.2 - 7.2	MB	Alluvium - Upper	Sandy Clay/Clay/Silty Clay	10/07/2012
A21	233696	6403940	313.7	15.0	0.0	0	MB	Alluvium - Upper	Alluvium	30/04/2013
A22	230924	6412502	258.5	7.2	0.6	2.2 - 7.2	MB	Alluvium - Upper	Clayey sand, clay & Sandstone	22/10/2012
A23	230607	6401103	334.1	9.4	0.6	3.4 - 9.4	MB	Alluvium - Upper	Clayey sand, sand, gravelly sand	15/10/2012
A23W	230607	6401103	334.1	16.4	0.5	10.4 - 16.4	MB	Weathered Permian	Weathered Zone	23/10/2012
A24-D	230810	6400659	342.7	8.6	0.5	5.6 - 8.6	MB	Alluvium - Lower	Alluvium	16/10/2012
A24-S	230810	6400659	342.7	5.4	0.6	2.4 - 5.4	MB	Alluvium - Upper	Gravelly sand and clay	16/10/2012
A25	231233	6400354	351.6	5.5	-	2.5 - 5.5	MB	Alluvium - Lower	Gravel, sand and sandstone	17/10/2012
AGE01A-D	229453	6414926	237.3	9.4	0.6	6.4 - 9.4	MB	Alluvium - Lower	Sandy gravel	22/10/2012
AGE01A-S	229453	6414926	237.3	4.8	0.8	1.8 - 4.8	MB	Alluvium - Upper	Clay and sandy gravel	15/10/2012

Bore	Easting (m) GDA94 Z56	Northing (m) GDA94 Z56	Elevation (mRL)	Total depth (mbgl)	Stickup (magl)	Screened interval (mbgl)	Bore type	Unit	Lithology	Date installed
AGE01W	229453	6414926	237.3	20.5	0.5	14.45 - 20.45	MB	Weathered Permian	Weathered siltstone/ sandstone	23/10/2012
AGE02-D	230102	6413814	TBC	11.5	0.5	5.5-11.5	MB	Alluvium - Lower	-	
AGE02-S	230102	6413816	TBC	4.8	0.6	1.8-4.8	MB	Alluvium - Upper	-	
AGE03W	230106	6412878	247.7	24.2	0.6	18 - 24.15	MB	Weathered Permian	Siltstone/ sandstone	16/10/2012
AGE04	228616	6411395	259.0	66.2	0.8	57.17 - 63.17	MB	Coggan Coal Seam	Coal seam	16/10/2012
AGE04-D	228616	6411395	259.0	17.3	0.7	14.3 - 17.3	MB	Alluvium - Lower	Sand and gravel	17/10/2012
AGE04-S	228616	6411395	259.0	11.3	0.8	5.3 - 11.3	MB	Alluvium - Upper	Silty sand and sand	23/11/2012
AGE04W	228616	6411395	259.0	26.0	0.8	19.95 - 25.95	MB	Weathered Permian	Siltstone, minor tuff and coal	23/11/2012
AGE05	227892	6410504	259.8	50.9	0.6	41.9 - 47.9	MB	Coggan Coal Seam	Coal seam	29/11/2012
AGE05A	227892	6410504	259.8	8.4	0.6	5.4 - 8.4	MB	Alluvium - Upper	Gravelly sand	29/11/2012
AGE05W	227892	6410504	259.8	15.7	0.5	9.7 - 15.7	MB	Weathered Permian	Siltstone/ sandstone	29/11/2012
AGE07	228651	6409109	313.7	42.0	-	-	MB	Coggan Coal Seam	Coal seam	9/05/2013
AGE07W	228651	6409109	313.7	20.0	-	-	MB	Weathered Permian	Weathered Zone	9/05/2013
AGE08	231144	6407148	282.1	36.4	-	29.4 - 33.4	MB	Coggan Coal Seam	Coal seam	13/12/2012
AGE08W	231144	6407148	282.1	13.8	-	7.8 - 13.8	MB	Weathered Permian	Sandstone and coal	13/12/2012
AGE09 / BY0173W	229945	6406680	285.8	36.5	-	24.1 - 28.6	MB	Coggan Coal Seam	Coal seam	3/04/2013
AGE09W	229945	6406680	285.8	18.1	-	7.56 - 15.06	MB	Weathered Permian	Weathered Zone	2/05/2013
AGE10	231810	6405356	298.3	54.2	-	41.0 - 45.5	MB	Coggan Coal Seam	Coal seam	6/04/2013
AGE10W	231810	6405356	298.3	21.0	-	12.0 - 18.0	MB	Weathered Permian	Weathered Zone	30/04/2013
AGE11W	230630	6402144	326.1	14.2	0.6	5.2 - 14.2	MB	Weathered Permian	Sandstone	4/12/2012

Bore	Easting (m) GDA94 Z56	Northing (m) GDA94 Z56	Elevation (mRL)	Total depth (mbgl)	Stickup (magl)	Screened interval (mbgl)	Bore type	Unit	Lithology	Date installed
AGE12W	230017	6400321	327.6	22.6	0.4	13.4 - 22.6	MB	Weathered Permian	Siltstone	29/10/2012
AGE13	231072	6401915	357.3	45.1	0.5	37.6 - 43.6	MB	Coggan Coal Seam	Sandstone and coal	6/12/2012
AGE13W	231072	6401915	357.3	14.1	0.6	4.1 - 14.1	MB	Weathered Permian	Siltstone	6/12/2012
AGE14	229442	6,406,005	TBC	27.0	0.5	22.7-25.7	MB	Coggan Coal Seam	Coal seam	
AGE15	229851	6405267	TBC	30.3	0.5	13.9-30.34	MB	Sandstone	Sandstone	
B3-D	235107	6406726	TBC	18.0	0.5	15.7-18.0	MB	Alluvium - Lower	-	
B3-S	235109	6406728	TBC	13.7	0.5	10.15-13.65	MB	Alluvium - Upper	-	
BY0001	233577	6409321	375.4	195.0	0.9	185 - 191	MB	Coggan Coal Seam	Coal seam	1/11/2011
BY0007	230443	6410218	368.7	169.5	0.6	161 - 167	MB	Coggan Coal Seam	Coal seam	1/11/2011
BY0010	231897	6412111	301.4	141.5	0.7	133 - 139	MB	Coggan Coal Seam	Coal seam	1/11/2011
BY0014	229611	6410328	259.5	57.1	0.7	50.2 - 56.2	MB	Coggan Coal Seam	Coal, siltstone, sandstone, conglomerate	1/11/2011
BY0015	230111	6412947	247.2	97.6	0.7	90 - 96	MB	Coggan Coal Seam	Sandstone, coal, carbonaceous shale	1/11/2011
BY0015PZ1	230111	6412947	247.2	20.6	-	-	MB	Alluvium - Upper	Alluvium	1/11/2011
BY0015PZ1	230111	6412947	247.2	20.6	-	-	MB	Alluvium - Upper	Alluvium	1/11/2011
BY0016	231315	6408236	292.9	47.5	0.7	39.8 - 45.8	MB	Coggan Coal Seam	Coal seam	31/10/2011
BY0020 (OP028)	230574	6401202	-	36.0	-	36	VWP	Marangaroo Sandstone	Sandstone	1/12/2011
BY0091-S	231773	6410454	363.9	36.0	0.6	30 - 36	MB	Marangaroo Sandstone	Sandstone	27/11/2012
BY0091-B	231773	6410454	363.9	23.0	0.6	11.4 - 16.0	MB	Basalt	Basalt	21/11/2012
OP032	229350	6400282	383.1	7.9	0.5	4.8 - 6.35	MB	Weathered Permian	Weathered Zone	12/12/2012
BY0174	231034	6406771	290.9	39.4	0.0	28.9 - 33.4	MB	Coggan Seam	Coal seam	5/04/2013

Bore	Easting (m) GDA94 Z56	Northing (m) GDA94 Z56	Elevation (mRL)	Total depth (mbgl)	Stickup (magl)	Screened interval (mbgl)	Bore type	Unit	Lithology	Date installed
BY0188	230858	6404064	326.6	43.6	0.0		MB	Coggan Seam	Coal seam	5/04/2013
BY0204	232611	6405080	296.7	62.5			MB	Coggan Seam	Coal seam	4/04/2013
BY0206W	231810	6405356	298.3	21.0			MB	Weathered Permian	Weathered Zone	6/04/2013
CP009	230111	6412947	247.3	90-96	0.7	90-96	MB	Coggan Coal Seam	Coal seam	
CP014	231893	6412110	301.4	161-167	0.7	133-139	MB	Coggan Coal Seam	Coal seam	
CP027	229611	6410330	259.4	50.2-56.2	0.7	50.2-56.2	MB	Coggan Coal Seam	Coal seam	
CP028	230443	6410217	368.9	161-167	0.4	161-167	MB	Coggan Coal Seam	Coal seam	
CP035	233581	6409310	375.9	185-191	0.8	185-191	MB	Coggan Coal Seam	Coal seam	
CP045	231315	6408236	292.8	39.8-45.8	0.7	39.8-45.8	MB	Coggan Coal Seam	Coal seam	
CP063	232616	6405079	296.8	62.5	0.7	55.0-61.0	MB	Coggan Coal Seam	Coal seam	
CPT13	231034	6406771	290.9	39.4	0.62	28.9-33.4	MB	Coggan Coal Seam	Coal seam	
CPT15	231054	6406004	284.2	14.9			MB	Weathered Permian	Weathered Zone	29/05/2013
CPT18	231030	6405355	297.5	23.5			MB	Weathered Permian	Weathered Zone	29/05/2013
CPT18	231030	6405355	297.5	23.5			MB	Weathered Permian	Weathered Zone	29/05/2013
CPT18	231030	6405355	297.5	23.5			MB	Weathered Permian	Weathered Zone	29/05/2013
CPT36	232278	6405003	302.8	59.2			MB	Weathered Permian	Weathered Zone	23/05/2013
CPT36	232278	6405003	302.8	59.2			MB	Weathered Permian	Weathered Zone	23/05/2013
CPT36	232278	6405003	302.8	59.2			MB	Weathered Permian	Weathered Zone	23/05/2013
CPT39/CP129	231304	6405128	306.5	42.0			MB	Weathered Permian	Weathered Zone	7/06/2013
CPT39/CP129	231304	6405128	306.5	42.0			MB	Weathered Permian	Weathered Zone	7/06/2013
CPT39/CP129	231304	6405128	306.5	42.0			MB	Weathered Permian	Weathered Zone	7/06/2013
CPT39W	231241	6405086	306.5	42.0	0.6	16.0-22.1	MB	Weathered Zone	Weathered Zone	

Bore	Easting (m) GDA94 Z56	Northing (m) GDA94 Z56	Elevation (mRL)	Total depth (mbgl)	Stickup (magl)	Screened interval (mbgl)	Bore type	Unit	Lithology	Date installed
M1	227087	6408374	TBC	24.0	0.5	15.5-23.0	MB	Sandstone	Sandstone	
M2	227521	6409097	TBC	5.9	0.5	2.9-5.9	MB	Alluvium	-	
OP020	230858	6404064	326.5	43.6	0.6	26.5-32.5	MB	Coggan and Ulan Seams	Coal seam	#N/A
OP032	229350	6400282	383.1	7.9	0.5	4.8 - 6.35	MB	Weathered Permian	Weathered Zone	12/12/2012
BY0011-VW1	232963	6411410	360.2	73.4	-	73.4	VWP	Permian Interburden	Sandstone	17/05/2013
BY0011-VW2	232963	6411410	360.2	148.8	-	148.8	VWP	Permian Interburden	Sandstone	1/11/2011
BY0011-VW3	232963	6411410	360.2	190.4	-	190.4	VWP	Ulan Coal Seam	Sandstone, minor coal	1/11/2011
BY0011-VW4	232963	6411410	360.2	202.4	-	202.4	VWP	Coggan Coal Seam	Coal seam	1/11/2011
BY0011-VW5	232963	6411410	360.2	220.0	-	220	VWP	Marangaroo Sandstone	Sandstone	1/11/2011
BY0077-VW1	230750	6411475	297.3	48.3	-	48.3	VWP	Permian Interburden	Sandstone, siltstone	1/11/2011
BY0077-VW2	230750	6411475	297.3	107.9	-	107.9	VWP	Ulan Coal Seam	Sandstone and coal	28/09/2012
BY0077-VW3	230750	6411475	297.3	118.8	-	118.8	VWP	Coggan Seam	Coal seam	28/09/2012
BY0077-VW4	230750	6411475	297.3	139.8	-	139.75	VWP	Marangaroo Sandstone	Sandstone	28/09/2012
BY0080-VW1	233295	6409002	405.9	177.2	-	177.2	VWP	Permian Interburden	Siltstone/ sandstone	28/09/2012
BY0080-VW2	233295	6409002	405.9	200.0	-	200	VWP	Ulan Coal Seam	Coal seam	5/11/2012
BY0080-VW3	233295	6409002	405.9	210.7	-	210.7	VWP	Coggan Coal Seam	Coal seam	5/11/2012
BY0080-VW4	233295	6409002	405.9	230.0	-	230	VWP	Marangaroo Sandstone	Sandstone	5/11/2012
BY0091-VW1	231773	6410454	363.9	57.0	-	57	VWP	Permian Interburden	Sandstone	23/11/2012
BY0091-VW2	231773	6410454	363.9	103.4	-	103.4	VWP	Permian Interburden	Sandstone/ siltstone	23/11/2012
BY0091-VW3	231773	6410454	363.9	172.5	-	172.5	VWP	Coggan Coal Seam	Coal seam	23/11/2012
BY0091-VW4	231773	6410454	363.9	185.0	-	185	VWP	Marangaroo Sandstone	Sandstone	23/11/2012
BY0208-VW1	234269	6403672	327.1	37.3	-	37.3	VWP	Permian Interburden	-	16/04/2013

Bore	Easting (m) GDA94 Z56	Northing (m) GDA94 Z56	Elevation (mRL)	Total depth (mbgl)	Stickup (magl)	Screened interval (mbgl)	Bore type	Unit	Lithology	Date installed
BY0208-VW2	234269	6403672	327.1	60.0	-	60	VWP	Permian Interburden	-	16/04/2013
BY0208-VW3	234269	6403672	327.1	87.5	-	87.5	VWP	Coggan Coal Seam	Coal seam	16/04/2013
BY0208-VW4	234269	6403672	327.1	98.5	-	98.5	VWP	Marangaroo Sandstone	Sandstone	16/04/2013
AGE01-VW1	229453	6414926	237.3	27.7	-	27.7	VWP	Permian Interburden	Carbonaceous siltstone with interbedded tuff	16/04/2013
AGE01-VW2	229453	6414926	237.3	67.1	-	67.1	VWP	Permian Interburden	Sandstone	30/04/2013
AGE01-VW3	229453	6414926	237.3	120.2	-	120.2	VWP	Ulan Coal Seam	Coal, sandstone and siltstone	30/04/2013
AGE01-VW4	229453	6414926	237.3	128.2	-	128.2	VWP	Coggan Coal Seam	Interburden and coal seam	30/04/2013
AGE01-VW5	229453	6414926	237.3	140.7	-	140.7	VWP	Marangaroo Sandstone	Sandstone/ siltstone	30/04/2013
AGE03-VW1	230106	6412878	247.7	30.5	-	30.5	VWP	Marangaroo Sandstone	Fresh Sandstone	30/04/2013

6.2 Seepage meters

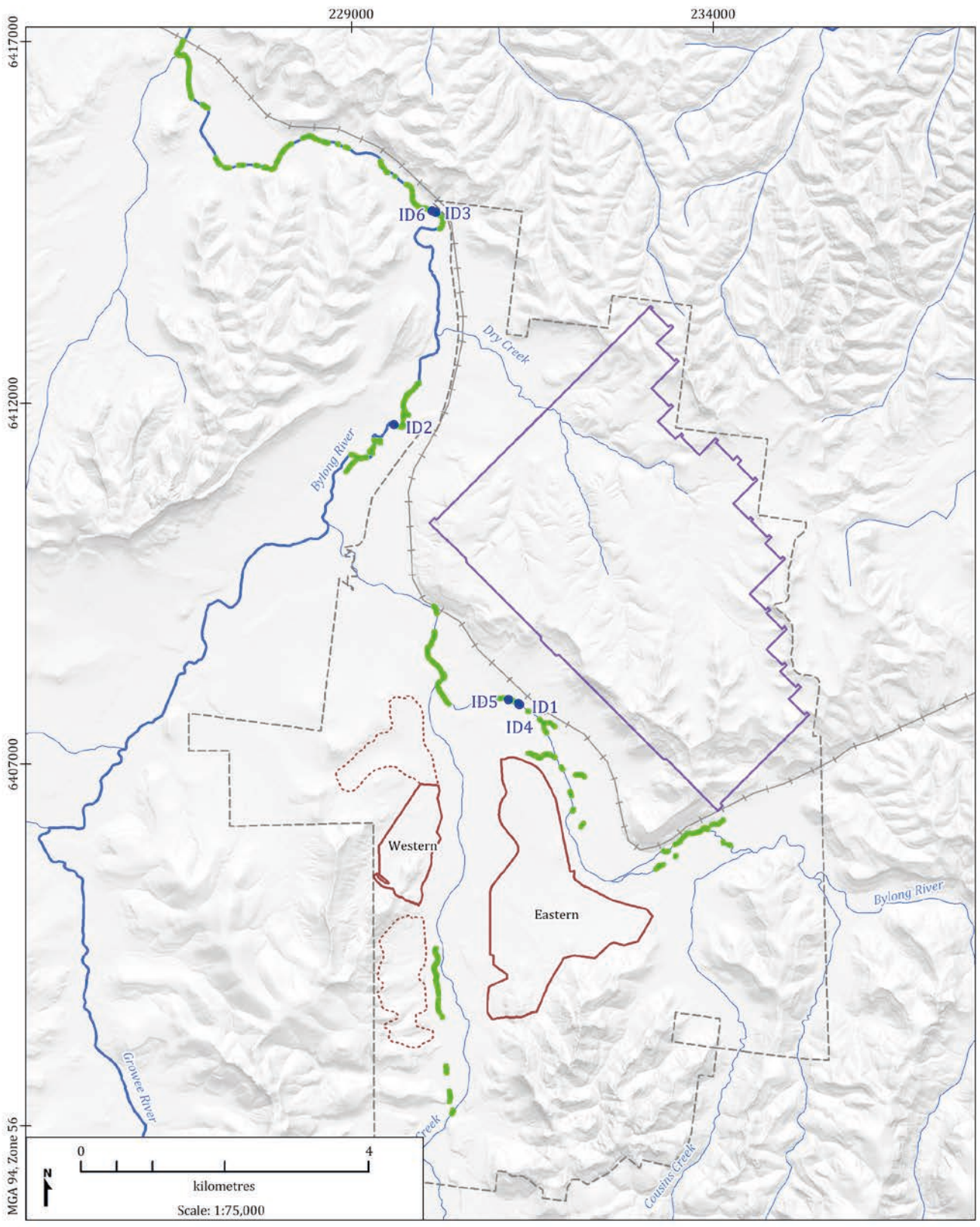
Six seepage meters were installed in sections of the Bylong River on 24th and 25th of June 2014. The purpose of the seepage meters was to measure the transfer of water across the stream bed, and determine if the streams are 'losing' or 'gaining' in nature. In losing streams water flows from the stream to the underlying aquifer, whilst in gaining streams the transfer of water is from the aquifer to the stream. Figure 6-2 shows the location of each seepage meters within the Bylong River.

Table 6.2 summarises the each instruments position and underlying sediment.

Table 6.2 Seepage monitoring sites

Seepage monitoring site ID	Easting (GDA94 Z56)	Northing (GDA94 Z56)	Elevation (m AHD)	Underlying sediment	Distance downstream from ID1 (km)
ID1	231113	6407829	269	silt with sand	N/A
ID2	229374	6411702	246	silt	7.20
ID3	229907	6414657	235	silt	11.20
ID4	231098	6407841	269	sand with silt veneer	0.02
ID5	230961	6407900	269	sand	0.17
ID6	229957	6414640	236	silt	11.15

Photographs of each of the seepage meter sites are shown in Figure 6-3. The location of the seepage meters is evident by the vent tube tied to a star picket.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Seepage monitoring
- River/Creek water presence
- Railway
- Major drainage
- Minor drainage

Bylong Coal Project (G1606)

Seepage monitoring sites (ID1 - ID6)

DATE: 10/2/2015

FIGURE No: **6.2**

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ID1

ID2

ID3

ID4

ID5

ID6

Figure 6-3 Photographs of seepage monitoring sites

The seepage flux (Q) was calculated as:

$$Q = \frac{(V_f - V_0)}{tA}$$

Where V_0 is the initial volume of water in the bag, V_f is the final volume in the bag, t is the time elapsed and A is the surface area of the chamber.

Table 6.3 shows the results of the seepage monitoring as a representative seepage flux.

Table 6.3 Seepage results

Seepage meter	Start date	Duration (days)	Result (+/- g)	Volume (L/day)	Flux Q (L/m²/day)	Average Q (L/m²/day)	Stream type
ID1	25/06/2014	13.964	+ 3444	>0.247	>0.866	not representative	gaining
	9/07/2014	6.799	+ 3496	>0.514	>1.805		
	16/07/2014	7.152	+ 3500	>0.489	>1.717		
ID2	24/06/2014	14.993	+ 1165	0.078	0.273	0.407	gaining
	9/07/2014	6.719	+ 937	0.139	0.489		
	16/07/2014	7.120	+ 928	0.130	0.457		
ID3	25/06/2014	14.198	+ 126	0.009	0.031	0.073	gaining
	9/07/2014	6.764	- 72	-0.011	-0.037		
	16/07/2014	7.084	+ 452	0.064	0.224		
ID4	24/06/2014	14.993	- 447	-0.030	-0.105	0.132	gaining
	9/07/2014	6.719	+ 808	0.120	0.422		
	16/07/2014	7.120	+ 160	0.022	0.079		
ID5	25/06/2014	14.021	- 557	-0.040	-0.139	-0.151	losing
	9/07/2014	6.854	- 379	-0.055	-0.194		
	16/07/2014	7.090	- 242	-0.034	-0.120		
ID6	25/06/2014	14.010	+ 2481	0.177	0.621	not representative	gaining

The results of the seepage monitoring during July, indicate that the majority of water holes along Bylong River where seepage meters have been installed show low to moderate fluxes of groundwater into the river bed. The exception is at ID5 where the stage of the river is considered a losing stream. Interestingly this site is close to ID1 and ID4, which are both gaining, suggesting some cycling of water into and out of water holes.

7 Hydrogeological regime

7.1 Hydrostratigraphic units

The available data indicates the presence of the following hydro-stratigraphic units:

- alluvium and colluvium;
- weathered Permian bedrock;
- Tertiary basalt capping; and
- coal seams.

The sections below detail the properties of the hydrostratigraphic units.

7.1.1 Alluvium and colluvium

7.1.1.1 Valley Floor alluvium

The fieldwork investigations indicate that the alluvium in the valley floors is predominantly permeable sand and gravels and provides a groundwater source to the majority of registered bores within the area. Investigative drilling has indicated that these sediments consist of an upper layer of sand/silt/clay overlying a basal layer of sand and gravel. Whilst the upper sediments in the alluvial sequence are commonly fine grained, groundwater levels respond rapidly to rainfall indicating recharge readily infiltrates the upper sequence.

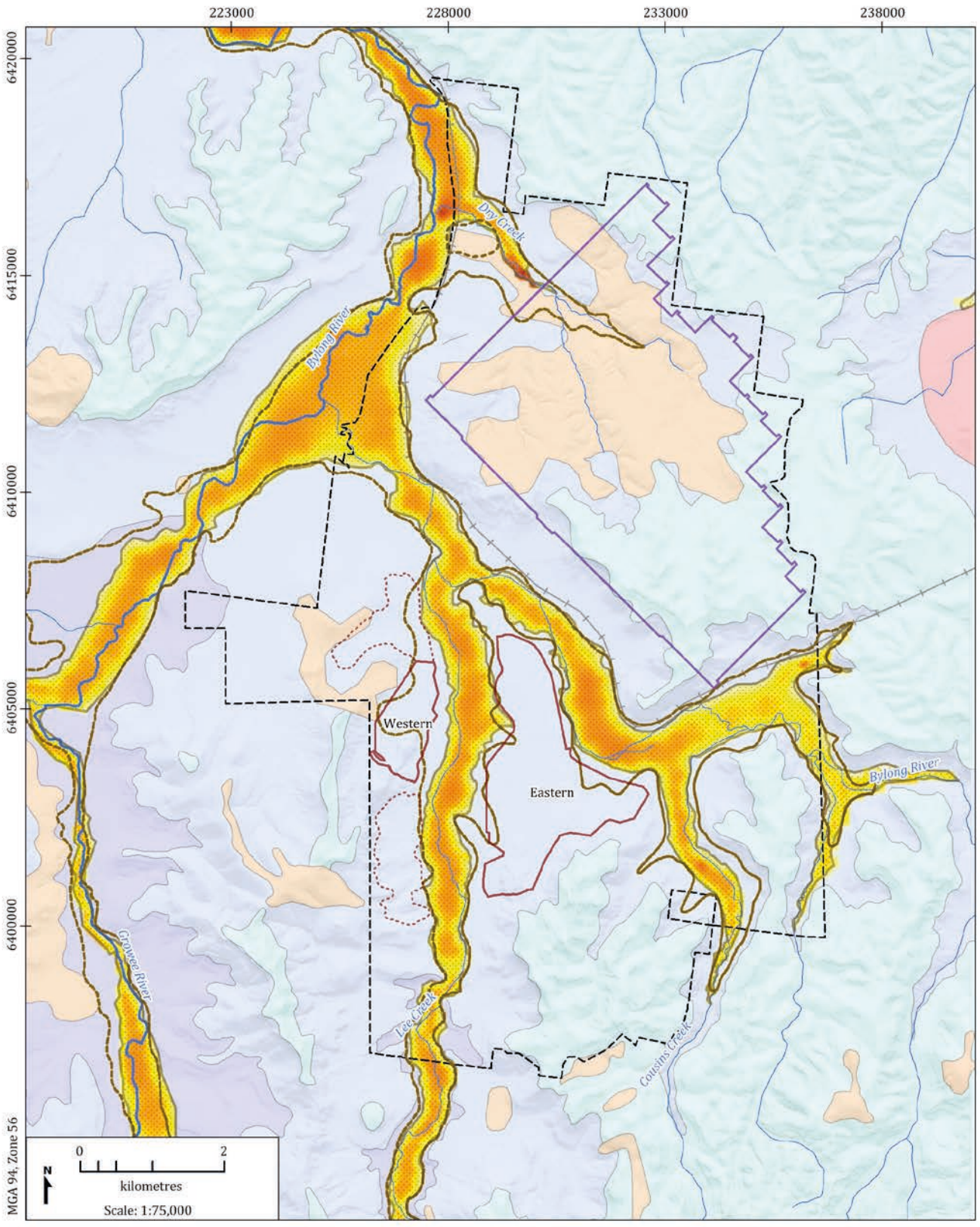
Testing indicates alluvial sediments are typically less than 20 m in depth along the Bylong River flood plain. The transmissivity varies from high in the thicker sequences of sand and gravel, to low where shallow rock bars act as local barriers to groundwater flow. No surface water is present in the lower reaches of the Growee River, suggesting the permeability of the alluvium is sufficient to allow all rainfall runoff to flow underground.

Figure 7-1 shows the interpreted thickness of alluvial sediment within the Project Boundary. Local scale mapping by DP of the alluvial and colluvial boundary replaces the 1:100,000 scale data from the Singleton Geological Sheet. Figure 7-1 also shows the limit of 'highly productive groundwater' as mapped by NSW Government's Strategic Regional Land Use Policy. Figure 7-2 shows the distance between the proposed mine and the mapped alluvial boundary and water courses. The proposed open cut pits are up to 180 m from the alluvium, 190 m from the Bylong River and 260 m from Lee Creek. DP has installed a number of groundwater monitoring bores (piezometers) across the Project Boundary in the Quaternary alluvium. Rising head tests were undertaken for all alluvial piezometers following installation. Hydraulic testing suggests that the hydraulic conductivity of the alluvium is generally moderate to high ranging from 0.04 m/day to 14 m/day. The basal gravelly sand reports the highest values.

7.1.1.2 Dry Creek alluvium

Mapping published by NOW indicates the Dry Creek alluvium (see Figure 5-16) forms a highly productive groundwater source overlying the area where longwall mining is proposed. Exploration drilling along Dry Creek however indicates a continuous interconnected sequence of alluvial sediments does not occur along this drainage line in the proposed mining area. Ten coal exploration holes have been drilled within the area defined as 'highly productive groundwater' along a 2 km reach of the Dry Creek upper catchment. The lithological logs from the holes indicate bedrock, being either basalt or sandstone typically occurs at between 5 m and 10 m below the ground surface. This is typically overlain by a mixture of weathered rock in a clayey matrix, with minor sands and gravels. The exploration drilling along Dry Creek indicates a thick and continuous interconnected sequence of alluvial sediments does not occur along this drainage line in the proposed mining area.

Groundwater level measurements are available from monitoring bores and VWPs along the alignment of Dry Creek. Two VWPs have sensors installed within the Coggan Coal seam and within the overlying and underlying strata (CP014 and CP035). The VWP sensors and monitoring bores record groundwater levels within the deep strata and coal seams between 50 m and 110 m below ground level. The shallow VWP sensors also record the presence of perched groundwater between 36 m and 57 m below ground level. The zones of perched water likely occur where permeable basalt or sandstone overlies less permeable strata, restricting vertical drainage of groundwater. The available data indicates the regional water table and the zones of perched groundwater occur well below the bed of Dry Creek, and its associated alluvium. Whilst no groundwater has been detected within the shallow Dry Creek alluvium, it is possible that a thin zone of perched water occurs ephemerally at the interface between the weathered rock/alluvium and the less permeable fresh rock along the alignment of Dry Creek. Any groundwater would be perched, fed by seepage through the creek when running, and not the regional water table. The data indicates the alluvium along Dry Creek does not meet the definition of 'highly productive groundwater', because it is not considered capable of supplying groundwater at a rate of greater than 5 L/s with a salinity of less than 1,500 mg/L.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Douglas Partners Alluvium Mapping 2014
- Highly productive groundwater zone

Alluvial thickness (m)

- 1
- 5
- 15
- 22

- Major drainage
- Minor drainage

Geology

- Qa - Quaternary - alluvium
- Tb - Tertiary - basalt
- Ma - Triassic - phonolite intrusion
- Mt - Triassic - tschenite intrusion
- TRn - Triassic - Narrabeen group
- Pi - Permian - Illawarra Coal Measures
- Ps - Permian - Shoalhaven group

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Alluvial thickness

DATE: 26/2/2015

FIGURE No: **7.1**

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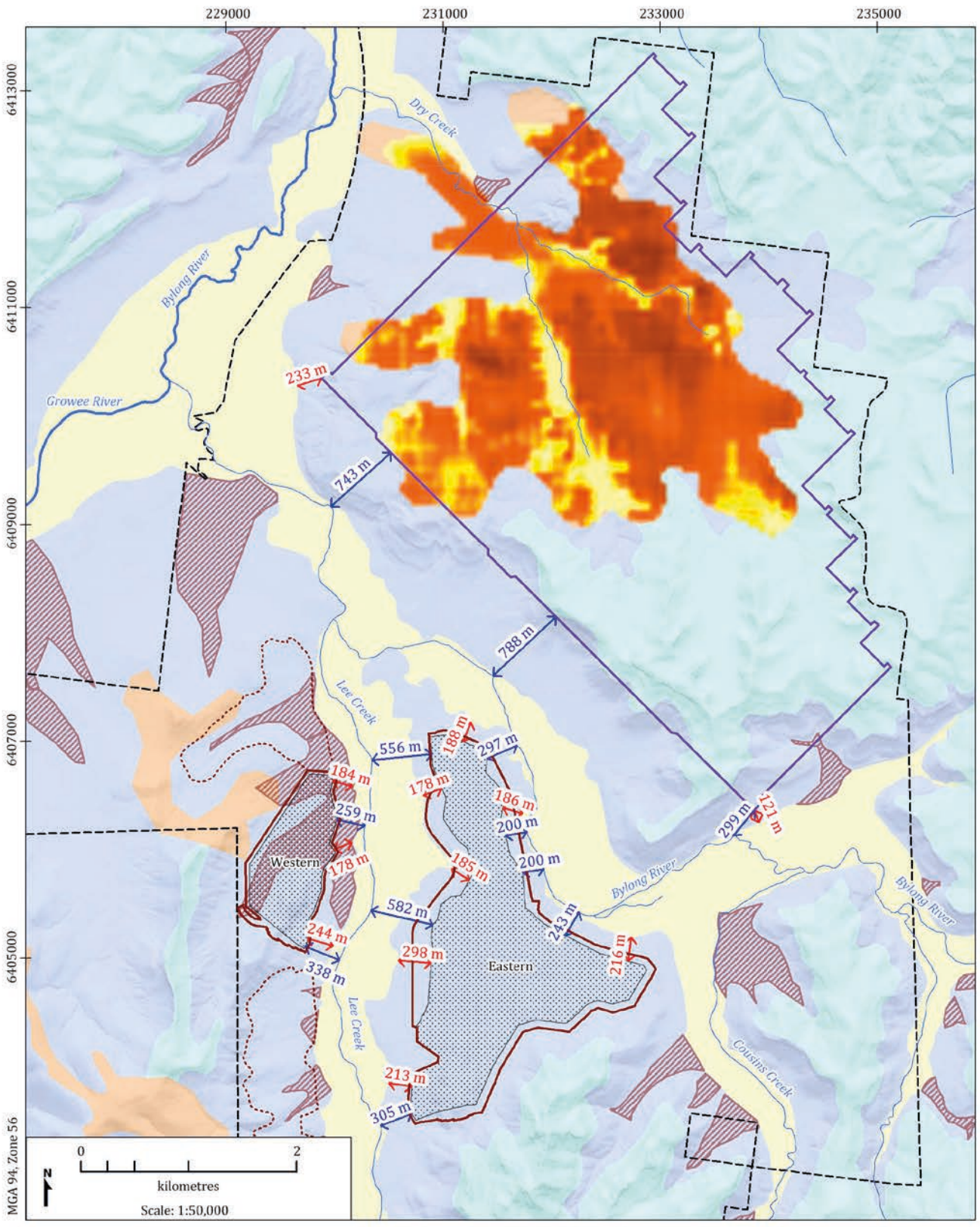

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Open Cut footprint
- Distance - Proposed mining area to creek
- Distance - Proposed mining area to alluvium

Basalt thickness (m)

- 1
- 5
- 15
- 60

- Major drainage
- Minor drainage

Geology

- Qa - Quaternary - alluvium
- Tb - Tertiary - basalt
- Ma - Triassic - phonolite intrusion
- Mt - Triassic - tschenite intrusion
- TRn - Triassic - Narrabeen group
- Pi - Permian - Illawarra Coal Measures
- Ps - Permian - Shoalhaven group
- Mapped colluvium

Bylong Coal Project (G1606)

Mining area setback distance and basalt thickness

DATE: 4/6/2015

FIGURE No: **7.2**

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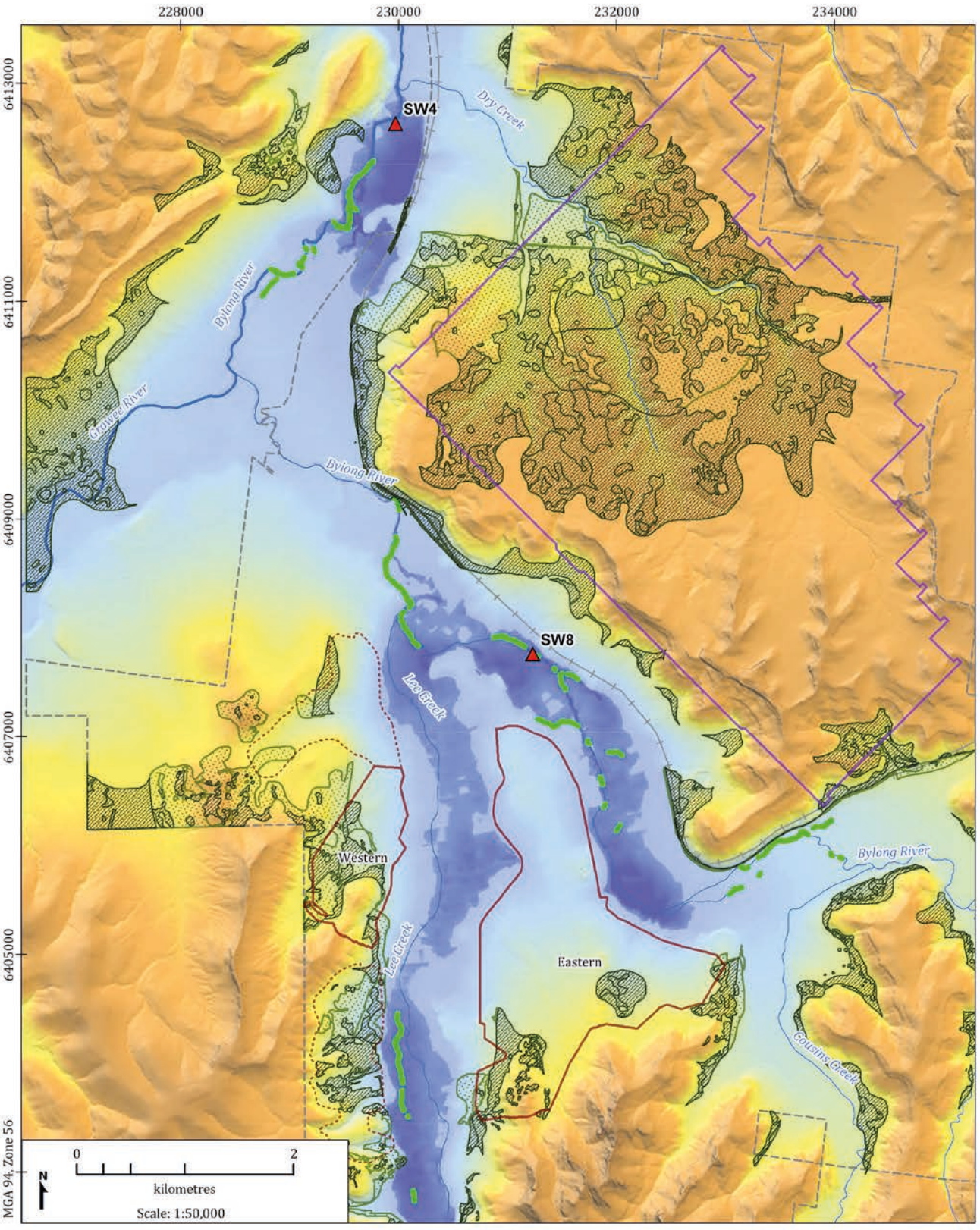
7.1.2 Weathered Tertiary and Permian formations

The weathering of the Tertiary and Permian within the Project Boundary ranges from 5 m to 30 m below ground surface. This zone of weathering acts as a zone of enhanced permeability in the weathered rock matrix, but is only saturated in the lower lying landscape within and around the Bylong River flood plain.

Figure 7-3 presents the depth to the water table and indicates that majority of the Permian weathered zone above the proposed underground extraction area is unsaturated. Weathered formations in elevated areas to the southeast also appear unsaturated (Figure 7-3). Data from vibrating wire piezometers indicates the localised perching of groundwater in the basalt cap above the longwall mining area.

In contrast, in areas of the lower lying valley floors, the weathered zone rock that is adjacent to and underlies the alluvium is saturated. This is of particular interest in the region between the proposed open pits and the flood plain where the weathered zone may yield groundwater to the open pits during mining. The potential for the weathered zone to act as a conduit for flow through from the alluvium during mining appears high in the northern portion of proposed Eastern Open Cut Mining Area and the eastern edge of the proposed Western Open Cut Mining Area. Groundwater levels and hydraulic gradients in this area are discussed further below.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Streamflow measurement location
- River/Creek water presence
- EPBC Act TECs (EEC)
- TSC Act TECs (EEC)
- Railway

Depth to groundwater (m)

- 0
- 2
- 2.1
- 10
- 50
- 100
- 430

Bylong Coal Project (G1606)

Depth to the water table and stream flow interaction

DATE: 25/5/2015

FIGURE No: **7.3**

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7.1.3 Permian coal measures

The Coggan and Ulan Coal Seams are the main economic targets for mining. These also represent the most permeable units within the Permian strata. There are several coal seams overlying the Coggan and Ulan Coal Seams, including the Farmers Creek, State Creek Mine Seam and Goulburn Seam. These upper seams are unsaturated over most of the Project Boundary, but may contain groundwater at lower elevations below about 250 mAHD further to the northeast.

The Permian interburden and overburden comprises of sandstones, interbedded siltstones, and claystones. These units typically form low permeability aquitards both when present close to the surface and therefore weathered, or at depth and therefore fresh.

Packer testing was undertaken on selected exploration holes to provide an estimate of the hydraulic conductivity of the consolidated hydrostratigraphic units within the Authorisations. Testing focused on the proposed underground mining area, within the overburden and multiple coal seams from which the Coggan Seam will be mined. DP carried out rising head tests on piezometers within the Coggan Coal Seam which indicated that the hydraulic conductivity of the coal seams can be high compared to interburden and overburden. The Coggan Seam recorded the highest mean median hydraulic conductivity at 0.2 m/day, with the Ulan seam being much lower at 6×10^{-3} m/day.

7.1.4 Tertiary basalts and localised perched aquifers

A basalt cap occurs on the elevated terrain where longwall mining is proposed, and overlies less permeable Permian units. Data indicates the basalt forms a localised perched groundwater system in the elevated plateau areas where it is permeable. VWP BY0011 intersected about 57 m of fractured basalt with a VWP sensor installed just below the basalt indicating the basal 20 m of the basalt flow was saturated. No other holes installed within or intersecting the basalt recorded the presence of groundwater. This indicates the basalt only appears saturated where it is thickest and at low points in the Permian paleosurface that the basalt unconformably overlies. Dry Creek also appears to contribute leakage to the basalt with VWP BY0011 being located in close proximity. The data indicates the basalt groundwater system is not extensive, or directly connected to the regional groundwater system.

7.1.5 Marrangaroo sandstone

The Marrangaroo Sandstone underlies the Coggan Coal Seam across most of the area within the Authorisations. Packer testing on the upper section of the Marrangaroo Sandstone indicates it typically has a low permeability with a median hydraulic conductivity of 8×10^{-4} m/day. This contrasts with the Wilpinjong area where drilling has shown the Marrangaroo Sandstone is a clean, coarse sandstone and forms a thin, but productive aquifer.

7.1.6 Summary

Table 7.1 summarises the hydraulic conductivity values attained from packer and rising head testing.

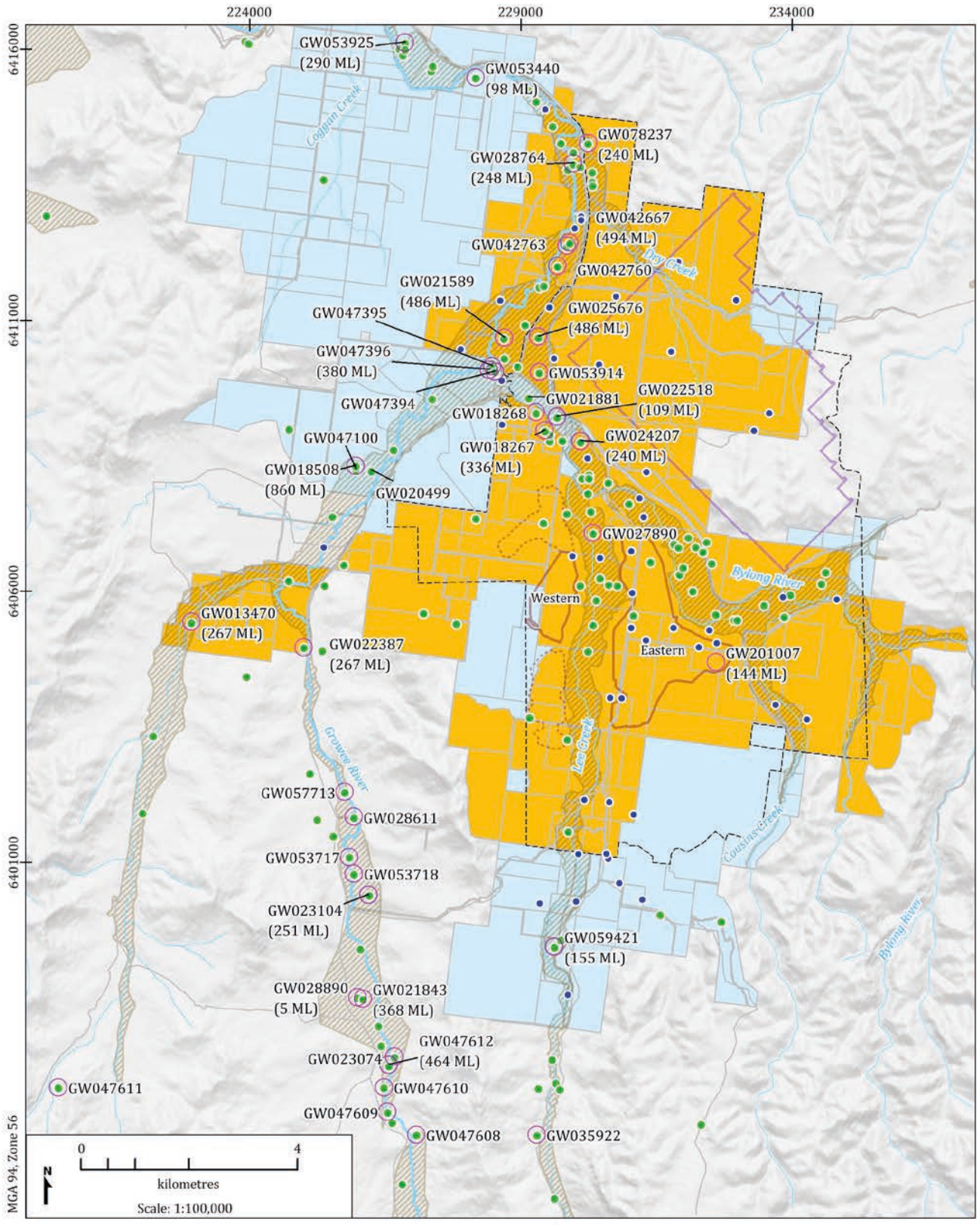
Table 7.1 Summary of hydraulic conductivity values

Unit	Number of tests	Hydraulic conductivity (m/day)	
		Range	Median
Quaternary alluvium	23	0.04 - 14	4.6
Tertiary Volcanics	4	4.5×10^{-5} – 0.2	8.8×10^{-3}
Permian interburden	92	1.9×10^{-5} – 8.3	6×10^{-3}
Ulan coal seam	10	3.9×10^{-4} – 6×10^{-1}	6×10^{-3}
Coggan coal seam	15	5.5×10^{-4} – 2.1	0.2
Marrangaroo Sandstone	17	2.3×10^{-4} – 7.1×10^{-1}	8.4×10^{-4}

7.2 Yields and usage

7.2.1 Government database

The WSP report card for the Bylong River water source indicates the area has a total groundwater entitlement of 5,843 ML/year (100% used for irrigation purposes). There are 23 groundwater licences in the area and the groundwater is primarily extracted from the Quaternary alluvium for agricultural purposes. Figure 7-4 shows the location of existing private bores sourced from the PINNEENA database and groundwater allocations obtained from a Freedom of Information Search.



LEGEND:

- Monitoring bore
- Registered bore (Pinneena)
- Licence allocation (volume in ML)
- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Quaternary alluvium

Landownership

- KEPCO Bylong Australia Pty Ltd
- Private Freehold

Bylong Coal Project (G1606)

Groundwater users and entitlements

DATE: 25/5/2015

FIGURE No: **7.4**

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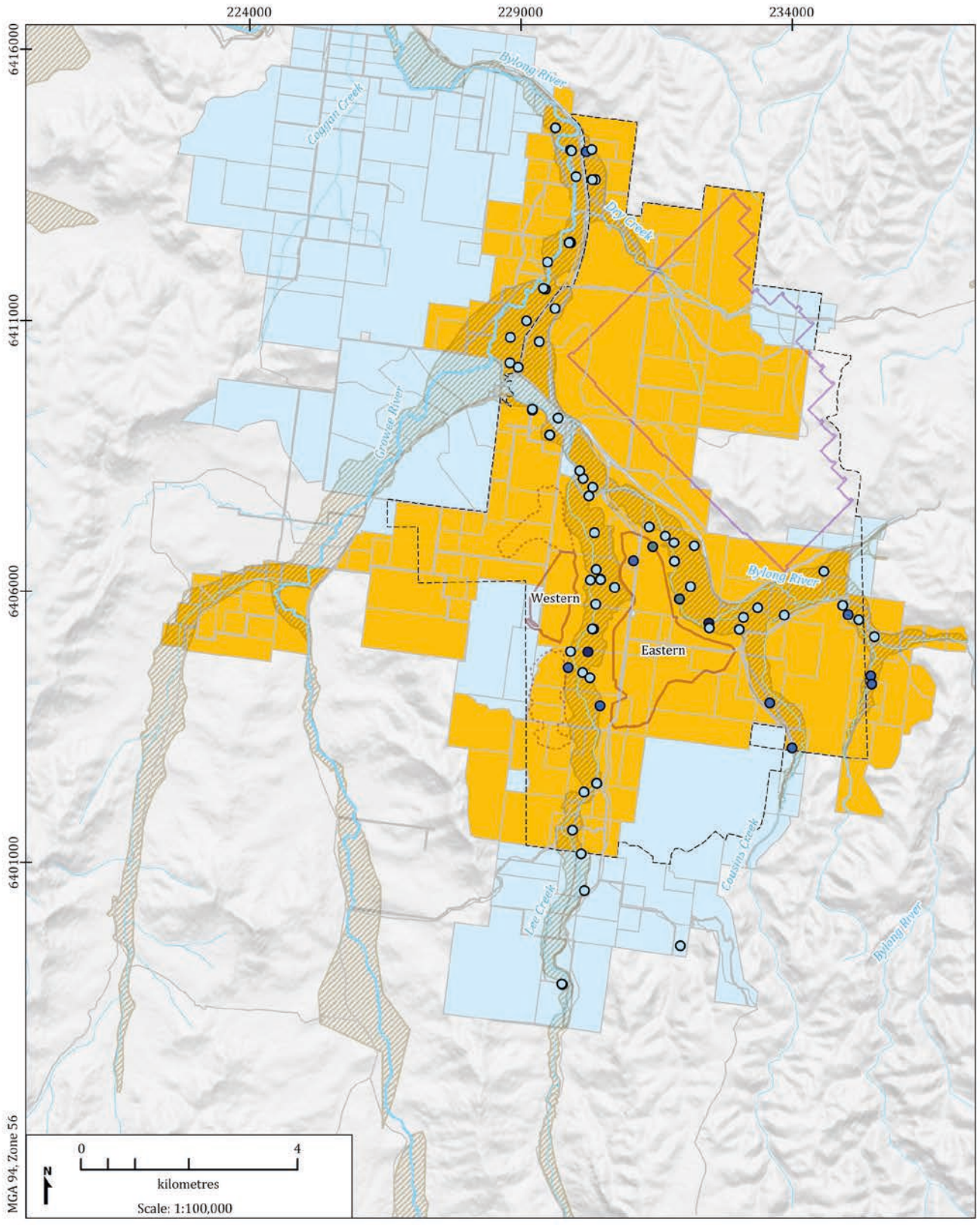
7.2.2 Bore census

The locations of existing water bores were surveyed by De Witt Consulting on properties owned by the proponent or by surrounding private landholders. Appendix D contains the survey co-ordinates. The purpose of the survey was to confirm the locations of bores and wells and to provide coordinates for measuring drawdown at with the groundwater model. The survey identified 84 sites comprising:

- nine bores;
- two government monitoring bores;
- 69 wells; and
- four sites unable to be identified.

Figure 7-6 shows the locations of the bores and wells identified in the survey. The wells were typically 1.2 m to 1.5 m diameter concrete caisson style, with the older wells being about 1.1 m x 1.1 m square and constructed of wood. The shallow wells are prevalent as they maximise yields from the relatively thin alluvial sequence. Figure 7-5 shows typical concrete wells encountered during the survey.

Figure 7-5 Typical concrete 'caisson' style wells in area



LEGEND:

Bores and wells from census
- Well
- Bore
- Government monitoring bore
- Not identified

Landownership
- KEPCO Bylong Australia Pty Ltd
- Private Freehold

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Quaternary alluvium

Bylong Coal Project (G1606)

Locations of bores and wells from census

DATE: 25/5/2015

FIGURE No: **7.6**

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7.3 Hydraulic gradients and water levels

Figure 7-7 presents time variant groundwater levels from the PINNEENA database for the region around the Authorisations from 1980 to 2015. Groundwater levels are presented against the CRD to infer where historical bore records are influenced by climate and hence groundwater recharge patterns.

The monitoring frequency has not been sufficient to detect rapid water level fluctuations due to recharge events that occur over a period of days or weeks. The data does show groundwater levels are relatively stable, with a downward trend evident in some of the bores between 1997 and 2008, a period now known as the 'Millennium Drought'. Declines of up to 7 m were recorded in some alluvial monitoring bores (e.g. GW053322, GW053266, and GW027030). Interestingly the CRD curve for the Wollar Gauge does not show a strong downward trend during this period. The falling trends are likely to be associated with groundwater pumping, below average rainfall, or a combination of both.

Figure 7-8 shows an interpreted regional groundwater flow pattern. Data for this contour map was sourced from historical information from the PINNEENA database (NOW, 2013) as well as from site monitoring bores. This regional groundwater contour map is not specific to any specific hydrostratigraphic unit. There is a general north easterly flow direction from contours.

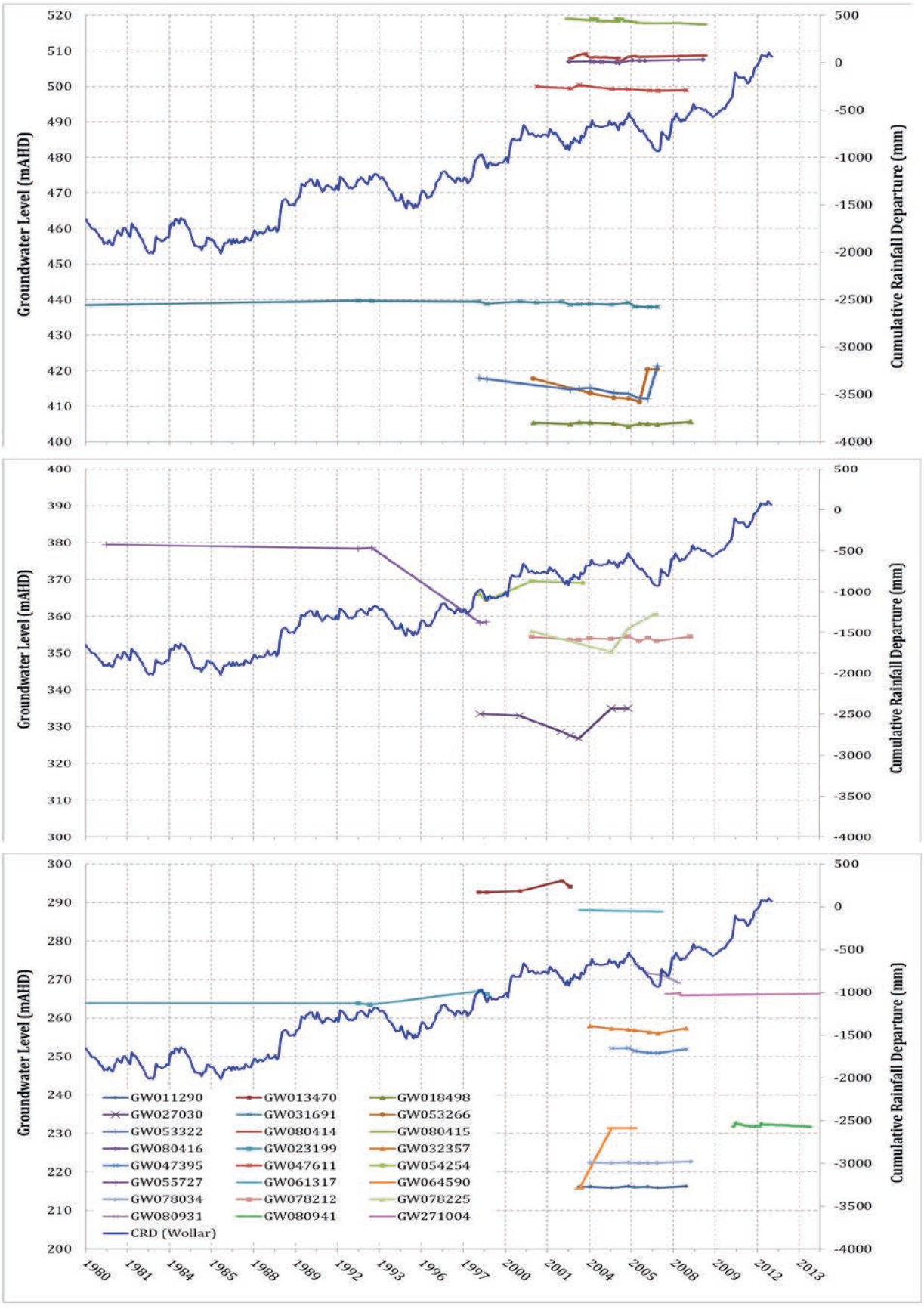
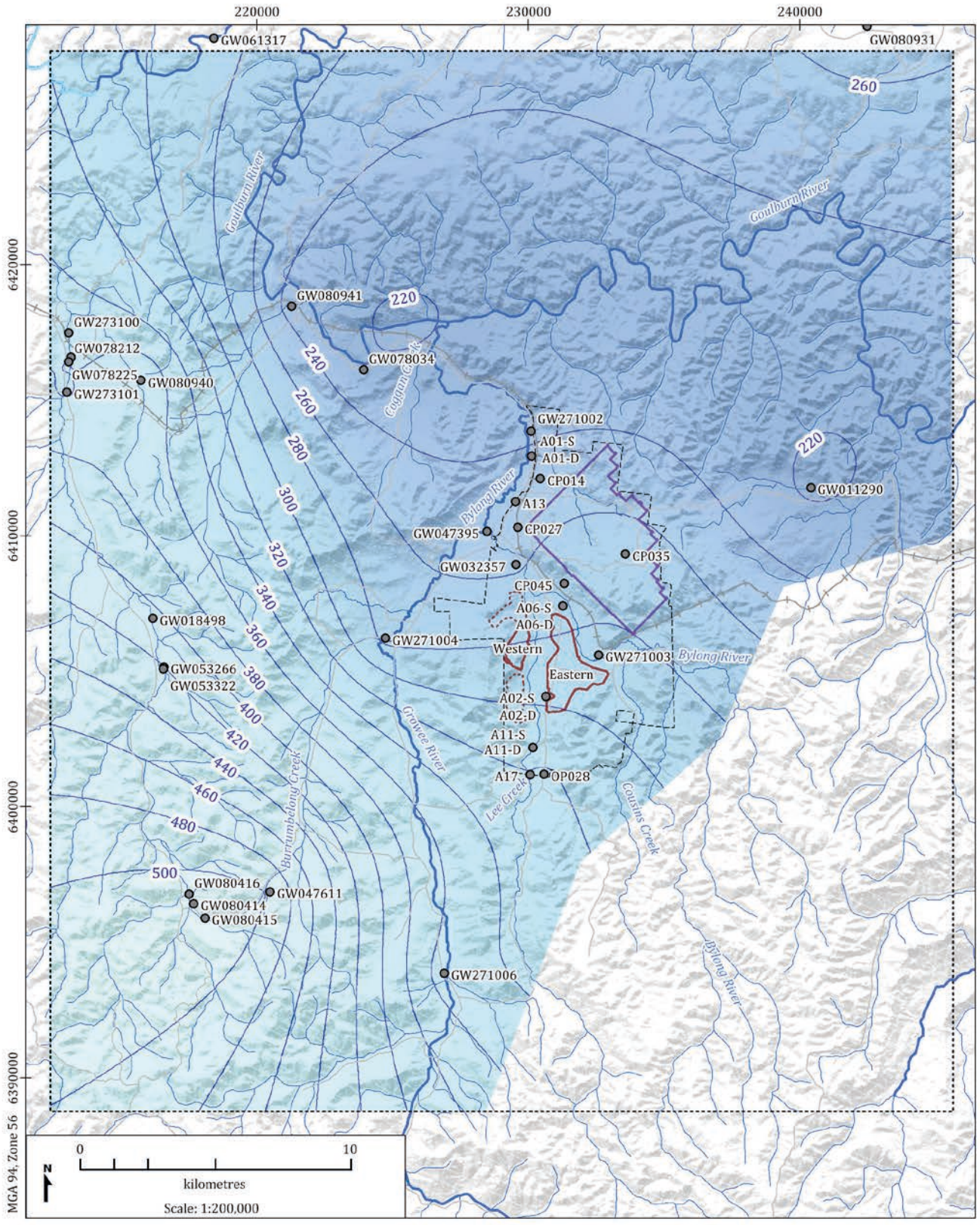


Figure 7-7 Regional historical groundwater levels (source PINNEENA)



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Model boundary
- Groundwater Level Contour (mAHD)
- Groundwater Observation Bore
- Major drainage
- Minor drainage
- Major road
- Road
- Railway

Bylong Coal Project (G1606)

Regional groundwater levels

DATE: 10/2/2015

FIGURE No: **7.8**

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Figure 7-9 shows groundwater levels within the alluvium associated with the Bylong River compared against flow volumes recorded at stream flow gauge SW8 which is located downstream of the proposed open cut mining area.

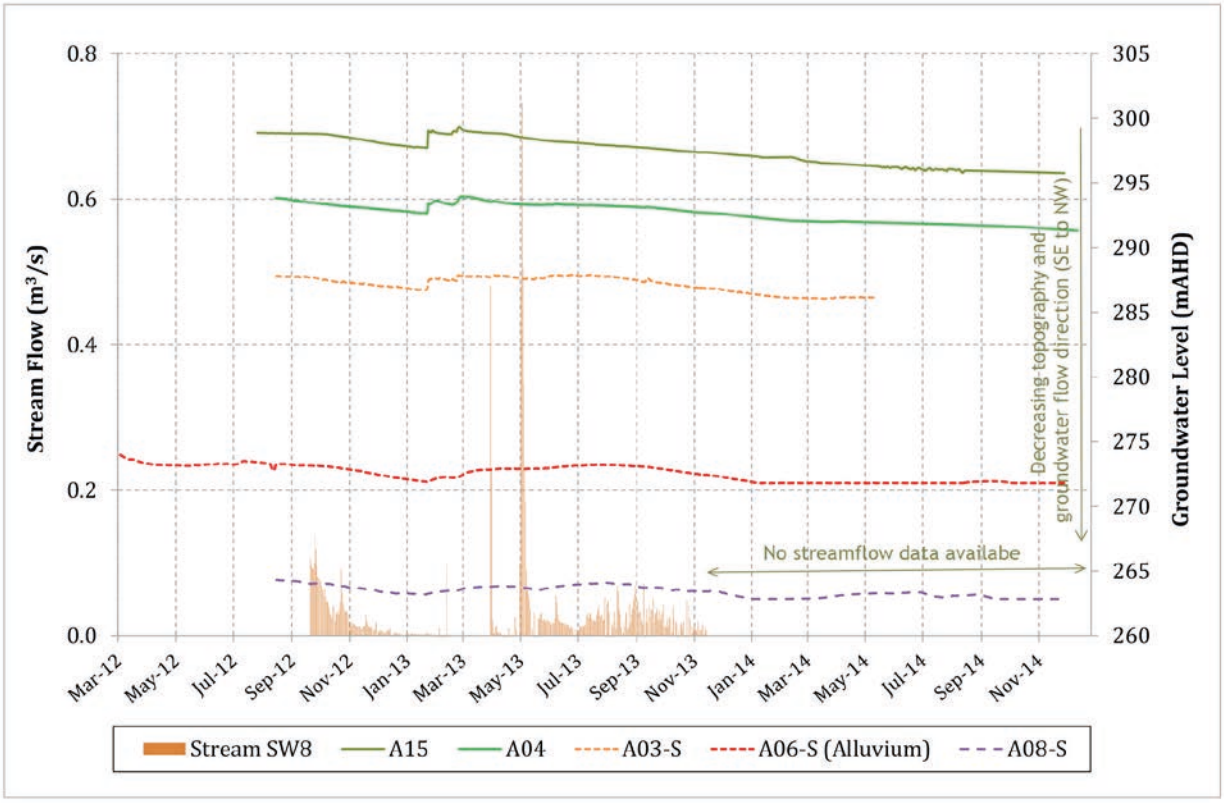


Figure 7-9 Alluvial groundwater levels - Bylong River valley

The hydrograph indicates groundwater levels decline during periods of low stream flow and low rainfall. Increases in groundwater levels occurred following significant stream flow events in February and March 2013. Interestingly the peak in groundwater levels and stream flows in February 2013 does not match rainfall at the site gauge, while increases noted in March 2013 do correlate with rainfall. This indicates rainfall alone is not the only contributor to recharge to the alluvial groundwater system and stream leakage is also significant. Rainfall in the upper catchment generating stream flow events is a recharge source to the groundwater system further downstream as stream flow leaks from the river bed into the underlying aquifer as the slopes flatten and the creek bed becomes less defined.

Figure 7-10 shows alluvial groundwater levels from within the Lee Creek valley.

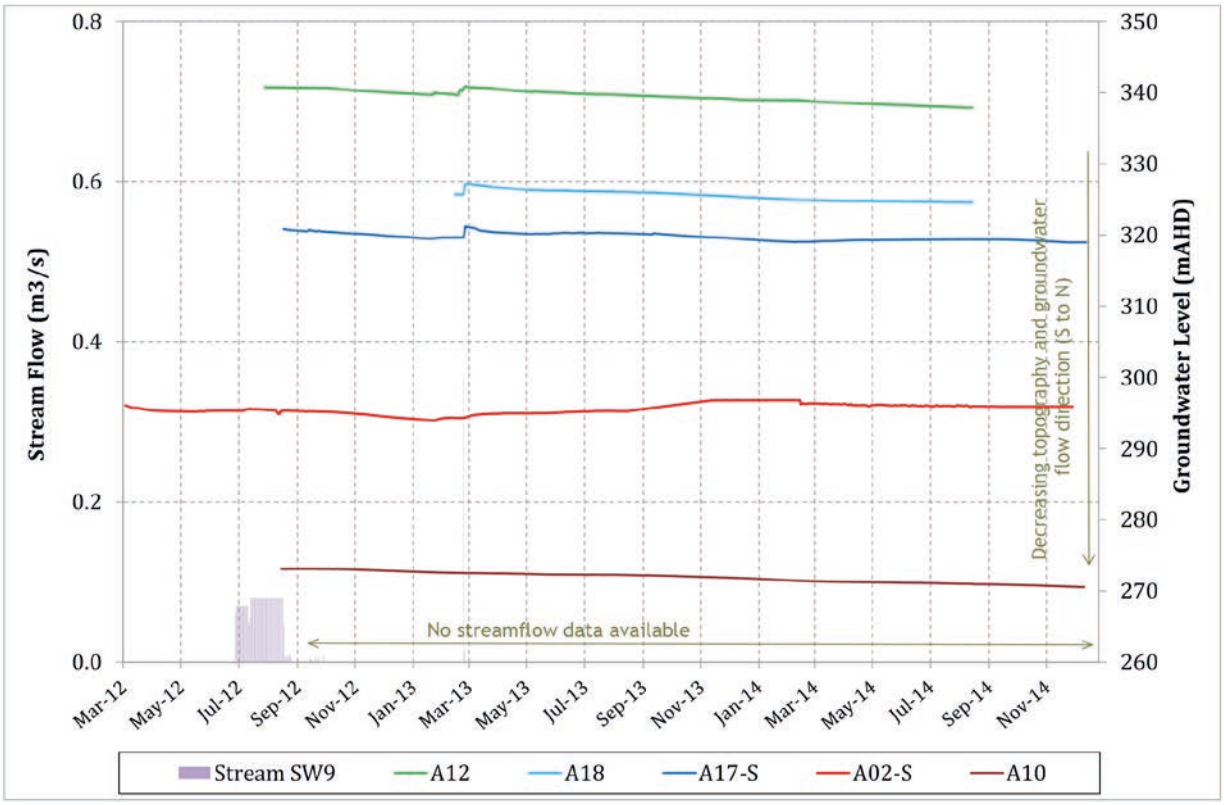


Figure 7-10 Alluvial groundwater levels - Lee Creek valley

Whilst similar to the Bylong River Valley, the groundwater levels lack the increase observed in the Bylong River Valley during February 2013. The long duration of low flow in the stream gauge record, and the flatter groundwater hydrographs, suggest that the Lee Creek catchment may have either a more subdued response to groundwater recharge or less groundwater recharge than the Bylong River Valley.

The observed decline in groundwater levels is expected to be due to the combined effect of below average rainfall recharge and licensed groundwater extraction. Flow directions within the Bylong River and Lee Creek alluvium follow topography, that is, downhill in each valley.

Figure 7-11 shows groundwater levels for the Coggan Coal Seam compared against rainfall.

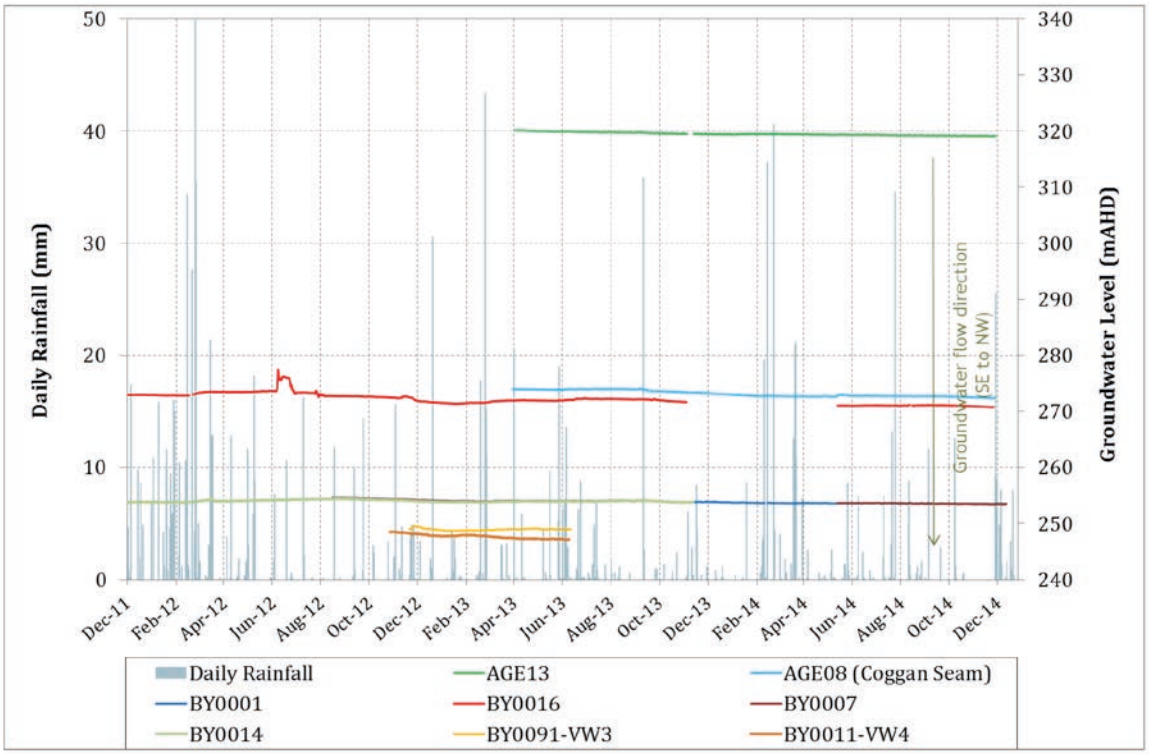


Figure 7-11 Coggan Coal Seam groundwater levels

The groundwater levels remain relatively static throughout the record with only a slight downward trend. This indicates a lesser discharge rate and permeability within the coal seam groundwater system compared with the alluvium. Groundwater levels show the flow direction in the Coggan Coal Seam is in a northerly or northeasterly direction coincidentally consistent with the direction of dip (Figure 7-7). The recharge event during March 2013 recorded in alluvial bores is not apparent in groundwater data from the Coggan Coal Seam. This suggests the Coggan Coal Seam is more limited and buffered from specific climatic events, which is to be expected given the greater depth of the seam.

Figure 7-12 shows groundwater levels in both the alluvium associated with the Bylong River and the Coggan Coal Seam adjacent to and sub-cropping below the alluvium. The hydrographs indicate the vertical gradient is either neutral or upwards.

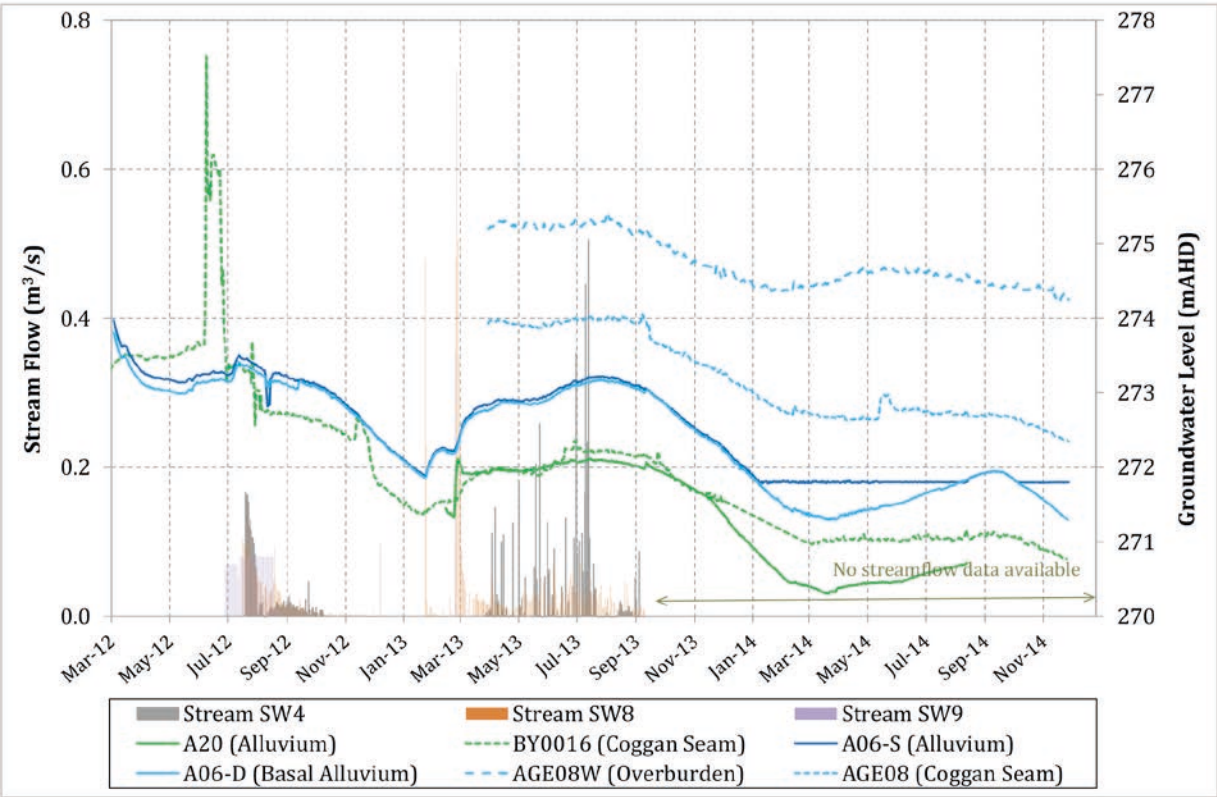


Figure 7-12 Vertical hydraulic gradients - Alluvium and Coggan Coal Seam

Figure 7-13 presents data from the Permian strata from the VWP installed at BY0011.

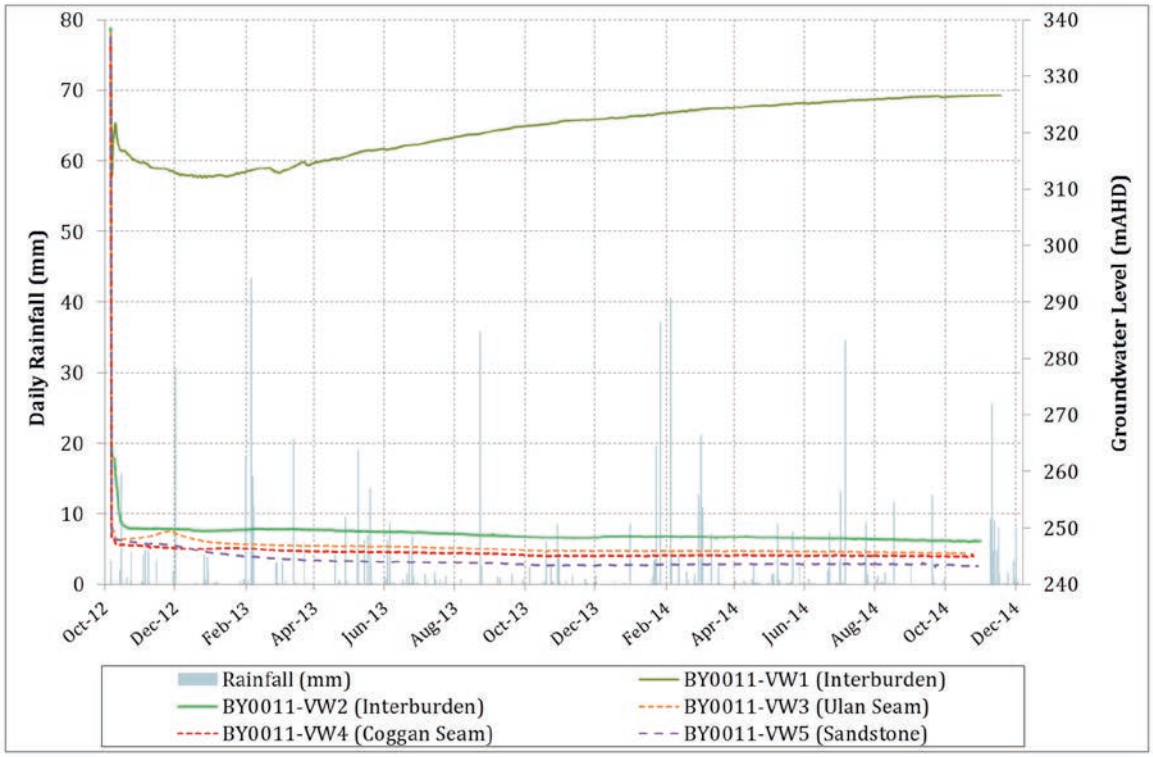


Figure 7-13 Vertical hydraulic gradients in the Permian sequence

The groundwater levels below, within and directly above the Coggan and Ulan Coal Seams (VW3) record similar elevations. The shallow VWP sensor (VW1) records a significantly higher groundwater level than the four lower sensors. Data from the VWP installed in BY0091 shows very similar data. Data indicates a perched groundwater system is present in elevated areas with aquitards separating the shallow Permian overburden from the lower Permian sequence. The Tertiary basalt cap in this area is expected to enhance recharge resulting in perching of water on the less permeable Permian sequence. The shallow VW1 in BY0011 also recorded a gradually rising trend suggesting a long lag time for recharge.

7.4 Recharge, discharge and groundwater flow

Recharge to the groundwater system within the Authorisations can be characterised from two major sources. Firstly, direct rainfall recharge through the soil zone to the water table. Secondly, infiltration of surface water through the beds of rivers and creeks. Leakage from river or creek beds is only likely to be significant when rivers are flowing and when surface water levels are higher than groundwater levels. Rainfall recharge through the soil zone will only be possible when soil moisture deficits are overcome and the soil profile reaches saturation (field capacity).

Variable rainfall in the area likely means, daily rainfall and / or stream flow may vary significantly on a catchment scale. This may explain water table rises when there is no rainfall recorded in the site gauge.

Experience in similar environments in the Western Coalfields and Hunter Valley has shown that recharge rates to alluvium are generally five to >ten times higher than the consolidated strata (e.g. AGE 2005). This is a direct reflection on the ground permeability and storage potential of the two formations.

Recharge to the Permian is through lateral migration along dip where units sub-crop near the surface, particularly in low-lying areas underneath or adjacent to alluvium. Due to the low bulk vertical hydraulic conductivity in the Permian overburden, downward recharge through the Permian sequence to the Coggan and Ulan Coal Seams would be very limited.

Groundwater hydrographs from the monitoring bores show that groundwater levels (particularly in the alluvium) do rise rapidly in the order of 0.5 m to 1 m in response to significant climatic events. Groundwater levels also demonstrate that recharge episodes are infrequent, leading to long term declines in groundwater levels over prolonged dry periods between soaking rainfall events.

A simplistic soil moisture balance calculated with a spreadsheet was used to estimate rainfall recharge rates to the shallow groundwater system. Daily rainfall from the gauge installed at the Project was used, along with data from the Wollar rainfall gauge (BOM station 62032) during periods when no data was available. The soil moisture balance also assumed:

- evapotranspiration – 2.5 mm/day;
- field capacity – 50 mm; and
- maximum daily recharge capacity – 25 mm replicating increased runoff under intense rainfall events.

Figure 7-14 shows the components of the soil moisture balance and the estimated capped effective recharge.

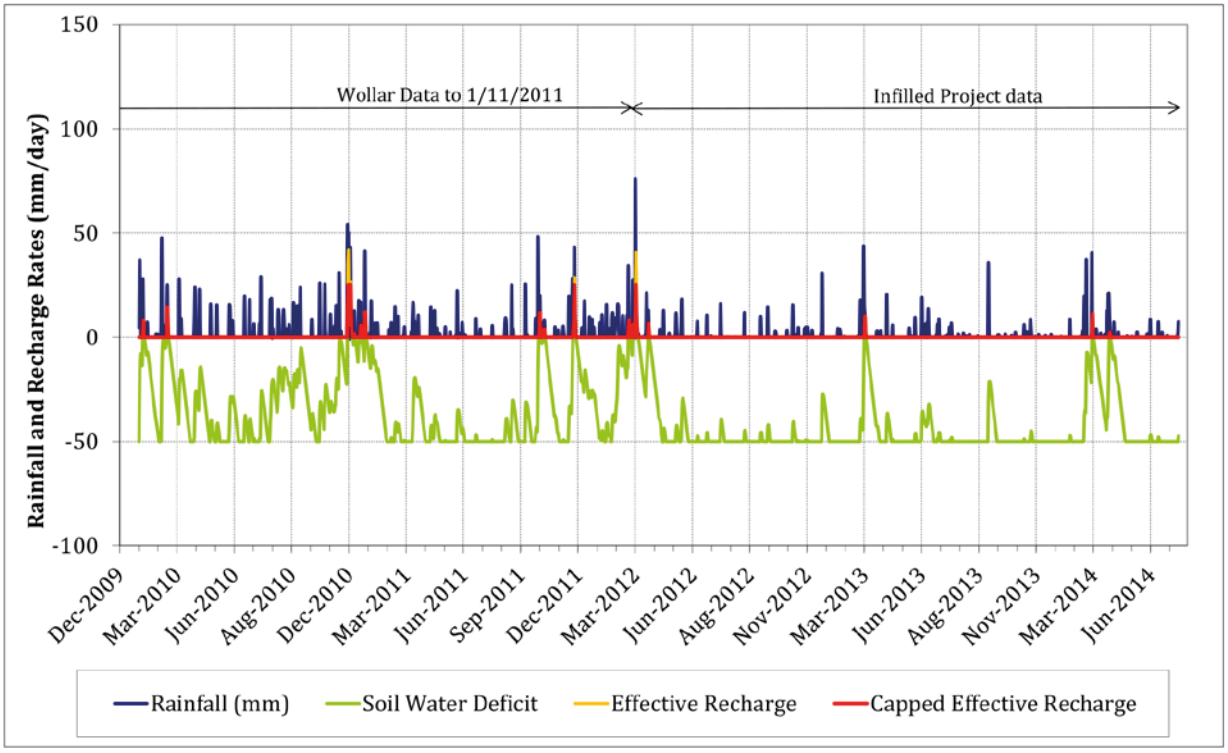


Figure 7-14 Rainfall recharge

Figure 7-14 shows the soil moisture deficit with recharge only occurring when the soil moisture deficit reaches zero. The extended records from the Wollar rainfall data shows the period prior to June 2012 was wetter than after this period. This wetter period potentially produced a larger number of recharge events. The below average rainfall recorded over 2013 and 2014 results in less recharge events and explains the declining groundwater levels recorded in the area.

Figure 7-15 compares the recharge results against alluvial groundwater levels. The recharge events generally correlate with rising groundwater levels, although the response to the event in March 2014 was relatively subdued.

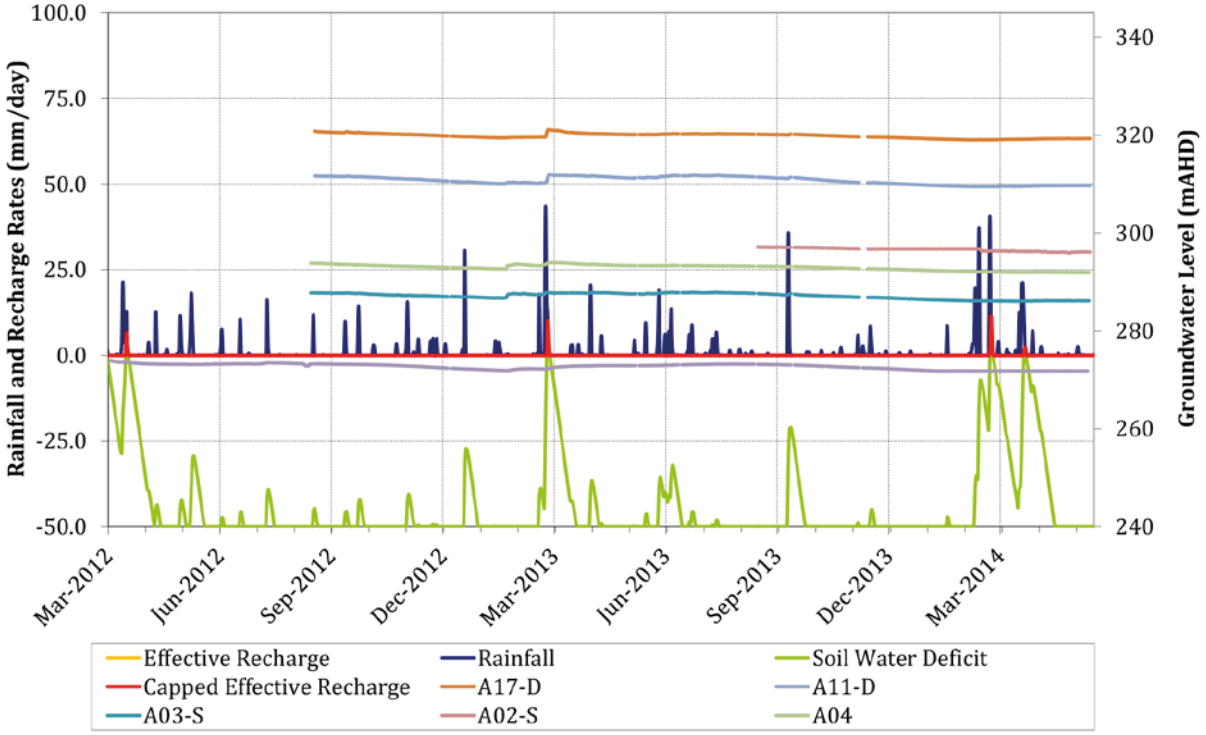


Figure 7-15 Rainfall recharge versus alluvial groundwater levels

Groundwater discharges either as baseflow to surface water systems, evapotranspiration, pumping from bores or down valley flow within the alluvium.

Stream flow data indicates that baseflow to streams does not sustain perennial flows. The seepage meters installed in pools within the Bylong River indicates a transfer of water into the pools from the aquifer during dry periods. Figure 7-3 shows where surface pools were identified on aerial photography during periods of low flow, which align well with the depth to water indicating the pools are water table windows. It is evident that, sections of creeks and rivers either recharge the groundwater system or receive discharge from the groundwater system depending on the climatic conditions.

Evapotranspiration is a significant component of the water balance and is greater in areas of shallow water table depth along the alluvial valley flats (Figure 7-3). A search of available data has confirmed that groundwater abstraction from private bores in the region has not been recorded; however, a FOI search indicates water entitlements are a significant component of the water balance. Groundwater through flow within the alluvium is also expected to be significant. The majority of outflow is expected where alluvium merges with the Goulburn River.

7.5 Water quality and environmental values / beneficial use

Douglas Partners (2013b, 2014a, 2014b) present tables of raw water quality data and along with statistical and graphical analysis. Douglas Partners (2013b) was appended to the Gateway application, whilst Douglas Partners (2014a, 2014b) are included within Appendix B of this report. The sections below summarise the baseline hydrochemical data. At December 2014 a total of 471 water quality samples had been collected from 15 alluvial monitoring bores, nine Permian monitoring bores and eight surface water sites. The samples were analysed for EC, pH and a full suite of major and minor ions.

Table 7.2 summarises the minimum, mean and maximum data for each site. Figure 7-16 presents a histogram of EC recorded in samples collected from the monitoring bores in the alluvium and Permian and surface waters sites.

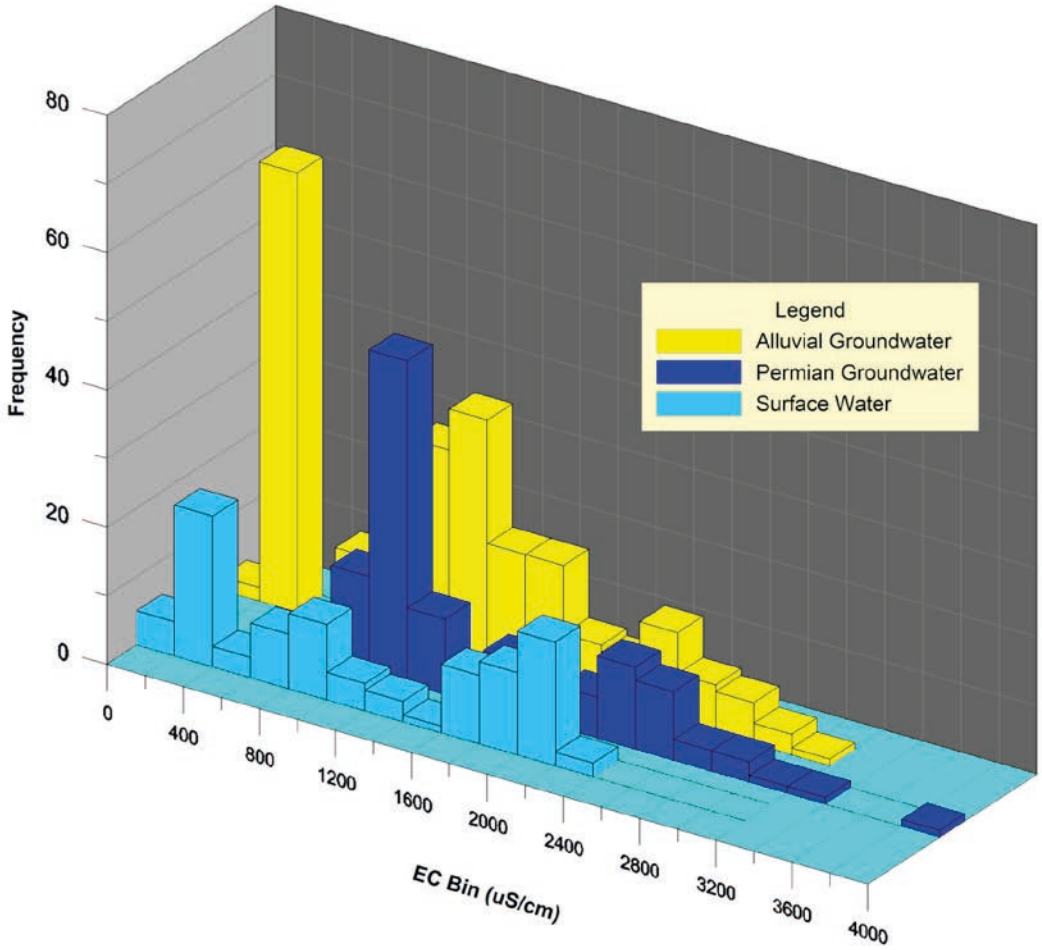


Figure 7-16 Histogram of groundwater and surface water EC

The data shows the salinity as indicated by the EC has a similar range in the alluvium and Permian, and is slightly lower in the surface water. This indicates good hydraulic connectivity between the alluvium and Permian groundwater systems and the surface waters.

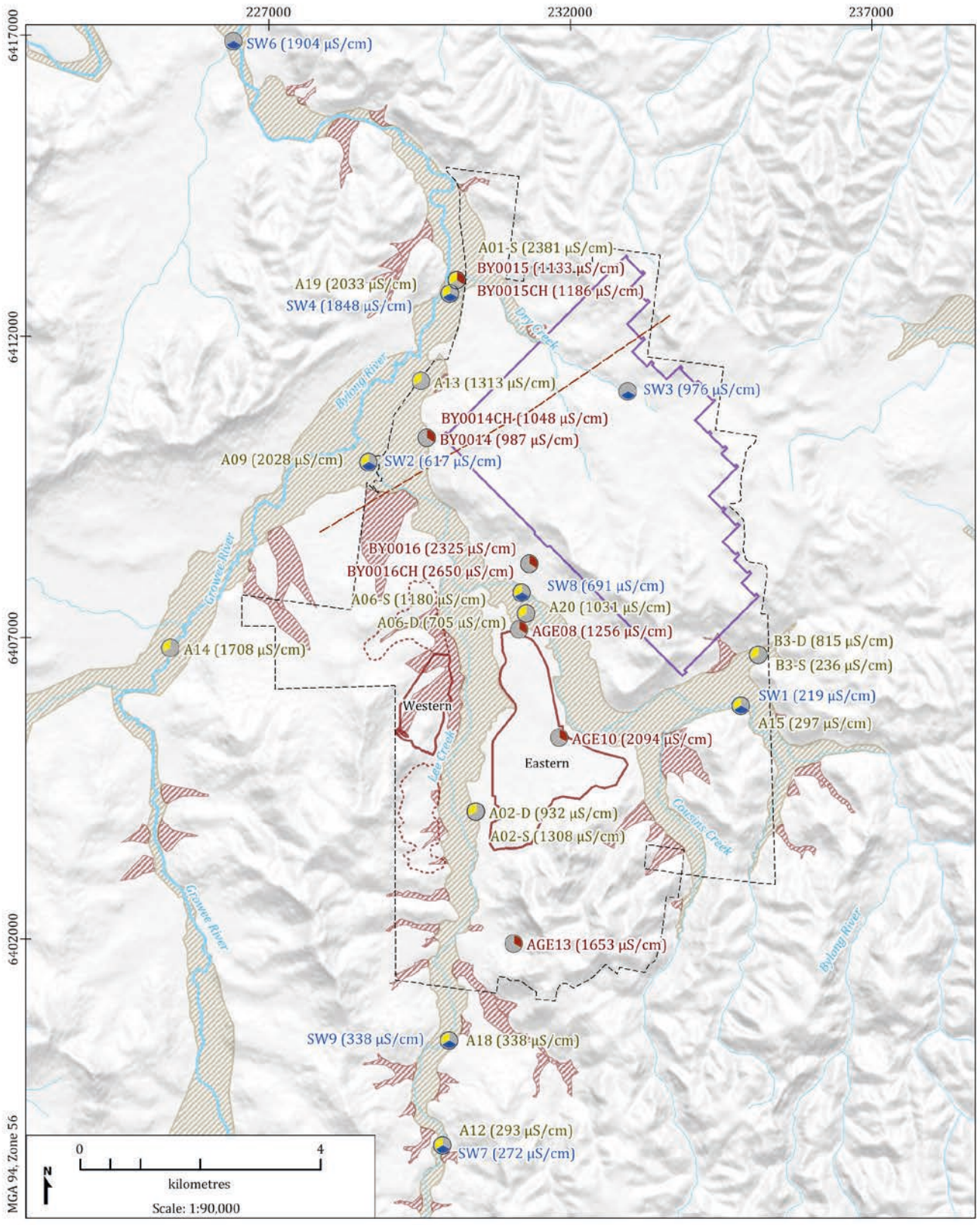
Alluvial water samples ranges from relatively fresh (190 µS/cm) to brackish (3,100 µS/cm). EC for the Permian Coal Measures is also fresh to brackish ranging from 930 µS/cm to 3,900 µS/cm. This low salinity for the Permian Coal Measures suggests that the alluvium is a recharge area to the Permian sequence.

Surface water sites range from 120 µS/cm to 2,300 µS/cm with five of the sites below 1,000 µS/cm. The salinity of surface water suggests a significant groundwater baseflow component from groundwater discharge. Figure 7-17 illustrates how the salinity varies spatially across the Project area.

Table 7.2 Groundwater and surface water quality summary

Lithology	Bore ID	No. Samples	EC (µS/cm)			pH			SO_4 (mg/L)			Na (mg/L)			Cl (mg/L)			Mg (mg/L)			K (mg/L)			HCO_3 (mg/L)			Ca (mg/L)		
			Min	Max	Avg.	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg.	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg.	Min	Max	Avg
Alluvium	A01-S	32	1,200	3,100	2,381	5.9	8.5	7.2	33	320	241	200	390	283	120	570	404	83	140	104	5	8	7	400	630	456	100	150	124
	A02-D	5	910	990	932	6.1	6.8	6.6	91	100	96	71	79	74	100	110	106	45	48	47	4	5	5	260	270	264	74	76	75
	A02-S	26	1,000	1,900	1,308	6.9	8.1	7.3	41	95	62	33	65	53	110	180	152	42	76	65	4	10	8	260	390	342	70	120	113
	A06-D	6	630	800	705	6.3	7.5	6.8	12	15	13	72	82	76	71	85	78	28	33	31	4	5	5	220	270	245	35	43	39
	A06-S	23	920	1,600	1,180	6.8	8.6	7.4	9	27	14	85	150	110	41	260	163	39	85	56	2	5	3	300	470	371	48	92	64
	A09	24	680	2,900	2,028	6.2	8.3	7.2	37	400	201	85	370	249	68	500	339	23	160	91	5	12	9	200	490	378	27	150	95
	A12	22	250	330	293	5.2	8	6.6	13	22	18	15	25	21	22	30	26	9	15	13	3	4	3	65	100	87	13	21	18
	A13	32	1,100	1,600	1,313	6.3	8.3	7.3	65	140	87	89	130	114	180	280	211	50	80	61	5	7	6	260	320	290	64	110	78
	A14	25	1,500	1,800	1,708	6.3	8.1	7.3	55	270	220	120	180	157	160	230	180	77	110	88	4	6	5	360	490	453	100	150	120
	A15	23	260	350	297	5.8	8	6.7	4	20	6	21	32	27	25	42	35	10	16	13	3	3	3	77	110	87	10	15	12
	A18	24	290	380	338	5.9	8.2	6.7	10	31	22	17	26	22	20	28	23	11	19	13	5	25	14	97	140	113	16	28	20
	A19	3	2,000	2,100	2,033	7.4	7.7	7.6	250	280	267	190	200	197	330	350	337	86	97	91	8	8	8	330	340	337	110	120	117
	A20	21	740	1,300	1,031	5.6	8.5	7.3	21	110	57	80	130	110	76	210	134	26	58	44	5	7	6	240	360	300	34	71	56
	B3-D	8	610	970	815	5.7	8	6.3	1	120	33	55	130	94	35	92	54	20	40	30	5	9	7	320	550	401	23	54	38
	B3-S	8	190	290	236	5	6.9	5.9	6	13	9	17	39	31	23	39	29	5	10	8	4	6	5	34	100	64	4	12	7
Permian	AGE08	18	1,100	1,300	1,256	5.8	8.6	7.0	1	1	1	190	280	241	38	100	84	25	30	28	11	16	14	520	610	581	31	39	35
	AGE10	16	1,900	2,300	2,094	6.7	8.4	7.2	15	35	22	130	460	376	190	250	217	52	69	63	19	29	25	660	960	860	49	60	55
	AGE13	15	1,500	1,800	1,653	6.8	8.1	7.2	41	66	54	100	250	208	130	170	151	65	83	76	15	21	19	660	840	694	65	77	72

Lithology	Bore ID	No. Samples	EC (µS/cm)			pH			SO_4 (mg/L)			Na (mg/L)			Cl (mg/L)			Mg (mg/L)			K (mg/L)			HCO_3 (mg/L)			Ca (mg/L)		
			Min	Max	Avg.	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg.	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg.	Min	Max	Avg
	BY0014	3	980	990	987	7.4	7.7	7.6	1	1	1	200	220	210	77	90	84	19	20	20	10	12	11	470	470	470	33	36	35
	BY0014CH	29	930	1,100	1,048	6.7	8.6	7.8	1	1	1	160	240	196	71	99	80	17	22	19	9	12	11	400	500	465	30	39	34
	BY0015	3	1,100	1,200	1,133	7.3	7.6	7.4	34	37	36	210	240	220	110	120	113	27	27	27	12	13	13	420	430	423	46	47	46
	BY0015CH	29	1,100	1,200	1,186	6.8	8.2	7.4	24	310	45	160	240	203	110	460	128	22	28	25	10	14	13	410	510	432	38	48	43
	BY0016	4	2,300	2,400	2,325	6.2	7.3	7.0	2	4	4	630	660	640	170	180	173	19	20	19	15	18	17	1100	1100	1100	29	32	31
	BY0016CH	28	2,400	3,900	2,650	7	8.8	7.4	5	130	32	490	740	613	170	630	271	17	88	28	15	26	19	890	1100	1059	27	71	37
Surface Water	SW1	8	120	290	219	6.7	7.7	7.2	2	6	4	13	28	21	18	34	29	4	12	9	2	3	3	28	87	64	4	13	9
	SW2	9	260	920	617	7	8.5	7.7	8	51	28	25	88	56	23	120	77	8	42	25	5	9	6	68	240	172	12	51	33
	SW3	8	330	1,200	976	7.2	8.6	8.1	6	31	15	40	180	153	41	140	97	10	46	30	3	8	6	100	440	334	13	36	28
	SW4	38	380	2,300	1,848	6.9	8.3	7.8	19	320	230	33	250	187	47	370	287	15	120	88	5	14	7	3	420	345	19	160	112
	SW6	19	480	2,300	1,904	7.1	8.5	8.2	29	280	206	43	300	216	64	440	333	19	130	94	6	11	8	120	400	343	25	120	97
	SW7	6	180	360	272	6.6	7.8	7.3	3	18	11	13	26	20	18	27	23	8	13	11	3	3	3	61	140	87	9	17	14
	SW8	12	250	950	691	6.9	8.2	7.8	4	18	11	23	99	70	30	120	78	9	43	28	4	8	6	71	310	223	11	52	35
	SW9	4	320	370	338	7.3	7.8	7.5	12	24	17	19	24	23	21	22	21	14	19	15	5	7	5	110	150	123	22	28	24



LEGEND:

- Monitoring bore - alluvium
- Monitoring bore - coal
- Surface water sampling point
- Project boundary
- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Quaternary alluvium
- Mapped colluvium

Bylong Coal Project (G1606)

Distribution of average electrical conductivity

DATE: 5/6/2015

FIGURE No: **7.17**

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Figure 7-18 shows major ions ratios of all samples plotted in a Piper diagram, with the average for each site shown in Figure 7-19.

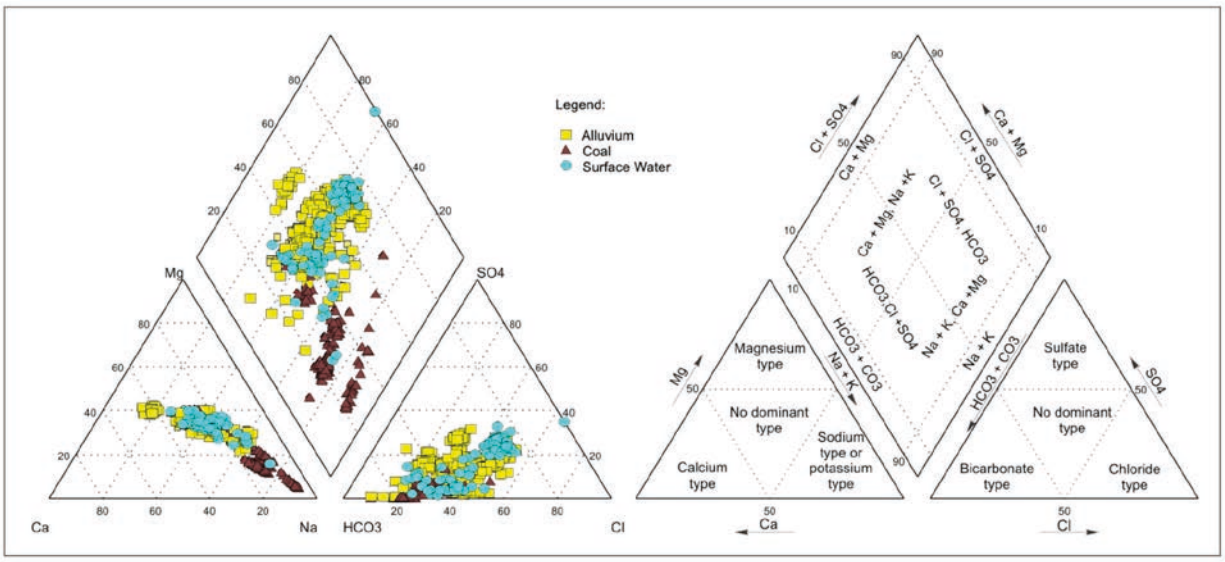


Figure 7-18 Piper diagram - all data

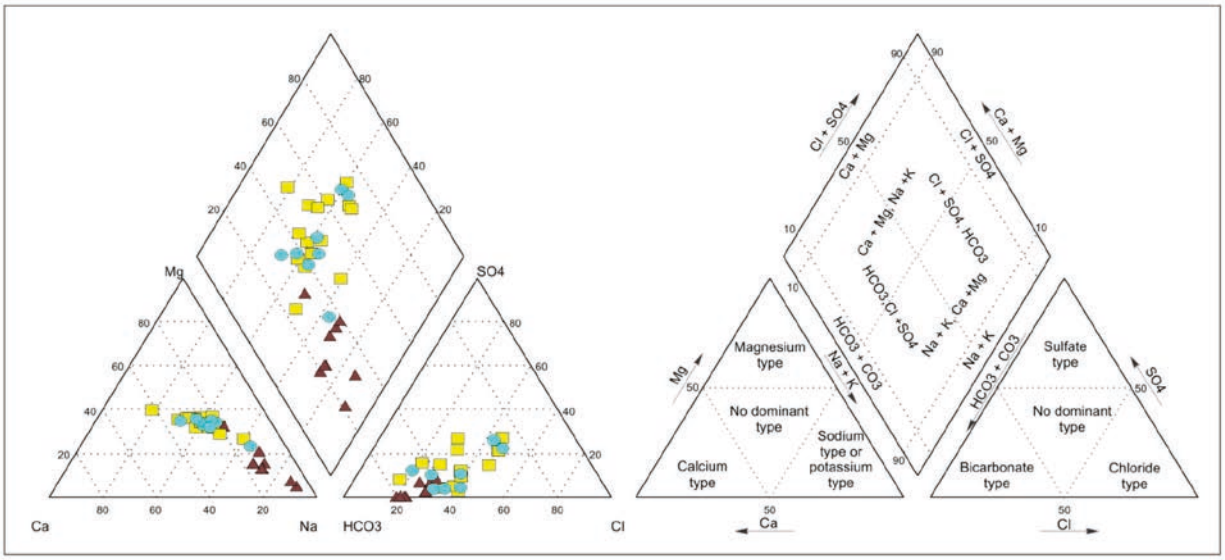


Figure 7-19 Piper diagram - average for each site

The Piper diagrams show that whilst EC is similar across the dataset, samples from the Permian groundwater samples plot in a different location on the Piper diagram compared with the alluvium and surface water samples due to a higher proportion of sodium. The one surface water sample that plots with Permian results is site SW3 located on Dry Creek within weathered Permian strata. The differing water types evident on the Piper diagram indicate that whilst the alluvium and surface water are highly connected, there is a more limited hydraulic connection between the alluvium and the Permian at this location.

The water quality results indicate the alluvium is suitable for stock watering and suitable for irrigation in many, but not all bores. Therefore, the main beneficial use for the alluvial groundwater water is agriculture.

7.6 Groundwater dependent ecosystems

Figure 7-20 presents the data from the National GDE Atlas[6] within the Authorisations. The GDE Atlas categorises groundwater dependent ecosystems into three classes:

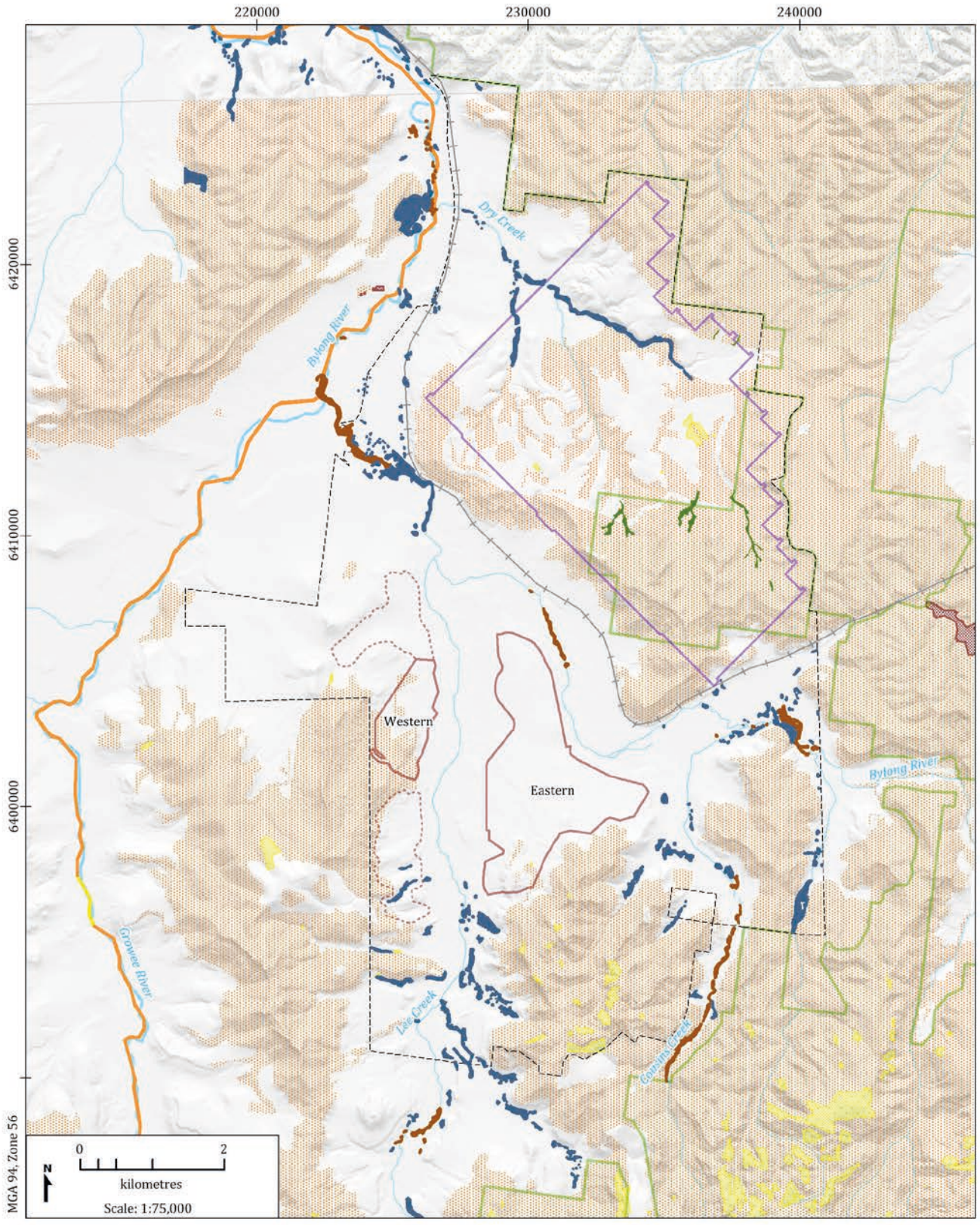
- ecosystems that may rely on the surface expression of groundwater—this includes all the surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs;
- ecosystems that may rely on the subsurface presence of groundwater – this includes all vegetation ecosystems; and
- subterranean ecosystems (Tasmania only) – this includes cave and aquifer ecosystems.

The atlas is derived from remotely sensed data and expresses the likelihood that landscapes are accessing water in addition to rainfall. The additional water source may be soil water, surface water, or groundwater. The atlas indicates a low to moderate potential for GDEs accessing surface water to occur in a thin riparian zone along the Growee River and Bylong River. There are no GDEs identified in Project area along the Bylong River and Lee Creek catchments. The GDE atlas indicates more extensive areas with moderate to be accessing subsurface groundwater.

It is important to note the GDE Atlas only presents a guide to potential GDEs. The EIS Ecology study investigated the potential for GDEs to occur within the project site and surrounds. It identified that three potential GDEs occurring in thin riparian zones along creeks as follows:

- Blakely's River Red Gum / Apple Riparian Forest occurring along the lower to mid reaches of Dry Creek, and also in remnants along Lee Creek and Bylong River;
- Blakely's Red Gum / Paperbark Forest isolated on a plateau within the headwaters of Dry Creek; and
- River Oak/Redgum Riparian woodland, with the largest stand occurring at the confluence of Growee River and Bylong River.
- The Hunter Unregulated Water Sharing Plan does not list any High Priority GDEs within the Bylong River catchment.

[6] http://www.bom.gov.au/water/groundwater/gde/



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Reserve

Potential GDE - EIS Ecology Study

- River Oak / Redgum Riparian Woodland
- Blakely's Red Gum / Apple Riparian Forest
- Blakely's Red Gum / Paperbark Forest

GDE Atlas (Surface Expression)

- High potential for GW interaction
- Moderate potential for GW interaction
- Low potential for GW interaction

GDE Atlas (Subsurface Expression)

- High potential for GW interaction
- Moderate potential for GW interaction
- Low potential for GW interaction

Bylong Coal Project (G1606)

Groundwater dependent ecosystems

DATE: 5/6/2015

FIGURE No: **7.20**

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7.7 Conceptual hydrogeology

Figure 7-21 shows a conceptual cross-section of the geology and groundwater regime. The valley floor areas in this schematic represent the present day alluvial valleys incised into the Permian Coal Measures. The Permian Coal Measures can be seen dipping to the right of the diagram (northeast). The schematic illustrates what is supported by hydrochemistry data that is the Permian Coal Measures are recharged in part by leakage from the alluvium. Although in some areas, higher water levels within the Permian Coal Measures may in-turn discharge groundwater to alluvium. During mining, water levels within the Permian Coal Measures will decline with the potential to increase flow from the alluvium to the Permian Coal Measures. This is illustrated in the schematic with the blue dotted line representing the depressurised groundwater level.

Baseline data presents two main groundwater systems within the Project Boundary. A shallow surface water and alluvial groundwater system, that based on water level and hydrochemistry data is highly connected. During periods of sustained rainfall groundwater levels rise above the base of the Bylong River and Lee Creek and a continuous discharge from the aquifer as baseflow occurs. During dry periods groundwater levels fall, and the interconnected surface water systems reduce to a chain of ponds along the drainage alignment, with no continuous baseflow. During these periods, sub-surface groundwater flow occurs through the alluvium along the alignment of present day water courses.

The Permian Coal Measures, in particular the Coggan Coal Seam and to a lesser extent the Ulan Coal Seams, represent the second main groundwater system. A third minor perched groundwater system occurs at the base of the Tertiary basalt cap in plateau area overlying the proposed underground extraction area.

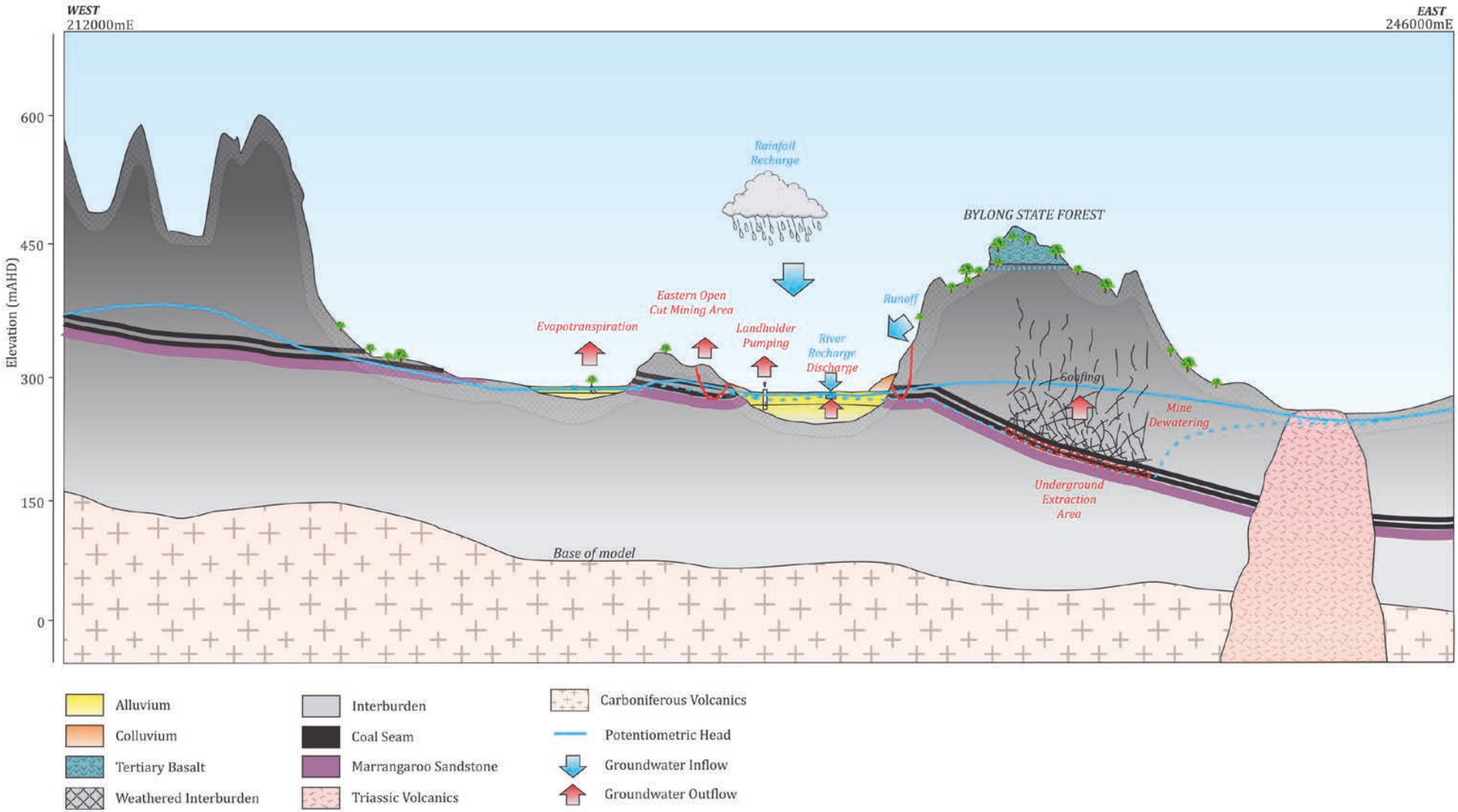
Recharge to the system is from rainfall infiltration through the soil zone during periods of above average rainfall when the soils reach field capacity. Leakage from creeks and rivers represents the second source of recharge to the system. Runoff from steeply sloping elevated areas collects where slopes become gentle allowing water to infiltrate through colluvium and stream beds.

Due to the permeability and storage of the alluvial sediments, a larger volume of recharge occurs to the alluvium compared to the Permian Coal Measures and other consolidated and weathered formations. The majority of recharge to the Permian Coal Measures is through rainfall recharge where sediment outcrops or sub-crops below the alluvium with recharged groundwater migrating down dip within the coal seams. The lower permeability of the interburden and overburden retard migration of recharge through the vertical profile where a thicker Permian sequence is present above the coal seams. In summary, recharge to the Permian Coal Measures is more likely where the units sub-crop or outcrop rather than where a complete Permian and Tertiary profile is present.

Jointing in dykes and sills appears widely spaced and these are not considered to form aquifers, rather barriers to groundwater flow.

Discharge in the current environment is from evaporation from open water bodies, evapotranspiration where water tables are near the surface, baseflow to creeks and rivers and extraction from bores. Discharge from the Permian Coal Measures to the alluvium also occurs but volumes are expected to be low compared to the volumes discharging from the alluvium.

The current conceptual understanding of the system has been used to develop the groundwater model for the Project, which is discussed further in the following sections of this report.



Schematic section showing conceptual hydrogeology

Figure 7.21

Bylong Coal Project (G1606)

8 Numerical model design

8.1 Modelling objectives

The primary objective of the groundwater modelling was to quantify the impact of the proposed mining and compare the impacts with the AIP. The design, construction and calibration of the model was tailored to this objective, while also providing a framework for future iterations during mining. The model was calibrated so that it broadly replicated groundwater flow directions, gradients and fluxes to the rivers and creeks. Following calibration, the model simulated the impact of the Project on the groundwater regime.

8.2 Model design

8.2.1 Model code

The MODFLOW SURFACT™ code simulated groundwater flows within the vicinity of the Project. SURFACT is a commercial derivative of the public domain MODFLOW code. It has some distinct advantages over the standard MODFLOW that are beneficial for simulating mining. SURFACT simulates variably saturated conditions, which is critical where mining progressively de-saturates model cells within the mining footprint. The MODFLOW pre and post processor PMWIN (Chaing and Kinzelbach, 1996) and Groundwater Vistas (Environmental Simulations Inc., 2011) generated some of the input files along with in house FORTRAN code.

SURFACT has several options to solve the equations for variably saturated water flow in the unsaturated zone, including:

- pseudo-soil function - a gravity based equation that does not require any parameters inputs;
- Van Genuchten (1980) – this model predicts the relationship between unsaturated zone hydraulic conductivity and water saturation/retention and requires inputs for the parameters alpha, beta and residual saturation; and
- a combination of Brooks and Corey (1964) for relative hydraulic conductivity (Kr), and van Genuchten (1980) for water retention - requires the van Genuchten parameters and Brooks and Corey value of n.

Mackie Environmental Research (2015) reviewed the groundwater model for the Watermark Coal Project and concluded that the pseudo-soil function was the optimal approach for modelling regional groundwater flow systems.

The pseudo-soil function was attempted in the Bylong model sensitivity analysis, however, the model failed to converge. This is not an uncommon experience, and was likely due to the large number of unsaturated cells in the upper layers of the groundwater model in the elevated plateau overlying the underground mining areas, coupled with the relatively low recharge rates.

A workable alternative was considered to be using the van Genuchten approach, supported by sensitivity analysis. SURFACT uses the van Genuchten equation to calculate the unsaturated permeability and storage at a given matric suction stress. It requires prescription of three parameters - the air entry (alpha - α), desaturation rate (beta - β) and residual saturation (Rs). There is data available for these parameters in the public domain for unconsolidated soils, but none for consolidated rocks. This limitation was addressed by treating the values of α, β and Rs as parameters, which do not necessarily have a physical meaning, but are factors that can be adjusted to achieve calibration. This is an approach others have adopted (e.g. Kabat et al., 1997).

A literature review was undertaken to determine values of α, β and Rs in the available literature. Appendix F tabulates the measured values of these parameters in soils. No data was available for fractured or porous rock. Table 8.1 summarises the van Genuchten parameters used in the model.

Table 8.1 Unsaturated zone parameters

Unit	Alpha α (m-1)	Beta β (-)	Residual saturation Rs (%)
Alluvium	0.02	7.0	1
Colluvium	0.02	7.0	1
Basalt	0.02	5.0	0.2
Weathered Permian (Layer 1-3)	0.02	5.0	1
Interburden (Layer 4)	0.02	5.0	1
Interburden (Layer 5,7,9,10)	0.02	5.0	0.2
Coal	0.02	5.0	0.2

The adopted values of alpha were relatively low when compared to the values used for soils that can range around 0.1 m^{-1} to 10 m^{-1}. The van Genuchten equation uses alpha, beta, and saturated permeability to calculate the unsaturated zone hydraulic conductivity. High values of alpha result in extremely low unsaturated hydraulic conductivity values when values of matric suction are high. To ensure a conservative approach to the modelling, the Bylong groundwater model adopted an alpha value that aimed to leave the unsaturated zone hydraulic conductivity effectively unaltered and relatively high, even at values of high matric suction. This approach allowed depressurisation to propagate through the unsaturated zone both vertically and horizontally and was therefore considered conservative.

The literature indicates values for beta for soils typically range between 1 and 10. The adopted values in the model were within a similar range. Residual saturation measurements in the literature range from 1.2 to 29%. The adopted values in the model were at the lower end of the measured range.

The van Genuchten algorithm (vG) is also known to be non-linear, and there is potential for error to eventuate when using this algorithm in a regional model. Model cells that are as thick as the aquifer require care and the correctness of the solution needs to be explored carefully (pers comm. S. Panday, author SURFACT). Therefore, the influence of the van Genuchten equation on the model predictions was fully assessed, a sensitivity analysis was conducted on the unsaturated zone parameters (Section 11.3). This included the Brooks and Corey options and the upstream weighting option, which is equivalent to the pseudo soil function and available in MODFLOW USG.

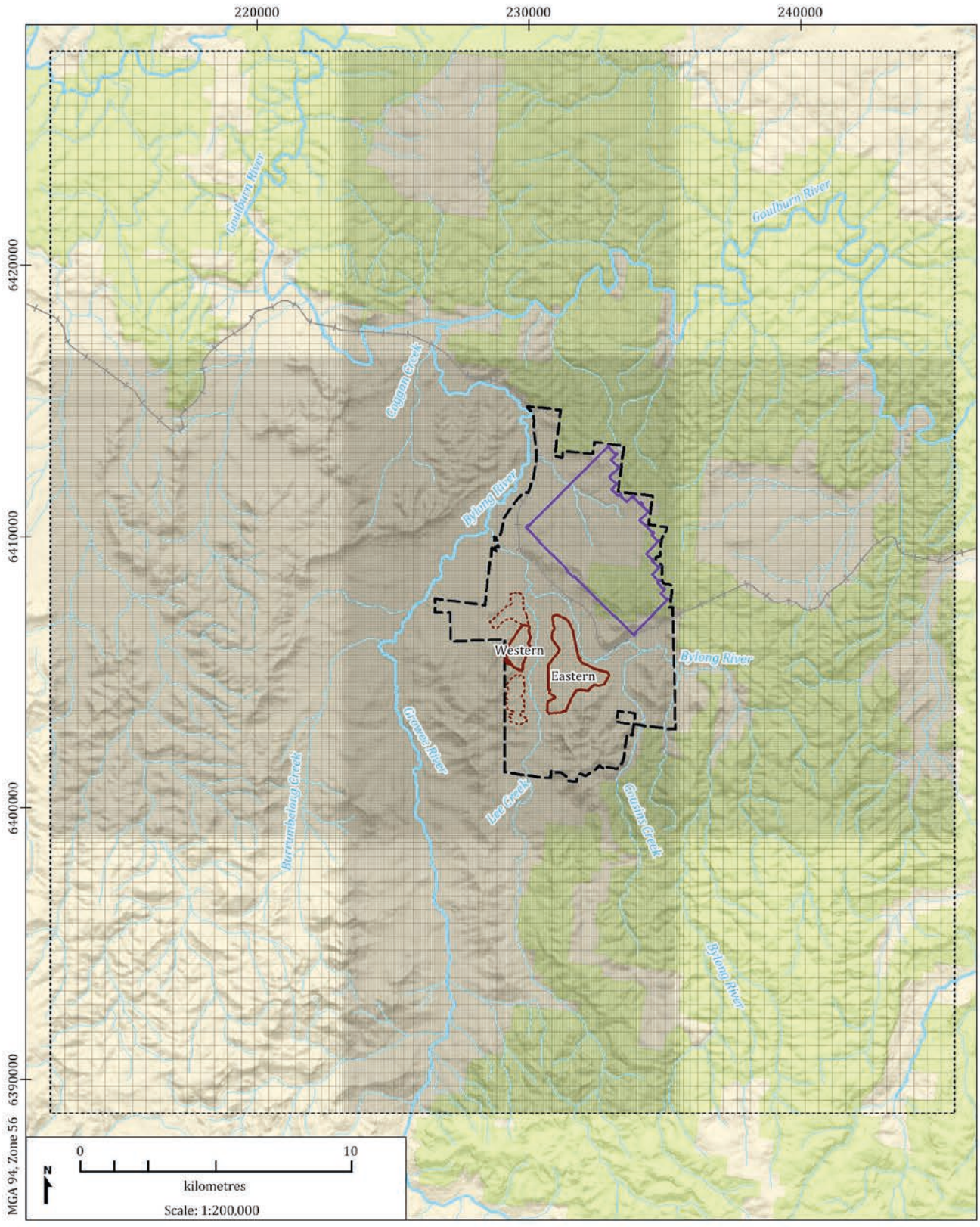
8.2.2 Model extent and boundary conditions

The model grid is 33 km wide (E-W) and 39 km long (N-S). The model grid aligned to the principal groundwater flow direction in the alluvial aquifer, which is from south to north in the alluvial aquifer. The boundaries were set at 10 km to 11 km from the proposed mining areas, to minimise the effect of no flow cells on the predictions. Figure 8-1 shows the model domain.

The model included a zone of general head boundary cells along a portion of the western boundary, where modelling for the Wilpinjong Mine (AGE 2005) predicted a slight drawdown could occur (~1m at Wollar at end of approved mining). These cells were included to allow for a cumulative impact, should the drawdown from the Project extend to this boundary. Impacts described within Section 10.5 indicated there was not potential for a cumulative impact between these mines.

8.2.3 Model layers

The aim of the layer discretisation was to find a balance between having sufficient layers to represent detail in the geology, whilst still limiting the number of cells to ensure the model run time was manageable. To achieve this, the model grouped geological units with similar hydraulic properties into single layers. Section 7 outlines the key hydrostratigraphic units that control groundwater flow in the region.



LEGEND:

- Model boundary
- Model Grid
- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Reserve
- Major drainage
- Minor drainage
- Railway

Bylong Coal Project (G1606)

Model extent

DATE: 10/2/2015

FIGURE No: **8.1**

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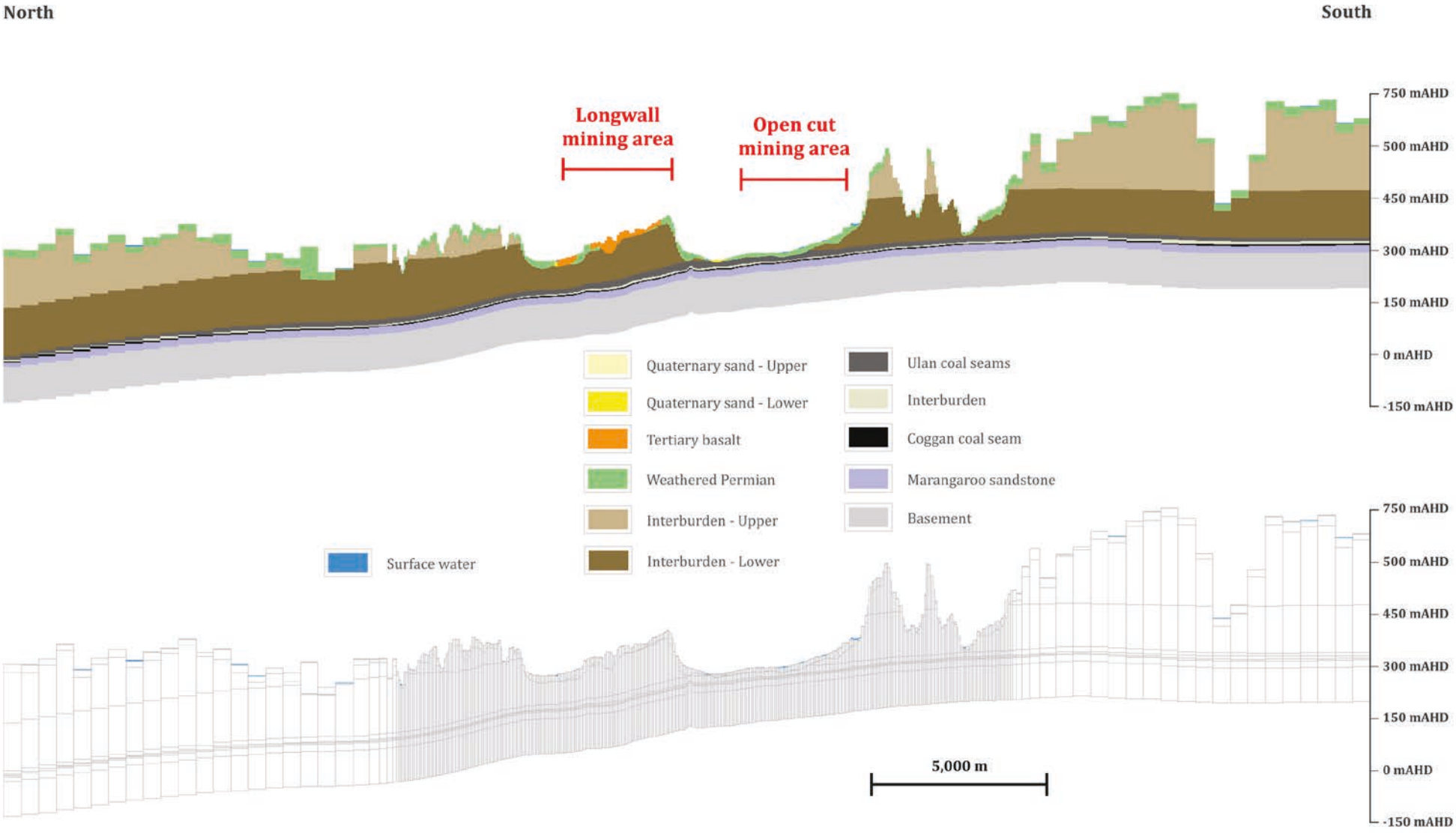
The model represented the main hydrostratigraphic units as ten layers, as follows:

	avg. thickness
• Layer 1 – Quaternary upper alluvium, colluvium, regolith	4 m
• Layer 2 – Quaternary lower alluvium, colluvium, regolith	6 m
• Layer 3 – Weathered interburden	20 m
• Layer 4 – Farmers Creek Seam, State Mine Creek interburden	50 m
• Layer 5 – Interburden	115 m
• Layer 6 – Ulan Seams & interburden	20 m
• Layer 7 – Interburden	4 m
• Layer 8 – Coggan Seam	5 m
• Layer 9 – Marrangaroo Sandstone	20 m
• Layer 10 – Underburden	100 m+

The model represented the:

- alluvium as two layers, with a lower, more permeable zone, and an upper, less permeable layer;
- sporadically occurring Tertiary basalts and Triassic intrusives to the east of the proposed mining area, and coal seam dykes as zones within model layers, not as separate layers; and
- all units between the base of the Marrangaroo sandstone and the Carboniferous volcanics basement as Layer 10.

Figure 8-2 presents a north/south section through the groundwater model.



Model grid cross section - north-south

Figure 8.2

Bylong Coal Project (G1606)

8.2.4 Grid and cell size

The model adopted a cell size of 500 m x 500 m, which was refined to 50 m x 50 m within the proposed mining areas. The cells within the transition zone were each 1.5x the size of the neighbouring cells. The model comprised a total of 1,164,000 cells.

8.2.5 Recharge and discharge

8.2.5.1 Rainfall

Topography strongly controls rainfall patterns in the region, with an average of 580 mm/year in the lower lying areas in the northeast, increasing to 860 mm/year in the elevated land to the southeast. The model represented the spatial distribution of rainfall and applied recharge as a portion of interpolated rainfall to zones based on outcropping geology.

The model also simulated areas where irrigation of crops such as lucerne and sorghum enhances deep drainage to the underlying groundwater system. Enhanced recharge in the irrigation areas was assumed to be directly related to the seasonal pumping at each irrigation bore, and applied as a calibrated percentage of pumped volumes at each stress period. The zones where enhanced recharge was applied were determined from high-resolution aerial photography. The surface area of the enhanced irrigation areas on KEPCOKEPCO owned land equated to 97Ha.

An agricultural assessment was undertaken assuming KEPCOKEPCO owned bores abstracted 750ML/year. The assessment concluded that 750ML usage per year equates to an area of 96.5Ha of cropped land, which suggests the modelled and agriculturally-assessed areas of irrigation are in agreement.

8.2.5.2 Evapotranspiration

The model represented evapotranspiration from the aquifers with the SURFACT Evapotranspiration package. The package removed water from the water table at a maximum rate of 10 % of the potential evapotranspiration rates (1,280-1,340 mm/year), for numerical stability. This is equivalent to 18 % of actual evapotranspiration (~750 mm/year). Whilst this value was relatively low it was necessary to ensure the model converged numerically to a solution. The package set the extinction depth at 2 m from the ground surface to simulate root system capillary action and the natural decline of evapotranspiration with depth.

8.2.5.3 Groundwater abstraction

Groundwater pumping allocations from individual bores were obtained from a FOI request. The majority of the usage records were incomplete over the calibration period, and therefore a synthesised seasonal abstraction rate was applied to transient simulations.

The SURFACT Well (WEL) package was used to simulate abstraction of water from bores and wells with water entitlements. Testing of the model indicated many of the wells could not abstract their full entitlement reliably due to the limited saturated thickness in the alluvial aquifer. Further investigation was conducted and included a survey within the Project area of water usage. Landholders (and tenants) indicated that they on average use between 30-50% of their entitlements. The groundwater system in the Bylong River is understood to be over allocated and users appear to adjust their usage to reflect this.

The calibration model therefore simulated the reduced abstraction rates according to the results of the survey. Irrigation bores that were not surveyed were assumed to extract 30% of their annual entitlement. In the calibration model, the well package assigned a monthly average seasonal pumping rate to a modelled cell and layer according to the coordinates and screen depth of each individual bore. The pumping rates varied at each bore on a monthly basis over the period from November 2011 to January 2014.

Figure 8-3 presents the total daily groundwater abstraction rates from the groundwater model for the transient and steady state calibrations.

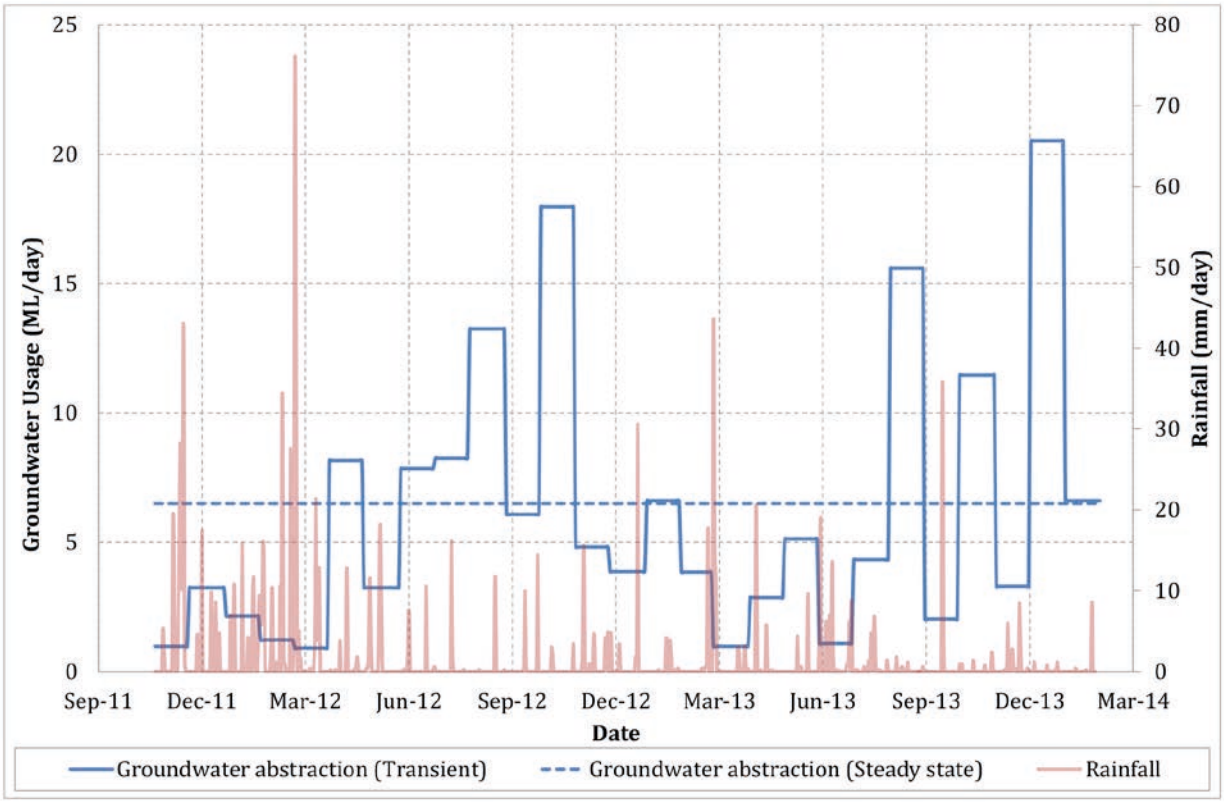


Figure 8-3 Groundwater abstraction

8.2.5.4 Rivers and drainage

The SURFACT river package simulated the river and creek drainages in the region. The bed of the major river and creek cells were set at 1 m below the LIDAR digital elevation data along the river alignment. The model represented all other creeks and drainage lines as drains, where only flow of water from the aquifer to the stream could occur.

As discussed previously, during dry periods the rivers in the area reduce to a chain of pools that are windows to the underlying water table. These pools were identified from high resolution aerial photography and assigned a permanent head of water with the river package. Figure 8-4 illustrates the method used to allow rivers to act as groundwater sinks or groundwater sources in the groundwater model.

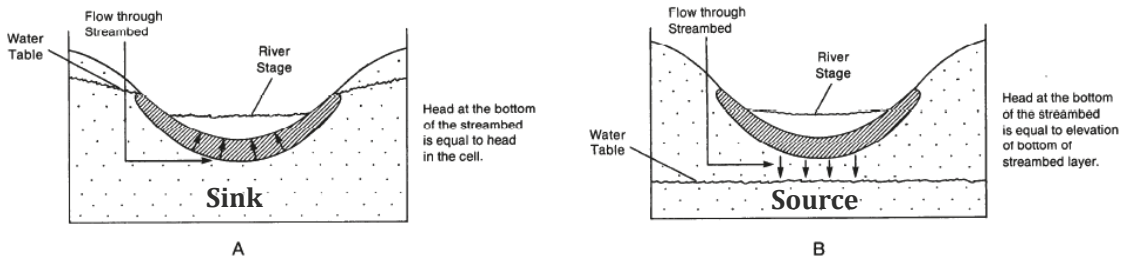
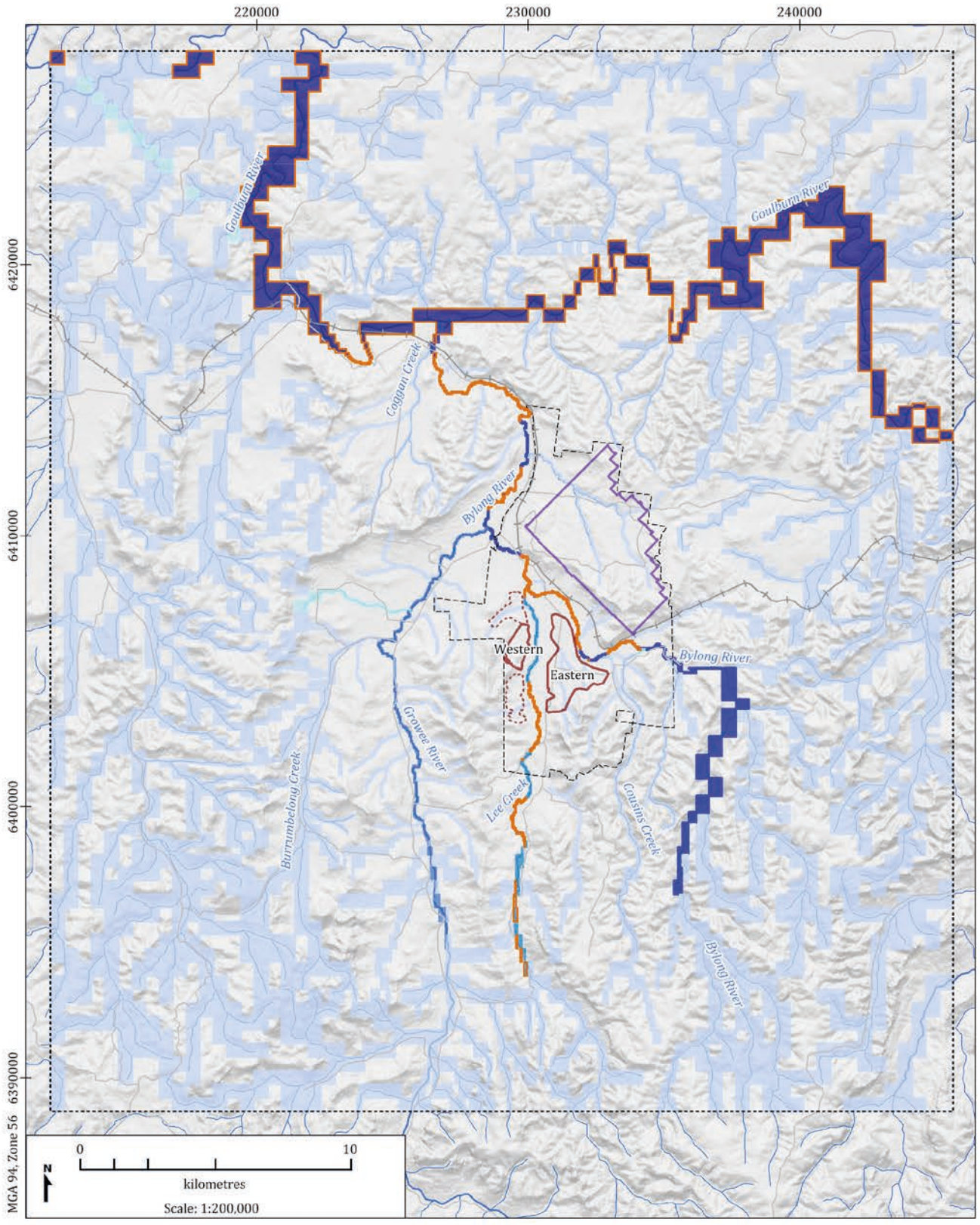


Figure 8-4 River package schematic – (source MODFLOW 2015)

Figure 8.5 displays the river cells in the model, and areas where surface water is allowed to leak into, or receive baseflow from the groundwater system according to stream gauge levels.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Model boundary
- Project boundary
- Road
- Railway

River Zones

- Goulburn River
- Bylong River (drains only)
- Lee Creek
- Growee River
- Minor Creeks
- Surface Drains
- Major drainage
- Minor drainage
- River cells with stage heights

Bylong Coal Project (G1606)

Model river cells

DATE: 27/2/2015

FIGURE No: **8.5**

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The stage height within areas with known permanent surface water was varied in the model according to water level records from the nearest gauge. The levels were not interpolated so are accurate to around ± 0.5 m. Gauging data for the Bylong River and Lee Creek was available for the period July 2012 to October 2013. The stage height was synthesised where it was necessary to fill the gaps in the data, based on average seasonal levels from the measured data and site observations. Figure 8-6 shows the simulated stage heights assigned to the transient calibration groundwater model.

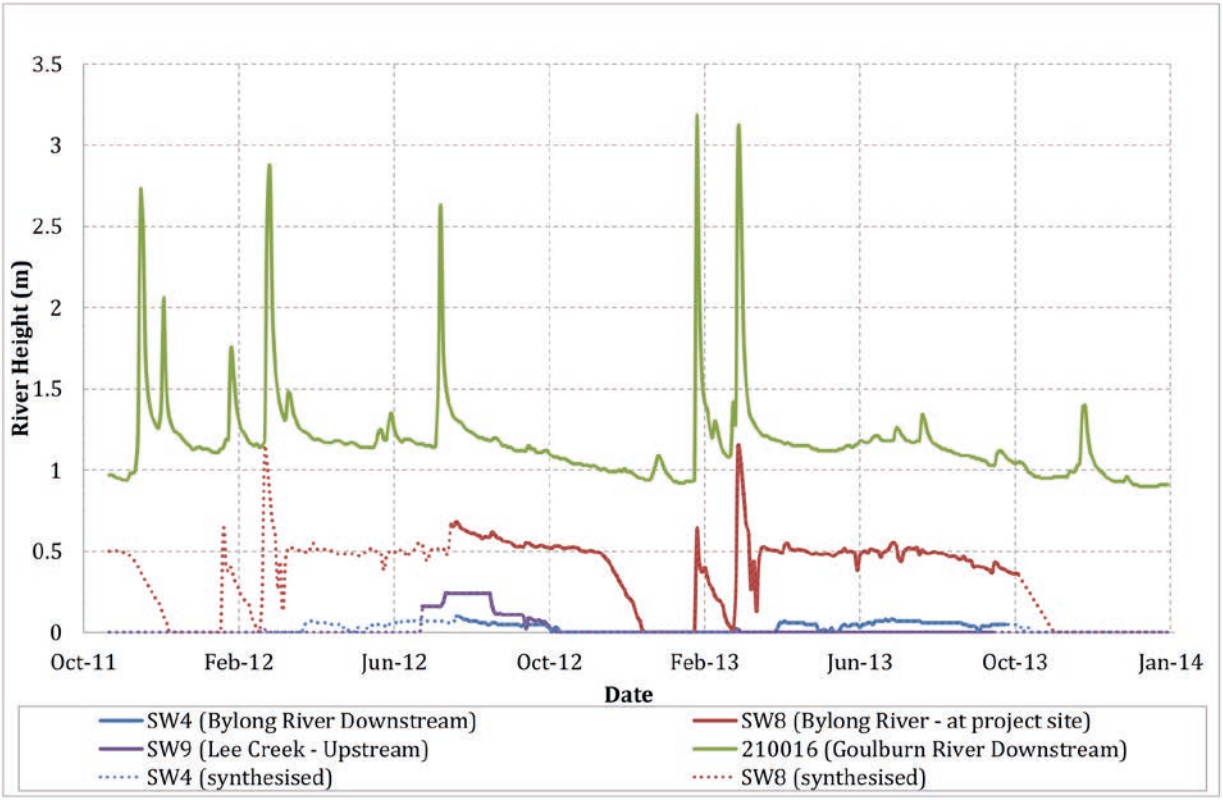


Figure 8-6 Simulated stage height – River (RIV) package

9 Model calibration and verification

9.1 Calibration

9.1.1 Calibration objectives

The groundwater model was calibrated to both steady state and transient conditions to ensure the seasonal response to rainfall, surface water flow, irrigation, and pumping was represented. The steady state model was calibrated by adjusting aquifer parameters and stresses to produce the best match between the observed and simulated water levels. A more detailed transient calibration to time series water level measurements reproduced the transient water level fluctuations measured in the monitoring bore network installed for the Project.

9.1.2 Calibration data points

Ninety-four bores were utilised for the steady state calibration, consisting of:

- 23 bores from the NOW PINNEENA database, which are predominantly screened in the Quaternary alluvium; and
- 71 monitoring bores and vibrating wire piezometers from the Project area, which provided data on the Quaternary alluvium, weathered Permian, interburden and coal seam water levels.

9.1.3 Steady state calibration

The objective of the steady state calibration of the model was to reproduce groundwater levels at the individual monitoring bores and replicate the general pattern of the groundwater potentiometric surface and the direction of groundwater flow. The steady state model was calibrated automatically by adjusting parameters across the entire model domain using Parameter Estimation Software (PEST) (Doherty, 2010) to replicate observed groundwater level data. The model parameters were uniform for each geological unit represented in the model, with the exception of the coal seam, which adopted a hydraulic conductivity that reduced with depth.

The calibrated parameters adjusted in the steady state calibration were:

- horizontal and vertical hydraulic conductivity;
- diffuse recharge rates to geological units;
- recharge rates in irrigation areas; and
- vertical hydraulic conductivity of river beds.

9.1.4 Transient calibration

The objective of the transient calibration of the model was to replicate the seasonal fluctuations observed in the groundwater level and surface water monitoring data collected between 2011 and 2014. Time was discretised into 412 stress periods and two day time steps.

The transient model was calibrated by adjusting parameters across the entire domain in collaboration with the steady state model to ensure the models and budgets were consistent.

Rainfall, river stage heights and landholder pumping varied every two days based on observed or synthesised data. The calibrated parameters adjusted in the transient calibration were:

- horizontal and vertical hydraulic conductivity;
- specific yield;
- specific storage;
- diffuse recharge rates to geological units;
- recharge rates in irrigation areas; and
- vertical hydraulic conductivity of river beds.

Both models were then manually adjusted following the automated PEST calibration to ensure baseflow measured at surface water gauges was replicated by the model.

9.2 Calibration results

9.2.1 Aquifer properties

Table 9.1 presents the calibrated hydraulic properties for each geological unit.

Table 9.1 Calibrated aquifer parameters

Unit	Horizontal hydraulic conductivity (m/day)	Vertical hydraulic conductivity(m/day)	Specific yield (%)	Specific storage (m^{-1})
Alluvium upper	2.7	1.06	10	0.005
Alluvium lower	4.72	1.66	9	0.001
Colluvium	$4.6x\ 10^{-1}$	8.62×10^{-4}	8	2.00×10^{-5}
Weathered Permian	2.41×10^{-1}	1.21×10^{-1}	10	2×10^{-4}
Tertiary basalts	1.10	1.92×10^{-2}	5	1.52×10^{-5}
Interburden	1.50×10^{-3}	1.5×10^{-4}	2	1.63×10^{-5}
Interburden	3.64×10^{-4}	4.32×10^{-7}	3	2.31×10^{-6}
Ulan Coal Seam	1×10^{-5} to 0.05	1×10^{-6} to 0.03	2	2.28×10^{-5}
Interburden	1.5×10^{-3}	1.5×10^{-4}	1	7.6×10^{-5}
Coggan Coal Seam	1×10^{-5} to 0.13	0.03 to 1×10^{-6}	2	$2. \times 10^{-4}$
Marangaroo Sandstone	1.63×10^{-3}	3.15×10^{-6}	1	1.31×10^{-5}
Basement	1.87×10^{-4}	1.87×10^{-5}	1	7.06×10^{-6}
Triassic intrusions	1.49×10^{-3}	7.47×10^{-4}	1	1.57×10^{-5}

The hydraulic conductivity of the coal seams was assumed to decrease exponentially with depth due to mechanical loading of overburden and calcite sealing of cleats. The decline in the hydraulic conductivity parameter with depth was based on a combination of site testing data, and data from other coal mine hydraulic testing studies within the Mid-Western Region, including Moolarben, Wilpinjong and Ulan. Figure 9-1 shows measured test hydraulic conductivity values from packer testing versus the calibrated hydraulic conductivity within the model. Figure 9-1 shows the model replicates the decline in horizontal hydraulic conductivity measured in Project area and the region.

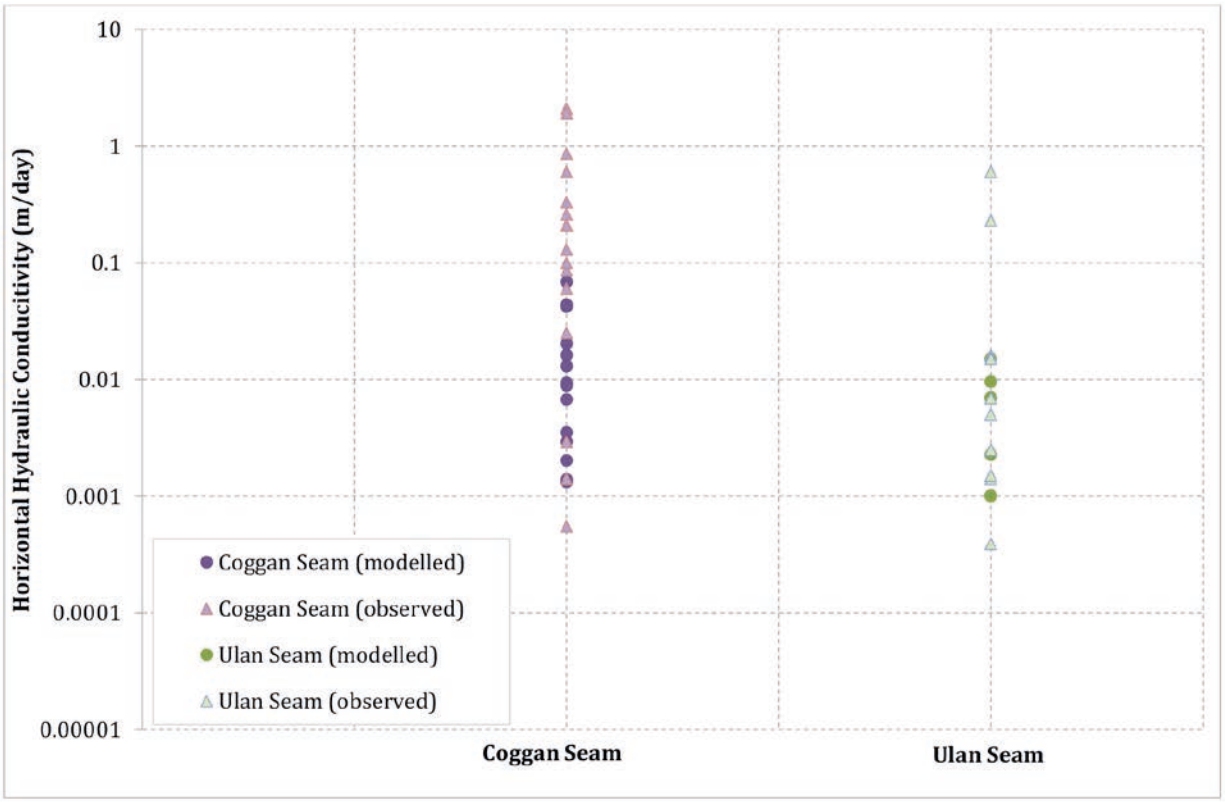


Figure 9-1 Observed packer testing vs modelled hydraulic conductivity

Figure 9-2 presents a box and whisker plot showing hydraulic testing data obtained from the Bylong field-testing program versus the calibrated values used in the Bylong model. The plot displays the range of the field-testing data (the 'whiskers'), median value, and the 25th/75th percentiles (the 'box').

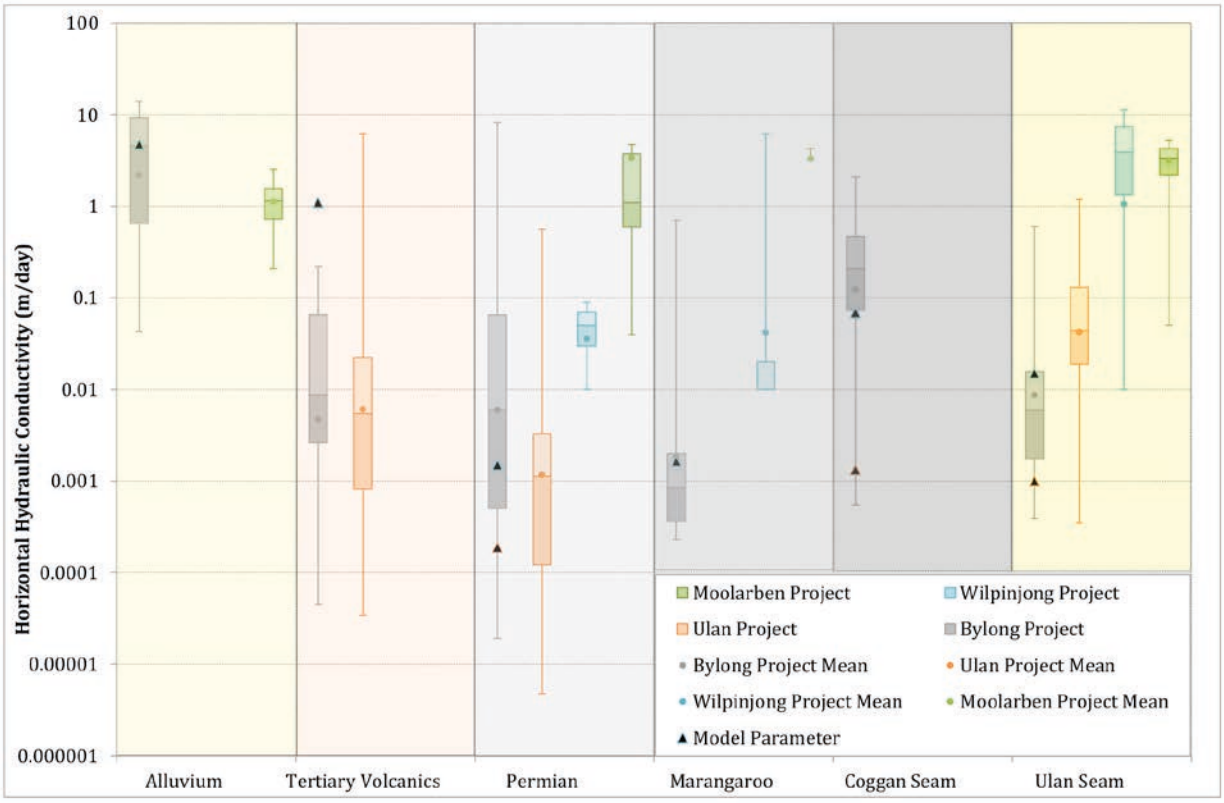


Figure 9-2 Modelled vs measured horizontal hydraulic conductivity ranges

Figure 9-2 shows parameters adopted in the calibration model fell within the range of the field measured values. The exception was the Tertiary basalt that calibrated best with a higher hydraulic conductivity value. Testing of the Tertiary basalt in the field was limited because of its fractured nature and variable saturation, and the calibrated value is considered appropriate for fractured volcanic rock. The measured hydraulic conductivity of the Marangaroo sandstone and Ulan coal seams were relatively low at the Project site, when compared to the surrounding mines; however the model calibrated within the range of the field data collected at the site.

9.2.2 Recharge

Rainfall recharge in the steady state model was applied as a percentage of annual rainfall, applied to outcropping geological units. The rainfall recharge in the transient model was estimated using a soil moisture model. A simple spreadsheet estimated daily recharge to the model using daily evaporation and rainfall records. The spreadsheet model assumed the soil profile requires 50 mm of rainfall to wet-up prior to deep drainage occurring and capped daily recharge rates at 25 mm to represent runoff under extreme rainfall events. The transient calibration model applied 100 % of the recharge estimated from soil moisture model to the alluvium, and a proportion of this to the other outcropping geological units. For the alluvium, this is the equivalent of an average of 6 % of annual rainfall, which reflects the low level of rainfall recharge experienced during November 2011 to January 2014. Recharge to the Permian outcrop also reflects the dry conditions, suggesting there were very few rainfall events that significantly recharged the Permian groundwater system.

Enhanced irrigation recharge was simulated as a percentage of the groundwater extracted from landholder pumping. The model calibrated 27% of pumped groundwater would return to the groundwater system. This factor was applied per stress period to try to replicate the localised recharge and discharge conditions in irrigated areas. Although this rate appears high, the volume is applied across a relatively small area, which equates to just 12% of the recharge budget, and 3% of the total input to the system.

Table 9.2 summarises the average recharge rates in the steady state and transient models.

Table 9.2 Calibrated average recharge rates

Recharge zone	Steady state model		Transient model	
	mm/year	% annual rainfall	mm/year	% annual rainfall
alluvium	89.6	14	35.8	6.0
colluvium	17.9	2.8	1.7	0.3
regolith/Permian outcrop	6.1	0.96	0.01	0.002
Tertiary basalt caps	57.6	9	5.8	1.0
Triassic intrusions	0.006	0.001	0.1	0.02
Enhanced Irrigation	358	56	358	56

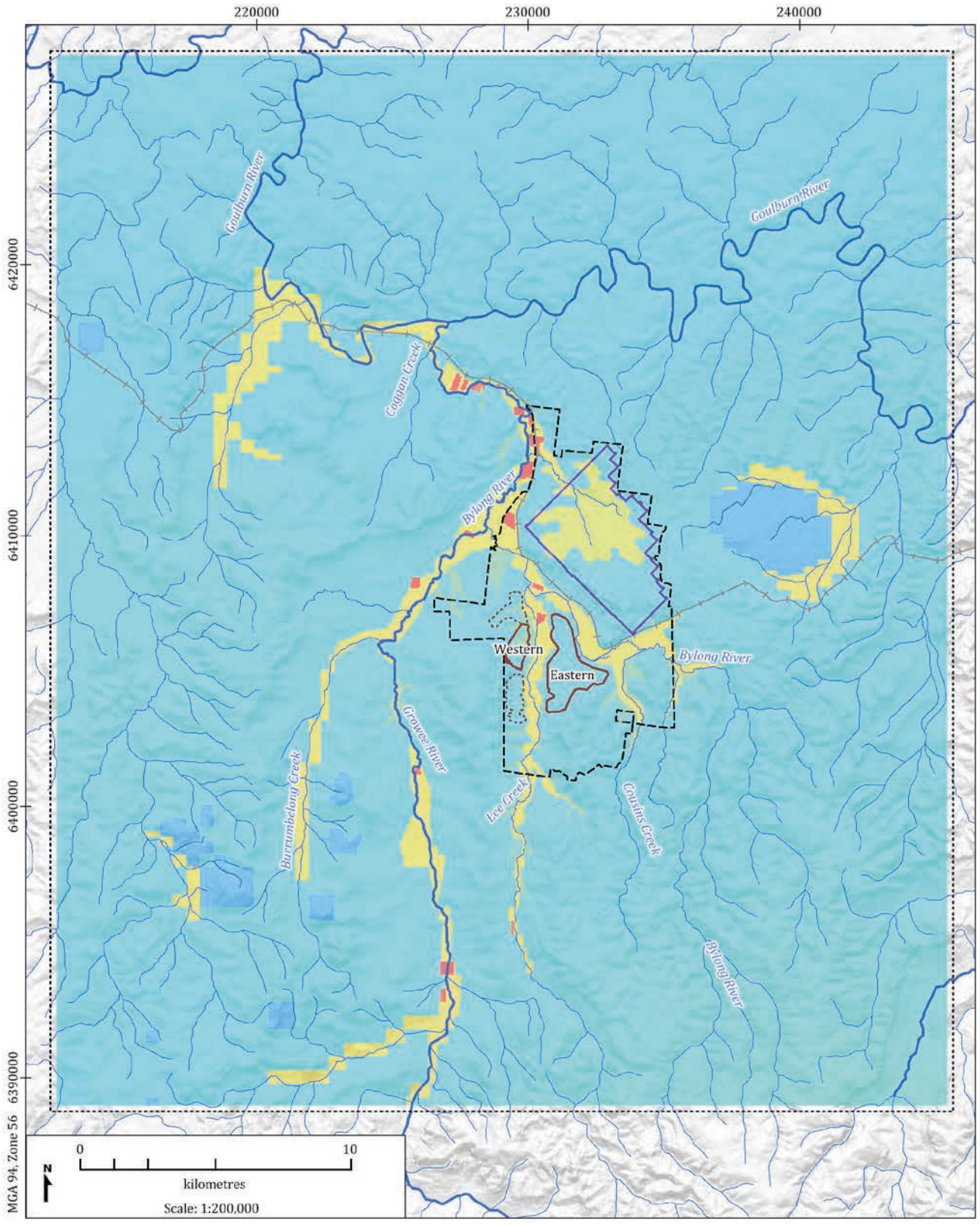
Note: **based on annual rainfall of 640mm at project site*

As detailed above, the recharge zone was based on outcropping geology; with the recharge rate varying across the Project Boundary based on local rainfall records. Figure 9-3 presents the spatial distribution of the recharge for each zone.

9.2.3 Steady state hydraulic heads

Figure 9-4 presents the steady state groundwater heads for Layer 2 in the model. It shows simulated water levels within the alluvial, weathered Permian and Tertiary basalt. The simulated heads are similar to observed hydraulic heads and gradients, with a regional northerly groundwater flow direction through the majority of the hydrostratigraphic units.

Figure 9-5 presents the steady state groundwater heads for Layer 8, which represents the Coggan Coal seam and basement Permian where the seam is removed by weathering. The results indicate that the model replicates the observed lower hydraulic head under areas of high topographic relief, while at the same time maintaining a northerly flow direction towards the Goulburn River.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Model boundary
- Project boundary
- Major drainage
- Minor drainage
- Railway

Calibrated recharge distribution (mm/year)

- 2
- 10
- 50
- 150
- 370

Bylong Coal Project (G1606)

Calibrated recharge distribution

DATE: 11/5/2015

FIGURE No: **9.3**

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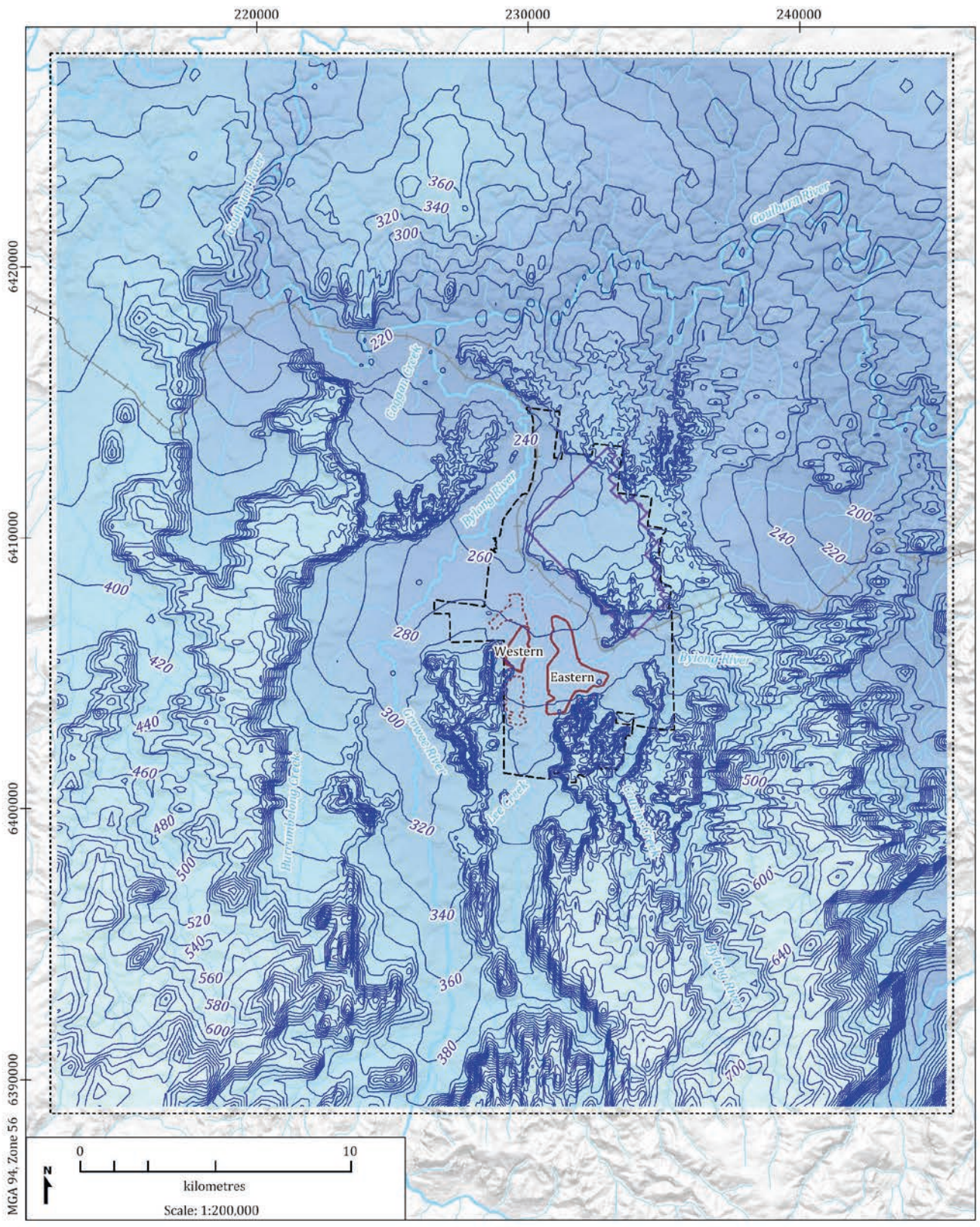

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Model boundary
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Heads contour - 20m interval (mAHD)

Bylong Coal Project (G1606)

Calibrated steady state heads alluvium/regolith- layer 2

DATE: 10/2/2015

FIGURE No: **9.4**

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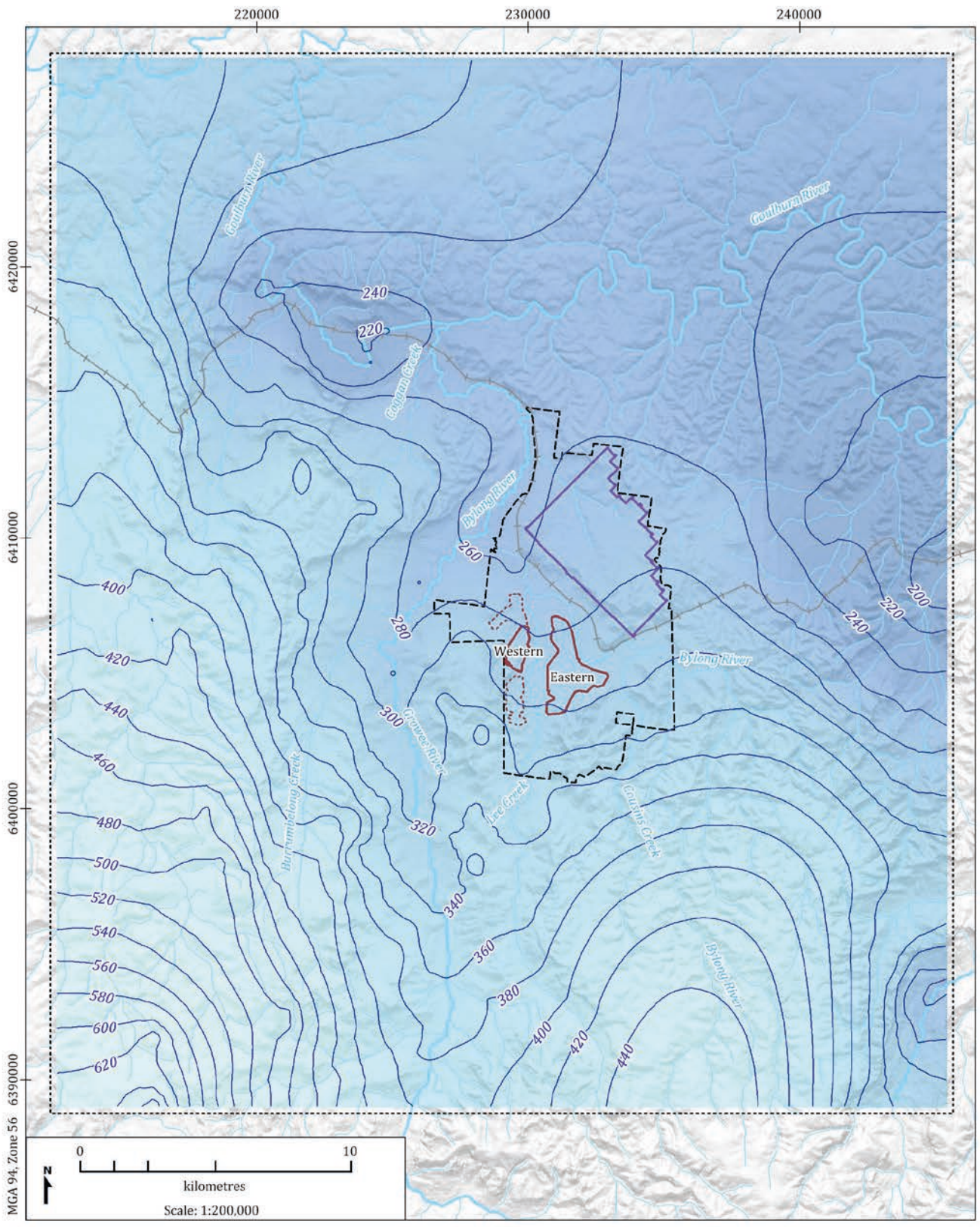

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Model boundary
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Heads contour - 20m interval (mAHD)

Bylong Coal Project (G1606)

Calibrated steady state heads
Coggan Seam - layer 8

DATE: 10/2/2015

FIGURE No: **9.5**

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9.2.4 Hydraulic head statistics

9.2.4.1 Steady state head statistics

Figure 9-6 compares the model simulated steady state groundwater levels with the values measure in the monitoring network in the Quaternary and Permian stratigraphy.

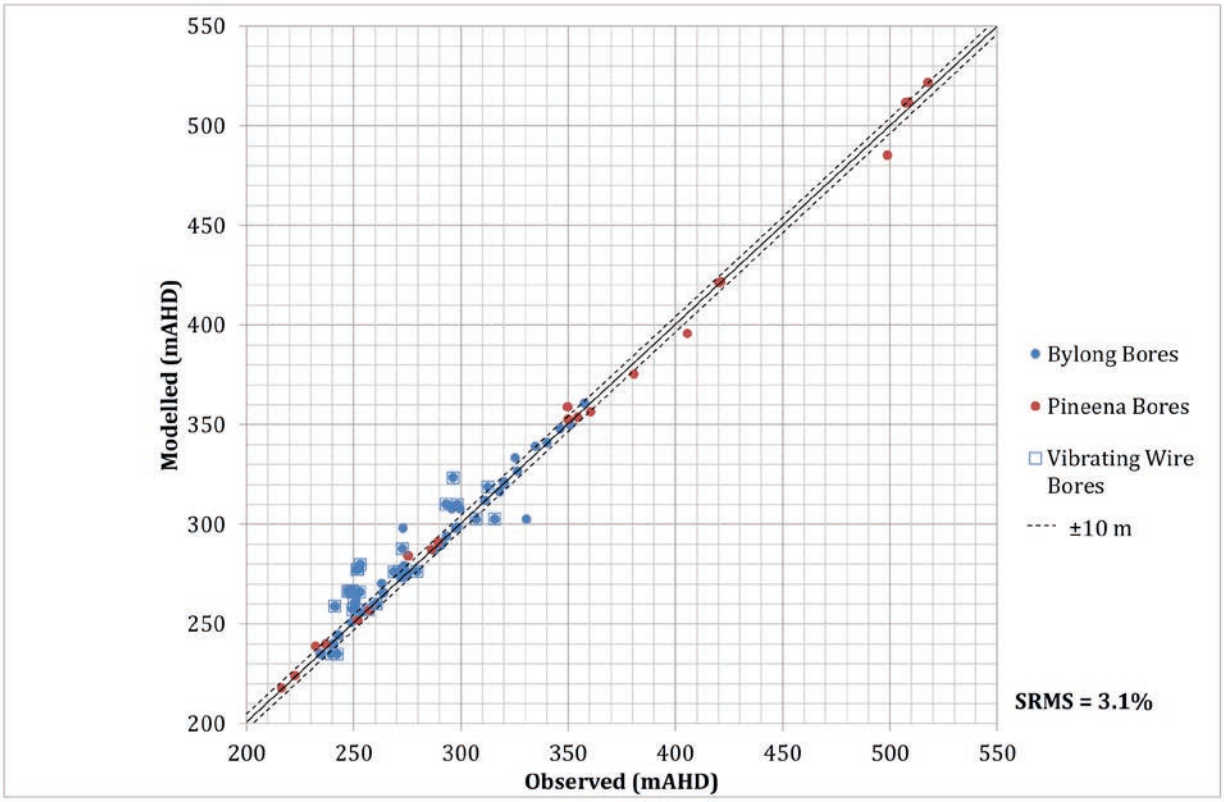


Figure 9-6 Scattergram – observed versus modelled steady state heads

Figure 9-6 shows the simulated water levels and the measured values correlate well. There are some areas of the model, that over and under predict groundwater levels. These data points represent the vibrating wire piezometers, and indicate the steady sate model generally over-predicts groundwater pressures in the Coggan and Ulan Seams in the underground mine area.

Table 9.3 summarises the calibration statistics.

Table 9.3 Statistical analysis – Steady state

Calibration performance measure	Unweighted value
Sum of Residuals (SR) (m)	-355.56
Mean Sum of Residuals (MSR) (m)	-3.78
Scaled Mean Sum of Residuals (SMSR) (%)	-1.25
Sum of Squares (SSQ) (m^2)	8252.63
Mean Sum of Squares (MSSQ) (m^2)	87.79
Root Mean Square (RMS) (m)	9.37

Calibration performance measure	Unweighted value
Root Mean Fraction Square (RMFS) (%)	0.12
Scaled RMFS (SRMFS) (%)	0.12
Scaled RMS (SRMS) (%)	**3.11**

The RMS error, which is a statistic similar to standard deviation, is a measure of the variability in the observed versus simulated water level records. The model reported an RMS error for the steady state model of 9.37 m. The ratio of RMS to the total head change across the calibration points (301.5 m) indicated a Scaled RMS 3.1%, indicating a close match between observed and predicted water levels.

Figure 9.7 presents a vertical profile of groundwater head with depth measured in the vibrating wire piezometers. The results indicate the model generally replicates the observed vertical downward gradient and the upward gradient.

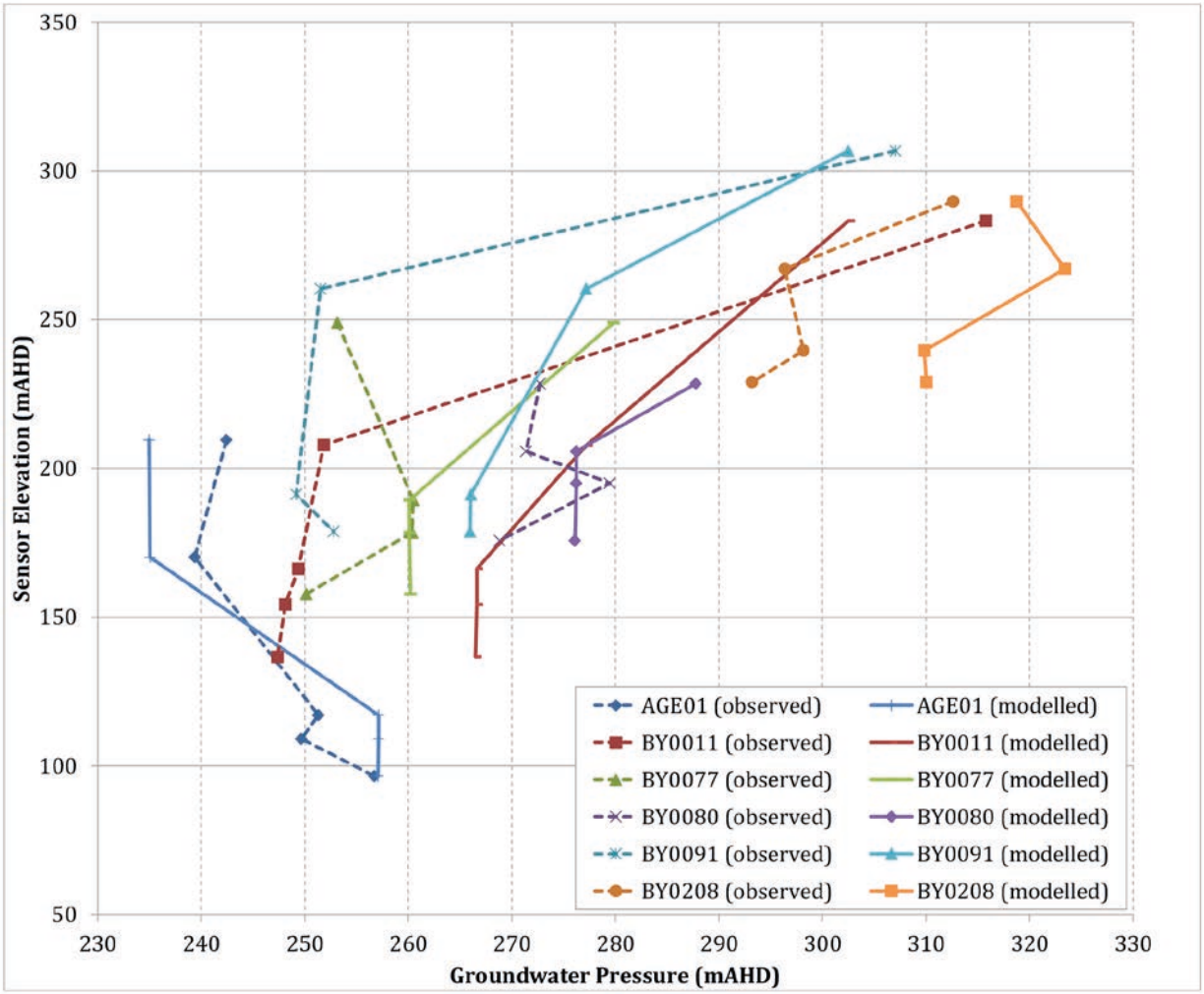


Figure 9-7 Observed vs modelled vertical gradient

9.2.4.2 Transient head statistics

Figure 9.8 compares the simulated steady state groundwater levels with the transient values measured in the monitoring network over the calibration period.

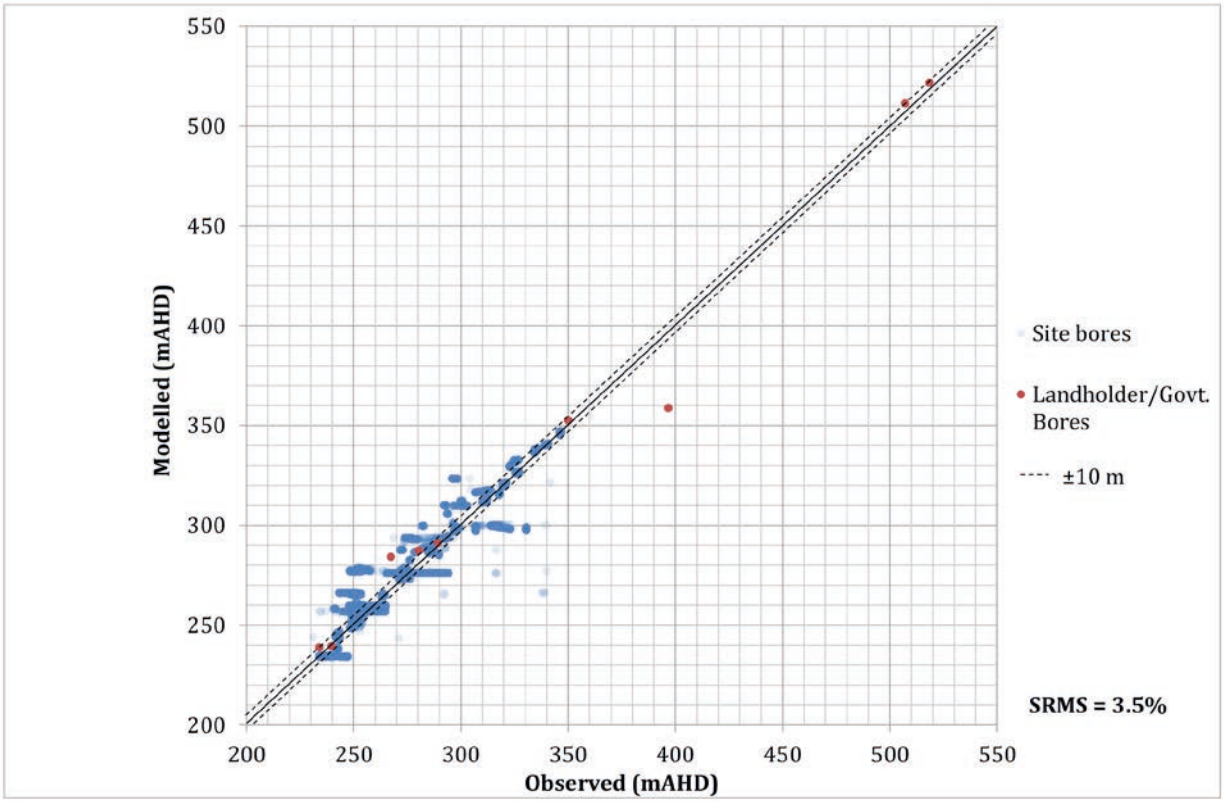


Figure 9-8 Scattergram – Observed vs modelled hydraulic transient heads

Similar to the steady state model Figure 9.8 shows a good correlation between the simulated water levels and the measured values. Table 9.4 shows the calibration statistics and reports a Scaled RMS of 3.5%, indicating a close match between observed and predicted water levels.

Table 9.4 Statistical analysis - Transient

Calibration performance measure	Unweighted value
Sum of Residuals (SR) (m)	-112,495
Mean Sum of Residuals (MSR) (m)	-3.50
Scaled Mean Sum of Residuals (SMSR) (%)	-1.22
Sum of Squares (SSQ) (m^2)	3,292,010
Mean Sum of Squares (MSSQ) (m^2)	102.50
Root Mean Square (RMS) (m)	10.12
Root Mean Fraction Square (RMFS) (%)	0.14
Scaled RMFS (SRMFS) (%)	0.14
Scaled RMS (SRMS) (%)	**3.52**

Appendix C contains hydrographs showing the measured and simulated water levels for each of the 94 bores and vibrating wire sensors used for the calibration. The hydrographs show that the model generally simulates the dynamics of the alluvial system and the recharge events recorded in the monitoring bores. However, some of the simulated bores recorded an overly sensitive response to rainfall recharge during March 2012 and March 2013. The model also replicates the gradual decline in groundwater water levels during 2013 in response to below average rainfall.

9.2.5 Water budgets

Table 9.5 summarises the water budget reported by the steady state model.

Table 9.5 Steady state model budget

Parameter	Input (ML/day)	Output (ML/day)
Rainfall recharge	39.2	-
River leakage	34.9	-
River baseflow	-	44.1
Evapotranspiration	-	23.5
General head	0.0	0.0
Wells	0.0	6.5
Percent discrepancy	-0.03%[1]	
Total	**74.1**	**74.1**

1. Note data is rounded and therefore the small discrepancy is not evident

The budget indicates that water enters the model domain at a rate of:

- 39.2 ML/day from diffuse rainfall recharge; and
- 34.9 ML/day from leakage from the major river systems.

The model predicts water discharges at a rate of:

- 44.1 ML/day into rivers and creeks;
- 0.0 ML/day out of general head boundary;
- 22.4 ML/day from evapotranspiration; and
- 6.5 ML/day from landholder well extraction.

The steady state model indicates that approximately 34.9 ML/day enters the model via river leakage, while a total of 44.1 ML/day leaves through baseflow. This represents a net outflow of 9.2 ML/day.

Table 9.6 Summarises the water budget reported by the transient model, with Figure 9-9 showing the data graphically.

Table 9.6 Average transient model budget

Parameter	Input (ML/day)	Output (ML/day)
Storage	36.4	15.2
Rainfall recharge	14.9	-
River leakage	34.7	-
River baseflow	-	43.3
Evapotranspiration	-	21.5
General head	-	0.1
Wells	-	6.2
Percent Discrepancy	-0.02%[1]	
Total	**86.1**	**86.1**

1. *Note data is rounded and therefore the small discrepancy is not evident*

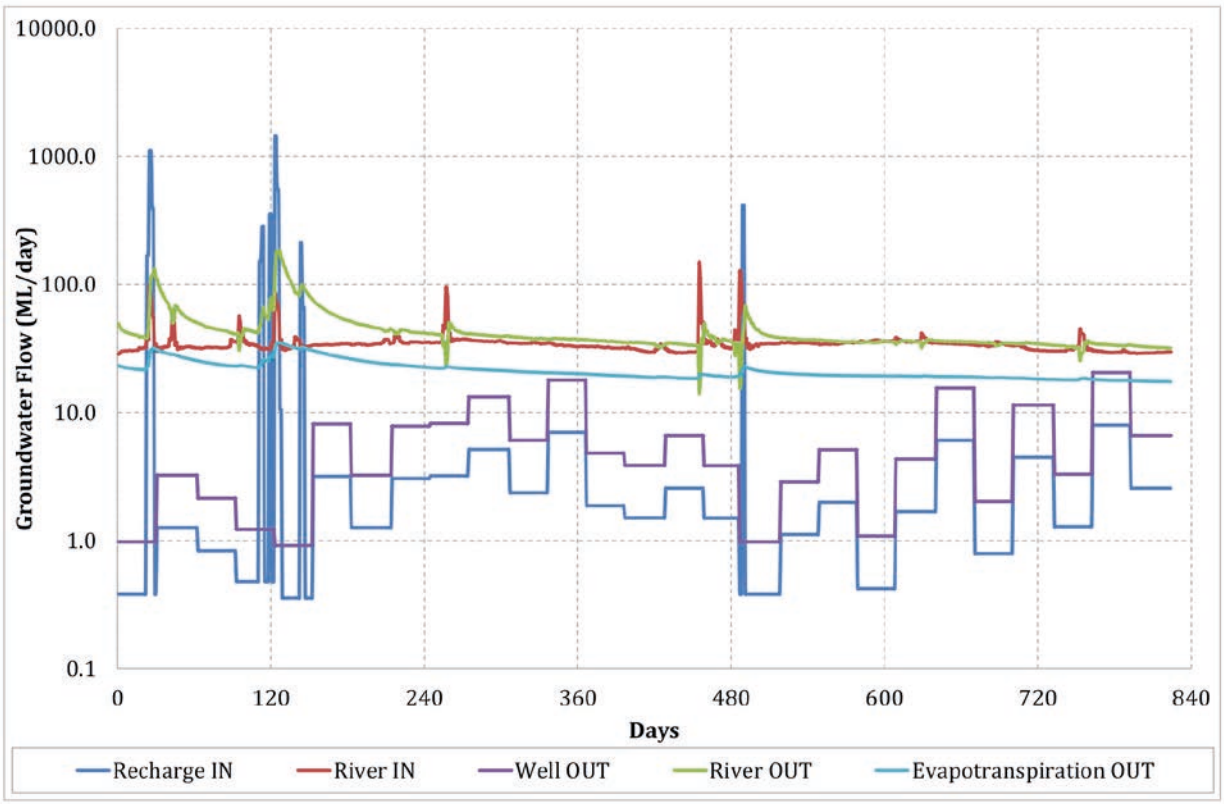


Figure 9-9 Transient model budget

The results display the highly variable nature of the hydraulic stresses imposed on the groundwater model.

9.2.6 River baseflow

DP installed three stream gauges to monitor key sub-catchments within the Project Boundary located as follows:

- SW4 – Bylong River downstream of the confluence with Growee River;
- SW8 - Bylong River downstream from the proposed Eastern Open Cut Mining Area and adjacent to the proposed underground extraction area; and
- SW9 - Lee Creek upstream of the proposed Open Cut Mining Areas.

As discussed previously the baseline monitoring undertaken for this assessment was undertaken during a period of historically relatively low rainfall. This resulted in very limited water above some of the flow gauges that potentially affected the gauging data. WRM (2015) reviewed the data with the objective of estimating the baseflow proportion of the total flow to compare with the predictions of the groundwater model. WRM considered SW8 on the Bylong River to be the most representative of the gauges and developed a rainfall runoff model using AWBM to replicate total flow and baseflow at this site.

Figure 9-10 shows graphically the baseflow estimated by the AWBM model and the groundwater model. It also shows total measured flow as a moving average, smoothing out the peaks and therefore also approximating baseflow.

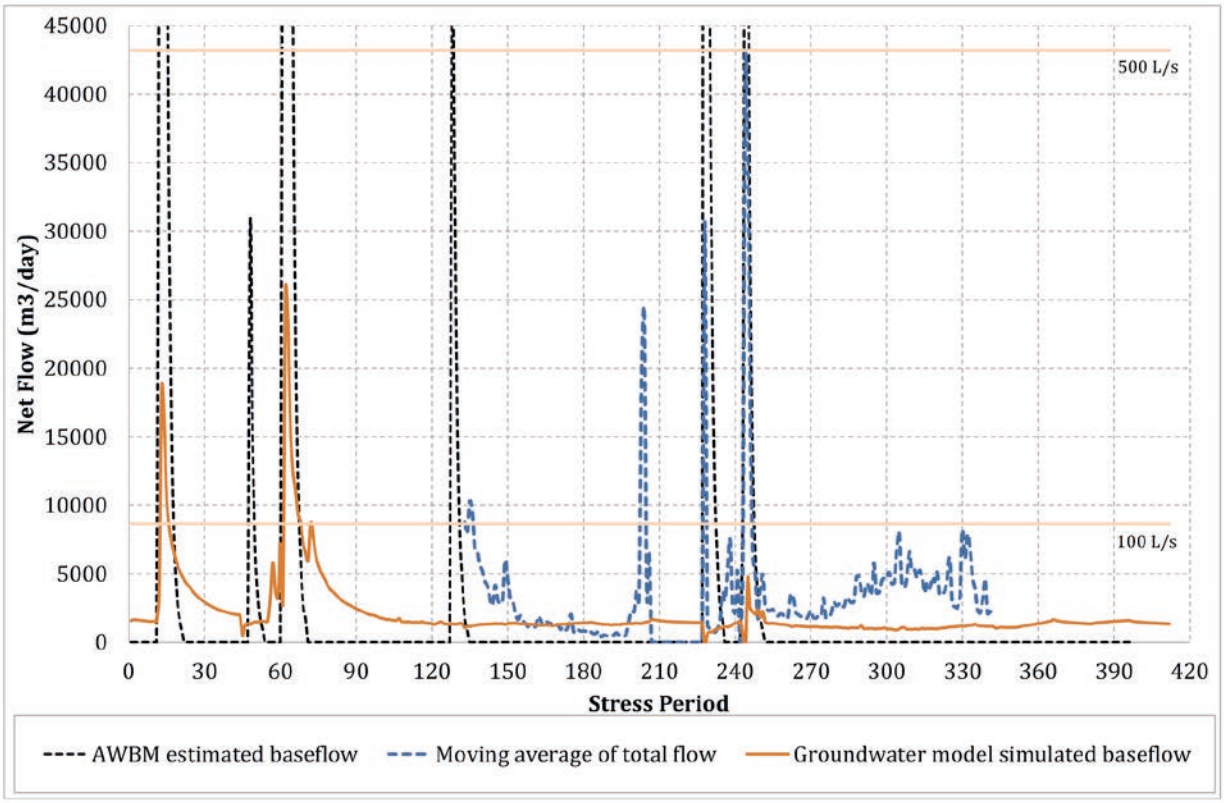


Figure 9-10 Baseflow at SW8 on Bylong River – transient model

Figure 9-10 indicates the groundwater model replicates the time of the peaks in baseflow simulated by the AWBM model, but the magnitude of the peaks is lower. Another plain difference is the AWBM model simulates no baseflow between rainfall events, whilst the groundwater model simulates a flow of about 1 ML/day at this gauge. The smoothed moving average total flow shows a better correlation with the groundwater model between the rainfall peaks where groundwater discharge dominates the recorded flow. WRM (2014) noted that the AWBM estimate of baseflow should be used with caution due to the noise in the data generated when the flows are low. Whilst the groundwater model does not perfectly match the available datasets, it is considered to be within a valid range based on the available data.

As described in Section 6.2, six seepage meters were installed in waterholes within the Bylong River to measure the transfer of water across the stream bed, and determine if the streams are 'losing' or 'gaining' in nature. Table 9.7 compares the flows to the river cells in the groundwater model with the fluxes measured through the stream beds with the seepage meters.

Table 9.7 Observed vs simulated baseflow – Seepage meters – Transient model

Parameter (KL/day)	Seepage meter					
	ID1	ID2	ID3	ID4	ID5	ID6
Average modelled net flow	0.4	-103.9	-5.2	-14.7	-16.2	8.4
Median modelled net flow	6.9	-69.1	-1.7	-6.4	-6.4	0.0
Min. modelled net flow	-343.1	-1,600.7	-131.1	-324.9	-761.3	-321.8
Max. modelled net flow	69.7	-9.0	9.4	52.0	158.5	51.1
Observed net flow	-103.8	-58.5	-0.6	-3.5	13.5	-36.0

***Note**: negative values indicate gaining conditions, whilst positive values indicate losing conditions*

The tabulated data indicates the model simulates fluxes of water within the range indicated by the seepage meters, and indicates parameters adopted in the transient calibration are appropriate.

9.3 Verification

A subset of water level measured from the period February 2014 to July 2014 was retained to verify the model could continue to replicate observed water levels outside the calibration period.

The verification model used the soil moisture balance approach to estimate recharge using rainfall records from the site rainfall gauge. Irrigation and landholder pumping were assumed equal to measured values from 2013. River stage height information was not available, so river cells were set to drains (zero stage height) to align with field observations. Figure 9-11 compares the simulated and observed transient groundwater levels.

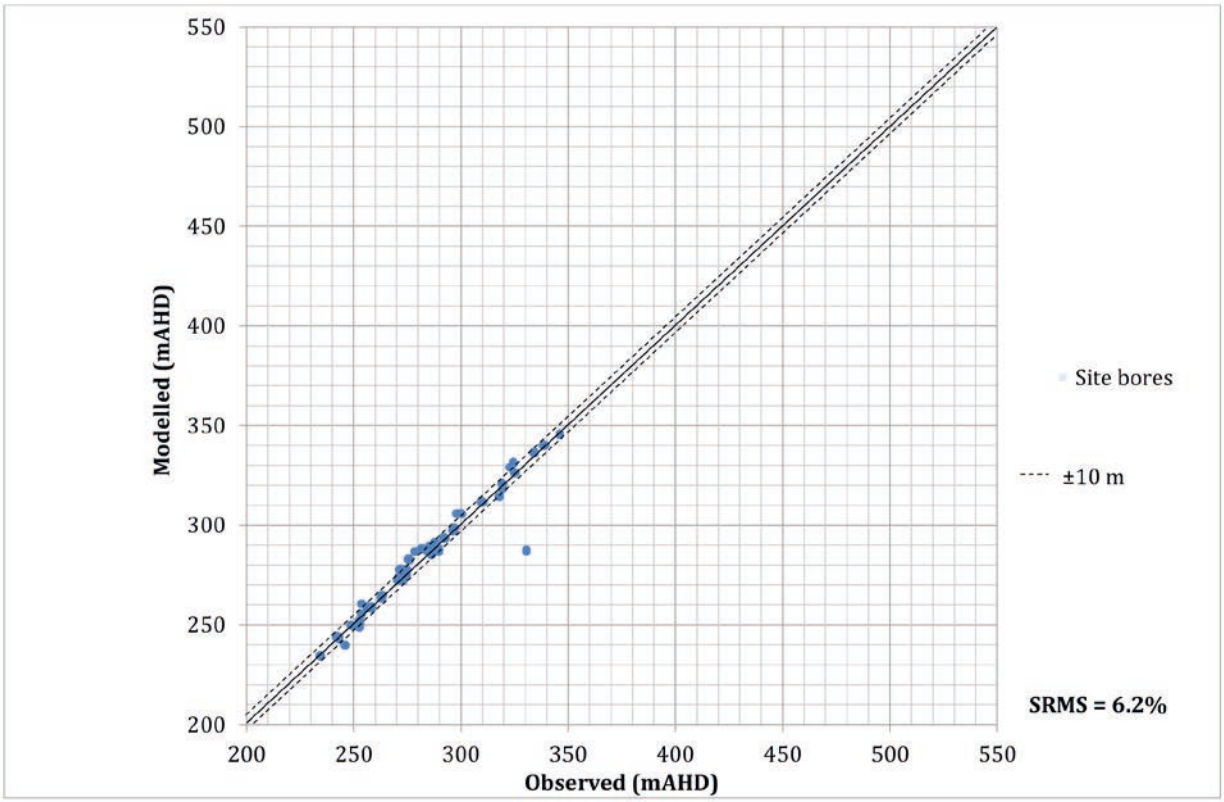


Figure 9-11 Modelled and observed transient water levels

Figure 9-11 shows the correlation between the observed and simulated transient water levels. The model replicates the measured water levels in the alluvium well. Similar to the calibration model, the statistical performance of the verification model is good, with an RMS and SRMS of 6.68m and 6.2% respectively. The outlier represents BY0091CH, which is consistent with the transient calibration model and represents a perched groundwater system which the model was unable to replicate.

Appendix C contains hydrographs showing the measured and simulated water levels for each of the 57 bores and vibrating wire sensors used for the verification. The hydrographs show that the model generally simulates the dynamics of the alluvial system and the recharge events recorded in the monitoring bores.

9.4 Model confidence level classification

Barnett *et al* (2012) developed a system to classify the confidence-level for groundwater models. Models are classified as either Class 1, Class 2 or Class 3 in order of increasing confidence (i.e. Class 3 has the highest level of confidence). The system considers the following factors when determining the model confidence level:

- available data;
- calibration procedures;
- consistency between calibration and predictive analysis; and
- level of stresses.

Whilst the model meets several of the Class 3 requirements, it is overall considered a Class 2 model for a range or reasons including:

Data

- the majority of all groundwater monitoring data points over the calibration period has been used in the calibration process;
- two-daily measured/synthesised abstraction, rainfall, and river stage height is used in the calibration simulation;
- streamflow and baseflow estimates at several locations have been undertaken to ensure consistency; and
- high resolution digital elevation data used across the entire model domain.

Calibration

- validation demonstrated;
- Scaled Root Mean Squared error (SRMS) is below prescribed limits;
- long-term trends in seasonal fluctuations and response to groundwater extraction replicated in majority of monitoring bores;
- recent transient calibration data used; and
- fluxes of regional flow calibrated from surface water exercises.

Prediction

- temporal discretisation and stresses are within the range of those used in the calibration model; and
- model verification suggests calibration is appropriate post calibration period.

Key indicators

- calibration statistics meet agreed targets;
- mass balance error is close to zero;
- model parameters are consistent with conceptualisation; and
- appropriate computational methods and spatial discretisation used.

The Class 2 confidence level is suitable for predicting groundwater responses to arbitrary changes in applied stress or hydrological conditions and the evaluation and management of potentially high-risk impacts.

It should be noted that the model simulates complex interactions between streamflow, landholder pumping, rainfall/irrigation recharge, and mine dewatering in high detail, equivalent to other Class 3 predictive models. The length and stress duration of the transient calibration (2 day stress periods for 2 years) in relation to the predictive simulation (91.3 day stress periods for 23 years) is one of the key indicators the model does not meet a Class 3 classification. Class 3 models require a model predictive period less than 3 times the duration of the transient calibration, and a temporal discretisation in the predictive model the same as that used in the calibration.

10 Model predictions and impact assessment

10.1 Mine plan

The Project comprises two open cut mining areas, the Eastern and Western Open Cuts, and one longwall mining area. The open cut mining areas operate from years 3 to 10. When open cut mining is completed a void will remain within the south eastern portion of the Eastern Open Cut Mining Area. This void area will be divided into two compartments and used to accommodate the coarse/fine reject generated by the processing of the ongoing underground mining operations materials and any excess mine water The compartment for the coarse and fine reject materials will be gradually filled throughout the life of the underground mining and will capped at year 25 with no final void remaining.

The development of the longwall drifts is proposed during years 4 to 6, and the underground main headings serve to access the longwall mining areas between years 6 to 25. Longwall panel mining operates from year 9 to year 25.

A bore field will be constructed to supply water for the operations where there are deficits of surface and mine water. The bore field will comprise about 15 shallow wells extracting water from the Bylong River alluvial aquifer. Section 10.2.5 presents the volumes of water proposed to be extracted from the bore field.

10.2 Setup and assumptions

10.2.1 Model goals

The purpose of the modelling was to estimate the:

- groundwater seepage rates to the open cut and underground mining areas;
- extent of the zone of depressurisation and drawdown due to mining activities;
- drawdown in private bores;
- change in groundwater flows from the bedrock to the alluvial aquifer;
- changes in creek base flows;
- areas of potential risk where groundwater impact mitigation/control measures may be necessary; and
- impacts on water quality.

10.2.2 Staged timing and stress periods

The calibrated model was set up with 100 quarterly stages covering the proposed 25 year mine life. The model stopped at each stage and the aquifer parameters in the mined areas changed to represent the gradual growth of the spoil heaps in the open cut mining area. These changes represented the increased hydraulic conductivity, specific yield and recharge rate to the spoil heaps. The model also changed the vertical hydraulic conductivity above the longwall panels to represent the fracturing induced by subsidence after the longwall mining has passed through.

10.2.3 Recharge

Recharge rates were based on the average quarterly rate determined from the calibration model for the period November 2011 to January 2014. These recharge rates were looped in the predictive model to replicate the seasonal changes over the Project life.

The model increased the recharge rate on the open cut spoil heaps to 5% of average annual rainfall after mining had passed through. The proposed coarse and fine rejects emplacement into the Eastern Open Cut Mining Area void was assigned a recharge rate of 1% of annual average rainfall.

10.2.4 Evapotranspiration

Regional evapotranspiration rates were maintained at the rates adopted in the calibration model scenario.

Following the emplacement of spoil, the model altered the evapotranspiration surface to reflect the raised landform due to the bulking of the waste material. This allowed for any possible mounding of the water table within the spoil piles.

10.2.5 Groundwater abstraction

The predictive model maintained the same groundwater abstraction rates from private bores as used in the transient calibration. Pumping rates in each bore remained constant for each quarter and looped annually to represent seasonal irrigation cycles.

The predictive model assumed that all irrigation bores located on land owned by the proponent would continue to pump and irrigate, with the exception of the two irrigated areas to the immediate north of open cut pits (refer to Figure 9-3). In these areas for years 3 to 25, irrigation recharge was removed from the model and returned to background rates.

Water balance modelling documented in the EIS Surface Water Impact Assessment (WRM 2015) indicated makeup water may be required throughout the mine life during periods of low rainfall. Figure 10-1 shows the annual make-up water requirements simulated by the groundwater model. The volume of makeup water was based on the 1st percentile requirement predicted in the EIS Surface Water Impact Assessment (WRM 2015).

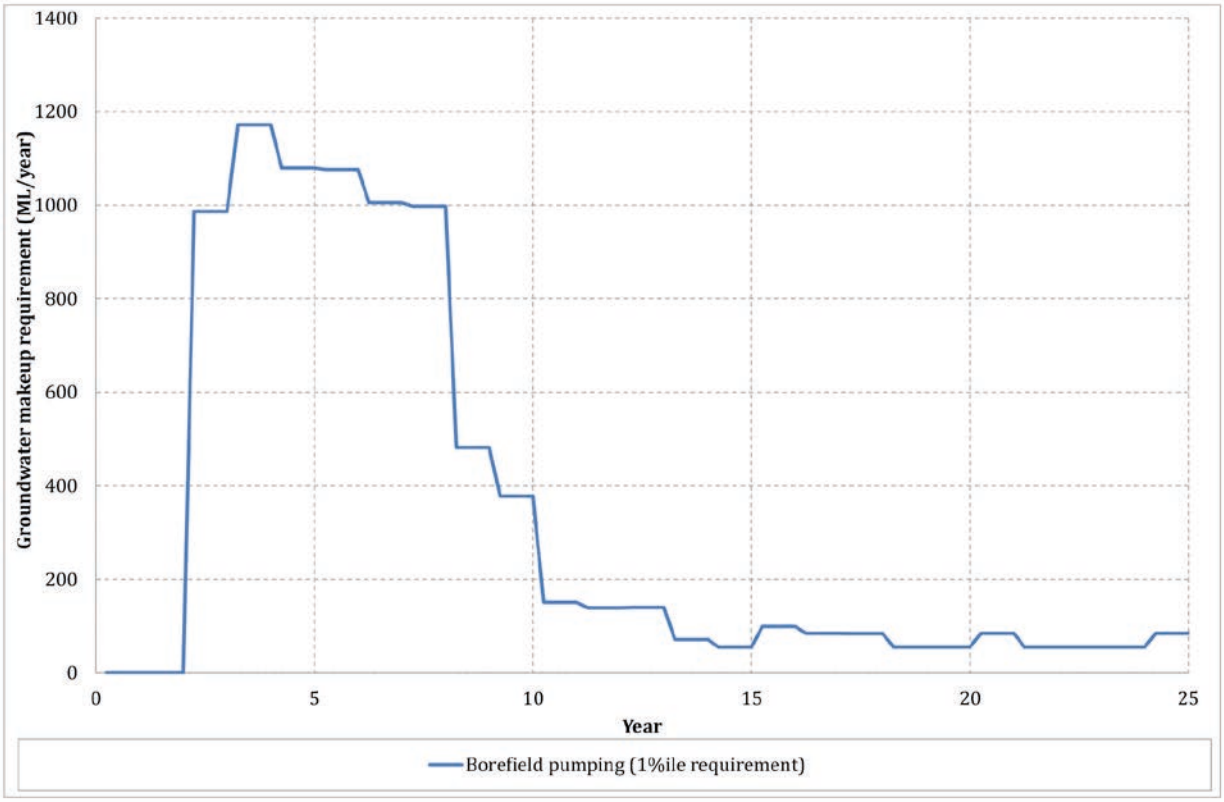
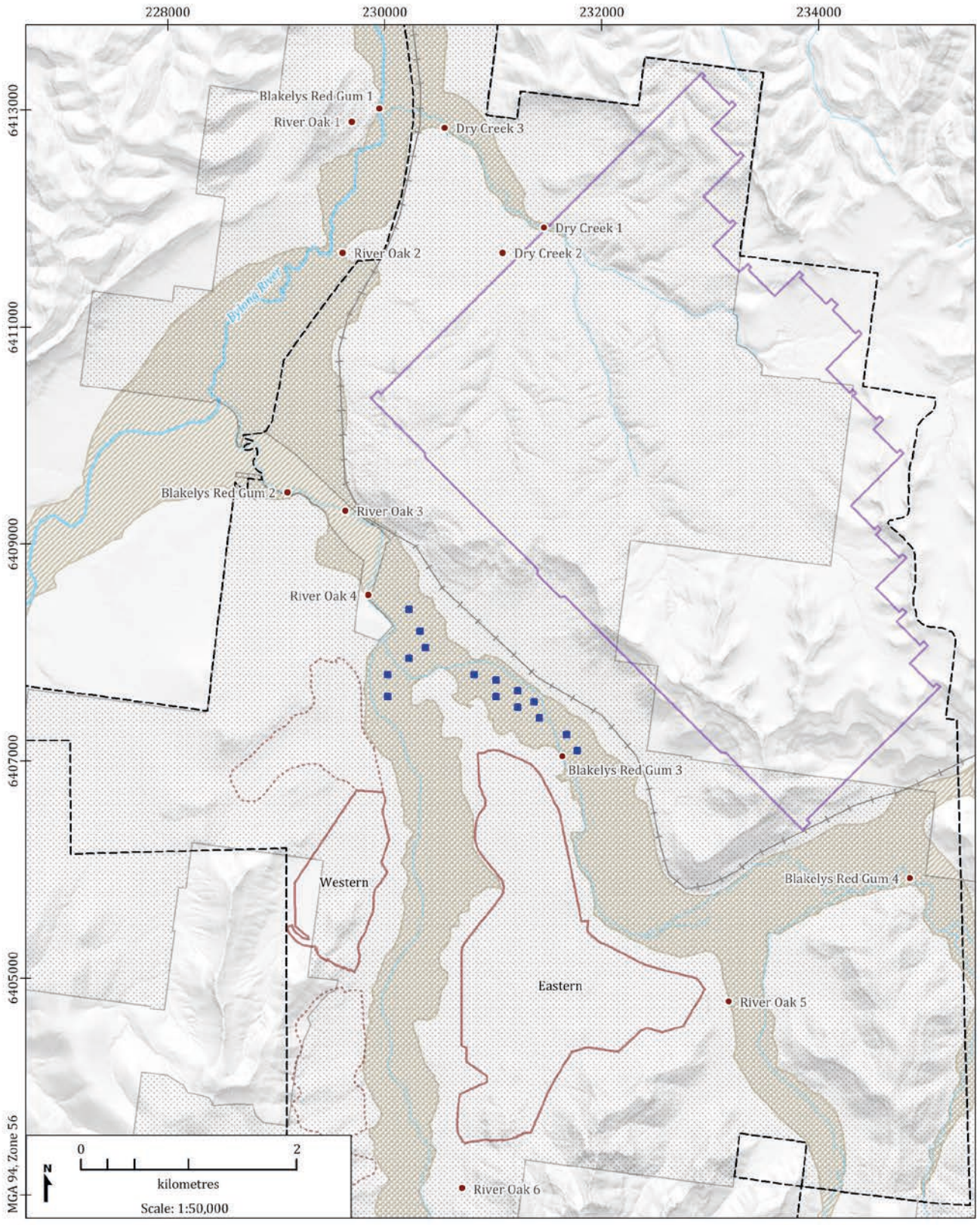


Figure 10-1 Project make-up water supply requirements

The model simulated the make-up water as being obtained from the alluvial aquifer system through a bore field which was simulated using the fractured well package (FWL). The proposed bore field consisted of 15 shallow bores. These bores were sited close to the proposed CHPP to reduce potential impacts on private bores and reduce the necessity of an extensive pipe network across the Project site. Figure 10-2 shows the locations of each proposed well in the bore field.

The modelling indicated all 15 wells are required to operate to supply the make-up water from years 3 to 8 when the requirement peaks at 1,172 ML/year peak. The demand for makeup water reduces when the development of the underground mine development commences and therefore only eight bores are required to operate from years 9 to 11. As underground mining ramps up the model indicates the seepage rates will increase and therefore only two bores extracting 55 ML to 85 ML/year are required to supply makeup water for the remainder of the Project life.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Proposed bore field
- GDE points
- Quaternary alluvium
- Landownership - KEPCO Bylong Australia Pty Ltd

Bylong Coal Project (G1606)

Proposed bore field for make-up water requirements

DATE: 25/5/2015

FIGURE No: **10.2**

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10.2.6 Mine water seepage

The SURFACT Drain package (DRN) represented the drainage of groundwater into the open cut and underground extraction areas. The model applied drain cells to the base of each model layer within the open cut footprint down to Layer 8 which represented the Coggan coal seam. For underground mining, the drain cells were applied in Layer 8.

Once applied, a drain boundary condition remained actively dewatering for one year. The drain cells were then removed from the area where open cut mining had been completed after one year, and were then applied to the cells representing new strips of mining. Drain cells remained active in each longwall mining panel until the entire panel was completed.

The model gradually introduced the main roads and gate roads according to the proposed underground mine plan. The model dewatered these roads until the end of the proposed mine life.

10.2.7 Overburden/ coarse and fine rejects backfilling

Table 10.1 shows the aquifer parameters adopted for the spoil and coarse/fine rejects proposed to be disposed into the void remaining after open cut mining. These parameters were based on work in the Hunter Valley by Mackie (2009).

Table 10.1 Hydraulic parameters of spoil

Geology type	Parameter	Value
Spoil	Horizontal Hydraulic Conductivity Kx	1 m/day
	Vertical Hydraulic Conductivity Kz	0.1 m/day
	Specific Yield S_y	10%
	Specific Storage S_s	5 x 10^{-3} m^{-1}
Coarse and fine rejects	Horizontal Hydraulic Conductivity Kx	0.01 m/day
	Vertical Hydraulic Conductivity Kz	0.001 m/day
	Specific Yield Sy	5%
	Specific Storage Ss	1 x 10^{-4} m^{-1}

The model represented the final void as being fully backfilled with coarse and fine rejects at year 11 after completion of open cut mining. Water storage was not represented within the void.

10.2.8 Subsidence induced fracturing above longwall mine

SCT (2015) assessed the potential height of fracturing induced above the subsiding longwall panels. They concluded the height of fracturing could extend to a maximum of 260 m above the roof of the longwall mine. This means fracturing would reach the land surface over the majority of the mine footprint. SCT used a numerical model to predict the vertical hydraulic conductivity for a free-draining fracture network, and advised their estimates should be adjusted to account for the slower drainage of groundwater from the rock matrix.

The model represented the fractured zone above the longwall panels by increasing the vertical hydraulic conductivity of the overlying layers. The vertical hydraulic conductivity was calculated for each layer by increasing the base value to a value between the free-draining vertical hydraulic conductivity value provided by SCT (2015), and the undisturbed host rock values. Table 10.2 and Figure 10-3 show the values used to represent the subsided and fractured overburden material.

Table 10.2 Vertical hydraulic conductivity of fractured zone

Layer	Unit	Undisturbed Kz (m/day)	Saturated Goafed Kz (m/day)	Unsaturated fracture network Kz (m/day)	Elevation mRL	Height (m)
8	Coggan coal seam	2.2×10^{-4}	1.1×10^{-1}	864	187	6
7	Interburden	1.5×10^{-4}	7.5×10^{-2}	864	191	10
6	Ulan coal seam	5.0×10^{-4}	5.0×10^{-2}	864	196	15
5	Interburden	4.3×10^{-7}	2.58×10^{-2}	864	218	37
4	Interburden	1.5×10^{-4}	3.75×10^{-3}	34.6	343	180
3	Weathered Permian	1.0×10^{-1}	1.0×10^{-1}	0.17	381	200
2	Basalt	1.9×10^{-2}	1.0×10^{-1}	0.17	381	260

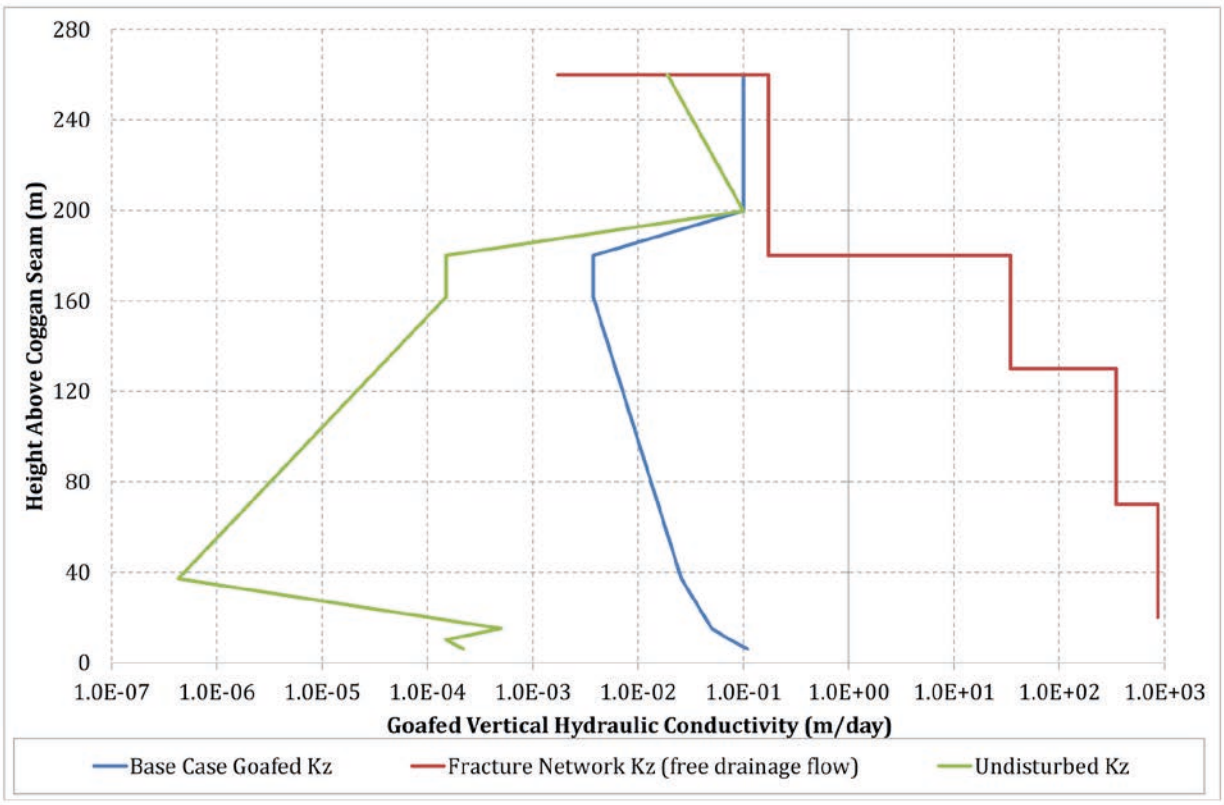


Figure 10-3 Vertical hydraulic conductivity of fracture zone

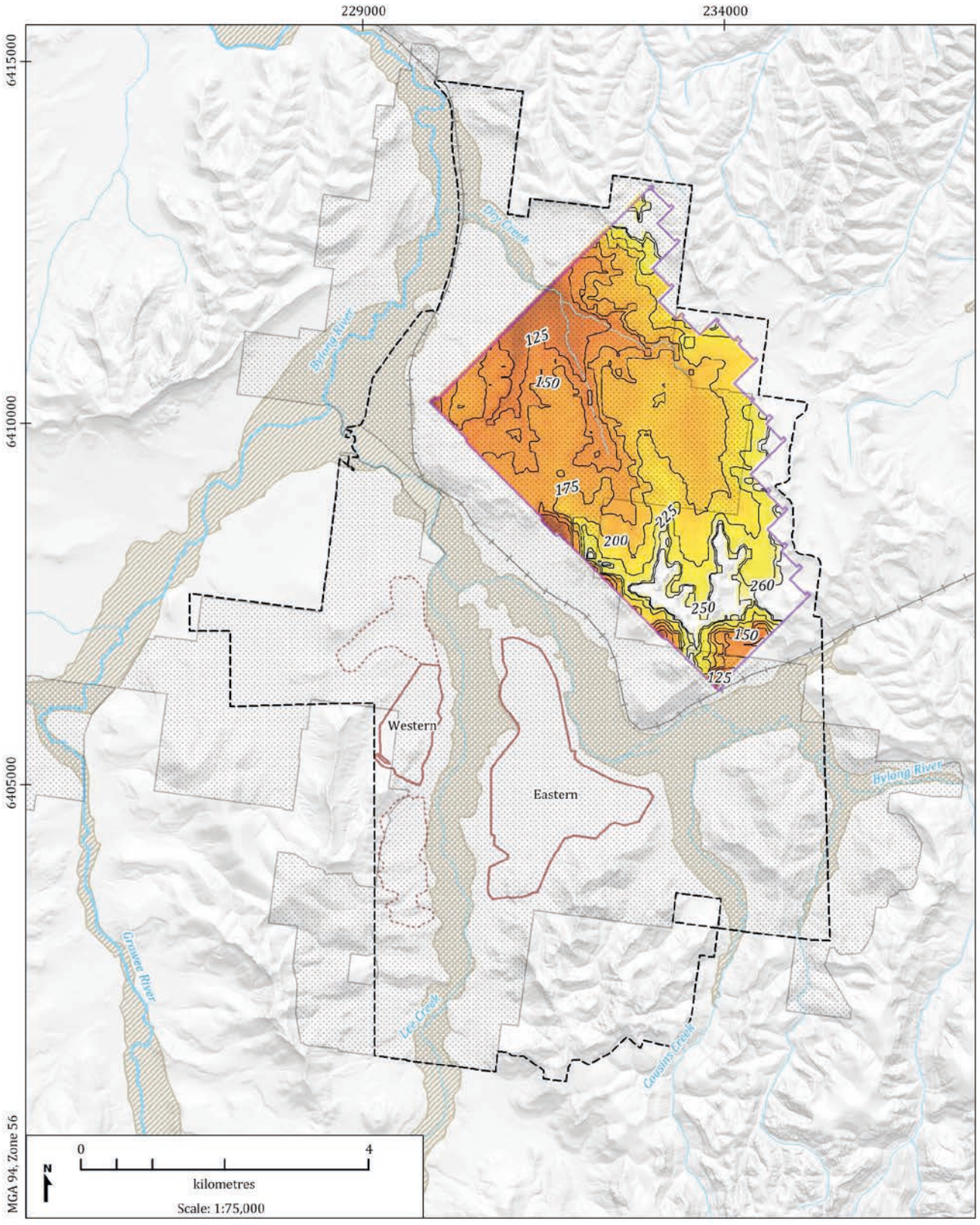
The gradual fracturing above the longwall mine was represented by running the model in short time "slices" of three months. The 25 years of mining was subdivided into 100 stages, each three months in length. At the end of each stage, the model was stopped and the last predicted groundwater levels for the simulation were used as starting points for the next simulation stage. At this point in time, changes in aquifer parameters resulting from the effects of the subsidence of material into the mined panel and the formation of a goaf above the panel were applied. A Fortran computer program was written to undertake the "stop-start" nature of the staged simulation. This program defined the active cell drains on a biannual basis and applied pre-defined rules for the changes in aquifer parameters and finally generated each of the time slices.

Once the main headings for the underground mine were completed, hydraulic parameters within the extracted coal seam were adjusted to represent the remaining void. Horizontal and vertical hydraulic conductivity were changed to 100 m/day, and specific yield values to 100%. The specific yield of the mined coal seam in the longwall panels was increased to 25% to allow for goafed material collapsing into the mined area.

10.2.9 Dry Creek inflow scenario

Dry Creek runs through the basalt capped plateau that occurs above the proposed longwall mining area. Figure 10-4 shows the zone where the longwall panels are less than 260m below the surface and therefore where connective fracturing could potentially reach the ground. In this area there is the potential for some flow from surface water courses to be routed directly into the underground mine via the fracture network. WRM (2014) assessed the flow-duration relationship for Dry Creek and concluded there was no flow for approximately 97% of the time, with significant flow (>1 m stage height) occurring approximately 0.1% of the time.

To assess inflows from Dry Creek directly into the longwall mine during a high rainfall event where the mine is less than 260 m below the ground surface, the vertical hydraulic conductivity was increased to the value recommended by SCT (2015) as representing a free-draining fracture network. The groundwater model assigned a stage height of 2 m to all drainage lines associated with Dry Creek for a seven day duration. Drain cells were also applied to the longwall panel in the Coggan seam directly underneath Dry Creek. Inflow from Dry Creek was assessed by comparing the results with a second scenario where Dry Creek was represented as dry for seven days.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Thickness to Coggan Seam contour (m)
- Landownership - KEPCO Bylong Australia Pty Ltd
- Quaternary alluvium

Bylong Coal Project (G1606)

Zone where connective fracturing potential reaches land surface

DATE: 25/5/2015

FIGURE No: **10.4**

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10.2.10 Post mining reinjection of excess water

A compartment within the open cut final void will be used to store any excess water removed from the underground mine. WRM (2015) estimated the excess water stored within the open void could be up to 2,542 ML, at the end of mining. It is proposed the excess water within the open void be pumped into the underground mining area to allow the open void to be backfilled and rehabilitated. The post-mining groundwater model simulated reinjection of the excess water using the fractured well package (FWL). The water was injected at two points in the north-western section of the main headings. This was adjacent to the last panels to be mined, allowing the excess water to flood the abandoned workings. The model simulated the re-injection at a constant rate of some 7 ML/day to the Coggan Seam (layer 8) for a period of 1 year.

10.3 Water budget

Figure 10-5 shows the changes in the model water budget over the proposed 25 year mine life.

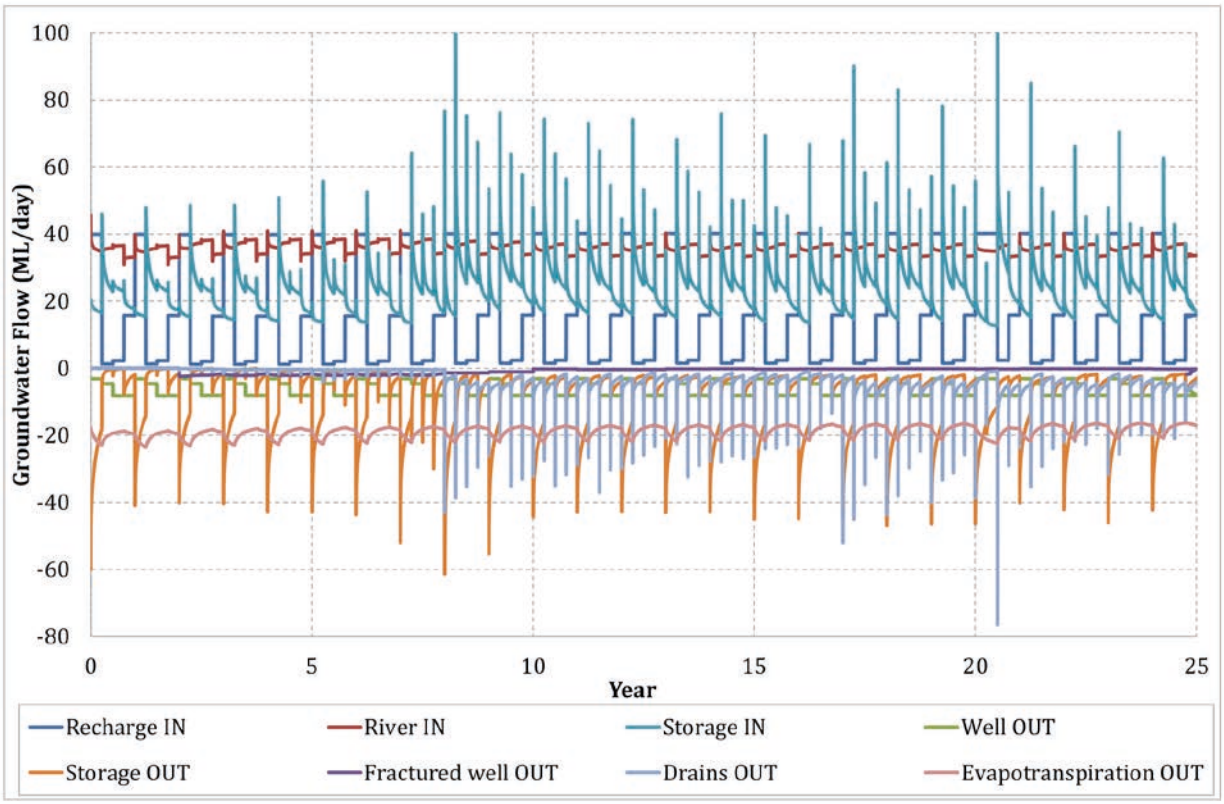


Figure 10-5 Predictive model water budget

Figure 10-5 shows that rainfall recharge dominates the inputs, averaging about 15 ML/day across the entire model domain. The recharge rate to the aquifers increases slightly over the 25-year mining period by approximately 1 ML/day, due to the increased recharge through the spoil material in the backfilled mining areas. Seepage through the bed of the rivers into the underlying alluvial aquifers is also a significant contributor to recharge, averaging 36 ML/day. The large spikes observed in Figure 10-5 are caused by the sudden introduction of drain cells to the model representing mining. The high rates for the peaks are generally only sustained for the first time step, being about 24 hours in duration. In reality, the mining process is more gradual than the model represents, that these short duration spikes in mine seepage would not be expected to occur.

River baseflow and evapotranspiration are the main mechanisms removing water from the model, which remove an average of 37 ML/day and 19 ML/day respectively.

The difference between the total inputs and outputs was low throughout the mining phase (<0.05%), with a maximum time step error of -0.67%, indicating the errors in calculating the water budgets are not significant.

10.4 Groundwater seepage to mining areas

Figure 10-6 shows the predicted total flux of water into the proposed mining areas, and the contribution from each mining area.

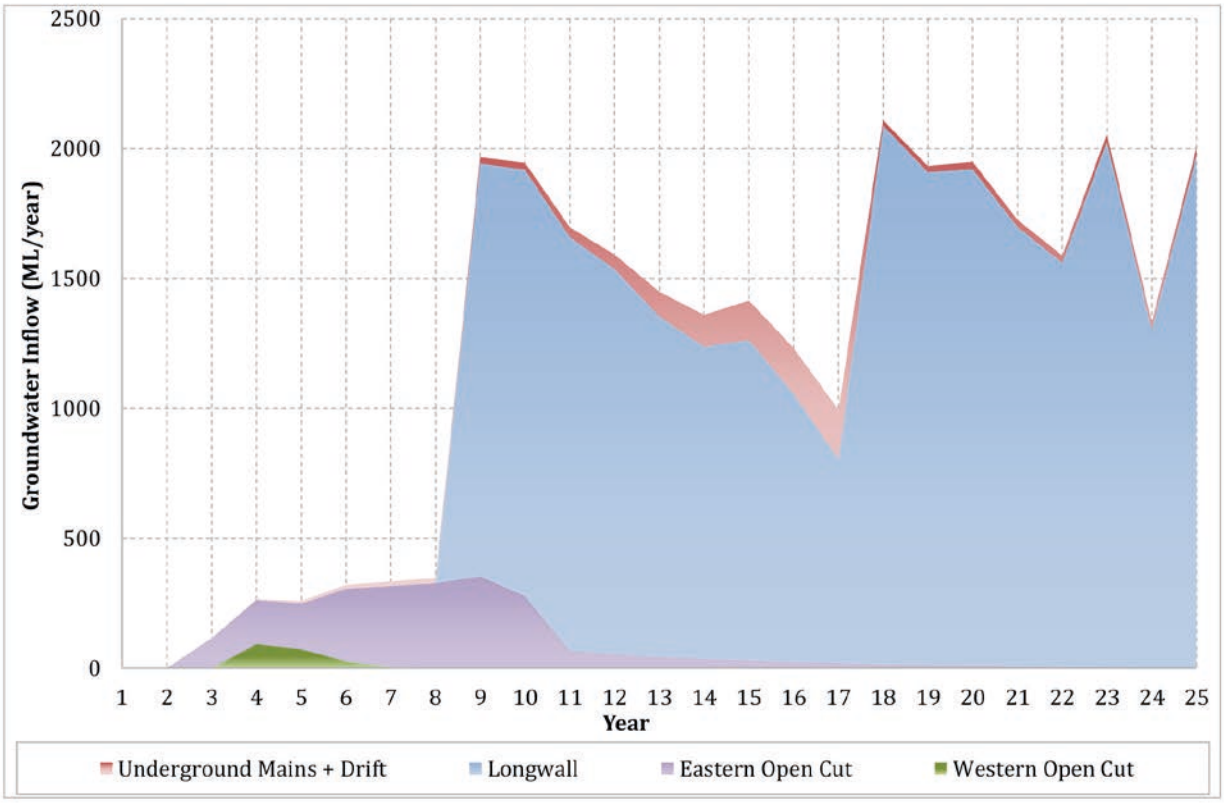


Figure 10-6 Predicted seepage to open cut and underground mining areas

The groundwater inflows to the mining areas were calculated by using a weighted average of budget outputs at each time step. The predicted mine seepage rates vary throughout the mining period. The variability is due to the proposed mine depth, strata being mined, proximity to alluvium and hydraulic gradients induced by the depressurisation.

The model predicts seepage rates to the open cut mining areas of less than 360 ML/year (1 ML/day). Groundwater inflows to Western Open Cut Mining Area decrease to zero at year 7, as mining advances up-dip, above the regional groundwater level. This represents a groundwater take from the Permian coal measures of 110 ML/year on average and a maximum of 354 ML/year maximum. Following mining, a small amount of water seeps into the coarse/fine rejects area remaining in the Eastern Open Cut Mining Area as water levels stabilise.

Groundwater inflow to the longwall panels, main headings and drift is higher than the open cut mining areas due to the larger footprint, higher water levels above the mining area and the effects of fracturing above the longwall panels. This results in a groundwater take from the Permian coal measures of 1,200 ML/year on average, peaking at a maximum of 2,109 ML/year.

When interpreting the above results, it is important to understand the simplifying assumptions. The predicted seepage rates in Figure 10-6 represent the total groundwater loss from the groundwater systems. In reality, evaporation from the coal face exposed in the highwall and endwall in the open cut mining areas would remove a proportion of the seepage predicted by the modelling and not all of the simulated seepage would flow to sumps for removal by pumping. Ventilation of the underground mine would also evaporate a proportion of the groundwater before it is captured for reuse within the mine water management system. Figure 10-7 presents corrected groundwater inflows for use with the site water balance. A factor to account for evaporative loss of water from the open cut mining area was used (54% to 78%) to estimate the volume of water needing pumping. The factor was determined through the analysis of the mine plan and aquifer saturated thickness. A 70% factor was applied to underground inflows, to account for loss of water in coal moisture, ventilation, and water entrained within the goaf and mined material.

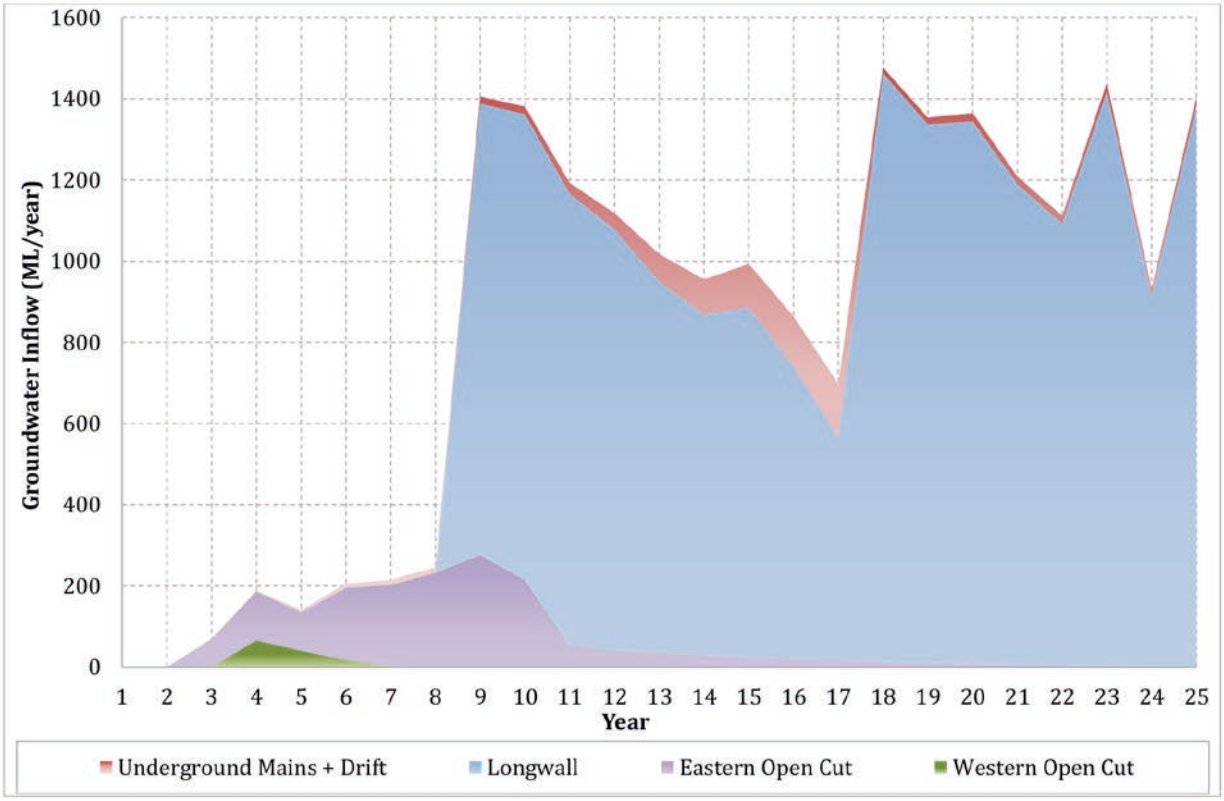


Figure 10-7 Corrected seepage to open cut and underground mining areas

The 'pumpable' seepage to the open cut mining areas is estimated to be less than 280 ML/year (0.8 ML/day). Corrected 'pumpable' groundwater inflow to the underground areas averages 874 ML/year (1,451 ML/year peak). Table 10.3 presents the corrected 'pumpable' groundwater inflows used in the site water balance.

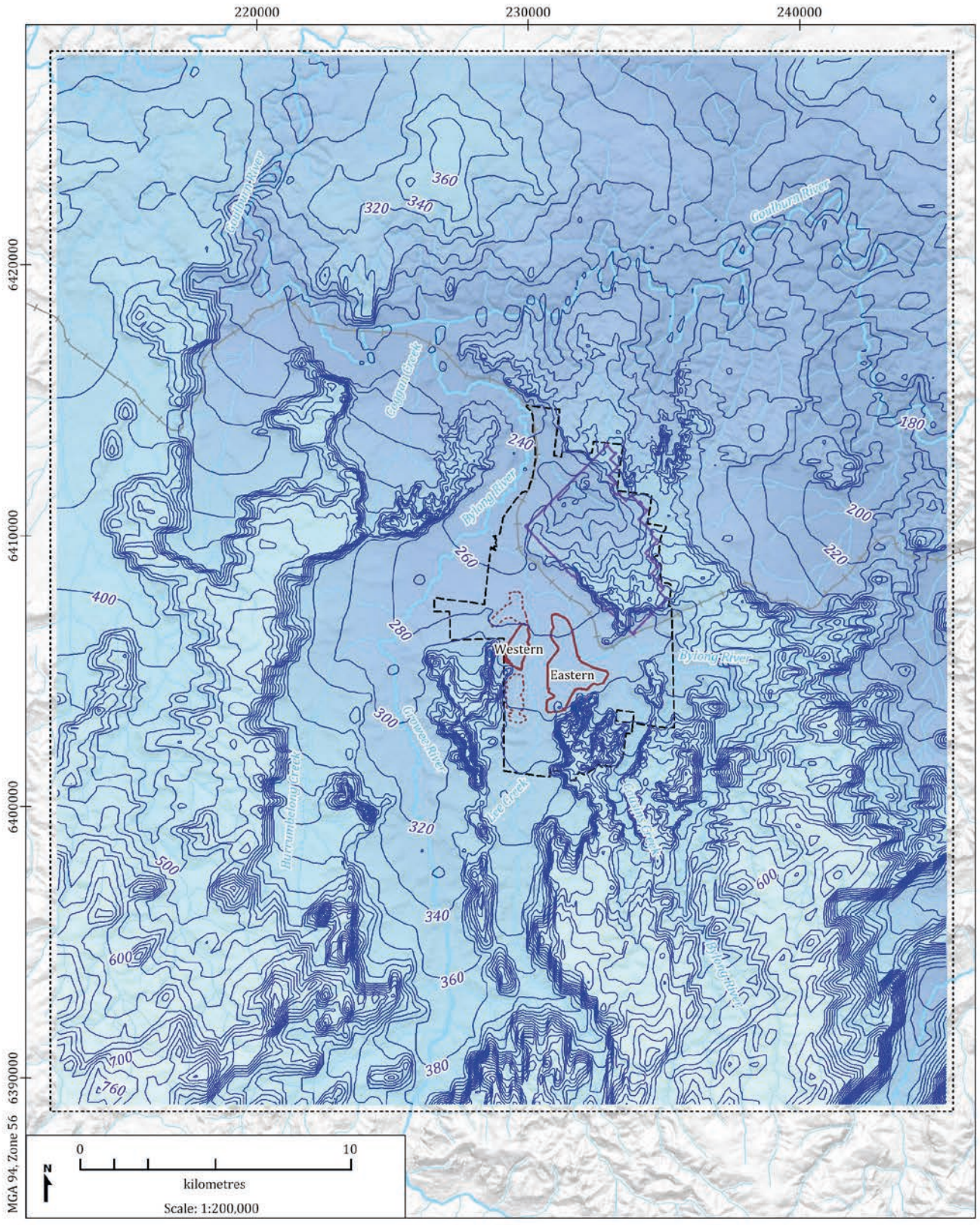
Table 10.3 Site water balance groundwater inflows

Year	Western open cut (ML)	Eastern open cut (ML)	Longwall (ML)	Haul Road + Drift (ML)	Total (ML)
1	0	0	0	0	0
2	0	0	0	0	0
3	0	69	0	0	69
4	66	120	0	3	189
5	40	95	0	7	142
6	17	178	0	10	206
7	2	200	0	13	215
8	0	232	0	14	246
9	0	276	1,113	17	1,406
10	0	214	1,148	19	1,381
11	0	53	1,114	27	1,193
12	0	42	1,038	39	1,119
13	0	34	916	67	1,017
14	0	28	841	86	955
15	0	23	863	106	993
16	0	19	722	122	864
17	0	16	549	133	698
18	0	12	1,451	14	1,477
19	0	10	1,328	17	1,354
20	0	7	1,338	20	1,365
21	0	5	1,185	19	1,209
22	0	4	1,090	19	1,112
23	0	2	1,418	20	1,440
24	0	1	912	20	933
25	0	1	1,383	20	1,405
Total	**125**	**1,643**	**18,409**	**812**	**20,990**

10.5 Changes in potentiometric surface / water table

10.5.1 Water levels

Figure 10-8 and Figure 10-9 present the predicted groundwater levels at the end of mining within the alluvium/regolith (Layer 2) and the Coggan Seam (Layer 8) coal seam respectively. The figures show that mining induces hydraulic gradients towards the mining areas. The extent of these zones is discussed further in sections below.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Model boundary
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Groundwater levels contour - 20m interval (mAHD)

Bylong Coal Project (G1606)

Groundwater levels - alluvium/regolith layer 2 - year 25

DATE: 11/5/2015

FIGURE No: **10.8**

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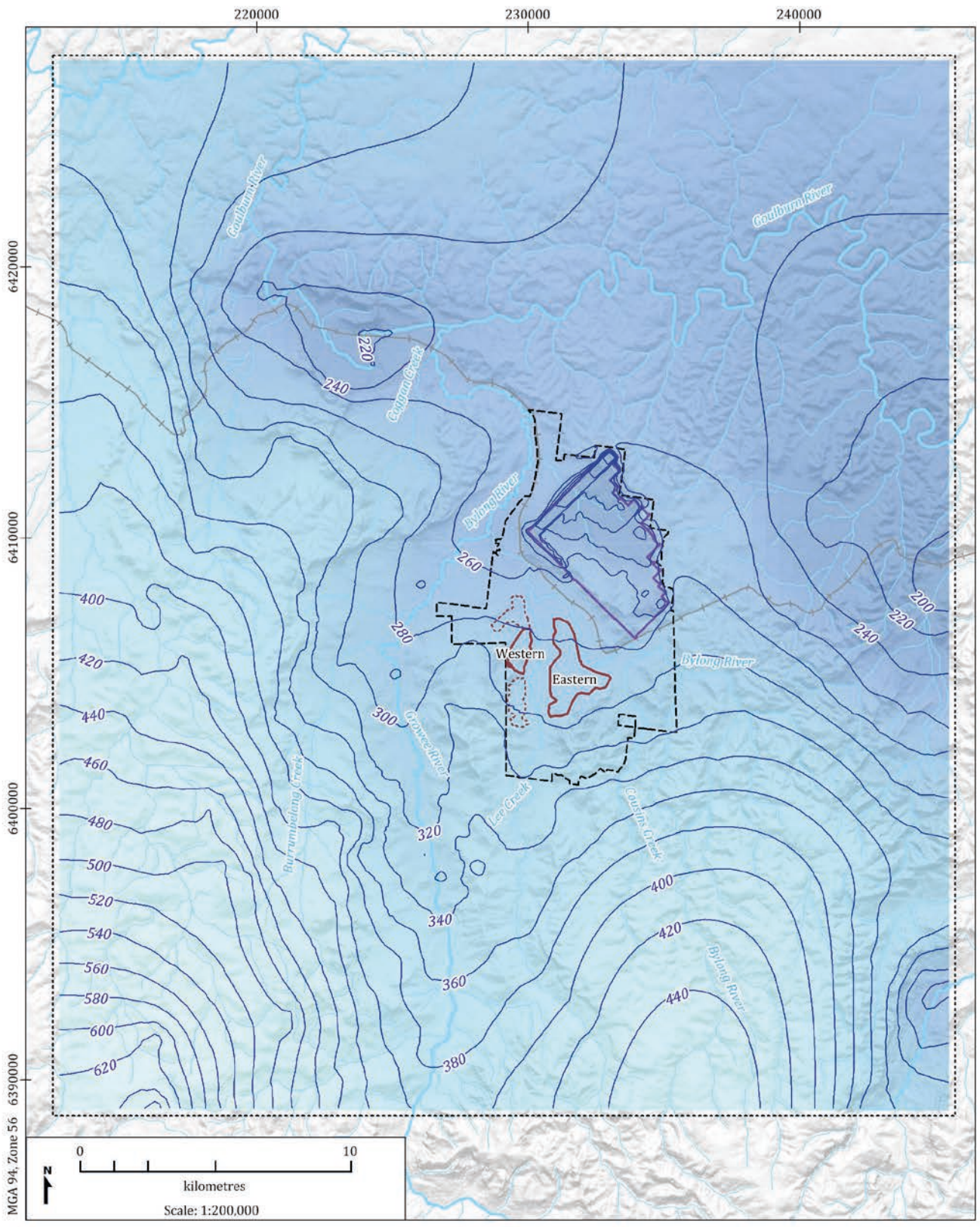

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Model boundary
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Groundwater levels contour - 20m interval (mAHD)

Bylong Coal Project (G1606)

Groundwater levels - Coggan Seam layer 8 - year 25

DATE: 11/5/2015

FIGURE No: **10.9**

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10.5.2 Alluvial drawdown

The process of mining reduces water levels in surrounding aquifers. The extent of the zone affected is dependent on the properties of the aquifers/aquitards and is referred to as the zone of depressurisation in a confined aquifer and zone of drawdown within the water table. Depressurisation and drawdown is greatest at the working coalface, and gradually reduces with distance from the mine.

The numerical model calculated the extent of the zone of depressurisation/drawdown within the Permian and alluvial groundwater systems due to mining by comparing water levels with and without the proposed mine operating. Two scenarios were simulated, firstly with all proposed mining active, and secondly with no mining at Bylong. The zone of depressurisation due to the Project was determined as the difference in the potentiometric surface between these two model runs. This process removed the influence of pumping from private bores on groundwater levels.

Layers 1 and 2 in the model represented the alluvium in the flood plains, and the weathered Permian bedrock outside these areas where alluvium is not present. The modelling indicates the proposed mining induces drawdown in the alluvium in the first 10 years of the Project life when open cut mining is active. Beyond year 10, pumping from the open cut demands on the borefield reduce and the zone of influence begins to retract with groundwater levels in the alluvium gradually recovering. At the end of the Project life, the drawdown within the alluvium only affects the fringes of the flood plain where the transmissivity is lowest.

When mining is completed within the open cut mining areas, the remaining void within the Eastern Open Cut is divided into two compartments for storage of coarse/fine rejects and mine water. One of the voids will be gradually filled with coarse and fine reject material from the processing of underground ROM coal for the remainder of the mine life.

The modelling indicates the void space within the backfilled overburden in the Eastern Open Cut Mining Area is slow to fill with groundwater, and there is a gradual drainage of groundwater from the alluvium into the backfilled pit. Despite the slow recovery of groundwater levels within the backfilled open cut mining area, the adjacent alluvium still recovers due to the recharge rate on the flood plain, and subsurface flow from upstream exceeding the rate of drainage of groundwater into the backfilled pit. The coarse and fine reject disposal area has a relatively small footprint and therefore does not have a significant influence of recovery of groundwater levels within the alluvium.

The underground mining operation depressurises the overlying strata, inducing steeper hydraulic gradients between the alluvium and Permian. This results in groundwater drawdown within the alluvium to the northwest of the underground mining area by year 22.

The following figures display the drawdown over the mine life:

- Figure 10-10 shows predicted drawdown in the alluvium/regolith (Layer 2) at Year 10, which is when open cut mining is expected to be completed;
- Figure 10-11 shows drawdown in Year 25, which is the end of the proposed longwall mining, by which time the open cut area has been recovering for 15 years; and
- Figure 10-12 presents a composite of the maximum drawdown in alluvium/regolith in each saturated model cell at any time throughout the entire simulation, and the year at which maximum drawdown occurs.

It should be noted, drawdown is not shown where layers are unsaturated. The figures show that drawdown within the alluvium extends approximately 1 km from the Eastern Open Cut Mining Area. In contrast, the drawdown extends some 2.3 km from the northern limit of the longwall mining area but influences only the very fringes of the alluvial aquifers. Drawdown due to extraction from the bore field proposed for makeup water is constrained to within 0.5 km, although groundwater levels are generally reduced by 5 to 9 m close to the extraction wells.

Figure 10-12 shows the time when maximum drawdown occurs at any model cell through the simulation. This figure shows the maximum drawdown within the Bylong River alluvium occurs at Year 10, which coincides with the final period of mining within the Eastern Open Cut Mining area. Drawdown in the Lee Creek alluvium gradually moves upstream with the majority of the drawdown occurring in response to open cut mining.

Some drawdown is also predicted occur after the open cut mine is closed. This is due to water levels in the open cut pits slowly drawing water from the alluvium whilst the system reaches a new equilibrium water level. Maximum drawdown in the Dry Creek alluvium occurs at Year 25 as the longwall depressurises the strata overlying the longwall panels. The drawdown in Bylong River alluvium downstream of open cut mining and adjacent the longwall mining is most extensive in Year 25, when the longwall mine is fully developed.

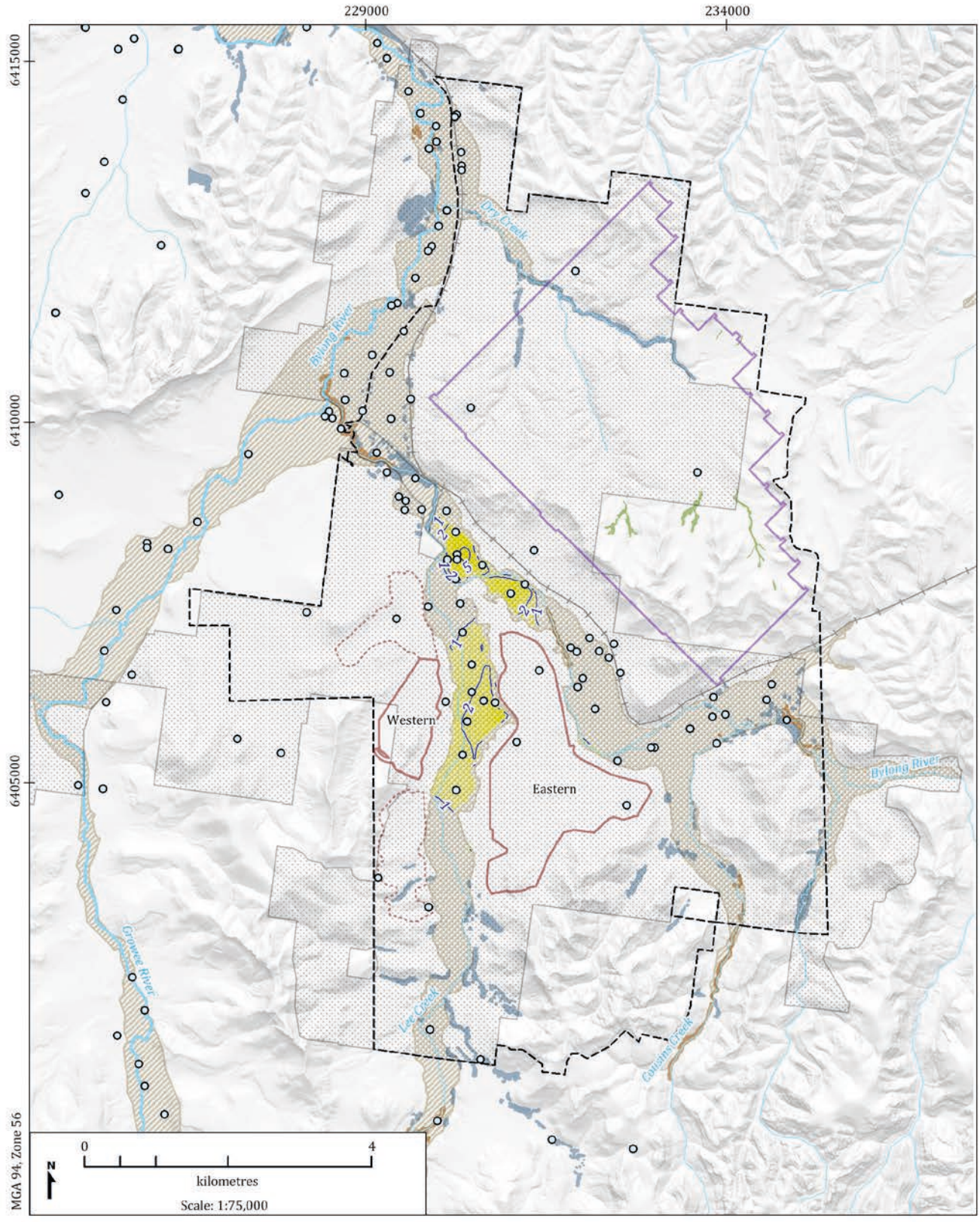
10.5.3 Permian depressurisation

Layer 8 represents the Coggan seam targeted for the proposed open cut and underground mining operations. The mining gradually depressurises the coal seams as mining advances. The following figures display the depressurisation in the Coggan seam over the Project life:

- Figure 10-13 shows predicted drawdown in the Coggan seam (Layer 8) at Year 10, which is when open cut mining ends;
- Figure 10-14 shows drawdown in Year 25, which is the end of the proposed longwall mining; and
- Figure 10-15 presents a composite of the maximum saturated drawdown in each model cell at any time throughout the entire simulation, and the year at which maximum drawdown occurs.

The figures show the open cut and underground mining depressurises the groundwater in the coal seam in a zone that extends to a maximum of 2.3 km from the proposed open cut mining areas. Depressurisation extends in the coal seam up to 2.4 km from the longwall panels, but is generally restricted to less than 1.0 km to the north of Project. This is due to the reduction of hydraulic conductivity with depth in the deeper areas.

Figure 10-15 shows the time when maximum drawdown occurs at any model cell through the simulation. The figure indicates the maximum drawdown within the mined footprint occurs as the longwall passes through the area, but outside the footprint the maximum depressurisation occurs around 5 to 10 years following mining.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Drawdown contour (m)
- Registered bore
- Landownership - KEPCO Bylong Australia Pty Ltd
- Quaternary alluvium

Potential GDE - EIS Ecology Study

- Blakely's Red Gum / Apple Riparian Forest
- River Oak / Redgum Riparian Woodland
- Blakely's Red Gum / Paperbark Forest

Bylong Coal Project (G1606)

Groundwater drawdown - Year 10 alluvium/regolith - layer 2

DATE: 25/5/2015

FIGURE No: **10.10**

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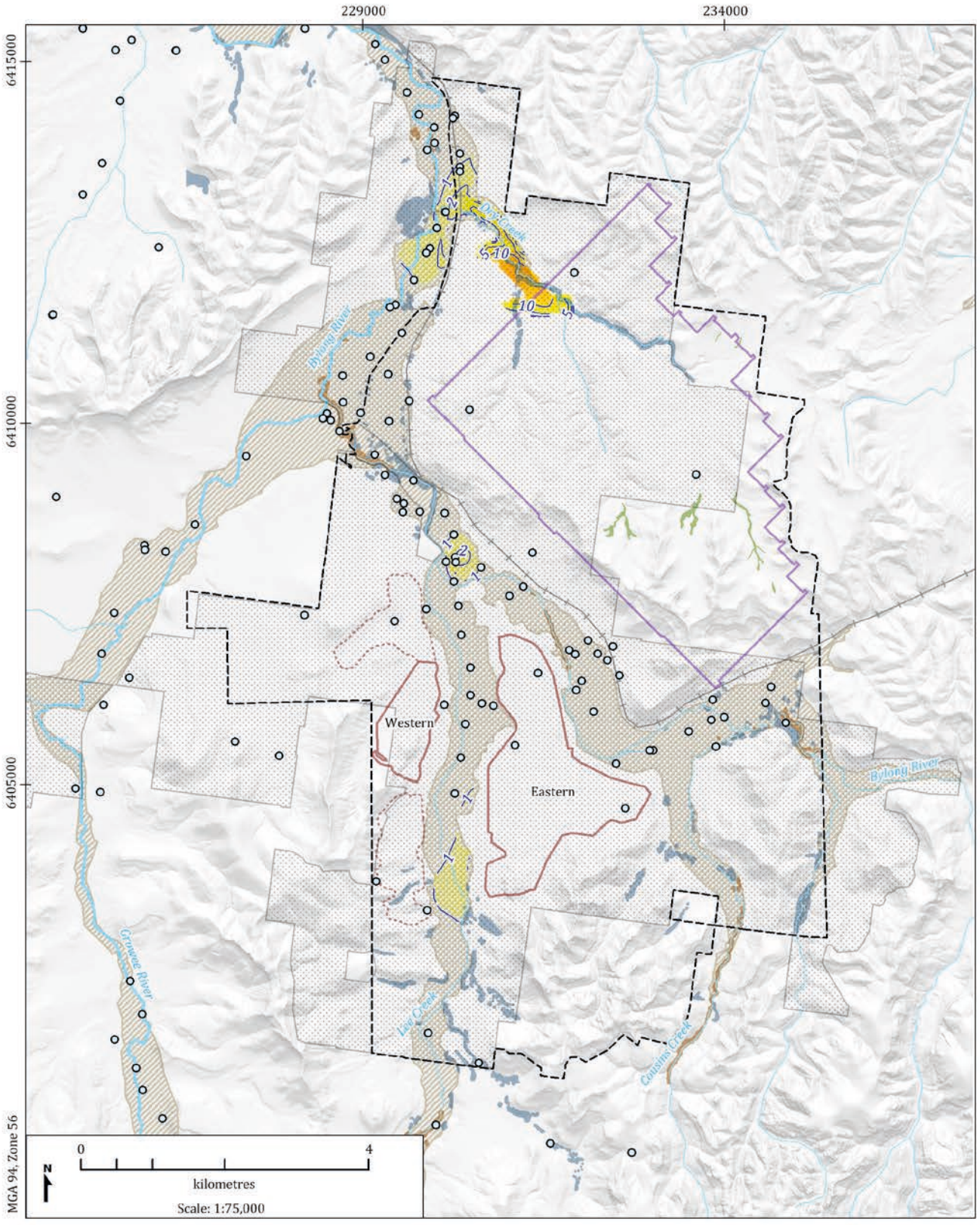

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Drawdown contour (m)
- Registered bore
- Landownership - KEPCO Bylong Australia Pty Ltd
- Quaternary alluvium

Potential GDE - EIS Ecology Study

- Blakely's Red Gum / Apple Riparian Forest
- River Oak / Redgum Riparian Woodland
- Blakely's Red Gum / Paperbark Forest

Bylong Coal Project (G1606)

Groundwater drawdown - Year 25 alluvium/regolith - layer 2

DATE: 25/5/2015

FIGURE No: **10.11**

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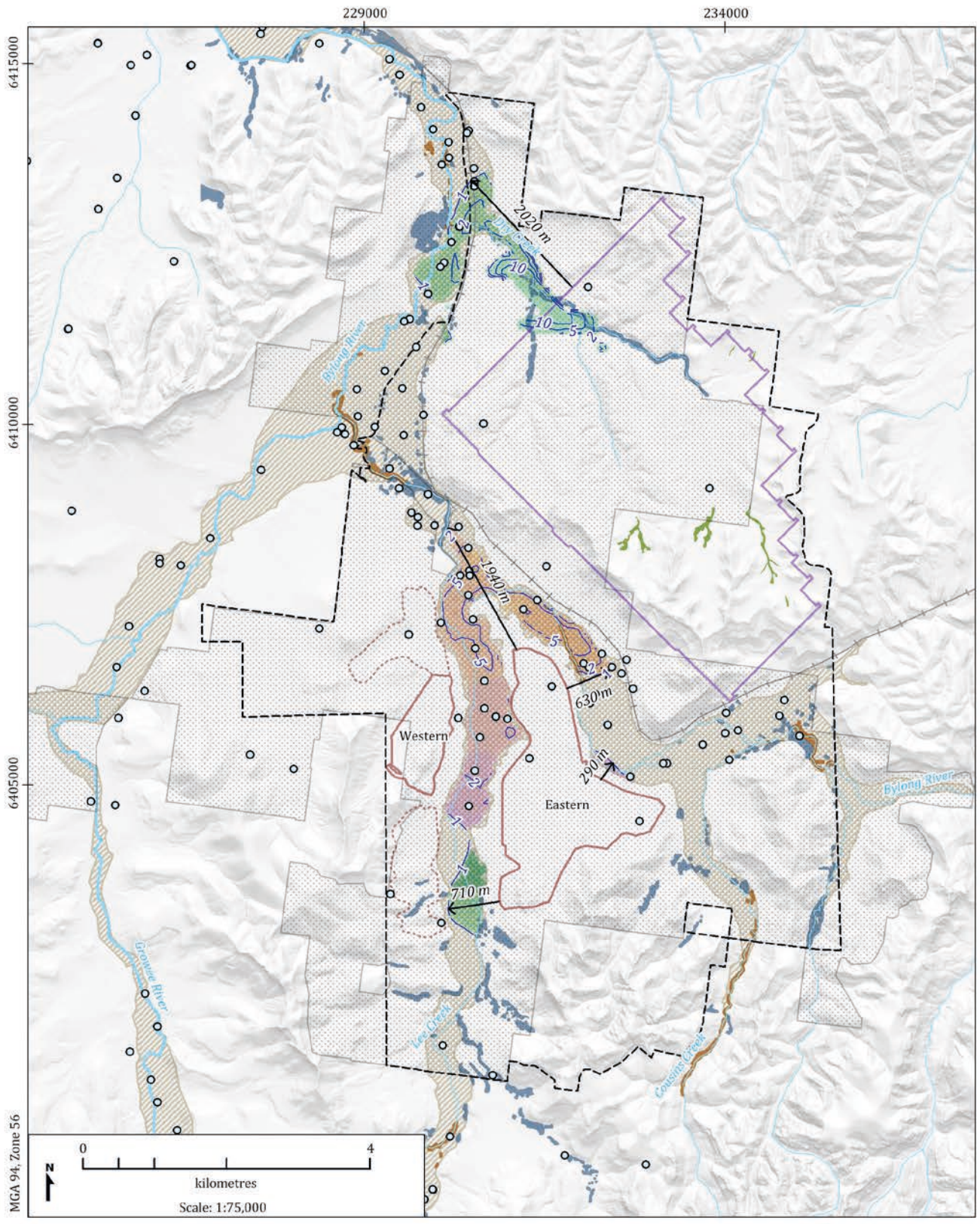

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Registered bore
- Quaternary alluvium
- Landownership - KEPCO Bylong Australia Pty Ltd
- Drawdown contour (m)

Time to reach maximum depressurisation (years)

- 29
- 20
- 15
- 10
- 5
- 1

Potential GDE - EIS Ecology Study

- Blakely's Red Gum / Apple Riparian Forest
- River Oak / Redgum Riparian Woodland
- Blakely's Red Gum / Paperbark Forest

Bylong Coal Project (G1606)

Maximum groundwater drawdown alluvium/regolith - layer 2 and time

DATE: 9/6/2015

FIGURE No: **10.12**

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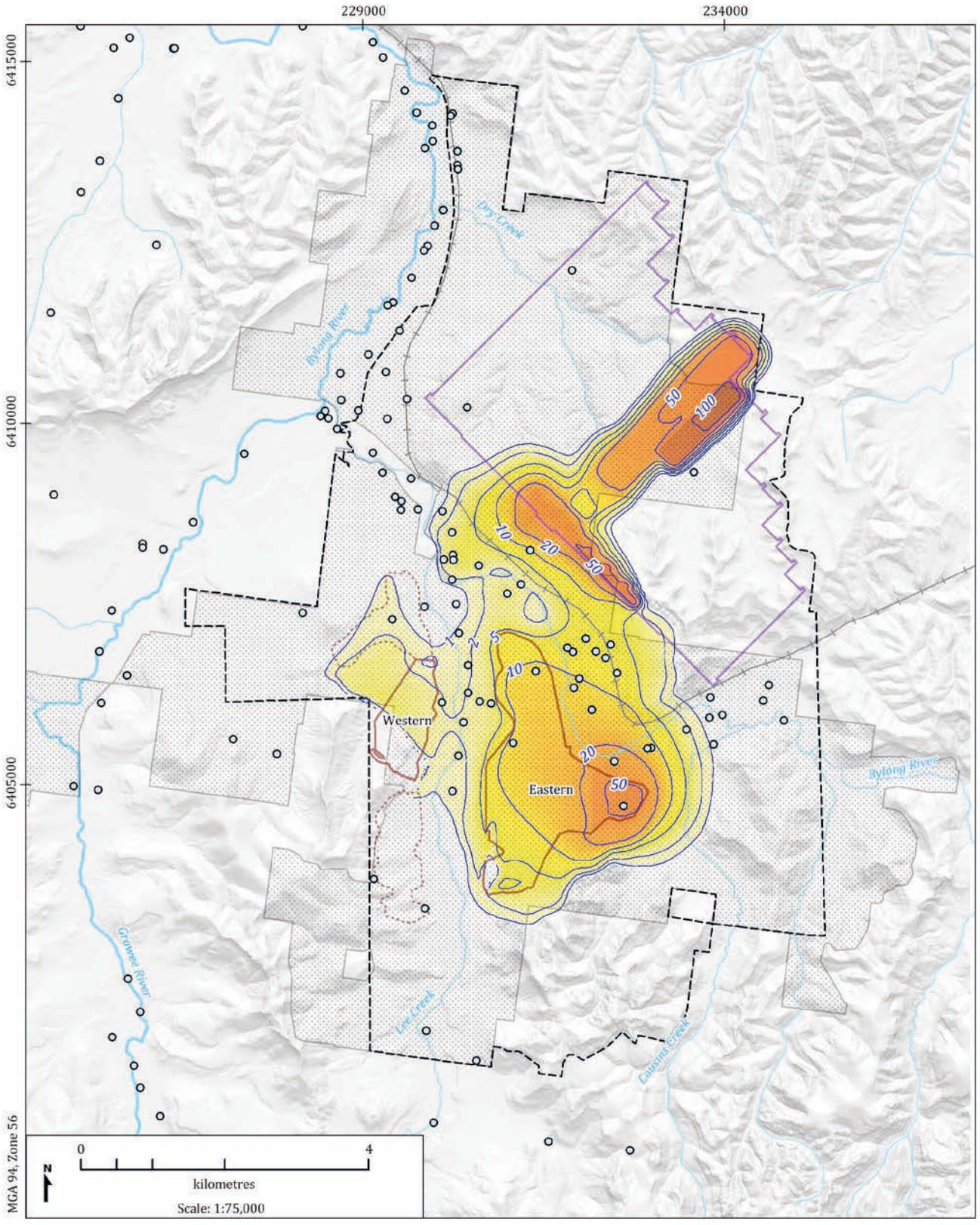

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Depressurisation contour (m)
- Registered bore
- Landownership - KEPCO Bylong Australia Pty Ltd

Bylong Coal Project (G1606)

Groundwater depressurisation - year 10
Coggan Seam - layer 8

DATE: 11/5/2015

FIGURE No: **10.13**

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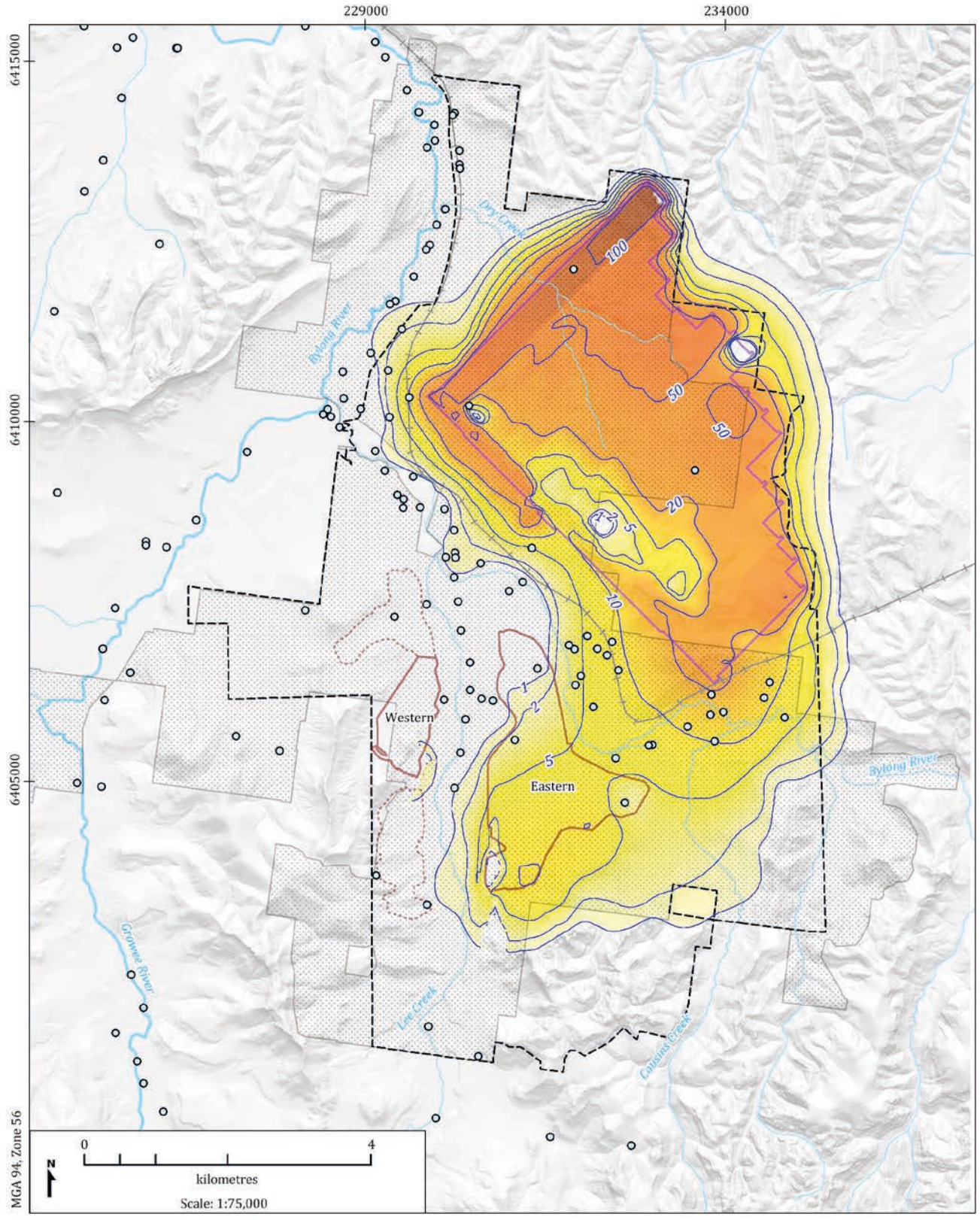

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Depressurisation contour (m)
- Registered bore
- Landownership - KEPCO Bylong Australia Pty Ltd

Bylong Coal Project (G1606)

Groundwater depressurisation - Year 25
Coggan Seam - layer 8

DATE: 25/5/2015

FIGURE No: **10.14**

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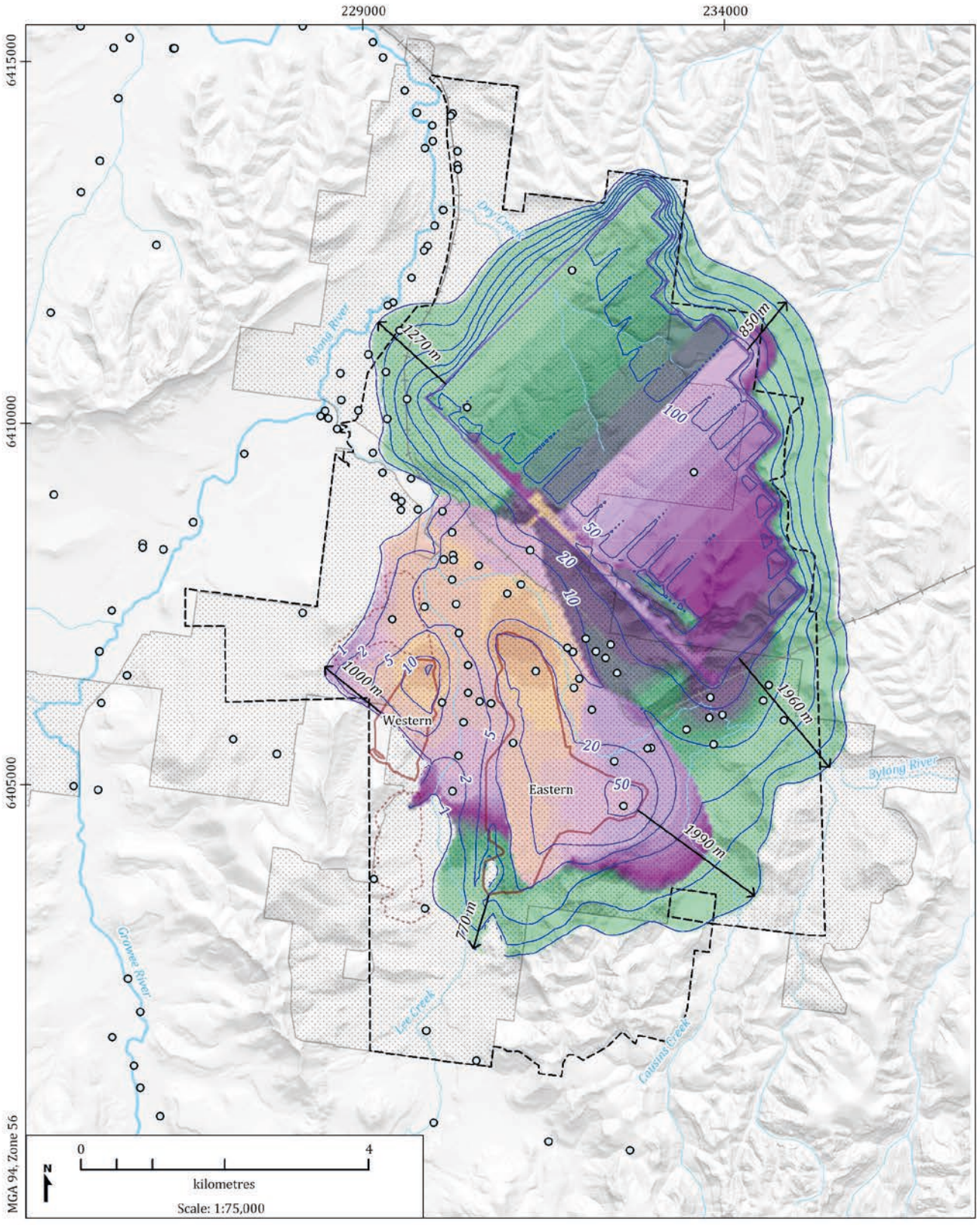

LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Registered bore
- Landownership - KEPCO Bylong Australia Pty Ltd
- Depressurisation contour (m)

Time to reach maximum depressurisation (years)

- 29
- 20
- 15
- 10
- 5
- 1

Bylong Coal Project (G1606)

Maximum groundwater depressurisation Coggan Seam - layer 8 and time

DATE: 9/6/2015

FIGURE No: **10.15**

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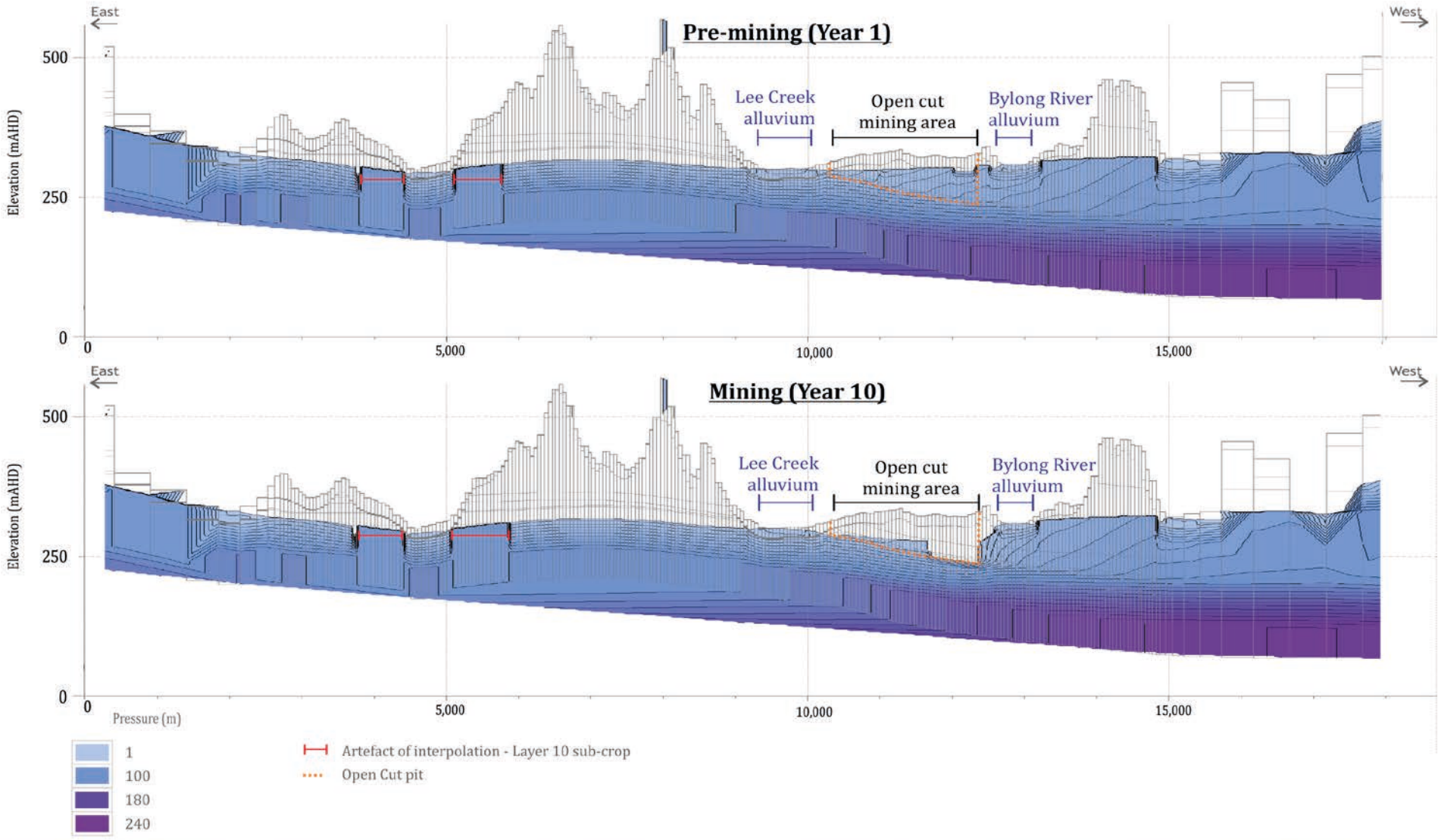
Figure 10-16 shows a cross section indicating the groundwater pressure head in the model cells. The figure shows the groundwater pressure head prior to mining commencing and at Year 10, which is the end of mining the open cut. Figure 10-17 and Figure 10-18 show groundwater pressure heads when the underground mining is active at years 12 and 24.

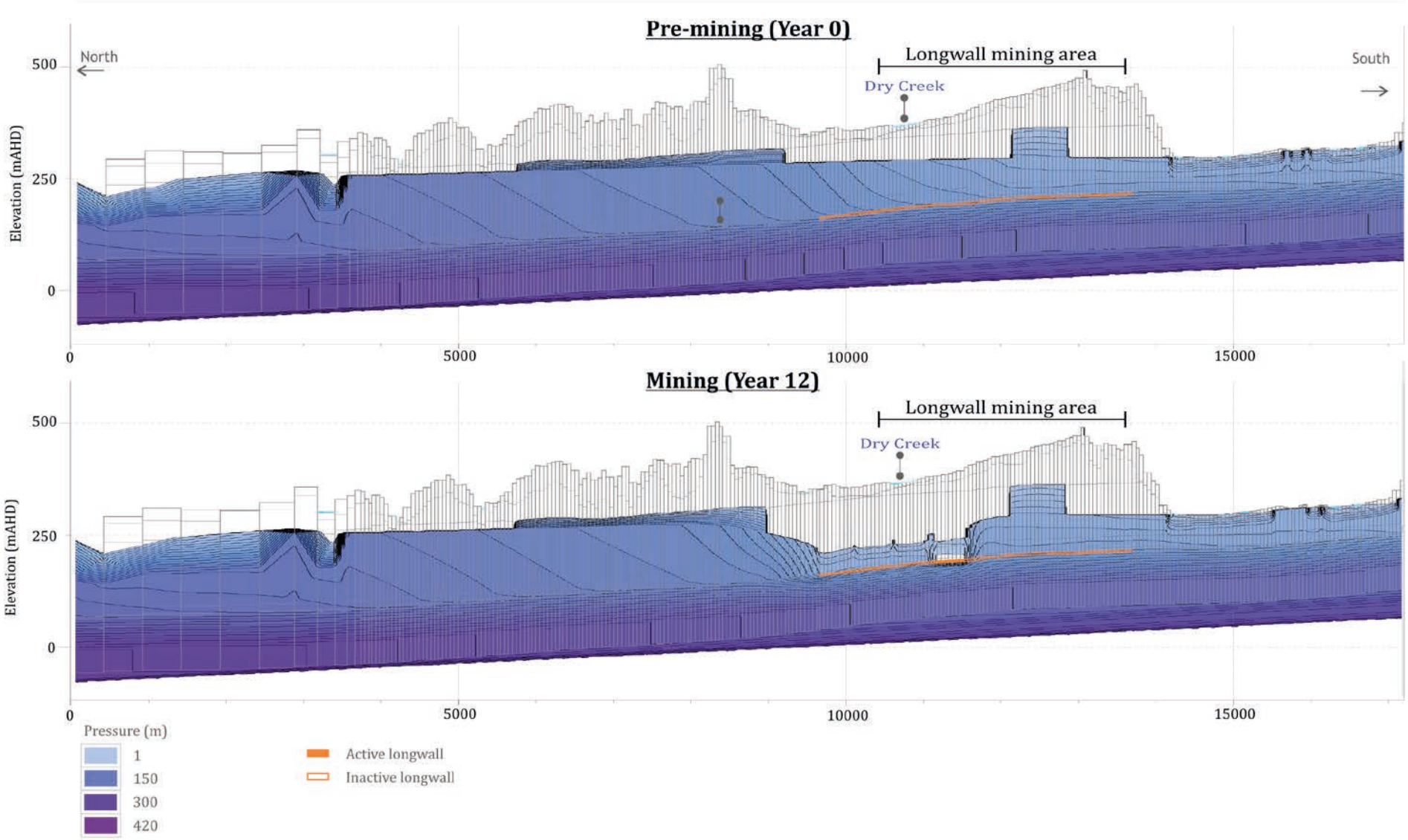
The cross sections show the groundwater pressure heads at the cell centre, interpolated between cell centres to create the contour lines of equal pressure head. It is important to note these figures represent a guide to the pressure head only. Where layers are relatively thick the number of interpolation points reduces, and in these areas some pressure head anomalies occur in the figures. In addition, where the basement units outcrop a larger number of layers are wrapped within the unsaturated zone and this also generates anomalies. These anomalies are not due to issues with stability and convergence of the model, rather just interpolation artefacts that are difficult to remove due to the data point spacing. Despite this, the figures show graphically in section the zone of depressurisation adjacent to the mining areas, and the limited impact on the alluvial groundwater levels. Figure 10-17 and Figure 10-18 also show graphically how the pressure head above the underground mine gradually reduces in the overlying strata.



Open cut groundwater pressure head (pre-mining and year 10)

Figure 10.16

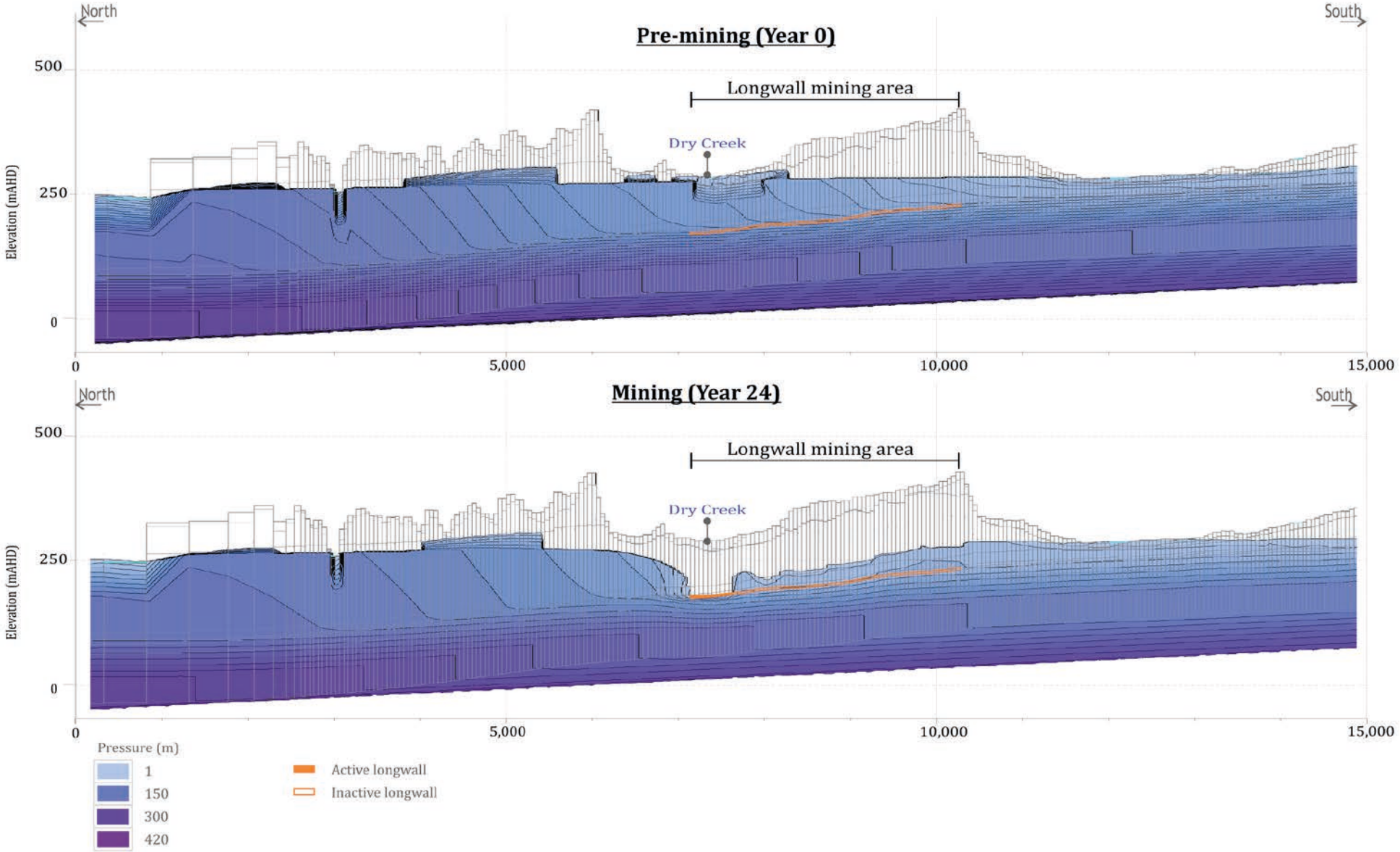
Bylong Coal Project (G1606)



Underground mine groundwater pressure head (pre-mining and year 12)

Figure 10.17

Bylong Coal Project (G1606)



Underground mine groundwater pressure head (pre-mining and year 24)

Figure 10.18

Bylong Coal Project (G1606)

10.6 Impact on groundwater users

10.6.1 Private bores

A number of bores are present within the zone of drawdown predicted by the model around the mining area. All of these bores are located on land owned by KEPCO. There are no bores on privately owned land where the drawdown is predicted by the numerical model to be greater than 0.1 m at any time. The AIP minimal impact considerations specify a maximum of a 2 m decline cumulatively at any water supply work.

Drawdown of less than 1 m is generally considered undetectable, given the seasonal variation of water levels in the area.

10.6.2 Groundwater dependent ecosystems

The EIS Ecology study identified potentially groundwater dependent vegetation occurs in thin riparian zones along Dry Creek, Lee Creek and the Bylong River. Blakely's River Red Gum / Apple Riparian Forest occur along the mid and upper reaches of Dry Creek, with the River Oak/ Redgum Riparian EEC and Blakely's River Red Gum / Apple Riparian Forest present in riparian fringes along the Bylong River (refer Figure 7-21). Blakely's Red Gum / Paperbark Forest occur at high elevations in the headwaters of Dry Creek.

Field investigations undertaken within the area of Dry Creek indicate bedrock, comprising basalt or sandstone typically occurs at between 5 m and 10 m below the ground surface. This is typically overlain by a mixture of alluvial weathered rock in a clayey matrix, with minor sands and gravels. In this elevated area of the Project Boundary, the regional potentiometric surface occurs well below the ground level at between 50 m and 110 m in depth. Zones of perched groundwater, above the regional ground surface have been detected within basalt and sandstone, at between 36 m and 57 m below ground level, occurring where permeable zones overly less permeable strata. Whilst no groundwater has been detected within the shallow Dry Creek alluvium, it is possible that a thin zone of perched water occurs ephemerally at the interface between the weathered rock/alluvium and the less permeable fresh rock along the alignment of Dry Creek. As this groundwater is perched, it is fed by seepage through the creek bed when it is flowing, and is not directly connected with the regional water table.

The EIS Subsidence study predicts cracking generated by the longwall mining could extend to the surface along the alignment of Dry Creek. This suggests there is potential for drainage of any shallow perched groundwater occurring within the Dry Creek alluvium into the underlying fractured strata. Despite this risk, the potential for River Red Gum/Apple Riparian Forest and the Red Gum/Paperbark Forest occurring along Dry Creek to be impacted is considered to be low. This is because Dry Creek is a losing stream, and therefore surface flows will continue to seep through the creek bed and into the underlying thin alluvial strata. This means that the vegetation will continue to have access to this water as is currently the case. Water from Dry Creek will also carry sediment, seeping into and sealing any significant fractures that are connected to sediment-laden water from the surface. Therefore, the potential to impact on the Blakely's River Red Gum/Apple Riparian Forest and the Red Gum/Paperbark Forest is further mitigated and considered to be low risk.

The River Oak/ Redgum Riparian EEC and Blakely's River Red Gum / Apple Riparian Forest also occur at lower elevations along the Bylong River and Lee Creek. In these areas the water table is close to the land surface being generally less than 5 m below the ground. Given the shallow water table in these areas, it is likely these vegetation communities rely to some degree on shallow groundwater. Figure 10-19 shows the maximum drawdown predicted during mining at potential GDEs located within the maximum zone of drawdown during mining. The sites of the potential GDEs are shown in Figure 10-20.

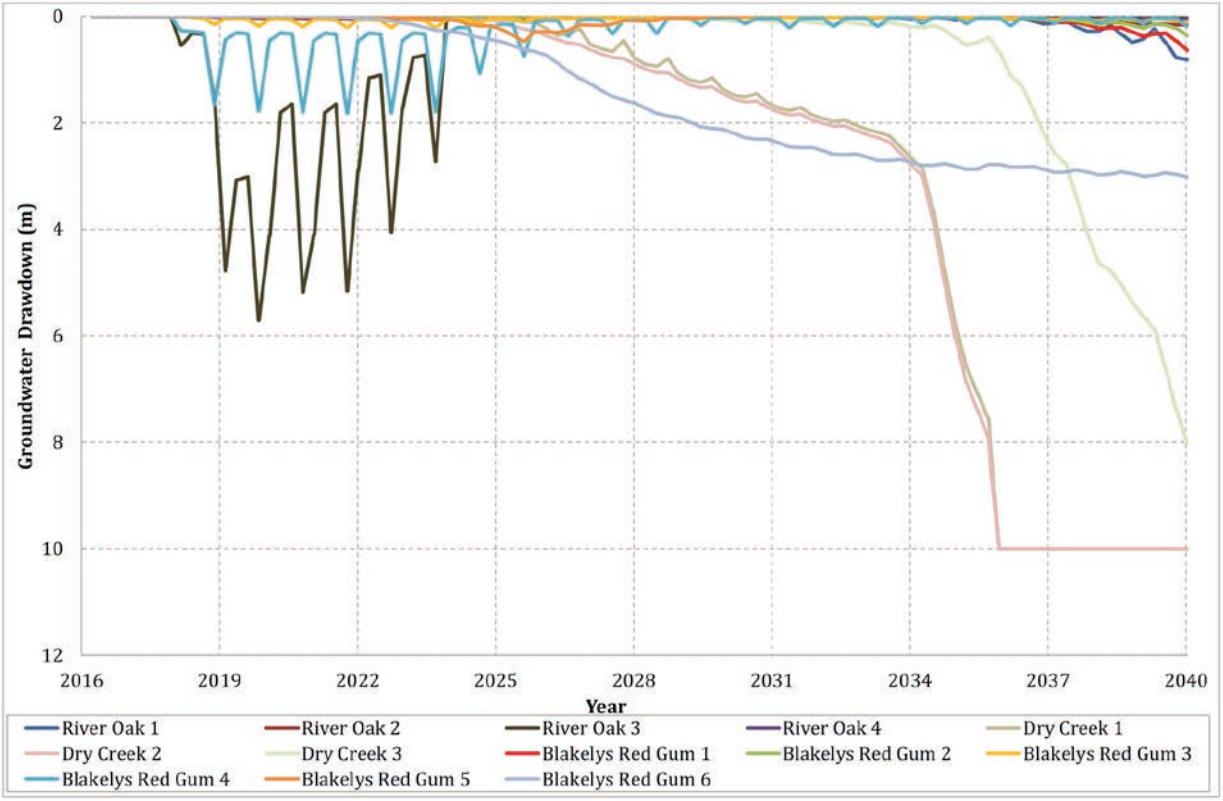
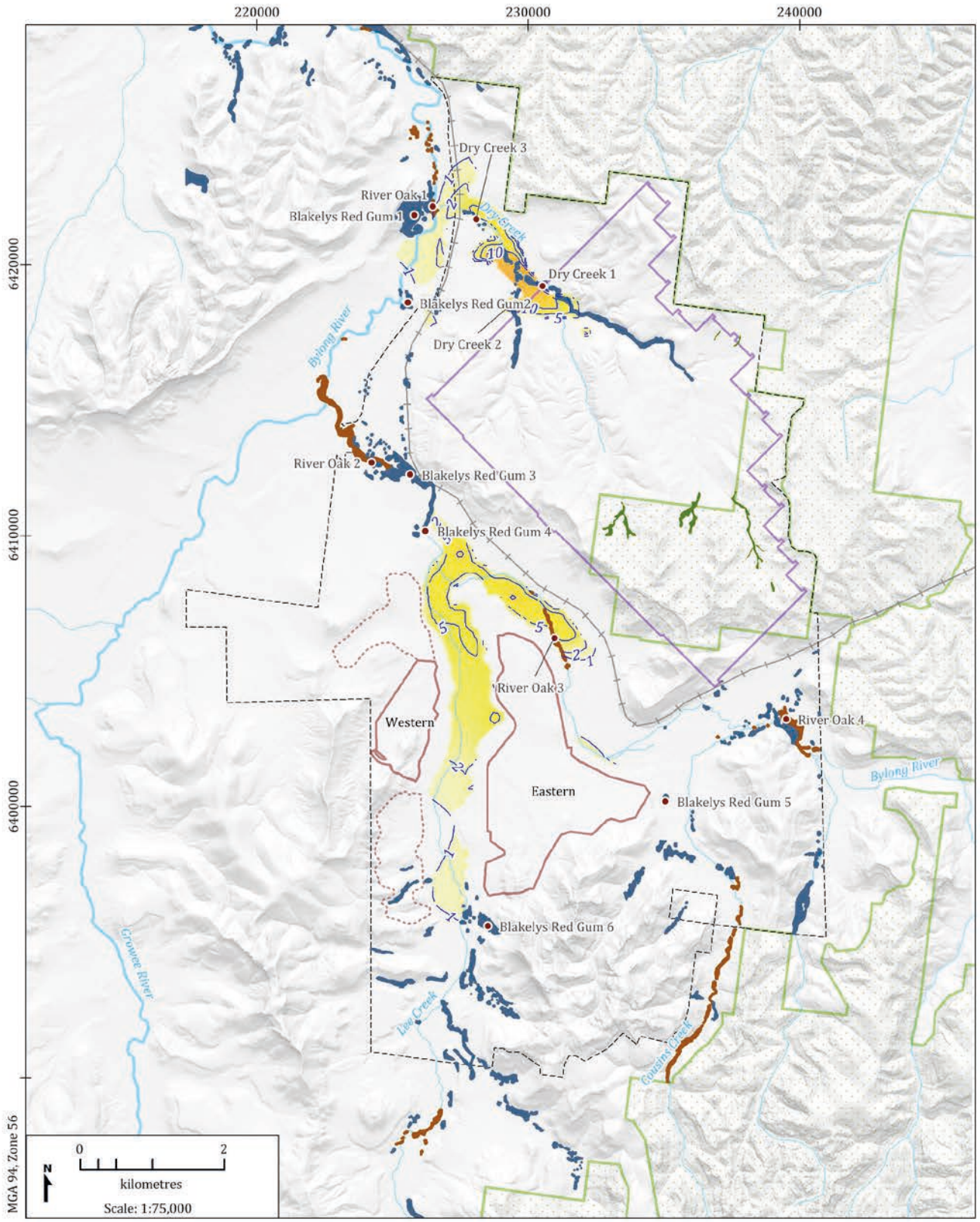


Figure 10-19 Predicted groundwater drawdown at potential GDEs



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Reserve
- Drawdown contour (m)

Potential GDE - EIS Ecology Study

- River Oak / Redgum Riparian Woodland
- Blakely's Red Gum / Apple Riparian Forest
- Blakely's Red Gum / Paperbark Forest
- GDE points

Bylong Coal Project (G1606)

Potential groundwater dependent ecosystems and predicted maximum drawdown in layer 2 (alluvium/regolith)

DATE: 10/6/2015

FIGURE No: **10.20**

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Figure 10-19 shows drawdown at most the of the potential GDE sites is generally less than 2 m. The AIP specifies *'less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic post-water sharing plan variations, 40m from any (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site listed in the schedule of the relevant water sharing plan.'*

Whilst there are no high priority groundwater dependent ecosystems identified in the Project site, drawdown greater than 2 m is predicted by the model to occur adjacent to the Eastern Open Cut (River Oak 3 / Blakelys Red Gum 6) and adjacent to the underground mine in Dry Creek (Dry Creek 1, 2, & 3). The EIS Ecology study discusses the potential for these vegetation communities to be impacted by the predicted drawdown.

10.7 Interaction with alluvial aquifers

In the absence of mining, the model predicts there is a net upward flow entering the alluvial aquifers from the underlying Permian formation of 1.1 ML/day to 8.5 ML/day across the whole model domain. The rate of transfer varies seasonally due to recharge, location and pumping. This is comprised of ~12.2 ML/day (4,450 ML/year) upward flow and 3.8 ML/day (1,370 ML/year) downward flow on average. Whilst this flow occurs through the base of the formation, not the top, it is effectively recharge to the alluvium, and is part of the alluvial system water budget.

The model predicts that once mining commences, depressurisation of the Permian strata occurs. Within the zone of influence, upward flow from the Permian to the alluvium reduces. This is due to changes in hydraulic gradients between the alluvium and Permian that reduce upward flow, and reverse the flow to downward flow in some areas adjacent to the proposed mining areas and bore field.

Figure 10-21 shows the changes to the flows from the Permian to the alluvium across the Project Boundary over the course of the Project. Figure 10-22 shows the net change in the upward flow rate from the Permian to the alluvium across the model domain due to the proposed mining.

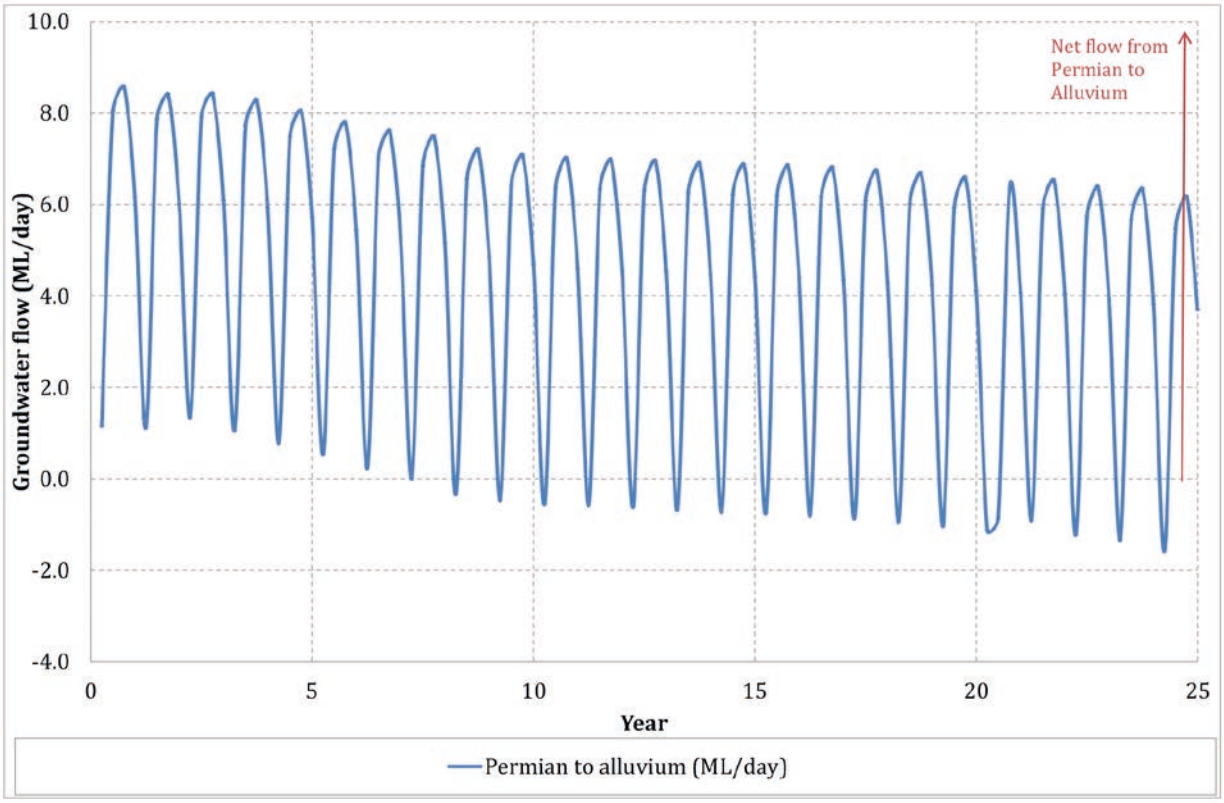


Figure 10-21 Net flow from Permian to alluvium

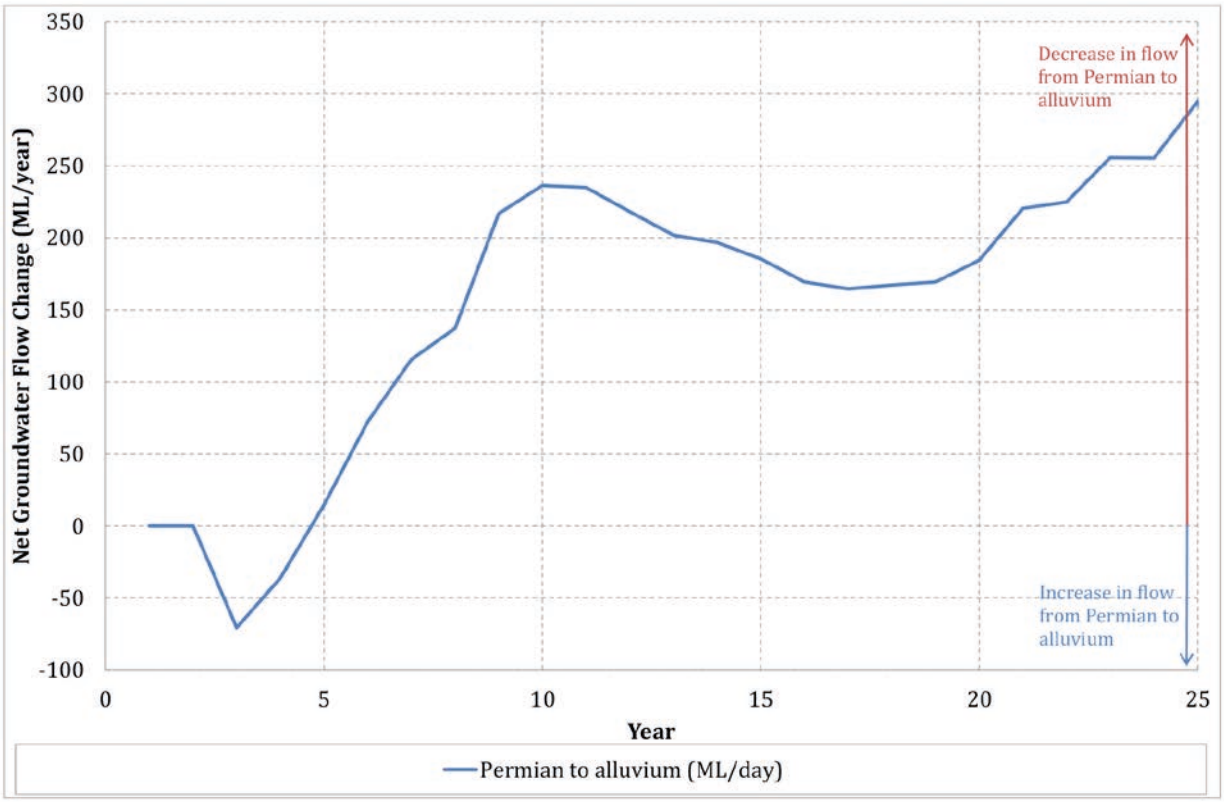


Figure 10-22 Net change in flow from Permian to alluvium due to mining

The water take from the alluvium due to mining peaks at 295 ML/year in Year 25. KEPCO has secured 2,535 units of water allocation from the Bylong River Water Source under the Hunter Unregulated WSP, which is more than sufficient to license the predicted indirect take of water from the alluvium. There is also potential to obtain additional water licenses as KEPCO acquire other properties within the Project area.

The extensive pumping required from the bore field during the early stages of the Project depressurizes the alluvium and increases the flow from the Permian to the alluvium aquifer by up to71 ML/year during Year 3. As open cut mining operations progress, the Permian is depressurised around the open cut mining areas, reducing this anomaly and leading to a net reduction in flow from the Permian to the alluvial aquifer.

Table 10.5 presents the annual total water take from the alluvial groundwater systems due to mining. The water take averages 153 ML/year (peak of 295 ML/year) with a total of 3,533 ML at the end of mining in Year 25.

Table 10.5 Predicted net indirect water take from alluvial aquifers due to mining

Year	Water take (ML)
1	0
2	0
3	-71
4	-36
5	14
6	72
7	116
8	137
9	217
10	236
11	235
12	218
13	202
14	197
15	185
16	169
17	165
18	167
19	169
20	184
21	221
22	225
23	256
24	255
25	295
Total	**3533**

10.8 Changes to surface water flow

As discussed above, once mining commences, the Permian strata become depressurised, and within the zone of influence, upward flow from the Permian to the alluvium reduces. The resultant lowering of groundwater levels in the alluvium, although small, reduces the hydraulic gradient between the bed of the river and the underlying aquifer, reducing the volumes of groundwater that contribute to baseflow, and in some areas increasing the flow of surface water back into the underlying aquifer. Figure 10-23 shows the predicted net river baseflow over the proposed Project life. The model simulates flow from the aquifers to the rivers, and the reverse, i.e. from the rivers to the aquifer. The net river baseflow is the sum of the leakage (flow from river to aquifer) and the baseflow (flow from aquifer to river).

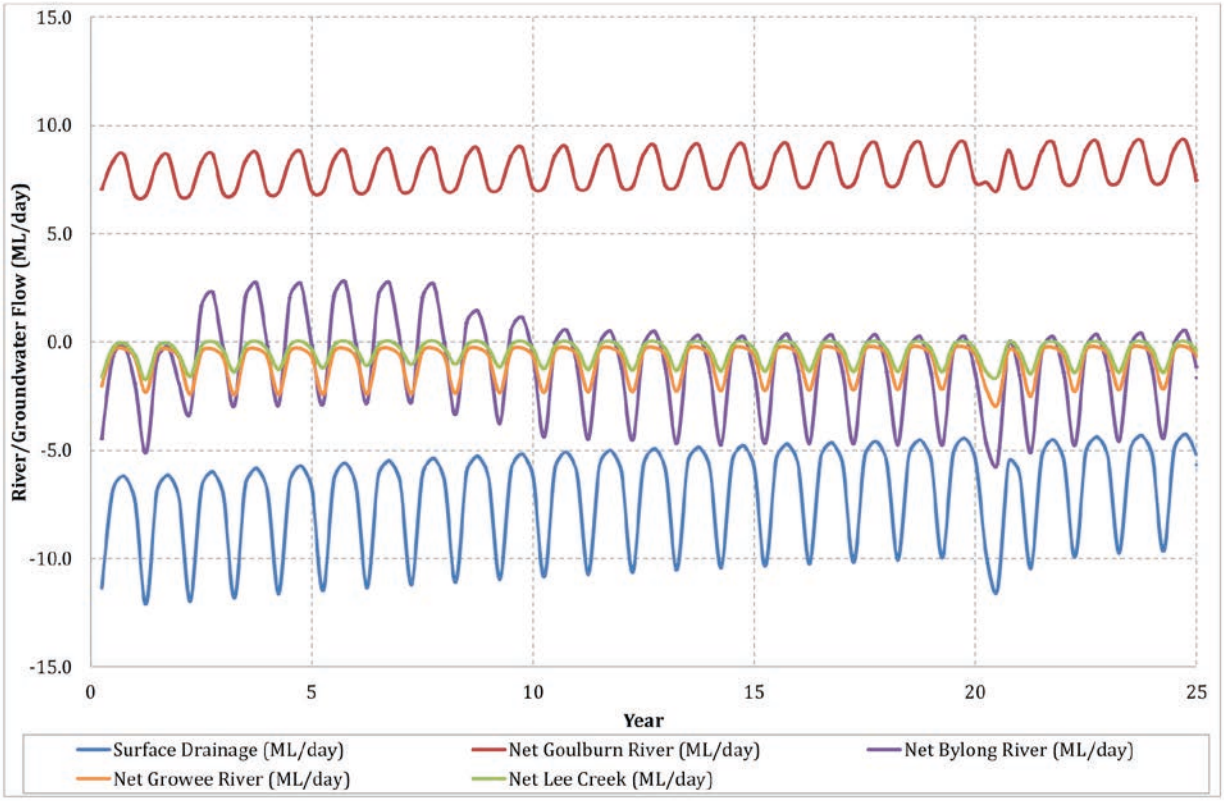


Figure 10-23 River baseflow during mining

Figure 10-23 shows all the streams in the Project area are gaining streams, on a net basis, and the Goulburn River is losing.

Figure 10-24 shows the net change in the predicted river baseflow due to the influence of mining. This was calculated by determining the difference between the river budgets for two versions of the model with, and without mining.

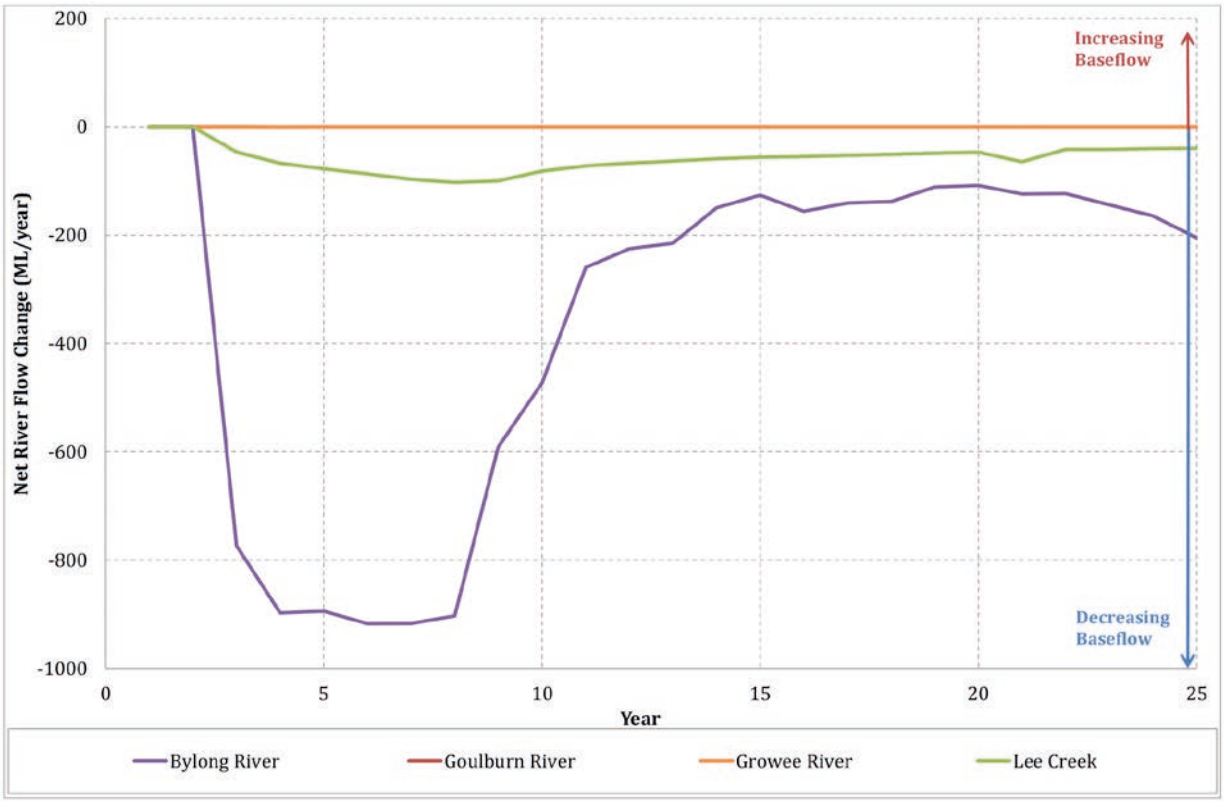


Figure 10-24 River change during mining

Figure 10-24 indicates mining reduces the baseflow, in Lee Creek and the Bylong River but does not have a measurable impact on flows in the Growee River, because it is more distant from the Project area. The Goulburn River, was not predicted to be impacted within the current modelling. This is because the maximum extent of depressurisation does not extend close to or underneath the Goulburn River model cells.

Figure 10-24 indicates the impact to the Bylong River occurs consistently during the project life, when the bore field is operating. During the mining period the baseflow to the Bylong River reduces by up to 918 ML/year. Once the open cut mining is completed and the make-up water requirements from the bore field reduce, the model indicates the net loss of baseflow to the Bylong River reduces to less than 150 ML/year. A second smaller peak in baseflow loss occurs at year 25 (205 ML/year) as the longwall panels move closer to the Bylong River.

It is important to note that the net change in Bylong River baseflow is due to a combination of firstly, reduced baseflow from the underlying alluvium, and secondly, increased leakage of surface water into the aquifer. In the area around the bore field the drawdown induces leakage from the stream into the aquifer, particularly during years 3 to 8 when the demand for makeup water is high. The pumping from the bore field induces steep gradients between the wells and the river, 'short circuiting' river water directly into the bore field. In terms of licencing, this leakage value has been removed from the licensing calculations to avoid 'double accounting' of water abstraction, as it is already accounted for in water removed from the bore field. This is discussed further in Section 10.10

Depending on climatic conditions during Years 4 to 10 of the Project, there is the potential for a detectable change in flow within the Bylong River, and a change to the flow duration curve. The model predicts baseflow to Lee Creek reduces by a peak of 103 ML/year, and averages 51 ML/year over the Project life.

10.9 Dry Creek Inflow

As described in section 10.2.9, inflow from Dry Creek into the proposed underground mine area was estimated for a seven-day period assuming a constant head of 2 m of water in the creek. Figure 10-25 shows the additional inflow into the proposed longwall mine from Dry Creek.

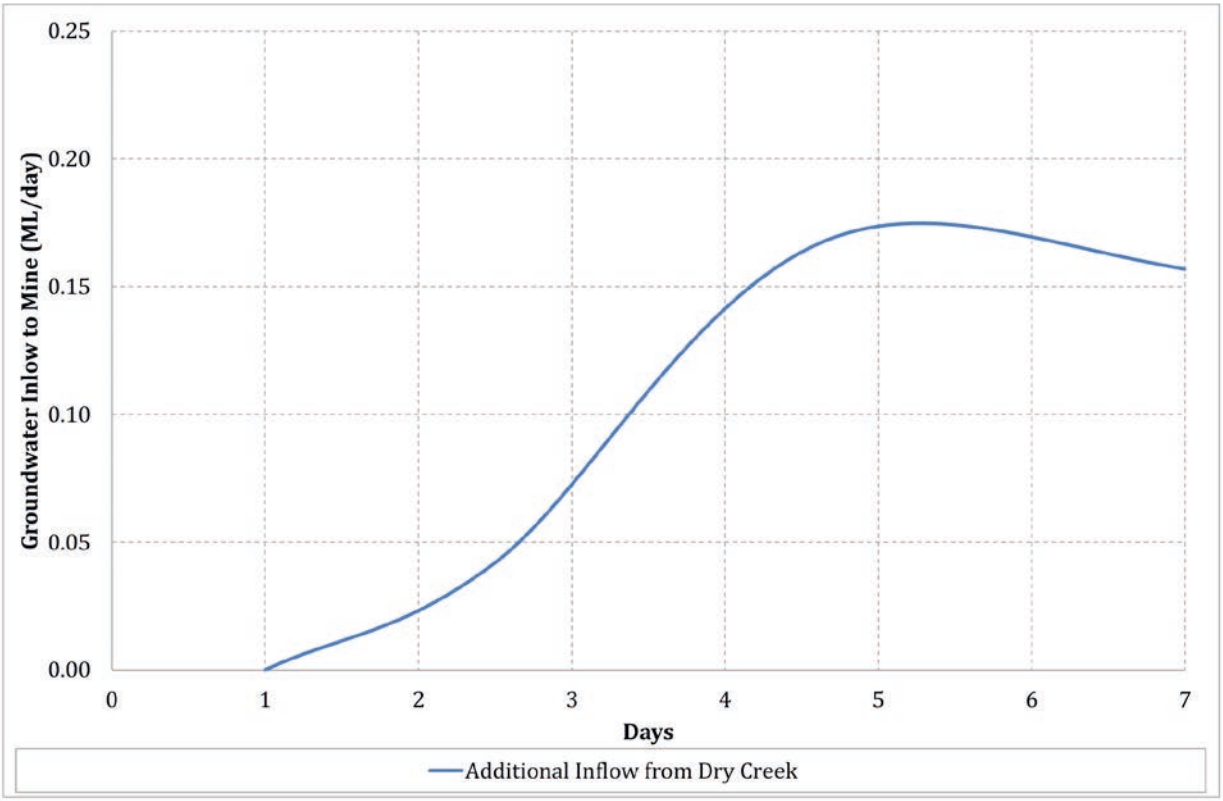


Figure 10-25 Additional longwall panel inflow from Dry Creek

The modelling indicates that the volume of water flowing from Dry Creek into the underground longwall mine area will be relatively low (<0.2ML/day), compared to predicted inflow from the groundwater systems. The inflow is relatively low because following a high rainfall event, the surface water must first flow through a silty river bed (vertical hydraulic conductivity of 0.1 m/day), and saturate the fracture network overlying the active longwall panel (Kz of 34 – 864m/day) which is largely drained due to mining. Figure 10-25 shows that the 'wetting up' process takes approximately one to two days to occur, following which inflow into the longwall panel inflow gradually increases.

WRM (2014) have predicted that continual surface water flows across the Dry Creek catchment are very unlikely to flow for longer than 1-2 days, and therefore estimates presented in Figure 10-25 are considered conservative. The model does not simulate the infilling of subsidence cracks with time, and assumes a perfect connection through the fractured zone, which also introduces conservatism. In reality sediment transported by the creek will infill the fractures readily and over time slowly reduce the seepage loss when flowing.

10.10 Water licensing

KEPCO has secured 2,535 units of water allocation from the Bylong Water Source under the Hunter Unregulated WSP. KEPCO may also secure additional water allocations from the Bylong River water source as the Project progresses due to acquisition of other properties Figure 10-26 shows the water take from the alluvial water sources, which is comprised of interception of water due to mining and pumping from the proposed bore field. Figure 10.25 demonstrates the proponent holds entitlements to account for its groundwater take even if the available water determination (AWD) reduces to less than 80%.

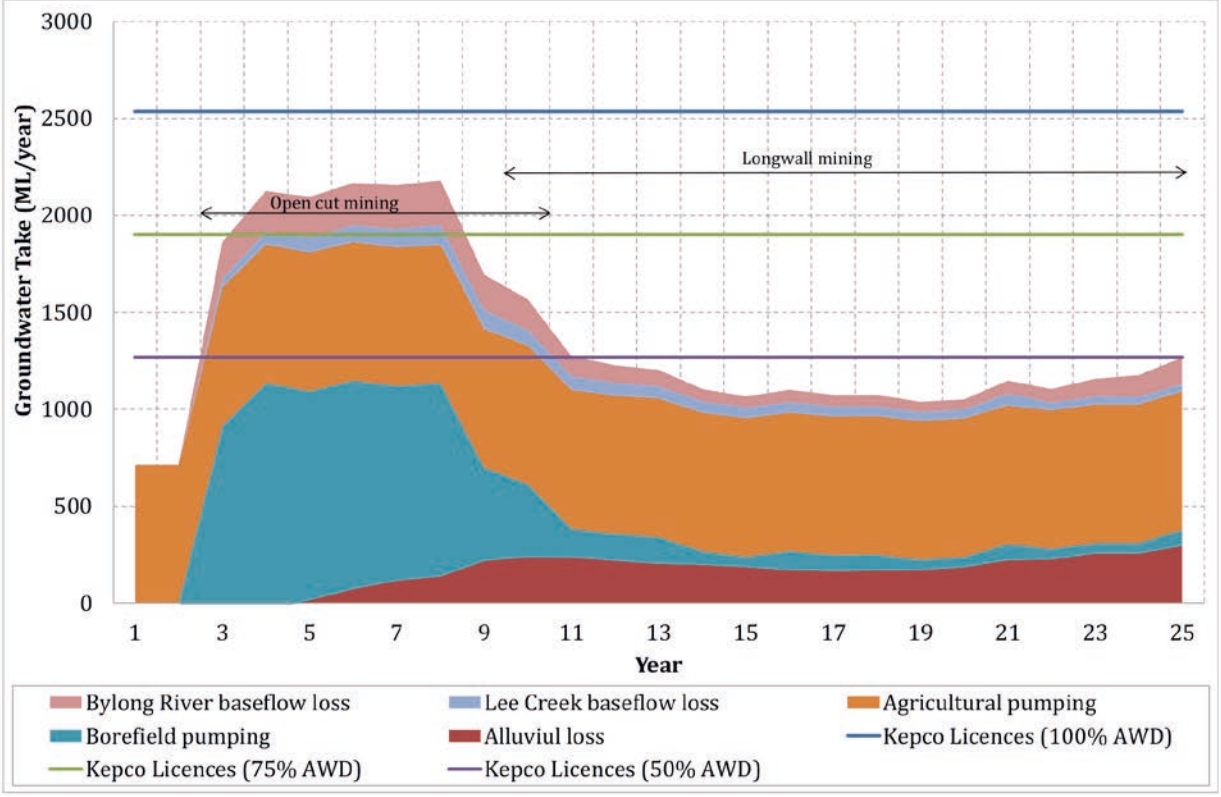


Figure 10-26 Water take from alluvium (mining interception + bore field)

As discussed in Section 10.8, the leakage component of Bylong River flow change has been removed from licence calculations because this take of water is already accounted for in water pumped from the bore field due to the 'short circuiting' of water from the highly connected surface water. Figure 10-26 shows the mine will reduce baseflow in the Bylong River and Lee Creek water source by a peak of about 332 ML/year during Year 8.

10.11 Post mining impacts

At the cessation of mining, there will be a relatively steep hydraulic gradient between the underground mine and surrounding aquifers, which will result in relatively rapid seepages. As the underground mine slowly floods, the hydraulic gradient reduces and the rate of groundwater inflow will slow. Eventually a state of equilibrium will occur where inputs are balanced by outputs and the water levels will have stabilised.

The rate of recovery of groundwater levels in the aquifers will depend on rainfall, with years of below average rainfall extending the recovery period, and wet years reducing the time for stabilisation. There is no final void planned to remain for the open cut mining areas, so there will be no permanent loss of water. However, the groundwater levels will re-equilibrate at slightly different levels compared with pre-mining levels due to the change of the hydraulic properties which occurs within the footprint of the open cut and underground mining areas.

The sections below outline the post mining impact on groundwater levels, water take from the alluvium and groundwater quality. These predictions are based on the assumption that there are no future applications for mining of additional coal resources which are known to occur within the existing Authorisations.

10.11.1 Water levels

Post mining impacts were investigated with a recovery model, commencing from the end of mining and run for 1,000 years. The model used the end of mining groundwater levels as the starting heads, and removed all drain cells simulating the proposed mining areas to allow groundwater levels to equilibrate. At the end of mining, the properties of the last longwall panel were converted to values representative of goafed/fractured values, and the main road drain cells were removed. As outlined in Section 10.2.10, excess water stored in the open cut void will be pumped into the underground mine over a period of one year.

Figure 10-27 shows the changes in groundwater levels at equilibrium conditions 1,000 years post mining. The figure indicates mining results in a permanent change in shape of the water table surface, with water levels generally mounding within the spoil areas due to the change in hydraulic properties and recharge rates. The results indicate a decrease in water levels above the mined longwall area, which is the result of changes to the vertical hydraulic conductivity in the goafed zone. The permanent drawdown is largely confined to within the footprint of the underground mining area, where water levels re-equilibrate at a slightly lower level.

10.11.2 Water take

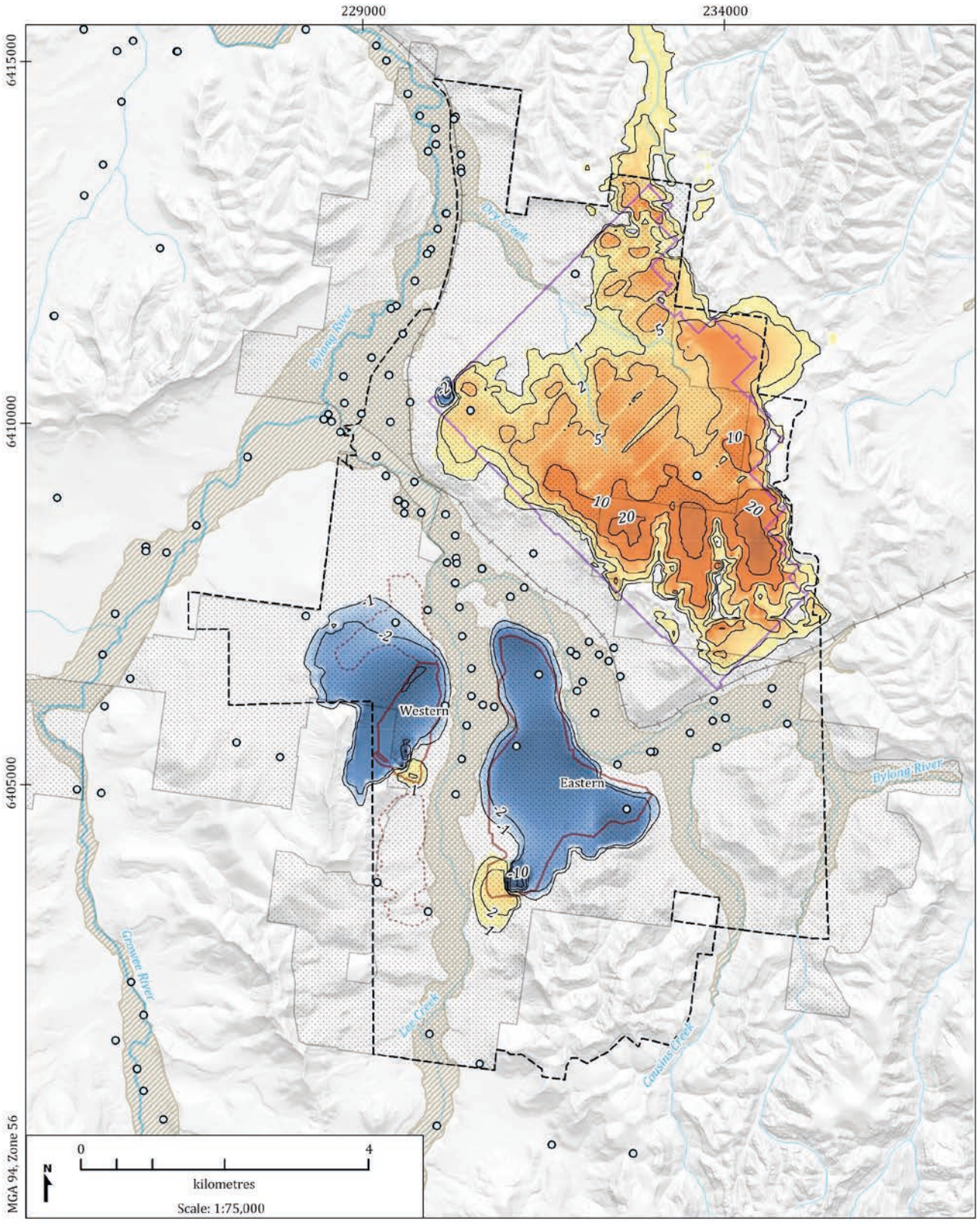
Table 10.6 presents the annual average water take from the alluvial groundwater system and baseflow in the surface water systems post mining.

Table 10.6 'Water take' from alluvium and baseflow post mining

Year	Water take from alluvium (ML/yr)	Net water take from surface water baseflow (ML/yr)
26	227	208
27	188	188
28-29	51	75
30-31	55	78
32-38	55	84
39-53	41	81
54-88	21	66
89-136	-2	49
137-506	-5	4

Table 10.6 indicates the groundwater system essentially re-equilibrates within 100 years of mining ceasing. Beyond about 100 years there is a slight increase in the Permian flow to the alluvium, and the baseflow due to enhanced recharge through the spoil piles. The disposal of excess water from the open void into the underground mine at closure enhances the recovery rate only slightly. Model runs without the reinjection required a marginally longer time to re-equilibrate, indicating the underground workings effectively store the excess water, with minimal impacts to groundwater system.

As discussed above the alluvial groundwater and surface water form a highly connected system and therefore when the water take from each is considered separately this is effectively double accounting. As discussed previously KEPCO has secured 2,535 units of water allocation from the Bylong Water Source under the Hunter Unregulated WSP, and can therefore adequately account for post mining water take. KEPCO may acquire other properties within the Project area and it is likely that additional water licenses will be available to account for water take due to the mining project.



LEGEND:

- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Major drainage
- Minor drainage
- Railway
- Change in groundwater level contour (m)
- Registered bore
- Landownership - KEPCO Bylong Australia Pty Ltd
- Quaternary alluvium

* Negative values indicate water levels above premining levels; positive values are below premining levels

Bylong Coal Project (G1606)

Change in groundwater levels 1000 years post mining

DATE: 11/5/2015

FIGURE No: **10.27**

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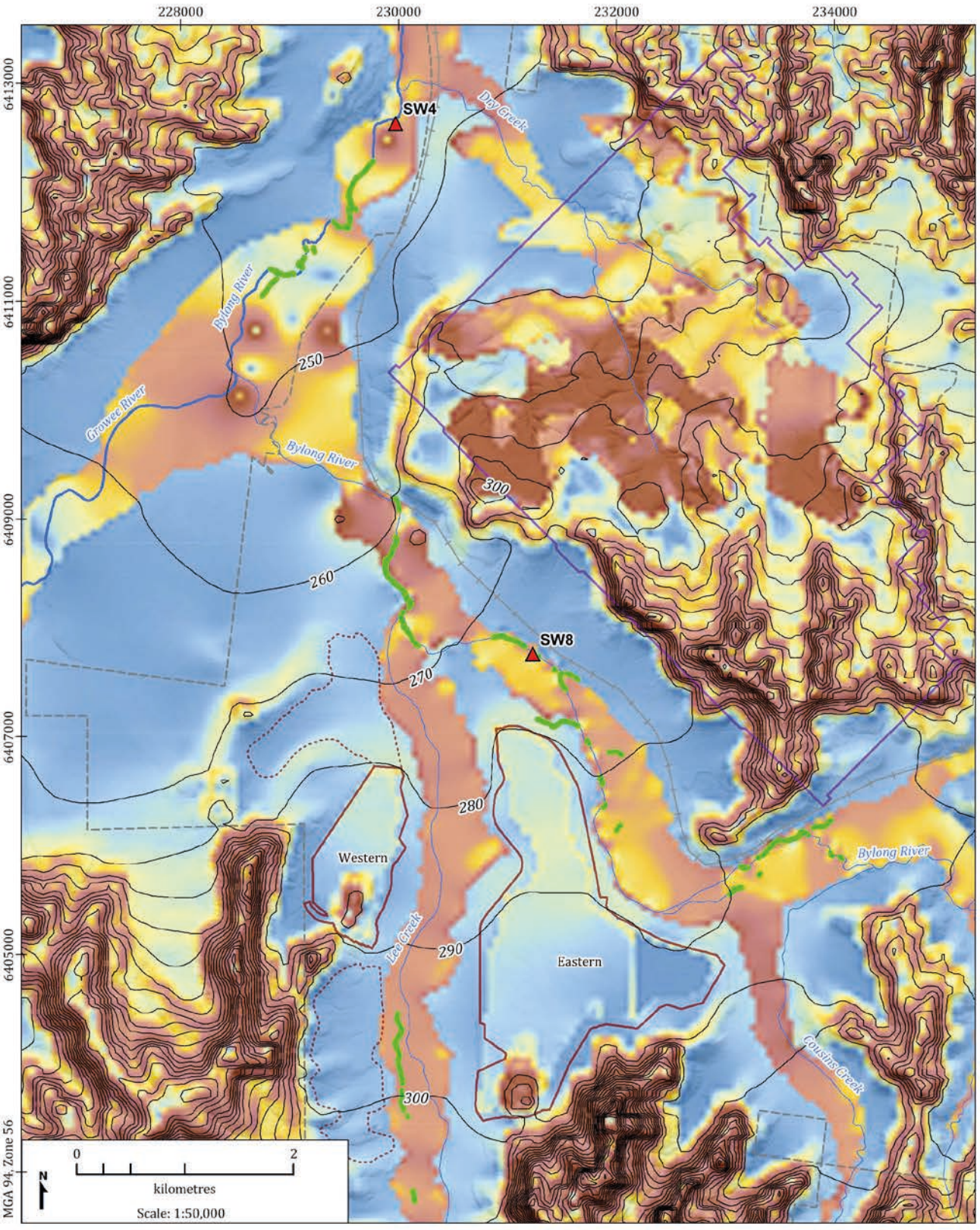
10.11.3 Water quality

As explained in Section 10.1, it is proposed to emplace mechanically dried coarse and fine reject materials into the Western and Eastern Open Cut Mining Areas during the years of open cut mining operations. Additionally, coarse and fine reject materials generated during the underground mining operations are proposed to be disposed into a compartment within the void remaining after the Eastern Open Cut Mining Areas is completed.

In order to understand the potential for the leachate from the reject and overburden materials to potentially impact on surrounding water quality, it is important to understand both the geochemistry of the reject and overburden materials and the rate of groundwater flow through the rejects and overburden materials.

Figure 10-28 shows the groundwater levels and flow directions 1,000 years post mining. The water levels indicate groundwater flow will occur through the proposed rejects material emplaced during the underground mine life, into the overburden material in the northern portions of the Eastern Open Cut Mining Area and then ultimately into the neighbouring alluvium and Bylong River. The shading indicates the groundwater velocity calculated using the estimated hydraulic conductivity of these materials and gradients extracted from the steady state model. As expected, this shows the groundwater velocity through the alluvium is many times higher than the Permian regolith sequence. This has important implications for water quality as discussed further below.



LEGEND:

- Groundwater levels (mAHD)
- Underground Extraction Area
- Open Cut Mining Area
- Overburden Emplacement Area
- Project boundary
- Streamflow measurement location
- River/Creek water presence
- Railway

Velocity - meters per 100 years

- 4000 and above
- 2000
- 1000
- 800
- 600
- 400
- 200
- 100
- 0

Bylong Coal Project (G1606)

Groundwater levels and flow velocity alluvium/regolith - layer 2

DATE: 25/5/2015

FIGURE No: **10.28**

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RGS (2014) collected samples of potential coarse and fine reject materials and leached the samples with deionised water to measure the resultant water quality. The kinetic leaching results provide an indication of the water quality that will be generated when rainfall comes into contact with this material disposed in the backfilled pits. Figure 10-29 compares the salinity (as EC) with the cumulative salinity from the leaching tests. The cumulative salinity adds the EC results from each leach event to produce the total displayed on Figure 10-29.

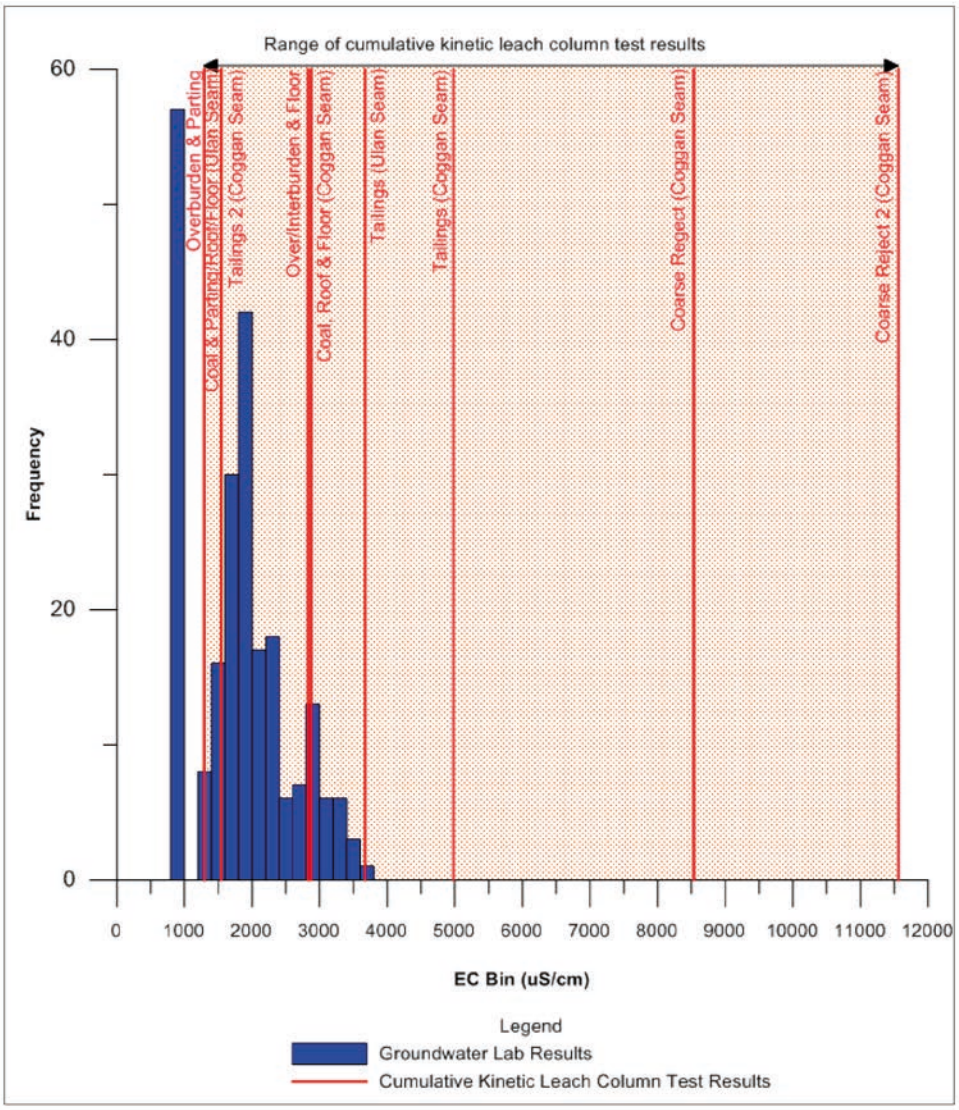

Figure 10-29 Histogram alluvial EC and cumulative EC from kinetic leach testing

Figure 10-29 shows the variability in the salinity generated by the samples. Six samples fall within the salinity range measured within the alluvial aquifer whilst three samples are more saline and outside this range. The leaching tests suggest the salinity generated by the coarse and fine rejects will vary but could exceed the currently observed baseline within the alluvial groundwater system, which is the ultimate discharge zone for this water.

RGS (2014) examined the leaching data and concluded the salinity of pore water in saturated overburden materials (i.e. in-pit spoils) at the Project site is likely to be in the range 1,500 µS/cm to 3,000 µS/cm. The managed coal reject materials were anticipated to have a higher salinity in the range 5,000 µS/cm to 8,000 µS/cm. RGS (2014) noted that when the coal reject material is co-disposed with the overburden materials, it makes up about 11 % of the total mine waste volume diluting the salinity of pore water. The long-term pore water salinity values derived from co-disposed overburden and well managed coal rejects was estimated to be in the range 1,800 µS/cm to 3,500 µS/cm. This is within the range of EC measured within the alluvium, although, generally at the upper end of that range.

The impact on the salinity from the rejects materials on the Bylong River and Lee Creek alluvium adjacent to the proposed open cut mining areas depends on dilution effects within the flow path towards the aquifers. The numerical model was used to extract a water budget for the area of the alluvial aquifer flanking the proposed Eastern and Western open cut mining areas. Table 10.7 summarises the components of the water budget for the alluvial aquifer adjacent to the proposed mining, and presents estimated average salinity data for each source.

Table 10.7 Water and salt budget – Bylong River and Lee Creek alluvium adjacent to open cut mining areas

Component	Total inputs to alluvium (ML/year) (a)	Estimated salinity		
		EC (µS/cm) (b)	TDS (mg/L) c = (b x 0.67)	Salt load (t/yr) d = ([a x c]/1000)
Rainfall recharge	488	1,000	670	327
Seepage from river	155	200	134	21
Up-valley inflow	92	2,000	1,340	123
Permian inflow	67	2,000	1,340	90
TOTAL	**802**			**561 = (699 mg/L)**

Note: *Alluvial TDS in mg/L calculated by (d/a x 1000)*

The water budget indicates that inflow from the Permian to the alluvium represents about 67 ML/year about 8% of the total flow into the alluvial aquifer around the mining area each year. The major sources of water in the alluvium are diffuse rainfall recharge (488 ML/year), river leakage (155 ML/year) and inflow from up valley (92 ML/year).

Hydraulic gradients indicate pore water within the backfilled overburden and reject materials will move through the Permian buffer and into the alluvial aquifer. The water budget indicates the water discharging from the Permian into the alluvium will be diluted by rainfall recharge, river leakage and the fresh upper catchment inflow to the alluvium outside the mining area.

The impact of the backfilled overburden and coarse and fine reject materials on the salinity of the alluvium can be assessed by assigning a salinity to each source. Assuming the salinity of the Permian inflows increases from 2,000 µS/cm to 3,500 µS/cm (refer EIS Geochemical Impact Assessment), the salt load increases from 561 t/yr to 628 t/yr. This is equivalent of the EC in the alluvium increasing from 699 mg/L to 783 mg/L. It is important to note this calculation includes many simplifying assumptions. The true magnitude of the dilution is difficult to calculate as the water sources are not perfectly mixed within the alluvial aquifer; however, the water budget does suggest the pore water from the mining area will be only a small portion of water present within the alluvium.

The AIP requires proponents determine if a project could change the water quality enough to potentially impact on current and future beneficial uses. It requires assessment of whether an activity will increase the salinity of groundwater or any highly connected surface water. The policy requires Projects do not increase the long-term average salinity in highly connected surface water nearest the activity by more than 1% unless studies can demonstrate that the River Condition index category of the surface water source is not reduced at that point.

During periods of low rainfall the Bylong River and Lee Creek form a series of pools or water holes, separated by dry sections of creek bed where water travels below the surface between the pools through the sandy alluvium. The EIS was prepared during a relatively dry period during which rainfall was generally below average. This provided an opportunity to assess the behaviour of the pools and the interconnectivity with groundwater system. The locations of pools closest to the mining areas were determined from aerial photography and the sites visited to install seepage meters. The seepage meters indicated the pools are gaining systems during the dry season, i.e. groundwater feeds the pools, and they are highly connected to the underlying aquifer. The pools are essentially water table windows.

The pools in the Bylong River adjacent to and north of the proposed open cut mining areas are considered the most sensitive to seepage given the proximity to the overburden and coarse and fine reject materials emplacements. Assuming the groundwater salinity increases on average from 699 mg/L to 783 mg/L, this represents a 12 % increase in salinity, in the groundwater, and therefore potentially in the surface water baseflow when no rainfall runoff occurs.

WRM (2015) concluded the total salt load (surface runoff plus baseflow) could increase from 4,297 to 4,339 tonnes per year, which represents an increase of about 1%, A 1% change in salinity is considered to be well within the range for natural variation, based on the data that has been collected within the system to date. In addition, the estimated change does not change the beneficial use of the groundwater and connected surface water, as it remains fresh. The potential for the salinity in the pools to increase by more than 1% is essentially impossible to quantify and measure with any confidence. For example assuming a pool has a salinity of 1,500 mg/L, a 1% increase represents a marginal change to 1,515 mg/L. The salinity within the pools depends on climatic conditions and salinity increases during periods of dry weather due to evaporation and decreases when rainfall runoff promotes flow within the river. Results from surface water gauges in the Project area show that water quality backs up this assumption, and fluctuates by up to 1,000 µS/cm (or ~100%) throughout the year.

The available data does indicate that the water from the backfilled pits is a small portion of the water within the alluvium, and that flow through the alluvium is significantly greater than in the weathered Permian. The diluting effect when the leachate from the overburden and reject materials enters the alluvium is expected to be significant and it is therefore improbable that environmental values, the river condition or beneficial use of the water in the alluvium or the pools would change due to the Project.

It is proposed post-mining, any excess water within the open void be pumped into the underground mining area to allow the open void to be backfilled and rehabilitated. Post-mining water levels indicate this water will mix with Permian groundwater and flow towards the north east through the Coggan coal seam. The salinity of the excess water is likely to be within the range of 1,800 µS/cm to 3,500 µS/cm, which is similar to the salinity determined for the coal rejects. Salinity of groundwater samples collected from the Permian Coal Measures recorded a similar range from 930 µS/cm to 3,900 µS/cm. This suggests there will be no significant impact from the re-injection of any excess water into the system.

11 Model uncertainty

The uncertainty in the model predictions was assessed using a traditional sensitivity analysis where model inputs were changed individually to assess the impact upon the predictions. A more complex Monte Carlo style uncertainty analysis was also undertaken where numerous model inputs were changed at the same time. Appendix F presents the results of the sensitivity and uncertainty analyses.

The results showed that changes to the hydraulic conductivity in the saturated zone had the largest impact on the Bylong River alluvium. The model was also sensitive to changes in storage (both saturated and unsaturated), which increased the maximum predicted groundwater seepage into the underground mining area by almost two times compared to the base case.

The results indicated that the base case model is a conservative tool for assessing the Project impacts from the open cut mining area during the mine life. In contrast more extreme impacts than predicted by the base case were predicted for the underground mining area when the vadose zone properties were changed.

12 Compliance with Government Policy

12.1 Aquifer Interference Policy

Table 12.1 to Table 12.3 below compare the groundwater impact predictions for the Project against the requirements under the NSW AIP (NOW, 2012).

Table 12.1 Accounting for or preventing the take of water

AIP requirement		Proponent response
1	Described the water source (s) the activity will take water from?	Based on the AIP, the groundwater system impacted by the Project can be separated into two systems, as follows: • porous and/or fractured consolidated sedimentary rock of the Permian coal measures; and • groundwater within alluvium associated with the Bylong River and Lee Creek alluvium Water quality and yields for the coal measures and Permian coal measures is considered a less productive aquifer according to the AIP because yields >5L/sec are considered unlikely and salinity <1,500 mg/L is not common, while the Bylong River and Lee Creek alluvium is considered a highly productive aquifer as yields >5L/sec are considered achievable and salinity <1,500 mg/L occurs in some areas.
2	Predicted the total amount of water that will be taken from each connected groundwater or surface water source on an annual basis as a result of the activity?	Predicted take based on this modelling for the Project include: • Permian coal measures: 2,109 ML/year at peak, 1,200 ML/year on average • Quaternary alluvium: 1,149 ML/year at peak, 491 ML/year on average • Take from Bylong River baseflow and Lee Creek baseflow is accounted for in Quaternary alluvium water take
3	Predicted the total amount of water that will be taken from each connected groundwater or surface water source after the closure of the activity?	• Gradual recovery to pre-mining conditions, and no greater water takes than that predicted during mining operations

AIP requirement		Proponent response
4	Made these predictions in accordance with Section 3.2.3 of the AIP? (page 27)	• Based on 3D numerical modelling.
5	Described how and in what proportions this take will be assigned to the affected aquifers and connected surface water sources?	Predicted takes based on the modelling for the Project include: • Permian coal measures: 2,109 ML/year at peak – 1,200 ML/year on average • Quaternary alluvium: 1,149 ML/year at peak 491ML/year on average
6	Described how any licence exemptions might apply?	• Not necessary.
7	Described the characteristics of the water requirements?	Initial estimates: • Mine Industrial Areas and Workforce Accommodation Facility– 22 ML/year • Open Cut – 1,041 ML/year • Underground – 50 - 500 ML/year • CHPP – 249 – 395 ML/year
8	Determined if there are sufficient water entitlements and water allocations that are able to be obtained for the activity?	KEPCO has secured approximately 2,535 units of water allocation from the Bylong Water Source under the Hunter Unregulated and Alluvial Water Sharing Plan.
9	Considered the rules of the relevant water sharing plan and if it can meet these rules?	No cease to pump rules have been established for Bylong River water source. The Hunter Unregulated WSP requires cease to pump rule be established by 2019. As a large landholding has been acquired by the proponent this affords the opportunity to space abstraction wells at sufficient distances to minimise drawdown and ensure compliance with future cease to pump levels.
10	Determined how it will obtain the required water?	Via seepage to the mine face – a portion will likely evaporate or be removed as moisture in coal and will not enter the site water circuit. A supplementary bore field will also be constructed within the alluvium.
11	Considered the effect that activation of existing entitlement may have on future available water determinations?	Modelling indicates the existing bores with entitlements cannot take their full entitlement due to the limited saturated thickness of the aquifer system. Current groundwater entitlements for Bylong River are 5,843 units (or ML/year at full AWD). The proponent has secured almost half of this at 2,535 units.
12	Considered actions required both during and post-closure to minimise the risk of inflows to a mine void as a result of flooding?	Open cut mine plans have been designed to be located outside of the flood limits of Bylong River and Lee Creek. The Open Cut Mining Area at completion of open cut operations will retain a void which is proposed to be backfilled throughout the ongoing underground mine life, and will therefore the final landform will not obtain a mining void post mining activities.
13	Developed a strategy to account for any water taken beyond the life of the operation of the Project?	Allocate existing and future water entitlements to the Project water takes to license take of water as necessary.

AIP requirement		Proponent response
	Will uncertainty in the predicted inflows have a significant impact on the environment or other authorised water users? Items 14-16 must be addressed if so.	The proponent has secured a large landholding surrounding the mine and a large volume of water entitlements. This creates a large buffer around the mining Project, meaning impacts on users beyond this buffer are considered unlikely.
14	Considered any potential for causing or enhancing hydraulic connections, and quantified the risk?	Mine plan has been designed to remain outside of the 150 m from the edge of the neighbouring alluvium to ensure that impacts to the alluvial system are minimised as far as possible. Underground mine will potentially fracture overlying strata, but this will not result in any direct connection to the alluvial aquifer. Designs have incorporated angle of draw to stay outside 40 m stand off from the alluvium.
15	Quantified any other uncertainties in the groundwater or surface water impact modelling conducted for the activity?	A sensitivity and uncertainty analysis has been completed to identify parameters that demonstrate most substantial changes in the predictions.
16	Considered strategies for monitoring actual and reassessing any predicted take of water throughout the life of the Project, and how these requirements will be accounted for?	Ongoing monitoring and verification of modelling.

Table 12.2 Determining water predictions

AIP requirement		Proponent response
1	Addressed the minimum requirements found on page 27 of the AIP for the estimation of water quantities both during and following cessation of the proposed activity?	Based on modelling

Table 12.3 Other requirements

AIP requirement		Proponent response
1	Establishment of baseline groundwater conditions?	Refer Section 7. The Project's monitoring program is extensive and has been undertaken over more than 2 years.
2	A strategy for complying with any water access rules?	Sufficient water licences are held by proponent to account for the predicted water take. No cease to pump rules have been established for Bylong River water source. The Hunter Unregulated WSP requires a cease to pump rule be established by 2019. As a large landholding has been acquired by the proponent this affords the opportunity to space abstraction wells at sufficient distances to minimise drawdown and ensure compliance with future cease to pump levels.

AIP requirement		Proponent response
3	Potential water level, quality or pressure drawdown impacts on nearby basic landholder rights water users?	No private bores predicted to be impacted >2 m
4	Potential water level, quality or pressure drawdown impacts on nearby licensed water users in connected groundwater and surface water sources?	No private bores are predicted to be impacted on land not owned by proponent
5	Potential water level, quality or pressure drawdown impacts on groundwater dependent ecosystems?	A low risk of temporary drawdown at River Oak and Blakely Red Gum a vegetation communities on Bylong River.
6	Potential for increased saline or contaminated water inflows to aquifers and highly connected river systems?	No mining activity below the ground surface will occur within 200 m laterally from the top of high bank. Study identified the potential for the project to increase salt loads, but the risk of changing the beneficial use of the water source was considered improbable
7	Potential to cause or enhance hydraulic connection between aquifers?	No - underground mine will potentially fracture overlying strata, but this is not predicted to result in any direct connection to the alluvial aquifer
8	Potential for river bank instability, or high wall instability or failure to occur?	
9	Details of the method for disposing of extracted activities (for CSG activities)?	N/A

There are two levels of minimal impact considerations specified in the AIP. If the predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable. Where the predicted impacts are greater than the Level 1 minimal impact considerations then the AIP requires additional studies to fully assess these predicted impacts. If this assessment shows that the predicted impacts do not prevent the long-term viability of the relevant water-dependent asset, then the impacts will be considered to be acceptable.

The modelling indicates no potential for drawdown in private bores to exceed the Level 1 minimal impact considerations.

12.2 EPBC Act Significant Impact on Water Resources Guidelines

12.2.1 Introduction

In June 2013 the Federal Government enacted changes to the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), to provide that 'water resources' are a matter of national environmental significance in relation to coal seam gas and large coal mining development. This change is referred to as the 'water trigger'. In December 2013, the Federal Department of Environment (DoE) released guidelines for proponents of coal seam gas and large coal mining projects to assess the potential for significant impacts on water resources. The guideline outlines a 'self-assessment' process that assists proponents to identify if their project is likely to have a significant impact on water resources.

This report considers the impact of the Project on groundwater resources, and if these impacts are significant according to the guidelines. It compares the predicted impacts against the DoE guidelines to determine if the Project could have a significant impact on water resources. It also considers the potential for cumulative impacts with other developments.

It is important to note that coal mining will always impact the groundwater regime, as dewatering of the mine workings is essential to extract coal safely. However, have been interpreted the DoE guidelines (Commonwealth of Australia, 2013) to mean that this unavoidable impact is only considered significant where there is a consequence from this impact, i.e. that groundwater users or the environment are affected by changes in the quality or quantity of groundwater.

The guidelines indicate that the Project must have '*a real or not remote chance or possibility that it will directly or indirectly result in a change to*' the '*hydrology*' or '*water quality*' of the water resource. This change must be of '*sufficient scale or intensity as to reduce the current or future utility of the water resource for third party users'*. Third party users can include '*environmental and other public benefit outcomes, or to create a material risk of such reduction in utility occurring'*. Furthermore, '*Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the water resource which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts'*.

12.2.2 Water availability to users

Numerical modelling predicted mining will generate a zone of depressurisation in the coal seam extending up to 2 km from the edge of the proposed longwall panels and the open cut mine plan. Despite this impact, the surrounding landholders do not target the coal seams for water supply due to the presence of better water at shallow depth in the alluvium. Therefore, a potential decline in the water levels within the coal seams is of no consequence as it will not reduce water availability to users accessing water via bores.

The zone of depressurisation within the alluvial aquifer is predicted to extend up to 1 km from the edge of the proposed longwall panels and the open cut mine. A number of bores are present within the zone of drawdown predicted by the model around the mining area. However, these bores are all located on land owned by the proponent. No licenced bores are predicted to be impacted on land not owned by the proponent.

Therefore the predicted declines in groundwater levels within the coal seams and within the alluvium has no consequences for groundwater users with bores and is therefore not considered to be a 'significant impact on water resources' as defined by the DoE guideline.

12.2.3 Water availability to the environment

The EIS Ecology study identified potentially groundwater dependent vegetation occurs in thin riparian zones along Dry Creek and the Bylong River. Blakely's River Red Gum / Apple Riparian Forest occurs along the mid and upper reaches of Dry Creek, with the River Oak/ Redgum Riparian EEC and Blakely's River Red Gum / Apple Riparian Forest occurring along the Bylong River (refer Figure 7-20).

Field investigations undertaken within the area of Dry Creek indicate in this elevated area of the Project the regional potentiometric surface occurs well below the ground surface at between 50 m and 110 m depth. Whilst no groundwater has been detected within the shallow Dry Creek alluvium, it is possible that a thin zone of perched water occurs ephemerally at the interface between the weathered rock/alluvium and the less permeable fresh rock along the alignment of Dry Creek. The EIS Subsidence study predicts cracking generated by the longwall mining could extend to the surface along the alignment of Dry Creek. This suggests there is potential for drainage of any shallow perched groundwater occurring within the Dry Creek alluvium into the underlying fractured strata.

Despite this risk, the potential for Blakely's River Red Gum/Apple Riparian Forest occurring along Dry Creek to be impacted is considered low. This is because Dry Creek is a losing stream, and therefore surface flows will continue to seep through the creek bed and into the underlying thin alluvial strata. This means the Blakely's River Red Gum/Apple Riparian Forest will continue to have access to this water. Water from the creek will also carry sediment, seeping into and sealing any significant fractures that are connected to sediment-laden water from the surface. Therefore, the potential to impact on the Blakely's River Red Gum/Apple Riparian Forest on Dry Creek is considered low.

In contrast the River Oak/ Redgum Riparian EEC and Blakely's River Red Gum / Apple Riparian Forest occur along the Bylong River and Lee Creek. In these areas, the water table is close to the land surface being generally less than 5 m below the ground. Given the shallow water table in these areas, it is likely these vegetation communities rely to some degree on shallow groundwater. Modelling indicates drawdown at the potential GDEs will generally be less than 2 m. Drawdown greater than 2 m occurs adjacent to the Eastern Open Cut (River Oak 3), and in the lower reaches of Dry Creek (Dry Creek 1,2,3).

12.2.4 Water quality

It is proposed to emplace coarse and fine reject materials into the Western and Eastern Open Cut Mining Areas during the years of open cut mining operations. Additionally, reject materials generated during the underground mining operations are proposed to be emplaced within the remaining Eastern open cut void. A simple water and salinity balance indicated that post mining, pore water from the backfilled overburden and coarse and fine rejects will flow into the alluvial aquifer, and there is potential for an increase in salinity within the alluvium and the connected surface waters of Bylong River and Lee Creek. Despite this potential for an increase, the salinity balance suggests the environmental value, and beneficial use of the water within the alluvium and interconnected surface water would not change due to the Project.

12.2.5 Cumulative impacts

Other existing mines within the Western Coalfield such as Moolarben Mine, Wilpinjong Mine and Ulan Mine are located well beyond the predicted zone of influence generated by the mining and therefore a cumulative impact on groundwater is considered improbable.

12.2.6 Avoidance or mitigation measures

The mine plan avoids the flood plain and does not intersect the alluvial aquifers. The impacts on the alluvial aquifers are therefore indirect, and occur through the depressurisation of the underlying Permian coal measures. Locating the mining outside the alluvial flood plain effectively mitigates the impact upon the alluvial aquifer and connected streams. The groundwater seepage to the mining areas cannot be prevented, and must be removed to ensure safe operating conditions within the open cut and underground mining areas.

The proponent has purchased a large landholding surrounding the Project and this means there are no private bores predicted to be impacted by mining. If the Project interferes with any private groundwater user possessing a water supply work, and mitigation measures are not feasible, make good measures with affected land owners will include:

- Ensuring the bore owner has access to a similar quantity and quality of water for the water bore's authorised purpose for example by:
    - Bore enhancement by deepening the bore or improving its pumping capacity;
    - Constructing a new water bore; and
    - Providing a supply of an equivalent amount of water of a suitable quality by piping it from an alternative source.

The make good agreements will also allow for the provision to the water bore owner of compensation (monetary or otherwise) for the bore's impaired capacity.

12.2.7 Tabulated impacts

Table 12.4 and Table 12.5 summarise the conclusions compared against DoE guidelines:

Table 12.4 Summary of impacts to the hydrology of the water resource compared to the DoE guidelines

Is there a substantial change to the hydrology of the water resource for:	Comment
flow volume?	Yes flow to alluvial aquifer and baseflow in streams is reduced during mining
flow timing?	No seasonal influences remain
flow duration and frequency of water flows?	Potential for reduced baseflow volume
recharge rates?	Recharge rates will potentially increase in the open cut mining area, and potentially increase where fracturing reaches the land surface above the longwall mining area
aquifer pressure or pressure relationships between aquifers?	Yes – pressures will reduce in coal measures and alluvium during the mine life but recover post mining
groundwater table levels?	Yes - water levels within the alluvial aquifer, particularly between the open cut mining areas and where the borefield is proposed will decline during mining but recover post mining
groundwater/surface interactions?	Yes – water table drawdown within the alluvial aquifer will reduce base flow to the interconnected streams
river/floodplain connectivity?	No impact as no mining proposed in flood plain. There is indirect connectivity through the Permian aquifer to the base of the alluvium and river system
inter-aquifer connectivity?	Yes - fracturing through subsidence may drain perched layers of water above the regional potentiometric surface within the longwall mining area
coastal processes?	not applicable
large scale subsidence?	The EIS Subsidence study predicts cracking generated by the longwall mining could extend to the surface
other uses?	No
state water resource plans?	No the Project has adequate water licenses to comply with the requirements of the state water resource plans (i.e. Hunter Unregulated and Alluvial Water Sharing Plan)
cumulative impact?	No, there are no other mines or coal seam gas projects in close proximity to the Project

Table 12.5 Summary of impacts to the water quality of the water resource compared to the DoE guidelines

Is there a substantial change in water quality of the water resource:	Comment
create risks to human or animal health or the condition of the natural environment?	No
substantially reduce the amount of water available for human consumptive uses or for other uses dependent on water quality?	No
cause persistent organic chemicals, heavy metals, salt or other potentially harmful substances to accumulate in the environment?	No
results in worsening of local water quality where local water quality is superior to local or regional water quality objectives (i.e. ANZECC guidelines for Fresh and Marine Water Quality)?	No, whilst additional salt loading is possible post-mining, beneficial use of water resources is not predicted to change
salt concentration/generation?	Minor change to salinity of adjacent groundwater system due to disposal of coal rejects within overburden emplacements, but no change to beneficial use of water resource
cumulative impact?	No
if significant impact on hydrology or water quality above, the likelihood of significant impacts to function and ecosystem integrity are to be assessed. The ecosystem function and integrity of a water resource includes the ecosystem components, processes and benefits/services that characterise the water resource	Refer EIS Ecology Study

13 Management / mitigation measures

This section recommends a program of ongoing monitoring to validate the predictions of the EIS and groundwater modelling. The outcome of the current investigation is that the impacts of the Project are manageable and that mitigation measures, apart from accounting for take of water with appropriate water licences, are not required. However, should monitoring reveal groundwater impacts, a range of mitigation, management and monitoring measures are provided below to manage the impacts of the Project.

13.1 Monitoring network

KEPCO installed a significant network of monitoring bores as part of the Project's exploration and mine planning phase. Should the Project receive approval, additional monitoring bores should be installed within the predicted zone of depressurisation to monitor regional groundwater and to provide for comparison against the modelling predictions provided within this report. The purpose of the monitoring bores will be to assess the extent and rate of depressurisation against model predictions.

Monitoring of water levels and flows from key private bores within, and adjacent to the zone of depressurisation is also recommended. The sites for the additional monitoring will be developed during the development of the Water Management Plan. NOW and adjacent landholders should be consulted during development of the Water Management Plan.

13.2 Water level monitoring plan

KEPCO has manually monitored groundwater levels on a routine basis in the majority of the groundwater monitoring bore network mentioned above. Many of the bores also have data loggers to electronically record water levels. Vibrating wire piezometers have also been installed and record pore pressures using data loggers. This monitoring should continue for the life of the Project.

Yearly reporting of the water level results from the monitoring network should be included in the annual review. The annual review should consider if any additional monitoring sites are required, or if optimisation of the existing monitoring sites should be undertaken.

13.3 Water quality monitoring plan

KEPCO currently collect groundwater samples from the monitoring bore network on a monthly basis for laboratory analysis. Groundwater samples are tested for:

- pH, EC, turbidity;
- major cations - calcium, magnesium, sodium and potassium;
- major anions - chloride, sulphate, carbonate / bicarbonate;
- minor anions – ammonia, nitrate, nitrite;
- total phosphorous; and
- 16 dissolved metals – Al, As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Hg, Ni, Se, V and Zn.

The Water Management Plan should consider the optimal sites for monitoring of groundwater quality during the life of the Project.

Similar to the water level monitoring yearly reporting of the water quality results from the monitoring network should be included in the annual review. The annual review should consider if any additional monitoring sites are required, or if optimisation of the existing monitoring sites, frequency of sampling and analytical suite should be undertaken.

13.4 Trigger levels

The aim of trigger levels is to provide mine management with an early warning mechanism that identifies water quality trends departing from historical values.

The trigger levels will be derived for water quality parameters as part of the development of the Water Management Plan. This will include an analysis of historical pre-mining water quality data.

13.4.1 Water quality triggers

Statistical data for each monitoring bore such as maximum, minimum, average and standard deviation for key parameters such as TDS (EC), sulphate, and pH will be determined as part of the Water Management Plan. Once mining commences, monitoring results for each indicator parameter are plotted against time, with control limits of mean + standard deviation, mean + 2 standard deviations and mean + 3 standard deviations. Control criteria are set such that one observation above mean + 3 standard deviation, or two consecutive observations more than mean + 2 standard deviations, or five successive observations above mean + standard deviation would constitute a trigger or alarm. If there is a period of no alarms (e.g. after, say, 12 observations), the mean and standard deviations could be recalculated and the control lines adjusted to provide better precision. Figure 13-1 is an example of a control chart and when alarms are triggered.

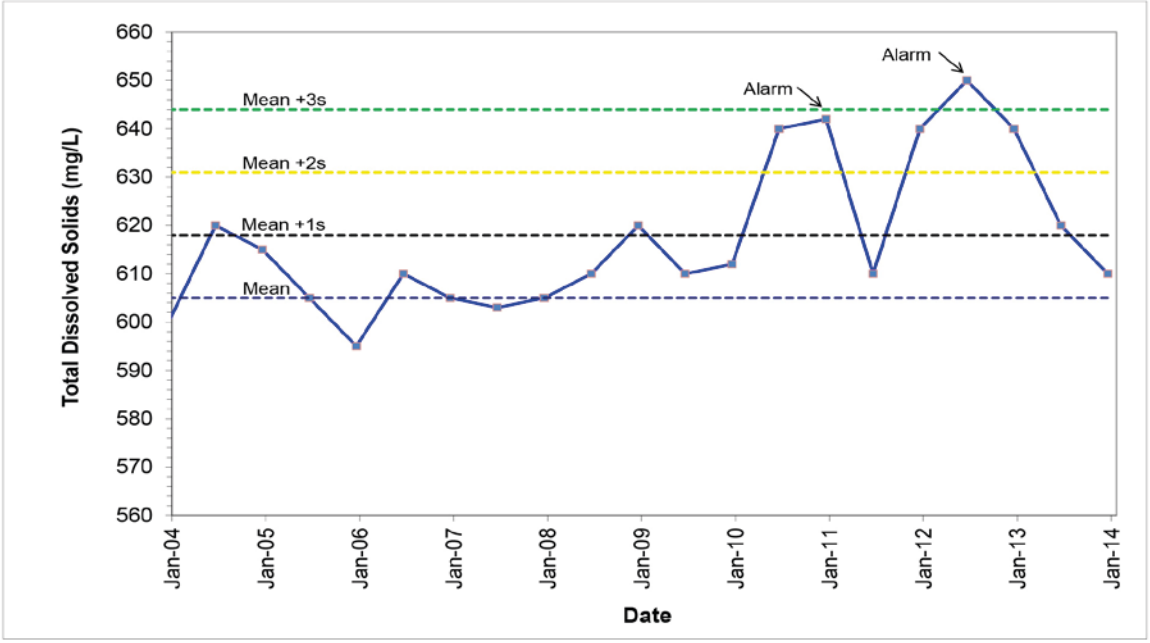

Figure 13-1 Example of a control chart (after DERM 2010)

Should post mining water quality data for these selected key parameters reach the trigger levels, then further detailed analysis of all water quality data will occur. Should this analysis indicate trends not consistent with historical variation, then the mitigation process and strategies will be implemented.

13.4.2 Water level triggers

The numerical modelling indicates that groundwater levels will fall within a zone around the proposed mining areas. An annual review should compare the measured groundwater levels in the monitoring bores with the model predicted levels. Judgement of an experienced hydrogeologist will determine when water levels deviate significantly from that predicted by the groundwater model, and determine the reason for this deviation. The review should consider the impact of mining, and other factors that could result in declining water levels including climatic conditions, rainfall recharge and pumping from private (and KEPCO owned) bores.

Water levels in bores located outside the predicted zone of influence will be assessed annually against a trigger level. If groundwater levels fall below the 5th percentile water level established from the preceding 24 months for a period of 30 days or over, a triggering event occurs. The trigger levels are based on a 7-day moving average water level. These triggers assume dataloggers are installed at all monitoring sites, with a six-hourly sample frequency, and monthly downloads. Figure 13-2 shows an example of a bore, not from the Project area that falls below the calculated 5th percentile level for over 30 days, and therefore triggers an investigation. As described above the investigation will consider the impact of mining, climatic conditions, rainfall recharge and pumping from private bores. It is important to understand that trigger values are not 'pass or fail' compliance criteria, simply a trigger that further consideration needs to be given to the data.

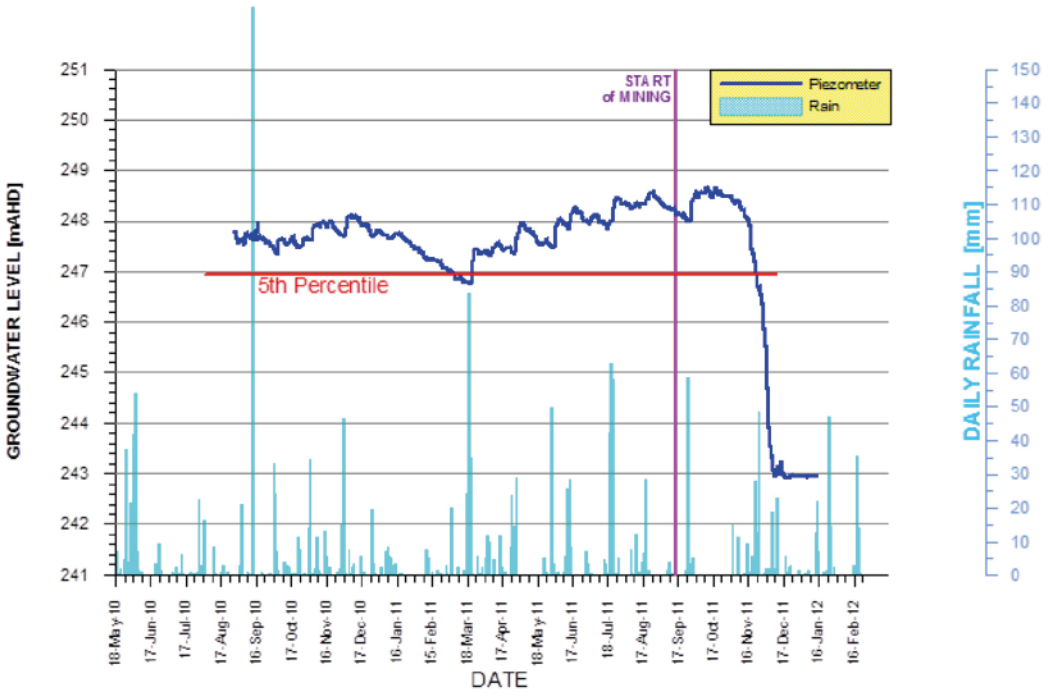

Figure 13-2 Example of a water level trigger event

13.5 Mine water seepage monitoring

It is recommended that monitoring of mine water seepage be undertaken, particularly to identify seepage rates and quality. Samples should be collected of any pumped seepage with the objective of providing an early indication of any mixing of shallow alluvial groundwaters with the Permian strata. Water quality analysis should be similar as for the groundwater monitoring bores. The seepage monitoring program should include:

- recording of the time, location and estimated volume of any unexpected increased groundwater outflow from the highwall, endwall, of the open cut mines, or underground mine;
- measurement of water pumped from the mining areas using flow meters or other suitable gauging apparatus;
- monitoring quality of water pumped from the mining areas (same analytical suite as groundwater);
- correlation of rainfall records (and catchments) with mining area seepage records so groundwater and surface water can be separated; and
- monitoring of coal moisture content.

13.6 Bore field design and layout

The groundwater study has concluded that the surface water and groundwater system are highly connected. Irrigation bores in the Project area are typically shallow, and directly connected to surface water systems. It is possible that historic pumping tests of irrigation wells were carried out after a high rainfall event, and the surface water systems were actively recharging the groundwater system. During the dry season, it is likely that many of the irrigation wells are unable to sustain high abstraction volumes, and the groundwater modelling confirms this.

The proposed bore field requires high volumes of water from a relatively thin aquifer system. The groundwater model assumes a component of this water is derived from a consistent surface water influx. Sensitivity analysis of the possible climatic scenarios concluded that the proposed bore field (up to 15 bores) will not be able to meet the Project requirements if extraordinarily dry periods coincide with high water volume requirements (between Year 3 to Year 10). The modelling indicated it would be necessary to expand the bore field by a further 25 to 31 bores.

Therefore, it is recommended that several test wells are constructed prior to bore field reliance, to test the true sustainability of the bore field. Long-term pumping tests should be carried out at varying times of the year, to ensure that the proposed bore field will be able to sustain water during dry periods. The data derived from these long-term pumping tests could also be used to further validate the groundwater model. The proponent has purchased a large area of land and this will enable the borefield to be distributed along the alluvial aquifer, to minimise take of surface water and interference between bores.

13.7 Future model iterations

After 24 months of mining operations, the assumptions on the geology, hydrogeology and hydraulic properties of the model in the mining area should be compared to the initial data input. If these data indicate substantial differences (previously unrecognised information) to those interpreted, these data should be incorporated into the model and revised predictions made and reported. Every five years the validity of the model predictions should be assessed and if the data indicates significant divergence from the model predictions, an updated groundwater model should be constructed for simulation of mining.

During the latter stage of mining, one of the primary drivers of groundwater depressurisation between the longwall mine and alluvium is the hydraulic connection through the fractured zone. Following the collapse of the first longwall panel, a hydrogeological assessment should be carried on the newly created fracture zone aquifer. The results, including pressure heads and hydraulic conductivity information, should be used to verify the model assumptions, and update the hydraulic parameters used if necessary.

13.8 Data management and reporting

It is recommended data management and reporting include:

- annual assessment of departures from identified monitoring data trends and comparison against specified trigger levels;
- formal review of depressurisation of coal measures and alluvial aquifers should be undertaken annually by a suitably qualified hydrogeologist;
- annual reporting (including all water level, water quality and mine water seepage data); and
- all groundwater data should be stored in a database customised for the Project and with suitable QA/QC controls.

13.9 Management and mitigation strategies

Management of groundwater beneath and adjacent to the Project will involve the establishment of a robust surface and groundwater level and quality monitoring program, for all groundwater and surface water sources. Operational reporting will occur at frequencies suited to the mine development and be part of the basis of annual reporting to key stakeholders.

Should monitoring indicate the changes in groundwater levels and quality, and surface water flow and quality are more extensive or significant than predicted, mitigation measures will be considered. Mitigation measures that may be considered following discussion with relevant government authorities include:

- injection of water into the depressurised aquifers;
- grouting and cut off measures;
- sourcing of additional water from other sources; and
- treatment of mine water for reuse within the water management system.

If mitigation measures are not feasible, 'make good' measures with affected land owners could be carried out, including:

- ensuring the bore owner has access to a similar quantity and quality of water for the water bore's authorised purpose for example by:
    - bore enhancement by deepening the bore or improving its pumping capacity;
    - constructing a new water bore; and
    - providing a supply of an equivalent amount of water of a suitable quality by piping it from an alternative source.
- carry out a plan to monitor the water bore, for example, by undertaking periodic bore assessments.

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15 Glossary

Alluvium - Sediment (gravel, sand, silt, clay) transported by water (i.e. deposits in a stream channel or floodplain).

Aquiclude - A low-permeability unit that forms either the upper or lower boundary of a ground-water flow system.

Aquifer - Rock or sediment in a formation, group of formations, or part of a formation which is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.

Aquifer, Confined - An aquifer that is overlain by a confining bed. The confining bed has a significantly lower hydraulic conductivity than the aquifer.

Aquifer, Perched - A region in the unsaturated zone where the soil may be locally saturated because it overlies a low-permeability unit.

Aquifer, Semi-confined - An aquifer confined by a low-permeability layer that permits water to slowly flow through it. During pumping of the aquifer, recharge to the aquifer can occur across the confining layer. Also known as a leaky artesian or leaky confined aquifer.

Aquifer, Unconfined - An aquifer in which there are no confining beds between the zone of saturation and the surface. There will be a water table in an unconfined aquifer. Water-table aquifer is a synonym.

Aquitard - A low-permeability unit than can store ground water and also transmit it slowly from one aquifer to another.

Colluvium - Sediment (gravel, sand, silt, clay) transported by gravity (i.e. deposits at the base of a slope).

Cone of Depression - The depression in the water table around a well or excavation defining the area of influence of the well. Also known as cone of influence.

Drawdown - A lowering of the water table of an unconfined aquifer or the potentiometric surface of a confined aquifer caused by pumping of ground water from wells or excavations.

Falling/Rising Head Test - A test made by the instantaneous addition, or removal, of a known volume of water to or from a well. The subsequent well recovery is measured.

Head - sum of datum level, elevation head and pressure head which in unconfined aquifers is equal to the groundwater elevation.

Hydraulic Conductivity - A measure of the rate at which water moves through a soil/rock mass. It is the volume of water that moves within a unit of time under a unit hydraulic gradient through a unit cross-sectional area that is perpendicular to the direction of flow.

Hydraulic Gradient - The change in total head with a change in distance in a given direction. The direction is that which yields a maximum rate of decrease in head.

Infiltration - The flow of water downward from the land surface into and through the upper soil layers.

Model Calibration - The process by which the independent variables of a digital computer model are varied in order to calibrate a dependent variable such as a head against a known value such as a water-table map.

Packer Test - An aquifer test performed in an open borehole to determine rock permeability; the segment of the borehole to be tested is sealed off from the rest of the borehole by inflating seals, called packers, both above and below the segment.

Piezometer - A non-pumping well, generally of small diameter, that is used to measure the elevation of the water table or potentiometric surface. A piezometer generally has a short well screen through which water can enter.

Porosity - The ratio of the volume of void spaces in a rock or sediment to the total volume of the rock or sediment.

Potentiometric Surface - A surface that represents the level to which water will rise in tightly cased wells. If the head varies significantly with depth in the aquifer, then there may be more than one potentiometric surface. The water table is a particular potentiometric surface for an unconfined aquifer.

Pumping Test - A test made by pumping a well for a period of time and observing the response/change in hydraulic head in the aquifer in order to determine aquifer hydraulic characteristics.

Slug Test - A test made by the instantaneous addition, or removal, of a known volume of water to or from a well. The subsequent well recovery is measured and analysed to provide a permeability value.

Specific Yield - The ratio of the volume of water a rock or soil will yield by gravity drainage to the volume of the rock or soil. Gravity drainage may take many months to occur.

Storativity - The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer, per unit change in head.

Transmissivity - A measure of the rate at which water moves through an aquifer of unit width under a unit hydraulic gradient.

Unsaturated Zone - The zone between the land surface and the water table. It includes the root zone, intermediate zone, and capillary fringe. The pore spaces contain water at less than atmospheric pressure, as well as air and other gases. Saturated bodies, such as perched ground water, may exist in the unsaturated zone. Also called zone of aeration and vadose zone.

Water Budget - An evaluation of all the sources of supply and the corresponding discharges with respect to an aquifer or a drainage basin.

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Appendix A

Study Requirements

A1 Study requirements

A1.1 Secretary's Environmental Assessment requirements

The Department of Planning and Environment (DP&E) collated the requirements from all NSW government departments and provided these to KEPCO. These are known as the Secretary's Environmental Assessment Requirements (SEARs). The sections below tabulate the requirements that relate to groundwater, and where these requirements are addressed within this report.

A1.1.1 Department of Planning and the Environment

Requirements	addressed in section
Detailed assessment of potential impacts on the quality and quantity of existing surface and ground water resources, including:	
• Detailed modelling of potential groundwater impacts;	8, 9 and 10
• Impacts on affected licensed water users and basic landholder rights; and	10.5
• Impacts on riparian, ecological, geo-morphological and hydrological values of watercourses, including environmental flows.	10.8
Identification of any licensing requirements or other approvals under the Water Act 1912 and/or Water Management Act 2000;	4 and 12.1
Demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP) or water source embargo;	4 and 12.1

A1.1.2 New South Wales Office of Water

Recommendations	addressed in section
To ensure the sustainable and integrated management of groundwater sources, the EIS needs to include adequate details to assess the impact of the Project on all groundwater sources including:	
• The predicted and highest groundwater table at the site	7.3 and 9.2.3
• Works likely to intercept, connect with or infiltrate the groundwater sources.	2.2 and 10.2.5
• Any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes	2.2 and 10.2.5
• A description of the flow directions and rates and physical and chemical characteristics of the groundwater source (including connectivity with other groundwater and surface water sources)	7.3 and 7.4
• Baseline monitoring (min 2 years) for groundwater quantity and quality for all aquifers and GDEs	6 and Douglas Partners report
• The predicted impacts of any final landform on the groundwater regime	10.11
• The existing groundwater users within the area (including the environment), any potential impacts on these users and safeguard measures to mitigate impacts	7.2, 10.5, 12.1 and 13
• An assessment of the quality of groundwater for the local groundwater catchment	7.5

Recommendations	addressed in section
• An assessment of the potential for groundwater contamination (considering both the impacts of the proposal on groundwater contamination and the impacts on contamination on the proposal)	10.11.3
• Measures to protect groundwater quality both in the short and long term	13
• Measures for preventing groundwater pollution so that remediation is not required.	13.8
• Protective measures for any groundwater dependent ecosystems(GDEs)	7.6 and 10.6.2
• The results of any predictive models or predictive tools used	10 and 11
Where potential impact/s are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users including	
• Any proposed monitoring programs, including water levels and quality data	13.2 and 13.3
• Reporting procedures for any monitoring program including mechanism for transfer of information	13.7
• An assessment of any groundwater source/aquifer that may be sterilised from future use as a water supply as a consequence of the proposal	not applicable
• Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category)	12.1, 13.4.1 and 13.4.2
• Description of the remedial measures or contingency plans proposed	13.8
• Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.	-
Groundwater Dependent Ecosystems	7.6, 10.6.2 and refer to EIS ecology study

A1.1.3 New South Wales Office of Resources and Energy

Recommendations	addressed in section
The EIS should state the interaction between the proposed mining activities and the existing environment and so include a comprehensive description of the following activities and their impacts:	
• Surface and groundwater usage and management.	7
Where a void is proposed to remain as part of the final landform, the assessment is to provide details in regards to the following: • Outcomes of the surface and groundwater assessments in relation to the likely final water level in the void. This should include as assessment of the potential for fill and spill along with measures required be implemented to minimise associated impacts to the environment and downstream users.	no void proposed, not applicable
The EIS should identify if the predicted subsidence will result in fracture connectivity to the surface, and the environmental consequence to the ground surface, groundwater aquifers and groundwater dependent ecosystems of the predicted subsidence.	10.2.8 and 10.9

A1.1.4 New South Wales EPA

Recommendations	addressed in section
The EIS should:	
4. Describe existing surface and groundwater quality.	7.5
6. where groundwater may be impacted the assessment should identify the appropriate environmental values.	7.5
7. state the indicators and associated trigger values or criteria for the identified environmental values.	13.4
13. Assess impacts on groundwater and groundwater dependent ecosystems	7.6, 10.6.2 and refer to EIS ecology study
17. Describe how predicted impacts will be monitored and assessed over time.	13

A1.1.5 New South Wales Office of Environment and Heritage

Recommendations	addressed in section
The EIS will need to consider changes to groundwater levels as changes in groundwater can lead to impacts such as drying of vegetation communities.	7.6, 10.6.2 and 10.5
In particular, the EIS should provide an analysis of the likely impacts of subsidence and fracturing groundwater.	10.2.8, 10.4 and 10.9
Whether the water loss impact will be temporary will the storage is filled, or if the fracture zone is connected to a source of escape (e.g. a deeper aquifer or bedding shear pathway into an open hillside), then whether it is possible for sufficient water to drain to alter the hydrologic balance of the swamp	10.2.8, 10.4 and 10.9

A1.2 Gateway Panel requirements

The Gateway Panel reviewed the Gateway Report and issued a Conditional Gateway Certificate for further work to be included into the EIS. During the Gateway Process, the Gateway Panel referred the Gateway Report to the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) and the New South Wales Office of Water (NOW). Tables below summarise the work program they recommended be undertaken during the EIS.

A1.2.1 Gateway Panel advice

The Gateway Panel's Conditional Gateway Certificate recommended the following tasks.

Recommendations	addressed in section
1. Develop a more complex transient 3D numerical model for the EIS stage of the Development Application which includes improved time variant input data, more details on recharge, geological imperfections (dykes, sills & faults), fractures from subsidence, and a sensitivity/ uncertainty analysis.	8
2. Complete baseline on water levels, and groundwater dependent ecosystems	6, 7.2 and 7.6
3. Provide an assessment of the hydrochemistry of spoil and rejects materials, and potential impact on nearby water sources	10.11.3
4. Provide a strategy for complying with the rules of the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources. In particular the implication of reduced available water determinations (AWDs) and the cease to pump rule	12.1
5. Supply a plan for monitoring actual water take and how any changes from the predictions will be accounted for with water licences and remediation	13

The Gateway Panel also provided a report accompanying the Conditional Gateway Certificate that included further recommendations as follows:

Recommendations	addressed in section
1. Using a transient 3D groundwater flow model recalculate the volumes of water to be taken from each water source. Provide this information in the EIS together with all assumptions made and data used. Include information on:	
a) A strategy for accounting for any water taken beyond the life of the operation;	13.8
b) Quantification of any uncertainties in the groundwater or surface water modelling;	11
c) A plan for monitoring actual water take and how any changes from the predictions will be accounted for with water licences and remediation;	13
2. The proponent should demonstrate more clearly how they will obtain the necessary Unregulated Surface licences to account for their estimated 215 ML/yr water take;	10.10
3. Undertake more studies to establish baseline groundwater conditions. Including:	
a) Determining the depth to water table under elevated country;	7.3
b) Determining the likely effects of geological faulting on groundwater flow;	5.6.3
c) Determining how the basalts (including sills and dykes) may affect groundwater flow;	5.6.3 and 7.1.4
d) Determining the interaction between surface water and groundwater;	7.4

Recommendations	addressed in section
e) Establishing the hydrochemistry of the spoil and reject material;	10.11.3 and refer to EIS geochemistry study
f) An assessment of groundwater recharge	7.4
4. The proponent should provide a strategy for complying with the rules of the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources;	10.10
5 & 6. Using a calibrated transient 3D model recalculate the impacts on nearby licenced water users. This updated modelling and reporting should:	10.5
a) Capture the complexity of the site;	8.1 and 8.2
b) Use temporal input data;	8.2.5
c) Have distributed input parameters;	9.2.1
d) Quantify any uncertainties in the groundwater/surface water impact modelling	11
7. Undertake a detailed assessment on the potential impacts of mining on GDEs and report on mitigating options as necessary	7.6, 10.6.2 and 12.1
8. Undertake studies to better characterize the hydrochemistry of spoil and rejects materials, including the potential for saline and acid forming drainage. The proponent should use these results together with the upgraded groundwater flow model to predict changes in water quality in both the alluvial aquifers and surface streams.	10.11.3 and refer to EIS geochemistry study
9. Include the fracturing results of the subsidence studies in the updated modelling for the EIS	10.2.8 and 10.9

A1.2.2 New South Wales Office of Water

NOW provided three recommendations as follows.

Recommendations	addressed in section
1. The proponent should identify contingency options given sufficient access to alluvial groundwater may not be available to meet the indicated mine water requirements.	10.10
2. Additional bore monitoring sites to be established along the Western Open Cut where mine spoil is proposed to be placed on colluvial material. Mitigation work should be a requirement if a rising trend in salinity is identified in this locality.	13
3. KEPCO make provision for continued access to Office of Water infrastructure located on KEPCO land.	not addressed as part of this report

A1.2.3 Independent scientific committee

The IESC provided 27 comments on the Gateway report. The table below reproduces the IESCs recommendations relevant to groundwater.

Recommendations	addressed in section
4. Future iterations of the Project assessment documentation should clearly define alluvial extents along Dry Creek and specify buffer distances from proposed longwalls.	2.2 and 5.6.2
5. Given the magnitude of the predicted alluvial drawdown, the potential for impacts to porosity and permeability and consequential implications for long-term flow storage and movement in the alluvium should be assessed.	not addressed as part of this report
7. Impacts on water dependent assets (including aquatic ecosystems, terrestrial ecosystems, drinking water supply, irrigation water supply, surface infrastructure and other industries), should be assessed following updates to the groundwater model. Mitigation measures to address impacts on groundwater dependent assets should be included	7.6, 10 and 13
8. Contrary to the stated significant alluvial through-flow to the Goulburn River, the preliminary groundwater model predicts that the Goulburn River will not be impacted by the proposed Project. The representation of the Goulburn River as a constant head boundary within the model may be influencing this inconsistency. The IESC has included recommendations for further studies into the representation of streams in the groundwater model in response to Question 2.	8.2, 9.2.6 and 10.8
9. The spatial and seasonal variation in streamflow and the groundwater pumping regime should be reflected in future versions of the groundwater model. These modifications would more accurately represent current surface-groundwater flux and therefore improve confidence in the predictions of impacts	8.2, 9.2.6 and 10.8
10. The proponent intends to contain all mine-affected water on site, with no discharges, but does intend to use mine water for dust suppression. Sediment-affected water may be released from site, following treatment if necessary. Documentation provided with the development application should include: d. Assessment of the risks to surface and groundwater quality of using mine water for dust suppression	refer to EIS surface water study
12. There is potential for contamination of the alluvium due to leaching from Coal Handling and Preparation Plant rejects within the backfilled pit, which may then flow into the adjacent surface water systems, in particular the Growee River and Lee Creek. Groundwater quality modelling of the final landform would be needed to accurately determine the potential transport of contaminants, including salts, to the alluvium and surface streams	10.11.3 and refer to EIS surface water study
15. The monitoring and management programme for subsidence would benefit from further investigations on the height and impacts of connective cracking and the effectiveness of proposed mitigation and remediation measures	refer to EIS subsidence study
16. Studies are needed on the location and volumetric requirements of the proposed borefield to supplement mine water requirements. The proposed water take from this borefield should then be incorporated into the groundwater model	10.2.5
17. The IESC agrees that improvements to the preliminary groundwater model are needed, consistent with the proponent's commitments. The IESC recommends that the updated numerical model should reflect the modifications and additions to the groundwater conceptualisation specified in paragraphs 18-21	7 and 8

Recommendations	addressed in section
18. Finer-scale understanding is needed of the spatial and temporal aspects of the existing connectivity regime between each of the hydrogeological units and surface water. In particular, the conceptualisation should include current groundwater extraction, streamflow, alluvial through-flow and discharge to the Goulburn River. In order to match the groundwater model outputs to seasonal field observations, consideration should be given to a variety of boundary conditions for streams across the model domain, including constant head or general head boundaries, river cells and drains. The Project assessment documentation would benefit from sensitivity analysis of stream boundary conditions and justification for the conditions applied in the final groundwater model	8.2.5.4, 9.2.6 and 11
19. Studies should assess the predicted perturbations to, and recovery of, the hydrological regime resulting from the proposed Project. In particular, the assessment should consider changes to hydraulic connectivity above shallow longwalls, where cracking is predicted to extend to the surface. Assessment of changes to interconnectivity between hydrogeological units and surface water would benefit from predictions at the sub-catchment level, including Lee Creek, Bylong River, Growee River and the Goulburn River	10
20. Further evidence should be provided to confirm the extent of the alluvium associated with Dry Creek and buffer distances from the proposed longwalls. Any modifications needed to the mine layout to maintain the integrity of alluvial aquifers should be clearly described	2.2 and 5.6.2
21. Water related assets should be identified. Studies relating to dependence on water resources for fauna (including stygofauna, macroinvertebrates, frogs and fish), flora and habitat, as well as the location of shallow groundwater discharge points and other groundwater dependent ecosystems (GDEs), should be included. A systematic approach to assessment of GDEs is recommended in which • The hydrogeological conceptualisation identifies areas of shallow groundwater (less than 20 metres below ground level) and groundwater discharge • Vegetation and wetland mapping is overlaid to identify areas of potential GDEs. Preliminary mapping should consider data sourced from the Vegetation Information System database, available from the NSW Office of Environment and Heritage • Techniques from the Australian GDE Toolbox may then be applied to confirm groundwater use by vegetation and groundwater discharge to surface water bodies	7.6, 10.6.2 and refer to EIS ecology study
25. Geochemical characterisation of rejects should be undertaken to assess the potential contamination risk to the alluvium and surface waters	10.11.3 and refer to EIS geochemistry study

A1.3 Local government

A1.3.1 Midwest Regional Council

Recommendations	addressed in section
Concern has been expressed by the community regarding the over allocation of water licences within the Bylong Valley water source. Council urges a thorough investigation be made on the actual impact on water resource rather than reliance placed on the purchase of water licences.	10 and 12.1
Council request that DGRs include a requirement to undertake a full assessment on the impact on local bores. Reliance on a condition of approval to 'make good' any adverse impact is considered insufficient.	10.5
The water balance investigation should include a guaranteed reasonable minimum water allocation available to agriculture and the temporary workers accommodation at all times.	12.1

A1.4 Federal Government

A1.4.1 Department of the Environment

Recommendations	addressed in section
The EIS must include a description of the environment and management practices of the proposal site and the surrounding areas and other areas that are affected by the action. Include the relevant MNES protected by controlling provisions of Part 3 of the EPBC Act:	
a) A description of the important water resources within the site and in surrounding areas, which is consistent with the most recent version of the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Developments' *Information Guidelines for Proposals Relating to the Development of Coal Seam Gas and Large Coal Mines where there is significant impact on water resources.*	A1.4.2
b) The EIS should identify and address cumulative impacts…	12.2.5

A1.4.2 Independent Expert Scientific Committee (IESC)

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) has information guidelines for advice on coal seam gas and large coal mining development proposals. The following section specifies where the IESC information requirements for individual proposals have been addressed within this report.

A1.4.2.1 Description of the proposal

Does the description of the proposal include details of the:	addressed in section
purpose	see main EIS report
location	see main EIS report
scale	see main EIS report
proposal's status within the regulatory assessment process	see main EIS report
character	see main EIS report
duration	see main EIS report
means by which a significant impact on water resources is likely	10
water management policies or regulations applicable to the proposal	4

A1.4.2.2 Contextual information

Does the contextual information include details of the:	addressed in section
water resources of the site and region	5, 7 and refer to EIS surface water report
geological sequence of the area, including names and descriptions of the formations	5.6 and refer to main EIS report
hydraulic characteristics for each hydrogeological unit	7
likely recharge sources, direction of discharge and discharge pathways for all hydrogeological units	7.4
assessments of the frequency, volume and direction of interactions between water sources	7
relevant information generated by a bioregional assessment, or best available information	see EIS ecology report
geology and hydrogeology at an appropriate level of spatial and vertical resolution	7
geological structures and their influence on groundwater	5.6.3
depths to the hydrogeological units and associated standing water levels or potentiometric heads, including, contours, maps and hydrochemical characteristics	7.3
descriptions of hydrology, water quality data and geomorphology for all watercourses across the site	refer to EIS surface water report
water related assets	5, 7 and refer to EIS surface water report
conceptual modelling	7

A1.4.2.3 Model-data analysis, including water and salt balances

Model-data analysis builds on background data and conceptual modelling to enable an analysis. The information provided should include:	**addressed in section**
surface water and groundwater assessments and modelling, including detailed hydrology and water quality assessments	5, 7, 8 and refer to EIS surface water report
quality of and risks and uncertainty inherent in the data and modelling	9.4 and 11

Has a groundwater model that is calibrated to baseline conditions and enables a probabilistic evaluation of potential future scenarios been provided? Does the groundwater modelling include:	**addressed in section**
the model conceptualisation of the hydrogeological system or systems, including key assumptions and model limitations	7, 8, 9 and 10
the various stages of the proposed development and predictions of water level/pressure declines in each hydrogeological unit	10
the volumes predicted to be dewatered with an indication of the proportion supplied from each a hydrogeological unit	10
consider a variety of boundary conditions for stream across model domain	8.2.2 and 9
be undertaken in accordance with the Australian groundwater modelling Guidelines, including being peer reviewed	9.4
each hydrogeological unit, including storage and flow characteristics, their existing recharge/discharge pathways and any linkages between units	7, 8, 9 and 10
maximum drawdown and the time for post development drawdown equilibrium to be reached	10.5 and 10.11.1
potential water level recovery rates and timeframes for each hydrogeological unit	10.11.1
include a sensitivity analysis of stream boundary conditions and justification of the conditions applied in the final model	11
recommendations and a program for review and update of the model	13.6

Do the water and salt balances provide details on specific flows and changes, including:	**addressed in section**
any changes that occur to the salt loads of the groundwater and surface water systems	10.11.3
water infiltration from surface stores	10.8
waste water from the operation	refer to EIS surface water report
volumes and quality of water used during mining	refer to EIS surface water report

Do the water and salt balances provide details on specific flows and changes, including:	addressed in section
all interactions and flows that exist that are part of the background (baseline) water flows	7
hydrogeological unit storage properties and groundwater flows and pressures resulting from depressurisation	10
an estimation of flow/exchange of water between hydrogeological units and the target coal measure	10
all volumes and quality of water intended for injection	10.2.10 and 10.11.3
any water that must be imported from elsewhere	not applicable
estimates of water use in transpiration by vegetation, and the predicted changes to vegetation water use	7.6 and 10.6.2

A1.4.2.4 Assessment of impacts on water resources and water related assets

Does the assessment of impacts include details of:	addressed in section
likely changes to water and salt balances	10
the hydrogeological units that will be directly impacted by mining operations	7 and 10
impacts on hydrological interactions between water resources	10
impacts associated with surface water diversions	refer to EIS surface water report
impacts on hydraulic properties of hydrogeological units	not addressed as part of this report
effects of depressurisation due to gas extraction	not applicable
the quality and quantity of operational discharges of water	refer to EIS surface water report
landscape modifications	refer to main EIS report
the cumulative impacts (see section titled Assessment of cumulative impacts)	12.2.5
proposed mitigation actions for each identified impact	13
subsidence and effects from dewatering and depressurisation	10
the hydrogeological units that will be dewatered or indirectly impacted by dewatering	7 and 10
the extent of the cone of depression and consequential impacts on water resources	10
direct and indirect impacts on water related assets	10

Does the assessment of impacts include details of:	addressed in section
potential for physical transmission of water within and between hydrogeological units	10
estimates of likelihood of leakage of contaminants from coal beds through geological formations	not addressed as part of this report
vulnerability to contamination and likely impacts of contamination on water related assets	10.11.3
long term impacts from final landform design	10.11
measures taken to avoid and minimise impacts	13

A1.4.2.5 Assessment of cumulative impacts

Does the assessment of cumulative impacts include:	addressed in section
a summary of CSG and large coal mining developments within the region	5.7 and refer to main EIS report
existing and planned water entitlements, and the actual take of water for consumptive, industrial and agricultural purposes	7.2, 8.2.5.3 and 10.10
the proportional increase in water resource use	10.10
catchment and regional scale information (from bioregional/other relevant assessments	5.7 and refer to main EIS report
existing water quality guidelines, targets, environmental flow objectives and requirements for the surface catchment and groundwater basin	4 and refer to EIS surface water report
the overall level of risk to water related assets	12.1

A1.4.2.6 Assessment of risk

Does the assessment of risk identify:	addressed in section
water related assets in the area	12.1
the likelihood and consequence of impacts occurring	12.1
the overall level of risk to assets that combine probability of occurrence with consequence or severity of impact	12.1
potential impacts to water related assets	12.1
the magnitude or severity of impact in the event that the impact was to occur	12.1
the residual risk following the application of mitigation measures	12.1

A1.4.2.7 Ongoing management and monitoring

Does ongoing management and monitoring include:	addressed in section
a robust monitoring plan to inform management and mitigation of all impacts identified through the assessment	13
comprehensive baseline monitoring dataset prior to commencement of the development	6 and 7
the hypotheses to be tested	not addressed as part of this report
the analytical methods to be used	13.6
water quality monitoring that is managed in accordance with the relevant National Water Quality Management Strategy (NWQMS) guideline	13.3
regular reviews and revisions of the monitoring program	13.6
clearly defined monitoring objectives and performance indicators	13
maps and coordinates of monitoring locations	6.1 and 13.1
the ability to capture seasonal and inter-annual variability and enable valid statistical analysis of results	13.4
groundwater, surface water and associated ecological attributes and be capable of tracking changes from pre-development conditions	13
the rationale and design for the monitoring program	13
the temporal and spatial frequency of monitoring and the potential indicators to be monitored	13
the identified triggers and threshold and proposed management actions if levels are reached and exceeded	13.4
a commitment to regular reporting of findings from monitoring programs, including raw data, analysis of data, and the results and conclusions	13.7
an adaptive management approach to manage changes in the predicted impacts	13.6 and 13.8
a description of local and regional surface water regime/s and detailed historical baseline data against which monitoring results can be assessed	refer to EIS surface water report
the number and spatial distribution of monitoring sites and monitoring frequency	13
a monitoring network that extends beyond the predicted impact area	13.1

Does the groundwater monitoring program include:	addressed in section
a network to collect sufficient physical aquifer parameters and hydrogeochemical data to establish pre-development (baseline) conditions	6.1
dedicated groundwater monitoring wells	6.1
information on the groundwater regime, recharge and discharge processes and identify changes over time in the groundwater system	7 and 13.6
a comprehensive assessment of all relevant chemical parameters to inform changes in groundwater quality and detect potential contamination events	13.4.1
specific aquifers for monitoring and management	13
appropriate management responses to mitigate impacts to groundwater resources	13.8

Does the surface water monitoring program include:	addressed in section
sufficient data to detect and identify the cause of any changes from baseline conditions	refer to EIS surface water report
a rationale for selected monitoring variables	refer to EIS surface water report
dedicated sites to monitor hydrology, water quality and channel geomorphology throughout the life of the proposal	refer to EIS surface water report
satellite or aerial impact, if required.	refer to EIS surface water report

Does the ecological monitoring program include:	addressed in section
an evaluation of the effectiveness of impact prevention or mitigation measures	refer to EIS ecology report
measurements of trends in ecological responses and whether ecological responses are within identified thresholds of acceptable change	refer to EIS ecology report

Appendix B

Field Investigation Reports

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Addendum Report on Hydrogeological Investigation and Monitoring January to May 2014

Proposed Coal Mine
Bylong, Mid-Western NSW

Prepared for
Cockatoo Coal Limited

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Addendum Report on Hydrogeological Investigation and Monitoring January to May 2014 Proposed Coal Mine, Bylong, Mid-Western NSW

1. Introduction

This addendum report presents factual results of ongoing hydrogeological investigation and monitoring from January 2014 to May 2014 for a proposed coal mine at Bylong in Mid-Western New South Wales (NSW). The work was undertaken for Cockatoo Coal Limited (CCL).

CCL is planning the development of a coal mine at Bylong in Mid-Western NSW. The mine is likely to comprise both open cut and underground workings. The scope of investigations and monitoring are based on a Preliminary Hydrogeological Assessment and Water Monitoring Plan (Ref 7), however, the scope of work has evolved and grown based on the ongoing findings.

Interim factual reports presenting the results of ongoing monitoring were provided by Douglas Partners Pty Ltd (DP) in August 2012 (Ref 5), January 2013 (Ref 6), July 2013 (Ref 9) and January 2014 (Ref 11). Monitoring results from December 2011 to October 2013 were additionally reported in November 2013 (Ref 10) for the purposes of the Gateway Application report. Reference should be made to the previous reports for a full site description, field work methods and the factual results of previous monitoring.

Factual monitoring data provided in this report comprises the following:

- Automated logging of piezometric head and Electrical Conductivity (EC) in selected locations;
- Manual gauging of piezometric head in standpipe piezometers;
- Surface water and groundwater sampling and chemical analyses at selected locations;
- Automated logging of surface water flow velocity at three locations; and
- Monitoring of vibrating wire piezometers (VWP) in dedicated investigation bores.

Previous DP reports prepared for the site should be read in conjunction with this addendum factual report. Issued reports to date are as follows:

- “Results of Cone Penetration Testing”, Project 49761.00, April 2012 (Ref 3);
- “Summary of Groundwater Assessment to Date”, Project 49761.00-03, April 2012 (Ref 4);
- “Interim Factual Report on Hydrogeological Investigation and Monitoring”, Project 49761.03, August 2012 (Ref 5);
- “Addendum Report on Hydrogeological Investigation and Monitoring, August to December 2012”, Project 49761.03-02, Rev 1, January 2013 (Ref 6);
- “Report on Baseline Groundwater and Surface Water Quality Monitoring, February 2012 to May 2013”, Project 49761.03-04, May 2013 (Ref 8);

- "Addendum Report on Hydrogeological Investigation and Monitoring, January to July 2013", Project 49761.03-05, Rev 1, 26 July 2013 (Ref 9);
- "Report on Hydrogeological Investigation and Monitoring – August 2011 to October 2013", Project 49761.03-07, Rev 0, 1 November 2013 (Ref 10);
- "Addendum Factual Report on Hydrogeological Investigation and Monitoring, July to December 2013", Project 49761.03-08, Rev 0, 28 January 2014 (Ref 11).

The purpose of this addendum report is to provide an updated summary of factual data collected to date.

2. Vibrating Wire Piezometer Monitoring

2.1 Overview

Vibrating wire piezometers (VWP) were installed in a total of thirteen piezometers over the period September 2012 to November 2013 as per the locations identified in the Preliminary Hydrogeological Assessment and Water Monitoring Plan (Ref 7). The purpose of the VWPs is to assess the vertical hydraulic gradients and aquifer connectivity.

In general, multiple VWPs were installed in the Ulan Seam, Coggan Seam and floor as well as relatively permeable stratum in the overlying coal measures (i.e. targeted to higher permeability zones). The depths targeted were based on the results of packer testing as detailed in Refs 8, 9 and 11.

RST Instrument data loggers were installed at the surface of selected VWPs to record piezometric head and temperature at daily intervals. The remaining VWPs were downloaded manually using a handheld GSA vibrating wire piezometer readout unit in conjunction with groundwater monitoring.

The depths of the installations, target stratum and monitoring methods are summarised in Table 1.

Installation details are provided in References 8 and 9.

Table 1: Summary of Vibrating Wire Installations

Bore ID	Depth (m)	Elevation (AHD)	Description	Monitoring Method
A06	Surface	275.16		
	12.5	262.66	Coal	Daily automated logging, downloaded quarterly
	17.0	258.16	Coal – Ulan Seam	
	26.8	248.36	Coal – Coggan Seam	
	36.6	238.56	Siltstone Floor	
AGE01	Surface	237.26		
	27.70	209.56	Siltstone	Daily automated logging, downloaded quarterly
	67.10	170.16	Sandstone	
	120.20	117.06	Coal – Ulan Seam	
	128.20	109.06	Coal – Coggan Seam	
	140.70	96.56	Sandstone Floor	
AGE02	Surface	241.71		
	31.2	210.51	Sandstone	Daily automated logging, downloaded quarterly
	45.5	196.21	Sandstone	
	84.3	157.41	Coal	
	94.0	147.71	Coal – Ulan Seam	
	103.0	138.71	Coal – Coggan Seam	
	116.0	125.71	Sandstone Floor	
AGE03	Surface	246.93		
	30.50	216.43	Sandstone	Monthly manual reading
B3	Surface	310.58		
	43.2	267.38	Coal	Daily automated logging, downloaded quarterly
	82.0	228.58	Coal	
	108.5	202.08	Coal – Ulan Seam	
	120.5	190.08	Coal – Coggan Seam	
	135.0	175.58	Sandstone Floor	
BY0011CH	Surface	356.62		
	73.40	283.22	Sandstone	Daily automated logging, downloaded quarterly
	148.80	207.82	Sandstone	
	190.40	166.22	Coal – Ulan Seam	
	202.40	154.22	Coal – Coggan Seam	
	220.00	136.62	Sandstone Floor	
BY0077CH	Surface	297.25		
	48.30	248.95	Sandstone/siltstone	Daily automated logging, downloaded quarterly
	107.90	189.35	Sandstone/coal – Ulan Seam	
	118.80	178.45	Coal – Coggan Seam	
	139.50	157.75	Sandstone Floor	
BY0080CH	Surface	405.73		
	177.20	228.53	Siltstone/sandstone	Daily automated logging, downloaded quarterly
	200.00	205.73	Coal – Ulan Seam	
	210.70	195.03	Coal – Coggan Seam	
	230.00	175.73	Sandstone Floor	
BY0091CH	Surface	363.74		
	57.00	306.74	Sandstone	Daily automated logging, downloaded quarterly
	103.40	260.34	Sandstone/siltstone	
	172.50	191.24	Coal	
	185.00	178.74	Sandstone Floor	
BY0208CH	Surface	327.08		
	37.30	289.78	Igneous intrusion	Daily automated logging, downloaded quarterly
	60.00	267.08	Sandstone / Siltstone	
	87.50	239.58	Coal – Coggan Seam	
CPT18	Surface	297.83		
	21.75	276.08	Coal	Monthly manual reading
CPT36	Surface	302.05		
	47.75	254.30	Coal – Ulan Seam	Monthly manual reading
	56.75	245.30	Coal – Coggan Seam	
CPT39	Surface	307.10		
	25.00	282.10	Coal – Ulan Seam	Monthly manual reading
	33.00	274.10	Coal – Coggan Seam	

2.2 Results

Plots of piezometric head for vibrating wire piezometers are included in Appendix C and are based on CCL supplied survey levels.

3. Piezometer Level Monitoring

3.1 Overview

Monitoring of groundwater levels in piezometers commenced in December 2011 with the number of regularly gauged locations increasing as additional piezometers were installed. The work to date has comprised the following:

- Manual gauging of water levels in standpipe piezometers using a Solinst Water Level Meter Tape, generally undertaken monthly in conjunction with groundwater sampling;
- Measurement of artesian pressure for piezometer BY0015 using a pressure gauge undertaken monthly in conjunction with groundwater sampling. The piezometer is capped with a ball valve;
- Installation of Solinst Leveloggers to automatically record piezometric head (i.e. water levels) at 20 minute intervals; and
- Installation of a Solinst Barologger at piezometer A01-D to automatically barometric pressure at 20 minute increments. The barometric pressure is used for correction of Levelogger data.

The purpose of gauging and installation of automated loggers was to monitor water level fluctuations that may occur due to seasonal changes and rainfall influences, in both deep and alluvial screened piezometers.

The gauging and installation of loggers was undertaken with reference to “Preliminary Hydrogeological Assessment and Water Monitoring Plan” (Ref 7). Additional automated loggers have now been installed in the majority of piezometers. Loggers are downloaded on a quarterly basis with manual gauging undertaken on a monthly basis only in bores subject to water quality sampling.

The piezometers locations with loggers installed to May 2014 and the screened strata are summarised in Table 2.

Table 2: Summary of Loggers Installed in Piezometers to May 2014

Alluvium	Weathered Zone	Basalt / Sandstone	Coal Measures
• A01-S* and A01-D* • A02-S* and A02-D* • A03-S* and A03-D* • A04-D • A06-S* and A06-D* • A08-S A08-D • A09* • A10 • A11-S and A11-D • A12* • A13 • A14* • A15* • A17-S and A17-D • A18*/SW9 • A19*/SW4 • A20*/SW8 • A21 • A23 • A24-D • A25 • AGE01-S and AGE01-D • AGE02-S and AGE01-D • B3-S and B3-D • M2	• AGE07-W • AGE08W • AGE09-W • AGE10-W • AGE11-W • CPT13 • CPT15 • CPT18 • CPT36 • CPT39-W	• BY0091CH-B (Basalt) • BY0091CH-S (Sandstone) • AGE15 (Sandstone) • M1 (Sandstone)	• AGE07 (Ulan and Coggan) • AGE08 (Coggan) • AGE09 (Coggan) • AGE10 (Coggan) • AGE13 (Coggan) • AGE14 (Coggan) • CP035 / BY0001 (Coggan) • CP028 / BY0007 (Coggan) • CP014 / BY0010 (Coggan) • CP027 / BY0014 (Coggan) • CP045 / BY0016 (Coggan) • OP028 (Ulan and Coggan) • CP063 / BY0204 (Coggan)

Notes to Table 2:

* Dual piezometric head and Electrical Conductivity logger (refer Section 3.2.2)

3.2 Results

3.2.1 Manual Gauging

The results of manual gauging of piezometric head within the piezometers from January to May 2014 are shown in Table 3. Piezometric head levels ranged from 234.40 AHD to 340.79 AHD.

Table 3: Results of Piezometric Head Manual Gauging – January to May 2014

Piezometer ID	A01-D (BY0015-D)	A01-S (BY0015-S)	A02-D	A02-S	A03 -S	A03-D	A04	A06-D	A06-S	A08-D	A08-S	A09 / SW2	A10	A11-D	A11-S	A12 / SW7	A13
Surface RL (AHD)	**247.25**	**247.29**	**299.76**	**299.73**	**288.08**	**288.08**	**294.59**	**275.32**	**275.34**	**267.14**	**267.14**	**255.97**	**278.25**	**312.50**	**312.52**	**341.80**	**251.58**
PVC Stickup (m)	**0.64**	**0.67**	**0.72**	**0.74**	**0.62**	**0.84**	**0.72**	**0.52**	**0.60**	**0.78**	**0.89**	**0.74**	**0.79**	**0.57**	**0.54**	**0.79**	**0.65**
Date	**Piezometric Head RL (AHD)**																
13/01/2014		242.07															248.66
14/01/2014												252.57					
15/01/2014									271.79								338.91
16/01/2014				296.41													
17/01/2014																	
17/02/2014		241.93															
18/02/2014	241.90							271.42	271.46			252.39		309.51	309.58		248.71
19/02/2014										262.66	262.67		271.44			338.74	
20/02/2014			296.26	296.23	286.13	286.14											
21/02/2014							292.09								309.57		
4/03/2014																	248.65
5/03/2014																	
17/03/2014																	
18/03/2014	241.89	241.94										252.52					248.74
19/03/2014			296.19	296.15				271.31	271.33							338.62	
20/03/2014																	
13/04/2014		242.19															
14/04/2014	240.97							270.19				252.60					
15/04/2014			296.15	296.12												338.51	248.93
16/04/2014																	
19/05/2014		242.24															
20/05/2014					286.13	286.16	291.95	271.47	271.49	263.27	263.27	252.58	271.20				248.96
21/05/2014			296.11	296.08										309.72	309.78	338.34	
22/05/2014	242.19																

Table 3: Results of Piezometric Head Manual Gauging – January to May 2014 (Continued)

Piezometer ID	A14 / SW5	A15 / SW1	A16/ SW6	A17-D	A17-S	A18 / SW9	A19/ SW4	A20	A21	A22?	A23	A23-W	A24-D	A24-S	A25	AGE01-D	AGE01-S
Surface RL (AHD)	**280.17**	**299.99**	**220.01**	**321.09**	**321.11**	**327.63**	**246.29**	**273.73**	**313.68**	**261.69**	**333.42**	**333.28**	**342.42**	**342.48**	**351.49**	**237.36**	**237.35**
PVC Stickup (m)	**0.70**	**0.74**	**0.81**	**0.65**	**0.66**	**0.65**	**0.75**	**0.68**	**0.63**	**0.63**	**0.63**	**0.53**	**0.46**	**0.58**	**0.61**	**0.60**	**0.72**
Date	**Piezometric Head RL (AHD)**																
13/01/2014																	
14/01/2014	273.05																
15/01/2014		296.97				325.16		270.84									
16/01/2014												324.13					
17/01/2014																	
17/02/2014							242.86									234.42	234.43
18/02/2014	273.02			319.05	319.05	324.95		270.46			Dry	324.04	334.19				
19/02/2014		296.74							299.41								
20/02/2014						324.94											
21/02/2014							242.89										
4/03/2014		296.68															
5/03/2014							242.91										
17/03/2014																	
18/03/2014	273.00																
19/03/2014		296.59						270.36									
20/03/2014						324.85					324.15	324.01	334.18				
13/04/2014																	
14/04/2014	273.01							270.40									
15/04/2014		296.47									324.16	323.97	334.17				
16/04/2014						324.81	243.16										
19/05/2014																234.48	234.48
20/05/2014	272.97						243.21										
21/05/2014		296.30		319.30	319.31	324.75						323.95	334.16				
22/05/2014								270.47									

Table 3: Results of Piezometric Head Manual Gauging – January to May 2014 (Continued)

Piezometer ID	AGE03-W	AGE04	AGE04-D	AGE04-S	AGE04-W	AGE05	AGE05-A	AGE05-W	AGE07	AGE07W	AGE08	AGE08-W	AGE09	AGE09W	AGE10	AGE10W	AGE11-W
Surface RL (AHD)	**246.93**	**257.08**	**257.07**	**257.05**	**257.06**	**259.92**	**259.91**	**259.88**	**270.68**	**270.68**	**282.09**	**282.03**	**285.69**	**285.81**	**298.30**	**298.47**	**326.05**
PVC Stickup (m)	**0.65**	**0.00**	**0.56**	**0.52**	**0.57**	**0.57**	**0.56**	**0.62**	**0.66**	**0.64**	**0.62**	**0.73**	**0.63**	**0.69**	**0.49**	**0.55**	**0.63**
Date	**Piezometric Head RL (AHD)**																
13/01/2014											272.98						
14/01/2014	241.98																
15/01/2014															281.82		
16/01/2014		250.50	250.58	250.54	250.58	253.06	253.04	252.97									
17/01/2014																	
17/02/2014	241.82																
18/02/2014		250.57	250.57	250.54	250.58	254.03	252.92		256.32	258.48	272.77						317.94
19/02/2014													273.33	271.85	281.75		
20/02/2014										258.48				274.53			
21/02/2014									256.32		272.76				281.71	284.35	
4/03/2014																	317.84
5/03/2014																	
17/03/2014																	
18/03/2014	241.83										272.68	274.45					
19/03/2014															281.62	284.30	
20/03/2014		250.55	250.57	250.54	250.58	253.95	252.83	252.77									
13/04/2014																	
14/04/2014											272.65	274.57					
15/04/2014		250.63	250.63	250.60	250.64	253.99	252.80	252.75							281.60	284.36	
16/04/2014																	
19/05/2014	242.11	250.61	250.61	250.57	250.61	253.95	252.76	252.72	256.10	258.39	272.78	274.64					
20/05/2014													273.01	274.53			
21/05/2014															281.48	284.33	317.78
22/05/2014																	

Table 3: Results of Piezometric Head Manual Gauging – January to May 2014 (Continued)

Piezometer ID	AGE12-W	AGE13	AGE13-W	BY0001 (CP035)	BY0007	BY0010 (CP014)	BY0014 (CP027)	BY0015 (CP009) - artesian	BY0016 (CP045)	BY0204	BY0091-B	BY0091-S	BY0188CH (OP020)	OP028	OP032	CPT15	CPT18
Surface RL (AHD)	**327.69**	**354.97**	**355.05**	**375.92**	**368.85**	**301.40**	**259.38**	**247.28**	**292.79**	**296.74**	**363.78**	**363.79**	**326.48**	**332.37**	**382.90**	**285.63**	**297.37**
PVC Stickup (m)	**0.43**	**0.60**	**0.56**	**0.85**	**0.35**	**0.74**	**0.73**	**0.69**	**0.69**	**0.74**	**0.59**	**0.64**	**0.62**	**0.64**	**0.64**	**0.63**	**0.48**
Date	**Piezometric Head RL (AHD)**																
13/01/2014							253.69		271.20								
14/01/2014								250.52									
15/01/2014																	
16/01/2014																	278.52
17/01/2014		319.42															
17/02/2014					253.64			250.21			340.79	330.51					
18/02/2014														322.86			
19/02/2014							253.67		271.02							275.81	
20/02/2014		319.52			253.70	251.06				287.63			294.24				278.49
21/02/2014				272.97												275.73	
4/03/2014									270.96								
5/03/2014																	
17/03/2014							253.61		270.97								
18/03/2014								251.03									
19/03/2014																	
20/03/2014	324.70	319.39															278.47
13/04/2014							253.68	250.21	271.06								
14/04/2014																	
15/04/2014		319.41															
16/04/2014	324.67																
19/05/2014					253.63			249.91	271.01		340.79	330.51					
20/05/2014							253.61						294.22			275.42	278.40
21/05/2014	324.61	319.38												322.86			
22/05/2014				272.66		251.07											

Table 3: Results of Piezometric Head Manual Gauging – January to May 2014 (Continued)

Piezometer ID	CPT36	CPT39	CPT13	B3-S	B3-D	AGE02-S	AGE02-D	M1	M2	AGE14	AGE15
Surface RL (AHD)	301.42	306.47	290.93	310.61	310.61	248.81	248.80	277.77	262.80	309.36	303.23
PVC Stickup (m)	0.63	0.65	0.62	0.54	0.51	0.57	0.51	0.45	0.50	0.54	0.50
Date	Piezometric Head RL (AHD)										
13/01/2014											
14/01/2014						246.06	246.07	261.31	257.72		
15/01/2014	289.67			298.77	298.85						
16/01/2014		286.40								286.27	282.61
17/01/2014											
17/02/2014						245.92	245.93				
18/02/2014											
19/02/2014	289.77	286.40	274.36	298.62	298.77					286.37	284.71
20/02/2014											
21/02/2014	289.68	286.40									
4/03/2014											
5/03/2014											
17/03/2014											
18/03/2014						245.90	245.91				
19/03/2014	289.63			298.15	298.56						
20/03/2014		286.51								286.22	285.13
13/04/2014											
14/04/2014											
15/04/2014				298.33	298.47						
16/04/2014				297.41	298.51					286.31	285.30
19/05/2014						246.03	246.04	261.31	257.49		
20/05/2014	289.65		275.07							286.25	285.34
21/05/2014				300.57	300.59						
22/05/2014		286.51									

3.2.2 Automated Level Logging

Plots of water level versus time for installed loggers and manual gauging levels are shown in Appendix B together with daily rainfall data collected at the CCL weather station at Bylong.

The results indicate varied response to rainfall, with greater response in the Alluvial Aquifer.

The results of EC logging are discussed in Section 4.

4. Automated Salinity Logging

4.1 Overview

Dual automated Electrical Conductivity (EC) and piezometric head (i.e. water level) loggers were installed in shallow and deeper alluvium screened piezometers to monitor changes in EC that may occur due to seasonal changes, rainfall influences and the depth within the alluvium for the assessment of baseline conditions.

The loggers were installed in piezometers using stainless steel wire to monitor EC at a fixed depth at 20 minute intervals. The loggers were generally positioned within the central to lower part of the piezometer screen to account for fluctuating water levels (i.e. minimise potential for the water table falling below the depth of the logger).

The piezometers locations with salinity loggers installed to May 2014 are summarised in Table 4.

Table 4: Summary of Loggers Installed in Piezometers to May 2014

Alluvium	Shallow Alluvium Adjacent to Surface Water Feature
• A01-S and A01-D • A02-S and A02-D • A03-S and A03-D • A06-S and A06-D • A09 • A12 • A14 • A15	• A18/SW9 • A19/SW4 • A20/SW8

Notes to Table 4:

"-D" suffix indicates deeper alluvium piezometer (installed to the base of the Alluvium)

"-S" suffix indicates shallow alluvium piezometer

Loggers installed at locations A18, A19 and A20 were connected to the surface flow gauge telemetry systems as discussed in Section 5.

The results of water level logging are discussed in Section 3.

4.2 Results

The results of ongoing logged EC are plotted against rainfall and are included in Appendix B. The range of measured EC is summarised in Table 5.

Table 5: Range of Measured Electrical Conductivity in Loggers

Location ID	Range of EC by Logger (µS/cm)
A01-S	1670 to 3340
A01-D	900 to 1060
A02-S	1060 to 1290
A02-D	830 to 990
A03-S	1330 to 3190
A03-D	1045 to 1185
A06-S	850 to 1680
A06-D	580 to 680
A09	305 to 2200
A12	160 to 310
A14	1380 to 1650
A15	110 to 390
A18/SW9	140 to 580
A19/SW4	960 to 1830
A20/SW8	565 to 1720

The results indicate that for shallower screened locations (i.e. A01-S, A02-S, A03-S and A06-S) the electrical conductivity fluctuates in apparent response to rainfall, with increases in salinity following rainfall. For deeper screened locations, the salinity is relatively consistent and generally less than for the shallow locations.

There is at times a slight difference between the logger readings and the manual readings and this is likely to be due to differences in the measurement method. Groundwater sampling using the low-flow pump also allows for some mixing of the water within the piezometer, whereas the logger measures EC at a specific and constant depth within the screen.

It is noted that apparent spikes/decline following sampling often occurs due to disturbance of the water column.

5. Surface Water Flow Monitoring

Updated figures of surface water flow and depth at SW4, SW8 and SW9 the period 25 July 2012 to 15 May 2014 are included in Appendix B. The velocity meters are rated for flow depths between 0.08 m and 1.5 m and at times when the water depths drops below 0.08 m, there is increased scatter in the output and the results are potentially unreliable. These remaining results should therefore be considered as approximate only. A line of best fit has been provided to assist with interpretation.

It is noted that in general low rainfall has occurred, in particular for the latter part of the monitoring period. Surface water flows have therefore significantly reduced. Locations SW9 was dry for the majority of the monitoring period.

It is noted that at times telemetry systems have at times been faulty, however, this has generally occurred during periods of low flow or no flow. Meter malfunction occurred at SW4 from 1 March 2013 to 2 April 2013 following a high water flow event which partially buried the flow unit with sands from the creek bed. Observations of surface water flows have been supplemented with weekly photographs from each telemetry unit, with comments provided on the plots in Appendix B.

The locations of the surface flow gauges at SW4, SW8 and SW9 are shown on Drawing 1 in Appendix D.

6. Water Quality Monitoring

6.1 Overview

Groundwater and surface water quality monitoring was undertaken with reference to the Preliminary Hydrogeological Assessment and Water Monitoring Plan (Ref 7). The purpose of the water monitoring was to assess the quality of water within the aquifer systems, namely: groundwater present within alluvial and coal measure aquifers; and surface waters present within the alluvial aquifers.

Groundwater and surface water monitoring commenced in February 2012 and has generally been undertaken monthly and is proposed to continue on this basis.

Monitoring locations were selected on the basis of the conceptual model and the results of hydraulic testing and have developed throughout the investigation as access became available. Broadly, monitoring locations were selected as follows:

- **Groundwater:** piezometers installed in the alluvial aquifer and the Coggan Seam to allow for collection of representative groundwater samples;
- **Surface Water:** at upstream, downstream, and central creek and river locations within the tenement based on the local and regional topography. Upstream locations are generally located in the northern areas of the tenement, downstream locations in southern areas, as well as central and eastern locations targeting mid-site surface water quality. Shallow piezometers installed at surface water locations allow collection of shallow groundwater at times when there is no surface water flow.

Groundwater and surface water monitoring conducted at the site from January to May 2014 is outlined below.

6.2 Groundwater Sampling and Testing

Groundwater sampling was undertaken on five occasions over the period of January 2014 to May 2014. A total of 20 piezometers were sampled over the period for the continued assessment of baseline groundwater quality as shown in Table 6. It is noted that A19 was dry during the monitoring period. Alluvial well A06-S was dry on two occasions, therefore, piezometer A06-D was sampled on as a substitute.

Table 6: Summary of Sampled Groundwater Piezometers – January to May 2014

Piezometer ID	Screened Stratum	Number of Monthly Sampling Events	Sampling Events
A01-S	Alluvium	5	January, February, March, April, May 2014
A02-S	Alluvium	5	January, February, March, April, May 2014
A06-S	Alluvium	3	January, February, March 2014
A06-D	Alluvium	2	April, May 2014 (as substitute for A06-S)
A09	Alluvium	5	January, February, March, April, May 2014
A12	Alluvium	5	January, February, March, April, May 2014
A13	Alluvium	5	January, February, March, April, May 2014
A14	Alluvium	5	January, February, March, April, May 2014
A15	Alluvium	5	January, February, March, April, May 2014
A18	Alluvium	5	January, February, March, April, May 2014
A19	Alluvium	0	-
A20	Alluvium	5	January, February, March, April, May 2014
B3-S	Alluvium	5	January, February, March, April, May 2014
B3-D	Alluvium	5	January, February, March, April, May 2014
AGE08	Coggan Seam	5	January, February, March, April, May 2014
AGE10	Coggan Seam	5	January, February, March, April, May 2014
AGE13	Coggan Seam	5	January, February, March, April, May 2014
BY0014CH	Coggan Seam	5	January, February, March, April, May 2014
BY0015CH	Coggan Seam	5	January, February, March, April, May 2014
BY0016CH	Coggan Seam	5	January, February, March, April, May 2014

Groundwater sampling of piezometers continues to occur on a monthly basis. Additional bores have been added throughout the course of the program following installation and development.

Piezometers B3-S and B3-D were added to the monitoring program in January 2014.

The methods of water level gauging, purging and sampling are outlined in Reference 5.

6.3 Surface Water Sampling and Testing

Nine surface water monitoring locations (SW1 to SW9) were selected to provide surface water quality baseline data. The locations are situated at upstream, downstream, and central creek and river locations within the tenement. Upstream locations are generally located in the northern areas of the tenement, downstream locations in southern areas, as well as central and eastern locations targeting mid-site surface water quality.

Monthly surface water sampling was undertaken on five occasions over the period of January to May 2014, however, it is noted that all sample locations were dry with the exception of SW4.

Shallow groundwater piezometers were installed in 2012 adjacent to all surface water sampling locations, with the exception of SW3 due to the presence of shallow rock. The purpose of these piezometers was to enable sampling of shallow groundwater when surface water was not present for the collection of baseline water quality information. In the instance that surface water was not present at the time of sampling, the piezometers were sampled where water was present (refer Section 6.2).

The surface water locations and alternative piezometers sampled from January to May 2014 are summarised in Table 7.

Table 7: Summary of Surface Water Sampling – January to May 2014

Surface Water Location	No. of Surface Water Sampling Events	Alternative Shallow Piezometer	No. of Piezometer Sampling Events
SW1	0	A15	5 (January, February, March, April, May 2014)
SW2	0	A13	5 (January, February, March, April, May 2014)
SW3	0	-	-
SW4	5 (January, February, March, April, May 2014)	A19	0
SW5	0	A14	5 (January, February, March, April, May 2014)
SW6	0	A16	0
SW7	0	A12	5 (January, February, March, April, May 2014)
SW8	0	A20	5 (January, February, March, April, May 2014)
SW9	0	A18	5 (January, February, March, April, May 2014)

Surface water and piezometer sampling methods are outlined in Reference 5. The sampling locations are shown on Drawing 1 in Appendix E.

6.4 Laboratory Testing

Laboratory testing was undertaken by Envirolab, a laboratory registered with the NATA. Analytical methods used are shown on the laboratory sheets in Appendix C.

Surface water and piezometer samples were analysed for the following:

- pH;
- Electrical Conductivity (EC);
- Turbidity;
- Alkalinity: Hydroxide (OH^-) as $CaCO_3$, Carbonate (CO_3^{2-}) as $CaCO_3$, Bicarbonate (HCO_3^-) as $CaCO_3$ and Total Alkalinity as $CaCO_3$;
- Anions: Chloride (Cl^-), Ammonia (NH_3) as Nitrogen (N), Nitrogen Oxides (NO_2^- and NO_3^-) and Sulphate (SO_4^{2-});
- Cations: Sodium (Na^+), Potassium (K^+), Calcium (Ca^{2+}) and Magnesium (Mg^{2+});
- Total Phosphorous (P); and

- Dissolved metals (16): Aluminium (Al), Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Vanadium (V), Zinc (Zn).

Laboratory testing of pH was undertaken in additional to the field measurements. The measurement of pH in the field is considered more reliable / representative as pH is highly sensitive and can change during sample transport. Therefore field pH readings are generally presented, with the exception of a number of occasions where malfunction of the field meter occurred, in which case the laboratory results are presented.

For the purposes of QA/QC, one duplicate surface water sample was generally collected for each sampling event analysed for the above suite. The results are detailed in the QA/QC report located in Appendix D.

It is noted that it is general industry practice to collect unfiltered surface water samples metal analyses, therefore providing total analyte concentrations. At the request of NOW, surface water samples were tested for dissolved metals (i.e. field filtered) to allow direct comparison of results with dissolved metal concentrations in groundwater as outlined in the Preliminary Hydrogeological Assessment and Water Monitoring Plan (Ref 7).

6.5 Results

6.5.1 Field Observations

A summary of field observations and measured field parameters for groundwater and surface water sampling undertaken from January to May 2014 is provided in Table 8 and Table 9.

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Table 8: Groundwater Field Parameters and Observations

Location ID	Date Sampled	pH	EC (µS/cm)	Eh (mV)	DO (ppm)	Turbidity (NTU)	Temp (°C)	Comments
A01-S	14/01/2014	7.0	2169	-137	0.2	0.1	18.9	Generally clear
	7/02/2014	7.2	2230	-80	0.8	0.9	17.9	Generally clear, trace black/dark fines, slight sulphur odour
	18/03/2014	6.3	2310	-121	0.3	0.7	16.7	Generally clear, sulphur odour
	13/04/2014	6.4	2580	-113	0.7	1.2	18.9	Generally clear, slight sulphur odour
	19/05/2014	6.8	1772	-84	0.4	2.7	18.9	Generally clear, slight sulphur odour
A02-S	16/01/2014	6.8	1256	73	3.0	61.5	20.8	Slightly turbid light brown
	20/02/2014	7.1	1227	152	4.8	517.0	23.1	Very turbid, light brown/moderate
	19/03/2014	6.8	1274	55	2.3	989.0	29.3	Very turbid, sediment laden, limited water
	15/04/2014	7.1	1179	19	3.1	>2000	21.3	Very turbid, brown, limited water in well
	21/05/2014	6.8	902	76	0.2	44.9	18.6	Slightly turbid grey
A06-S	15/01/2014	6.7	960	40	0.3	36.7	18.1	Slightly turbid, grey/brown
	18/02/2014	7.0	946	87	3.9	124.0	20.5	Slightly turbid grey
	19/03/2014	7.3	943	41	1.9	287.0	18.0	Slightly turbid grey
A06-D	14/04/2014	6.8	798	25	0.3	105.2	18.1	Generally clear/slightly turbid grey
	20/05/2014	6.5	684	47	0.1	26.0	18.0	Generally clear
A09	14/01/2014	6.8	2220	19	0.0	6.4	21.9	Generally clear
	18/02/2014	7.1	2061	126	2.2	16.7	20.5	Generally clear
	18/03/2014	6.7	2450	-130	0.2	28.8	21.4	Generally clear
	14/04/2014	7.0	2580	42	1.5	19.7	21.6	Generally clear
	20/05/2014	6.6	2082	74	0.3	25.0	20.2	Generally clear
A12	15/01/2014	5.4	323	42	2.0	229.0	21.1	Very turbid, grey
	19/02/2014	5.6	302	135	0.8	333.0	20.4	Moderately turbid grey
	19/03/2014	5.3	317	61	0.2	498.0	19.1	Moderately turbid grey
	15/04/2014	6.7	308	16	4.4	96.0	19.2	Slight/generally clear
	21/05/2014	5.3	303	78	0.2	103.0	19.3	Slight
A13	13/01/2014	5.3	1373	26	0.3	4.1	20.2	Generally clear
	18/02/2014	7.0	1428	130	0.2	1.9	18.3	Generally clear
	18/03/2014	6.7	1407	-28	0.2	1.3	18.3	Generally clear
	15/04/2014	6.6	1395	55	0.5	2.6	19.2	Generally clear
	20/05/2014	6.9	1123	56	0.2	6.0	19.2	Generally clear
A14	14/01/2014	6.7	1661	93	2.8	594.0	21.8	Moderately turbid
	18/02/2014	7.2	1700	158	5.1	58.9	17.7	Slight
	18/03/2014	7.5	1758	18	4.9	29.2	18.5	Generally clear
	14/04/2014	7.2	1744	42	4.5	150.7	20.7	Moderate/slight
	20/05/2014	6.2	1377	62	4.3	35.5	18.5	Generally clear
A15	15/01/2014	6.2	298	73	0.1	9.0	19.9	Generally clear
	19/02/2014	6.3	272	139	0.2	7.1	18.8	Generally clear
	19/03/2014	5.9	291	14	0.2	18.1	19.4	Generally clear
	15/04/2014	6.6	274	12	3.7	90.4	18.7	Generally clear, slight grey
	21/05/2014	5.5	264	41	0.4	11.3	18.6	Generally clear
A18	15/01/2014	5.5	364	-5	0.1	101.7	20.0	Moderately turbid, light brown, slight
	20/02/2014	6.6	325	47	0.7	69.7	18.0	Generally clear
	20/03/2014	5.8	333	133	0.2	33.6	18.4	Generally clear
	16/04/2014	6.5	322	70	0.9	16.7	19.6	Generally clear
	21/05/2014	6.5	304	57	0.2	18.8	19.2	Generally clear

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Table 8: Groundwater Field Parameters and Observations (Cont'd)

Location ID	Date Sampled	pH	EC (µS/cm)	Eh (mV)	DO (ppm)	Turbidity (NTU)	Temp (°C)	Comments
A20	15/01/2014	7.4	1071	-9	5.5	195.0	17.6	Slightly turbid
	18/02/2014	7.3	1004	13	6.0	40.7	22.8	Generally clear
	19/03/2014	5.9	1144	41	0.5	422.0	18.9	Moderate
	14/04/2014	6.8	1122	26	6.3	20.4	18.0	Generally clear
	22/05/2014	5.5	1160	-16	0.3	40.5	19.8	Slight brown
AGE08W	13/01/2014	6.7	1308	-30	0.3	5.9	24.6	Generally clear
	18/02/2014	7.1	1270	63	0.3	6.1	20.0	Generally clear
	18/03/2014	6.0	1320	59	0.4	71.8	21.0	Slight / Generally clear
	14/04/2014	7.0	1323	33	0.5	8.5	20.4	Generally clear
	19/05/2014	6.0	715	69	0.2	3.6	19.3	Generally clear
AGE10	15/01/2014	6.5	2140	-122	0.2	89.1	23.9	Slightly turbid, grey-brown
	19/02/2014	6.7	2190	-121	0.1	80.5	20.9	Generally clear / slightly turbid grey-brown
	19/03/2014	6.8	2290	-186	0.5	33.1	22.3	Generally clear
	15/04/2014	6.9	2239	-194	0.4	46.0	21.4	Generally clear / slightly turbid, dark grey
	21/05/2014	7.0	1911	-132	0.3	22.3	18.5	Generally clear
AGE13	16/01/2014	6.9	1707	68	1.1	84.6	25.0	Generally clear, trace grey suspended fines
	20/02/2014	7.0	1630	94	1.7	53.7	19.0	Generally clear
	20/03/2014	7.0	1683	127	3.6	16.3	21.2	Generally clear
	15/04/2014	6.9	1118	8	1.6	20.8	20.9	Generally clear
	21/05/2014	6.5	1600	102	3.3	4.8	21.9	Generally clear
B3-D	15/01/2014	7.8	973	NT	3.0	91.5	20.7	Slightly turbid, dark grey suspended fines
	19/02/2014	5.8	903	-88	0.3	65.5	20.9	Slight turbid, dark grey
	19/03/2014	6.1	880	-108	0.3	28.7	19.2	Generally clear
	15/04/2014	6.7	870	-83	4.3	28.9	19.3	Generally clear, slightly grey
	21/05/2014	6.0	646	-83	0.5	17.3	18.2	Generally clear / slightly dark grey
B3-S	15/01/2014	6.8	307	43	4.2	731.0	22.4	Very turbid, light brown
	19/02/2014	6.5	266	8	2.5	32.0	22.2	Generally clear, slight
	19/03/2014	6.6	295	-71	2.3	372.0	20.5	Slightly turbid, light brown
	15/04/2014	6.0	290	47	1.9	24.3	19.2	Generally clear / slight
	21/05/2014	4.8	183	60	3.6	163.1	18.6	Slightly to moderately turbid, light brown
BY0014CH	13/01/2014	7.1	1117	-116	0.2	0.5	28.2	Generally clear
	19/02/2014	7.5	1057	-57	0.2	0.2	19.1	Generally clear
	17/03/2014	7.6	1118	-125	0.4	0.5	19.7	Generally clear
	13/04/2014	7.4	1108	-94	1.6	0.2	20.9	Generally clear
	20/05/2014	7.4	944	51	0.3	2.3	17.1	Generally clear
BY0015CH	14/01/2014	7.5	1184	-130	1.0	1.4	19.4	Generally clear, flowing (artesian)
	17/02/2014	7.8	1265	-95	1.6	0.9	20.5	Generally clear, flowing (artesian)
	18/03/2014	7.8	1239	-111	0.7	1.6	16.9	Generally clear, flowing (artesian), slight sulphur odour
	13/04/2014	7.4	1205	-76	0.4	0.4	18.3	Generally clear, flowing (artesian)
	19/05/2014	7.3	1022	-67	0.7	0.1	17.9	Generally clear, flowing (artesian), slight sulphur odour
BY0016CH	13/01/2014	6.8	2320	-117	0.2	4.1	24.3	Generally clear
	19/02/2014	7.2	2380	-81	0.2	0.5	19.7	Generally clear
	17/03/2014	7.2	2470	-63	0.4	12.7	20.5	Generally clear
	13/04/2014	6.7	2430	-16	0.4	4.3	20.2	Generally clear
	19/05/2014	6.9	1931	-50	0.4	5.4	19.4	Generally clear

Notes to Table 8:

DO – Dissolved Oxygen
EC – Electrical Conductivity
NT – Not tested
NTU – Nephelometric Turbidity Units
ppm – parts per million

Table 9: Surface Water Field Parameters and Observations

Location ID	Date	pH	EC (µS/cm)	ORP (mV)	DO (ppm)	Turbidity (NTU)	Temp (°C)	Comments
SW4	13/01/2014	6.8	2189	83	1.41	6.5	19.9	Generaly clear, no flow
	17/02/2014	7.2	3400	121	4.05	8.6	22.6	Generaly clear, no flow , large body of pooled w ater
	13/03/2014	7.7	1244	29	2.70	8.7	15.3	Generaly clear, no flow , large body of pooled w ater
	16/04/2014	6.7	2092	53	3.3	5.1	16.6	Generaly clear, trace algae
	20/05/2014	6.4	1666	121	7.11	7.8	12.7	Generaly clear, no flow , large body of pooled w ater

Notes to Table 9:

DO – Dissolved Oxygen
EC – Electrical Conductivity
ppm – parts per million
NTU – Nephelometric Turbidity Units
ORP – Oxidation Reduction Potential

6.5.2 Analytical Testing

The laboratory report sheets and summarised results tables for surface water analyses from February 2012 to May 2014 are included in Appendix C.

The DECC "*Guidelines for the Assessment and Management of Groundwater Contamination"* (Ref 2) state that the applicable guidelines for groundwater contaminants are the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000) guidelines (Ref 1) in the case of protection of aquatic ecosystems. The groundwater investigation levels (GILs) for 95% protection of the aquatic ecosystem should be used.

Groundwater and surface water chemical analysis results were therefore compared to the ANZECC (2000) GILs (trigger values) for slightly to moderately disturbed systems for fresh waters for the assessment of groundwater and surface water quality.

The hierarchy of selecting appropriate ANZECC guideline values was as follows:

- The fresh water trigger levels for slightly to moderately disturbed ecosystems were adopted as the primary guideline value;
- Where no high reliability trigger value is given in ANZECC for fresh water conditions, the high reliability marine water value was adopted as the guideline value; and
- Where neither marine nor freshwater trigger values are given at high reliability, low reliability trigger values were adopted as the guideline value.

The adopted guideline for each tested analyte is highlighted in the summary tables in Appendix C.

The DECC Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (2009, Ref 2) indicate that reference should be also made to the NHMRC & NRMMC *Australian Drinking Water Guidelines* (2011, Ref 12) with respect to groundwater. The laboratory test results were therefore assessed against the Australian Drinking Water Guidelines where there were no guidelines specified by ANZECC.

6.6 Discussion

6.6.1 Water Quality Plots

The results of water quality testing from February 2012 to May 2014 were plotted against time, separated for groundwater and surface water for ease of distinction, and are included in Appendix C.

The plots enable a visual review of parameter concentrations, ranges and trends for individual piezometers and surface water sampling locations. Most parameters are plotted on a logarithmic scale due to the wide variation in values.

The plots also show the relevant ANZECC (2000) criteria (Ref 1), based on the hierarchy selection outlined above in Section 6.5.2. Some parameters have no ANZECC criteria at all, and no line is plotted. For comparison, the most common laboratory practical quantitation limit (PQL) is shown on the graphs as a blue horizontal line. In general, the PQL should be lower than the ANZECC criteria. This was achieved for the majority of analytes.

The observations regarding groundwater and surface water trends for February 2012 to May 2014 monitoring are summarised as follows:

Surface Water

- The pH of surface waters was generally higher than the pH of groundwater. pH values were reasonably consistent between pH 7.5 and 8.5, and were regularly above the ANZECC criteria upper range of pH 8.0 for many locations. The majority of surface water monitoring locations were dry from March 2013, with only SW4;
- EC provides an indirect measure of water salinity. Surface waters were generally fresher than groundwater based on EC, with values ranging from 180 µS/cm to 2,200 µS/cm. ECs were lowest for the March 2012 event-based sampling following several consecutive days of rainfall including 76 mm recorded at the Bylong weather station on 1 March 2012. Similarly lower ECs were observed for the March 2013 sampling event which also followed significant rainfall. Increasing salinity trends were apparent as sampling locations progress downstream, with upstream locations SW1, SW7 and SW9, all located on the upstream reaches with consistently lower EC than SW3 and SW4 which are located on the downstream reaches of the site;
- A similar trend in increasing concentration with distance downstream was also observed for the major anions and cations, in particular Sodium, Magnesium, Potassium, Chloride, Sulphate and Bicarbonate, which indicate increasing salinity;
- Turbidity varied between sampling events, however, was generally within the ANZECC criteria range of 1 to 50 NTU for most monitoring locations;
- Metals Aluminium, Copper and Zinc and to a lesser extent Cobalt were found to be variable both spatially and temporally and regularly exceeded ANZECC criteria at many locations. Cobalt was less variable from April 2013, however, it is noted that the majority of sampling locations were dry;
- Of the remaining metals only occasional minor exceedances of ANZECC criteria were found for Aluminium, Cadmium and Chromium;
- In terms of nutrients, Total Phosphorus and NOx, were highly variable both spatially and temporally and regularly exceeded ANZECC criteria at many locations. Ammonia was present at concentrations within ANZECC criteria.

Groundwater

Groundwater sampling was undertaken for both the Alluvial Aquifer and the Coal Measures (Coggan Seam). Results for piezometers screened in the coal measures are shown as plotted in black to distinguish them from the Alluvial samples. From the plots in Appendix C, the following comments on the difference in groundwater quality between the two aquifers can be made:

- pH values were reasonably consistent between the ANZECC criteria range of pH 6.5 and 8.0. The pH for wells screened in the coal measures were generally slightly higher than those screened in the Alluvium;

- General declining trends in pH from November 2013 are apparent for wells screened in the Alluvium and may be associated with declining water levels which have been recorded over the period;
- ECs generally ranged between 1,000 µS/cm to 3,000 µS/cm for the majority of piezometers. ECs for Coal Measure piezometers were generally evenly spread over this range. The most saline piezometers were BY0016CH which is screened in the coal measures and A01-S screened in the Alluvium;
- In terms of major cations, the results indicated a preference towards sodium and potassium over calcium and magnesium in the coal measures compared to the alluvium. In terms of major anions, the coal measures were generally relatively high in carbonate/bicarbonate with BY0016CH and AGE10 relatively high in Chloride and BY0014CH and AGE08 relatively low in Sulphate;
- Piezometers A12, A15 and A18, respectively installed adjacent to surface water locations SW7, SW1 and SW9, were notably fresher than the remainder of alluvial piezometers. EC values ranged between 250 µS/cm to 400 µS/cm which is considered more representative of surface water quality at these locations (i.e. shallow screened wells). These locations are also located on the upstream reaches of the site;
- Turbidity varied between sampling events and regularly exceeded the ANZECC criteria range of 1 to 50 NTU, however, turbidity is considered to be of limited importance with respect to groundwater as it can be affected by the disturbed conditions near the well;
- Metals Copper and Zinc and to a lesser extent Cobalt were found to highly variable both spatially and temporally and were observed to regularly exceed ANZECC criteria at most of the alluvial locations. Occasional minor exceedances of ANZECC criteria were found for Dissolved Chromium, Beryllium, Nickel, Manganese and Arsenic. Concentrations were generally only slightly in excess of criteria and laboratory detection limits;
- The concentrations of metals in the coal measures was generally less than the criteria, with the exception of BY0016CH, which regularly exceeded for Dissolved Arsenic, Copper, Cobalt and Nickel. There majority of piezometers in the Coal measures regularly exceeded ANZECC criteria for Dissolved Zinc, with occasional exceedances for Arsenic, Beryllium, Cobalt, Copper and Nickel;
- A02-S exceeded ANZECC criteria for Dissolved Selenium for most sampling occasions. A09 exceeded the criteria for one occasion;
- In terms of nutrients, Total Phosphorus and NOx, regularly exceeded the criteria in the Alluvial locations, in particular at A02-S, with Ammonia concentrations below the criteria in all Alluvial wells. The concentrations of Total Phosphorus and NOx were consistently lower in the coal measures wells, with only occasional and exceedances of the criteria. Ammonia concentrations, however, consistently exceeded or were equal to the criteria for the coal measures (with the exception of BY0014CH on two occasions);
- B3-D indicated notably higher concentrations of metals, Ammonia, Total Alkalinity and NOx than other Alluvium screened wells, with water quality similar to that of wells screened in the coal measures. Concentrations regularly exceeded ANZECC criteria for a number of analytes.

6.6.2 Tri-Linear Analysis (Piper Plots)

Tri-linear diagrams of major ionic composition were plotted for groundwater and surface to assess spatial variation in water chemistry and aquifer systems. Separate plots for groundwater and surface water, as well as a combined plot of groundwater and surface water are included in Appendix C.

The plots indicate the following:

- Groundwater in the coal measures is spatially separate (i.e. clustered) from groundwater in the Alluvium. Ionic composition is dominated by Sodium/Potassium and Carbonates, indicative of rock weathering in the coal measures. Groundwater is low in Sulphates;
- Groundwater in the Alluvium generally shows no cation dominance, with the results centrally plotted for cations. In terms of anions, groundwater is lower in Sulphates and high in Carbonates and Chloride;
- Similar ionic composition is apparent for surface water and groundwater in the Alluvium, indicating linkage of water quality;
- Groundwater quality at A02-S is noticeably separate from the other wells screened in the Alluvium. A02-S is dominated by Calcium and Magnesium and is lower in Sodium and Potassium;
- Ionic composition at B3-S and B3-D is notably separate from other Alluvium screened wells, indicating composition is more directed toward groundwater quality in the coal measures.

7. References

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6. Douglas Partners (2013), “Addendum Report on Hydrogeological Investigation and Monitoring, August to December 2012”, Project 49761.03-02, Rev 1, January 2013.
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9. Douglas Partners (2013), “Addendum Report on Hydrogeological Investigation and Monitoring, January to July 2013”, Project 49761.03-05, Rev 1, 26 July 2013.

10. Douglas Partners (2013), "Report on Hydrogeological Investigation and Monitoring – August 2011 to October 2013", Project 49761.03-07, Rev 0, 1 November 2013.
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12. NHMRC, NRMMC (2011), "Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy", National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra, October 2011.

8. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Bylong in accordance with DP's proposal NCL130823-Rev1-Final dated 27 February 2014 and acceptance Purchase Order 113360 dated 21 May 2014. The work was carried out under DP's Conditions of Engagement and Contract BYLP030. This report is provided for the exclusive use of Cockatoo Coal Limited for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Douglas Partners Pty Ltd

Appendix A

About this Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Laboratory Report Sheets (disc only)

Table B1: Summary of Laboratory Test Results – February 2012 to May 2014

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CERTIFICATE OF ANALYSIS **103498**

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	11 Waters
Date samples received / completed instructions received	15/01/14 / 15/01/14

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	22/01/14 / 4/02/14
Date of Preliminary Report:	Not issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

HM in water - dissolved						
Our Reference:	UNITS	103498-1	103498-2	103498-3	103498-4	103498-5
Your Reference	----------	BY0014	BY0015	BY0016	A01-S	A09
Date Sampled	----------	13/01/2014	14/01/2014	13/01/2014	14/01/2014	14/01/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Date analysed	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Arsenic-Dissolved	µg/L	<1	<1	31	2	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	<1	1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	2	3	10	5	7
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	2	<1	2	2
Aluminium-Dissolved	µg/L	8	7	6	5	6
Barium-Dissolved	µg/L	210	100	340	140	110
Beryllium-Dissolved	µg/L	<0.1	<0.1	0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1	<1
Iron-Dissolved	µg/L	120	280	400	1,800	<10
Manganese-Dissolved	µg/L	22	47	27	1,100	110
Vanadium-Dissolved	µg/L	<1	<1	<1	<1	1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1

HM in water - dissolved					
Our Reference:	UNITS	103498-6	103498-7	103498-8	103498-9
Your Reference	----------	A13	A14	AGE08	SW4
Date Sampled	----------	13/01/2014	14/01/2014	13/01/2014	14/01/2014
Type of sample		Water	Water	Water	Water
Date prepared	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Date analysed	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Arsenic-Dissolved	µg/L	<1	<1	2	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	2	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1
Zinc-Dissolved	µg/L	6	4	27	2
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	2	<1	<1	2
Aluminium-Dissolved	µg/L	6	8	7	7
Barium-Dissolved	µg/L	100	100	160	130
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1
Iron-Dissolved	µg/L	13	<10	170	53
Manganese-Dissolved	µg/L	240	<5	110	240
Vanadium-Dissolved	µg/L	1	1	<1	<1
Selenium-Dissolved	µg/L	<1	2	<1	<1

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103498-1 BY0014 13/01/2014 Water	103498-2 BY0015 14/01/2014 Water	103498-3 BY0016 13/01/2014 Water	103498-4 A01-S 14/01/2014 Water	103498-5 A09 14/01/2014 Water
Date prepared	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Date analysed	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Calcium - Dissolved	mg/L	37	45	31	120	100
Potassium - Dissolved	mg/L	12	13	19	7.4	11
Sodium - Dissolved	mg/L	210	210	630	270	320
Magnesium - Dissolved	mg/L	21	27	21	100	91
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	500	440	1,100	440	430
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	500	440	1,100	440	430
Sulphate, SO4	mg/L	<1	32	10	230	190
Chloride, Cl	mg/L	83	120	200	370	400
Ionic Balance	%	3.2	3.5	4.9	5.1	5.8

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103498-6 A13 13/01/2014 Water	103498-7 A14 14/01/2014 Water	103498-8 AGE08 13/01/2014 Water	103498-9 SW4 14/01/2014 Water	103498-10 RT1 14/01/2014 Water
Date prepared	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Date analysed	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Calcium - Dissolved	mg/L	82	120	37	130	2.8
Potassium - Dissolved	mg/L	6.5	5.9	16	7.8	6.1
Sodium - Dissolved	mg/L	120	170	250	240	0.9
Magnesium - Dissolved	mg/L	67	90	29	110	1
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	310	480	600	420	27
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	310	480	600	420	27
Sulphate, SO4	mg/L	90	210	1	220	1
Chloride, Cl	mg/L	230	170	88	350	2
Ionic Balance	%	2.9	5.0	3.6	5.7	-19

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103498-11 RT4 14/01/2014 Water
Date prepared	-	16/01/2014
Date analysed	-	16/01/2014
Calcium - Dissolved	mg/L	<0.5
Potassium - Dissolved	mg/L	<0.5
Sodium - Dissolved	mg/L	<0.5
Magnesium - Dissolved	mg/L	<0.5
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	7
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	7
Sulphate, SO4	mg/L	<1
Chloride, Cl	mg/L	<1
Ionic Balance	%	-100

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	103498-1	103498-2	103498-3	103498-4	103498-5
Your Reference	----------	BY0014	BY0015	BY0016	A01-S	A09
Date Sampled	----------	13/01/2014	14/01/2014	13/01/2014	14/01/2014	14/01/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Date analysed	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	0.07	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	103498-6	103498-7	103498-8	103498-9	103498-10
Your Reference	----------	A13	A14	AGE08	SW4	RT1
Date Sampled	----------	13/01/2014	14/01/2014	13/01/2014	14/01/2014	14/01/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Date analysed	-	16/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014
Phosphorus - Total	mg/L	<0.05	1.6	<0.05	<0.05	0.2

Metals in Waters - Acid extractable		
Our Reference:	UNITS	103498-11
Your Reference	----------	RT4
Date Sampled	----------	14/01/2014
Type of sample		Water
Date prepared	-	16/01/2014
Date analysed	-	16/01/2014
Phosphorus - Total	mg/L	<0.05

Client Reference: 49761.03, Bylong

HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103498-10 RT1 14/01/2014 Water	103498-11 RT4 14/01/2014 Water
Date prepared	-	16/01/2014	16/01/2014
Date analysed	-	16/01/2014	16/01/2014
Arsenic-Total	µg/L	<1	<1
Cadmium-Total	µg/L	0.1	0.1
Chromium-Total	µg/L	<1	<1
Copper-Total	µg/L	26	1,000
Lead-Total	µg/L	11	14
Zinc-Total	µg/L	8,800	600
Mercury-Total	µg/L	<0.05	<0.05
Nickel-Total	µg/L	1	5
Aluminium-Total	µg/L	13	16
Barium-Total	µg/L	9	7
Beryllium-Total	µg/L	<0.1	<0.1
Cobalt-Total	µg/L	<1	<1
Iron-Total	µg/L	130	<10
Manganese-Total	µg/L	49	9
Vanadium-Total	µg/L	<1	<1
Selenium-Total	µg/L	<1	<1

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Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103498-1 BY0014 13/01/2014 Water	103498-2 BY0015 14/01/2014 Water	103498-3 BY0016 13/01/2014 Water	103498-4 A01-S 14/01/2014 Water	103498-5 A09 14/01/2014 Water
Date prepared	-	15/01/2014	15/01/2014	15/01/2014	15/01/2014	15/01/2014
Date analysed	-	15/01/2014	15/01/2014	15/01/2014	15/01/2014	15/01/2014
pH	pH Units	7.6	7.3	7.2	7.2	7.1
Electrical Conductivity	µS/cm	1,100	1,200	2,500	2,300	2,400
NOx as N in water	mg/L	0.02	<0.005	0.02	0.07	0.02
Ammonia as N in water	mg/L	1.0	0.95	2.0	0.048	<0.005
Turbidity	NTU	2.6	4.6	3.9	6.3	5.0

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103498-6 A13 13/01/2014 Water	103498-7 A14 14/01/2014 Water	103498-8 AGE08 13/01/2014 Water	103498-9 SW4 14/01/2014 Water	103498-10 RT1 14/01/2014 Water
Date prepared	-	15/01/2014	15/01/2014	15/01/2014	15/01/2014	15/01/2014
Date analysed	-	15/01/2014	15/01/2014	15/01/2014	15/01/2014	15/01/2014
pH	pH Units	7.1	7.3	7.3	7.6	6.5
Electrical Conductivity	µS/cm	1,400	1,800	1,300	2,300	70
NOx as N in water	mg/L	0.4	1.3	0.02	0.04	1.8
Ammonia as N in water	mg/L	<0.005	<0.005	1.6	<0.005	<0.005
Turbidity	NTU	4.1	1,600	3.2	3.1	0.3
Total Cyanide	mg/L	[NA]	[NA]	[NA]	[NA]	<0.004

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103498-11 RT4 14/01/2014 Water
Date prepared	-	15/01/2014
Date analysed	-	15/01/2014
pH	pH Units	6.4
Electrical Conductivity	µS/cm	14
NOx as N in water	mg/L	0.1
Ammonia as N in water	mg/L	<0.005
Turbidity	NTU	0.1
Total Cyanide	mg/L	<0.004

Client Reference: 49761.03, Bylong

Microbiologocal Testing			
Our Reference:	UNITS	103498-10	103498-11
Your Reference	----------	RT1	RT4
Date Sampled	----------	14/01/2014	14/01/2014
Type of sample		Water	Water
Date testing started	-	15/01/2014	15/01/2014
Date testing completed	-	15/01/2014	15/01/2014
E. Coli	CFU/100mL	<1	<1
Faecal Coliforms	CFU/100mL	<1	<1

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-013	Cyanide - total determined colourimetrically after distillation, based on APHA 22nd ED, 4500-CN_C,E. Free cyanide determined colourimetrically after filtration and confirmed by diffusion. Solids are extracted in a caustic media prior to distillation and analysis.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/01/2014	103498-6	16/01/2014 || 16/01/2014	LCS-W1	16/01/2014
Date analysed	-			16/01/2014	103498-6	16/01/2014 || 16/01/2014	LCS-W1	16/01/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	<1 || <1	LCS-W1	102%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	103498-6	<0.1 || <0.1	LCS-W1	101%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	<1 || <1	LCS-W1	97%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	<1 || <1	LCS-W1	100%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	<1 || <1	LCS-W1	102%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	6 || 6 || RPD: 0	LCS-W1	104%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	120	103498-6	<0.05 || [N/T]	LCS-W1	116%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	2 || 2 || RPD: 0	LCS-W1	98%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	103498-6	6 || 5 || RPD: 18	LCS-W1	107%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	100 || 100 || RPD: 0	LCS-W1	102%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	103498-6	<0.1 || <0.1	LCS-W1	89%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	<1 || <1	LCS-W1	103%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	103498-6	13 || 13 || RPD: 0	LCS-W1	104%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	103498-6	240 || 240 || RPD: 0	LCS-W1	100%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	1 || 1 || RPD: 0	LCS-W1	95%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103498-6	<1 || <1	LCS-W1	99%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			15/01/2013	103498-1	16/01/2014 || 16/01/2014	LCS-W1	16/01/2014
Date analysed	-			15/01/2013	103498-1	16/01/2014 || 16/01/2014	LCS-W1	16/01/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	103498-1	37 || 36 || RPD: 3	LCS-W1	104%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	103498-1	12 || 12 || RPD: 0	LCS-W1	114%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	103498-1	210 || 210 || RPD: 0	LCS-W1	106%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	103498-1	21 || 20 || RPD: 5	LCS-W1	108%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	103498-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	103498-1	500 || 490 || RPD: 2	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	103498-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	103498-1	500 || 490 || RPD: 2	LCS-W1	102%
Sulphate, SO4	mg/L	1	Inorg-081	<1	103498-1	<1 || <1	LCS-W1	117%
Chloride, Cl	mg/L	1	Inorg-081	<1	103498-1	83 || 82 || RPD: 1	LCS-W1	103%
Ionic Balance	%		Inorg-041	[NT]	103498-1	3.2 || 3.1 || RPD: 3	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/01/2014	103498-5	16/01/2014 || 16/01/2014	LCS-W2	16/01/2014
Date analysed	-			16/01/2014	103498-5	16/01/2014 || 16/01/2014	LCS-W2	16/01/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	103498-5	<0.05 || <0.05	LCS-W2	103%
QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/01/2014	103498-10	16/01/2014 || 16/01/2014	LCS-W1	16/01/2014
Date analysed	-			16/01/2014	103498-10	16/01/2014 || 16/01/2014	LCS-W1	16/01/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	<1 || [N/T]	LCS-W1	100%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	103498-10	0.1 || [N/T]	LCS-W1	104%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	<1 || [N/T]	LCS-W1	95%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	26 || [N/T]	LCS-W1	101%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	11 || [N/T]	LCS-W1	100%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	8800 || [N/T]	LCS-W1	99%

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	103498-10	<0.05 || <0.05	LCS-W1	104%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	1 || [N/T]	LCS-W1	98%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	103498-10	13 || [N/T]	LCS-W1	99%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	9 || [N/T]	LCS-W1	102%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	103498-10	<0.1 || [N/T]	LCS-W1	90%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	<1 || [N/T]	LCS-W1	101%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	103498-10	130 || [N/T]	LCS-W1	102%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	103498-10	49 || [N/T]	LCS-W1	97%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	<1 || [N/T]	LCS-W1	96%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	103498-10	<1 || [N/T]	LCS-W1	105%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			15/01/2014	103498-1	15/01/2014 || 15/01/2014	LCS-W1	15/01/2014
Date analysed	-			15/01/2014	103498-1	15/01/2014 || 15/01/2014	LCS-W1	15/01/2014
pH	pH Units		Inorg-001	[NT]	103498-1	7.6 || 7.6 || RPD: 0	LCS-W1	102%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	103498-1	1100 || 1100 || RPD: 0	LCS-W1	101%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	103498-1	0.02 || 0.02 || RPD: 0	LCS-W1	96%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	103498-1	1.0 || 0.86 || RPD: 15	LCS-W1	93%
Turbidity	NTU	0.1	Inorg-022	<0.1	103498-1	2.6 || 2.0 || RPD: 26	LCS-W1	90%
Total Cyanide	mg/L	0.004	Inorg-013	<0.004	[NT]	[NT]	LCS-W1	102%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			[NT]
Date testing completed	-			[NT]
E. Coli	CFU/100 mL	1	Ext-008	[NT]
Faecal Coliforms	CFU/100 mL	1	Ext-008	[NT]

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	103498-1	16/01/2014 || 16/01/2014	103498-2	16/01/2014
Date analysed	-	103498-1	16/01/2014 || 16/01/2014	103498-2	16/01/2014
Mercury-Dissolved	µg/L	103498-1	<0.05 || <0.05	103498-2	116%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	103498-11	16/01/2014 || 16/01/2014	103498-2	16/01/2014
Date analysed	-	103498-11	16/01/2014 || 16/01/2014	103498-2	16/01/2014
Calcium - Dissolved	mg/L	103498-11	<0.5 || <0.5	103498-2	#
Potassium - Dissolved	mg/L	103498-11	<0.5 || <0.5	103498-2	100%
Sodium - Dissolved	mg/L	103498-11	<0.5 || <0.5	103498-2	#
Magnesium - Dissolved	mg/L	103498-11	<0.5 || <0.5	103498-2	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	103498-11	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	103498-11	7 || 6 || RPD: 15	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	103498-11	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	103498-11	7 || 6 || RPD: 15	[NR]	[NR]
Sulphate, SO4	mg/L	103498-11	<1 || <1	103498-2	86%
Chloride, Cl	mg/L	103498-11	<1 || <1	103498-2	115%
Ionic Balance	%	103498-11	-100 || -100 || RPD: 0	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	103498-6	16/01/2014
Date analysed	-	[NT]	[NT]	103498-6	16/01/2014
Phosphorus - Total	mg/L	[NT]	[NT]	103498-6	104%
QUALITY CONTROL HM in water - total	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	103498-11	16/01/2013
Date analysed	-	[NT]	[NT]	103498-11	16/01/2013
Arsenic-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Cadmium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Chromium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Copper-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Lead-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Zinc-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Mercury-Total	µg/L	[NT]	[NT]	103498-11	116%
Nickel-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Aluminium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Barium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Beryllium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Cobalt-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Iron-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Manganese-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Vanadium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Selenium-Total	µg/L	[NT]	[NT]	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	103498-11	15/01/2014 || 15/01/2014	103498-2	15/01/2014
Date analysed	-	103498-11	15/01/2014 || 15/01/2014	103498-2	15/01/2014
pH	pH Units	103498-11	6.4 || 6.3 || RPD: 2	[NR]	[NR]
Electrical Conductivity	µS/cm	103498-11	14 || 8 || RPD: 55	[NR]	[NR]
NOx as N in water	mg/L	103498-11	0.1 || 0.1 || RPD: 0	103498-2	103%
Ammonia as N in water	mg/L	103498-11	<0.005 || <0.005	103498-2	120%
Turbidity	NTU	103498-11	0.1 || 0.1 || RPD: 0	[NR]	[NR]
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	103498-10	15/01/2014 || 15/01/2014	103498-11	15/01/2014
Date analysed	-	103498-10	15/01/2014 || 15/01/2014	103498-11	15/01/2014
Total Cyanide	mg/L	103498-10	<0.004 || <0.004	103498-11	100%

Client Reference: 49761.03, Bylong

Report Comments:

ION_BALANCE: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
The mass inbalance in sample # 11 is due to low results.

E.coli & Faecal Coliforms analysed by Sonic Food & Water Testing. Report No.W1400788.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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CERTIFICATE OF ANALYSIS 103686

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	15 Waters
Date samples received / completed instructions received	17/01/2014 / 17/01/2014

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	28/01/14 / 4/02/14
Date of Preliminary Report:	Not issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-1 A20 15/01/2014 Water	103686-2 A06-S 15/01/2014 Water	103686-3 A15 15/01/2014 Water	103686-4 B3-S 15/01/2014 Water	103686-5 BS-D 15/01/2014 Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Arsenic-Dissolved	µg/L	<1	<1	<1	<1	5
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	1	<1	1	5
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	11	6	5	20	7
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	4	1	2	4	15
Aluminium-Dissolved	µg/L	<0.5	<0.5	<0.5	5	34
Barium-Dissolved	µg/L	37	43	26	39	150
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	2	<1	<1	5	6
Iron-Dissolved	µg/L	49	<10	14	11	310
Manganese-Dissolved	µg/L	890	9	88	380	520
Vanadium-Dissolved	µg/L	<1	2	<1	<1	9
Selenium-Dissolved	µg/L	<1	<1	<1	<1	2

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-6 AGE10 15/01/2014 Water	103686-7 A18 15/01/2014 Water	103686-8 A12 15/01/2014 Water	103686-9 A02-5 16/01/2014 Water	103686-10 AGE13 16/01/2014 Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Arsenic-Dissolved	µg/L	<1	<1	<1	<1	1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	3	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	<1	8	10	9	16
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	1	3	4	2	4
Aluminium-Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Barium-Dissolved	µg/L	320	90	57	98	92
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	1	<1	<1	9
Iron-Dissolved	µg/L	470	450	61	<10	33
Manganese-Dissolved	µg/L	140	84	83	52	75
Vanadium-Dissolved	µg/L	<1	<1	<1	1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	5	<1

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-14 D44 15/01/2014 Water
Date prepared	-	20/01/2014
Date analysed	-	20/01/2014
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	<1
Lead-Dissolved	µg/L	<1
Zinc-Dissolved	µg/L	10
Mercury-Dissolved	µg/L	<0.05
Nickel-Dissolved	µg/L	4
Aluminium-Dissolved	µg/L	<0.5
Barium-Dissolved	µg/L	54
Beryllium-Dissolved	µg/L	<0.1
Cobalt-Dissolved	µg/L	<1
Iron-Dissolved	µg/L	66
Manganese-Dissolved	µg/L	86
Vanadium-Dissolved	µg/L	<1
Selenium-Dissolved	µg/L	<1

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-1 A20 15/01/2014 Water	103686-2 A06-S 15/01/2014 Water	103686-3 A15 15/01/2014 Water	103686-4 B3-S 15/01/2014 Water	103686-5 BS-D 15/01/2014 Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Calcium - Dissolved	mg/L	58	55	14	12	33
Potassium - Dissolved	mg/L	6.5	3.9	3.1	5.1	9.3
Sodium - Dissolved	mg/L	110	95	27	38	130
Magnesium - Dissolved	mg/L	47	44	12	10	29
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	340	320	84	100	390
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	340	320	84	100	390
Sulphate, SO4	mg/L	35	14	5	13	70
Chloride, Cl	mg/L	160	130	39	39	92
Ionic Balance	%	0.19	0.36	0.45	-3.4	-10

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-6 AGE10 15/01/2014 Water	103686-7 A18 15/01/2014 Water	103686-8 A12 15/01/2014 Water	103686-9 A02-5 16/01/2014 Water	103686-10 AGE13 16/01/2014 Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Calcium - Dissolved	mg/L	58	21	20	120	75
Potassium - Dissolved	mg/L	23	16	3.5	8.1	20
Sodium - Dissolved	mg/L	390	23	22	54	210
Magnesium - Dissolved	mg/L	69	13	14	68	83
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	920	110	99	340	710
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	920	110	99	340	710
Sulphate, SO4	mg/L	20	26	19	64	53
Chloride, Cl	mg/L	250	25	30	150	170
Ionic Balance	%	0.52	1.5	0.60	6.7	0.73

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-11 RT5 16/01/2014 Water	103686-12 RT3 16/01/2014 Water	103686-13 RT2 16/01/2014 Water	103686-14 D44 15/01/2014 Water	103686-15 D45 16/01/2014 Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Calcium - Dissolved	mg/L	24	0.5	1.7	20	1.7
Potassium - Dissolved	mg/L	1.7	<0.5	<0.5	3.4	<0.5
Sodium - Dissolved	mg/L	16	0.6	2.0	22	1.9
Magnesium - Dissolved	mg/L	13	<0.5	1.2	15	1.3
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	73	9	15	100	16
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	73	9	15	100	16
Sulphate, SO4	mg/L	37	1	2	18	2
Chloride, Cl	mg/L	28	<1	4	29	4
Ionic Balance	%	-0.72	-58	-26	2.1	-26

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	103686-1	103686-2	103686-3	103686-4	103686-5
Your Reference	----------	A20	A06-S	A15	B3-S	BS-D
Date Sampled	----------	15/01/2014	15/01/2014	15/01/2014	15/01/2014	15/01/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	21/01/2014	21/01/2014	21/01/2014	21/01/2014	21/01/2014
Phosphorus - Total	mg/L	0.09	0.1	<0.05	0.3	0.3

Metals in Waters - Acid extractable						
Our Reference:	UNITS	103686-6	103686-7	103686-8	103686-9	103686-10
Your Reference	----------	AGE10	A18	A12	A02-5	AGE13
Date Sampled	----------	15/01/2014	15/01/2014	15/01/2014	16/01/2014	16/01/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	21/01/2014	21/01/2014	21/01/2014	21/01/2014	21/01/2014
Phosphorus - Total	mg/L	<0.05	0.1	0.06	<0.05	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	103686-11	103686-12	103686-13	103686-14	103686-15
Your Reference	----------	RT5	RT3	RT2	D44	D45
Date Sampled	----------	16/01/2014	16/01/2014	16/01/2014	15/01/2014	16/01/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	21/01/2014	21/01/2014	21/01/2014	21/01/2014	21/01/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	0.05	<0.05

Client Reference: 49761.03, Bylong

HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-11 RT5 16/01/2014 Water	103686-12 RT3 16/01/2014 Water	103686-13 RT2 16/01/2014 Water	103686-15 D45 16/01/2014 Water
Date prepared	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Date analysed	-	20/01/2014	20/01/2014	20/01/2014	20/01/2014
Arsenic-Total	µg/L	<1	<1	<1	<1
Cadmium-Total	µg/L	<0.1	0.8	0.5	0.5
Chromium-Total	µg/L	<1	<1	<1	<1
Copper-Total	µg/L	190	23	6	7
Lead-Total	µg/L	<1	6	4	4
Zinc-Total	µg/L	960	4,600	5,500	5,400
Mercury-Total	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Total	µg/L	4	2	<1	<1
Aluminium-Total	µg/L	12	<0.5	1	2
Barium-Total	µg/L	37	4	5	5
Beryllium-Total	µg/L	<0.1	<0.1	<0.1	<0.1
Cobalt-Total	µg/L	<1	<1	<1	<1
Iron-Total	µg/L	11	<10	<10	<10
Manganese-Total	µg/L	11	10	<5	<5
Vanadium-Total	µg/L	<1	<1	<1	<1
Selenium-Total	µg/L	<1	<1	<1	<1

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-1 A20 15/01/2014 Water	103686-2 A06-S 15/01/2014 Water	103686-3 A15 15/01/2014 Water	103686-4 B3-S 15/01/2014 Water	103686-5 BS-D 15/01/2014 Water
Date prepared	-	17/01/2014	17/01/2014	17/01/2014	17/01/2014	17/01/2014
Date analysed	-	17/01/2014	17/01/2014	17/01/2014	17/01/2014	17/01/2014
pH	pH Units	7.9	7.2	6.8	6.9	8.0
Electrical Conductivity	µS/cm	980	970	280	290	880
NOx as N in water	mg/L	0.04	0.02	0.01	0.08	0.08
Ammonia as N in water	mg/L	0.026	<0.005	0.017	<0.005	5.3
Turbidity	NTU	140	24	6.6	26,000	80

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-6 AGE10 15/01/2014 Water	103686-7 A18 15/01/2014 Water	103686-8 A12 15/01/2014 Water	103686-9 A02-5 16/01/2014 Water	103686-10 AGE13 16/01/2014 Water
Date prepared	-	17/01/2014	17/01/2014	17/01/2014	17/01/2014	17/01/2014
Date analysed	-	17/01/2014	17/01/2014	17/01/2014	17/01/2014	17/01/2014
pH	pH Units	7.2	6.9	7.0	7.4	7.3
Electrical Conductivity	µS/cm	2,100	320	280	1,200	1,600
NOx as N in water	mg/L	0.02	0.03	0.01	15	0.04
Ammonia as N in water	mg/L	3.4	0.071	0.005	<0.005	1.4
Turbidity	NTU	33	71	140	17	33

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-11 RT5 16/01/2014 Water	103686-12 RT3 16/01/2014 Water	103686-13 RT2 16/01/2014 Water	103686-14 D44 15/01/2014 Water	103686-15 D45 16/01/2014 Water
Date prepared	-	17/01/2014	17/01/2014	17/01/2014	17/01/2014	17/01/2014
Date analysed	-	17/01/2014	17/01/2014	17/01/2014	17/01/2014	17/01/2014
pH	pH Units	7.8	6.3	6.8	6.9	6.8
Electrical Conductivity	µS/cm	280	21	44	290	45
NOx as N in water	mg/L	0.3	0.71	0.84	0.02	0.83
Ammonia as N in water	mg/L	<0.005	0.005	<0.005	0.008	<0.005
Turbidity	NTU	0.4	0.3	0.3	140	0.3
Total Cyanide	mg/L	<0.004	<0.004	<0.004	[NA]	<0.004

Client Reference: 49761.03, Bylong

Microbiologocal Testing Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	103686-11 RT5 16/01/2014 Water	103686-12 RT3 16/01/2014 Water	103686-13 RT2 16/01/2014 Water	103686-15 D45 16/01/2014 Water
Date testing started	-	18/01/2014	18/01/2014	18/01/2014	18/01/2014
Date testing completed	-	18/01/2014	18/01/2014	18/01/2014	18/01/2014
E. Coli	CFU/100mL	<1	<1	<1	<1
Faecal Coliforms	CFU/100mL	<1	<1	<1	<1

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-013	Cyanide - total determined colourimetrically after distillation, based on APHA 22nd ED, 4500-CN_C,E. Free cyanide determined colourimetrically after filtration and confirmed by diffusion. Solids are extracted in a caustic media prior to distillation and analysis.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/01/2014	103686-6	20/01/2014 || 20/01/2014	LCS-W1	20/01/2014
Date analysed	-			20/01/2014	103686-6	20/01/2014 || 20/01/2014	LCS-W1	20/01/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	<1 || <1	LCS-W1	95%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	103686-6	<0.1 || <0.1	LCS-W1	97%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	<1 || <1	LCS-W1	96%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	<1 || <1	LCS-W1	95%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	<1 || <1	LCS-W1	97%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	<1 || <1	LCS-W1	95%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	103686-6	<0.05 || [N/T]	LCS-W1	112%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	1 || 1 || RPD: 0	LCS-W1	100%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	103686-6	<0.5 || 2	LCS-W1	105%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	320 || 320 || RPD: 0	LCS-W1	99%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	103686-6	<0.1 || <0.1	LCS-W1	116%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	<1 || <1	LCS-W1	99%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	103686-6	470 || 480 || RPD: 2	LCS-W1	99%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	103686-6	140 || 140 || RPD: 0	LCS-W1	96%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	<1 || <1	LCS-W1	98%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	103686-6	<1 || <1	LCS-W1	96%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/01/2014	103686-1	20/01/2014 || 20/01/2014	LCS-W1	20/01/2014
Date analysed	-			20/01/2014	103686-1	20/01/2014 || 20/01/2014	LCS-W1	20/01/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	103686-1	58 || 57 || RPD: 2	LCS-W1	109%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	103686-1	6.5 || 6.5 || RPD: 0	LCS-W1	112%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	103686-1	110 || 120 || RPD: 9	LCS-W1	108%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	103686-1	47 || 47 || RPD: 0	LCS-W1	113%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	103686-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	103686-1	340 || 330 || RPD: 3	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	103686-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	103686-1	340 || 330 || RPD: 3	LCS-W1	103%
Sulphate, SO4	mg/L	1	Inorg-081	<1	103686-1	35 || 35 || RPD: 0	LCS-W1	116%
Chloride, Cl	mg/L	1	Inorg-081	<1	103686-1	160 || 160 || RPD: 0	LCS-W1	113%
Ionic Balance	%		Inorg-041	[NT]	103686-1	0.19 || 0.61 || RPD: 105	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/01/2014	103686-6	20/01/2014 || 20/01/2014	LCS-W1	20/01/2014
Date analysed	-			21/01/2014	103686-6	21/01/2014 || 21/01/2014	LCS-W1	21/01/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	103686-6	<0.05 || <0.05	LCS-W1	104%
QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/01/2014	[NT]	[NT]	LCS-W1	20/01/2014
Date analysed	-			20/01/2014	[NT]	[NT]	LCS-W1	20/01/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	95%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	97%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	93%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	93%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	95%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	94%

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]	[NT]	LCS-W1	116%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	92%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]	[NT]	LCS-W1	107%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	97%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	85%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	97%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	[NT]	[NT]	LCS-W1	94%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	[NT]	[NT]	LCS-W1	94%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	97%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	95%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			17/01/2014	103686-1	17/01/2014 || 17/01/2014	LCS-W1	17/01/2014
Date analysed	-			17/01/2014	103686-1	17/01/2014 || 17/01/2014	LCS-W1	17/01/2014
pH	pH Units		Inorg-001	[NT]	103686-1	7.9 || 7.9 || RPD: 0	LCS-W1	102%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	103686-1	980 || 990 || RPD: 1	LCS-W1	103%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	103686-1	0.04 || 0.04 || RPD: 0	LCS-W1	107%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	103686-1	0.026 || 0.020 || RPD: 26	LCS-W1	100%
Turbidity	NTU	0.1	Inorg-022	<0.1	103686-1	140 || 140 || RPD: 0	LCS-W1	102%
Total Cyanide	mg/L	0.004	Inorg-013	<0.004	[NT]	[NT]	LCS-W1	104%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			[NT]
Date testing completed	-			[NT]
E. Coli	CFU/100 mL	1	Ext-008	[NT]
Faecal Coliforms	CFU/100 mL	1	Ext-008	[NT]

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	103686-8	20/01/2014 || 20/01/2014	103686-1	20/01/2014
Date analysed	-	103686-8	20/01/2014 || 20/01/2014	103686-1	20/01/2014
Mercury-Dissolved	µg/L	103686-8	<0.05 || <0.05	103686-1	116%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	103686-11	20/01/2014 || 20/01/2014	103686-2	20/01/2014
Date analysed	-	103686-11	20/01/2014 || 20/01/2014	103686-2	20/01/2014
Calcium - Dissolved	mg/L	103686-11	24 || 24 || RPD: 0	103686-2	#
Potassium - Dissolved	mg/L	103686-11	1.7 || 1.8 || RPD: 6	103686-2	116%
Sodium - Dissolved	mg/L	103686-11	16 || 17 || RPD: 6	103686-2	#
Magnesium - Dissolved	mg/L	103686-11	13 || 13 || RPD: 0	103686-2	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	103686-11	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	103686-11	73 || 73 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	103686-11	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	103686-11	73 || 73 || RPD: 0	[NR]	[NR]
Sulphate, SO4	mg/L	103686-11	37 || 37 || RPD: 0	103686-2	84%
Chloride, Cl	mg/L	103686-11	28 || 28 || RPD: 0	103686-2	93%
Ionic Balance	%	103686-11	-0.72 || 0.58 || RPD: -1857	[NR]	[NR]
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	103686-11	17/01/2014 || 17/01/2014	103686-2	20/01/2014
Date analysed	-	103686-11	17/01/2014 || 17/01/2014	103686-2	20/01/2014
pH	pH Units	103686-11	7.8 || 7.8 || RPD: 0	[NR]	[NR]
Electrical Conductivity	µS/cm	103686-11	280 || 280 || RPD: 0	[NR]	[NR]
NOx as N in water	mg/L	103686-11	0.3 || 0.3 || RPD: 0	103686-2	100%
Ammonia as N in water	mg/L	103686-11	<0.005 || <0.005	103686-2	106%
Turbidity	NTU	103686-11	0.4 || 0.2 || RPD: 67	[NR]	[NR]
Total Cyanide	mg/L	103686-11	<0.004 || <0.004	[NR]	[NR]

Client Reference: 49761.03, Bylong

Report Comments:

ION_BALANCE: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
The mass inbalance in sample #12,13 and 15 may be due to low results.

E. coli & Faecal Coliforms analysed by Sonic Food & Water Testing. Report No.W1400943.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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CERTIFICATE OF ANALYSIS **105282**

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	12 Waters
Date samples received / completed instructions received	19/02/14 / 19/02/14

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	26/02/14 / 26/02/14
Date of Preliminary Report:	None Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-4 SW4 17/02/2014 Water	105282-5 A01-S 17/02/2014 Water	105282-6 A06-S 18/02/2014 Water	105282-7 A09 18/02/2014 Water	105282-8 A13 18/02/2014 Water
Date prepared	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Date analysed	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Arsenic-Dissolved	µg/L	<1	2	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	2	3	2
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	8	14	15	12	16
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	2	7	2	3	3
Aluminium-Dissolved	µg/L	8	3	2	2	3
Barium-Dissolved	µg/L	87	140	44	100	100
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1	<1
Iron-Dissolved	µg/L	160	2,100	15	<10	14
Manganese-Dissolved	µg/L	500	1,100	12	110	220
Vanadium-Dissolved	µg/L	<1	<1	2	1	1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-9 A14 18/02/2014 Water	105282-10 A20 18/02/2014 Water	105282-11 AGE08 18/02/2014 Water	105282-12 BYO015 17/02/2014 Water
Date prepared	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Date analysed	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Arsenic-Dissolved	µg/L	<1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1
Copper-Dissolved	µg/L	1	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1
Zinc-Dissolved	µg/L	5	9	11	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	4	<1	<1
Aluminium-Dissolved	µg/L	3	1	2	3
Barium-Dissolved	µg/L	100	28	160	100
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	1	<1	<1
Iron-Dissolved	µg/L	<10	65	160	280
Manganese-Dissolved	µg/L	<5	460	98	44
Vanadium-Dissolved	µg/L	1	<1	<1	<1
Selenium-Dissolved	µg/L	2	<1	<1	<1

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-1 RT2 18/02/2014 Water	105282-2 RT3 18/02/2014 Water	105282-3 RT4 18/02/2014 Water	105282-4 SW4 17/02/2014 Water	105282-5 A01-S 17/02/2014 Water
Date prepared	-	20/02/2014	20/02/2014	20/02/2014	20/02/2014	20/02/2014
Date analysed	-	20/02/2014	20/02/2014	20/02/2014	20/02/2014	20/02/2014
Calcium - Dissolved	mg/L	1.3	0.5	<0.5	120	120
Potassium - Dissolved	mg/L	<0.5	<0.5	<0.5	8.7	7.4
Sodium - Dissolved	mg/L	2.2	0.8	<0.5	220	270
Magnesium - Dissolved	mg/L	1.0	<0.5	<0.5	100	99
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	17	10	9	390	430
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	17	10	9	390	430
Sulphate, SO4	mg/L	2	2	<1	240	210
Chloride, Cl	mg/L	3	1	<1	290	340
Ionic Balance	%	-33	-64	-100	6.8	7.0

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-6 A06-S 18/02/2014 Water	105282-7 A09 18/02/2014 Water	105282-8 A13 18/02/2014 Water	105282-9 A14 18/02/2014 Water	105282-10 A20 18/02/2014 Water
Date prepared	-	20/02/2014	20/02/2014	20/02/2014	20/02/2014	20/02/2014
Date analysed	-	20/02/2014	20/02/2014	20/02/2014	20/02/2014	20/02/2014
Calcium - Dissolved	mg/L	50	81	83	120	53
Potassium - Dissolved	mg/L	4.3	10	6.5	5.9	6.7
Sodium - Dissolved	mg/L	100	290	130	170	110
Magnesium - Dissolved	mg/L	40	79	68	88	43
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	310	370	290	460	330
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	310	370	290	460	330
Sulphate, SO4	mg/L	13	170	95	220	21
Chloride, Cl	mg/L	110	330	210	170	110
Ionic Balance	%	4.0	7.1	5.6	6.0	4.6

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-11 AGE08 18/02/2014 Water	105282-12 BYO015 17/02/2014 Water
Date prepared	-	20/02/2014	20/02/2014
Date analysed	-	20/02/2014	20/02/2014
Calcium - Dissolved	mg/L	36	45
Potassium - Dissolved	mg/L	15	14
Sodium - Dissolved	mg/L	250	210
Magnesium - Dissolved	mg/L	29	26
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	590	420
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	590	420
Sulphate, SO4	mg/L	<1	34
Chloride, Cl	mg/L	82	110
Ionic Balance	%	5.2	6.7

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	105282-1	105282-2	105282-3	105282-4	105282-5
Your Reference	----------	RT2	RT3	RT4	SW4	A01-S
Date Sampled	----------	18/02/2014	18/02/2014	18/02/2014	17/02/2014	17/02/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/02/2014	20/02/2014	20/02/2014	20/02/2014	20/02/2014
Date analysed	-	20/02/2014	20/02/2014	20/02/2014	20/02/2014	20/02/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	0.09	0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	105282-6	105282-7	105282-8	105282-9	105282-10
Your Reference	----------	A06-S	A09	A13	A14	A20
Date Sampled	----------	18/02/2014	18/02/2014	18/02/2014	18/02/2014	18/02/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/02/2014	20/02/2014	20/02/2014	20/02/2014	20/02/2014
Date analysed	-	20/02/2014	20/02/2014	20/02/2014	20/02/2014	20/02/2014
Phosphorus - Total	mg/L	0.1	<0.05	<0.05	<0.05	<0.05

Metals in Waters - Acid extractable			
Our Reference:	UNITS	105282-11	105282-12
Your Reference	----------	AGE08	BYO015
Date Sampled	----------	18/02/2014	17/02/2014
Type of sample		Water	Water
Date prepared	-	20/02/2014	20/02/2014
Date analysed	-	20/02/2014	20/02/2014
Phosphorus - Total	mg/L	<0.05	<0.05

Client Reference: 49761.03, Bylong

HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-1 RT2 18/02/2014 Water	105282-2 RT3 18/02/2014 Water	105282-3 RT4 18/02/2014 Water
Date prepared	-	20/02/2014	20/02/2014	20/02/2014
Date analysed	-	20/02/2014	20/02/2014	20/02/2014
Arsenic-Total	µg/L	<1	<1	<1
Cadmium-Total	µg/L	0.6	0.8	<0.1
Chromium-Total	µg/L	<1	<1	<1
Copper-Total	µg/L	3	10	720
Lead-Total	µg/L	5	2	14
Zinc-Total	µg/L	5,800	5,600	130
Mercury-Total	µg/L	<0.05	<0.05	<0.05
Nickel-Total	µg/L	<1	2	<1
Aluminium-Total	µg/L	10	6	24
Barium-Total	µg/L	5	4	8
Beryllium-Total	µg/L	<0.1	<0.1	<0.1
Cobalt-Total	µg/L	<1	<1	<1
Iron-Total	µg/L	<10	<10	<10
Manganese-Total	µg/L	<5	14	9
Vanadium-Total	µg/L	<1	<1	<1
Selenium-Total	µg/L	<1	<1	<1

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-1 RT2 18/02/2014 Water	105282-2 RT3 18/02/2014 Water	105282-3 RT4 18/02/2014 Water	105282-4 SW4 17/02/2014 Water	105282-5 A01-S 17/02/2014 Water
Date prepared	-	19/02/2014	19/02/2014	19/02/2014	19/02/2014	19/02/2014
Date analysed	-	19/02/2014	19/02/2014	19/02/2014	19/02/2014	19/02/2014
pH	pH Units	6.8	6.3	6.5	7.6	7.2
Electrical Conductivity	µS/cm	50	30	15	2,000	2,300
NOx as N in water	mg/L	0.83	0.67	0.09	<0.005	0.2
Ammonia as N in water	mg/L	0.029	<0.005	0.022	0.012	0.062
Turbidity	NTU	0.4	<0.1	<0.1	3.1	3.6
Total Cyanide	mg/L	<0.004	<0.004	<0.004	[NA]	[NA]

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-6 A06-S 18/02/2014 Water	105282-7 A09 18/02/2014 Water	105282-8 A13 18/02/2014 Water	105282-9 A14 18/02/2014 Water	105282-10 A20 18/02/2014 Water
Date prepared	-	19/02/2014	19/02/2014	19/02/2014	19/02/2014	19/02/2014
Date analysed	-	19/02/2014	19/02/2014	19/02/2014	19/02/2014	19/02/2014
pH	pH Units	7.1	7.2	7.2	7.3	7.4
Electrical Conductivity	µS/cm	970	2,100	1,400	1,700	1,000
NOx as N in water	mg/L	0.04	0.02	0.3	1.6	0.01
Ammonia as N in water	mg/L	<0.005	0.013	<0.005	<0.005	0.022
Turbidity	NTU	54	5.4	5.4	29	45

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-11 AGE08 18/02/2014 Water	105282-12 BYO015 17/02/2014 Water
Date prepared	-	19/02/2014	19/02/2014
Date analysed	-	19/02/2014	19/02/2014
pH	pH Units	7.3	7.4
Electrical Conductivity	µS/cm	1,300	1,200
NOx as N in water	mg/L	0.02	<0.005
Ammonia as N in water	mg/L	1.7	1.1
Turbidity	NTU	5.4	4.3

Client Reference: 49761.03, Bylong

Microbiologocal Testing Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105282-1 RT2 18/02/2014 Water	105282-2 RT3 18/02/2014 Water	105282-3 RT4 18/02/2014 Water
Date testing started	-	18/02/2014	18/02/2014	18/02/2014
Date testing completed	-	19/02/2014	19/02/2014	19/02/2014
E. Coli	CFU/100mL	<1	<1NBO	<1
Faecal Coliforms	CFU/100mL	<1	<1NBO	<1

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-013	Cyanide - total determined colourimetrically after distillation, based on APHA 22nd ED, 4500-CN_C,E. Free cyanide determined colourimetrically after filtration and confirmed by diffusion. Solids are extracted in a caustic media prior to distillation and analysis.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			21/02/2014	105282-5	21/02/2014 || 21/02/2014	LCS-W1	20/02/2014
Date analysed	-			21/02/2014	105282-5	21/02/2014 || 21/02/2014	LCS-W1	20/02/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	2 || 1 || RPD: 67	LCS-W1	101%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	105282-5	<0.1 || <0.1	LCS-W1	101%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	<1 || <1	LCS-W1	101%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	<1 || <1	LCS-W1	102%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	<1 || <1	LCS-W1	101%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	14 || 14 || RPD: 0	LCS-W1	99%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	105282-5	<0.05 || <0.05	LCS-W1	100%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	7 || 7 || RPD: 0	LCS-W1	94%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	105282-5	3 || 2 || RPD: 40	LCS-W1	99%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	140 || 140 || RPD: 0	LCS-W1	103%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	105282-5	<0.1 || <0.1	LCS-W1	12%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	<1 || <1	LCS-W1	101%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	105282-5	2100 || 2000 || RPD: 5	LCS-W1	102%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	105282-5	1100 || 1100 || RPD: 0	LCS-W1	92%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	<1 || <1	LCS-W1	94%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105282-5	<1 || <1	LCS-W1	97%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/02/2014	105282-1	20/02/2014 || 20/02/2014	LCS-W1	20/02/2014
Date analysed	-			19/02/2014	105282-1	20/02/2014 || 20/02/2014	LCS-W1	20/02/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	105282-1	1.3 || 1.3 || RPD: 0	LCS-W1	101%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	105282-1	<0.5 || <0.5	LCS-W1	114%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	105282-1	2.2 || 2.2 || RPD: 0	LCS-W1	109%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	105282-1	1.0 || 1.0 || RPD: 0	LCS-W1	106%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	105282-1	<5 || [N/T]	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	105282-1	17 || [N/T]	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	105282-1	<5 || [N/T]	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	105282-1	17 || [N/T]	LCS-W1	102%
Sulphate, SO4	mg/L	1	Inorg-081	<1	105282-1	2 || 2 || RPD: 0	LCS-W1	99%
Chloride, Cl	mg/L	1	Inorg-081	<1	105282-1	3 || 3 || RPD: 0	LCS-W1	94%
Ionic Balance	%		Inorg-041	[NT]	105282-1	-33 || [N/T]	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/02/2014	105282-9	20/02/2014 || 20/02/2014	LCS-W2	20/02/2014
Date analysed	-			20/02/2014	105282-9	20/02/2014 || 20/02/2014	LCS-W2	20/02/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	105282-9	<0.05 || <0.05	LCS-W2	102%
QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			21/02/2014	[NT]	[NT]	LCS-W1	21/02/2014
Date analysed	-			21/02/2014	[NT]	[NT]	LCS-W1	21/02/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	108%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	113%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	103%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	105%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	106%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	110%

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QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]	[NT]	LCS-W1	108%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	102%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]	[NT]	LCS-W1	108%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	113%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	111%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	108%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	[NT]	[NT]	LCS-W1	113%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	[NT]	[NT]	LCS-W1	101%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	105%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	112%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/02/2014	105282-1	19/02/2014 || 19/02/2014	LCS-W1	19/02/2014
Date analysed	-			19/02/2014	105282-1	19/02/2014 || 19/02/2014	LCS-W1	19/02/2014
pH	pH Units		Inorg-001	[NT]	105282-1	6.8 || [N/T]	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	105282-1	50 || [N/T]	LCS-W1	107%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	105282-1	0.83 || 0.83 || RPD: 0	LCS-W1	102%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	105282-1	0.029 || 0.029 || RPD: 0	LCS-W1	100%
Turbidity	NTU	0.1	Inorg-022	<0.1	105282-1	0.4 || 0.4 || RPD: 0	LCS-W1	102%
Total Cyanide	mg/L	0.004	Inorg-013	<0.004	105282-1	<0.004 || [N/T]	LCS-W1	107%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			18/02/2014
Date testing completed	-			19/02/2014
E. Coli	CFU/100 mL	1	Ext-008	<1
Faecal Coliforms	CFU/100 mL	1	Ext-008	<1

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	105282-4	21/02/2014 || 21/02/2014	105282-5	21/02/2014
Date analysed	-	105282-4	21/02/2014 || 21/02/2014	105282-5	21/02/2014
Mercury-Dissolved	µg/L	105282-4	<0.05 || <0.05	105282-5	96%
QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	105282-11	20/02/2014 || 20/02/2014	105282-2	20/02/2014
Date analysed	-	105282-11	20/02/2014 || 20/02/2014	105282-2	20/02/2014
Calcium - Dissolved	mg/L	105282-11	36 || 36 || RPD: 0	105282-2	105%
Potassium - Dissolved	mg/L	105282-11	15 || 15 || RPD: 0	105282-2	99%
Sodium - Dissolved	mg/L	105282-11	250 || 250 || RPD: 0	105282-2	115%
Magnesium - Dissolved	mg/L	105282-11	29 || 29 || RPD: 0	105282-2	109%
Sulphate, SO4	mg/L	105282-11	<1 || <1	105282-2	98%
Chloride, Cl	mg/L	105282-11	82 || 81 || RPD: 1	105282-2	91%
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	105282-10	20/02/2014
Date analysed	-	[NT]	[NT]	105282-10	20/02/2014
Phosphorus - Total	mg/L	[NT]	[NT]	105282-10	106%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	105282-11	19/02/2014 || 19/02/2014	105282-2	19/02/2014
Date analysed	-	105282-11	19/02/2014 || 19/02/2014	105282-2	19/02/2014
NOx as N in water	mg/L	105282-11	0.02 || 0.02 || RPD: 0	105282-2	103%
Ammonia as N in water	mg/L	105282-11	1.7 || 1.7 || RPD: 0	105282-2	106%
Turbidity	NTU	105282-11	5.4 || 5.4 || RPD: 0	[NR]	[NR]
Total Cyanide	mg/L	[NT]	[NT]	[NR]	[NR]

Client Reference: 49761.03, Bylong

Report Comments:

ION_BALANCE: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

For the determination of dissolved metals in samples 105282-1, 105282-2 and 105282-3 the unpreserved sample was filtered through 0.45um filter at the lab due to the presence of colloids and/or sediment in the supplied HNO3 bottle.
The mass inbalance in sample #1,2,3 may be due to low results.

MICRO analysed by Sonic Food & Water report number W1402634
. NBO note that the presence of competing background organisms in the sample may have reduced the count obtained

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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CERTIFICATE OF ANALYSIS **105433**

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	14 Waters
Date samples received / completed instructions received	19/02/14 / 19/02/14

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	4/03/14 / 3/03/14
Date of Preliminary Report:	None Issued

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Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-3 BY0014 19/02/2014 Water	105433-4 BY0016 19/02/2014 Water	105433-5 AGE10 19/02/2014 Water	105433-6 A15 19/02/2014 Water	105433-7 B3D 19/02/2014 Water
Date prepared	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Date analysed	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Arsenic-Dissolved	µg/L	<1	28	<1	<1	3
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	1	3
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	2	10	4	15	94
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	<1	2	2	14
Aluminium-Dissolved	µg/L	12	10	11	7	55
Barium-Dissolved	µg/L	200	340	360	24	140
Beryllium-Dissolved	µg/L	<0.1	0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1	5
Iron-Dissolved	µg/L	200	430	530	17	890
Manganese-Dissolved	µg/L	24	31	130	93	900
Vanadium-Dissolved	µg/L	<1	<1	<1	<1	4
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-8 B3S 19/02/2014 Water	105433-9 A12 19/02/2014 Water	105433-10 A18 20/02/2014 Water	105433-11 AGE13 20/02/2014 Water	105433-12 A02-S 20/02/2014 Water
Date prepared	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Date analysed	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Arsenic-Dissolved	µg/L	<1	<1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	1
Copper-Dissolved	µg/L	<1	1	<1	<1	5
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	12	130	12	14	16
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	7	14	4	2	6
Aluminium-Dissolved	µg/L	13	6	6	8	200
Barium-Dissolved	µg/L	53	61	82	92	110
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	9	1	1	3	<1
Iron-Dissolved	µg/L	2,700	310	600	66	57
Manganese-Dissolved	µg/L	670	120	95	64	250
Vanadium-Dissolved	µg/L	<1	<1	<1	<1	2
Selenium-Dissolved	µg/L	<1	<1	<1	<1	5

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-13 D46 19/02/2014 Water
Date prepared	-	24/02/2014
Date analysed	-	24/02/2014
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	2
Lead-Dissolved	µg/L	<1
Zinc-Dissolved	µg/L	21
Mercury-Dissolved	µg/L	<0.05
Nickel-Dissolved	µg/L	2
Aluminium-Dissolved	µg/L	6
Barium-Dissolved	µg/L	22
Beryllium-Dissolved	µg/L	<0.1
Cobalt-Dissolved	µg/L	<1
Iron-Dissolved	µg/L	19
Manganese-Dissolved	µg/L	94
Vanadium-Dissolved	µg/L	<1
Selenium-Dissolved	µg/L	<1

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-1 RT1 20/02/2014 Water	105433-2 RT5 20/02/2014 Water	105433-3 BY0014 19/02/2014 Water	105433-4 BY0016 19/02/2014 Water	105433-5 AGE10 19/02/2014 Water
Date prepared	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Date analysed	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Calcium - Dissolved	mg/L	3.6	17	34	30	53
Potassium - Dissolved	mg/L	7.6	1.4	10	16	24
Sodium - Dissolved	mg/L	1.0	12	190	560	370
Magnesium - Dissolved	mg/L	1.1	9.4	19	18	60
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	32	59	480	1,100	960
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	32	59	480	1,100	960
Sulphate, SO4	mg/L	2	30	<1	8	18
Chloride, Cl	mg/L	3	18	77	180	210
Ionic Balance	%	-19	-4.0	0.28	-0.44	-1.6

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-6 A15 19/02/2014 Water	105433-7 B3D 19/02/2014 Water	105433-8 B3S 19/02/2014 Water	105433-9 A12 19/02/2014 Water	105433-10 A18 20/02/2014 Water
Date prepared	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Date analysed	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Calcium - Dissolved	mg/L	12	30	7.7	20	19
Potassium - Dissolved	mg/L	2.8	6.2	4.4	3.2	13
Sodium - Dissolved	mg/L	26	110	35	19	19
Magnesium - Dissolved	mg/L	11	21	8.5	13	11
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	85	340	80	96	110
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	85	340	80	96	110
Sulphate, SO4	mg/L	5	47	6	18	24
Chloride, Cl	mg/L	34	69	32	26	21
Ionic Balance	%	-0.52	-9.8	1.5	-0.30	-4.1

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-11 AGE13 20/02/2014 Water	105433-12 A02-S 20/02/2014 Water	105433-13 D46 19/02/2014 Water	105433-14 D47 20/02/2014 Water
Date prepared	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Date analysed	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Calcium - Dissolved	mg/L	70	100	10	3.6
Potassium - Dissolved	mg/L	18	8.2	2.6	7.4
Sodium - Dissolved	mg/L	200	52	25	1.0
Magnesium - Dissolved	mg/L	73	60	11	1.1
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	700	370	86	29
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	700	370	86	29
Sulphate, SO4	mg/L	52	59	5	2
Chloride, Cl	mg/L	150	120	35	3
Ionic Balance	%	-1.4	2.1	-4.3	-16

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	105433-1	105433-2	105433-3	105433-4	105433-5
Your Reference	----------	RT1	RT5	BY0014	BY0016	AGE10
Date Sampled	----------	20/02/2014	20/02/2014	19/02/2014	19/02/2014	19/02/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Date analysed	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Phosphorus - Total	mg/L	0.3	<0.05	<0.05	<0.05	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	105433-6	105433-7	105433-8	105433-9	105433-10
Your Reference	----------	A15	B3D	B3S	A12	A18
Date Sampled	----------	19/02/2014	19/02/2014	19/02/2014	19/02/2014	20/02/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Date analysed	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Phosphorus - Total	mg/L	<0.05	0.1	<0.05	0.1	<0.05

Metals in Waters - Acid extractable					
Our Reference:	UNITS	105433-11	105433-12	105433-13	105433-14
Your Reference	----------	AGE13	A02-S	D46	D47
Date Sampled	----------	20/02/2014	20/02/2014	19/02/2014	20/02/2014
Type of sample		Water	Water	Water	Water
Date prepared	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Date analysed	-	24/02/2014	24/02/2014	24/02/2014	24/02/2014
Phosphorus - Total	mg/L	<0.05	1	<0.05	0.3

Client Reference: 49761.03, Bylong

HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-1 RT1 20/02/2014 Water	105433-2 RT5 20/02/2014 Water	105433-14 D47 20/02/2014 Water
Date prepared	-	24/02/2014	24/02/2014	24/02/2014
Date analysed	-	24/02/2014	24/02/2014	24/02/2014
Arsenic-Total	µg/L	<1	<1	<1
Cadmium-Total	µg/L	<0.1	<0.1	<0.1
Chromium-Total	µg/L	<1	<1	<1
Copper-Total	µg/L	7	65	9
Lead-Total	µg/L	8	<1	8
Zinc-Total	µg/L	6,600	1,200	6,900
Mercury-Total	µg/L	<0.05	<0.05	<0.05
Nickel-Total	µg/L	<1	2	<1
Aluminium-Total	µg/L	33	24	28
Barium-Total	µg/L	7	24	7
Beryllium-Total	µg/L	<0.1	<0.1	<0.1
Cobalt-Total	µg/L	<1	<1	<1
Iron-Total	µg/L	220	28	210
Manganese-Total	µg/L	61	17	61
Vanadium-Total	µg/L	<1	<1	<1
Selenium-Total	µg/L	<1	<1	<1

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-1 RT1 20/02/2014 Water	105433-2 RT5 20/02/2014 Water	105433-3 BY0014 19/02/2014 Water	105433-4 BY0016 19/02/2014 Water	105433-5 AGE10 19/02/2014 Water
Date prepared	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Date analysed	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
pH	pH Units	6.8	7.4	7.7	7.3	6.7
Electrical Conductivity	µS/cm	83	260	1,100	2,600	2,300
NOx as N in water	mg/L	0.87	0.2	0.07	0.03	0.02
Ammonia as N in water	mg/L	0.054	0.008	1.2	2.2	3.1
Turbidity	NTU	3.0	1.4	2.7	6.4	61
Total Cyanide	mg/L	<0.004	<0.004	[NA]	[NA]	[NA]

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-6 A15 19/02/2014 Water	105433-7 B3D 19/02/2014 Water	105433-8 B3S 19/02/2014 Water	105433-9 A12 19/02/2014 Water	105433-10 A18 20/02/2014 Water
Date prepared	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Date analysed	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014	21/02/2014
pH	pH Units	6.3	5.7	6.5	5.4	6.8
Electrical Conductivity	µS/cm	300	970	280	330	360
NOx as N in water	mg/L	0.02	0.3	0.02	0.72	0.03
Ammonia as N in water	mg/L	0.014	4.7	<0.005	0.017	0.073
Turbidity	NTU	4.8	53	100	330	44

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-11 AGE13 20/02/2014 Water	105433-12 A02-S 20/02/2014 Water	105433-13 D46 19/02/2014 Water	105433-14 D47 20/02/2014 Water
Date prepared	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014
Date analysed	-	21/02/2014	21/02/2014	21/02/2014	21/02/2014
pH	pH Units	7.1	7.3	6.5	6.9
Electrical Conductivity	µS/cm	1,800	1,300	300	82
NOx as N in water	mg/L	0.2	14	0.05	0.84
Ammonia as N in water	mg/L	1.3	0.008	0.023	0.054
Turbidity	NTU	35	120	4.9	1.8
Total Cyanide	mg/L	[NA]	[NA]	[NA]	<0.004

Client Reference: 49761.03, Bylong

Microbiologocal Testing Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	105433-1 RT1 20/02/2014 Water	105433-2 RT5 20/02/2014 Water	105433-14 D47 20/02/2014 Water
Date testing started	-	22/02/2014	22/02/2014	22/02/2014
Date testing completed	-	22/02/2014	22/02/2014	22/02/2014
E. Coli	CFU/100mL	<1	<1	<1
Faecal Coliforms	CFU/100mL	5	1 Approximate	6

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-013	Cyanide - total determined colourimetrically after distillation, based on APHA 22nd ED, 4500-CN_C,E. Free cyanide determined colourimetrically after filtration and confirmed by diffusion. Solids are extracted in a caustic media prior to distillation and analysis.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			24/02/2014	105433-8	24/02/2014 || 24/02/2014	LCS-W2	24/02/2014
Date analysed	-			24/02/2014	105433-8	24/02/2014 || 24/02/2014	LCS-W2	24/02/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	<1 || <1	LCS-W2	97%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	105433-8	<0.1 || <0.1	LCS-W2	95%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	<1 || <1	LCS-W2	90%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	<1 || <1	LCS-W2	96%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	<1 || <1	LCS-W2	100%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	12 || 11 || RPD: 9	LCS-W2	94%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	105433-8	<0.05 || [N/T]	LCS-W2	100%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	7 || 7 || RPD: 0	LCS-W2	100%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	105433-8	13 || 10 || RPD: 26	LCS-W2	111%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	53 || 52 || RPD: 2	LCS-W2	97%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	105433-8	<0.1 || <0.1	LCS-W2	106%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	9 || 9 || RPD: 0	LCS-W2	94%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	105433-8	2700 || 2700 || RPD: 0	LCS-W2	100%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	105433-8	670 || 650 || RPD: 3	LCS-W2	103%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	<1 || <1	LCS-W2	95%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	105433-8	<1 || <1	LCS-W2	87%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			21/02/2014	105282-1	21/02/2014 || 21/02/2014	LCS-W1	24/02/2014
Date analysed	-			21/02/2014	105282-1	21/02/2014 || 21/02/2014	LCS-W1	24/02/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	105282-1	3.6 || [N/T]	LCS-W1	106%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	105282-1	7.6 || [N/T]	LCS-W1	109%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	105282-1	1.0 || [N/T]	LCS-W1	102%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	105282-1	1.1 || [N/T]	LCS-W1	114%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	105282-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	105282-1	32 || 35 || RPD: 9	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	105282-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	105282-1	32 || 35 || RPD: 9	LCS-W1	105%
Sulphate, SO4	mg/L	1	Inorg-081	<1	105282-1	2 || 2 || RPD: 0	LCS-W1	95%
Chloride, Cl	mg/L	1	Inorg-081	<1	105282-1	3 || 3 || RPD: 0	LCS-W1	93%
Ionic Balance	%		Inorg-041	[NT]	105282-1	-19 || [N/T]	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			24/02/2014	105433-8	24/02/2014 || 24/02/2014	LCS-W1	24/02/2014
Date analysed	-			24/02/2014	105433-8	24/02/2014 || 24/02/2014	LCS-W1	24/02/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	105433-8	<0.05 || <0.05	LCS-W1	98%
QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			24/02/2014	105433-1	24/02/2014 || 24/02/2014	LCS-W1	24/02/2014
Date analysed	-			24/02/2014	105433-1	24/02/2014 || 24/02/2014	LCS-W1	24/02/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	<1 || [N/T]	LCS-W1	93%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	105433-1	<0.1 || [N/T]	LCS-W1	96%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	<1 || [N/T]	LCS-W1	88%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	7 || [N/T]	LCS-W1	91%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	8 || [N/T]	LCS-W1	91%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	6600 || [N/T]	LCS-W1	92%

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	105433-1	<0.05 || <0.05	LCS-W1	100%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	<1 || [N/T]	LCS-W1	93%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	105433-1	33 || [N/T]	LCS-W1	97%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	7 || [N/T]	LCS-W1	99%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	105433-1	<0.1 || [N/T]	LCS-W1	90%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	<1 || [N/T]	LCS-W1	94%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	105433-1	220 || [N/T]	LCS-W1	97%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	105433-1	61 || [N/T]	LCS-W1	96%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	<1 || [N/T]	LCS-W1	92%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	105433-1	<1 || [N/T]	LCS-W1	91%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			21/02/2014	105282-1	21/02/2014 || 21/02/2014	LCS-W1	21/02/2014
Date analysed	-			21/02/2014	105282-1	21/02/2014 || 21/02/2014	LCS-W1	21/02/2014
pH	pH Units		Inorg-001	[NT]	105282-1	6.8 || 6.8 || RPD: 0	LCS-W1	100%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	105282-1	83 || 83 || RPD: 0	LCS-W1	108%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	105282-1	0.87 || 0.86 || RPD: 1	LCS-W1	105%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	105282-1	0.054 || 0.056 || RPD: 4	LCS-W1	106%
Turbidity	NTU	0.1	Inorg-022	<0.1	105282-1	3.0 || 3.0 || RPD: 0	LCS-W1	100%
Total Cyanide	mg/L	0.004	Inorg-013	<0.004	105282-1	<0.004 || <0.004	LCS-W1	113%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			[NT]
Date testing completed	-			[NT]
E. Coli	CFU/100 mL	1	Ext-008	<1
Faecal Coliforms	CFU/100 mL	1	Ext-008	<1

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	105433-4	24/02/2014 || 24/02/2014
Date analysed	-	105433-4	24/02/2014 || 24/02/2014
Mercury-Dissolved	µg/L	105433-4	<0.05 || <0.05

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	105282-11	21/02/2014 || 21/02/2014	105433-2	21/02/2014
Date analysed	-	105282-11	21/02/2014 || 21/02/2014	105433-2	21/02/2014
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	105282-11	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	105282-11	700 || 710 || RPD: 1	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	105282-11	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	105282-11	700 || 710 || RPD: 1	[NR]	[NR]
Sulphate, SO4	mg/L	105282-11	52 || [N/T]	105433-2	102%
Chloride, Cl	mg/L	105282-11	150 || [N/T]	105433-2	92%
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	105433-9	24/02/2014
Date analysed	-	[NT]	[NT]	105433-9	24/02/2014
Phosphorus - Total	mg/L	[NT]	[NT]	105433-9	97%
QUALITY CONTROL HM in water - total	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	105433-2	24/02/2014
Date analysed	-	[NT]	[NT]	105433-2	24/02/2014
Arsenic-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Cadmium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Chromium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Copper-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Lead-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Zinc-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Mercury-Total	µg/L	[NT]	[NT]	105433-2	100%
Nickel-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Aluminium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Barium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Beryllium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Cobalt-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Iron-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Manganese-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Vanadium-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Selenium-Total	µg/L	[NT]	[NT]	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	105282-11	21/02/2014 || 21/02/2014	105282-2	21/02/2014
Date analysed	-	105282-11	21/02/2014 || 21/02/2014	105282-2	21/02/2014
pH	pH Units	105282-11	7.1 || 7.1 || RPD: 0	[NR]	[NR]
Electrical Conductivity	µS/cm	105282-11	1800 || 1800 || RPD: 0	[NR]	[NR]
NOx as N in water	mg/L	105282-11	0.2 || 0.2 || RPD: 0	105282-2	104%
Ammonia as N in water	mg/L	105282-11	1.3 || 1.3 || RPD: 0	105282-2	112%
Turbidity	NTU	105282-11	35 || 35 || RPD: 0	[NR]	[NR]
Total Cyanide	mg/L	[NT]	[NT]	105282-2	101%

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	105433-8	21/02/2014 || 21/02/2014
Date analysed	-	105433-8	21/02/2014 || 21/02/2014
Calcium - Dissolved	mg/L	105433-8	7.7 || 7.6 || RPD: 1
Potassium - Dissolved	mg/L	105433-8	4.4 || 4.4 || RPD: 0
Sodium - Dissolved	mg/L	105433-8	35 || 35 || RPD: 0
Magnesium - Dissolved	mg/L	105433-8	8.5 || 8.5 || RPD: 0
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	105433-8	<5 || [N/T]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	105433-8	80 || [N/T]
Carbonate Alkalinity as $CaCO_3$	mg/L	105433-8	<5 || [N/T]
Total Alkalinity as $CaCO_3$	mg/L	105433-8	80 || [N/T]
Sulphate, SO4	mg/L	105433-8	6 || [N/T]
Chloride, Cl	mg/L	105433-8	32 || [N/T]
Ionic Balance	%	105433-8	1.5 || [N/T]

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	105433-10	21/02/2014 || 21/02/2014
Date analysed	-	105433-10	21/02/2014 || 21/02/2014
Calcium - Dissolved	mg/L	105433-10	19 || [N/T]
Potassium - Dissolved	mg/L	105433-10	13 || [N/T]
Sodium - Dissolved	mg/L	105433-10	19 || [N/T]
Magnesium - Dissolved	mg/L	105433-10	11 || [N/T]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	105433-10	<5 || [N/T]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	105433-10	110 || [N/T]
Carbonate Alkalinity as $CaCO_3$	mg/L	105433-10	<5 || [N/T]
Total Alkalinity as $CaCO_3$	mg/L	105433-10	110 || [N/T]
Sulphate, SO4	mg/L	105433-10	24 || 23 || RPD: 4
Chloride, Cl	mg/L	105433-10	21 || 21 || RPD: 0
Ionic Balance	%	105433-10	-4.1 || [N/T]

Client Reference: 49761.03, Bylong

Report Comments:

ION_BALANCE: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

For the determination of dissolved metals in samples 105282-1, 105282-2 and 105282-3 the unpreserved sample was filtered through 0.45um filter at the lab due to the presence of colloids and/or sediment in the supplied HNO3 bottle.

E. coli & Faecal Coliforms analysed by Sonic Food & Water Testing. Report No.W1402854.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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CERTIFICATE OF ANALYSIS **106730**

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	9 Waters
Date samples received / completed instructions received	19/03/14 / 19/03/14

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	26/03/14 / 25/03/14
Date of Preliminary Report:	Not issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-1 BY0014 17/03/2014 Water	106730-2 BY0016 17/03/2014 Water	106730-3 A01-S 18/03/2014 Water	106730-4 BY0015 18/03/2014 Water	106730-5 A13 18/03/2014 Water
Date prepared	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Date analysed	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Arsenic-Dissolved	µg/L	<1	26	1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	1	<1	2
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	3	10	63	1	20
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	6	4	6	<1	3
Aluminium-Dissolved	µg/L	5	2	6	3	2
Barium-Dissolved	µg/L	220	340	140	100	98
Beryllium-Dissolved	µg/L	<0.1	0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1	2
Iron-Dissolved	µg/L	240	510	2,300	270	67
Manganese-Dissolved	µg/L	25	32	1,300	50	340
Vanadium-Dissolved	µg/L	<1	<1	<1	<1	<1
Selenium-Dissolved	µg/L	4	7	7	3	5

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-6 A14 18/03/2014 Water	106730-7 A09 18/03/2014 Water	106730-8 AGE08 18/03/2014 Water
Date prepared	-	20/03/2014	20/03/2014	20/03/2014
Date analysed	-	20/03/2014	20/03/2014	20/03/2014
Arsenic-Dissolved	µg/L	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	1	<1	2
Lead-Dissolved	µg/L	<1	<1	<1
Zinc-Dissolved	µg/L	7	13	160
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	4	27
Aluminium-Dissolved	µg/L	<0.5	2	21
Barium-Dissolved	µg/L	99	120	160
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1
Iron-Dissolved	µg/L	<10	22	180
Manganese-Dissolved	µg/L	<5	140	130
Vanadium-Dissolved	µg/L	1	1	<1
Selenium-Dissolved	µg/L	7	5	3

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-1 BY0014 17/03/2014 Water	106730-2 BY0016 17/03/2014 Water	106730-3 A01-S 18/03/2014 Water	106730-4 BY0015 18/03/2014 Water	106730-5 A13 18/03/2014 Water
Date prepared	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Date analysed	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Calcium - Dissolved	mg/L	38	34	120	47	89
Potassium - Dissolved	mg/L	12	19	6.9	14	6.4
Sodium - Dissolved	mg/L	240	720	300	240	130
Magnesium - Dissolved	mg/L	21	21	99	27	67
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	470	1,100	440	430	290
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	470	1,100	440	430	290
Sulphate, SO4	mg/L	<1	7	210	34	91
Chloride, Cl	mg/L	78	180	350	110	210
Ionic Balance	%	10	13	9.2	11	7.7

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-6 A14 18/03/2014 Water	106730-7 A09 18/03/2014 Water	106730-8 AGE08 18/03/2014 Water	106730-9 RT3 18/03/2014 Water
Date prepared	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Date analysed	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Calcium - Dissolved	mg/L	120	110	39	<0.5
Potassium - Dissolved	mg/L	5.5	11	14	<0.5
Sodium - Dissolved	mg/L	180	370	260	<0.5
Magnesium - Dissolved	mg/L	89	97	28	<0.5
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	460	410	580	7
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	460	410	580	7
Sulphate, SO4	mg/L	230	210	<1	<1
Chloride, Cl	mg/L	170	400	82	<1
Ionic Balance	%	7.7	11	6.7	-100

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	106730-1	106730-2	106730-3	106730-4	106730-5
Your Reference	----------	BY0014	BY0016	A01-S	BY0015	A13
Date Sampled	----------	17/03/2014	17/03/2014	18/03/2014	18/03/2014	18/03/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Date analysed	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Phosphorus - Total	mg/L	<0.05	<0.05	0.07	<0.05	<0.05

Metals in Waters - Acid extractable					
Our Reference:	UNITS	106730-6	106730-7	106730-8	106730-9
Your Reference	----------	A14	A09	AGE08	RT3
Date Sampled	----------	18/03/2014	18/03/2014	18/03/2014	18/03/2014
Type of sample		Water	Water	Water	Water
Date prepared	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Date analysed	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	<0.05

Client Reference: 49761.03, Bylong

HM in water - total		
Our Reference:	UNITS	106730-9
Your Reference	----------	RT3
Date Sampled	----------	18/03/2014
Type of sample		Water
Date prepared	-	20/03/2014
Date analysed	-	20/03/2014
Arsenic-Total	µg/L	<1
Cadmium-Total	µg/L	0.6
Chromium-Total	µg/L	<1
Copper-Total	µg/L	8
Lead-Total	µg/L	1
Zinc-Total	µg/L	3,300
Mercury-Total	µg/L	<0.05
Nickel-Total	µg/L	<1
Aluminium-Total	µg/L	1
Barium-Total	µg/L	2
Beryllium-Total	µg/L	<0.1
Cobalt-Total	µg/L	<1
Iron-Total	µg/L	<10
Manganese-Total	µg/L	<5
Vanadium-Total	µg/L	<1
Selenium-Total	µg/L	<1

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-1 BY0014 17/03/2014 Water	106730-2 BY0016 17/03/2014 Water	106730-3 A01-S 18/03/2014 Water	106730-4 BY0015 18/03/2014 Water	106730-5 A13 18/03/2014 Water
Date prepared	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Date analysed	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
pH	pH Units	7.5	7.2	5.9	7.3	6.3
Electrical Conductivity	µS/cm	930	2,400	2,200	1,200	1,400
NOx as N in water	mg/L	<0.005	<0.005	0.006	<0.005	0.3
Ammonia as N in water	mg/L	1.0	1.9	0.069	0.98	<0.005
Turbidity	NTU	2.8	5.8	1.5	4.5	0.6

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-6 A14 18/03/2014 Water	106730-7 A09 18/03/2014 Water	106730-8 AGE08 18/03/2014 Water	106730-9 RT3 18/03/2014 Water
Date prepared	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Date analysed	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014
pH	pH Units	7.2	6.6	5.8	6.2
Electrical Conductivity	µS/cm	1,600	2,300	1,200	21
NOx as N in water	mg/L	1.6	0.3	0.02	0.3
Ammonia as N in water	mg/L	<0.005	<0.005	1.7	<0.005
Turbidity	NTU	24	24	51	0.3
Total Cyanide	mg/L	[NA]	[NA]	[NA]	<0.004

Client Reference: 49761.03, Bylong

Microbiologocal Testing		
Our Reference:	UNITS	106730-9
Your Reference	----------	RT3
Date Sampled	----------	18/03/2014
Type of sample		Water
Date testing started	-	20/03/2014
Date testing completed	-	20/03/2014
E. Coli	CFU/100mL	<1
Faecal Coliforms	CFU/100mL	<1

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-013	Cyanide - total determined colourimetrically after distillation, based on APHA 22nd ED, 4500-CN_C,E. Free cyanide determined colourimetrically after filtration and confirmed by diffusion. Solids are extracted in a caustic media prior to distillation and analysis.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/03/2014	106730-8	20/03/2014 || 20/03/2014	LCS-W1	20/03/2014
Date analysed	-			20/03/2014	106730-8	20/03/2014 || 20/03/2014	LCS-W1	20/03/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	96%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	106730-8	<0.1 || <0.1	LCS-W1	95%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	97%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	2 || 2 || RPD: 0	LCS-W1	101%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	98%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	160 || 160 || RPD: 0	LCS-W1	95%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	106730-8	<0.05 || [N/T]	LCS-W1	100%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	27 || 26 || RPD: 4	LCS-W1	98%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	106730-8	21 || 21 || RPD: 0	LCS-W1	96%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	160 || 160 || RPD: 0	LCS-W1	99%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	106730-8	<0.1 || <0.1	LCS-W1	92%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	98%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	106730-8	180 || 190 || RPD: 5	LCS-W1	101%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	106730-8	130 || 130 || RPD: 0	LCS-W1	104%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	102%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	3 || 5 || RPD: 50	LCS-W1	95%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/03/2014	106730-1	19/03/2014 || 19/03/2014	LCS-W1	19/03/2014
Date analysed	-			19/03/2014	106730-1	19/03/2014 || 19/03/2014	LCS-W1	19/03/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106730-1	38 || 37 || RPD: 3	LCS-W1	117%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106730-1	12 || 12 || RPD: 0	LCS-W1	117%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106730-1	240 || 240 || RPD: 0	LCS-W1	111%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106730-1	21 || 20 || RPD: 5	LCS-W1	117%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	106730-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106730-1	470 || 470 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106730-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106730-1	470 || 470 || RPD: 0	LCS-W1	101%
Sulphate, SO4	mg/L	1	Inorg-081	<1	106730-1	<1 || <1	LCS-W1	102%
Chloride, Cl	mg/L	1	Inorg-081	<1	106730-1	78 || 79 || RPD: 1	LCS-W1	96%
Ionic Balance	%		Inorg-041	[NT]	106730-1	10 || 11 || RPD: 10	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/03/2014	106730-5	20/03/2014 || 20/03/2014	LCS-W2	20/03/2014
Date analysed	-			20/03/2014	106730-5	20/03/2014 || 20/03/2014	LCS-W2	20/03/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	106730-5	<0.05 || <0.05	LCS-W2	104%
QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/03/2014	[NT]	[NT]	LCS-W3	20/03/2014
Date analysed	-			20/03/2014	[NT]	[NT]	LCS-W3	20/03/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	97%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W3	99%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	102%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	105%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	98%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	104%

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]	[NT]	LCS-W3	96%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	104%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]	[NT]	LCS-W3	107%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	100%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W3	89%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	99%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	[NT]	[NT]	LCS-W3	101%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	[NT]	[NT]	LCS-W3	106%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	103%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	103%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/03/2014	106730-1	19/03/2014 || 19/03/2014	LCS-W1	19/03/2014
Date analysed	-			19/03/2014	106730-1	19/03/2014 || 19/03/2014	LCS-W1	19/03/2014
pH	pH Units		Inorg-001	[NT]	106730-1	7.5 || 7.6 || RPD: 1	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	106730-1	930 || 1000 || RPD: 7	LCS-W1	94%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	106730-1	<0.005 || <0.005	LCS-W1	98%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	106730-1	1.0 || 0.99 || RPD: 1	LCS-W1	105%
Turbidity	NTU	0.1	Inorg-022	<0.1	106730-1	2.8 || 2.7 || RPD: 4	LCS-W1	100%
Total Cyanide	mg/L	0.004	Inorg-013	<0.004	[NT]	[NT]	LCS-W1	103%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			[NT]
Date testing completed	-			[NT]
E. Coli	CFU/100 mL	1	Ext-008	<1
Faecal Coliforms	CFU/100 mL	1	Ext-008	<1

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	106730-1	20/03/2014 || 20/03/2014
Date analysed	-	106730-1	20/03/2014 || 20/03/2014
Mercury-Dissolved	µg/L	106730-1	<0.05 || <0.05
Selenium-Dissolved	µg/L	106730-1	4 || <1

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	106730-2	19/03/2014
Date analysed	-	[NT]	[NT]	106730-2	19/03/2014
Calcium - Dissolved	mg/L	[NT]	[NT]	106730-2	#
Potassium - Dissolved	mg/L	[NT]	[NT]	106730-2	#
Sodium - Dissolved	mg/L	[NT]	[NT]	106730-2	#
Magnesium - Dissolved	mg/L	[NT]	[NT]	106730-2	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Sulphate, SO4	mg/L	[NT]	[NT]	106730-2	80%
Chloride, Cl	mg/L	[NT]	[NT]	106730-2	82%
Ionic Balance	%	[NT]	[NT]	[NR]	[NR]
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	106730-2	19/03/2014
Date analysed	-	[NT]	[NT]	106730-2	19/03/2014
pH	pH Units	[NT]	[NT]	[NR]	[NR]
Electrical Conductivity	µS/cm	[NT]	[NT]	[NR]	[NR]
NOx as N in water	mg/L	[NT]	[NT]	106730-2	94%
Ammonia as N in water	mg/L	[NT]	[NT]	106730-2	70%
Turbidity	NTU	[NT]	[NT]	[NR]	[NR]
Total Cyanide	mg/L	[NT]	[NT]	[NR]	[NR]

Client Reference: 49761.03, Bylong

Report Comments:

Ion_balance: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.E. Coli & Faecal Coliforms analysed by Sonic Food & Water Testing. Report No.W1404330.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Envirolab Services Pty Ltd
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CERTIFICATE OF ANALYSIS 106730

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	9 Waters
Date samples received / completed instructions received	19/03/14 / 19/03/14

This report replaces the one dated 25/03/2014 (R00) due to the ammendment of Se results.

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	26/03/14 / 26/03/14
Date of Preliminary Report:	Not issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-1 BY0014 17/03/2014 Water	106730-2 BY0016 17/03/2014 Water	106730-3 A01-S 18/03/2014 Water	106730-4 BY0015 18/03/2014 Water	106730-5 A13 18/03/2014 Water
Date prepared	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Date analysed	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Arsenic-Dissolved	µg/L	<1	26	1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	1	<1	2
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	3	10	63	1	20
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	6	4	6	<1	3
Aluminium-Dissolved	µg/L	5	2	6	3	2
Barium-Dissolved	µg/L	220	340	140	100	98
Beryllium-Dissolved	µg/L	<0.1	0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1	2
Iron-Dissolved	µg/L	240	510	2,300	270	67
Manganese-Dissolved	µg/L	25	32	1,300	50	340
Vanadium-Dissolved	µg/L	<1	<1	<1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-6 A14 18/03/2014 Water	106730-7 A09 18/03/2014 Water	106730-8 AGE08 18/03/2014 Water
Date prepared	-	20/03/2014	20/03/2014	20/03/2014
Date analysed	-	20/03/2014	20/03/2014	20/03/2014
Arsenic-Dissolved	µg/L	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	1	<1	2
Lead-Dissolved	µg/L	<1	<1	<1
Zinc-Dissolved	µg/L	7	13	160
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	4	27
Aluminium-Dissolved	µg/L	<0.5	2	21
Barium-Dissolved	µg/L	99	120	160
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1
Iron-Dissolved	µg/L	<10	22	180
Manganese-Dissolved	µg/L	<5	140	130
Vanadium-Dissolved	µg/L	1	1	<1
Selenium-Dissolved	µg/L	2	1	<1

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-1 BY0014 17/03/2014 Water	106730-2 BY0016 17/03/2014 Water	106730-3 A01-S 18/03/2014 Water	106730-4 BY0015 18/03/2014 Water	106730-5 A13 18/03/2014 Water
Date prepared	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Date analysed	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Calcium - Dissolved	mg/L	38	34	120	47	89
Potassium - Dissolved	mg/L	12	19	6.9	14	6.4
Sodium - Dissolved	mg/L	240	720	300	240	130
Magnesium - Dissolved	mg/L	21	21	99	27	67
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	470	1,100	440	430	290
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	470	1,100	440	430	290
Sulphate, SO4	mg/L	<1	7	210	34	91
Chloride, Cl	mg/L	78	180	350	110	210
Ionic Balance	%	10	13	9.2	11	7.7

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-6 A14 18/03/2014 Water	106730-7 A09 18/03/2014 Water	106730-8 AGE08 18/03/2014 Water	106730-9 RT3 18/03/2014 Water
Date prepared	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Date analysed	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Calcium - Dissolved	mg/L	120	110	39	<0.5
Potassium - Dissolved	mg/L	5.5	11	14	<0.5
Sodium - Dissolved	mg/L	180	370	260	<0.5
Magnesium - Dissolved	mg/L	89	97	28	<0.5
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	460	410	580	7
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	460	410	580	7
Sulphate, SO4	mg/L	230	210	<1	<1
Chloride, Cl	mg/L	170	400	82	<1
Ionic Balance	%	7.7	11	6.7	-100

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	106730-1	106730-2	106730-3	106730-4	106730-5
Your Reference	----------	BY0014	BY0016	A01-S	BY0015	A13
Date Sampled	----------	17/03/2014	17/03/2014	18/03/2014	18/03/2014	18/03/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Date analysed	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Phosphorus - Total	mg/L	<0.05	<0.05	0.07	<0.05	<0.05

Metals in Waters - Acid extractable					
Our Reference:	UNITS	106730-6	106730-7	106730-8	106730-9
Your Reference	----------	A14	A09	AGE08	RT3
Date Sampled	----------	18/03/2014	18/03/2014	18/03/2014	18/03/2014
Type of sample		Water	Water	Water	Water
Date prepared	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Date analysed	-	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	<0.05

Client Reference: 49761.03, Bylong

HM in water - total		
Our Reference:	UNITS	106730-9
Your Reference	----------	RT3
Date Sampled	----------	18/03/2014
Type of sample		Water
Date prepared	-	20/03/2014
Date analysed	-	20/03/2014
Arsenic-Total	µg/L	<1
Cadmium-Total	µg/L	0.6
Chromium-Total	µg/L	<1
Copper-Total	µg/L	8
Lead-Total	µg/L	1
Zinc-Total	µg/L	3,300
Mercury-Total	µg/L	<0.05
Nickel-Total	µg/L	<1
Aluminium-Total	µg/L	1
Barium-Total	µg/L	2
Beryllium-Total	µg/L	<0.1
Cobalt-Total	µg/L	<1
Iron-Total	µg/L	<10
Manganese-Total	µg/L	<5
Vanadium-Total	µg/L	<1
Selenium-Total	µg/L	<1

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-1 BY0014 17/03/2014 Water	106730-2 BY0016 17/03/2014 Water	106730-3 A01-S 18/03/2014 Water	106730-4 BY0015 18/03/2014 Water	106730-5 A13 18/03/2014 Water
Date prepared	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Date analysed	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
pH	pH Units	7.5	7.2	5.9	7.3	6.3
Electrical Conductivity	µS/cm	930	2,400	2,200	1,200	1,400
NOx as N in water	mg/L	<0.005	<0.005	0.006	<0.005	0.3
Ammonia as N in water	mg/L	1.0	1.9	0.069	0.98	<0.005
Turbidity	NTU	2.8	5.8	1.5	4.5	0.6

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106730-6 A14 18/03/2014 Water	106730-7 A09 18/03/2014 Water	106730-8 AGE08 18/03/2014 Water	106730-9 RT3 18/03/2014 Water
Date prepared	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Date analysed	-	19/03/2014	19/03/2014	19/03/2014	19/03/2014
pH	pH Units	7.2	6.6	5.8	6.2
Electrical Conductivity	µS/cm	1,600	2,300	1,200	21
NOx as N in water	mg/L	1.6	0.3	0.02	0.3
Ammonia as N in water	mg/L	<0.005	<0.005	1.7	<0.005
Turbidity	NTU	24	24	51	0.3
Total Cyanide	mg/L	[NA]	[NA]	[NA]	<0.004

Client Reference: 49761.03, Bylong

Microbiologocal Testing		
Our Reference:	UNITS	106730-9
Your Reference	----------	RT3
Date Sampled	----------	18/03/2014
Type of sample		Water
Date testing started	-	20/03/2014
Date testing completed	-	20/03/2014
E. Coli	CFU/100mL	<1
Faecal Coliforms	CFU/100mL	<1

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-013	Cyanide - total determined colourimetrically after distillation, based on APHA 22nd ED, 4500-CN_C,E. Free cyanide determined colourimetrically after filtration and confirmed by diffusion. Solids are extracted in a caustic media prior to distillation and analysis.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/03/2014	106730-8	20/03/2014 || 20/03/2014	LCS-W1	20/03/2014
Date analysed	-			20/03/2014	106730-8	20/03/2014 || 20/03/2014	LCS-W1	20/03/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	96%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	106730-8	<0.1 || <0.1	LCS-W1	95%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	97%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	2 || 2 || RPD: 0	LCS-W1	101%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	98%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	160 || 160 || RPD: 0	LCS-W1	95%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	106730-8	<0.05 || [N/T]	LCS-W1	100%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	27 || 26 || RPD: 4	LCS-W1	98%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	106730-8	21 || 21 || RPD: 0	LCS-W1	96%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	160 || 160 || RPD: 0	LCS-W1	99%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	106730-8	<0.1 || <0.1	LCS-W1	92%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	98%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	106730-8	180 || 190 || RPD: 5	LCS-W1	101%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	106730-8	130 || 130 || RPD: 0	LCS-W1	104%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	102%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106730-8	<1 || <1	LCS-W1	95%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/03/2014	106730-1	19/03/2014 || 19/03/2014	LCS-W1	19/03/2014
Date analysed	-			19/03/2014	106730-1	19/03/2014 || 19/03/2014	LCS-W1	19/03/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106730-1	38 || 37 || RPD: 3	LCS-W1	117%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106730-1	12 || 12 || RPD: 0	LCS-W1	117%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106730-1	240 || 240 || RPD: 0	LCS-W1	111%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106730-1	21 || 20 || RPD: 5	LCS-W1	117%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	106730-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106730-1	470 || 470 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106730-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106730-1	470 || 470 || RPD: 0	LCS-W1	101%
Sulphate, SO4	mg/L	1	Inorg-081	<1	106730-1	<1 || <1	LCS-W1	102%
Chloride, Cl	mg/L	1	Inorg-081	<1	106730-1	78 || 79 || RPD: 1	LCS-W1	96%
Ionic Balance	%		Inorg-041	[NT]	106730-1	10 || 11 || RPD: 10	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/03/2014	106730-5	20/03/2014 || 20/03/2014	LCS-W2	20/03/2014
Date analysed	-			20/03/2014	106730-5	20/03/2014 || 20/03/2014	LCS-W2	20/03/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	106730-5	<0.05 || <0.05	LCS-W2	104%
QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/03/2014	[NT]	[NT]	LCS-W3	20/03/2014
Date analysed	-			20/03/2014	[NT]	[NT]	LCS-W3	20/03/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	97%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W3	99%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	102%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	105%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	98%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	104%

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]	[NT]	LCS-W3	96%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	104%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]	[NT]	LCS-W3	107%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	100%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W3	89%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	99%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	[NT]	[NT]	LCS-W3	101%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	[NT]	[NT]	LCS-W3	106%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	103%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W3	103%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			19/03/2014	106730-1	19/03/2014 || 19/03/2014	LCS-W1	19/03/2014
Date analysed	-			19/03/2014	106730-1	19/03/2014 || 19/03/2014	LCS-W1	19/03/2014
pH	pH Units		Inorg-001	[NT]	106730-1	7.5 || 7.6 || RPD: 1	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	106730-1	930 || 1000 || RPD: 7	LCS-W1	94%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	106730-1	<0.005 || <0.005	LCS-W1	98%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	106730-1	1.0 || 0.99 || RPD: 1	LCS-W1	105%
Turbidity	NTU	0.1	Inorg-022	<0.1	106730-1	2.8 || 2.7 || RPD: 4	LCS-W1	100%
Total Cyanide	mg/L	0.004	Inorg-013	<0.004	[NT]	[NT]	LCS-W1	103%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			[NT]
Date testing completed	-			[NT]
E. Coli	CFU/100 mL	1	Ext-008	<1
Faecal Coliforms	CFU/100 mL	1	Ext-008	<1

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	106730-1	20/03/2014 || 20/03/2014
Date analysed	-	106730-1	20/03/2014 || 20/03/2014
Mercury-Dissolved	µg/L	106730-1	<0.05 || <0.05

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	106730-2	19/03/2014
Date analysed	-	[NT]	[NT]	106730-2	19/03/2014
Calcium - Dissolved	mg/L	[NT]	[NT]	106730-2	#
Potassium - Dissolved	mg/L	[NT]	[NT]	106730-2	#
Sodium - Dissolved	mg/L	[NT]	[NT]	106730-2	#
Magnesium - Dissolved	mg/L	[NT]	[NT]	106730-2	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	[NT]	[NT]	[NR]	[NR]
Sulphate, SO4	mg/L	[NT]	[NT]	106730-2	80%
Chloride, Cl	mg/L	[NT]	[NT]	106730-2	82%
Ionic Balance	%	[NT]	[NT]	[NR]	[NR]
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	106730-2	19/03/2014
Date analysed	-	[NT]	[NT]	106730-2	19/03/2014
pH	pH Units	[NT]	[NT]	[NR]	[NR]
Electrical Conductivity	µS/cm	[NT]	[NT]	[NR]	[NR]
NOx as N in water	mg/L	[NT]	[NT]	106730-2	94%
Ammonia as N in water	mg/L	[NT]	[NT]	106730-2	70%
Turbidity	NTU	[NT]	[NT]	[NR]	[NR]
Total Cyanide	mg/L	[NT]	[NT]	[NR]	[NR]

Client Reference: 49761.03, Bylong

Report Comments:

Ion_balance: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

E. Coli & Faecal Coliforms analysed by Sonic Food & Water Testing. Report No.W1404330.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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CERTIFICATE OF ANALYSIS **106867**

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	17 Waters
Date samples received / completed instructions received	21/03/14 / 21/03/14

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	28/03/14 / 31/03/14
Date of Preliminary Report:	

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-1 SW4 19/03/2014 Water	106867-2 A10 19/03/2014 Water	106867-3 A06-S 19/03/2014 Water	106867-4 AGE10 19/03/2014 Water	106867-5 A15 19/03/2014 Water
Date prepared	-	24/03/2014	24/03/2014	24/03/2014	24/03/2014	24/03/2014
Date analysed	-	24/03/2014	24/03/2014	24/03/2014	24/03/2014	24/03/2014
Arsenic-Dissolved	µg/L	<1	1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	1	<1	2
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	2	49	4	1	23
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	1	22	2	17	5
Aluminium-Dissolved	µg/L	2	19	5	3	3
Barium-Dissolved	µg/L	80	69	42	320	26
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	4	<1	<1	<1
Iron-Dissolved	µg/L	250	620	22	690	22
Manganese-Dissolved	µg/L	430	1,400	11	130	91
Vanadium-Dissolved	µg/L	<1	<1	2	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-6 B3-D 19/03/2014 Water	106867-7 B3-S 19/03/2014 Water	106867-8 A02-S 19/03/2014 Water	106867-9 A12 19/03/2014 Water	106867-11 A18 20/03/2014 Water
Date prepared	-	24/03/2014	24/03/2014	24/03/2014	24/03/2014	24/03/2014
Date analysed	-	24/03/2014	24/03/2014	24/03/2014	24/03/2014	24/03/2014
Arsenic-Dissolved	µg/L	2	<1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	2	<1	1	<1	<1
Copper-Dissolved	µg/L	15	<1	7	<1	2
Lead-Dissolved	µg/L	5	<1	<1	<1	<1
Zinc-Dissolved	µg/L	82	13	41	38	49
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	20	6	10	11	7
Aluminium-Dissolved	µg/L	1,000	6	10	9	5
Barium-Dissolved	µg/L	210	50	130	65	79
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	7	8	2	1	1
Iron-Dissolved	µg/L	5,700	1,600	<10	550	620
Manganese-Dissolved	µg/L	1,800	650	650	130	89
Vanadium-Dissolved	µg/L	5	<1	1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	4	<1	<1

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-12 AGE13 20/03/2014 Water	106867-16 D48 20/03/2014 Water
Date prepared	-	24/03/2014	24/03/2014
Date analysed	-	24/03/2014	24/03/2014
Arsenic-Dissolved	µg/L	3	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1
Copper-Dissolved	µg/L	<1	1
Lead-Dissolved	µg/L	<1	<1
Zinc-Dissolved	µg/L	110	31
Mercury-Dissolved	µg/L	<0.05	<0.05
Nickel-Dissolved	µg/L	3	7
Aluminium-Dissolved	µg/L	12	5
Barium-Dissolved	µg/L	89	82
Beryllium-Dissolved	µg/L	<0.1	<0.1
Cobalt-Dissolved	µg/L	1	1
Iron-Dissolved	µg/L	580	580
Manganese-Dissolved	µg/L	58	88
Vanadium-Dissolved	µg/L	<1	<1
Selenium-Dissolved	µg/L	<1	<1

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-1 SW4 19/03/2014 Water	106867-2 A10 19/03/2014 Water	106867-3 A06-S 19/03/2014 Water	106867-4 AGE10 19/03/2014 Water	106867-5 A15 19/03/2014 Water
Date prepared	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Date analysed	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Calcium - Dissolved	mg/L	130	64	52	56	14
Potassium - Dissolved	mg/L	7.9	6.3	4.7	27	3.2
Sodium - Dissolved	mg/L	230	120	110	450	30
Magnesium - Dissolved	mg/L	99	48	39	66	12
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	320	340	310	920	77
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	320	340	310	920	77
Sulphate, SO4	mg/L	310	31	13	15	5
Chloride, Cl	mg/L	290	130	110	210	33
Ionic Balance	%	8.0	5.3	6.3	7.2	8.7

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-6 B3-D 19/03/2014 Water	106867-7 B3-S 19/03/2014 Water	106867-8 A02-S 19/03/2014 Water	106867-9 A12 19/03/2014 Water	106867-10 RT4 20/03/2014 Water
Date prepared	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Date analysed	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Calcium - Dissolved	mg/L	34	7.2	120	21	<0.5
Potassium - Dissolved	mg/L	5.3	4.7	9.5	3.7	<0.5
Sodium - Dissolved	mg/L	91	39	58	24	<0.5
Magnesium - Dissolved	mg/L	27	9.0	67	14	<0.5
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	380	70	360	86	6
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	380	70	360	86	6
Sulphate, SO4	mg/L	18	9	56	17	<1
Chloride, Cl	mg/L	58	31	120	25	<1
Ionic Balance	%	-8.8	8.6	11	9.7	-100

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Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-11 A18 20/03/2014 Water	106867-12 AGE13 20/03/2014 Water	106867-13 RT5 20/03/2014 Water	106867-14 RT1 20/03/2014 Water	106867-15 RT2 20/03/2014 Water
Date prepared	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Date analysed	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Calcium - Dissolved	mg/L	19	74	11	2.8	0.7
Potassium - Dissolved	mg/L	14	20	1.0	5.6	<0.5
Sodium - Dissolved	mg/L	24	230	7.6	0.8	1.1
Magnesium - Dissolved	mg/L	12	81	5.6	0.9	0.5
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	100	680	38	27	10
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	100	680	38	27	10
Sulphate, SO4	mg/L	22	50	18	1	1
Chloride, Cl	mg/L	21	140	10	2	2
Ionic Balance	%	4.0	6.3	-1.4	-22	-37

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-16 D48 20/03/2014 Water	106867-17 D49 20/03/2014 Water
Date prepared	-	21/03/2014	21/03/2014
Date analysed	-	21/03/2014	21/03/2014
Calcium - Dissolved	mg/L	21	0.7
Potassium - Dissolved	mg/L	15	<0.5
Sodium - Dissolved	mg/L	25	1.1
Magnesium - Dissolved	mg/L	13	0.5
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	100	10
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	100	10
Sulphate, SO4	mg/L	22	1
Chloride, Cl	mg/L	21	2
Ionic Balance	%	7.4	-37

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	106867-1	106867-2	106867-3	106867-4	106867-5
Your Reference	----------	SW4	A10	A06-S	AGE10	A15
Date Sampled	----------	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Phosphorus - Total	mg/L	0.1	0.1	0.6	<0.05	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	106867-6	106867-7	106867-8	106867-9	106867-10
Your Reference	----------	B3-D	B3-S	A02-S	A12	RT4
Date Sampled	----------	19/03/2014	19/03/2014	19/03/2014	19/03/2014	20/03/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Phosphorus - Total	mg/L	0.08	<0.05	0.2	0.1	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	106867-11	106867-12	106867-13	106867-14	106867-15
Your Reference	----------	A18	AGE13	RT5	RT1	RT2
Date Sampled	----------	20/03/2014	20/03/2014	20/03/2014	20/03/2014	20/03/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Phosphorus - Total	mg/L	0.05	<0.05	<0.05	0.2	<0.05

Metals in Waters - Acid extractable			
Our Reference:	UNITS	106867-16	106867-17
Your Reference	----------	D48	D49
Date Sampled	----------	20/03/2014	20/03/2014
Type of sample		Water	Water
Date prepared	-	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014
Phosphorus - Total	mg/L	<0.05	<0.05

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HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-10 RT4 20/03/2014 Water	106867-13 RT5 20/03/2014 Water	106867-14 RT1 20/03/2014 Water	106867-15 RT2 20/03/2014 Water	106867-16 D48 20/03/2014 Water
Date prepared	-	26/03/2014	26/03/2014	26/03/2014	26/03/2014	26/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014	26/03/2014	26/03/2014
Arsenic-Total	µg/L	<1	<1	<1	<1	<1
Cadmium-Total	µg/L	<0.1	<0.1	0.1	0.5	<0.1
Chromium-Total	µg/L	<1	<1	<1	<1	1
Copper-Total	µg/L	1,900	54	7	6	4
Lead-Total	µg/L	4	<1	7	3	1
Zinc-Total	µg/L	120	1,500	8,600	4,700	41
Mercury-Total	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Total	µg/L	<1	2	<1	<1	8
Aluminium-Total	µg/L	11	9	19	2	740
Barium-Total	µg/L	7	17	6	3	97
Beryllium-Total	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Total	µg/L	<1	<1	<1	<1	2
Iron-Total	µg/L	<10	13	150	<10	1,300
Manganese-Total	µg/L	9	11	44	<5	87
Vanadium-Total	µg/L	<1	<1	<1	<1	2
Selenium-Total	µg/L	<1	<1	<1	<1	<1

HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-17 D49 20/03/2014 Water
Date prepared	-	26/03/2014
Date analysed	-	26/03/2014
Arsenic-Total	µg/L	<1
Cadmium-Total	µg/L	0.5
Chromium-Total	µg/L	<1
Copper-Total	µg/L	6
Lead-Total	µg/L	4
Zinc-Total	µg/L	4,700
Mercury-Total	µg/L	<0.05
Nickel-Total	µg/L	<1
Aluminium-Total	µg/L	2
Barium-Total	µg/L	3
Beryllium-Total	µg/L	<0.1
Cobalt-Total	µg/L	<1
Iron-Total	µg/L	<10
Manganese-Total	µg/L	<5
Vanadium-Total	µg/L	<1
Selenium-Total	µg/L	<1

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Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-1 SW4 19/03/2014 Water	106867-2 A10 19/03/2014 Water	106867-3 A06-S 19/03/2014 Water	106867-4 AGE10 19/03/2014 Water	106867-5 A15 19/03/2014 Water
Date prepared	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Date analysed	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
pH	pH Units	6.9	5.6	7.0	6.7	5.8
Electrical Conductivity	µS/cm	1,900	1,100	920	2,200	280
NOx as N in water	mg/L	<0.005	0.01	<0.005	0.01	0.02
Ammonia as N in water	mg/L	0.028	0.036	<0.005	2.9	<0.005
Turbidity	NTU	13	280	640	31	15

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-6 B3-D 19/03/2014 Water	106867-7 B3-S 19/03/2014 Water	106867-8 A02-S 19/03/2014 Water	106867-9 A12 19/03/2014 Water	106867-10 RT4 20/03/2014 Water
Date prepared	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Date analysed	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
pH	pH Units	5.9	6.4	6.9	5.2	5.9
Electrical Conductivity	µS/cm	840	230	1,200	310	14
NOx as N in water	mg/L	0.01	<0.005	24	0.04	0.07
Ammonia as N in water	mg/L	2.9	<0.005	<0.005	0.008	<0.005
Turbidity	NTU	25	21	620	300	0.3
Total Cyanide	mg/L	[NA]	[NA]	[NA]	[NA]	<0.004

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-11 A18 20/03/2014 Water	106867-12 AGE13 20/03/2014 Water	106867-13 RT5 20/03/2014 Water	106867-14 RT1 20/03/2014 Water	106867-15 RT2 20/03/2014 Water
Date prepared	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
Date analysed	-	21/03/2014	21/03/2014	21/03/2014	21/03/2014	21/03/2014
pH	pH Units	5.9	7.1	6.9	6.7	6.3
Electrical Conductivity	µS/cm	320	1,700	150	61	28
NOx as N in water	mg/L	0.01	0.009	0.3	0.72	0.72
Ammonia as N in water	mg/L	0.053	0.98	<0.005	<0.005	<0.005
Turbidity	NTU	28	14	0.6	0.8	0.2
Total Cyanide	mg/L	[NA]	[NA]	<0.004	<0.004	<0.004

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Miscellaneous Inorganics			
Our Reference:	UNITS	106867-16	106867-17
Your Reference	----------	D48	D49
Date Sampled	----------	20/03/2014	20/03/2014
Type of sample		Water	Water
Date prepared	-	21/03/2014	21/03/2014
Date analysed	-	21/03/2014	21/03/2014
pH	pH Units	5.9	6.3
Electrical Conductivity	µS/cm	320	29
NOx as N in water	mg/L	0.007	0.71
Ammonia as N in water	mg/L	0.062	<0.005
Turbidity	NTU	30	0.7
Total Cyanide	mg/L	[NA]	<0.004

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Microbiologocal Testing Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	106867-10 RT4 20/03/2014 Water	106867-13 RT5 20/03/2014 Water	106867-14 RT1 20/03/2014 Water	106867-15 RT2 20/03/2014 Water	106867-17 D49 20/03/2014 Water
Date testing started	-	22/03/2014	22/03/2014	22/03/2014	22/03/2014	22/03/2014
Date testing completed	-	22/03/2014	22/03/2014	22/03/2014	22/03/2014	22/03/2014
E. Coli	CFU/100mL	<1 NBO	2 Approximate NBO	<1	<1	<10 NBO
Faecal Coliforms	CFU/100mL	<1 NBO	2 Approximate NBO	<1	1 Approximate	20 Approximate NBO

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Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-013	Cyanide - total determined colourimetrically after distillation, based on APHA 22nd ED, 4500-CN_C,E. Free cyanide determined colourimetrically after filtration and confirmed by diffusion. Solids are extracted in a caustic media prior to distillation and analysis.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

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QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			26/03/2014	106867-7	24/03/2014 || 24/03/2014	LCS-W2	26/03/2014
Date analysed	-			26/03/2014	106867-7	24/03/2014 || 24/03/2014	LCS-W2	26/03/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	<1 || <1	LCS-W2	95%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	106867-7	<0.1 || <0.1	LCS-W2	94%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	<1 || <1	LCS-W2	98%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	<1 || <1	LCS-W2	102%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	<1 || <1	LCS-W2	91%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	13 || 14 || RPD: 7	LCS-W2	94%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	106867-7	<0.05 || [N/T]	LCS-W2	88%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	6 || 6 || RPD: 0	LCS-W2	94%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	106867-7	6 || 4 || RPD: 40	LCS-W2	104%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	50 || 49 || RPD: 2	LCS-W2	94%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	106867-7	<0.1 || <0.1	LCS-W2	98%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	8 || 8 || RPD: 0	LCS-W2	99%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	106867-7	1600 || 1600 || RPD: 0	LCS-W2	99%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	106867-7	650 || 630 || RPD: 3	LCS-W2	96%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	<1 || <1	LCS-W2	101%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	106867-7	<1 || <1	LCS-W2	94%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			28/03/2014	106867-7	21/03/2014 || 21/03/2014	LCS-W1	21/03/2014
Date analysed	-			28/03/2014	106867-7	21/03/2014 || 21/03/2014	LCS-W1	21/03/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106867-7	7.2 || 6.9 || RPD: 4	LCS-W1	104%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106867-7	4.7 || 4.7 || RPD: 0	LCS-W1	107%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106867-7	39 || 39 || RPD: 0	LCS-W1	102%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	106867-7	9.0 || 8.8 || RPD: 2	LCS-W1	103%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	106867-7	<5 || [N/T]	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106867-7	70 || [N/T]	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106867-7	<5 || [N/T]	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	106867-7	70 || [N/T]	LCS-W1	102%
Sulphate, SO4	mg/L	1	Inorg-081	<1	106867-7	9 || [N/T]	LCS-W1	97%
Chloride, Cl	mg/L	1	Inorg-081	<1	106867-7	31 || [N/T]	LCS-W1	90%
Ionic Balance	%		Inorg-041	[NT]	106867-7	8.6 || [N/T]	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			28/03/2014	106867-1	25/03/2014 || 25/03/2014	LCS-W2	25/03/2014
Date analysed	-			28/03/2014	106867-1	25/03/2014 || 25/03/2014	LCS-W2	25/03/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	106867-1	0.1 || 0.08 || RPD: 22	LCS-W2	103%
QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			26/03/2014	106867-15	26/03/2014 || 26/03/2014	LCS-W2	26/03/2014
Date analysed	-			26/03/2014	106867-15	26/03/2014 || 26/03/2014	LCS-W2	26/03/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	<1 || <1	LCS-W2	102%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	106867-15	0.5 || 0.5 || RPD: 0	LCS-W2	102%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	<1 || <1	LCS-W2	98%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	6 || 5 || RPD: 18	LCS-W2	98%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	3 || 3 || RPD: 0	LCS-W2	98%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	4700 || 4800 || RPD: 2	LCS-W2	104%

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	106867-15	<0.05 || [N/T]	LCS-W2	88%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	<1 || <1	LCS-W2	103%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	106867-15	2 || 4 || RPD: 67	LCS-W2	116%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	3 || 3 || RPD: 0	LCS-W2	105%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	106867-15	<0.1 || <0.1	LCS-W2	112%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	<1 || <1	LCS-W2	101%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	106867-15	<10 || <10	LCS-W2	98%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	106867-15	<5 || <5	LCS-W2	100%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	<1 || <1	LCS-W2	104%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	106867-15	<1 || <1	LCS-W2	120%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			21/03/2014	106867-1	21/03/2014 || 21/03/2014	LCS-W1	21/03/2014
Date analysed	-			21/03/2014	106867-1	21/03/2014 || 21/03/2014	LCS-W1	21/03/2014
pH	pH Units		Inorg-001	[NT]	106867-1	6.9 || 6.9 || RPD: 0	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	106867-1	1900 || 1800 || RPD: 5	LCS-W1	101%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	106867-1	<0.005 || <0.005	LCS-W1	102%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	106867-1	0.028 || 0.023 || RPD: 20	LCS-W1	97%
Turbidity	NTU	0.1	Inorg-022	<0.1	106867-1	13 || 13 || RPD: 0	LCS-W1	99%
Total Cyanide	mg/L	0.004	Inorg-013	<0.004	[NT]	[NT]	LCS-W1	88%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			28/03/2014
Date testing completed	-			28/03/2014
E. Coli	CFU/100 mL	1	Ext-008	<1
Faecal Coliforms	CFU/100 mL	1	Ext-008	<1

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	106867-1	24/03/2014 || 24/03/2014	106867-2	26/03/2014
Date analysed	-	106867-1	24/03/2014 || 24/03/2014	106867-2	26/03/2014
Mercury-Dissolved	µg/L	106867-1	<0.05 || <0.05	106867-2	88%
QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	106867-1	21/03/2014 || 21/03/2014	106867-2	21/03/2014
Date analysed	-	106867-1	21/03/2014 || 21/03/2014	106867-2	21/03/2014
Calcium - Dissolved	mg/L	106867-1	130 || [N/T]	106867-2	#
Potassium - Dissolved	mg/L	106867-1	7.9 || [N/T]	106867-2	84%
Sodium - Dissolved	mg/L	106867-1	230 || [N/T]	106867-2	#
Magnesium - Dissolved	mg/L	106867-1	99 || [N/T]	106867-2	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	106867-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	106867-1	320 || 320 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	106867-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	106867-1	320 || 320 || RPD: 0	[NR]	[NR]
Sulphate, SO4	mg/L	106867-1	310 || 310 || RPD: 0	106867-2	78%
Chloride, Cl	mg/L	106867-1	290 || 290 || RPD: 0	106867-2	95%
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	106867-11	25/03/2014 || 25/03/2014	106867-2	25/03/2014
Date analysed	-	106867-11	25/03/2014 || 25/03/2014	106867-2	25/03/2014
Phosphorus - Total	mg/L	106867-11	0.05 || 0.05 || RPD: 0	106867-2	106%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	106867-11	21/03/2014 || 21/03/2014	106867-2	21/03/2014
Date analysed	-	106867-11	21/03/2014 || 21/03/2014	106867-2	21/03/2014
pH	pH Units	106867-11	5.9 || 5.9 || RPD: 0	[NR]	[NR]
Electrical Conductivity	µS/cm	106867-11	320 || 320 || RPD: 0	[NR]	[NR]
NOx as N in water	mg/L	106867-11	0.01 || 0.01 || RPD: 0	106867-2	104%
Ammonia as N in water	mg/L	106867-11	0.053 || 0.053 || RPD: 0	106867-2	89%
Turbidity	NTU	106867-11	28 || 28 || RPD: 0	[NR]	[NR]
Total Cyanide	mg/L	[NT]	[NT]	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	106867-12	24/03/2014 || 24/03/2014	106867-8	24/03/2014
Date analysed	-	106867-12	24/03/2014 || 24/03/2014	106867-8	24/03/2014
Arsenic-Dissolved	µg/L	106867-12	3 || [N/T]	106867-8	97%
Cadmium-Dissolved	µg/L	106867-12	<0.1 || [N/T]	106867-8	93%
Chromium-Dissolved	µg/L	106867-12	<1 || [N/T]	106867-8	98%
Copper-Dissolved	µg/L	106867-12	<1 || [N/T]	106867-8	102%
Lead-Dissolved	µg/L	106867-12	<1 || [N/T]	106867-8	90%
Zinc-Dissolved	µg/L	106867-12	110 || [N/T]	106867-8	93%
Mercury-Dissolved	µg/L	106867-12	<0.05 || <0.05	[NR]	[NR]
Nickel-Dissolved	µg/L	106867-12	3 || [N/T]	106867-8	93%
Aluminium-Dissolved	µg/L	106867-12	12 || [N/T]	106867-8	110%
Barium-Dissolved	µg/L	106867-12	89 || [N/T]	106867-8	92%
Beryllium-Dissolved	µg/L	106867-12	<0.1 || [N/T]	106867-8	102%
Cobalt-Dissolved	µg/L	106867-12	1 || [N/T]	106867-8	96%
Iron-Dissolved	µg/L	106867-12	580 || [N/T]	106867-8	98%
Manganese-Dissolved	µg/L	106867-12	58 || [N/T]	106867-8	105%
Vanadium-Dissolved	µg/L	106867-12	<1 || [N/T]	106867-8	102%
Selenium-Dissolved	µg/L	106867-12	<1 || [N/T]	106867-8	94%

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	106867-11	21/03/2014 || 21/03/2014
Date analysed	-	106867-11	21/03/2014 || 21/03/2014
Bicarbonate Alkalinity as $CaCO_3$	mg/L	106867-11	100 || 100 || RPD: 0
Total Alkalinity as $CaCO_3$	mg/L	106867-11	100 || 100 || RPD: 0
Sulphate, SO4	mg/L	106867-11	22 || 21 || RPD: 5
Chloride, Cl	mg/L	106867-11	21 || 22 || RPD: 5

Client Reference: 49761.03, Bylong

Report Comments:

ION_BALANCE: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

The mass inbalance in sample #10,14,15 and17 is due to low results.

E. coli & Faecal Coliforms analysed by Sonic Food & Water Testing. Report No.W1404471.
NBO: Note that the presence of competing background organisms in the sample may have reduced the count obtained.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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CERTIFICATE OF ANALYSIS **108220**

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	16 Waters
Date samples received / completed instructions received	15/04/2014 / 15/04/2014

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	24/04/14 / 24/04/14
Date of Preliminary Report:	

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-1 BY0016 13/04/2014 Water	108220-2 BY0014 13/04/2014 Water	108220-3 A01-S 13/04/2014 Water	108220-4 BY0015 13/04/2014 Water	108220-5 A20 14/04/2014 Water
Date prepared	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Date analysed	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
pH	pH Units	7.0	8.0	7.0	7.8	7.8
Electrical Conductivity	µS/cm	2,400	1,100	2,500	1,200	1,100
NOx as N in water	mg/L	0.01	0.02	0.008	0.01	0.03
Ammonia as N in water	mg/L	2.1	1.1	0.11	1.1	0.036
Turbidity	NTU	11	19	18	3.5	20

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-6 A06-D 14/04/2014 Water	108220-7 AGE08 14/04/2014 Water	108220-8 A14 14/04/2014 Water	108220-9 A09 14/04/2014 Water	108220-10 RT1 14/04/2014 Water
Date prepared	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Date analysed	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
pH	pH Units	7.5	7.7	7.8	7.7	6.8
Electrical Conductivity	µS/cm	780	1,300	1,700	2,500	69
NOx as N in water	mg/L	0.02	0.01	1.7	1.2	0.69
Ammonia as N in water	mg/L	0.069	1.6	0.009	<0.005	0.030
Turbidity	NTU	65	4.5	120	10	1.2
Total Cyanide	mg/L	[NA]	[NA]	[NA]	[NA]	<0.004

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-11 RT2 14/04/2014 Water	108220-12 RT3 14/04/2014 Water	108220-13 RT4 14/04/2014 Water	108220-14 RT5 14/04/2014 Water	108220-15 RT5F 14/04/2014 Water
Date prepared	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Date analysed	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
pH	pH Units	6.4	6.4	4.6	6.8	7.1
Electrical Conductivity	µS/cm	19	12	16	66	150
NOx as N in water	mg/L	0.50	0.2	0.50	0.3	0.2
Ammonia as N in water	mg/L	<0.005	0.022	<0.005	<0.005	0.01
Turbidity	NTU	0.4	<0.1	0.4	0.6	<0.1
Total Cyanide	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics		
Our Reference:	UNITS	108220-16
Your Reference	----------	D50
Date Sampled	----------	14/04/2014
Type of sample		Water
Date prepared	-	15/04/2014
Date analysed	-	15/04/2014
pH	pH Units	7.7
Electrical Conductivity	µS/cm	1,300
NOx as N in water	mg/L	0.03
Ammonia as N in water	mg/L	1.6
Turbidity	NTU	5.2

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-1 BY0016 13/04/2014 Water	108220-2 BY0014 13/04/2014 Water	108220-3 A01-S 13/04/2014 Water	108220-4 BY0015 13/04/2014 Water	108220-5 A20 14/04/2014 Water
Date prepared	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Date analysed	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Calcium - Dissolved	mg/L	32	37	130	46	60
Potassium - Dissolved	mg/L	18	11	6.8	13	6.4
Sodium - Dissolved	mg/L	680	220	330	230	130
Magnesium - Dissolved	mg/L	21	20	110	25	47
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	1,100	490	630	440	350
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	1,100	490	630	440	350
Sulphate, SO4	mg/L	6	<1	190	33	35
Chloride, Cl	mg/L	170	73	350	110	130
Ionic Balance	%	8.7	6.3	6.7	7.4	5.1

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-6 A06-D 14/04/2014 Water	108220-7 AGE08 14/04/2014 Water	108220-8 A14 14/04/2014 Water	108220-9 A09 14/04/2014 Water	108220-10 RT1 14/04/2014 Water
Date prepared	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Date analysed	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Calcium - Dissolved	mg/L	43	37	120	110	2.5
Potassium - Dissolved	mg/L	4.8	15	5.4	11	5.1
Sodium - Dissolved	mg/L	82	270	170	350	0.7
Magnesium - Dissolved	mg/L	33	28	83	100	0.8
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	270	610	490	440	26
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	270	610	490	440	26
Sulphate, SO4	mg/L	12	<1	210	260	1
Chloride, Cl	mg/L	85	79	160	400	1
Ionic Balance	%	3.7	6.6	4.3	8.3	-24

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-11 RT2 14/04/2014 Water	108220-12 RT3 14/04/2014 Water	108220-13 RT4 14/04/2014 Water	108220-14 RT5 14/04/2014 Water	108220-15 RT5F 14/04/2014 Water
Date prepared	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Date analysed	-	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Calcium - Dissolved	mg/L	<0.5	0.6	<0.5	5.2	13
Potassium - Dissolved	mg/L	<0.5	<0.5	<0.5	0.6	0.9
Sodium - Dissolved	mg/L	0.6	<0.5	<0.5	3.2	6.4
Magnesium - Dissolved	mg/L	<0.5	<0.5	<0.5	2.0	6.1
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	8	7	<5	21	43
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	8	7	<5	21	43
Sulphate, SO4	mg/L	<1	<1	<1	5	16
Chloride, Cl	mg/L	<1	<1	<1	3	10
Ionic Balance	%	-100	-69	[NT]	-3.9	-1.0

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-16 D50 14/04/2014 Water
Date prepared	-	15/04/2014
Date analysed	-	15/04/2014
Calcium - Dissolved	mg/L	37
Potassium - Dissolved	mg/L	16
Sodium - Dissolved	mg/L	280
Magnesium - Dissolved	mg/L	28
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	600
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	600
Sulphate, SO4	mg/L	<1
Chloride, Cl	mg/L	79
Ionic Balance	%	8.0

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-1 BY0016 13/04/2014 Water	108220-2 BY0014 13/04/2014 Water	108220-3 A01-S 13/04/2014 Water	108220-4 BY0015 13/04/2014 Water	108220-5 A20 14/04/2014 Water
Date prepared	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Date analysed	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Arsenic-Dissolved	µg/L	24	<1	2	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	4	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	27	2	42	<1	10
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	2	1	5	<1	5
Aluminium-Dissolved	µg/L	5	0.8	<0.5	2	<0.5
Barium-Dissolved	µg/L	350	210	170	99	42
Beryllium-Dissolved	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	1	<1	2
Iron-Dissolved	µg/L	500	54	6,800	250	240
Manganese-Dissolved	µg/L	27	23	1,800	43	810
Vanadium-Dissolved	µg/L	2	2	2	2	2
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-6 A06-D 14/04/2014 Water	108220-7 AGE08 14/04/2014 Water	108220-8 A14 14/04/2014 Water	108220-9 A09 14/04/2014 Water	108220-16 D50 14/04/2014 Water
Date prepared	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Date analysed	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Arsenic-Dissolved	µg/L	<1	1	<1	<1	1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	8	220	5	6	230
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	3	53	<1	2	53
Aluminium-Dissolved	µg/L	<0.5	2	<0.5	<0.5	0.7
Barium-Dissolved	µg/L	19	160	100	130	150
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1	<1
Iron-Dissolved	µg/L	90	140	<10	22	140
Manganese-Dissolved	µg/L	680	110	<5	110	110
Vanadium-Dissolved	µg/L	2	2	2	2	2
Selenium-Dissolved	µg/L	<1	<1	2	4	<1

Client Reference: 49761.03, Bylong

HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-10 RT1 14/04/2014 Water	108220-11 RT2 14/04/2014 Water	108220-12 RT3 14/04/2014 Water	108220-13 RT4 14/04/2014 Water	108220-14 RT5 14/04/2014 Water
Date prepared	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Date analysed	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Arsenic-Total	µg/L	<1	<1	<1	<1	<1
Cadmium-Total	µg/L	<0.1	0.4	0.2	<0.1	<0.1
Chromium-Total	µg/L	<1	<1	<1	<1	<1
Copper-Total	µg/L	10	6	<1	540	86
Lead-Total	µg/L	7	3	<1	9	<1
Zinc-Total	µg/L	8,900	3,600	2,700	170	1,400
Mercury-Total	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Total	µg/L	<1	<1	<1	<1	2
Aluminium-Total	µg/L	21	15	17	47	14
Barium-Total	µg/L	5	1	<1	7	6
Beryllium-Total	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Total	µg/L	<1	<1	<1	<1	<1
Iron-Total	µg/L	150	<10	<10	<10	10
Manganese-Total	µg/L	37	<5	<5	9	<5
Vanadium-Total	µg/L	<1	<1	<1	<1	<1
Selenium-Total	µg/L	<1	<1	1	<1	<1

HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-15 RT5F 14/04/2014 Water
Date prepared	-	16/04/2014
Date analysed	-	16/04/2014
Arsenic-Total	µg/L	<1
Cadmium-Total	µg/L	<0.1
Chromium-Total	µg/L	<1
Copper-Total	µg/L	69
Lead-Total	µg/L	1
Zinc-Total	µg/L	1,100
Mercury-Total	µg/L	<0.05
Nickel-Total	µg/L	11
Aluminium-Total	µg/L	5
Barium-Total	µg/L	9
Beryllium-Total	µg/L	<0.1
Cobalt-Total	µg/L	<1
Iron-Total	µg/L	12
Manganese-Total	µg/L	11
Vanadium-Total	µg/L	<1
Selenium-Total	µg/L	<1

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	108220-1	108220-2	108220-3	108220-4	108220-5
Your Reference	----------	BY0016	BY0014	A01-S	BY0015	A20
Date Sampled	----------	13/04/2014	13/04/2014	13/04/2014	13/04/2014	14/04/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Date analysed	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Phosphorus - Total	mg/L	<0.05	<0.05	0.1	<0.05	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	108220-6	108220-7	108220-8	108220-9	108220-10
Your Reference	----------	A06-D	AGE08	A14	A09	RT1
Date Sampled	----------	14/04/2014	14/04/2014	14/04/2014	14/04/2014	14/04/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Date analysed	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Phosphorus - Total	mg/L	<0.05	<0.05	0.09	<0.05	0.3

Metals in Waters - Acid extractable						
Our Reference:	UNITS	108220-11	108220-12	108220-13	108220-14	108220-15
Your Reference	----------	RT2	RT3	RT4	RT5	RT5F
Date Sampled	----------	14/04/2014	14/04/2014	14/04/2014	14/04/2014	14/04/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Date analysed	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Metals in Waters - Acid extractable		
Our Reference:	UNITS	108220-16
Your Reference	----------	D50
Date Sampled	----------	14/04/2014
Type of sample		Water
Date prepared	-	16/04/2014
Date analysed	-	16/04/2014
Phosphorus - Total	mg/L	<0.05

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Microbiologocal Testing Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-10 RT1 14/04/2014 Water	108220-11 RT2 14/04/2014 Water	108220-12 RT3 14/04/2014 Water	108220-13 RT4 14/04/2014 Water	108220-14 RT5 14/04/2014 Water
Date testing started	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
Date testing completed	-	16/04/2014	16/04/2014	16/04/2014	16/04/2014	16/04/2014
E. Coli	CFU/100mL	2 Approximate	<1	<1	<1	18 NBO
Faecal Coliforms	CFU/100mL	2 Approximate	<1	<1	<1	18 NBO

Microbiologocal Testing Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108220-15 RT5F 14/04/2014 Water
Date testing started	-	16/04/2014
Date testing completed	-	16/04/2014
E. Coli	CFU/100mL	<1
Faecal Coliforms	CFU/100mL	<1

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-013	Cyanide - total determined colourimetrically after distillation, based on APHA 22nd ED, 4500-CN_C,E. Free cyanide determined colourimetrically after filtration and confirmed by diffusion. Solids are extracted in a caustic media prior to distillation and analysis.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

Client Reference: 49761.03, Bylong

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			15/04/2014	108220-1	15/04/2014 || 15/04/2014	LCS-W1	15/04/2014
Date analysed	-			15/04/2014	108220-1	15/04/2014 || 15/04/2014	LCS-W1	15/04/2014
pH	pH Units		Inorg-001	[NT]	108220-1	7.0 || 7.0 || RPD: 0	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	108220-1	2400 || 2500 || RPD: 4	LCS-W1	104%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	108220-1	0.01 || 0.009 || RPD: 11	LCS-W1	103%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	108220-1	2.1 || 2.1 || RPD: 0	LCS-W1	104%
Turbidity	NTU	0.1	Inorg-022	<0.1	108220-1	11 || 11 || RPD: 0	LCS-W1	100%
Total Cyanide	mg/L	0.004	Inorg-013	<0.004	[NT]	[NT]	LCS-W1	111%
QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			15/04/2014	108220-1	15/04/2014 || 15/04/2014	LCS-W1	15/04/2014
Date analysed	-			15/04/2014	108220-1	15/04/2014 || 15/04/2014	LCS-W1	15/04/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	108220-1	32 || 32 || RPD: 0	LCS-W1	101%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	108220-1	18 || 17 || RPD: 6	LCS-W1	105%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	108220-1	680 || 660 || RPD: 3	LCS-W1	112%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	108220-1	21 || 20 || RPD: 5	LCS-W1	103%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	108220-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	108220-1	1100 || 1100 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	108220-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	108220-1	1100 || 1100 || RPD: 0	LCS-W1	106%
Sulphate, SO4	mg/L	1	Inorg-081	<1	108220-1	6 || 6 || RPD: 0	LCS-W1	97%
Chloride, Cl	mg/L	1	Inorg-081	<1	108220-1	170 || 170 || RPD: 0	LCS-W1	91%
Ionic Balance	%		Inorg-041	[NT]	108220-1	8.7 || 7.2 || RPD: 19	[NR]	[NR]

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QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/04/2014	108220-6	16/04/2014 || 16/04/2014	LCS-W1	16/04/2014
Date analysed	-			16/04/2014	108220-6	16/04/2014 || 16/04/2014	LCS-W1	16/04/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	<1 || <1	LCS-W1	96%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	108220-6	<0.1 || <0.1	LCS-W1	99%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	<1 || <1	LCS-W1	100%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	<1 || <1	LCS-W1	104%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	<1 || <1	LCS-W1	99%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	8 || 8 || RPD: 0	LCS-W1	96%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	108220-6	<0.05 || [N/T]	LCS-W1	100%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	3 || 3 || RPD: 0	LCS-W1	96%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	108220-6	<0.5 || <0.5	LCS-W1	97%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	19 || 19 || RPD: 0	LCS-W1	98%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	108220-6	<0.1 || <0.1	LCS-W1	88%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	<1 || <1	LCS-W1	101%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	108220-6	90 || 88 || RPD: 2	LCS-W1	96%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	108220-6	680 || 680 || RPD: 0	LCS-W1	92%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	2 || 2 || RPD: 0	LCS-W1	101%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108220-6	<1 || <1	LCS-W1	98%

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QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/04/2014	108220-10	16/04/2014 || 16/04/2014	LCS-W2	16/04/2014
Date analysed	-			16/04/2014	108220-10	16/04/2014 || 16/04/2014	LCS-W2	16/04/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	<1 || <1	LCS-W2	92%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	108220-10	<0.1 || <0.1	LCS-W2	95%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	<1 || <1	LCS-W2	95%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	10 || 10 || RPD: 0	LCS-W2	98%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	7 || 7 || RPD: 0	LCS-W2	97%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	8900 || 9100 || RPD: 2	LCS-W2	98%
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	108220-10	<0.05 || [N/T]	LCS-W2	104%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	<1 || <1	LCS-W2	91%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	108220-10	21 || 21 || RPD: 0	LCS-W2	98%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	5 || 5 || RPD: 0	LCS-W2	97%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	108220-10	<0.1 || <0.1	LCS-W2	86%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	<1 || <1	LCS-W2	97%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	108220-10	150 || 150 || RPD: 0	LCS-W2	92%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	108220-10	37 || 37 || RPD: 0	LCS-W2	87%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	<1 || <1	LCS-W2	93%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	108220-10	<1 || <1	LCS-W2	95%

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QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/04/2014	108220-1	16/04/2014 || 16/04/2014	LCS-W1	16/04/2014
Date analysed	-			16/04/2014	108220-1	16/04/2014 || 16/04/2014	LCS-W1	16/04/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	108220-1	<0.05 || <0.05	LCS-W1	99%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			[NT]
Date testing completed	-			[NT]
E. Coli	CFU/100 mL	1	Ext-008	[NT]
Faecal Coliforms	CFU/100 mL	1	Ext-008	[NT]

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	108220-11	15/04/2014 || 15/04/2014	108220-2	15/04/2014
Date analysed	-	108220-11	15/04/2014 || 15/04/2014	108220-2	15/04/2014
pH	pH Units	108220-11	6.4 || 6.4 || RPD: 0	[NR]	[NR]
Electrical Conductivity	µS/cm	108220-11	19 || 19 || RPD: 0	[NR]	[NR]
NOx as N in water	mg/L	108220-11	0.50 || 0.50 || RPD: 0	108220-2	104%
Ammonia as N in water	mg/L	108220-11	<0.005 || <0.005	108220-2	116%
Turbidity	NTU	108220-11	0.4 || 0.4 || RPD: 0	[NR]	[NR]
Total Cyanide	mg/L	108220-11	<0.004 || <0.004	[NR]	[NR]

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	108220-11	15/04/2014 || 15/04/2014	108220-2	15/04/2014
Date analysed	-	108220-11	15/04/2014 || 15/04/2014	108220-2	15/04/2014
Calcium - Dissolved	mg/L	108220-11	<0.5 || <0.5	108220-2	#
Potassium - Dissolved	mg/L	108220-11	<0.5 || <0.5	108220-2	82%
Sodium - Dissolved	mg/L	108220-11	0.6 || 0.6 || RPD: 0	108220-2	#
Magnesium - Dissolved	mg/L	108220-11	<0.5 || <0.5	108220-2	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	108220-11	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	108220-11	8 || 8 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	108220-11	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	108220-11	8 || 8 || RPD: 0	[NR]	[NR]
Sulphate, SO4	mg/L	108220-11	<1 || <1	108220-2	79%
Chloride, Cl	mg/L	108220-11	<1 || <1	108220-2	87%
Ionic Balance	%	108220-11	-100 || -100 || RPD: 0	[NR]	[NR]

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QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	108220-1	16/04/2014 || 16/04/2014	108220-2	16/04/2014
Date analysed	-	108220-1	16/04/2014 || 16/04/2014	108220-2	16/04/2014
Mercury-Dissolved	µg/L	108220-1	<0.05 || <0.05	108220-2	104%
QUALITY CONTROL HM in water - total	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	108220-11	16/04/2014
Date analysed	-	[NT]	[NT]	108220-11	16/04/2014
Arsenic-Total	µg/L	[NT]	[NT]	108220-11	97%
Cadmium-Total	µg/L	[NT]	[NT]	108220-11	98%
Chromium-Total	µg/L	[NT]	[NT]	108220-11	98%
Copper-Total	µg/L	[NT]	[NT]	108220-11	101%
Lead-Total	µg/L	[NT]	[NT]	108220-11	101%
Zinc-Total	µg/L	[NT]	[NT]	108220-11	#
Mercury-Total	µg/L	[NT]	[NT]	[NR]	[NR]
Nickel-Total	µg/L	[NT]	[NT]	108220-11	93%
Aluminium-Total	µg/L	[NT]	[NT]	108220-11	94%
Barium-Total	µg/L	[NT]	[NT]	108220-11	97%
Beryllium-Total	µg/L	[NT]	[NT]	108220-11	90%
Cobalt-Total	µg/L	[NT]	[NT]	108220-11	100%
Iron-Total	µg/L	[NT]	[NT]	108220-11	95%
Manganese-Total	µg/L	[NT]	[NT]	108220-11	92%
Vanadium-Total	µg/L	[NT]	[NT]	108220-11	97%
Selenium-Total	µg/L	[NT]	[NT]	108220-11	98%

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QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	108220-11	16/04/2014 || 16/04/2014	LCS-W2	16/04/2014
Date analysed	-	108220-11	16/04/2014 || 16/04/2014	LCS-W2	16/04/2014
Phosphorus - Total	mg/L	108220-11	<0.05 || <0.05	LCS-W2	100%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	108220-10	15/04/2014 || 15/04/2014	108220-11	15/04/2014
Date analysed	-	108220-10	15/04/2014 || 15/04/2014	108220-11	15/04/2014
Total Cyanide	mg/L	108220-10	<0.004 || <0.004	108220-11	88%
QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	108220-7	16/04/2014
Date analysed	-	[NT]	[NT]	108220-7	16/04/2014
Arsenic-Dissolved	µg/L	[NT]	[NT]	108220-7	99%
Cadmium-Dissolved	µg/L	[NT]	[NT]	108220-7	98%
Chromium-Dissolved	µg/L	[NT]	[NT]	108220-7	99%
Copper-Dissolved	µg/L	[NT]	[NT]	108220-7	103%
Lead-Dissolved	µg/L	[NT]	[NT]	108220-7	95%
Zinc-Dissolved	µg/L	[NT]	[NT]	108220-7	95%
Mercury-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Nickel-Dissolved	µg/L	[NT]	[NT]	108220-7	93%
Aluminium-Dissolved	µg/L	[NT]	[NT]	108220-7	98%
Barium-Dissolved	µg/L	[NT]	[NT]	108220-7	99%
Beryllium-Dissolved	µg/L	[NT]	[NT]	108220-7	93%
Cobalt-Dissolved	µg/L	[NT]	[NT]	108220-7	99%
Iron-Dissolved	µg/L	[NT]	[NT]	108220-7	92%
Manganese-Dissolved	µg/L	[NT]	[NT]	108220-7	91%
Vanadium-Dissolved	µg/L	[NT]	[NT]	108220-7	103%
Selenium-Dissolved	µg/L	[NT]	[NT]	108220-7	101%

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QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	108220-12	16/04/2014
Date analysed	-	[NT]	[NT]	108220-12	16/04/2014
Phosphorus - Total	mg/L	[NT]	[NT]	108220-12	100%

Client Reference: 49761.03, Bylong

Report Comments:

Trace metals:# Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

ION_BALANCE: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

The mass inbalance in sample #10,11 and 12 may be due to low results.

E. coli & Faecal Coliforms analysed by Sonic Food & Water Testing. Report No.W1405891.
NBO- note that the presence of competing background organisms in the sample may have reduced the count obtained.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as

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CERTIFICATE OF ANALYSIS 108392

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	10 Waters
Date samples received / completed instructions received	17/04/14 / 17/04/14

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	29/04/14 / 29/04/14
Date of Preliminary Report:	not issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics						
Our Reference:	UNITS	108392-1	108392-2	108392-3	108392-4	108392-5
Your Reference	----------	A13	B3-S	B3-D	A15	AGE10
Date Sampled	----------	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	17/04/2014	17/04/2014	17/04/2014	17/04/2014	17/04/2014
Date analysed	-	17/04/2014	17/04/2014	17/04/2014	17/04/2014	17/04/2014
pH	pH Units	7.2	6.6	6.9	6.7	7.1
Electrical Conductivity	µS/cm	1,200	240	840	280	2,200
NOx as N in water	mg/L	0.4	0.05	2.0	0.02	0.09
Ammonia as N in water	mg/L	0.014	0.005	2.2	0.081	2.5
Turbidity	NTU	1.4	31	22	41	44

Miscellaneous Inorganics						
Our Reference:	UNITS	108392-6	108392-7	108392-8	108392-9	108392-10
Your Reference	----------	A02-S	AGE13	A12	A18	SW4
Date Sampled	----------	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	17/04/2014	17/04/2014	17/04/2014	17/04/2014	17/04/2014
Date analysed	-	17/04/2014	17/04/2014	17/04/2014	17/04/2014	17/04/2014
pH	pH Units	7.2	7.1	6.9	6.7	7.7
Electrical Conductivity	µS/cm	1,200	1,700	310	320	2,100
NOx as N in water	mg/L	12	0.05	0.01	0.02	0.03
Ammonia as N in water	mg/L	0.12	0.93	0.041	0.061	0.053
Turbidity	NTU	260	28	88	11	2.2

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108392-1 A13 15/04/2014 Water	108392-2 B3-S 15/04/2014 Water	108392-3 B3-D 15/04/2014 Water	108392-4 A15 15/04/2014 Water	108392-5 AGE10 15/04/2014 Water
Date prepared	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Date analysed	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Calcium - Dissolved	mg/L	79	7.9	47	13	56
Potassium - Dissolved	mg/L	6.4	4.6	6.2	3.1	27
Sodium - Dissolved	mg/L	130	38	90	28	450
Magnesium - Dissolved	mg/L	64	8.7	35	12	66
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	300	79	450	82	950
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	300	79	450	82	950
Sulphate, SO4	mg/L	85	8	120	9	21
Chloride, Cl	mg/L	200	29	48	32	190
Ionic Balance	%	5.6	5.9	-15	3.5	6.7

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108392-6 A02-S 15/04/2014 Water	108392-7 AGE13 15/04/2014 Water	108392-8 A12 15/04/2014 Water	108392-9 A18 15/04/2014 Water	108392-10 SW4 15/04/2014 Water
Date prepared	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Date analysed	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Calcium - Dissolved	mg/L	120	73	21	17	140
Potassium - Dissolved	mg/L	9.1	20	3.8	17	8.9
Sodium - Dissolved	mg/L	56	230	25	24	210
Magnesium - Dissolved	mg/L	66	79	14	12	99
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	390	720	100	110	400
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	390	720	100	110	400
Sulphate, SO4	mg/L	55	50	17	20	230
Chloride, Cl	mg/L	110	140	24	20	290
Ionic Balance	%	8.2	3.3	4.7	1.5	8.3

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108392-1 A13 15/04/2014 Water	108392-2 B3-S 15/04/2014 Water	108392-3 B3-D 15/04/2014 Water	108392-4 A15 15/04/2014 Water	108392-5 AGE10 15/04/2014 Water
Date prepared	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Date analysed	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Arsenic-Dissolved	µg/L	<1	<1	3	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	3	<1	<1
Copper-Dissolved	µg/L	<1	<1	1	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	4	12	42	4	6
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	2	6	20	2	3
Aluminium-Dissolved	µg/L	0.8	9	220	1	5
Barium-Dissolved	µg/L	95	49	340	23	320
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	8	18	<1	<1
Iron-Dissolved	µg/L	13	730	19,000	14	570
Manganese-Dissolved	µg/L	230	560	3,500	83	130
Vanadium-Dissolved	µg/L	1	<1	3	<1	<1
Selenium-Dissolved	µg/L	1	<1	<1	<1	<1

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	108392-6 A02-S 15/04/2014 Water	108392-7 AGE13 15/04/2014 Water	108392-8 A12 15/04/2014 Water	108392-9 A18 15/04/2014 Water	108392-10 SW4 15/04/2014 Water
Date prepared	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Date analysed	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Arsenic-Dissolved	µg/L	<1	2	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	1	<1	<1	<1	<1
Copper-Dissolved	µg/L	6	<1	<1	<1	1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	5	4	4	6	2
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	8	2	4	3	2
Aluminium-Dissolved	µg/L	3	6	2	1	<0.5
Barium-Dissolved	µg/L	110	91	56	75	110
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	1	<1	1	<1
Iron-Dissolved	µg/L	<10	520	99	150	14
Manganese-Dissolved	µg/L	460	56	82	58	150
Vanadium-Dissolved	µg/L	1	<1	1	<1	1
Selenium-Dissolved	µg/L	4	<1	<1	<1	<1

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	108392-1	108392-2	108392-3	108392-4	108392-5
Your Reference	----------	A13	B3-S	B3-D	A15	AGE10
Date Sampled	----------	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Date analysed	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Phosphorus - Total	mg/L	<0.05	<0.05	0.05	<0.05	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	108392-6	108392-7	108392-8	108392-9	108392-10
Your Reference	----------	A02-S	AGE13	A12	A18	SW4
Date Sampled	----------	15/04/2014	15/04/2014	15/04/2014	15/04/2014	15/04/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Date analysed	-	22/04/2014	22/04/2014	22/04/2014	22/04/2014	22/04/2014
Phosphorus - Total	mg/L	0.1	<0.05	<0.05	<0.05	<0.05

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.

Client Reference: 49761.03, Bylong

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			17/04/2014	108392-1	17/04/2014 || 17/04/2014	LCS-W1	17/04/2014
Date analysed	-			17/04/2014	108392-1	17/04/2014 || 17/04/2014	LCS-W1	17/04/2014
pH	pH Units		Inorg-001	[NT]	108392-1	7.2 || 7.2 || RPD: 0	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	108392-1	1200 || 1400 || RPD: 15	LCS-W1	102%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	108392-1	0.4 || 0.3 || RPD: 29	LCS-W1	102%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	108392-1	0.014 || 0.009 || RPD: 43	LCS-W1	90%
Turbidity	NTU	0.1	Inorg-022	<0.1	108392-1	1.4 || 1.5 || RPD: 7	LCS-W1	101%
QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			22/04/2014	108392-1	22/04/2014 || 22/04/2014	LCS-W1	22/04/2014
Date analysed	-			22/04/2014	108392-1	22/04/2014 || 22/04/2014	LCS-W1	22/04/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	108392-1	79 || [N/T]	LCS-W1	99%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	108392-1	6.4 || [N/T]	LCS-W1	108%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	108392-1	130 || [N/T]	LCS-W1	105%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	108392-1	64 || [N/T]	LCS-W1	99%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	108392-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	108392-1	300 || 310 || RPD: 3	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	108392-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	108392-1	300 || 310 || RPD: 3	LCS-W1	111%
Sulphate, SO4	mg/L	1	Inorg-081	<1	108392-1	85 || 84 || RPD: 1	LCS-W1	97%
Chloride, Cl	mg/L	1	Inorg-081	<1	108392-1	200 || 200 || RPD: 0	LCS-W1	94%
Ionic Balance	%		Inorg-041	[NT]	108392-1	5.6 || [N/T]	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			22/04/2014	108392-9	22/04/2014 || 22/04/2014	LCS-W1	22/04/2014
Date analysed	-			22/04/2014	108392-9	22/04/2014 || 22/04/2014	LCS-W1	22/04/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	<1 || <1	LCS-W1	97%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	108392-9	<0.1 || <0.1	LCS-W1	97%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	<1 || <1	LCS-W1	97%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	<1 || <1	LCS-W1	94%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	<1 || <1	LCS-W1	99%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	6 || 6 || RPD: 0	LCS-W1	96%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	108392-9	<0.05 || [N/T]	LCS-W1	112%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	3 || 3 || RPD: 0	LCS-W1	90%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	108392-9	1 || 0.7 || RPD: 35	LCS-W1	84%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	75 || 75 || RPD: 0	LCS-W1	96%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	108392-9	<0.1 || <0.1	LCS-W1	95%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	1 || <1	LCS-W1	100%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	108392-9	150 || 150 || RPD: 0	LCS-W1	102%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	108392-9	58 || 58 || RPD: 0	LCS-W1	88%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	<1 || <1	LCS-W1	96%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	108392-9	<1 || <1	LCS-W1	96%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			22/04/2014	108392-4	22/04/2014 || 22/04/2014	LCS-W2	22/04/2014
Date analysed	-			22/04/2014	108392-4	22/04/2014 || 22/04/2014	LCS-W2	22/04/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	108392-4	<0.05 || <0.05	LCS-W2	97%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	108392-2	22/04/2014
Date analysed	-	[NT]	[NT]	108392-2	22/04/2014
pH	pH Units	[NT]	[NT]	[NR]	[NR]
Electrical Conductivity	µS/cm	[NT]	[NT]	[NR]	[NR]
NOx as N in water	mg/L	[NT]	[NT]	108392-2	112%
Ammonia as N in water	mg/L	[NT]	[NT]	108392-2	88%
Turbidity	NTU	[NT]	[NT]	[NR]	[NR]
QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	108392-8	22/04/2014 || 22/04/2014	108392-2	22/04/2014
Date analysed	-	108392-8	22/04/2014 || 22/04/2014	108392-2	22/04/2014
Calcium - Dissolved	mg/L	108392-8	21 || 21 || RPD: 0	[NR]	[NR]
Potassium - Dissolved	mg/L	108392-8	3.8 || 3.9 || RPD: 3	[NR]	[NR]
Sodium - Dissolved	mg/L	108392-8	25 || 25 || RPD: 0	[NR]	[NR]
Magnesium - Dissolved	mg/L	108392-8	14 || 14 || RPD: 0	[NR]	[NR]
Sulphate, SO4	mg/L	108392-8	17 || [N/T]	108392-2	117%
Chloride, Cl	mg/L	108392-8	24 || [N/T]	108392-2	91%
QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	108392-2	22/04/2014
Date analysed	-	[NT]	[NT]	108392-2	22/04/2014
Arsenic-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Cadmium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Chromium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Copper-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Lead-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Zinc-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Mercury-Dissolved	µg/L	[NT]	[NT]	108392-2	96%
Nickel-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Aluminium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Barium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Beryllium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Cobalt-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Iron-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Manganese-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Vanadium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
Selenium-Dissolved	µg/L	[NT]	[NT]	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	108392-5	22/04/2014
Date analysed	-	[NT]	[NT]	108392-5	22/04/2014
Phosphorus - Total	mg/L	[NT]	[NT]	108392-5	100%

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	108392-1	22/04/2014 || 22/04/2014
Date analysed	-	108392-1	22/04/2014 || 22/04/2014
Arsenic-Dissolved	µg/L	108392-1	<1 || [N/T]
Cadmium-Dissolved	µg/L	108392-1	<0.1 || [N/T]
Chromium-Dissolved	µg/L	108392-1	<1 || [N/T]
Copper-Dissolved	µg/L	108392-1	<1 || [N/T]
Lead-Dissolved	µg/L	108392-1	<1 || [N/T]
Zinc-Dissolved	µg/L	108392-1	4 || [N/T]
Mercury-Dissolved	µg/L	108392-1	<0.05 || <0.05
Nickel-Dissolved	µg/L	108392-1	2 || [N/T]
Aluminium-Dissolved	µg/L	108392-1	0.8 || [N/T]
Barium-Dissolved	µg/L	108392-1	95 || [N/T]
Beryllium-Dissolved	µg/L	108392-1	<0.1 || [N/T]
Cobalt-Dissolved	µg/L	108392-1	<1 || [N/T]
Iron-Dissolved	µg/L	108392-1	13 || [N/T]
Manganese-Dissolved	µg/L	108392-1	230 || [N/T]
Vanadium-Dissolved	µg/L	108392-1	1 || [N/T]
Selenium-Dissolved	µg/L	108392-1	1 || [N/T]

Client Reference: 49761.03, Bylong

Report Comments:
pH:insufficient time was allowed to analyse samples within holding time.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions
Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria
Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Envirolab Services Pty Ltd
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CERTIFICATE OF ANALYSIS **110170**

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**		
No. of samples:	11 waters		
Date samples received / completed instructions received	21/5/2014	/	21/5/2014

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	28/05/14	/	27/05/14
Date of Preliminary Report:	Not Issued		

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-1 BY0016 19/05/2014 Water	110170-2 A01-S 19/05/2014 Water	110170-3 BY0015 19/05/2014 Water	110170-4 AGE08 19/05/2014 Water	110170-5 SW4 20/05/2014 Water
Date prepared	-	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Date analysed	-	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Arsenic-Dissolved	µg/L	20	1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	2	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	5	23	1	230	3
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	3	4	<1	40	1
Aluminium-Dissolved	µg/L	<5	<5	<5	<5	<5
Barium-Dissolved	µg/L	370	160	100	160	100
Beryllium-Dissolved	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1	<1
Iron-Dissolved	µg/L	530	3,900	280	190	27
Manganese-Dissolved	µg/L	27	1,500	49	110	130
Vanadium-Dissolved	µg/L	<1	<1	<1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-6 BY0014 20/05/2014 Water	110170-7 A14 20/05/2014 Water	110170-8 A13 20/05/2014 Water	110170-9 A09 20/05/2014 Water	110170-10 A06-D 20/05/2014 Water
Date prepared	-	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Date analysed	-	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Arsenic-Dissolved	µg/L	<1	<1	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	5	33	6	14	11
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	1	3	2	3	4
Aluminium-Dissolved	µg/L	<5	<5	<5	<5	<5
Barium-Dissolved	µg/L	220	110	97	150	21
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	<1	<1	<1	<1
Iron-Dissolved	µg/L	280	<10	<10	<10	49
Manganese-Dissolved	µg/L	24	<5	210	140	830
Vanadium-Dissolved	µg/L	<1	1	2	<1	<1
Selenium-Dissolved	µg/L	<1	2	<1	7	<1

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-11 D51 19/05/2014 Water
Date prepared	-	22/05/2014
Date analysed	-	22/05/2014
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	3
Lead-Dissolved	µg/L	<1
Zinc-Dissolved	µg/L	250
Mercury-Dissolved	µg/L	<0.05
Nickel-Dissolved	µg/L	42
Aluminium-Dissolved	µg/L	<5
Barium-Dissolved	µg/L	160
Beryllium-Dissolved	µg/L	<0.1
Cobalt-Dissolved	µg/L	<1
Iron-Dissolved	µg/L	190
Manganese-Dissolved	µg/L	120
Vanadium-Dissolved	µg/L	<1
Selenium-Dissolved	µg/L	<1

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	110170-1	110170-2	110170-3	110170-4	110170-5
Your Reference	----------	BY0016	A01-S	BY0015	AGE08	SW4
Date Sampled	----------	19/05/2014	19/05/2014	19/05/2014	19/05/2014	20/05/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Date analysed	-	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Phosphorus - Total	mg/L	<0.05	0.08	<0.05	<0.05	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	110170-6	110170-7	110170-8	110170-9	110170-10
Your Reference	----------	BY0014	A14	A13	A09	A06-D
Date Sampled	----------	20/05/2014	20/05/2014	20/05/2014	20/05/2014	20/05/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Date analysed	-	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Phosphorus - Total	mg/L	<0.05	0.06	<0.05	<0.05	<0.05

Metals in Waters - Acid extractable		
Our Reference:	UNITS	110170-11
Your Reference	----------	D51
Date Sampled	----------	19/05/2014
Type of sample		Water
Date prepared	-	22/05/2014
Date analysed	-	22/05/2014
Phosphorus - Total	mg/L	<0.05

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-1 BY0016 19/05/2014 Water	110170-2 A01-S 19/05/2014 Water	110170-3 BY0015 19/05/2014 Water	110170-4 AGE08 19/05/2014 Water	110170-5 SW4 20/05/2014 Water
Date prepared	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Date analysed	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
pH	pH Units	7.1	7.1	7.3	5.9	7.7
Electrical Conductivity	µS/cm	2,400	2,200	1,200	1,300	2,100
NOx as N in water	mg/L	0.01	0.07	0.09	0.006	0.1
Ammonia as N in water	mg/L	2.0	0.087	1.0	1.5	<0.005
Turbidity	NTU	16	8.5	3.8	0.8	4.6

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-6 BY0014 20/05/2014 Water	110170-7 A14 20/05/2014 Water	110170-8 A13 20/05/2014 Water	110170-9 A09 20/05/2014 Water	110170-10 A06-D 20/05/2014 Water
Date prepared	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Date analysed	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
pH	pH Units	7.7	6.3	7.2	7.0	6.9
Electrical Conductivity	µS/cm	1,100	1,800	1,400	2,800	800
NOx as N in water	mg/L	0.009	1.7	0.3	1.8	0.02
Ammonia as N in water	mg/L	1.0	<0.005	<0.005	<0.005	0.070
Turbidity	NTU	3.9	29	3.7	15	17

Miscellaneous Inorganics Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-11 D51 19/05/2014 Water
Date prepared	-	21/05/2014
Date analysed	-	21/05/2014
pH	pH Units	5.9
Electrical Conductivity	µS/cm	1,300
NOx as N in water	mg/L	0.008
Ammonia as N in water	mg/L	1.6
Turbidity	NTU	0.7

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-1 BY0016 19/05/2014 Water	110170-2 A01-S 19/05/2014 Water	110170-3 BY0015 19/05/2014 Water	110170-4 AGE08 19/05/2014 Water	110170-5 SW4 20/05/2014 Water
Date prepared	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Date analysed	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Calcium - Dissolved	mg/L	33	120	48	36	130
Potassium - Dissolved	mg/L	17	6.5	13	13	7.3
Sodium - Dissolved	mg/L	600	250	200	210	190
Magnesium - Dissolved	mg/L	20	99	27	28	96
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	1,100	440	410	570	360
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	1,100	440	410	570	360
Sulphate, SO4	mg/L	5	200	33	<1	240
Chloride, Cl	mg/L	180	320	110	81	290
Ionic Balance	%	5.5	6.8	6.5	0.030	5.8

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-6 BY0014 20/05/2014 Water	110170-7 A14 20/05/2014 Water	110170-8 A13 20/05/2014 Water	110170-9 A09 20/05/2014 Water	110170-10 A06-D 20/05/2014 Water
Date prepared	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Date analysed	-	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Calcium - Dissolved	mg/L	37	130	76	130	43
Potassium - Dissolved	mg/L	11	5.2	5.6	11	4.8
Sodium - Dissolved	mg/L	190	150	110	320	73
Magnesium - Dissolved	mg/L	20	86	61	120	33
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	460	460	280	430	250
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	460	460	280	430	250
Sulphate, SO4	mg/L	<1	210	81	320	13
Chloride, Cl	mg/L	75	160	190	420	81
Ionic Balance	%	3.3	5.1	4.0	6.6	4.0

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110170-11 D51 19/05/2014 Water
Date prepared	-	21/05/2014
Date analysed	-	21/05/2014
Calcium - Dissolved	mg/L	34
Potassium - Dissolved	mg/L	13
Sodium - Dissolved	mg/L	210
Magnesium - Dissolved	mg/L	27
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	570
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	570
Sulphate, SO4	mg/L	<1
Chloride, Cl	mg/L	81
Ionic Balance	%	-0.86

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			22/05/2014	110170-1	22/05/2014 || 22/05/2014	LCS-W1	22/05/2014
Date analysed	-			22/05/2014	110170-1	22/05/2014 || 22/05/2014	LCS-W1	22/05/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	20 || 20 || RPD: 0	LCS-W1	99%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	110170-1	<0.1 || <0.1	LCS-W1	99%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	<1 || <1	LCS-W1	93%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	<1 || <1	LCS-W1	97%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	<1 || <1	LCS-W1	99%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	5 || 5 || RPD: 0	LCS-W1	100%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	110170-1	<0.05 || <0.05	LCS-W1	100%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	3 || 3 || RPD: 0	LCS-W1	100%
Aluminium-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	110170-1	<5 || <5	LCS-W1	93%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	370 || 370 || RPD: 0	LCS-W1	96%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	110170-1	0.1 || 0.1 || RPD: 0	LCS-W1	84%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	<1 || <1	LCS-W1	93%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	110170-1	530 || 530 || RPD: 0	LCS-W1	100%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	110170-1	27 || 27 || RPD: 0	LCS-W1	96%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	<1 || <1	LCS-W1	92%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110170-1	<1 || <1	LCS-W1	100%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			22/05/2014	110170-1	22/05/2014 || 22/05/2014	LCS-W1	22/05/2014
Date analysed	-			22/05/2014	110170-1	22/05/2014 || 22/05/2014	LCS-W1	22/05/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	110170-1	<0.05 || <0.05	LCS-W1	102%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			21/05/2014	110170-1	21/05/2014 || 21/05/2014	LCS-W1	21/05/2014
Date analysed	-			21/05/2014	110170-1	21/05/2014 || 21/05/2014	LCS-W1	21/05/2014
pH	pH Units		Inorg-001	[NT]	110170-1	7.1 || 7.1 || RPD: 0	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	110170-1	2400 || 2500 || RPD: 4	LCS-W1	104%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	110170-1	0.01 || 0.01 || RPD: 0	LCS-W1	110%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	110170-1	2.0 || 2.0 || RPD: 0	LCS-W1	98%
Turbidity	NTU	0.1	Inorg-022	<0.1	110170-1	16 || 16 || RPD: 0	LCS-W1	101%
QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			21/05/2014	110170-1	21/05/2014 || 21/05/2014	LCS-W1	21/05/2014
Date analysed	-			21/05/2014	110170-1	21/05/2014 || 21/05/2014	LCS-W1	21/05/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	110170-1	33 || 32 || RPD: 3	LCS-W1	107%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	110170-1	17 || 17 || RPD: 0	LCS-W1	105%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	110170-1	600 || 580 || RPD: 3	LCS-W1	99%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	110170-1	20 || 20 || RPD: 0	LCS-W1	108%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	110170-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	110170-1	1100 || 1100 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	110170-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	110170-1	1100 || 1100 || RPD: 0	LCS-W1	100%
Sulphate, SO4	mg/L	1	Inorg-081	<1	110170-1	5 || 5 || RPD: 0	LCS-W1	100%
Chloride, Cl	mg/L	1	Inorg-081	<1	110170-1	180 || 180 || RPD: 0	LCS-W1	93%
Ionic Balance	%		Inorg-041	[NT]	110170-1	5.5 || 4.4 || RPD: 22	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	110170-11	22/05/2014 || 22/05/2014	110170-2	22/05/2014
Date analysed	-	110170-11	22/05/2014 || 22/05/2014	110170-2	22/05/2014
Arsenic-Dissolved	µg/L	110170-11	<1 || <1	[NR]	[NR]
Cadmium-Dissolved	µg/L	110170-11	<0.1 || <0.1	[NR]	[NR]
Chromium-Dissolved	µg/L	110170-11	<1 || <1	[NR]	[NR]
Copper-Dissolved	µg/L	110170-11	3 || 3 || RPD: 0	[NR]	[NR]
Lead-Dissolved	µg/L	110170-11	<1 || <1	[NR]	[NR]
Zinc-Dissolved	µg/L	110170-11	250 || 240 || RPD: 4	[NR]	[NR]
Mercury-Dissolved	µg/L	110170-11	<0.05 || [N/T]	110170-2	112%
Nickel-Dissolved	µg/L	110170-11	42 || 41 || RPD: 2	[NR]	[NR]
Aluminium-Dissolved	µg/L	110170-11	<5 || <5	[NR]	[NR]
Barium-Dissolved	µg/L	110170-11	160 || 160 || RPD: 0	[NR]	[NR]
Beryllium-Dissolved	µg/L	110170-11	<0.1 || <0.1	[NR]	[NR]
Cobalt-Dissolved	µg/L	110170-11	<1 || <1	[NR]	[NR]
Iron-Dissolved	µg/L	110170-11	190 || 190 || RPD: 0	[NR]	[NR]
Manganese-Dissolved	µg/L	110170-11	120 || 120 || RPD: 0	[NR]	[NR]
Vanadium-Dissolved	µg/L	110170-11	<1 || <1	[NR]	[NR]
Selenium-Dissolved	µg/L	110170-11	<1 || <1	[NR]	[NR]
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	110170-7	22/05/2014 || 22/05/2014	110170-2	22/05/2014
Date analysed	-	110170-7	22/05/2014 || 22/05/2014	110170-2	22/05/2014
Phosphorus - Total	mg/L	110170-7	0.06 || 0.06 || RPD: 0	110170-2	106%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	110170-11	21/05/2014 || 21/05/2014	110170-2	21/05/2014
Date analysed	-	110170-11	21/05/2014 || 21/05/2014	110170-2	21/05/2014
pH	pH Units	110170-11	5.9 || 5.9 || RPD: 0	[NR]	[NR]
Electrical Conductivity	µS/cm	110170-11	1300 || 1300 || RPD: 0	[NR]	[NR]
NOx as N in water	mg/L	110170-11	0.008 || 0.006 || RPD: 29	110170-2	103%
Ammonia as N in water	mg/L	110170-11	1.6 || 1.6 || RPD: 0	110170-2	100%
Turbidity	NTU	110170-11	0.7 || 0.7 || RPD: 0	[NR]	[NR]
QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	110170-11	21/05/2014 || 21/05/2014	110170-2	21/05/2014
Date analysed	-	110170-11	21/05/2014 || 21/05/2014	110170-2	21/05/2014
Calcium - Dissolved	mg/L	110170-11	34 || 35 || RPD: 3	110170-2	#
Potassium - Dissolved	mg/L	110170-11	13 || 13 || RPD: 0	110170-2	103%
Sodium - Dissolved	mg/L	110170-11	210 || 210 || RPD: 0	110170-2	#
Magnesium - Dissolved	mg/L	110170-11	27 || 28 || RPD: 4	110170-2	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	110170-11	<5 || <5	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Bicarbonate Alkalinity as $CaCO_3$	mg/L	110170-11	570 || 570 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	110170-11	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	110170-11	570 || 570 || RPD: 0	[NR]	[NR]
Sulphate, SO4	mg/L	110170-11	<1 || <1	110170-2	76%
Chloride, Cl	mg/L	110170-11	81 || 82 || RPD: 1	110170-2	71%
Ionic Balance	%	110170-11	-0.86 || -0.20 || RPD: -125	[NR]	[NR]

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	110170-8	22/05/2014 || 22/05/2014
Date analysed	-	110170-8	22/05/2014 || 22/05/2014
Arsenic-Dissolved	µg/L	110170-8	<1 || [N/T]
Cadmium-Dissolved	µg/L	110170-8	<0.1 || [N/T]
Chromium-Dissolved	µg/L	110170-8	<1 || [N/T]
Copper-Dissolved	µg/L	110170-8	<1 || [N/T]
Lead-Dissolved	µg/L	110170-8	<1 || [N/T]
Zinc-Dissolved	µg/L	110170-8	6 || [N/T]
Mercury-Dissolved	µg/L	110170-8	<0.05 || <0.05
Nickel-Dissolved	µg/L	110170-8	2 || [N/T]
Aluminium-Dissolved	µg/L	110170-8	<5 || [N/T]
Barium-Dissolved	µg/L	110170-8	97 || [N/T]
Beryllium-Dissolved	µg/L	110170-8	<0.1 || [N/T]
Cobalt-Dissolved	µg/L	110170-8	<1 || [N/T]
Iron-Dissolved	µg/L	110170-8	<10 || [N/T]
Manganese-Dissolved	µg/L	110170-8	210 || [N/T]
Vanadium-Dissolved	µg/L	110170-8	2 || [N/T]
Selenium-Dissolved	µg/L	110170-8	<1 || [N/T]

Client Reference: 49761.03, Bylong

Report Comments:

ION_BALANCE:# Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Client Reference: 49761.03, Bylong

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

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CERTIFICATE OF ANALYSIS **110321**

Client:
Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Angela Peade, Dana Wilson

Sample log in details:

Your Reference:	**49761.03, Bylong**
No. of samples:	14 Waters
Date samples received / completed instructions received	23/05/14 / 23/05/14

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	3/06/14 / 30/05/14
Date of Preliminary Report:	

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Client Reference: 49761.03, Bylong

Miscellaneous Inorganics						
Our Reference:	UNITS	110321-1	110321-2	110321-3	110321-4	110321-5
Your Reference	----------	RT6	RT3	RT2	RT1	RT5
Date Sampled	----------	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/05/2014	23/05/2014	23/05/2014	23/05/2014	23/05/2014
Date analysed	-	23/05/2014	23/05/2014	23/05/2014	23/05/2014	23/05/2014
pH	pH Units	4.8	6.2	6.3	6.8	6.8
Electrical Conductivity	µS/cm	21	13	22	66	74
NOx as N in water	mg/L	0.67	0.4	0.71	1.2	0.5
Ammonia as N in water	mg/L	0.087	<0.005	<0.005	<0.005	<0.005
Turbidity	NTU	0.6	0.6	0.2	0.4	0.4
Total Cyanide	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference:	UNITS	110321-6	110321-7	110321-8	110321-9	110321-10
Your Reference	----------	AGE10	B3-D	B3-S	AGE13	A15
Date Sampled	----------	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/05/2014	23/05/2014	23/05/2014	23/05/2014	23/05/2014
Date analysed	-	23/05/2014	23/05/2014	23/05/2014	23/05/2014	23/05/2014
pH	pH Units	7.1	6.1	5.0	7.1	6.0
Electrical Conductivity	µS/cm	2,300	680	200	1,700	290
NOx as N in water	mg/L	<0.005	0.03	1.2	0.02	0.02
Ammonia as N in water	mg/L	2.6	2.4	<0.005	1.1	0.014
Turbidity	NTU	26	10	130	48	7.9

Miscellaneous Inorganics					
Our Reference:	UNITS	110321-11	110321-12	110321-13	110321-14
Your Reference	----------	A18	A12	A02-D	A20
Date Sampled	----------	21/05/2014	21/05/2014	21/05/2014	22/05/2014
Type of sample		Water	Water	Water	Water
Date prepared	-	23/05/2014	23/05/2014	23/05/2014	23/05/2014
Date analysed	-	23/05/2014	23/05/2014	23/05/2014	23/05/2014
pH	pH Units	6.7	5.4	7.1	5.8
Electrical Conductivity	µS/cm	330	320	1,000	1,300
NOx as N in water	mg/L	0.01	0.03	1.4	0.02
Ammonia as N in water	mg/L	0.044	1.5	<0.005	0.070
Turbidity	NTU	45	74	48	27

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110321-1 RT6 22/05/2014 Water	110321-2 RT3 22/05/2014 Water	110321-3 RT2 22/05/2014 Water	110321-4 RT1 22/05/2014 Water	110321-5 RT5 22/05/2014 Water
Date prepared	-	27/05/2014	27/05/2014	27/05/2014	27/05/2014	27/05/2014
Date analysed	-	27/05/2014	27/05/2014	27/05/2014	27/05/2014	27/05/2014
Calcium - Dissolved	mg/L	<0.5	0.7	<0.5	2.5	6.4
Potassium - Dissolved	mg/L	<0.5	<0.5	<0.5	4.9	0.6
Sodium - Dissolved	mg/L	0.8	<0.5	0.6	0.8	2.2
Magnesium - Dissolved	mg/L	<0.5	<0.5	<0.5	0.7	1.8
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	<5	6	7	25	23
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	<5	6	7	25	23
Sulphate, SO4	mg/L	<1	<1	<1	1	5
Chloride, Cl	mg/L	<1	<1	<1	2	3
Ionic Balance	%	100	-52	-70	-25	-6.6

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110321-6 AGE10 21/05/2014 Water	110321-7 B3-D 21/05/2014 Water	110321-8 B3-S 21/05/2014 Water	110321-9 AGE13 21/05/2014 Water	110321-10 A15 21/05/2014 Water
Date prepared	-	27/05/2014	27/05/2014	27/05/2014	27/05/2014	27/05/2014
Date analysed	-	27/05/2014	27/05/2014	27/05/2014	27/05/2014	27/05/2014
Calcium - Dissolved	mg/L	49	23	4.3	66	13
Potassium - Dissolved	mg/L	24	7.7	5.1	17	2.8
Sodium - Dissolved	mg/L	360	100	17	190	25
Magnesium - Dissolved	mg/L	55	20	5.4	70	11
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	910	320	34	660	77
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	910	320	34	660	77
Sulphate, SO4	mg/L	16	1	8	54	5
Chloride, Cl	mg/L	210	43	23	150	35
Ionic Balance	%	-2.7	-1.8	0.83	-1.7	0.43

Client Reference: 49761.03, Bylong

Ion Balance Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110321-11 A18 21/05/2014 Water	110321-12 A12 21/05/2014 Water	110321-13 A02-D 21/05/2014 Water	110321-14 A20 22/05/2014 Water
Date prepared	-	27/05/2014	27/05/2014	27/05/2014	27/05/2014
Date analysed	-	27/05/2014	27/05/2014	27/05/2014	27/05/2014
Calcium - Dissolved	mg/L	20	19	70	64
Potassium - Dissolved	mg/L	12	3.2	4.3	6.2
Sodium - Dissolved	mg/L	20	19	65	100
Magnesium - Dissolved	mg/L	11	12	42	50
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	100	86	260	320
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	100	86	260	320
Sulphate, SO4	mg/L	21	19	95	110
Chloride, Cl	mg/L	22	26	110	160
Ionic Balance	%	-0.080	0.0	-1.7	-4.7

Client Reference: 49761.03, Bylong

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110321-6 AGE10 21/05/2014 Water	110321-7 B3-D 21/05/2014 Water	110321-8 B3-S 21/05/2014 Water	110321-9 AGE13 21/05/2014 Water	110321-10 A15 21/05/2014 Water
Date prepared	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Date analysed	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Arsenic-Dissolved	µg/L	<1	1	<1	1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	3	<1	<1	<1
Copper-Dissolved	µg/L	<1	5	5	<1	<1
Lead-Dissolved	µg/L	<1	3	<1	<1	<1
Zinc-Dissolved	µg/L	2	160	63	5	22
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	3	29	9	1	3
Aluminium-Dissolved	µg/L	2	66	4	2	<0.5
Barium-Dissolved	µg/L	340	200	57	96	27
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	<1	10	<1	<1	<1
Iron-Dissolved	µg/L	610	7,600	15	370	16
Manganese-Dissolved	µg/L	110	3,200	8	52	89
Vanadium-Dissolved	µg/L	<1	1	<1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1

HM in water - dissolved Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110321-11 A18 21/05/2014 Water	110321-12 A12 21/05/2014 Water	110321-13 A02-D 21/05/2014 Water	110321-14 A20 22/05/2014 Water
Date prepared	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Date analysed	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Arsenic-Dissolved	µg/L	<1	<1	<1	1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	7	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1
Zinc-Dissolved	µg/L	11	53	6	53
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	4	7	2	9
Aluminium-Dissolved	µg/L	7	1	<0.5	5
Barium-Dissolved	µg/L	84	62	130	68
Beryllium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	1	<1	<1	3
Iron-Dissolved	µg/L	680	180	<10	540
Manganese-Dissolved	µg/L	93	98	110	1,300
Vanadium-Dissolved	µg/L	<1	<1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	3	<1

Client Reference: 49761.03, Bylong

HM in water - total Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110321-1 RT6 22/05/2014 Water	110321-2 RT3 22/05/2014 Water	110321-3 RT2 22/05/2014 Water	110321-4 RT1 22/05/2014 Water	110321-5 RT5 22/05/2014 Water
Date prepared	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Date analysed	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Arsenic-Total	µg/L	<1	<1	<1	<1	<1
Cadmium-Total	µg/L	<0.1	0.4	0.5	<0.1	<0.1
Chromium-Total	µg/L	1	<1	<1	<1	<1
Copper-Total	µg/L	150	4	5	12	680
Lead-Total	µg/L	4	<1	3	6	<1
Zinc-Total	µg/L	160	3,100	4,100	8,800	1,800
Mercury-Total	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Total	µg/L	<1	<1	<1	<1	3
Aluminium-Total	µg/L	33	0.8	0.7	8	7
Barium-Total	µg/L	13	1	2	5	10
Beryllium-Total	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt-Total	µg/L	2	<1	<1	<1	<1
Iron-Total	µg/L	15	<10	<10	100	14
Manganese-Total	µg/L	14	<5	<5	33	<5
Vanadium-Total	µg/L	<1	<1	<1	<1	<1
Selenium-Total	µg/L	<1	<1	<1	<1	<1

Client Reference: 49761.03, Bylong

Metals in Waters - Acid extractable						
Our Reference:	UNITS	110321-1	110321-2	110321-3	110321-4	110321-5
Your Reference	----------	RT6	RT3	RT2	RT1	RT5
Date Sampled	----------	22/05/2014	22/05/2014	22/05/2014	22/05/2014	22/05/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Date analysed	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	0.3	<0.05

Metals in Waters - Acid extractable						
Our Reference:	UNITS	110321-6	110321-7	110321-8	110321-9	110321-10
Your Reference	----------	AGE10	B3-D	B3-S	AGE13	A15
Date Sampled	----------	21/05/2014	21/05/2014	21/05/2014	21/05/2014	21/05/2014
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Date analysed	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Metals in Waters - Acid extractable					
Our Reference:	UNITS	110321-11	110321-12	110321-13	110321-14
Your Reference	----------	A18	A12	A02-D	A20
Date Sampled	----------	21/05/2014	21/05/2014	21/05/2014	22/05/2014
Type of sample		Water	Water	Water	Water
Date prepared	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Date analysed	-	26/05/2014	26/05/2014	26/05/2014	26/05/2014
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	<0.05

Client Reference: 49761.03, Bylong

Microbiologocal Testing Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	110321-1 RT6 22/05/2014 Water	110321-2 RT3 22/05/2014 Water	110321-3 RT2 22/05/2014 Water	110321-4 RT1 22/05/2014 Water	110321-5 RT5 22/05/2014 Water
Date testing started	-	24/05/2014	24/05/2014	24/05/2014	24/05/2014	24/05/2014
Date testing completed	-	24/05/2014	24/05/2014	24/05/2014	24/05/2014	24/05/2014
E. Coli	CFU/100mL	<1	<1	<1	<1	<1
Faecal Coliforms	CFU/100mL	<1	<1	<1	<1	<1

Client Reference: 49761.03, Bylong

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.
Inorg-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA 22nd ED, 2130-B.
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Inorg-041	Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

Client Reference: 49761.03, Bylong

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			23/05/2014	110321-1	23/05/2014 || 23/05/2014	LCS-W1	23/05/2014
Date analysed	-			23/05/2014	110321-1	23/05/2014 || 23/05/2014	LCS-W1	23/05/2014
pH	pH Units		Inorg-001	[NT]	110321-1	4.8 || 4.6 || RPD: 4	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	110321-1	21 || 16 || RPD: 27	LCS-W1	109%
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	110321-1	0.67 || 0.66 || RPD: 2	LCS-W1	112%
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	110321-1	0.087 || 0.077 || RPD: 12	LCS-W1	92%
Turbidity	NTU	0.1	Inorg-022	<0.1	110321-1	0.6 || 0.6 || RPD: 0	LCS-W1	103%
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	110321-1	<0.004 || <0.004	LCS-W1	118%
QUALITY CONTROL Ion Balance	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			23/05/2014	110321-1	27/05/2014 || 27/05/2014	LCS-W1	26/05/2014
Date analysed	-			23/05/2014	110321-1	27/05/2014 || 27/05/2014	LCS-W1	26/05/2014
Calcium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	110321-1	<0.5 || [N/T]	LCS-W1	114%
Potassium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	110321-1	<0.5 || [N/T]	LCS-W1	120%
Sodium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	110321-1	0.8 || [N/T]	LCS-W1	112%
Magnesium - Dissolved	mg/L	0.5	Metals-020 ICP-AES	<0.5	110321-1	<0.5 || [N/T]	LCS-W1	110%
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	110321-1	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	110321-1	<5 || <5	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	110321-1	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	110321-1	<5 || <5	LCS-W1	101%
Sulphate, SO4	mg/L	1	Inorg-081	<1	110321-1	<1 || <1	LCS-W1	100%
Chloride, Cl	mg/L	1	Inorg-081	<1	110321-1	<1 || <1	LCS-W1	94%
Ionic Balance	%		Inorg-041	[NT]	110321-1	100 || [N/T]	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			26/05/2014	110321-6	26/05/2014 || 26/05/2014	LCS-W1	26/05/2014
Date analysed	-			26/05/2014	110321-6	26/05/2014 || 26/05/2014	LCS-W1	26/05/2014
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	<1 || <1	LCS-W1	96%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	110321-6	<0.1 || <0.1	LCS-W1	99%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	<1 || <1	LCS-W1	94%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	<1 || <1	LCS-W1	93%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	<1 || <1	LCS-W1	101%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	2 || 2 || RPD: 0	LCS-W1	96%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	110321-6	<0.05 || [N/T]	LCS-W1	96%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	3 || 3 || RPD: 0	LCS-W1	95%
Aluminium-Dissolved	µg/L	0.5	Metals-022 ICP-MS	<0.5	110321-6	2 || 2 || RPD: 0	LCS-W1	105%
Barium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	340 || 340 || RPD: 0	LCS-W1	97%
Beryllium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	110321-6	<0.1 || <0.1	LCS-W1	92%
Cobalt-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	<1 || <1	LCS-W1	96%
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	110321-6	610 || 620 || RPD: 2	LCS-W1	103%
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	110321-6	110 || 110 || RPD: 0	LCS-W1	97%
Vanadium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	<1 || <1	LCS-W1	93%
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	110321-6	<1 || <1	LCS-W1	95%

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - total	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			26/05/2014	[NT]	[NT]	LCS-W1	26/05/2014
Date analysed	-			26/05/2014	[NT]	[NT]	LCS-W1	26/05/2014
Arsenic-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	95%
Cadmium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	99%
Chromium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	95%
Copper-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	100%
Lead-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	99%
Zinc-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	98%
Mercury-Total	µg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]	[NT]	LCS-W1	92%
Nickel-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	94%
Aluminium-Total	µg/L	0.5	Metals-022 ICP-MS	<0.5	[NT]	[NT]	LCS-W1	90%
Barium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	95%
Beryllium-Total	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	LCS-W1	83%
Cobalt-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	99%
Iron-Total	µg/L	10	Metals-022 ICP-MS	<10	[NT]	[NT]	LCS-W1	92%
Manganese-Total	µg/L	5	Metals-022 ICP-MS	<5	[NT]	[NT]	LCS-W1	92%
Vanadium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	92%
Selenium-Total	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	LCS-W1	99%

Client Reference: 49761.03, Bylong

QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			26/05/2014	110321-9	26/05/2014 || 26/05/2014	LCS-W1	26/05/2014
Date analysed	-			26/05/2014	110321-9	26/05/2014 || 26/05/2014	LCS-W1	26/05/2014
Phosphorus - Total	mg/L	0.05	Metals-020 ICP-AES	<0.05	110321-9	<0.05 || <0.05	LCS-W1	102%

QUALITY CONTROL Microbiologocal Testing	UNITS	PQL	METHOD	Blank
Date testing started	-			[NT]
Date testing completed	-			[NT]
E. Coli	CFU/100 mL	1	Ext-008	[NT]
Faecal Coliforms	CFU/100 mL	1	Ext-008	[NT]

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	110321-11	23/05/2014 || 23/05/2014	110321-2	23/05/2014
Date analysed	-	110321-11	23/05/2014 || 23/05/2014	110321-2	23/05/2014
pH	pH Units	110321-11	6.7 || 6.7 || RPD: 0	[NR]	[NR]
Electrical Conductivity	µS/cm	110321-11	330 || 330 || RPD: 0	[NR]	[NR]
NOx as N in water	mg/L	110321-11	0.01 || 0.01 || RPD: 0	110321-2	96%
Ammonia as N in water	mg/L	110321-11	0.044 || 0.046 || RPD: 4	110321-2	102%
Turbidity	NTU	110321-11	45 || 45 || RPD: 0	[NR]	[NR]
Total Cyanide	mg/L	[NT]	[NT]	110321-2	116%
QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	110321-11	27/05/2014 || 27/05/2014	110321-13	26/05/2014
Date analysed	-	110321-11	27/05/2014 || 27/05/2014	110321-13	26/05/2014
Calcium - Dissolved	mg/L	110321-11	20 || [N/T]	110321-13	#
Potassium - Dissolved	mg/L	110321-11	12 || [N/T]	110321-13	102%
Sodium - Dissolved	mg/L	110321-11	20 || [N/T]	110321-13	#
Magnesium - Dissolved	mg/L	110321-11	11 || [N/T]	110321-13	#
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	110321-11	<5 || <5	[NR]	[NR]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	110321-11	100 || 100 || RPD: 0	[NR]	[NR]
Carbonate Alkalinity as $CaCO_3$	mg/L	110321-11	<5 || <5	[NR]	[NR]
Total Alkalinity as $CaCO_3$	mg/L	110321-11	100 || 100 || RPD: 0	[NR]	[NR]
Sulphate, SO4	mg/L	110321-11	21 || 21 || RPD: 0	[NR]	[NR]
Chloride, Cl	mg/L	110321-11	22 || 22 || RPD: 0	[NR]	[NR]

Client Reference: 49761.03, Bylong

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	110321-13	26/05/2014 || 26/05/2014	110321-7	26/05/2014
Date analysed	-	110321-13	26/05/2014 || 26/05/2014	110321-7	26/05/2014
Arsenic-Dissolved	µg/L	110321-13	<1 || <1	110321-7	98%
Cadmium-Dissolved	µg/L	110321-13	<0.1 || <0.1	110321-7	96%
Chromium-Dissolved	µg/L	110321-13	<1 || <1	110321-7	92%
Copper-Dissolved	µg/L	110321-13	<1 || 1	110321-7	89%
Lead-Dissolved	µg/L	110321-13	<1 || <1	110321-7	97%
Zinc-Dissolved	µg/L	110321-13	6 || 6 || RPD: 0	110321-7	91%
Mercury-Dissolved	µg/L	110321-13	<0.05 || [N/T]	110321-7	96%
Nickel-Dissolved	µg/L	110321-13	2 || 2 || RPD: 0	110321-7	89%
Aluminium-Dissolved	µg/L	110321-13	<0.5 || <0.5	110321-7	97%
Barium-Dissolved	µg/L	110321-13	130 || 130 || RPD: 0	110321-7	93%
Beryllium-Dissolved	µg/L	110321-13	<0.1 || <0.1	110321-7	87%
Cobalt-Dissolved	µg/L	110321-13	<1 || <1	110321-7	90%
Iron-Dissolved	µg/L	110321-13	<10 || <10	110321-7	#
Manganese-Dissolved	µg/L	110321-13	110 || 110 || RPD: 0	110321-7	#
Vanadium-Dissolved	µg/L	110321-13	<1 || <1	110321-7	92%
Selenium-Dissolved	µg/L	110321-13	3 || 3 || RPD: 0	110321-7	93%
QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	LCS-2	26/05/2014
Date analysed	-	[NT]	[NT]	LCS-2	26/05/2014
Phosphorus - Total	mg/L	[NT]	[NT]	LCS-2	93%
QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	110321-2	27/05/2014 || 27/05/2014	110321-2	23/05/2014
Date analysed	-	110321-2	27/05/2014 || 27/05/2014	110321-2	23/05/2014
Calcium - Dissolved	mg/L	110321-2	0.7 || 0.7 || RPD: 0	[NR]	[NR]
Potassium - Dissolved	mg/L	110321-2	<0.5 || <0.5	[NR]	[NR]
Sodium - Dissolved	mg/L	110321-2	<0.5 || <0.5	[NR]	[NR]
Magnesium - Dissolved	mg/L	110321-2	<0.5 || <0.5	[NR]	[NR]
Sulphate, SO4	mg/L	110321-2	<1 || [N/T]	110321-2	95%
Chloride, Cl	mg/L	110321-2	<1 || [N/T]	110321-2	88%

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QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	110321-12	26/05/2014 || 26/05/2014
Date analysed	-	110321-12	26/05/2014 || 26/05/2014
Mercury-Dissolved	µg/L	110321-12	<0.05 || <0.05

QUALITY CONTROL Metals in Waters - Acid extractable	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	110321-10	26/05/2014
Date analysed	-	[NT]	[NT]	110321-10	26/05/2014
Phosphorus - Total	mg/L	[NT]	[NT]	110321-10	95%

QUALITY CONTROL Ion Balance	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	110321-12	27/05/2014 || 27/05/2014
Date analysed	-	110321-12	27/05/2014 || 27/05/2014
Calcium - Dissolved	mg/L	110321-12	19 || 18 || RPD: 5
Potassium - Dissolved	mg/L	110321-12	3.2 || 3.1 || RPD: 3
Sodium - Dissolved	mg/L	110321-12	19 || 19 || RPD: 0
Magnesium - Dissolved	mg/L	110321-12	12 || 12 || RPD: 0
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	110321-12	<5 || [N/T]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	110321-12	86 || [N/T]
Carbonate Alkalinity as $CaCO_3$	mg/L	110321-12	<5 || [N/T]
Total Alkalinity as $CaCO_3$	mg/L	110321-12	86 || [N/T]
Sulphate, SO4	mg/L	110321-12	19 || [N/T]
Chloride, Cl	mg/L	110321-12	26 || [N/T]
Ionic Balance	%	110321-12	0.0 || [N/T]

Client Reference: 49761.03, Bylong

QUALITY CONTROL Miscellaneous Inorganics	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	110321-1	23/05/2014 || 23/05/2014
Date analysed	-	110321-1	23/05/2014 || 23/05/2014
pH	pH Units	110321-1	4.8 || 4.6 || RPD: 4
Electrical Conductivity	µS/cm	110321-1	21 || 16 || RPD: 27
NOx as N in water	mg/L	110321-1	0.67 || 0.66 || RPD: 2
Ammonia as N in water	mg/L	110321-1	0.087 || 0.077 || RPD: 12
Turbidity	NTU	110321-1	0.6 || 0.6 || RPD: 0
Total Cyanide	mg/L	110321-1	<0.004 || <0.004

Client Reference: 49761.03, Bylong

Report Comments:

ION_BALANCE:# Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

METALS_WLL_8_D: For the determination of dissolved metals in sample 110321-7, the unpreserved sample was filtered through 0.45um filter at the lab due to the presence of colloids and/or sediment in the supplied HNO3 bottle.

E. coli & Faecal Coliforms analysed by Sonic Food & Water Testing. Report No.W1407864.

The mass inbalance in sample #1,2,3 and 4 may be due to low results..

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Client Reference: 49761.03, Bylong

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Douglas Partners
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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012	Oct 2012	Dec 2012			Fresh	Marine	Irrigation Waters
	23/2/2012	31/5/2012	27/06/2012	24/07/2012	22/08/2012	17/09/2012	21/10/2012	5/12/012					
pH	6.3	8.5	7.2	7.1	7.1	6.9	8.1	7.4	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2100	3100	3000	1200	2800	2900	2900	2800	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	21	3.4	2.1	1.7	3.9	1.2	1.8	3.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<1	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	51	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	490	460	470	460	490	470	500	470	1/5	NC	NC	NC	NC
Total Alkalinity	490	510	470	460	490	470	500	470	1/5				
Anions													
Chloride (Cl)	310	570	500	120	450	490	480	500	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.17	0.14	0.13	0.1	0.12	0.1	0.11	0.096	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.02	0.04	0.07	0.4	0.1	0.2	0.07	0.06	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	180	320	270	33	260	300	290	280	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	110	140	140	130	140	150	150	130	0.5	NC	NC	NC	NC
Potassium	4.8	7	5.3	7.2	6.3	8.2	6.8	6.1	0.5	NC	NC	NC	NC
Sodium	240	300	290	320	300	350	310	300	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	83	120	100	110	120	130	140	110	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.012	0.008	<0.01	0.007	0.0040	0.0070	0.004	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.003	0.004	0.002	0.002	0.0030	0.0030	0.003	0.002	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.17	0.23	0.190	0.170	0.1800	0.1900	0.180	0.170	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.002	0.003	0.002	0.001	0.001	0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	2.7	3.7	<0.01	1.700	1.50	1.60	1.900	2.100	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	1.3	2.2	<0.005	0.840	1.100	1.000	1.100	1.200	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.01	0.01	0.007	0.006	0.0070	0.0040	0.006	0.005	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	0.002	0.0010	0.0020	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.047	0.021	0.010	0.016	0.012	0.010	0.022	0.014	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.1	<0.05	0.07	0.06	0.07	0.06	0.08	0.08	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A01-S	A01-S (D17)	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Jan 2013	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013	Jul 2013	Aug 2013			Fresh	Marine	Irrigation Waters
	14/01/2013	14/01/2013	18/02/2013	3/19/2013	4/16/2013	5/12/2013	6/18/2013	7/22/2013	8/19/2013					
pH	7.3	7.3	7.2	7.5	7.7	7.7	7.3	7.6	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2700	2700	2700	2500	2500	2500	2600	2300	2300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	1.6	1.5	1.6	1.2	0.8	2	4.2	1.1	5.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	470	460	470	440	450	460	480	470	440	1/5	NC	NC	NC	NC
Total Alkalinity	470	460	470	440	450	460	480	470	440	1/5				
Anions														
Chloride (Cl)	500	500	490	460	430	510	450	500	350	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.093	0.034	0.1	0.068	0.026	0.054	0.051	0.054	0.048	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.1	0.1	0.08	0.02	0.01	0.02	0.05	0.05	0.006	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	300	310	280	270	240	290	240	230	230	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	120	120	140	120	130	120	120	130	100	0.5	NC	NC	NC	NC
Potassium	7	7.1	6.7	6.7	7.2	6.5	7.2	5.8	5.2	0.5	NC	NC	NC	NC
Sodium	380	390	290	270	250	280	300	270	200	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	120	130	120	99	110	100	100	98	88	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.007	0.001	0.006	0.003	0.007	0.001	0.003	0.003	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.004	0.004	0.003	0.002	0.002	0.002	0.002	0.003	0.002	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.170	0.160	0.160	0.150	0.150	0.150	0.16	0.150	0.14	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0004	0.0003	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.003	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	2.200	2.100	1.500	1.700	1.600	1.400	1.2	1.100	1.4	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	1.200	1.200	1.000	0.990	0.990	0.940	1.0	0.83	0.87	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.006	0.005	0.005	0.004	0.005	0.004	0.013	0.008	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.003	0.003	0.007	0.008	0.012	0.014	0.035	0.010	0.008	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.06	0.06	0.05	<0.05	0.07	0.07	0.09	0.06	0.08	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	A01-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	9/19/2013	16/101/2013	11/19/2013	12/16/2013	1/14/2014	17/02/2014	3/18/2014	4/13/2014	5/19/2014					
pH	7.4	8.1	6.3	7.2	7.2	7.2	5.9	7.0	7.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2400	2300	2300	2300	2300	2300	2200	2500	2200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	19	24	9.5	2.7	6.3	3.6	1.5	18	8.5	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	450	470	450	440	440	430	440	630	440	1/5	NC	NC	NC	NC
Total Alkalinity	450	470	450	440	440	430	440	630	440	1/5				
Anions														
Chloride (Cl)	400	420	390	410	370	340	350	350	320	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.044	0.017	0.085	0.047	0.048	0.062	0.069	0.11	0.087	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.009	0.01	0.01	0.1	0.07	0.2	0.006	0.008	0.07	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	240	240	240	270	230	210	210	190	200	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	110	130	120	120	120	120	120	130	120	0.5	NC	NC	NC	NC
Potassium	6.8	6.8	7.3	6.3	7.4	7.4	6.9	6.8	6.5	0.5	NC	NC	NC	NC
Sodium	240	280	270	270	270	270	300	330	250	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	89	100	100	100	100	99	99	110	99	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.012	0.005	0.002	0.007	0.005	0.003	0.006	<0.0005	<0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.002	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.14	0.15	0.17	0.14	0.14	0.14	0.14	0.17	0.16	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	0.001	0.001	0.002	<0.001	<0.001	0.001	0.004	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	1.3	1.7	2	2.1	1.8	2.1	2.3	6.8	3.9	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	1	1.3	1.5	1.2	1.1	1.1	1.3	1.8	1.5	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.004	0.004	0.009	0.002	0.002	0.007	0.006	0.005	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.014	0.02	0.092	0.015	0.005	0.014	0.063	0.042	0.023	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.1	0.1	0.1	0.06	0.07	0.05	0.07	0.1	0.08	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A02-S	A02-S	A02-S	A02-S (D8)	A02-S	A02-S	A02-S (D11/KMH)	A02-S	A02-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	May 2012	Jun 2012	Jul 2012	Jul 2012	Aug 2012	Sept 2012	Sept 2012	Oct 2012	Dec 2012			Fresh	Marine	Irrigation Waters
	30/5/2012	27/06/2012	23/07/2012	23/07/2012	22/08/2012	18/09/2012	18/09/2012	22/10/2012	3/12/2012					
pH	8.0	7.4	7.1	7.1	7.1	7.0	7.0	8.0	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6)(18)]
Electrical Conductivity (µS/cm)	1200	1400	1400	1400	1300	1300	1300	1500	1300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	180	150	30	42	20	20	14	51	96	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	290	340	380	380	350	330	330	350	340	1/5	NC	NC	NC	NC
Total Alkalinity	290	340	380	380	350	330	330	350	340	1/5				
Anions														
Chloride (Cl)	170	170	160	180	140	160	160	160	160	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.056	0.02	0.007	0.007	<0.005	<0.005	<0.005	0.01	0.038	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	15	16	19	18	14	19	19	20	16	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	61	51	57	65	47	57	57	59	58	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	120	120	110	120	120	120	120	120	120	0.5	NC	NC	NC	NC
Potassium	8.3	8	7.9	7.8	7.2	8	8	7.7	7.9	0.5	NC	NC	NC	NC
Sodium	51	52	57	55	51	59	58	55	56	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	63	63	65	63	66	71	70	76	65	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.004	<0.01	0.006	0.003	0.0030	0.0010	0.0020	0.024	0.004	0.0005	0.2 [8]	0.0008 [15)(L)]/0.055 [14)(L)]	0.0005 [16)(L)]	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L) (17)]	0.1 [4]
Barium	0.11	0.110	0.092	0.093	0.1000	0.0940	0.0940	0.097	0.088	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	0.002	0.003	0.002	0.010	0.012	0.013	0.013	0.008	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	0.017	<0.01	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.036	0.062	0.012	0.012	0.028	0.018	0.019	0.025	0.039	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.002	0.004	0.004	0.0030	0.0020	0.0030	0.003	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.015	0.013	0.013	0.013	0.0170	0.0170	0.0170	0.0170	0.012	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.011	0.018	0.022	0.008	0.014	0.098	0.023	0.015	0.016	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15)(L)]/0.055 [14)(L)]	0.0005 [16)(L)]	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L) (17)]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A02-S	A02-S	A02-S	A02-S	A02-S	A02-S	A02-S	A02-S	A02-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013	Jul 2013	Aug 2013	Sept 2013			Fresh	Marine	Irrigation Waters
	16/01/2013	20/02/2013	3/20/2013	4/17/2013	5/14/2013	6/19/2013	24/07/2013	8/22/2013	9/18/2013					
pH	7.0	7.0	7.2	7.9	7.1	7.1	7.1	7.2	7.2	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1300	1500	1300	1900	1300	1300	1100	1200	1300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	110	250	18	160	160	100	33	640	190	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	330	340	360	360	350	350	340	340	340	1/5	NC	NC	NC	NC
Total Alkalinity	330	340	360	360	350	350	340	340	340	1/5				
Anions														
Chloride (Cl)	160	160	160	160	170	160	140	130	180	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	0.006	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	17	17	17	15	15	17	15	14	13	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	65	61	41	65	69	68	52	60	68	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	110	110	120	110	110	120	120	100	110	0.5	NC	NC	NC	NC
Potassium	6.9	9.2	8.6	8.6	8.3	8.3	6.6	5.6	7.5	0.5	NC	NC	NC	NC
Sodium	46	56	55	53	50	50	45	33	48	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	64	68	71	70	66	67	61	56	65	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	0.008	0.003	0.008	0.001	0.002	0.0008	<0.0005	0.002	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.089	0.090	0.091	0.120	0.100	0.11	0.098	0.086	0.095	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0005	0.0005	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.005	0.007	0.005	0.007	0.006	0.007	0.002	0.003	0.005	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	<0.01	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.040	0.120	0.022	0.049	0.023	0.015	0.053	0.024	0.02	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.004	0.002	0.004	0.003	0.003	0.003	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.012	0.009	0.009	0.012	0.010	0.01	0.009	0.008	0.008	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.014	0.012	0.023	0.017	0.016	0.010	0.024	0.012	0.014	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	0.1	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A02-S	A02-S	A02-S	A02-S	A02-S	A02-S	A02-S	A02-S	ANZECC (2000) - Trigger Values		
									Slightly to Moderately Disturbed Systems		
Date Sampled	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Fresh	Marine	Irrigation Waters
	16/101/2013	11/13/2013	12/12/2013	1/16/2014	2/20/2014	3/19/2014	4/15/2014	5/21/2014			
pH	8.1	7.6	8.0	7.4	7.3	6.9	7.2	7.1	6.5-8.0 (1)	7.0-8.5 (2)	>6 (6)(18)
Electrical Conductivity (µS/cm)	1300	1300	1200	1200	1300	1200	1200	1000	NC	NC	1000 - 7500 (3)
Turbidity (NTU)	19	34	170	17	120	620	260	48	1-50	0.5-10	NC
Alkalinity											
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	NC	NC	NC
Bicarbonate (HCO_3^-)	340	360	260	340	370	360	390	260	NC	NC	NC
Total Alkalinity	340	360	260	340	370	360	390	260			
Anions											
Chloride (Cl)	170	160	140	150	120	120	110	110	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	0.12	<0.005	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	14	12	14	15	14	24	12	1.4	0.04 (1)	0.015 (2)	NC
Sulphate (SO_4^{2-})	66	73	73	64	59	56	55	95	NC	NC	NC
Cations - Dissolved											
Calcium	120	120	100	120	100	120	120	70	NC	NC	NC
Potassium	7.8	7.9	8.2	8.1	8.2	9.5	9.1	4.3	NC	NC	NC
Sodium	56	55	55	54	52	58	56	65	NC	NC	Species Dependent
Magnesium	69	71	61	68	60	67	66	42	NC	NC	NC
Metals - Dissolved											
Aluminium	0.006	0.01	0.002	<0.0005	0.2	0.010	0.003	<0.0005	0.0008(15)(L)/0.055(14)(L)	0.0005(16)(L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.013 (9)	0.0023 (L) (17)	0.1 (4)
Barium	0.093	0.11	0.1	0.098	0.11	0.13	0.11	0.13	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00013 (16)	NC	0.1 (4)
Cadmium	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0007	0.01 (4)
Chromium	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	<0.001	0.001 (7)	0.0044 (7)	0.1 (4)
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	NC	0.001	0.05 (4)
Copper	0.003	0.004	0.006	0.003	0.005	0.007	0.006	<0.001	0.0014	0.0013	0.2 (4)
Iron (Fe^{2+})	<0.01	<0.01	<0.01	<0.01	0.057	<0.01	<0.01	<0.01	NC	NC	0.2 (4)
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0034	0.0044	2 (4)
Manganese	0.023	0.025	0.26	0.052	0.25	0.65	0.46	0.11	1.9	0.08 (L)	0.2 (4)
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006 (10)	0.0001 (10)	0.002 (4)
Nickel	0.002	0.002	0.005	0.002	0.006	0.010	0.008	0.002	0.011	0.007	0.2 (4)
Selenium	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.003	0.005	0.003 (L)	0.02 (4)
Vanadium	<0.001	<0.001	0.001	0.001	0.002	0.001	0.001	<0.001	0.006 (L)	0.1	0.1 (4)
Zinc	0.033	0.023	0.023	0.009	0.016	0.041	0.005	0.006	0.008	0.015	2 (4)
Metals - Total											
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	0.0008(15)(L)/0.055(14)(L)	0.0005(16)(L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	0.013 (9)	0.0023 (L) (17)	0.1 (4)
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	0.00013 (16)	NC	0.1 (4)
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	0.0002	0.0007	0.01 (4)
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	0.001 (7)	0.0044 (7)	0.1 (4)
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NC	0.001	0.05 (4)
Copper	NT	NT	NT	NT	NT	NT	NT	NT	0.0014	0.0013	0.2 (4)
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NC	NC	0.2 (4)
Lead	NT	NT	NT	NT	NT	NT	NT	NT	0.0034	0.0044	2 (4)
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	1.9	0.08 (L)	0.2 (4)
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	0.00006 (10)	0.0001 (10)	0.002 (4)
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	0.011	0.007	0.2 (4)
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.003 (L)	0.02 (4)
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	0.006 (L)	0.1	0.1 (4)
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	0.008	0.015	2 (4)
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	1	0.2	0.1	<0.05	0.05 (1)	0.03 (2)	0.05 (5)

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A06-S	A06-S	A06-S	A06-S	A06-S	A06-S	A06-S	A06-S	A06-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	May 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012	Oct 2012	Dec 2012	Jan 2013	Feb 2013			Fresh	Marine	Irrigation Waters
	30/5/2012	27/06/2012	24/07/2012	22/08/2012	18/09/2012	21/10/2012	4/12/2012	15/01/2013	19/02/2013					
pH	8.5	7.3	6.8	7.0	6.9	8.0	6.9	7.0	7.0	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1500	1500	1500	1500	1600	1500	1400	1400	1200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	17	41	2.1	4.7	1.6	3.4	42	310	71	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	36	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	380	390	460	470	460	460	420	350	370	1/5	NC	NC	NC	NC
Total Alkalinity	410	390	460	470	460	460	420	350	370	1/5				
Anions														
Chloride (Cl)	260	230	250	220	240	220	230	210	190	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.005	0.01	0.007	0.024	<0.005	0.01	0.022	0.009	0.014	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.02	<0.005	0.02	<0.005	<0.005	0.03	0.08	25	0.08	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	14	12	13	9	11	12	12	16	15	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	79	73	79	83	92	88	92	73	73	0.5	NC	NC	NC	NC
Potassium	3.4	3.7	3.7	3.8	4.1	3.7	3.8	3.8	3.4	0.5	NC	NC	NC	NC
Sodium	120	120	130	130	140	130	150	110	110	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	71	64	73	73	81	80	85	60	63	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	<0.01	0.005	0.0010	0.0210	0.0008	0.002	0.016	0.004	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.019	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.08	0.070	0.073	0.0800	0.0760	0.068	0.065	0.060	0.057	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006	0.0006	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.005	0.003	0.003	0.002	<0.001	<0.001	0.003	0.002	0.005	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.016	0.026	0.020	0.09	0.10	0.042	0.026	0.018	<0.01	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.05	0.048	0.032	0.084	0.055	0.032	0.025	0.018	0.011	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.004	0.003	0.007	0.0040	0.0030	0.003	0.002	0.003	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.003	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.027	0.027	0.030	0.013	0.017	0.016	0.015	0.014	0.020	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	0.1	0.09	0.09	0.09	0.08	0.1	0.3	0.1	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A06-S	A06-S	A06-S	A06-S	A06-S	A06-S	A06-S	A06-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Mar 2013	Apr 2013	May 2013	Jun 2013	Jul 2013	Aug 2013	Sept 2013	Oct 2013			Fresh	Marine	Irrigation Waters
	3/20/2013	4/17/2013	5/13/2013	6/20/2013	7/23/2013	8/20/2013	9/17/2013	10/15/2013					
pH	7.2	8.4	7.8	7	7.4	7.2	8.3	6.9	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1000	1000	970	1100	980	940	1100	1100	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	2.5	6.2	570	25	56	8.4	14	17	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	360	330	330	350	350	350	370	370	1/5	NC	NC	NC	NC
Total Alkalinity	360	330	330	350	350	350	370	370	1/5				
Anions													
Chloride (Cl)	140	120	160	150	41	110	120	140	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	0.016	0.013	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.08	0.04	0.09	0.05	0.02	<0.005	0.03	0.01	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	10	12	14	15	27	12	15	16	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	58	51	50	57	48	50	49	56	0.5	NC	NC	NC	NC
Potassium	3.2	2.9	2.5	2.8	2.5	2.2	2.5	2.6	0.5	NC	NC	NC	NC
Sodium	100	91	100	99	100	85	91	100	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	49	44	45	47	42	43	42	49	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.003	0.006	<0.0005	0.003	0.003	0.003	0.001	0.015	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.047	0.045	0.044	0.053	0.052	0.041	0.044	0.043	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.008	0.009	0.002	0.011	0.006	0.004	0.005	0.003	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	<0.01	<0.01	<0.01	<0.010	<0.010	<0.01	0.016	0.016	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.006	<0.005	<0.005	0.006	0.005	0.008	0.007	0.007	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.003	0.001	0.002	0.002	0.001	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	0.002	0.003	0.002	0.002	0.002	0.003	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.009	0.019	0.003	0.023	0.019	0.01	0.019	0.028	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.09	0.09	0.4	0.07	0.10	0.09	0.09	0.1	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A06-S	A06-S (D40)	A06-S	A06-S	A06-S	A06-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
									Slightly to Moderately Disturbed Systems		
Date Sampled	Nov 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014			Fresh	Marine	Irrigation Waters
	11/19/2013	11/19/2013	12/12/2013	1/15/2014	18/02/2014	3/19/2014					
pH	6.9	6.9	8.6	7.2	7.1	7.0	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1000	1000	1000	970	970	920	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	19	19	35	24	54	640	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity											
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	30	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	360	370	300	320	310	310	1/5	NC	NC	NC	NC
Total Alkalinity	360	370	330	320	310	310	1/5				
Anions											
Chloride (Cl)	120	120	120	130	110	110	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.014	0.013	<0.005	<0.005	<0.005	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.04	<0.005	0.02	0.02	0.04	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	13	13	14	14	13	13	1	500	NC	NC	NC
Cations - Dissolved											
Calcium	54	54	54	55	50	52	0.5	NC	NC	NC	NC
Potassium	3.3	2.8	3.2	3.9	4.3	4.7	0.5	NC	NC	NC	NC
Sodium	110	100	110	95	100	110	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	48	49	46	44	40	39	0.5	NC	NC	NC	NC
Metals - Dissolved											
Aluminium	<0.0005	<0.0005	0.003	<0.0005	0.002	0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.052	0.059	0.044	0.043	0.044	0.042	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.005	0.004	0.004	0.001	0.002	0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.015	0.014	0.011	<0.01	0.015	0.022	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.011	0.011	0.008	0.009	0.012	0.011	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.004	0.005	0.002	0.001	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	0.002	0.002	0.002	0.002	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.064	0.059	0.024	0.006	0.015	0.004	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total											
Aluminium	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.09	0.09	0.1	0.10	0.1	0.6	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A06-D	A06-D	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
					Slightly to Moderately Disturbed Systems		
Date Sampled	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	4/14/2014	5/20/2014					
pH	7.5	6.9	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	780	800	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	65	17	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity							
Hydroxide (OH^-)	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	270	250	1/5	NC	NC	NC	NC
Total Alkalinity	270	250	1/5				
Anions							
Chloride (Cl)	85	81	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.069	0.07	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.02	0.02	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	12	13	1	500	NC	NC	NC
Cations - Dissolved							
Calcium	43	43	0.5	NC	NC	NC	NC
Potassium	4.8	4.8	0.5	NC	NC	NC	NC
Sodium	82	73	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	33	33	0.5	NC	NC	NC	NC
Metals - Dissolved							
Aluminium	<0.0005	<0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.019	0.021	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.09	0.049	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.68	0.83	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.008	0.011	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total							
Aluminium	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A09	A09	A09	A09	A09	A09	A09	A09	A09	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Oct 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013	Jul 2013			Fresh	Marine	Irrigation Waters
	23/10/2012	5/12/2012	16/01/2013	20/02/2013	3/20/2013	4/16/2013	5/16/2013	6/19/2013	7/22/2013					
pH	7.6	7.5	7.2	7.2	7.3	7.8	7.2	7.2	7.4	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1000	1500	2000	1500	680	780	1200	1800	2000	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	75	15	41	27	4.1	27	49	7.2	18	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	240	320	420	320	200	210	270	330	400	1/5	NC	NC	NC	NC
Total Alkalinity	240	320	420	320	200	210	270	330	400	1/5				
Anions														
Chloride (Cl)	150	240	330	220	68	97	200	340	390	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.06	0.029	0.033	0.028	<0.005	0.009	<0.005	<0.005	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.04	0.930	0.960	0.400	<0.005	<0.005	0.3	1.2	1.8	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	73	110	150	120	37	45	110	190	110	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	46	81	93	72	27	35	51	87	92	0.5	NC	NC	NC	NC
Potassium	6.8	7.7	8.5	8.7	4.9	5.7	6.4	8.4	7.5	0.5	NC	NC	NC	NC
Sodium	94	130	180	170	87	85	120	180	220	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	53	68	84	67	23	30	47	79	85	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.006	0.004	0.007	0.005	0.004	0.011	<0.0005	0.004	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.049	0.065	0.086	0.064	0.022	0.033	0.054	0.095	0.100	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0006	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	0.004	0.006	0.007	0.007	0.012	0.006	0.009	0.004	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.220	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.060	0.083	0.036	0.024	0.010	0.030	0.024	0.054	0.054	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.002	0.002	0.003	0.002	0.003	0.002	0.003	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.003	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.014	0.025	0.010	0.022	0.009	0.032	0.012	0.022	0.013	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A09	A09	A09	A09	A09	A09 (D41)	A09	A09	A09	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014			Fresh	Marine	Irrigation Waters
	8/20/2013	9/19/2013	10/15/2013	11/13/2013	12/10/2013	12/10/2013	1/14/2014	18/02/2014	3/18/2014					
pH	7.2	7.5	6.9	6.8	8.3	8.3	7.1	7.2	6.6	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2200	2200	2300	2000	2400	2400	2400	2100	2300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	35	15	9.4	9.9	11	8.9	5	5.4	24	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	7	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	430	420	410	390	390	380	430	370	410	1/5	NC	NC	NC	NC
Total Alkalinity	430	420	410	390	390	380	430	370	410	1/5				
Anions														
Chloride (Cl)	350	360	380	370	420	420	400	330	400	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	0.005	0.007	<0.005	0.017	<0.005	0.013	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.3	0.3	0.03	0.007	0.1	0.01	0.02	0.02	0.30	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	210	210	190	190	230	230	190	170	210	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	99	94	100	94	100	100	100	81	110	0.5	NC	NC	NC	NC
Potassium	8	9.7	10	9.8	12	12	11	10	11	0.5	NC	NC	NC	NC
Sodium	220	250	280	290	330	340	320	290	370	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	93	90	95	87	98	98	91	79	97	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	0.012	0.005	0.008	0.001	0.003	0.006	0.002	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.11	0.1	0.1	0.1	0.11	0.11	0.11	0.1	0.12	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.010	0.004	0.017	0.009	0.008	0.009	0.001	0.003	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.023	<0.01	<0.01	0.017	<0.01	<0.01	<0.01	<0.01	0.022	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.076	0.074	0.091	0.1	0.11	0.11	0.11	0.11	0.14	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.003	0.003	0.004	0.003	0.003	0.002	0.003	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.015	0.014	0.043	0.067	0.016	0.028	0.007	0.012	0.013	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A09	A09	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
					Slightly to Moderately Disturbed Systems		
Date Sampled	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	4/14/2014	5/20/2014					
pH	7.7	7.0	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2500	2800	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	10	15	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity							
Hydroxide (OH^-)	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	440	430	1/5	NC	NC	NC	NC
Total Alkalinity	440	430	1/5				
Anions							
Chloride (Cl)	400	420	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	1.2	1.8	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	260	320	1	500	NC	NC	NC
Cations - Dissolved							
Calcium	110	130	0.5	NC	NC	NC	NC
Potassium	11	11	0.5	NC	NC	NC	NC
Sodium	350	320	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	100	120	0.5	NC	NC	NC	NC
Metals - Dissolved							
Aluminium	<0.0005	<0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.13	0.15	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.022	<0.01	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.11	0.14	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.004	0.007	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.006	0.014	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total							
Aluminium	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A12	A12	A12	A12	A12	A12	A12	A12	A12	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Oct 2012	Dec 2012	Jan 2013	Feb 2013	Apr 2013	May 2013	Jun 2013	Jul 2013	Aug 2013			Fresh	Marine	Irrigation Waters
	23/10/2012	3/12/2012	16/01/2013	20/02/2013	4/17/2013	5/14/2013	6/19/2013	24/07/2013	8/21/2013					
pH	6.8	6.5	6.7	6.9	8.0	6.7	6.8	6.6	6.6	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	250	280	290	290	250	250	270	280	300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	270	180	57	1200	40	1200	210	34	580	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	65	66	81	86	78	76	78	82	88	1/5	NC	NC	NC	NC
Total Alkalinity	65	66	81	86	78	76	78	82	88	1/5				
Anions														
Chloride (Cl)	25	28	27	26	22	28	26	23	24	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.077	0.014	0.03	0.018	0.02	0.035	0.021	0.009	0.058	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	<0.005	0.02	0.02	0.02	<0.005	0.05	0.01	<0.005	0.4	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	14	17	20	18	13	17	18	15	18	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	15	19	17	18	14	13	16	16	16	0.5	NC	NC	NC	NC
Potassium	2.6	2.8	3.2	3.4	2.6	2.7	2.9	2.9	2.6	0.5	NC	NC	NC	NC
Sodium	15	19	20	22	17	18	18	19	17	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	11	14	12	13	9.5	9.3	10	12	11	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	0.0009	0.0090	0.0030	0.007	0.002	0.004	<0.0005	0.012	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.047	0.046	0.052	0.052	0.045	0.043	0.045	0.052	0.05	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0006	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.002	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	0.001	0.001	<0.001	0.003	0.001	0.003	<0.001	0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.360	0.260	0.250	0.210	0.059	0.078	0.19	0.070	0.086	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.120	0.087	0.094	0.110	0.053	0.070	0.075	0.060	0.083	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.005	0.003	0.004	0.004	0.004	0.003	0.004	0.005	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.012	0.011	0.022	0.009	0.029	0.005	0.020	0.017	0.012	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.1	0.07	<0.05	0.2	<0.05	0.4	0.06	<0.05	0.1	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A12	A12	A12	A12	A12	A12 (D44)	A12	A12	A12	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Jan 2014	Feb 2014	Mar 2014	Apr 2014			Fresh	Marine	Irrigation Waters
	9/18/2013	16/101/2013	11/13/2013	12/11/2013	1/15/2014	1/15/2014	2/19/2014	3/19/2014	4/15/2014					
pH	6.9	7.6	5.5	8.0	7.0	6.9	5.4	5.2	6.9	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	310	320	330	320	280	290	330	310	310	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	290	60	32	800	140	140	330	300	88	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	93	92	92	94	99	100	96	86	100	1/5	NC	NC	NC	NC
Total Alkalinity	93	92	92	94	99	100	96	86	100	1/5				
Anions														
Chloride (Cl)	26	26	26	29	30	29	26	25	24	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	0.016	0.014	0.005	0.008	0.017	0.008	0.041	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.01	0.005	0.02	0.06	0.01	0.02	0.72	0.04	0.01	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	21	20	21	22	19	18	18	17	17	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	18	19	21	18	20	20	20	21	21	0.5	NC	NC	NC	NC
Potassium	3.3	2.9	2.9	3.5	3.5	3.4	3.2	3.7	3.8	0.5	NC	NC	NC	NC
Sodium	20	21	22	25	22	22	19	24	25	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	13	14	14	13	14	15	13	14	14	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.010	0.006	0.012	0.004	<0.0005	<0.0005	0.006	0.009	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.055	0.055	0.062	0.059	0.057	0.054	0.061	0.065	0.056	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	0.002	0.017	0.003	<0.001	<0.001	0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.099	0.38	0.21	0.23	0.061	0.066	0.31	0.55	0.099	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.08	0.096	0.086	0.11	0.083	0.086	0.12	0.13	0.082	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.005	0.005	0.015	0.005	0.004	0.004	0.014	0.011	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.021	0.031	0.19	0.024	0.010	0.010	0.13	0.038	0.004	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.07	<0.05	<0.05	0.1	0.06	0.05	0.1	0.1	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A12	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
				Slightly to Moderately Disturbed Systems		
Date Sampled	May 2014			Fresh	Marine	Irrigation Waters
	5/21/2014					
pH	5.4	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	320	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	74	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity						
Hydroxide (OH^-)	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	86	1/5	NC	NC	NC	NC
Total Alkalinity	86	1/5				
Anions						
Chloride (Cl)	26	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.5	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.03	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	19	1	500	NC	NC	NC
Cations - Dissolved						
Calcium	19	0.5	NC	NC	NC	NC
Potassium	3.2	0.5	NC	NC	NC	NC
Sodium	19	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	12	0.5	NC	NC	NC	NC
Metals - Dissolved						
Aluminium	0.001	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.062	0.001	2	NC	NC	NC
Beryllium	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.007	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.18	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.098	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.007	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.053	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total						
Aluminium	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	0.001	2	NC	NC	NC
Beryllium	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A13	A13	A13 (D6)	A13	A13	A13	A13	A13	A13 (D15)	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	May 2012	Jun 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012	Oct 2012	Dec 2012	Dec 2012			Fresh	Marine	Irrigation Waters
	30/5/2012	27/06/2012	27/06/2012	24/07/2012	22/08/2012	18/09/2012	21/10/2012	3/12/2012	4/12/2012					
pH	8.3	7.3	7.4	6.9	7.1	7.0	8.0	7	7.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1300	1400	1400	1400	1400	1400	1300	1400	1500	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	55	9.9	14	4.9	4.2	3.8	4.2	11	9.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	15	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	260	290	290	320	310	300	310	300	300	1/5	NC	NC	NC	NC
Total Alkalinity	280	290	290	320	310	300	310	300	300	1/5				
Anions														
Chloride (Cl)	200	210	210	220	190	210	190	230	230	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.006	0.006	<0.005	<0.005	0.009	0.017	0.01	0.023	0.087	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.008	0.1	0.3	0.03	0.01	0.02	0.09	0.64	0.69	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	90	81	81	94	69	83	79	88	88	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	69	72	74	76	80	86	83	110	100	0.5	NC	NC	NC	NC
Potassium	6.1	5.5	5.7	6.2	5.7	6.2	5.7	6	5.7	0.5	NC	NC	NC	NC
Sodium	100	110	110	120	110	130	110	130	130	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	55	56	59	60	62	66	66	78	80	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.039	<0.01	<0.01	0.005	0.0040	0.0020	0.002	0.001	0.001	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.095	0.099	0.099	0.099	0.1100	0.1000	0.094	0.100	0.095	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	0.002	<0.001	0.001	0.002	0.003	0.002	0.002	0.002	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.25	0.120	0.120	0.130	0.11	0.11	0.120	0.046	0.050	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.25	0.250	0.250	0.230	0.240	0.230	0.250	0.290	0.310	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.005	0.003	0.0030	0.007	0.0020	0.0030	0.016	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.022	0.010	0.005	0.027	0.015	0.120	0.019	0.014	0.011	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A13	A13	A13	A13	A13	A13 (D26)	A13	A13	A13	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	May 2013	Jun 2013	Jul 2013	Aug 2013			Fresh	Marine	Irrigation Waters
	14/01/2013	19/02/2013	3/19/2013	4/16/2013	5/12/2013	5/12/2013	6/18/2013	7/22/2013	8/19/2013					
pH	7	7.1	7.5	7.7	7.6	7.7	7.3	7.3	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1600	1500	1300	1200	1200	1200	1200	1200	1200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	4	89	20	0.7	1.3	1.1	2.3	14	0.5	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	300	310	310	280	280	280	290	280	280	1/5	NC	NC	NC	NC
Total Alkalinity	300	310	310	280	280	280	290	280	280	1/5				
Anions														
Chloride (Cl)	280	240	200	180	210	220	210	240	180	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.006	0.018	0.005	<0.005	0.01	0.007	<0.005	0.009	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	37	0.3	0.3	0.3	0.4	0.4	0.4	0.2	0.2	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	140	120	89	69	81	83	80	65	68	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	91	92	68	70	64	64	67	64	67	0.5	NC	NC	NC	NC
Potassium	5.5	5.7	5.2	5.5	5.1	5	5.7	4.6	4.6	0.5	NC	NC	NC	NC
Sodium	130	120	110	100	100	100	110	100	89	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	71	73	53	55	52	50	53	50	52	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.013	0.006	0.002	0.005	0.002	0.002	0.001	0.002	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.110	0.110	0.092	0.093	0.087	0.086	0.093	0.091	0.084	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0006	0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.004	0.003	0.002	0.002	0.002	0.003	0.002	0.001	0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.021	0.016	0.015	0.019	<0.01	0.010	0.018	0.093	0.034	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.280	0.240	0.220	0.220	0.200	0.190	0.19	0.18	0.18	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.004	0.003	0.002	0.003	0.002	0.002	0.004	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	0.001	0.001	0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	0.001	0.001	<0.001	0.001	0.001	0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.020	0.022	0.016	0.009	0.012	0.011	0.013	0.016	0.007	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A13	A13	A13	A13	A13	A13	A13	A13	A13	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	9/19/2013	10/15/2013	11/11/2013	12/11/2013	1/13/2014	18/02/2014	3/18/2014	4/15/2014	5/20/2014					
pH	7.3	7	7.7	8.2	7.1	7.2	6.3	7.2	7.2	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1300	1300	1300	1400	1400	1400	1400	1200	1400	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	1.1	0.7	1.9	1.6	4.1	5.4	0.6	1.4	3.7	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	280	280	280	260	310	290	290	300	280	1/5	NC	NC	NC	NC
Total Alkalinity	280	280	280	260	310	290	290	300	280	1/5				
Anions														
Chloride (Cl)	220	230	220	220	230	210	210	200	190	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.014	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.3	0.4	0.4	0.4	0.4	0.3	0.30	0.4	0.3	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	84	94	98	96	90	95	91	85	81	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	76	80	80	79	82	83	89	79	76	0.5	NC	NC	NC	NC
Potassium	5.6	5.5	5.4	6.2	6.5	6.5	6.4	6.4	5.6	0.5	NC	NC	NC	NC
Sodium	99	110	120	130	120	130	130	130	110	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	58	62	62	62	67	68	67	64	61	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.002	0.003	0.008	0.004	0.006	0.003	0.002	0.0008	<0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.094	0.089	0.097	0.099	0.1	0.1	0.098	0.095	0.097	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	0.001	0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	0.002	0.002	0.004	<0.001	0.002	0.002	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.053	0.034	0.021	0.02	0.013	0.014	0.067	0.013	<0.01	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.2	0.24	0.22	0.23	0.24	0.22	0.34	0.23	0.21	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	<0.001	0.001	0.001	0.001	0.001	<0.001	0.001	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.025	0.021	0.012	0.024	0.006	0.016	0.020	0.004	0.006	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A14	A14	A14	A14	A14	A14	A14	A14	A14	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Aug 2012	Sept 2012	Oct 2012	Dec 2012	Jan 2013	Feb 2013	Apr 2013	May 2013	Jun 2013			Fresh	Marine	Irrigation Waters
	21/08/2012	19/09/2012	22/10/2012	4/12/2012	16/01/2013	20/02/2013	4/16/2013	5/14/2013	6/19/2013					
pH	7.2	7.1	8.1	7.2	7.3	7.2	7.9	7.3	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1800	1800	1800	1800	1800	1800	1700	1700	1700	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	180	26	140	49	100	160	620	82	43	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	440	440	470	450	460	460	450	460	460	1/5	NC	NC	NC	NC
Total Alkalinity	440	440	470	450	460	460	450	460	460	1/5				
Anions														
Chloride (Cl)	190	180	190	190	190	180	180	200	180	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.079	0.055	0.016	<0.005	0.021	0.006	0.014	<0.005	0.016	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.64	0.84	1	1.3	1.2	1.2	1.1	1.3	1.3	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	210	210	230	230	250	230	220	270	250	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	120	130	130	150	110	120	110	110	120	0.5	NC	NC	NC	NC
Potassium	5.4	5	5.5	5.1	3.8	5.6	5.3	4.9	5.1	0.5	NC	NC	NC	NC
Sodium	150	150	160	180	120	170	140	150	140	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	87	95	99	110	79	91	84	83	83	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.0050	0.0030	0.003	0.002	0.003	0.004	0.005	0.002	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.1500	0.1400	0.110	0.099	0.100	0.100	0.100	0.098	0.11	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	0.0006	0.0005	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	0.003	0.002	0.005	0.004	0.004	0.002	0.004	0.004	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.44	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.660	0.220	0.063	0.020	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.0040	0.0030	0.002	<0.001	0.001	0.002	<0.001	0.001	0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.0030	0.0030	0.003	0.002	0.002	0.002	0.003	0.002	0.003	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.014	0.032	0.010	0.017	0.014	0.016	0.005	0.011	0.015	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.1	<0.05	0.09	0.07	0.06	0.1	0.2	0.07	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A14	A14	A14	A14	A14 (D37)	A14	A14	A14	A14	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Jul 2013	Aug 2013	Sept 2013	Oct 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014			Fresh	Marine	Irrigation Waters
	7/23/2013	8/20/2013	9/19/2013	10/15/2013	10/15/2013	11/13/2013	12/12/2013	1/14/2014	18/02/2014					
pH	7.5	7.4	7.4	7.2	7.2	7.8	8.1	7.3	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1600	1600	1700	1800	1800	1800	1600	1800	1700	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	40	58	110	36	30	27	34	1600	29	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	460	450	450	450	440	460	360	480	460	1/5	NC	NC	NC	NC
Total Alkalinity	460	450	450	450	440	460	360	480	460	1/5				
Anions														
Chloride (Cl)	230	160	200	190	190	180	180	170	170	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	1.2	1.2	1.3	1.5	1.4	1.4	1.5	1.3	1.6	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	55	210	230	230	230	240	240	210	220	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	120	110	110	120	120	120	130	120	120	0.5	NC	NC	NC	NC
Potassium	4.4	3.9	4.9	5	5	4.9	5.5	5.9	5.9	0.5	NC	NC	NC	NC
Sodium	150	120	130	160	160	170	180	170	170	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	78	77	79	92	92	91	94	90	88	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	0.004	0.003	0.004	0.004	0.012	0.002	0.008	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.100	0.094	0.1	0.098	0.095	0.11	0.1	0.1	0.1	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.003	0.002	0.003	0.004	0.003	0.004	0.006	0.002	0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	<0.010	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	<0.01	<0.01	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	<0.001	0.001	0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.015	0.012	0.016	0.017	0.01	0.033	0.027	0.004	0.005	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	0.05	0.09	0.05	0.06	<0.05	0.06	1.6	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A14	A14	A14	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
						Slightly to Moderately Disturbed Systems		
Date Sampled	Mar 2014	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	3/18/2014	4/14/2014	5/20/2014					
pH	7.2	7.8	6.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1600	1700	1800	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	24	120	29	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity								
Hydroxide (OH^-)	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	460	490	460	1/5	NC	NC	NC	NC
Total Alkalinity	460	490	460	1/5				
Anions								
Chloride (Cl)	170	160	160	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	0.009	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	1.6	1.7	1.7	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	230	210	210	1	500	NC	NC	NC
Cations - Dissolved								
Calcium	120	120	130	0.5	NC	NC	NC	NC
Potassium	5.5	5.4	5.2	0.5	NC	NC	NC	NC
Sodium	180	170	150	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	89	83	86	0.5	NC	NC	NC	NC
Metals - Dissolved								
Aluminium	<0.0005	<0.0005	<0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.099	0.1	0.11	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	<0.01	<0.01	<0.01	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	<0.005	<0.005	<0.005	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	<0.001	<0.001	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.002	0.002	0.002	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	0.002	0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.007	0.005	0.033	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total								
Aluminium	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	0.09	0.06	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A15	A15	A15	A15	A15	A15	A15	A15	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Oct 2012	Dec 2012	Jan 2013	Feb 2013	Apr 2013	May 2013	Jun 2013	Jul 2013			Fresh	Marine	Irrigation Waters
	23/10/2012	4/12/2012	16/01/2013	20/02/2013	4/17/2013	5/14/2013	6/19/2013	7/23/2013					
pH	7.0	6.6	6.8	6.7	8.0	6.7	6.7	7.0	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	290	280	310	350	260	300	340	320	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	400	25	210	86	55	90	40	120	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	77	78	97	80	78	97	110	110	1/5	NC	NC	NC	NC
Total Alkalinity	77	78	97	80	78	97	110	110	1/5				
Anions													
Chloride (Cl)	33	34	35	32	30	41	36	25	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.058	0.039	0.038	0.024	0.03	0.02	0.031	0.012	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	<0.005	0.01	0.1	0.03	0.03	0.008	0.03	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	5	5	6	5	5	4	7	20	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	12	13	12	12	10	11	15	13	0.5	NC	NC	NC	NC
Potassium	2.9	2.9	3.1	2.9	2.5	3	3.1	2.8	0.5	NC	NC	NC	NC
Sodium	24	29	24	27	21	23	26	26	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	12	14	12	12	10	13	16	15	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.012	0.0008	0.0100	0.0060	0.009	0.001	0.002	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.025	0.023	0.027	0.022	0.023	0.027	0.032	0.030	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0006	0.0002	<0.0001	<0.0001	0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.003	0.002	0.003	0.001	0.002	0.003	0.004	0.003	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	<0.001	0.003	<0.001	<0.001	<0.001	0.007	0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.510	0.026	0.038	0.480	0.590	0.250	0.096	0.099	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.160	0.110	0.120	0.087	0.110	0.160	0.15	0.12	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.002	0.003	0.003	0.004	0.003	0.003	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.012	0.008	0.011	0.012	0.017	0.017	0.019	0.013	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.3	<0.05	0.09	<0.05	<0.05	0.05	<0.05	0.06	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A15	A15	A15	A15	A15	A15	A15	A15 (D46)	A15	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Feb 2014	Mar 2014			Fresh	Marine	Irrigation Waters
	8/22/2013	9/18/2013	16/101/2013	11/14/2013	12/11/2013	1/15/2014	2/19/2014	2/19/2014	3/19/2014					
pH	7.0	6.9	7.6	6.3	7.9	6.8	6.3	6.5	5.8	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	320	310	300	300	290	280	300	300	280	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	280	340	200	18	11	6.6	4.8	4.9	15	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	100	100	87	84	78	84	85	86	77	1/5	NC	NC	NC	NC
Total Alkalinity	100	100	87	84	78	84	85	86	77	1/5				
Anions														
Chloride (Cl)	38	42	33	34	36	39	34	35	33	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.017	0.007	<0.005	0.01	0.017	0.017	0.014	0.023	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.03	0.02	0.02	<0.005	0.03	0.01	0.02	0.05	0.02	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	5	6	6	6	6	5	5	5	5	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	13	14	12	13	11	14	12	10	14	0.5	NC	NC	NC	NC
Potassium	2.7	3.3	3.1	2.8	2.9	3.1	2.8	2.6	3.2	0.5	NC	NC	NC	NC
Sodium	22	25	27	28	28	27	26	25	30	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	13	15	12	12	11	12	11	11	12	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	0.002	<0.005	0.009	0.001	<0.0005	0.007	0.006	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.028	0.031	0.024	0.027	0.025	0.026	0.024	0.022	0.026	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.003	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	0.004	0.003	0.008	0.003	<0.001	0.001	0.002	0.002	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.078	0.027	0.022	0.024	0.01	0.014	0.017	0.019	0.022	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.12	0.14	0.11	0.096	0.083	0.088	0.093	0.094	0.091	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.003	0.003	0.004	0.002	0.002	0.002	0.002	0.005	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.013	0.016	0.023	0.06	0.032	0.005	0.015	0.021	0.023	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.3	0.5	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A15	A15	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
					Slightly to Moderately Disturbed Systems		
Date Sampled	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	4/15/2014	5/21/2014					
pH	6.7	6.0	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	280	290	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	41	7.9	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity							
Hydroxide (OH^-)	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	82	77	1/5	NC	NC	NC	NC
Total Alkalinity	82	77	1/5				
Anions							
Chloride (Cl)	32	35	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.081	0.014	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.02	0.02	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	9	5	1	500	NC	NC	NC
Cations - Dissolved							
Calcium	13	13	0.5	NC	NC	NC	NC
Potassium	3.1	2.8	0.5	NC	NC	NC	NC
Sodium	28	25	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	12	11	0.5	NC	NC	NC	NC
Metals - Dissolved							
Aluminium	0.001	<0.0005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.023	0.027	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.014	0.016	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.083	0.089	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.004	0.022	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total							
Aluminium	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A18	A18	A18	A18	A18	A18	A18	A18	A18	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Oct 2012	Dec 2012	Jan 2013	Feb 2013	Apr 2013	May 2013	Jun 2013	Jul 2013	Aug 2013			Fresh	Marine	Irrigation Waters
	23/10/2012	3/12/2012	16/01/2013	20/02/2013	4/17/2013	5/14/2013	6/19/2013	24/07/2013	8/22/2013					
pH	6.8	6.6	6.7	6.7	8.2	6.6	6.6	6.6	6.8	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	330	380	370	360	370	350	360	350	360	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	3400	270	71	38	230	39	57	140	60	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	130	140	130	120	140	130	130	120	110	1/5	NC	NC	NC	NC
Total Alkalinity	130	140	130	120	140	130	130	120	110	1/5				
Anions														
Chloride (Cl)	22	22	24	26	22	28	23	20	24	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.2	0.053	0.064	0.079	0.097	0.068	0.1	0.082	0.085	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.02	0.01	0.02	0.05	0.007	<0.005	0.02	0.007	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	10	11	22	25	10	16	24	20	28	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	21	28	21	21	21	20	21	20	18	0.5	NC	NC	NC	NC
Potassium	5.1	11	10	19	14	14	15	17	15	0.5	NC	NC	NC	NC
Sodium	21	26	17	24	20	20	22	21	18	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	15	19	14	14	14	13	14	13	12	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.008	0.0007	0.0050	0.0030	0.005	<0.0005	0.002	<0.0005	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.084	0.097	0.098	0.100	0.110	0.100	0.1	0.098	0.1	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.006	0.003	0.002	0.001	0.003	0.002	0.002	0.002	0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	<0.001	0.001	0.001	0.001	<0.001	0.002	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.670	2.100	1.100	0.400	1.700	0.990	<0.010	0.890	0.39	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.410	0.250	0.100	0.075	0.150	0.100	0.092	0.090	0.073	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.007	0.005	0.005	0.004	0.007	0.006	0.005	0.005	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.007	0.008	0.011	0.011	0.029	0.015	0.016	0.023	0.011	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.6	0.2	<0.05	<0.05	0.2	0.06	<0.05	0.20	0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A18	A18	A18	A18	A18	A18	A18	A18 (A48)	A18	A18	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)
Date Sampled	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Mar 2014	Apr 2014	May 2014		
	9/18/2013	16/101/2013	11/14/2013	12/11/2013	1/15/2014	2/20/2014	3/20/2014	3/20/2014	4/15/2014	5/21/2014		
pH	6.9	7.6	6.4	7.9	6.9	6.8	5.9	5.9	6.7	6.7	0.1 pH unit	6.5-8.5 [8]
Electrical Conductivity (µS/cm)	320	360	370	360	320	360	320	320	320	330	1	NC
Turbidity (NTU)	57	70	48	40	71	44	28	30	11	45	0.1	5 [8]
Alkalinity												
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC
Bicarbonate (HCO_3^-)	110	110	110	110	110	110	100	100	110	100	1/5	NC
Total Alkalinity	110	110	110	110	110	110	100	100	110	100	1/5	
Anions												
Chloride (Cl)	25	22	22	23	25	21	21	21	20	22	1	250 [8]
Ammonia (NH_3) as N	0.08	0.1	0.08	0.073	0.071	0.073	0.053	0.062	0.061	0.044	0.005	0.5 [8]/0.41 [12]
NO_x (NO_2^- + NO_3^-)	0.01	<0.005	<0.005	0.02	0.03	0.03	0.01	0.007	0.02	0.01	0.005	3 [13]
Sulphate (SO_4^{2-})	31	30	31	31	26	24	22	22	20	21	1	500
Cations - Dissolved												
Calcium	20	19	21	19	21	19	19	21	17	20	0.5	NC
Potassium	17	25	16	20	16	13	14	15	17	12	0.5	NC
Sodium	21	23	24	26	23	19	24	25	24	20	0.5	180 [8]
Magnesium	13	12	14	12	13	11	12	13	12	11	0.5	NC
Metals - Dissolved												
Aluminium	0.031	<0.005	0.018	0.002	<0.0005	0.006	0.005	0.005	0.001	0.007	0.0005	0.2 [8]
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01
Barium	0.11	0.1	0.1	0.097	0.09	0.082	0.079	0.082	0.075	0.084	0.001	2
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06
Cadmium	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]
Cobalt	0.002	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	NC
Copper	0.003	0.002	0.004	0.005	<0.001	<0.001	0.002	0.001	<0.001	<0.001	0.001	2
Iron (Fe^{2+})	0.74	0.17	0.72	0.56	0.45	0.6	0.62	0.58	0.15	0.68	0.01	0.3 [8]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01
Manganese	0.095	0.058	0.095	0.086	0.084	0.095	0.089	0.088	0.058	0.093	0.005	0.5
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001
Nickel	0.005	0.004	0.005	0.005	0.003	0.004	0.007	0.007	0.003	0.004	0.001	0.02
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC
Zinc	0.021	0.015	0.079	0.068	0.008	0.012	0.049	0.031	0.006	0.011	0.001	3 [8]
Metals - Total												
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]
Total Phosphorus	0.1	0.05	0.07	0.05	0.10	<0.05	0.05	<0.05	<0.05	<0.05	0.05	NC

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A19	A19	A19	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
						Slightly to Moderately Disturbed Systems		
Date Sampled	Dec 2012	Jan 2013	Feb 2013			Fresh	Marine	Irrigation Waters
	5/12/2012	15/01/2013	19/02/2013					
pH	7.7	7.4	7.7	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2100	2000	2000	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	240	6200	130	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity								
Hydroxide (OH^-)	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	340	330	340	1/5	NC	NC	NC	NC
Total Alkalinity	340	330	340	1/5				
Anions								
Chloride (Cl)	330	350	330	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.02	0.03	0.028	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.03	0.06	0.71	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	250	280	270	1	500	NC	NC	NC
Cations - Dissolved								
Calcium	120	110	120	0.5	NC	NC	NC	NC
Potassium	8.4	7.9	8	0.5	NC	NC	NC	NC
Sodium	200	200	190	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	89	86	97	0.5	NC	NC	NC	NC
Metals - Dissolved								
Aluminium	0.002	0.003	0.007	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.120	0.140	0.120	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0006	0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.023	0.140	0.051	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.690	0.630	0.560	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.005	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	0.005	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.005	0.007	0.010	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total								
Aluminium	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.2	1.7	0.1	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A20	A20	A20	A20 (D20)	A20	A20	A20	A20	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Dec 2012	Jan 2013	Feb 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013			Fresh	Marine	Irrigation Waters
	3/12/2012	14/01/2013	19/02/2013	19/02/2013	5/13/2013	17/04/2013	5/13/2013	6/20/2013					
pH	7.1	7.5	7.5	7.5	7.8	8.4	7.8	7.4	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1200	1300	1000	1100	760	740	760	770	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	220	3500	290	320	97	61	97	180	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	340	360	270	270	260	240	260	250	1/5	NC	NC	NC	NC
Total Alkalinity	340	360	270	270	260	240	260	250	1/5				
Anions													
Chloride (Cl)	160	210	140	140	110	76	110	78	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.023	0.02	0.024	0.024	0.027	0.013	0.027	0.065	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.01	0.03	0.02	0.02	0.006	0.01	0.006	0.03	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	27	50	76	76	41	24	41	40	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	71	68	55	53	40	34	40	37	0.5	NC	NC	NC	NC
Potassium	6.4	6.1	6	6.1	5.1	4.8	5.1	5.3	0.5	NC	NC	NC	NC
Sodium	130	130	110	110	89	80	89	84	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	58	54	44	43	31	26	31	28	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.047	0.007	0.004	0.006	<0.0005	0.007	<0.0005	0.0005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.047	0.089	0.044	0.043	0.032	0.020	0.032	0.025	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0006	0.0002	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.002	0.004	0.002	0.002	0.002	0.001	0.002	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	0.002	<0.001	<0.001	0.003	0.002	0.003	0.003	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.430	0.011	0.047	0.041	0.044	0.140	0.044	<0.010	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	1.000	2.100	0.900	0.900	0.700	0.440	0.700	0.39	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.004	0.008	0.005	0.005	0.006	0.005	0.006	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	0.002	0.001	0.001	<0.001	<0.001	<0.001	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.011	0.005	0.006	0.005	0.026	0.028	0.026	0.014	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.2	0.4	0.1	0.1	0.05	0.1	0.05	0.10	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	A20	A20	A20	A20	A20	A20	A20	A20	A20	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Aug 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	8/20/2013	16/101/2013	11/19/2013	12/12/2013	1/15/2014	18/02/2014	3/19/2014	4/14/2014	5/22/2014					
pH	7.6	8.1	7.3	8.5	7.9	7.4	5.6	7.8	5.8	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1100	1200	1200	1100	980	1000	1100	1100	1300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	33	40	32	50	140	45	280	20	27	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	20	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	300	300	320	270	340	330	340	350	320	1/5	NC	NC	NC	NC
Total Alkalinity	300	300	320	290	340	330	340	350	320	1/5				
Anions														
Chloride (Cl)	160	180	160	130	160	110	130	130	160	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.098	<0.005	0.022	<0.005	0.026	0.022	0.036	0.036	0.07	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.009	0.009	0.007	0.1	0.04	0.01	0.01	0.03	0.02	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	64	58	57	40	35	21	31	35	110	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	60	61	59	54	58	53	64	60	64	0.5	NC	NC	NC	NC
Potassium	5.2	6.3	7	6.6	6.5	6.7	6.3	6.4	6.2	0.5	NC	NC	NC	NC
Sodium	98	120	120	130	110	110	120	130	100	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	47	49	48	43	47	43	48	47	50	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.004	<0.005	0.003	0.004	<0.0005	0.001	0.019	<0.0005	0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.074	0.033	0.029	0.031	0.037	0.028	0.069	0.042	0.068	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.003	0.001	0.001	0.001	0.002	0.001	0.004	0.002	0.003	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	0.002	0.003	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.21	0.059	0.11	0.038	0.049	0.065	0.62	0.24	0.54	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	1.1	0.42	0.61	0.52	0.89	0.46	1.4	0.81	1.3	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.005	0.004	0.004	0.004	0.004	0.004	0.022	0.005	0.009	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.009	0.021	0.022	0.038	0.011	0.009	0.049	0.010	0.053	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.1	0.05	<0.05	0.05	0.09	<0.05	0.1	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	AGE08	AGE08	AGE08	AGE08	AGE08	AGE08	AGE08	AGE08	AGE08	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Jun 2013	Jul 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014			Fresh	Marine	Irrigation Waters
	6/20/2013	7/23/2013	8/20/2013	9/17/2013	10/15/2013	11/19/2013	12/12/2013	1/13/2014	18/02/2014					
pH	7.2	7.5	7.4	8.3	7.1	6.9	8.6	7.3	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1300	1200	1200	1300	1300	1200	1300	1300	1300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	13	21	6.1	3.1	33	2.8	4.3	3.2	5.4	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	17	<5	<5	37	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	590	590	580	570	570	590	520	600	590	1/5	NC	NC	NC	NC
Total Alkalinity	590	590	580	580	570	590	550	600	590	1/5				
Anions														
Chloride (Cl)	88	38	78	93	100	98	91	88	82	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.5	1.5	1.4	1.6	1.5	1.6	1.7	1.6	1.7	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.01	<0.005	0.2	0.02	0.01	0.007	0.03	0.02	0.02	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	<1	<1	1	<1	<1	<1	<1	1	<1	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	35	31	34	34	37	34	34	37	36	0.5	NC	NC	NC	NC
Potassium	14	13	11	14	15	16	16	16	15	0.5	NC	NC	NC	NC
Sodium	220	230	190	220	240	240	280	250	250	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	27	25	26	26	30	29	28	29	29	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.006	0.004	0.006	0.003	0.008	0.002	0.006	0.007	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.002	0.001	0.002	0.003	0.003	<0.001	0.002	0.002	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.15	0.150	0.15	0.15	0.15	0.19	0.16	0.16	0.16	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.003	<0.001	<0.001	<0.001	<0.001	0.004	0.003	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.24	0.170	0.19	0.18	0.18	0.21	0.19	0.17	0.16	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.11	0.092	0.1	0.1	0.11	0.15	0.12	0.11	0.098	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.013	0.002	0.001	0.002	0.002	0.003	0.002	<0.001	<0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.140	0.022	0.066	0.14	0.16	0.16	0.083	0.027	0.011	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	AGE08	AGE08	AGE08 (D50)	AGE08	AGE08 (D51)	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
								Slightly to Moderately Disturbed Systems		
Date Sampled	Mar 2014	Apr 2014	Apr 2014	May 2014	May 2014			Fresh	Marine	Irrigation Waters
	3/18/2014	4/14/2014	4/14/2014	5/19/2014	5/19/2014					
pH	5.8	7.7	7.7	5.9	5.9	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6)(18)]
Electrical Conductivity (µS/cm)	1200	1300	1300	1300	1300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	51	4.5	5.2	0.8	0.7	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity										
Hydroxide (OH^-)	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	580	610	600	570	570	1/5	NC	NC	NC	NC
Total Alkalinity	580	610	600	570	570	1/5				
Anions										
Chloride (Cl)	82	79	79	81	81	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.7	1.6	1.6	1.5	1.6	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.020	0.01	0.03	0.006	0.008	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	<1	<1	<1	<1	<1	1	500	NC	NC	NC
Cations - Dissolved										
Calcium	39	37	37	36	34	0.5	NC	NC	NC	NC
Potassium	14	15	16	13	13	0.5	NC	NC	NC	NC
Sodium	260	270	280	210	210	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	28	28	28	28	27	0.5	NC	NC	NC	NC
Metals - Dissolved										
Aluminium	0.021	0.002	0.0007	<0.005	<0.005	0.0005	0.2 [8]	0.0008 [15)(L)]/0.055 [14)(L)]	0.0005 [16)(L)]	NC
Arsenic	<0.001	0.001	0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [(L) (17)]	0.1 [4]
Barium	0.16	0.16	0.15	0.16	0.16	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	<0.001	<0.001	0.002	0.003	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.18	0.14	0.14	0.19	0.19	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.13	0.11	0.11	0.11	0.12	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.027	0.053	0.053	0.040	0.042	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	0.002	0.002	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.160	0.22	0.23	0.23	0.25	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total										
Aluminium	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15)(L)]/0.055 [14)(L)]	0.0005 [16)(L)]	NC
Arsenic	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [(L) (17)]	0.1 [4]
Barium	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	AGE10	AGE10 (D31)	AGE10	AGE10	AGE10	AGE10	AGE10	AGE10	AGE10	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Jul 2013	Jul 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014			Fresh	Marine	Irrigation Waters
	25/07/2013	25/07/2013	8/22/2013	9/19/2013	16/101/2013	11/14/2013	12/10/2013	1/15/2014	2/19/2014					
pH	6.9	6.9	7.3	7.2	7.7	7.5	8.4	7.2	6.7	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2000	2000	1900	1900	2000	2200	2100	2100	2300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	96	89	69	54	32	98	31	33	61	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	29	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	850	850	660	700	730	810	750	920	960	1/5	NC	NC	NC	NC
Total Alkalinity	850	850	660	700	730	810	780	920	960	1/5				
Anions														
Chloride (Cl)	190	190	210	250	250	210	210	250	210	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	2.9	3	2.6	3.7	3.7	3.3	3.3	3.4	3.1	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	<0.005	<0.005	0.2	<0.005	<0.005	<0.005	0.02	0.02	0.02	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	23	22	33	23	35	28	26	20	18	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	54	55	54	60	58	55	55	58	53	0.5	NC	NC	NC	NC
Potassium	23	22	19	28	27	26	29	23	24	0.5	NC	NC	NC	NC
Sodium	320	330	130	280	330	390	430	390	370	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	58	59	52	65	67	65	65	69	60	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.0010	0.0009	0.009	0.005	0.011	0.027	0.009	<0.0005	0.011	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.009	0.009	0.030	0.008	0.005	0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.410	0.410	0.23	0.26	0.24	0.31	0.31	0.32	0.36	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.650	0.640	0.6	0.89	0.35	0.48	0.54	0.47	0.53	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.120	0.120	0.19	0.15	0.19	0.18	0.16	0.14	0.13	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.002	0.003	0.003	0.005	0.016	0.001	0.001	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.670	0.650	6.5	0.26	0.002	0.008	0.007	<0.001	0.004	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	AGE10	AGE10	AGE10	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
						Slightly to Moderately Disturbed Systems		
Date Sampled	Mar 2014	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	3/19/2014	4/15/2014	5/21/2014					
pH	6.7	7.1	7.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2200	2200	2300	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	31	44	26	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity								
Hydroxide (OH^-)	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	920	950	910	1/5	NC	NC	NC	NC
Total Alkalinity	920	950	910	1/5				
Anions								
Chloride (Cl)	210	190	210	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	2.9	2.5	2.6	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.01	0.09	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	15	21	16	1	500	NC	NC	NC
Cations - Dissolved								
Calcium	56	56	49	0.5	NC	NC	NC	NC
Potassium	27	27	24	0.5	NC	NC	NC	NC
Sodium	450	450	360	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	66	66	55	0.5	NC	NC	NC	NC
Metals - Dissolved								
Aluminium	0.003	0.005	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.32	0.32	0.34	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.69	0.57	0.61	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.13	0.13	0.11	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.017	0.003	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.001	0.006	0.002	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total								
Aluminium	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	AGE13	AGE13	AGE13	AGE13	AGE13	AGE13	AGE13	AGE13	AGE13	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Jul 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014			Fresh	Marine	Irrigation Waters
	24/07/2013	8/22/2013	9/17/2013	10/17/2013	11/13/2013	12/17/2013	1/16/2014	2/20/2014	3/20/2014					
pH	6.8	7.1	8.1	7.6	7.1	7.4	7.3	7.1	7.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1600	1600	1700	1700	1700	1700	1600	1800	1700	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	30	140	180	3200	49	170	33	35	14	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	660	670	660	840	700	680	710	700	680	1/5	NC	NC	NC	NC
Total Alkalinity	660	670	660	840	700	680	710	700	680	1/5				
Anions														
Chloride (Cl)	130	140	150	170	150	170	170	150	140	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.2	1.1	1.3	1.1	1.3	1.3	1.4	1.3	0.98	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.01	0.02	0.07	0.02	0.008	0.06	0.04	0.2	0.009	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	41	49	58	48	59	66	53	52	50	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	71	65	70	75	77	73	75	70	74	0.5	NC	NC	NC	NC
Potassium	18	15	17	20	19	21	20	18	20	0.5	NC	NC	NC	NC
Sodium	180	100	190	220	230	220	210	200	230	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	73	65	71	78	81	74	83	73	81	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.0030	0.005	0.002	0.009	0.019	0.011	<0.0005	0.008	0.012	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.002	0.002	<0.001	0.01	0.001	0.009	0.001	<0.001	0.003	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.098	0.092	0.091	0.1	0.1	0.11	0.092	0.092	0.089	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0002	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	0.001	0.002	0.014	0.002	0.011	0.009	0.003	0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.007	0.002	0.003	0.005	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.840	0.56	0.085	0.014	0.43	0.011	0.033	0.066	0.58	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.060	0.059	0.064	0.076	0.06	0.11	0.075	0.064	0.058	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.002	0.007	0.013	0.002	0.011	0.004	0.002	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.017	0.031	0.075	0.031	0.049	0.04	0.016	0.014	0.110	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	1.1	<0.05	0.06	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	AGE13	AGE13	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
					Slightly to Moderately Disturbed Systems		
Date Sampled	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	4/15/2014	5/21/2014					
pH	7.1	7.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1700	1700	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	28	48	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity							
Hydroxide (OH^-)	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	720	660	1/5	NC	NC	NC	NC
Total Alkalinity	720	660	1/5				
Anions							
Chloride (Cl)	140	150	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.93	1.1	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.05	0.02	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	50	54	1	500	NC	NC	NC
Cations - Dissolved							
Calcium	73	66	0.5	NC	NC	NC	NC
Potassium	20	17	0.5	NC	NC	NC	NC
Sodium	230	190	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	79	70	0.5	NC	NC	NC	NC
Metals - Dissolved							
Aluminium	0.006	0.002	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	0.002	0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.091	0.096	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.52	0.37	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.056	0.052	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.004	0.005	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total							
Aluminium	NT	NT	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH (D9)	BY0014CH	BY0014CH	BY0014CH (D13)	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Aug 2012	Sept 2012	Oct 2012	Oct 2012			Fresh	Marine	Irrigation Waters
	23/2/2012	31/5/2012	28/06/2012	22/07/2012	20/08/2012	20/08/2012	17/09/2012	21/10/2012	21/10/2012					
pH	6.7	8.6	7.8	7.5	7.7	7.7	7.5	8.4	8.4	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	990	990	1100	1100	1100	1100	1100	1000	1100	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	4.8	26	7	19	3.5	4.4	2.7	9.5	4.1	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<1	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	33	<5	<5	<5	<5	<5	23	19	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	420	400	440	500	470	460	460	460	460	1/5	NC	NC	NC	NC
Total Alkalinity	970	430	440	500	470	460	460	480	480	1/5				
Anions														
Chloride (Cl)	75	78	75	81	75	76	82	75	75	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.65	0.72	1.0	1.0	1.1	1.1	1.0	1.1	1.1	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.006	0.2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	1	1	<1	<1	<1	<1	<1	<1	<1	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	31	32	31	31	34	34	34	37	37	0.5	NC	NC	NC	NC
Potassium	10	11	11	11	12	12	11	10	11	0.5	NC	NC	NC	NC
Sodium	190	170	190	210	180	180	210	190	200	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	17	18	18	17	19	20	19	21	20	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.025	0.007	<0.01	0.009	0.0080	0.0060	0.0040	0.005	0.006	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.004	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.2	0.21	0.210	0.210	0.2300	0.2300	0.2100	0.220	0.220	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.59	0.11	0.220	0.160	0.20	0.20	0.18	0.130	0.130	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.079	0.03	0.029	0.027	0.026	0.025	0.023	0.025	0.026	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.012	0.005	0.005	0.009	0.0020	0.0020	0.0010	0.003	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.088	0.01	0.005	0.012	0.015	0.002	0.006	0.006	0.008	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013	Jul 2013	Aug 2013			Fresh	Marine	Irrigation Waters
	3/12/2012	14/01/2013	18/02/2013	3/19/2013	4/15/2013	5/12/2013	6/18/2013	7/22/2013	8/19/2013					
pH	7.8	7.8	7.6	7.9	8.0	8.1	7.6	7.8	7.6	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1100	1100	1000	1100	1000	980	1000	1000	1000	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	2.6	14	12	11	5.1	3.8	5.4	34	58	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	470	470	470	480	460	450	470	480	470	1/5	NC	NC	NC	NC
Total Alkalinity	470	470	470	480	460	450	470	480	470	1/5				
Anions														
Chloride (Cl)	76	80	78	86	80	87	79	87	71	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.9	1.0	1.2	1.0	1.0	1.0	1	0.97	0.99	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.009	0.03	<0.005	0.006	0.006	<0.005	<0.005	<0.005	0.03	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	<1	<1	<1	<1	1	<1	<1	<1	<1	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	39	32	35	31	34	32	32	31	32	0.5	NC	NC	NC	NC
Potassium	12	9.8	9.4	10	11	10	11	9.7	8.8	0.5	NC	NC	NC	NC
Sodium	230	200	170	190	180	190	200	190	160	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	22	18	19	17	18	18	17	17	18	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.004	0.002	0.008	0.004	0.012	0.006	0.018	0.003	0.006	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.190	0.210	0.200	0.220	0.210	0.210	0.21	0.200	0.22	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0002	0.0003	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.033	0.140	0.180	0.290	0.200	0.170	0.22	0.190	0.23	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.021	0.024	0.029	0.037	0.030	0.025	0.024	0.02	0.022	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.001	0.002	0.008	0.002	0.003	0.001	0.002	0.001	0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.006	0.003	0.008	0.002	0.011	0.006	0.010	0.006	0.009	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0014CH	BY0014CH (D34)	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH	BY0014CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Sept 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014			Fresh	Marine	Irrigation Waters
	9/19/2013	9/19/2013	10/14/2013	11/13/2013	12/16/2013	1/13/2014	2/19/2014	3/17/2014					
pH	7.9	7.7	7.4	8.1	7.6	7.6	7.7	7.5	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1000	1000	1100	1000	1000	1100	1100	930	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	3.7	3	4.6	5.2	17	2.6	2.7	2.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	470	470	450	480	470	500	480	470	1/5	NC	NC	NC	NC
Total Alkalinity	470	470	450	480	470	500	480	470	1/5				
Anions													
Chloride (Cl)	86	99	93	86	88	83	77	78	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.95	1.1	1	1	1.1	1.0	1.2	1.0	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.02	<0.005	0.006	0.01	0.05	0.02	0.07	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	<1	<1	<1	<1	<1	<1	<1	<1	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	33	30	35	37	34	37	34	38	0.5	NC	NC	NC	NC
Potassium	11	11	11	11	11	12	10	12	0.5	NC	NC	NC	NC
Sodium	180	170	200	220	210	210	190	240	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	19	18	20	20	19	21	19	21	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.003	0.003	0.011	0.011	0.011	0.008	0.012	0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.22	0.23	0.21	0.21	0.21	0.21	0.2	0.22	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	<0.001	0.002	0.003	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.2	0.21	0.13	0.16	0.062	0.12	0.2	0.24	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.02	0.021	0.022	0.023	0.025	0.022	0.024	0.025	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	<0.001	<0.001	0.003	0.002	0.002	<0.001	<0.001	0.006	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.008	0.003	0.013	0.015	0.019	0.002	0.002	0.003	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0014CH	BY0014CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
					Slightly to Moderately Disturbed Systems		
Date Sampled	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	4/13/2014	5/20/2014					
pH	8.0	7.7	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1100	1100	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	19	3.9	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity							
Hydroxide (OH^-)	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	490	460	1/5	NC	NC	NC	NC
Total Alkalinity	490	460	1/5				
Anions							
Chloride (Cl)	73	75	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.1	1.0	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.02	0.009	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	<1	<1	1	500	NC	NC	NC
Cations - Dissolved							
Calcium	37	37	0.5	NC	NC	NC	NC
Potassium	11	11	0.5	NC	NC	NC	NC
Sodium	220	190	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	20	20	0.5	NC	NC	NC	NC
Metals - Dissolved							
Aluminium	0.0008	<0.005	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.21	0.22	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.054	0.28	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.023	0.024	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.001	0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.002	0.005	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total							
Aluminium	NT	NT	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0015CH	BY0015CH (D2)	BY0015CH	BY0015CH (D4)	BY0015CH	BY0015CH	BY0015CH	BY0015CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	Feb 2012	May 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012			Fresh	Marine	Irrigation Waters
	23/2/2012	23/2/2012	29/05/2012	29/05/2012	27/06/2012	24/07/2012	22/08/2012	17/09/2012					
pH	7.2	7.3	7.5	7.5	7.5	6.8	7.3	7.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1200	1200	1200	1200	1200	1200	1200	1200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	1.8	1.8	0.2	0.3	3.2	1.5	2.5	2.6	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<1	<1	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	<1	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	410	420	460	450	410	510	440	420	1/5	NC	NC	NC	NC
Total Alkalinity	410	420	460	450	410	510	440	420	1/5				
Anions													
Chloride (Cl)	110	110	120	120	110	460	110	110	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.1	1.1	1.0	1.0	1.1	0.96	0.92	1.0	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.009	<0.005	<0.005	<0.005	<0.005	0.03	<0.005	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	33	32	34	34	28	310	24	31	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	44	41	43	41	39	41	40	45	0.5	NC	NC	NC	NC
Potassium	13	13	13	13	12	14	12	14	0.5	NC	NC	NC	NC
Sodium	200	200	210	200	190	200	190	230	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	26	25	26	24	23	24	24	26	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.003	0.002	0.004	0.008	<0.01	0.003	0.0009	0.0020	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.093	0.094	0.098	0.092	0.095	0.092	0.0990	0.0930	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.19	0.19	0.21	0.2	0.180	0.160	0.17	0.12	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.044	0.045	0.046	0.043	0.045	0.042	0.044	0.042	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.008	<0.001	0.001	0.007	0.011	0.006	0.002	0.100	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH (D29)	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Oct 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013	Jun 2013			Fresh	Marine	Irrigation Waters
	21/10/2012	5/12/2012	14/01/2013	18/02/2013	3/19/2013	4/16/2013	5/12/2013	6/18/2013	6/18/2013					
pH	8.2	7.6	7.4	7.2	7.7	7.8	7.8	7.3	7.6	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1200	1200	1200	1200	1100	1200	1100	1200	1200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	3.2	4.3	3.7	4.5	3.7	3.3	4.9	3.9	3.4	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	450	430	430	430	450	420	420	430	430	1/5	NC	NC	NC	NC
Total Alkalinity	450	430	430	430	450	420	420	430	430	1/5				
Anions														
Chloride (Cl)	120	120	110	120	120	110	130	120	120	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.1	1.0	1.1	1.3	1.2	1.0	1.1	1	1.1	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	<0.005	0.01	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	32	31	33	33	34	31	38	36	36	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	47	44	43	42	38	42	40	39	40	0.5	NC	NC	NC	NC
Potassium	12	12	12	12	12	13	12	13	13	0.5	NC	NC	NC	NC
Sodium	200	200	210	190	190	180	190	200	200	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	28	24	25	25	22	25	24	23	24	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	0.002	0.005	0.009	0.008	0.014	<0.0005	0.001	<0.0005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.098	0.090	0.092	0.091	0.092	0.095	0.093	0.094	0.1	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0003	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.260	0.320	0.240	0.280	0.270	0.280	0.300	0.29	0.29	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.044	0.045	0.042	0.042	0.046	0.047	0.047	0.047	0.046	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.003	0.001	0.007	0.003	0.006	0.007	<0.001	0.001	<0.001	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	BY0015CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Jul 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014			Fresh	Marine	Irrigation Waters
	7/22/2013	8/19/2013	9/19/2013	10/16/2013	11/19/2013	12/16/2013	1/14/2014	17/02/2014	3/18/2014					
pH	7.5	7.3	7.6	7.6 (field)	7.4	7.3	7.3	7.4	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1100	1200	1200	1070 (field)	1200	1200	1200	1200	1200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	4.3	3.8	3.9	1 (field)	4	4.1	4.6	4.3	4.5	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	430	420	420	420	430	430	440	420	430	1/5	NC	NC	NC	NC
Total Alkalinity	430	420	420	420	430	430	440	420	430	1/5				
Anions														
Chloride (Cl)	120	110	120	110	120	140	120	110	110	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1	0.95	0.97	1.1	1.1	1.2	0.95	1.1	0.98	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	<0.005	<0.005	<0.005	NT	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	34	32	39	35	39	81	32	34	34	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	39	41	42	42	43	42	45	45	47	0.5	NC	NC	NC	NC
Potassium	11	10	13	13	14	13	13	14	14	0.5	NC	NC	NC	NC
Sodium	190	160	190	230	200	210	210	210	240	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	23	24	25	26	27	25	27	26	27	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	0.005	0.005	0.014	0.003	0.008	0.007	0.003	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.095	0.092	0.095	0.1	0.12	0.094	0.1	0.1	0.10	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.270	0.3	0.3	0.34	0.37	0.34	0.28	0.28	0.27	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.042	0.045	0.045	0.051	0.06	0.05	0.047	0.044	0.05	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.007	0.005	0.007	0.005	0.005	0.007	0.003	<0.001	0.001	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0015CH	BY0015CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
					Slightly to Moderately Disturbed Systems		
Date Sampled	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	4/13/2014	5/19/2014					
pH	7.8	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1200	1200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	3.5	3.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity							
Hydroxide (OH^-)	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	440	410	1/5	NC	NC	NC	NC
Total Alkalinity	440	410	1/5				
Anions							
Chloride (Cl)	110	110	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.1	1.0	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.01	0.09	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	33	33	1	500	NC	NC	NC
Cations - Dissolved							
Calcium	46	48	0.5	NC	NC	NC	NC
Potassium	13	13	0.5	NC	NC	NC	NC
Sodium	230	200	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	25	27	0.5	NC	NC	NC	NC
Metals - Dissolved							
Aluminium	0.002	<0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.099	0.1	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.25	0.28	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.043	0.049	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	<0.001	<0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	<0.001	0.001	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total							
Aluminium	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0016CH	BY0016CH	BY0016CH	BY0016CH	BY0016CH	BY0016CH	BY0016CH	BY0016CH	BY0016CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012	Oct 2012	Dec 2012	Jan 2013			Fresh	Marine	Irrigation Waters
	23/2/2012	30/5/2012	28/06/2012	23/07/2012	19/08/2012	17/09/2012	21/10/2012	3/12/2012	14/01/2013					
pH	7.1	8.8	7.3	7.1	7.2	7.0	8.3	7.2	7.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2900	2700	3900	3000	3400	3100	2900	2800	2700	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	0.6	540	0.9	55	47	37	37	19	170	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<1	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	110	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	970	900	890	1100	1000	1000	1100	1000	1000	1/5	NC	NC	NC	NC
Total Alkalinity	420	1000	890	1100	1000	1000	1100	1000	1000	1/5				
Anions														
Chloride (Cl)	350	340	630	420	470	380	330	300	280	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.9	1.9	1.9	2.0	2.1	2.0	2.1	1.8	1.9	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	<0.005	<0.005	1.8	0.5	0.007	0.008	0.009	0.07	0.06	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	59	47	130	78	91	67	50	38	35	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	49	40	71	47	54	49	47	48	36	0.5	NC	NC	NC	NC
Potassium	21	19	26	22	24	21	19	20	16	0.5	NC	NC	NC	NC
Sodium	620	590	740	740	640	740	620	690	670	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	43	32	88	37	51	40	35	35	28	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.018	0.008	<0.01	0.014	0.0090	0.0040	0.006	0.002	0.007	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.025	0.002	0.008	0.029	0.0290	0.0420	<0.001	0.034	0.029	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.31	0.31	<0.001	0.340	0.4400	0.3500	0.290	0.280	0.390	0.001	2	NC	NC	NC
Beryllium	0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.005	0.003	0.007	0.002	0.002	<0.001	0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	<0.001	0.002	0.008	0.002	0.001	0.002	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.78	0.32	<0.01	0.190	0.04	0.26	0.220	0.430	0.083	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.058	0.054	0.043	0.063	0.075	0.057	0.049	0.038	0.043	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.013	0.041	0.093	0.0490	0.010	0.014	0.006	0.009	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.011	0.026	0.015	0.084	0.035	0.088	0.050	0.020	0.017	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0016CH	BY0016CH	BY0016CH (D22)	BY0016CH	BY0016CH (D23)	BY0016CH	BY0016CH	BY0016CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2013	Mar 2013	Mar 2013	Apr 2013	Apr 2013	May 2013	June 2013	Jul 2013			Fresh	Marine	Irrigation Waters
	19/02/2013	3/18/2013	3/18/2013	4/15/2013	4/15/2013	5/12/2013	6/18/2013	7/22/2013					
pH	7.2	7.5	7.5	7.7	7.8	7.8	7.2	7.4	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2500	2500	2600	2500	2500	2400	2500	2400	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	1.6	13	13	28	29	4	190	54	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	1100	1100	1100	1000	1100	1100	1100	1100	1/5	NC	NC	NC	NC
Total Alkalinity	1100	1100	1100	1000	1100	1100	1100	1100	1/5				
Anions													
Chloride (Cl)	230	250	250	220	250	240	230	220	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	2.2	1.9	2.1	2.1	2.1	2.1	2	1.9	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.007	0.007	<0.005	0.52	0.05	<0.005	0.02	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	22	26	26	21	21	18	19	16	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	35	32	35	35	34	31	32	30	0.5	NC	NC	NC	NC
Potassium	18	18	19	19	19	17	18	15	0.5	NC	NC	NC	NC
Sodium	570	560	630	550	520	560	600	540	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	24	23	25	25	24	20	23	20	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.006	0.003	0.004	0.012	0.013	0.003	0.002	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.037	0.036	0.038	0.036	0.036	0.038	0.083	0.034	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.290	0.300	0.320	0.290	0.290	0.300	0.39	0.350	0.001	2	NC	NC	NC
Beryllium	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0003	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	<0.001	0.002	0.001	0.007	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.170	0.51	0.54	0.31	0.300	0.032	0.87	0.610	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.029	0.037	0.041	0.035	0.036	0.031	0.041	0.03	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.005	0.003	0.004	0.008	0.008	0.007	0.011	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.017	0.007	0.019	0.050	0.042	0.039	0.024	0.031	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0016CH	BY0016CH (D33)	BY0016CH	BY0016CH	BY0016CH	BY0016CH	BY0016CH	BY0016CH	BY0016CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Aug 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014			Fresh	Marine	Irrigation Waters
	8/19/2013	8/19/2013	9/17/2013	10/15/2013	11/11/2013	12/16/2013	1/13/2014	2/19/2014	3/17/2014					
pH	7.3	7.4	8.4	7	7.8	7.2	7.2	7.3	7.2	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2400	2400	2500	2500	2400	2400	2500	2600	2400	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	3.8	5.2	5	5.7	7.8	4.9	3.9	6.4	5.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	32	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	1100	1100	1000	1100	1100	1100	1100	1100	1100	1/5	NC	NC	NC	NC
Total Alkalinity	1100	1100	1100	1100	1100	1100	1100	1100	1100	1/5				
Anions														
Chloride (Cl)	200	200	240	230	220	200	200	180	180	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	1.8	0.98	2	1.9	2.1	2	2.0	2.2	1.9	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	<0.005	0.008	<0.005	<0.005	<0.005	0.07	0.02	0.03	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	21	15	17	15	14	10	10	8	7	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	30	31	31	33	31	27	31	30	34	0.5	NC	NC	NC	NC
Potassium	15	15	17	18	16	17	19	16	19	0.5	NC	NC	NC	NC
Sodium	490	500	570	630	600	610	630	560	720	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	21	21	20	23	20	17	21	18	21	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.009	0.007	0.006	0.007	0.012	0.008	0.006	0.01	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.032	0.034	0.038	0.036	0.037	0.031	0.031	0.028	0.026	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.31	0.33	0.32	0.33	0.33	0.33	0.34	0.34	0.34	0.001	2	NC	NC	NC
Beryllium	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	<0.001	<0.001	<0.001	0.001	0.002	<0.001	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.55	0.59	0.48	0.44	0.49	0.23	0.4	0.43	0.51	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.031	0.033	0.031	0.028	0.033	0.028	0.027	0.031	0.032	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.005	0.005	0.007	0.004	0.003	0.002	<0.001	<0.001	0.004	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.034	0.028	0.029	0.031	0.028	0.048	0.010	0.010	0.010	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	BY0016CH	BY0016CH	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
					Slightly to Moderately Disturbed Systems		
Date Sampled	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	4/13/2014	5/19/2014					
pH	7.0	7.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2400	2400	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	11	16	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity							
Hydroxide (OH^-)	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	1100	1100	1/5	NC	NC	NC	NC
Total Alkalinity	1100	1100	1/5				
Anions							
Chloride (Cl)	170	180	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	2.1	2.0	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.01	0.01	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	6	5	1	500	NC	NC	NC
Cations - Dissolved							
Calcium	32	33	0.5	NC	NC	NC	NC
Potassium	18	17	0.5	NC	NC	NC	NC
Sodium	680	600	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	21	20	0.5	NC	NC	NC	NC
Metals - Dissolved							
Aluminium	0.005	<0.005	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	0.024	0.020	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.35	0.37	0.001	2	NC	NC	NC
Beryllium	0.0001	0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.5	0.53	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.027	0.027	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.027	0.005	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total							
Aluminium	NT	NT	0.0005	0.2 [8]	0.0008 [15][L]/0.055 [14][L]	0.0005 [16][L]	NC
Arsenic	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	B3-S	B3-S	B3-S	B3-S	B3-S	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
								Slightly to Moderately Disturbed Systems		
Date Sampled	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	1/15/2014	2/19/2014	3/19/2014	4/15/2014	5/21/2014					
pH	6.9	6.5	6.4	6.6	5.0	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	290	280	230	240	200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	26000	100	21	31	130	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity										
Hydroxide (OH^-)	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	100	80	70	79	34	1/5	NC	NC	NC	NC
Total Alkalinity	100	80	70	79	34	1/5				
Anions										
Chloride (Cl)	39	32	31	29	23	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	<0.005	0.005	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.08	0.02	<0.005	0.05	1.2	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	13	6	9	8	8	1	500	NC	NC	NC
Cations - Dissolved										
Calcium	12	7.7	7.2	7.9	4.3	0.5	NC	NC	NC	NC
Potassium	5.1	4.4	4.7	4.6	5.1	0.5	NC	NC	NC	NC
Sodium	38	35	39	38	17	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	10	8.5	9	8.7	5.4	0.5	NC	NC	NC	NC
Metals - Dissolved										
Aluminium	0.005	0.013	0.006	0.009	0.004	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.039	0.053	0.05	0.049	0.057	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.005	0.009	0.008	0.008	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	<0.001	<0.001	<0.001	0.005	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.011	2.7	1.6	0.73	0.015	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.38	0.67	0.65	0.56	0.008	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.004	0.007	0.006	0.006	0.009	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.020	0.012	0.013	0.012	0.063	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total										
Aluminium	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.30	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	B3-D	B3-D	B3-D	B3-D	B3-D	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
								Slightly to Moderately Disturbed Systems		
Date Sampled	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	1/15/2014	2/19/2014	3/19/2014	4/15/2014	5/21/2014					
pH	8.0	5.7	5.9	6.9	6.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6)(18)]
Electrical Conductivity (µS/cm)	880	970	840	840	680	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	80	53	25	22	10	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity										
Hydroxide (OH^-)	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	390	340	380	450	320	1/5	NC	NC	NC	NC
Total Alkalinity	390	340	380	450	320	1/5				
Anions										
Chloride (Cl)	92	69	58	48	43	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	5.3	4.7	2.9	2.2	2.4	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.08	0.3	0.01	2	0.03	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	70	47	18	120	1	1	500	NC	NC	NC
Cations - Dissolved										
Calcium	33	30	34	47	23	0.5	NC	NC	NC	NC
Potassium	9.3	6.2	5.3	6.2	7.7	0.5	NC	NC	NC	NC
Sodium	130	110	91	90	100	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	29	21	27	35	20	0.5	NC	NC	NC	NC
Metals - Dissolved										
Aluminium	0.034	0.055	1.0	0.22	0.066	0.0005	0.2 [8]	0.0008 [15)(L)]/0.055 [14)(L)]	0.0005 [16)(L)]	NC
Arsenic	0.005	0.003	0.002	0.003	0.001	0.001	0.01	0.013 [9]	0.0023 [(L) (17)]	0.1 [4]
Barium	0.15	0.14	0.21	0.34	0.2	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.002	0.003	0.003	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.006	0.005	0.007	0.018	0.010	0.001	NC	NC	0.001	0.05 [4]
Copper	0.005	0.003	0.015	0.001	0.005	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.31	0.89	5.7	19	7.6	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.005	<0.001	0.003	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.52	0.9	1.8	3.5	3.2	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.015	0.014	0.020	0.020	0.029	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.002	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.009	0.004	0.005	0.003	0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.007	0.094	0.082	0.042	0.16	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total										
Aluminium	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15)(L)]/0.055 [14)(L)]	0.0005 [16)(L)]	NC
Arsenic	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [(L) (17)]	0.1 [4]
Barium	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.30	0.1	0.08	0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW1	SW1	SW1	SW1	SW1	SW1 (D7)	SW1	SW1	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	Mar 2012	May 2012	Jun 2012	Jul 2012	Jul 2012	Aug 2012	Sept 2012			Fresh	Marine	Irrigation Waters
	22/2/2012	8/03/2012	29/05/2012	27/06/2012	22/07/2012	22/07/2012	20/08/2012	19/09/2012					
pH	7.0	6.7	7.5	7.7	7.1	7.1	7.4	7.2	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	120	160	270	250	200	210	250	290	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	9.2	26	1.8	4.2	8.3	7.3	3.2	2.9	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<1	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	28	38	84	72	62	62	87	81	1/5	NC	NC	NC	NC
Total Alkalinity	28	38	84	72	62	62	87	81	1/5				
Anions													
Chloride (Cl)	18	20	34	33	28	29	34	33	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.02	0.01	<0.005	0.007	0.006	0.008	<0.005	0.007	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.05	0.1	0.02	<0.005	0.03	0.05	<0.005	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	2	3	6	4	3	3	5	4	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	3.5	4.7	12	11	6.8	6.1	12	13	0.5	NC	NC	NC	NC
Potassium	2.8	3.1	3.2	2.8	2.4	2.4	3.2	3.1	0.5	NC	NC	NC	NC
Sodium	13	14	25	24	19	19	28	28	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	4.1	5.5	11	10	7.5	8.1	12	12	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.15	0.11	0.003	<0.01	0.012	0.007	0.0030	0.0020	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.01	0.013	0.019	0.0160	0.0150	0.0140	0.0210	0.0260	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.003	0.003	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.23	0.21	0.023	0.0620	0.0890	0.0870	0.06	0.06	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.013	0.032	0.11	0.1100	0.0890	0.0910	0.120	0.150	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.008	0.007	0.014	0.013	0.014	0.003	0.005	0.014	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	1.5	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	<0.001	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	0.021	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	<0.0001	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	<0.0001	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	0.004	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	0.001	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	0.001	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	1.6	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	<0.001	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	0.047	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	<0.00005	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	0.006	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	<0.001	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	0.003	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	0.005	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW1	SW1	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
					Slightly to Moderately Disturbed Systems		
Date Sampled	Oct 2012	Mar 2013**			Fresh	Marine	Irrigation Waters
	22/10/2012	11/03/2013					
pH	7.7	7.5	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	290	180	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	0.6	3	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity							
Hydroxide (OH^-)	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	81	54	1/5	NC	NC	NC	NC
Total Alkalinity	81	54	1/5				
Anions							
Chloride (Cl)	35	23	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.03	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.01	0.09	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	5	2	1	500	NC	NC	NC
Cations - Dissolved							
Calcium	12	6.2	0.5	NC	NC	NC	NC
Potassium	3.5	2.6	0.5	NC	NC	NC	NC
Sodium	26	16	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	13	7.3	0.5	NC	NC	NC	NC
Metals - Dissolved							
Aluminium	0.003	0.035	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.023	0.012	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.100	0.210	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.062	0.067	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.009	0.003	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total							
Aluminium	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW2	SW2	SW2 (D3)	SW2	SW2	SW2	SW2	SW2	SW2	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	Mar 2012	Mar 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012	Mar 2013**			Fresh	Marine	Irrigation Waters
	22/2/2012	8/03/2012	8/03/2012	29/05/2012	26/06/2012	22/07/2012	20/08/2012	19/09/2012	11/03/2013					
pH	7.3	7.0	7.0	8.1	8.1	7.7	8.5	7.8	7.8	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	260	300	300	890	920	670	830	880	500	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	11	12	10	1.6	1.4	3.5	2.5	5.5	2.9	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<1	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	<5	<5	<5	<5	<5	19	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	68	90	99	240	230	210	220	220	170	1/5	NC	NC	NC	NC
Total Alkalinity	68	90	99	240	230	210	240	220	170	1/5				
Anions														
Chloride (Cl)	23	37	39	120	120	78	110	110	52	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.02	0.57	0.02	0.008	<0.005	0.02	0.036	0.006	0.01	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.03	0.04	0.03	0.1	0.4	0.2	0.04	<0.005	0.02	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	8	8	8	48	51	24	47	37	18	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	12	14	14	49	47	34	51	50	29	0.5	NC	NC	NC	NC
Potassium	6.4	6.4	6.3	8.9	5.2	5.2	5.2	6.9	6.2	0.5	NC	NC	NC	NC
Sodium	25	27	27	88	73	60	80	79	41	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	8.2	12	11	36	34	24	42	39	21	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.035	0.021	0.034	0.004	0.005	0.005	0.0310	0.0040	0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0010	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.019	0.024	0.025	0.051	0.0500	0.0350	0.0560	0.0570	0.029	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0001	0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.004	<0.001	0.003	0.001	0.002	<0.001	<0.001	0.002	0.003	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.21	0.15	0.17	0.028	<0.01	0.0210	0.22	0.09	0.059	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	<0.005	0.041	0.04	<0.005	<0.005	0.0760	0.100	0.610	0.008	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.004	0.004	0.005	0.003	0.002	0.002	0.002	0.003	0.005	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.007	0.007	0.017	0.02	0.007	0.012	0.002	0.100	0.011	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	0.48	0.55	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	<0.001	<0.001	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	0.028	0.028	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	<0.0001	<0.0001	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	<0.0001	<0.0001	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	0.002	0.002	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	<0.001	<0.001	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	<0.001	<0.001	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	0.75	0.78	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	<0.001	<0.001	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	0.049	0.051	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	<0.00005	<0.00005	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	0.005	0.005	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	<0.001	<0.001	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	0.002	0.002	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	0.002	0.002	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.2	0.1	0.1	<0.05	<0.05	<0.05	<0.05	0.1	0.09	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW3	SW3 (D1)	SW3	SW3	SW3	SW3	SW3	SW3	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
											Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	Feb 2012	Mar 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012			Fresh	Marine	Irrigation Waters
	22/2/2012	22/2/2012	8/03/2012	29/05/2012	26/06/2012	22/07/2012	21/08/2012	19/09/2012					
pH	8.1	8.1	7.2	8.3	8.3	8.0	8.6	8.4	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	940	950	330	1000	1200	990	1200	1200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	99	99	54	2.3	20	5.3	1.6	2.4	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity													
Hydroxide (OH^-)	<1	<1	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	<1	<5	13	24	<5	33	19	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	310	320	100	330	370	380	440	420	1/5	NC	NC	NC	NC
Total Alkalinity	310	320	100	340	390	380	470	440	1/5				
Anions													
Chloride (Cl)	47	55	41	130	140	110	120	130	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	0.055	0.01	<0.005	0.008	0.017	0.013	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	15	15	0.09	<0.005	<0.005	0.01	<0.005	0.01	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	26	31	7	16	16	12	8	6	1	500	NC	NC	NC
Cations - Dissolved													
Calcium	22	21	13	32	33	30	36	35	0.5	NC	NC	NC	NC
Potassium	3.2	3	6.9	6.8	7.5	5.7	6	7.1	0.5	NC	NC	NC	NC
Sodium	180	180	40	150	160	150	180	180	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	20	20	9.9	35	38	32	41	46	0.5	NC	NC	NC	NC
Metals - Dissolved													
Aluminium	0.045	0.039	0.51	0.006	0.007	0.007	0.0110	0.0050	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.064	0.063	0.048	0.065	0.0740	0.0640	0.0800	0.0720	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.003	0.001	0.004	0.001	0.002	0.002	0.001	0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.032	0.028	0.45	0.012	0.0120	0.017	0.02	0.02	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.001	0.006	0.002	0.002	0.002	0.001	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.008	0.002	0.01	0.016	0.018	0.013	0.004	0.015	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total													
Aluminium	NT	NT	2.8	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	<0.001	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	0.064	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	0.0002	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	<0.0001	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	0.004	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	0.001	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	0.003	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	2.7	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	<0.001	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	0.023	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	<0.00005	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	0.008	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	<0.001	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	0.005	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	0.004	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.1	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW4	SW4	SW4	SW4	SW4 (D5-270612)	SW4	SW4	SW4	SW4	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	Mar 2012	May 2012	Jun 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012	Oct 2012			Fresh	Marine	Irrigation Waters
	22/2/2012	8/03/2012	29/05/2012	27/06/2012	27/06/2012	22/07/2012	21/08/2012	19/09/2012	22/10/2012					
pH	7.9	7.1	7.9	7.8	7.8	7.7	8.0	8.2	8.3	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	660	380	1800	1900	1900	1200	1700	1800	2100	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	6.3	28	2.5	1.8	1.7	3.1	1.8	0.6	8.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<1	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	<5	<5	<5	<5	<5	<5	<5	6	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	160	110	370	340	350	290	350	340	380	1/5	NC	NC	NC	NC
Total Alkalinity	160	110	370	340	350	290	350	340	390	1/5				
Anions														
Chloride (Cl)	79	47	270	260	260	160	230	270	290	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.02	0.04	0.01	0.02	0.03	0.016	0.028	0.013	0.028	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.03	0.01	0.03	<0.005	0.007	0.08	0.1	0.007	0.01	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	52	19	220	200	200	110	180	210	240	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	41	19	100	96	98	63	110	120	120	0.5	NC	NC	NC	NC
Potassium	8.9	6.9	7.6	6.6	7.2	6.4	6.5	7.1	7.3	0.5	NC	NC	NC	NC
Sodium	62	33	170	160	200	110	160	170	210	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	28	15	80	74	78	48	86	92	110	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.013	0.019	0.011	<0.01	<0.01	0.005	0.0020	0.0020	0.008	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.037	0.03	0.085	0.0910	0.091	0.0560	0.0900	0.0910	0.094	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	0.002	0.003	<0.001	0.002	<0.001	0.002	0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.13	0.14	0.027	0.0960	0.092	0.040	0.11	0.03	0.190	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.01	0.047	0.2	0.2000	0.190	0.1200	0.140	0.013	0.580	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.004	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.001	<0.001	0.001	0.001	0.001	<0.001	0.0020	0.0030	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.003	0.008	0.015	0.005	0.024	0.009	0.006	0.012	0.006	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	1.3	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	0.044	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	0.0001	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	<0.0001	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	0.003	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	0.001	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	0.002	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	2	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	0.094	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	<0.00005	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	0.006	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	0.004	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	0.006	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.2	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW4	SW4 (D16)	SW4	SW4 (D18)	SW4	SW4 (D19)	SW4	SW4	SW4 (D24)	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Dec 2012	Dec 2012	Jan 2013	Jan 2013	Feb 2013	Feb 2013	Mar 2013**	Apr 2013	Apr 2013			Fresh	Marine	Irrigation Waters
	4/12/2012	3/12/2012	15/01/2013	15/01/2013	19/02/2013	19/02/2013	11/03/2013	4/16/2013	4/16/2013					
pH	7.6	7.6	7.6	7.6	7.6	7.6	7.9	8.1	8.1	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2200	2200	2200	2200	2200	2100	1300	1900	1900	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	8	7.8	13	15	4	4.8	1.2	3.7	2.6	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	320	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	390	390	410	410	410	410	<5	370	370	1/5	NC	NC	NC	NC
Total Alkalinity	390	390	410	410	410	410	320	370	370	1/5				
Anions														
Chloride (Cl)	330	330	360	340	340	340	180	290	290	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.046	0.054	<0.005	<0.005	0.018	0.017	0.009	0.007	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.04	0.04	0.02	<0.005	0.008	0.01	0.04	<0.005	<0.005	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	250	250	310	300	290	290	130	220	210	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	150	160	120	120	150	130	81	110	110	0.5	NC	NC	NC	NC
Potassium	7.7	7.5	7.1	7.1	7.2	7.1	6.2	6.4	6.3	0.5	NC	NC	NC	NC
Sodium	240	240	230	250	220	210	100	170	170	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	120	120	96	110	100	100	59	89	88	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.001	0.001	0.003	0.003	0.004	0.007	0.011	0.005	0.008	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.094	0.091	0.091	0.087	0.079	0.080	0.073	0.099	0.098	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0004	0.0001	<0.0001	0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.001	0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.002	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.029	0.024	0.300	0.300	0.017	0.019	0.032	0.062	0.078	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.790	0.790	0.560	0.570	0.250	0.250	0.088	0.110	0.110	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.001	0.001	0.003	0.002	0.001	0.002	0.003	0.001	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.006	0.004	<0.001	<0.001	0.001	0.005	0.014	<0.001	0.008	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.06	0.06	0.1	0.1	<0.05	<0.05	0.07	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW4	SW4 (D28)	SW4	SW4 (D30)	SW4	SW4	SW4	SW4	SW4	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	May 2013	May 2013	Jun 2013	Jun 2013	Jul 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013			Fresh	Marine	Irrigation Waters
	5/13/2013	5/13/2013	6/18/2013	6/18/2013	7/22/2013	8/19/2013	9/17/2013	10/16/2013	11/12/2013					
pH	8.2	8.2	7.9	8.1	7.9	8.1	8.3	7.8	7.6	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1800	1800	1800	1900	1800	1800	2200	2000	1900	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	3.4	3.3	3.1	2.8	7.2	2.7	2.4	4.4	21	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	17	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	360	360	380	370	370	360	310	360	300	1/5	NC	NC	NC	NC
Total Alkalinity	360	360	380	370	370	360	320	360	300	1/5				
Anions														
Chloride (Cl)	320	320	290	290	350	240	370	320	300	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.015	0.017	0.019	0.023	0.04	0.01	<0.005	0.011	0.018	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	<0.005	<0.005	0.05	0.05	0.03	<0.005	0.06	0.02	18	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	260	260	240	240	230	190	320	240	250	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	110	110	100	100	120	100	110	120	120	0.5	NC	NC	NC	NC
Potassium	5.9	6.1	7.2	7.4	6	5.3	14	6.2	5.8	0.5	NC	NC	NC	NC
Sodium	170	180	180	180	170	150	230	200	190	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	84	85	80	84	82	82	98	97	91	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.002	<0.0005	0.0006	<0.0005	0.003	0.005	0.009	0.01	0.009	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.088	0.085	0.085	0.095	0.092	0.09	0.09	0.1	0.14	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.002	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.066	0.049	0.075	0.074	0.079	0.048	0.13	0.074	0.14	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.120	0.130	0.11	0.12	0.26	0.12	0.12	0.27	1.4	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.001	0.001	0.001	0.001	0.001	0.004	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.002	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.005	<0.001	0.008	0.001	0.003	0.009	0.01	0.012	0.009	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	0.08	0.10	<0.05	<0.05	0.08	0.05	0.3	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW4	SW4	SW4	SW4	SW4	SW4	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
									Slightly to Moderately Disturbed Systems		
Date Sampled	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014			Fresh	Marine	Irrigation Waters
	12/16/2013	1/14/2014	17/02/2014	3/19/2014	4/15/2014	5/20/2014					
pH	7.9	7.6	7.6	6.9	7.7	7.7	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2000	2300	2000	1900	2100	2100	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	5.6	3.1	3.1	13	2.2	4.6	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity											
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	370	420	390	320	400	360	1/5	NC	NC	NC	NC
Total Alkalinity	370	420	390	320	400	360	1/5				
Anions											
Chloride (Cl)	360	350	290	290	290	290	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	<0.005	0.012	0.028	0.053	<0.005	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	1.9	0.04	<0.005	<0.005	0.03	0.1	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	290	220	240	310	230	240	1	500	NC	NC	NC
Cations - Dissolved											
Calcium	110	130	120	130	140	130	0.5	NC	NC	NC	NC
Potassium	6.2	7.8	8.7	7.9	8.9	7.3	0.5	NC	NC	NC	NC
Sodium	220	240	220	230	210	190	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	99	110	100	99	99	96	0.5	NC	NC	NC	NC
Metals - Dissolved											
Aluminium	0.005	0.007	0.008	0.002	<0.0005	<0.005	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.12	0.13	0.087	0.08	0.11	0.1	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	<0.001	<0.001	<0.001	0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.017	0.053	0.16	0.25	0.014	0.027	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.13	0.24	0.5	0.43	0.15	0.13	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.002	0.002	0.001	0.002	0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.011	0.002	0.008	0.002	0.002	0.003	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total											
Aluminium	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.09	<0.05	0.09	0.1	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6 (D14)	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	Mar 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012	Oct 2012	Oct 2012			Fresh	Marine	Irrigation Waters
	22/2/2012	8/03/2012	29/05/2012	26/06/2012	22/07/2012	21/08/2012	19/09/2012	22/10/2012	22/10/2012					
pH	8.0	7.1	8.2	8.1	7.8	8.2	8.1	8.5	8.5	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	1700	480	1400	2100	1400	2000	2100	2200	2200	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	18	17	15	11	15	19	20	14	14	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<1	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	<5	<5	14	<5	<5	<5	27	27	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	260	120	400	330	320	380	370	340	340	1/5	NC	NC	NC	NC
Total Alkalinity	260	120	400	350	320	380	370	360	370	1/5				
Anions														
Chloride (Cl)	280	64	340	330	220	310	340	360	360	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.03	0.04	0.007	0.01	0.015	0.029	0.011	0.024	0.035	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.08	0.03	0.07	0.06	0.05	0.09	0.02	<0.005	0.01	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	150	29	230	210	140	200	200	220	220	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	62	25	110	97	72	100	110	99	97	0.5	NC	NC	NC	NC
Potassium	11	7.5	9.7	7	6.5	6.5	6.6	6.2	6.2	0.5	NC	NC	NC	NC
Sodium	190	43	220	200	140	200	210	240	240	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	70	19	93	83	57	88	100	110	110	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.003	0.018	0.009	0.005	0.003	0.0050	0.0040	0.002	0.003	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	0.099	0.039	0.11	0.0970	0.0690	0.1100	0.1100	0.097	0.098	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	0.003	0.005	<0.001	<0.001	0.001	0.002	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.017	0.1	0.017	0.0110	0.014	0.02	0.01	0.020	0.018	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.043	0.018	0.017	0.0190	0.0280	0.041	0.030	0.019	0.018	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.004	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.003	0.003	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.004	0.009	0.017	0.013	0.011	0.004	0.015	0.003	0.005	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	0.5	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 (L) [17]	0.1 [4]
Barium	NT	0.041	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	<0.0001	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	<0.0001	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	0.002	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	0.001	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	0.62	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	0.022	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	<0.00005	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	0.004	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	0.002	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	0.002	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW6	SW6	SW6	SW6	SW6 (D35)	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
								Slightly to Moderately Disturbed Systems		
Date Sampled	Dec 2012	Mar 2013**	Jul 2013	Sept 2013	Sept 2013			Fresh	Marine	Irrigation Waters
	4/12/2012	11/03/2013	24/07/2013	9/16/2013	9/16/2013					
pH	8.5	8.1	8.3	8.4	8.2	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	2300	1600	2100	2100	2100	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	17	18	18	4.5	7.4	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity										
Hydroxide (OH^-)	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	23	<5	8	27	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	330	360	390	340	370	1/5	NC	NC	NC	NC
Total Alkalinity	350	360	400	370	370	1/5				
Anions										
Chloride (Cl)	400	260	340	360	390	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	<0.005	0.032	0.012	0.009	0.01	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.02	0.05	0.006	0.05	0.09	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	210	150	180	240	280	1	500	NC	NC	NC
Cations - Dissolved										
Calcium	100	88	110	100	100	0.5	NC	NC	NC	NC
Potassium	9.7	7.8	6.1	7.3	6.9	0.5	NC	NC	NC	NC
Sodium	300	150	190	220	210	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	130	73	98	96	96	0.5	NC	NC	NC	NC
Metals - Dissolved										
Aluminium	0.005	0.011	0.0009	0.001	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	0.001	0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.100	0.092	0.110	0.11	0.1	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	0.0005	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	0.001	<0.001	0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.010	0.019	<0.01	0.01	<0.01	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.005	0.023	0.008	0.008	0.008	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.002	0.003	0.002	0.002	0.001	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.004	0.004	0.003	0.003	0.003	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.004	0.006	0.005	0.008	0.002	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total										
Aluminium	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.1	0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

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Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW7	SW7	SW7	SW7 (D12/KMH)	SW7	SW7 (D21)	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
									Slightly to Moderately Disturbed Systems		
Date Sampled	Mar 2012	Aug 2012	Sept 2012	Sept 2012	Mar 2013**	Mar 2013**			Fresh	Marine	Irrigation Waters
	8/03/2012	20/08/2012	19/09/2012	19/09/2012	11/03/2013	11/03/2013					
pH	6.9	7.6	6.6	7.2	7.8	7.8	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	180	360	320	310	230	230	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	36	1.4	1.8	1.8	5.1	3.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity											
Hydroxide (OH^-)	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	68	140	61	83	84	84	1/5	NC	NC	NC	NC
Total Alkalinity	68	140	61	83	84	84	1/5				
Anions											
Chloride (Cl)	18	26	27	25	20	19	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.03	<0.005	<0.005	<0.005	0.015	0.015	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.03	0.01	<0.005	<0.005	0.03	0.03	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	3	18	18	16	8	5	1	500	NC	NC	NC
Cations - Dissolved											
Calcium	8.7	17	17	17	12	13	0.5	NC	NC	NC	NC
Potassium	2.8	3.4	3.1	3.1	3.2	3.1	0.5	NC	NC	NC	NC
Sodium	13	26	25	25	16	15	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	7.8	13	13	12	11	11	0.5	NC	NC	NC	NC
Metals - Dissolved											
Aluminium	0.036	0.0030	0.0070	0.0030	0.007	0.007	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.022	0.0450	0.0450	0.0450	0.027	0.031	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.002	0.001	<0.001	0.002	<0.001	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.16	0.04	0.06	0.06	0.240	0.270	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.014	0.110	0.120	0.120	0.050	0.053	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.002	0.002	0.0020	0.002	0.003	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	<0.001	<0.001	<0.001	<0.001	0.002	0.002	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.007	0.005	0.010	0.028	<0.001	0.003	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total											
Aluminium	1.3	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.034	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	<0.0001	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	0.003	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	0.001	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	2	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.048	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.006	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.003	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.003	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW8	SW8	SW8	SW8 (D5-290512)	SW8	SW8	SW8	SW8	SW8	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
												Slightly to Moderately Disturbed Systems		
Date Sampled	Feb 2012	Mar 2012	May 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sept 2012	Oct 2012			Fresh	Marine	Irrigation Waters
	22/2/2012	8/03/2012	29/05/2012	29/05/2012	27/06/2012	22/07/2012	21/08/2012	19/09/2012	22/10/2012					
pH	7.3	6.9	7.9	8.0	8.0	7.6	7.8	7.8	8.2	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	260	250	800	800	760	620	730	880	950	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	5.7	8	2.3	2.1	2.5	2.1	2.6	2.7	1.3	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity														
Hydroxide (OH^-)	<1	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<1	<5	<5	<5	<5	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	71	84	250	250	230	220	250	260	300	1/5	NC	NC	NC	NC
Total Alkalinity	71	84	250	250	230	220	250	260	300	1/5				
Anions														
Chloride (Cl)	30	30	100	100	82	74	79	110	120	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.03	0.01	<0.005	<0.005	0.01	0.014	0.021	0.018	0.015	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.04	<0.005	0.02	0.02	0.02	<0.005	0.2	<0.005	0.03	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	6	4	18	18	9	11	11	13	13	1	500	NC	NC	NC
Cations - Dissolved														
Calcium	12	11	42	40	36	29	40	46	52	0.5	NC	NC	NC	NC
Potassium	6.7	5.8	8.1	8.3	4.7	5.3	4.3	5	4.7	0.5	NC	NC	NC	NC
Sodium	25	23	86	88	72	63	71	99	96	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	9	9.6	32	32	29	23	30	38	43	0.5	NC	NC	NC	NC
Metals - Dissolved														
Aluminium	0.042	0.034	0.003	0.001	<0.01	0.006	0.0060	0.0020	0.002	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	0.018	0.02	0.035	0.034	0.0330	0.0270	0.0370	0.0420	0.058	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.003	0.003	<0.001	<0.001	<0.001	0.001	0.002	0.002	<0.001	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.24	0.15	0.035	0.028	0.0560	0.045	0.03	0.03	0.042	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.006	0.006	0.043	0.044	0.0310	0.1300	0.068	0.140	0.470	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.003	0.004	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.008	0.015	0.015	0.002	0.017	0.014	0.010	0.017	0.018	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total														
Aluminium	NT	0.53	NT	NT	NT	NT	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L][17]	0.1 [4]
Barium	NT	0.023	NT	NT	NT	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	<0.0001	NT	NT	NT	NT	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	<0.0001	NT	NT	NT	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	0.002	NT	NT	NT	NT	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	0.66	NT	NT	NT	NT	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	0.018	NT	NT	NT	NT	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	<0.00005	NT	NT	NT	NT	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	0.004	NT	NT	NT	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	<0.001	NT	NT	NT	NT	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	0.002	NT	NT	NT	NT	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	0.001	NT	NT	NT	NT	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.2	0.1	0.06	0.06	<0.05	0.09	<0.05	<0.05	<0.05	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW8	SW8	SW8	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
						Slightly to Moderately Disturbed Systems		
Date Sampled	Mar 2013**	Jul 2013	Sept 2013			Fresh	Marine	Irrigation Waters
	11/03/2013	7/23/2013	9/17/2013					
pH	7.9	8.1	8.2	0.1 pH unit	6.5-8.5 [8]	6.5-8.0 [1]	7.0-8.5 [2]	>6 [6][18]
Electrical Conductivity (µS/cm)	590	900	750	1	NC	NC	NC	1000 - 7500 [3]
Turbidity (NTU)	0.5	4.6	4.8	0.1	5 [8]	1-50	0.5-10	NC
Alkalinity								
Hydroxide (OH^-)	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	230	310	220	1/5	NC	NC	NC	NC
Total Alkalinity	230	310	220	1/5				
Anions								
Chloride (Cl)	59	60	93	1	250 [8]	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.008	0.097	0.14	0.005	0.5 [8]/0.41 [12]	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.006	<0.005	0.4	0.005	3 [13]	0.04 [1]	0.015 [2]	NC
Sulphate (SO_4^{2-})	9	6	15	1	500	NC	NC	NC
Cations - Dissolved								
Calcium	33	42	33	0.5	NC	NC	NC	NC
Potassium	5.5	5.5	5.6	0.5	NC	NC	NC	NC
Sodium	51	96	65	0.5	180 [8]	NC	NC	Species Dependent
Magnesium	26	33	26	0.5	NC	NC	NC	NC
Metals - Dissolved								
Aluminium	0.003	0.004	0.006	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	<0.001	<0.001	<0.001	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	0.025	0.039	0.025	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	<0.001	<0.001	<0.001	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	<0.001	<0.001	<0.001	0.001	NC	NC	0.001	0.05 [4]
Copper	0.001	<0.001	0.003	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	0.063	0.010	0.027	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	0.006	0.054	0.066	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	0.005	0.003	0.002	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	0.002	<0.001	<0.001	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	0.006	0.008	0.008	0.001	3 [8]	0.008	0.015	2 [4]
Metals - Total								
Aluminium	NT	NT	NT	0.0005	0.2 [8]	0.0008 [15](L)/0.055 [14](L)	0.0005 [16](L)	NC
Arsenic	NT	NT	NT	0.001	0.01	0.013 [9]	0.0023 [L] [17]	0.1 [4]
Barium	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	0.0001	0.06	0.00013 [16]	NC	0.1 [4]
Cadmium	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 [4]
Chromium	NT	NT	NT	0.001	0.05 [7]	0.001 [7]	0.0044 [7]	0.1 [4]
Cobalt	NT	NT	NT	0.001	NC	NC	0.001	0.05 [4]
Copper	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 [4]
Iron (Fe^{2+})	NT	NT	NT	0.01	0.3 [8]	NC	NC	0.2 [4]
Lead	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 [4]
Manganese	NT	NT	NT	0.005	0.5	1.9	0.08 [L]	0.2 [4]
Mercury	NT	NT	NT	0.00005	0.001	0.00006 [10]	0.0001 [10]	0.002 [4]
Nickel	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 [4]
Selenium	NT	NT	NT	0.001	0.01	0.005	0.003 [L]	0.02 [4]
Vanadium	NT	NT	NT	0.001	NC	0.006 [L]	0.1	0.1 [4]
Zinc	NT	NT	NT	0.001	3 [8]	0.008	0.015	2 [4]
Total Phosphorus	0.07	<0.05	0.2	0.05	NC	0.05 [1]	0.03 [2]	0.05 [5]

See Notes to Table Following

Table 1 - Summary of Laboratory Testing Results - February 2012 to May 2014 (Surface Water and Groundwater) - mg/L

Sample Identification	SW9	SW9 (D10)	SW9	SW9	Laboratory PQL	Australian Drinking Water Guidelines - Health Based (mg/L)	ANZECC (2000) - Trigger Values		
							Slightly to Moderately Disturbed Systems		
Date Sampled	Aug 2012	Aug 2012	Sept 2012	Mar 2013**			Fresh	Marine	Irrigation Waters
	20/08/2012	20/08/2012	19/09/2012	11/03/2013					
pH	7.5	7.5	7.8	7.3	0.1 pH unit	6.5-8.5 (8)	6.5-8.0 (1)	7.0-8.5 (2)	>6 (6)(18)
Electrical Conductivity (µS/cm)	330	330	320	370	1	NC	NC	NC	1000 - 7500 (3)
Turbidity (NTU)	4	4.7	26	1.5	0.1	5 (8)	1-50	0.5-10	NC
Alkalinity									
Hydroxide (OH^-)	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Carbonate (CO_3^{2-})	<5	<5	<5	<5	1/5	NC	NC	NC	NC
Bicarbonate (HCO_3^-)	110	120	110	150	1/5	NC	NC	NC	NC
Total Alkalinity	110	120	110	150	1/5				
Anions									
Chloride (Cl)	21	22	21	21	1	250 (8)	NC	NC	Species Dependent
Ammonia (NH_3) as N	0.033	0.04	0.03	0.031	0.005	0.5 (8)/0.41 (12)	0.9	0.91	NC
NO_x (NO_2^- + NO_3^-)	0.2	0.2	<0.005	0.06	0.005	3 (13)	0.04 (1)	0.015 (2)	NC
Sulphate (SO_4^{2-})	15	15	12	24	1	500	NC	NC	NC
Cations - Dissolved									
Calcium	23	22	23	28	0.5	NC	NC	NC	NC
Potassium	4.6	4.5	4.9	7.4	0.5	NC	NC	NC	NC
Sodium	24	24	23	19	0.5	180 (8)	NC	NC	Species Dependent
Magnesium	14	14	14	19	0.5	NC	NC	NC	NC
Metals - Dissolved									
Aluminium	0.0090	0.0050	0.0090	0.011	0.0005	0.2 (8)	0.0008 (15)(L)/0.055 (14)(L)	0.0005 (16)(L)	NC
Arsenic	<0.001	<0.001	<0.001	0.001	0.001	0.01	0.013 (9)	0.0023 (L) (17)	0.1 (4)
Barium	0.0450	0.0440	0.0300	0.058	0.001	2	NC	NC	NC
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.06	0.00013 (16)	NC	0.1 (4)
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.002	0.0002	0.0007	0.01 (4)
Chromium	<0.001	<0.001	<0.001	<0.001	0.001	0.05 (7)	0.001 (7)	0.0044 (7)	0.1 (4)
Cobalt	0.002	0.002	0.001	0.003	0.001	NC	NC	0.001	0.05 (4)
Copper	0.001	<0.001	0.002	<0.001	0.001	2	0.0014	0.0013	0.2 (4)
Iron (Fe^{2+})	0.29	0.27	0.29	0.300	0.01	0.3 (8)	NC	NC	0.2 (4)
Lead	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.0034	0.0044	2 (4)
Manganese	0.480	0.480	0.370	0.380	0.005	0.5	1.9	0.08 (L)	0.2 (4)
Mercury	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	0.001	0.00006 (10)	0.0001 (10)	0.002 (4)
Nickel	0.004	0.0030	0.004	0.008	0.001	0.02	0.011	0.007	0.2 (4)
Selenium	<0.001	<0.001	<0.001	<0.001	0.001	0.01	0.005	0.003 (L)	0.02 (4)
Vanadium	<0.001	<0.001	<0.001	0.002	0.001	NC	0.006 (L)	0.1	0.1 (4)
Zinc	0.007	0.002	0.017	0.005	0.001	3 (8)	0.008	0.015	2 (4)
Metals - Total									
Aluminium	NT	NT	NT	NT	0.0005	0.2 (8)	0.0008 (15)(L)/0.055 (14)(L)	0.0005 (16)(L)	NC
Arsenic	NT	NT	NT	NT	0.001	0.01	0.013 (9)	0.0023 (L) (17)	0.1 (4)
Barium	NT	NT	NT	NT	0.001	2	NC	NC	NC
Beryllium	NT	NT	NT	NT	0.0001	0.06	0.00013 (16)	NC	0.1 (4)
Cadmium	NT	NT	NT	NT	0.0001	0.002	0.0002	0.0007	0.01 (4)
Chromium	NT	NT	NT	NT	0.001	0.05 (7)	0.001 (7)	0.0044 (7)	0.1 (4)
Cobalt	NT	NT	NT	NT	0.001	NC	NC	0.001	0.05 (4)
Copper	NT	NT	NT	NT	0.001	2	0.0014	0.0013	0.2 (4)
Iron (Fe^{2+})	NT	NT	NT	NT	0.01	0.3 (8)	NC	NC	0.2 (4)
Lead	NT	NT	NT	NT	0.001	0.01	0.0034	0.0044	2 (4)
Manganese	NT	NT	NT	NT	0.005	0.5	1.9	0.08 (L)	0.2 (4)
Mercury	NT	NT	NT	NT	0.00005	0.001	0.00006 (10)	0.0001 (10)	0.002 (4)
Nickel	NT	NT	NT	NT	0.001	0.02	0.011	0.007	0.2 (4)
Selenium	NT	NT	NT	NT	0.001	0.01	0.005	0.003 (L)	0.02 (4)
Vanadium	NT	NT	NT	NT	0.001	NC	0.006 (L)	0.1	0.1 (4)
Zinc	NT	NT	NT	NT	0.001	3 (8)	0.008	0.015	2 (4)
Total Phosphorus	<0.05	<0.05	0.1	0.06	0.05	NC	0.05 (1)	0.03 (2)	0.05 (5)

See Notes to Table Following

Notes to Table 1:
Results expressed in mg/L unless otherwise stated
NC - No Criteria
PQL - Practical Quantitation Limits
(1) - Trigger Values for physical and chemical stressors for south-east Australia for Slightly Disturbed Ecosystems -Lowland Rivers
(2) - Trigger Values for physical and chemical stressors for south-east Australia for Slightly Disturbed Ecosystems -Estuaries
(3) - Tolerance value of Clover (Conservative Value for Pastures)
(4) - Long Term Trigger Values (up to 100 yrs)
(5) - To minimise bioclogging of irrigation equipment
(6) - Trigger Values for assessing corrosiveness of water
(7) - Chromium (VI)
(8) - Aesthetic Guideline Value
(9) - Arsenic (V) (conservative)
(10) - Mercury (Inorganic)
(11) - Trigger Value for Phenol not Total Phenols (Conservative)
(12) - Drinking Water Criteria re-calculated for N
(13) - Health Based Criteria of Nitrite (Conservative)
(14) - Trigger Values for Fresh Water pH>6.5
(15) - Trigger Values for Fresh Water pH<6.5
(16) - Trigger Values for Marine Water pH<6.5
(17) - Environmental Concern Level (ECL) - indicative interim working level only
(18) pH less than 6 has corrosive potential
(L) - 95% Low Reliability Trigger Values (99% protection level applied where recommended)
Exceeds ANZECC 2000 Guidelines - Fresh Waters
Exceeds Australian Drinking Water Guidelines
Sample D1 - replicate sample of SW3 (22/2/2012)
Sample D2 - replicate sample of BY0015CH (23/2/2012)
Sample D3 - replicate sample of SW2 (8/3/2012)
Sample D4 - replicate sample of BY0015CH (29/5/2012)
Sample D5-290512 - replicate sample of SW8 (29/5/2012)
Sample D5-270612 - replicate sample of SW4 (27/6/2012)
Sample D6 - replicate sample of A13 (27/6/2012)
Sample D7 - replicate sample of SW1 (22/7/2012)
Sample D8 - replicate sample of A02-S (23/7/2012)
Sample D9 - replicate sample of BY0014CH (20/8/2012)
Sample D10 - replicate sample of SW9 (20/8/2012)
Sample D11/KMH - replicate sample of A02-S (18/9/2012)
Sample D12/KMH replicate sample of SW7 (19/9/2012)
Sample D13 replicate sample of BY0014CH (21/10/2012)
Sample D14 replicate sample of SW6 (22/10/2012)
Sample D15 replicate sample of A13 (4/12/2012)
Sample D16 replicate sample of SW4 (3/12/2012)
Sample D17 replicate sample of A01-S (14/1/2013)
Sample D18 replicate sample of SW4 (15/1/2013)
Sample D19 replicate sample of SW4 (19/2/2013)
Sample D20 replicate sample of A20 (19/2/2013)
Sample D21 replicate sample of SW7 (11/3/2013)
Sample D22 replicate sample of BY0016CH (18/3/2013)
Sample D23 replicate sample of BY0016CH (15/4/2013)
Sample D24 replicate sample of SW4 (16/4/2013)
Sample D26 replicate sample of A13 (12/5/2013)
Sample D28 replicate sample of SW4 (13/5/2013)
Sample D29 replicate sample of BY0015CH (18/6/2013)
Sample D30 replicate sample of SW4 (18/6/2013)
Sample D31 replicate sample of AGE10 (25/7/2013)
Sample D33 replicate sample of BY0016CH (19/8/2013)
Sample D34 replicate sample of BY0014CH (19/9/2013)
Sample D35 replicate sample of SW6 (16/9/2013)
Sample D37 replicate sample of A14 (15/10/2013)
Sample D40 replicate sample of A06-S (19/11/2013)
Sample D41 replicate sample of A09 (10/12/2013)
Sample D44 replicate sample of A12 (15/1/2014)
Sample D46 replicate sample of A15 (19/2/2014)
Sample D48 replicate sample of A18 (20/3/2014)
Sample D50 replicate sample of AGE08 (14/4/2014)
Sample D51 replicate sample of AGE08 (19/5/2014)