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REPORT:

Arrow Energy Surat Gas Project

Supplementary Surface Water Assessment Part B – Water Quality

June 2013

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Executive Summary

Arrow Energy Pty Ltd (Arrow) is preparing a supplementary report to the Surat Gas Project Environmental Impact Statement (SREIS) to present updates to the project description, to address issues identified in the Surat Gas Project Environmental Impact Statement (EIS) as requiring further consideration and/or information and to respond to stakeholder comments raised in the submissions on the EIS. This report builds upon the findings of the EIS and refines the water quality assessment included in the EIS.

The main changes to the project description as presented in the EIS, which have the potential to affect the surface water impact assessment, include a reduction of the size of the project development area and the identification of sites to locate four central gas processing facilities (CGPFs) and two water treatment facilities. In addition, the updated project description proposes to potentially discharge treated or untreated coal seam gas water to Bottle Tree Creek and the Condamine River in the Maranoa-Balonne-Border River and Condamine-Macintyre River catchments, respectively. There have been no major changes to the project description for the Fitzroy River catchment since the EIS and as such, the assessment of impacts and mitigation measures to manage the potential impacts to surface water quality in the Fitzroy River catchment remain as per the EIS.

The results of the SREIS water quality field survey showed that the surface waters in the receiving environment of the CGPF2 property (Bottle Tree Creek, Dogwood Creek) and the CGPF9 property (Crawlers Creek, Condamine River) contained levels of nutrients and suspended solids that are indicative of slight-moderately disturbed waters. Waters in Bottle Tree and Dogwood Creek were marginally more acidic and lower in electrical conductivity than those of Condamine River and Crawlers Creek. The SREIS water quality results from the Bottle Tree/Dogwood Creek catchment and the Condamine River catchment were generally comparable with interim site-specific guideline values for protection of slight-moderately disturbed aquatic ecosystems (95% species protection level) that were derived as part of EIS assessment.

E1 Environmental Values

In the absence of specified environmental values or water quality objectives for the Condamine-Macintyre and Maranoa-Balonne-Border Rivers in Schedule 1 of the *Environmental Protection (Water) Policy* 2009, all environmental values that potentially apply to the water resources of the Condamine-Macintyre and Maranoa-Balonne-Border Rivers catchments (aquatic ecosystems, drinking water, agriculture, waters that may be used for aquaculture, stock watering, farm supply, recreation and aesthetic, industrial uses, aquatic foods for human consumption and cultural and spiritual values) were nominated for the Surat Gas Project. The environmental protection objectives for surface waters in the receiving environment of the project development area aim to avoid any degradation in water quality, water access, and the physical, chemical and biological characteristics of the creeks and rivers and to maintain their values.

E2 Potential Impacts

Discharge to Watercourses

Part of Arrow's Coal Seam Gas Water and Salt Management Strategy for disposal of coal seam gas water proposes the potential discharge of treated or untreated coal seam gas water into Bottle Tree Creek and the Condamine River. The SREIS water quality assessment determined that the recommendations given by Alluvium 2013, regarding the location of infrastructure within the CGPF2 and 9 properties and the type of discharge strategy for each water treatment facility were adequate to prevent significant increases in suspended sediment that would lead to deterioration in water quality and potent impacts on nominated environmental values.

The untreated water quality of Arrow's test wells and dams exceed guideline values for the protection of nominated environmental values for the Surat Gas Project suggesting that it has the potential to impact on the receiving environment if untreated water was released into the receiving environment. The EIS determined that through the implementation of appropriate mitigation measures, potential impacts associated with controlled and uncontrolled releases of treated or untreated quality coal seam gas water to the Surat Gas Project receiving environment could be managed under emergency situations. As part of the SREIS

assessment, flood modelling has identified areas suitable to locate potential project infrastructure that are mostly flood-free, allowing for a reduction in the risk of overland flows inundating these facilities resulting in uncontrolled releases of untreated coal seam gas water to the receiving environment. In the event that dams cannot be practicably sited outside of the 1-in-100 Annual Recurrence Interval (ARI) flood extent, such storages should be designed to account for predicted flood conditions.

Erosion and Sedimentation Mobilisation
There is the potential for water quality impacts on the receiving environment of the Surat Gas Project from land disturbance due to the construction of wells and the CGPFs. It is determined that through the implementation of appropriate mitigation measures, the potential impacts on water quality can be managed.

Beneficial Use
The distribution of coal seam gas water to existing and new users for beneficial use will be used to manage volumes of coal seam gas water over the yearly cycle. It is noted that the distribution of coal seam gas water to potential users would need to be of a quality that meets the guideline value for that respective use. Where there is the opportunity for waters that are distributed to agricultural users (crop irrigation and stock watering) to impact on aquatic ecosystems in areas surrounding agricultural land (via surface water runoff and infiltration to shallow aquifers), it is recommended that the quality of distributed water is of a standard that meets the more stringent aquatic ecosystem guideline value.

E3 Cumulative Impact Assessment

The results of the SREIS water quality field survey indicate that the water quality of streams in the project development area is influenced by anthropogenic uses (*i.e.* agricultural use, mining and urban development). Providing all other planned developments are managed with efficient mitigation measures and discharge strategies with similar objectives as that of the Surat Gas Project, significant impacts on surface water quality should not occur.

E4 Proposed Avoidance, Mitigation and Management

The recommendations from the EIS water quality report with regards to standard control strategies, mitigation measures and monitoring requirements to protect surface water quality and mitigate potential impacts to the environmental values for the Surat Gas Project remain relevant. The SREIS assessment details a framework for achieving a surface water discharge strategy that aims to satisfy the water quality requirements for protection of all nominated environmental values.

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Abbreviations and Acronyms

ADWG	Australian Drinking Water Guidelines
Alluvium	Alluvium Consulting Australia
ANZECC & ARMCANZ 2000	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ARI	Annual Recurrence Interval
CGPF	Central gas processing facility
Coffey Environments	Coffey Environments Australia Pty Ltd
CQCHM	Central Queensland Cultural Heritage Management Pty Ltd
DEHP	Department of Environment and Heritage Protection
DERM	Department of Environment and Resource Management
DNRM	Department of Natural Resources and Mines
DO	Dissolved Oxygen
EA	Environmental Authority
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EP Act	Environmental Protection Act 1994
EP Regulation	Environmental Protection Regulation 2008
EPP(Waste)	Environmental Protection (Waste Management) Policy 2000
EPP(Water)	Environmental Protection (Water) Policy 2009
ha	Hectare
IESC	Independent Expert Scientific Committee
L	Litre
LOR	Limit of Reporting
mg	Milligram (1 thousandth of a gram)
mg/L	Milligrams per litre
µg/L	Micrograms per litre
µS/cm	Microsiemens per centimetre
NAP	National Action Plan
NPA	National Partnership Agreement
NRA	NRA Environmental Consultants (for Alluvium)
NTU	Nephelometric Turbidity Units, provides a measure of turbidity
NWQMS	National Water Quality Management Strategy
pH	Per Hydrogen. Measurement of the hydrogen ion concentration.
QWQG	Queensland Water Quality Guidelines
SREIS	Supplementary Report to the Environmental Impact Statement
TJ/d	TeraJoule per day
WRR	Waste Reduction and Recycling Act, 2011

Glossary

Coal Seam Water	Underground water taken from or interfered with from a coal seam gas well during the course of or resulting from carrying out petroleum activities. Water from petroleum activities is also known as associated water.
Dissolved Oxygen	A measure of the amount of oxygen dissolved in water, measured as % saturation.
Electrical Conductivity	A measure of the amount of total dissolved salts in water, measured in units of S/m or µS/cm.
Eutrophication	Excessive plant growth in water bodies resulting from inputs of nutrients which can deplete dissolved oxygen and cause other organisms to die.
Trigger value	A nominated concentration for a surface water quality parameter of interest, where an exceedance of this value prompts further investigation to assess the risk to the environmental values.
Turbidity	A measure of the cloudiness or haziness of water, measured in units of NTU.

1 Introduction

The supplementary report to the Surat Gas Project Environmental Impact Statement (SREIS) presents updates to the project description since development of the Environmental Impact Statement (EIS), items requiring further consideration and responds to stakeholder comments raised in submissions on the Arrow Energy Surat Gas Project EIS. NRA Environmental Consultants (NRA) was commissioned by Alluvium Consulting Australia (Alluvium) to address aspects relating to surface water quality for the SREIS.

The water quality assessment included the following tasks:

- Review of the updated project description.
- Responses to address stakeholder comments relating to the EIS surface water quality assessment.
- Design and completion of a water quality field survey.
- Assessment of potential impacts associated with the updated project description.
- Design of a framework for achieving a coal seam gas water discharge strategy that satisfies water quality requirements for all nominated environmental values during periods of discharge.

The following assessment builds on and refines the water quality assessment included in the EIS (Volume 5, Appendix I, Part B: Water Quality) (NRA 2011).

2 Background

2.1 Overview of Work Completed to Date

The water quality component of the EIS surface water assessment comprised a desk-based study and field surveys to characterise the water quality conditions of streams and wetlands in the Surat Gas Project development area, to define the environmental values of these surface waters to inform the assessment of impacts and the development of mitigation measures. Environmental values (e.g., aquatic ecosystems, drinking water and agricultural use) were nominated for the Project in accordance with the *Queensland Water Quality Guidelines* 2009 (QWQG) (DERM 2009a) and *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC) (ANZECC & ARMCANZ 2000). Water quality conditions and the use of surface water in the project development area were also considered.

The desk-based study considered a conceptual layout of project infrastructure (including facilities, wells, access tracks and gathering lines) in the assessment of potential impacts on the nominated environmental values. Site-specific assessments were not possible because infrastructure locations were not known, although the general condition of surface waters in the project development area was described. While specific impacts from well pads and facility locations on surface water values could not be determined, the EIS provided mitigation measures to reduce potential impacts to surface waters.

The following section describes changes to the project description since the EIS and identifies project components that could potentially have impacts on the surface water quality.

2.2 Project Description Update

The main changes to the project description as presented in the EIS, which have the potential to affect the surface water impact assessment or provide the opportunity to undertake site-specific assessments, include a reduction of the size of the project development area, the identification of sites to locate four central gas processing facilities (CGPFs) and two water treatment facilities. In addition, the updated project description outlined options for the proposed discharge of treated or untreated coal seam gas water under normal operations. Details of changes to the project description are provided below.

Due to the relinquishment of parcels of land within Arrows' exploration tenements, there has been a reduction in the overall size of the project development area from 8,600 km^2 to 6,100 km^2. The majority of these relinquishments were made in the Goondiwindi development region. With a smaller project development area, there has been a reduction in the number of production wells anticipated to be drilled from 7,500 to approximately 6,500. In addition to single wells, multi-well pads will also be drilled, which will be comprised of up to 12 wells per pad, approximately 8 m apart.

The EIS presented the sequence of the project's development in terms of 5 development regions. The SREIS now describes the development sequence in terms of 11 drainage areas. Each drainage area contains wells, a water and gas gathering network and a CGPF. They are identified by sequential numbering and correspond with the gas reserves that will be fed into the CGPF within each drainage area. This number of CGPFs has been reduced from 12 described in the EIS to 8. The number of water treatment facilities has been reduced from six described in the EIS to two.

The water treatment facilities will be co-located with two of the CGPFs. Arrow has identified four properties to locate the following CGPFs: CGPF2, CGPF7, CGPF8 and CGPF9. CGPFs are numbered according to which drainage area they will be located within. The southern water treatment facility, within drainage area (DA) 9, will be co-located with CGPF9 and the northern water treatment facility, within DA2, will be co-located with CGPF2. A fifth property has been identified by Arrow to locate a temporary workers accommodation facility (TWAF), TWAF F, and this property is located within DA9. For the purposes of this report, the properties are referred to as 'CGPF # property' or 'TWAF F property' (e.g., the property identified to locate CGPF2 is referred to as CGPF2 property). The exact locations of infrastructure within these properties have not been determined and the final positioning of infrastructure will be informed by detailed design which will include environmental

constraints as well as technical constraints. Site-specific surface water assessments of geomorphology and hydrology, including flooding regimes were undertaken at the five properties and water quality assessments undertaken at the CGPF2 and CGPF9 properties.

The number of water treatment facilities has been reduced from six described in the EIS to two. There have been changes to the volumes of water treated by these facilities per day, which were described in the EIS as having a modular water treatment capacity of 30 to 60 ML per day (ML/d). The northern water treatment facility, co-located with CGPF2, is planned to treat approximately 35 ML/d of coal seam gas water. The southern water treatment facility, co-located with the CGPF9, is expected to be rated at approximately 90 ML/d.

One of the coal seam gas water management options is for coal seam gas water to be discharged from each water treatment facility to a nearby watercourse as required and within prescribed limits yet to be determined. Discharge to watercourses is a management option that addresses the variability of other coal seam gas water management options (*i.e.* distribution to existing and new water users for beneficial use and re-injection to a suitable aquifer). Surface water aspects such as watercourse type, morphology, and aquatic ecosystems at the two identified water treatment facility sites (CGPF2 property and CGPF9 property) will dictate the coal seam gas water management options that can be utilised at each facility site.

3 Legislative Context and Standards

The opinions of NRA relate solely and exclusively to environmental management matters, and are based on the technical and practical experience of environmental practitioners. They are not presented as legal advice, nor do they represent decisions from the regulatory agencies charged with the administration of the relevant Acts.

In February 2012, Queensland signed the National Partnership Agreement (NPA) on Coal Seam Gas and Large Mining Development. The purpose of this agreement is to create a more consistent national approach to strengthen the regulation of coal seam gas and large coal mining development by ensuring that future decisions are informed by substantially improved science and independent expert advice. The agreement does this by establishing an Independent Expert Scientific Committee (IESC) which gives expert scientific advice on significant coal seam gas and large coal mining development proposals likely to have a significant effect on water resources to the Queensland and Australian governments.

In accordance with the terms of the NPA, the former Queensland Department of Environment and Resource Management published a protocol which specifies how the Queensland Government will decide which project applications should be referred to the IESC for advice. The Queensland Government has committed to referring all project applications for coal seam gas developments that are likely to have a significant impact on water resources to the IESC for advice.

3.1 Relevant Legislation

This section focuses solely on legislative aspects that may have relevance to surface water quality. Legislation relevant to all project activities and environmental aspects is extensive and not discussed here.

Coal Seam Gas Fields
Key legislation governing the management of surface water quality in regards to coal seam gas fields includes:

- Queensland *Environment Protection Act* 1994 (EP Act). The EP Act provides the principal legislative framework for environmental management and protection in Queensland. The objective of the EP Act is to '*protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends*'. The EP Act establishes a general environmental duty which requires that 'a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm'.
- *Environmental Protection (Water) Policy* 2009 (EPP(Water)). The policy provides a framework for achieving the objectives of the EP Act in relation to Queensland waters through:
  - identification of environmental values and management goals for Queensland waters,
  - implementation of surface water quality guidelines and objectives to enhance or protect the environmental values, and
  - monitoring and reporting on the condition of Queensland waters.
- *Environmental Protection Regulation* 2008 (EP Regulation), the Queensland *Waste Reduction and Recycling Act* 2011 (WRR Act) and the *Environmental Protection (Waste Management) Regulation* 2000. These promote the beneficial use of coal seam gas water from petroleum activities in accordance with the waste and resource management hierarchy in the WRR Act and minimisation of environmental harm.
- Queensland *Water Act* 2000 (Water Act). The purpose of the Water Act includes providing for the sustainable management of water and other resources and the establishment and operation of water authorities. The Water Act aims '*to advance sustainable management and efficient use of water and other resources by establishing a system for the planning, allocation and use of water*'. Under the Water Act, the term watercourse includes seasonally flowing watercourses, the definition of which often requires a site inspection by the administering authority. The Water Act sets out permitting and licencing requirements for taking or interfering with water and other resources. A riverine protection permit is required where the development will destroy vegetation, excavate or place fill in a watercourse. A development permit may be required to take or interfere with water from a

watercourse or take or interfere with overland flow water. An application for allocation of quarry material or development approval may be required for use of material from a watercourse. Although permits under the Queensland *Vegetation Management Act* 1999 are not required by petroleum activities because vegetation clearing is regulated through the Environmental Authority (EA), activities associated with clearing in watercourses may trigger requirements under the Queensland Biodiversity Offsets Policy (2011) and the Queensland *Nature Conservation Act* 1992. Where a riverine protection permit is not required, activities in watercourses should be undertaken in accordance with the *Guideline – activities in a watercourse, lake or spring associated with a resource activity or mining operations* (DNRM 2012), unless otherwise authorised by the administering authority.

- Queensland *Fisheries Act* 1994. The construction of a barrier (temporary or permanent) that may act as a barrier to fish passage requires a development approval.
- Queensland *Water Supply (Safety and Reliability) Act* 2008*.* A development approval may be required for construction of a referable dam. The *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* (EHP 2012b) sets out the requirements for hazard category assessment and certification of the design of regulated structures.
- Queensland *Sustainable Planning Act* 2009 (SP Act)*.* Authorised petroleum activities undertaken on a petroleum authority are exempt from most provisions of the SP Act. However, if petroleum tenure holders wish to construct infrastructure off-tenure, such as pipelines, they will need to comply with the provisions of the SP Act. Operational works for taking, or interfering with, water are assessable development (Schedule 3 of *Sustainable Planning Regulation* 2009).

Guidelines and Policies

Key guidelines and policies relevant to surface water quality management are:

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ 2000). These guidelines provide a methodology for assessing water quality through comparison with guidelines derived from local reference values.
- *Queensland Water Quality Guidelines* (QWQG) (DERM 2009a). The guidelines provide locally and regionally relevant water quality values for fresh, estuarine and marine waters. Where the QWQG values are more localised than those derived using ANZECC & ARMCANZ 2000, the QWQG take precedence.
- *Environmental Protection (Water) Policy* 2009 *Dawson River Sub-basin Environmental Values and Water Quality Objectives* (DERM 2011). This document contains environmental values and water quality objectives for waters in the Dawson River Sub-basin (excluding Callide Creek catchment), and is listed under schedule 1 of the EPP (Water).
- Coal Seam Gas Water Management Policy (EHP 2012a). The purpose of the policy is to ensure that water produced through coal seam gas activities does not impact the environment and to encourage the beneficial use of treated coal seam gas water.

Some additional considerations include:

- The *Petroleum and Gas (Production and Safety) Act* 2004 and *Petroleum Act* 1923*,* in addition to the *Water Act* 2000, *Water Supply (Safety and Reliability) Act* 2008 and *Waste Reduction and Recycling Act* 2011 mentioned above, establish the regime for the taking, use and on-supply of coal seam gas water and impose obligations for monitoring and making good any impacts the extraction of coal seam gas water has on existing bores licensed under the *Water Act 2000*. The EP Act deals with the regulation of environmental impacts arising from the use or disposal of coal seam gas water (as identified above).
- The *Water Resources (Fitzroy Basin) Plan* 2011, *Water Resources (Moonie) Plan* 2003 and *Water Resources (Condamine and Balonne) Plan* 2004 and their respective Resource Operations Plans are of relevance to the Surat Gas Project. The purpose of these plans is to provide a framework for managing water and includes reversing, where practicable, degradation that has occurred to natural ecosystems including stressed rivers.
- The Condamine-Balonne, Moonie and Border River catchments are part of the Murray-Darling system. The *Murray-Darling Basin Agreement* was signed in 1992. This is given legislative status by the Commonwealth *Water Act 2007.* The agreement was ratified by identical legislation that has been

enacted by the parliaments of all the signatory governments. In terms of salinity management, the Queensland Government has obligations in the implementation of the *Basin Salinity Management Strategy 2001-2015.* According to the strategy, salinity and water quality outcomes will be delivered within the framework of integrated catchment management and the *National Action Plan (NAP) for Salinity and Water Quality*. Meanwhile, Queensland has committed to accountabilities and responsibilities for implementing the strategy. A Murray Darling Basin Plan was adopted in November 2012 and prepared under the Commonwealth *Water Act* 2007. The Plan was prepared to improve ecological health, water quality and water management arrangements for the Basin and includes long-term average sustainable diversion limits which will restrict the amount of water that can be taken for consumption so as not to compromise key ecosystem functions, key environmental assets, the productive base of the water resource and key environmental outcomes for the water resource. This is of relevance with respect to surface water quality management in parts of the project development area.

- The Healthy Headwaters Coal Seam Gas Water Feasibility Study is being managed by the Department of Natural Resources and Mines (DNRM) and is intended to analyse the opportunities for, and the risks and practicability of, using coal seam gas water to address water sustainability and adjustment issues in the Queensland section of the Murray–Darling Basin. The study is due for completion in early 2013. The outcomes of this study may be of relevance with respect to surface water quality management in parts of the project development area.
- The rehabilitation and decommissioning of the coal seam gas fields will be undertaken progressively over the life of the project and will be in accordance with the *Petroleum and Gas (Production and Safety) Act 2004, Petroleum Act 1923,* EP Act 1994*, Waste Reduction and Recycling Act* 2011*,* the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* 1998 and EHP *Guideline Rehabilitation requirements for mining projects* (12 August 2012). EHP published the *Guideline for Contaminated Land Professionals* for consultation in October 2012; it is understood that upon its finalisation the 2012 document will supersede earlier guidelines prepared by the State.

Pipelines

The *Petroleum and Gas (Production and Safety) Act* 2004 is key legislation which applies to the construction of any water or petroleum pipelines, as well as that described above.

Rehabilitation and decommissioning of pipelines will be undertaken in accordance with relevant regulatory requirements, Australian Standards and industry guidelines including the *Petroleum and Gas (Production and Safety) Act* 2004, EP Act, Australian Pipeline Industry Association *Code of Environmental Practice – onshore pipelines* 2009; and the Australian Petroleum Production and Exploration Association *Code of Environmental Practice* 2008.

3.2 Approvals Relevant to Surface Water

The approvals relevant to water quality were determined in consultation with the relevant regulatory authorities. Table 3-1 presents a list of approvals considered relevant to the project.

Table 3-1. Approvals relevant to surface water

Approval Source	Responsible Authority	Relevant Aspect of Project
Commonwealth *Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The then Commonwealth Minister for the Environment, Water, Heritage and the Arts (now the Department of Sustainability, Environment, Water, Population and Communities) decided the project constitutes a "controlled action" under relevant controlling provisions of the EPBC Act.	Commonwealth Minister for Sustainability, Environment, Water, Population and Communities.	Any aspect of the project which is likely to impact on a relevant matter of national environmental significance, including water resources.

Approval Source	Responsible Authority	Relevant Aspect of Project
Queensland EP Act and Environmental Protection Regulation 2008	Department of Environment and Heritage Protection	An EA is required to carry out an environmentally relevant activity which includes petroleum activities. The EA will also authorise other environmentally relevant activities to be carried out in the area of a petroleum authority granted under the Petroleum and Gas (Production and Safety) Act 2004. If any environmentally relevant activities are undertaken on areas other than those subject to a petroleum authority, then a development approval under the SP Act or an EA under the EP Act may be required.
Queensland *Sustainable Planning Act* 2009 (and other legislation) or local government planning schemes.	Department of State Development, Infrastructure and Planning.	If an activity is located outside Arrow's petroleum tenures, a development approval under the SP Act may be required. Schedule 3 of the Sustainable Planning Regulation sets out activities that require development approval. The intention is that the activities associated with the Surat Gas Project will almost entirely occur on areas subject to relevant petroleum authorities.
Queensland *Water Act* 2000. Development approval for operational work (SP Regulation, Schedule 3, Part 1, Table 4, Item 3(a), (b) and (c)).	Department of Natural Resources and Mines	A development approval may be required to: • take or interfere with water from a watercourse; or • take or interfere with artesian water; or • take or interfere with overland flow water or subartesian water.
Queensland Water Act 2000. Allocation notice for quarry material Development approval for removing quarry material from a watercourse (SP Regulation, Schedule 3, Part 1, Table 5, Item 1).	Department of Natural Resources and Mines	Quarry material includes stone, gravel, sand, rock, clay, earth and soil, unless it is removed from a watercourse as waste material.
Queensland *Water Act* 2000. Riverine protection permit.	Department of Natural Resources and Mines	A riverine protection permit is required to do any or all of the following activities in a watercourse, lake or spring: • destroy vegetation; • excavate, and • place fill.
Queensland *Fisheries Act* 1994. Development approval for a waterway barrier (SP Regulation, Schedule 3, Part 1, Table 4, Item 6).	Department of Agriculture, Fisheries and Forestry	A development approval is required for the construction and raising of waterway barrier works (waterway barriers).
Water Supply (Safety and Reliability) Act 2008. Development approval for operational work being the construction of a referrable dam as defined under the *Water Supply (Safety and Reliability) Act* 2008. (SP Regulation, Schedule 3, Part 1, Table 4, Item 4 (a)).	Department of Natural Resources and Mines	A development permit for operational work is required for the construction of a referrable dam as defined under the *Water Supply (Safety and Reliability) Act* 2008. This only applies to dams of a certain size and does not include dams that contain hazardous waste.

4 Survey Areas

Watercourses within the receiving environment of the two properties identified to locate water treatment facilities were monitored for water quality. The northern water treatment facility is co-located with CGPF2 (on the CGPF2 property) in the headwaters of Maranoa-Balonne-Border Rivers catchment. The area assessed in the receiving environment of the CGPF2 property is referred to as survey area 2. The southern water treatment facility is co-located with CGPF9 (on the CGPF9 property) in the Condamine-Macintyre Rivers catchment. The area assessed in the receiving environment of the CGPF9 property is referred to as survey area 9.

Survey area 2 included watercourses of the Bottle Tree Creek catchment, including Bottle Tree Creek and Dogwood Creek (see Figure 4-1). Bottle Tree Creek is a tributary of Dogwood Creek that flows south into the Balonne River approximately 8 km downstream of Miles. The streams of the Bottle Tree Creek catchment are intermittent, with surface waters receding to disconnected pools over the dry winter months (NRA 2011). Survey area 9 included streams of the Condamine River catchment including the Condamine River and Crawlers Creek (see Figure 4-2). For proposed treated water discharge locations refer to the Surface Water Technical Study – Part A Geomorphology and Hydrology Report (Alluvium 2013a).

The hydrology of the Condamine River has been greatly altered since European settlement through clearance of vegetation and construction of weirs, dams and extraction of water for agriculture. Water quality in the streams of the Maranoa-Balonne-Border and Condamine-Macintyre Rivers varies in response to flow seasonality and generally exceeds ANZECC & ARMCANZ 2000 guideline values for the protection of slightly-moderately disturbed ecosystems (NRA 2011).

There are several tributaries of the Condamine River in the central part of the project development area which run through three of the five main sites identified as the locations of potential project infrastructure (properties to site CGPF7, CGPF8 and TWAF F). No discharge of coal seam gas water from these facilities is proposed.

The Surat Gas Project includes a small number of streams in the north of the project development area in the headwaters of the Dawson River which flow northwards into the Fitzroy River catchment and discharge to the Great Barrier Reef Marine Park between Rockhampton and Gladstone. There have been no major changes to the project description for the Fitzroy River catchment since the EIS assessment and as such, the assessment of impacts and mitigation measures to manage the potential impacts to surface water quality in the Fitzroy River catchment remain as per NRA 2011.

Present and potential water uses for the catchments in the project development area include drinking water, agriculture (irrigation of crops and pasture, stock watering), industrial, aquaculture and recreational use. Water is drawn from streams in the Condamine-Balonne River catchment for drinking water supply including from the weir pool on the Condamine River at Cecil Plains. The project development area contains a rich and varied cultural landscape that is of particular significance to the local Aboriginal communities (CQCHM 2011).

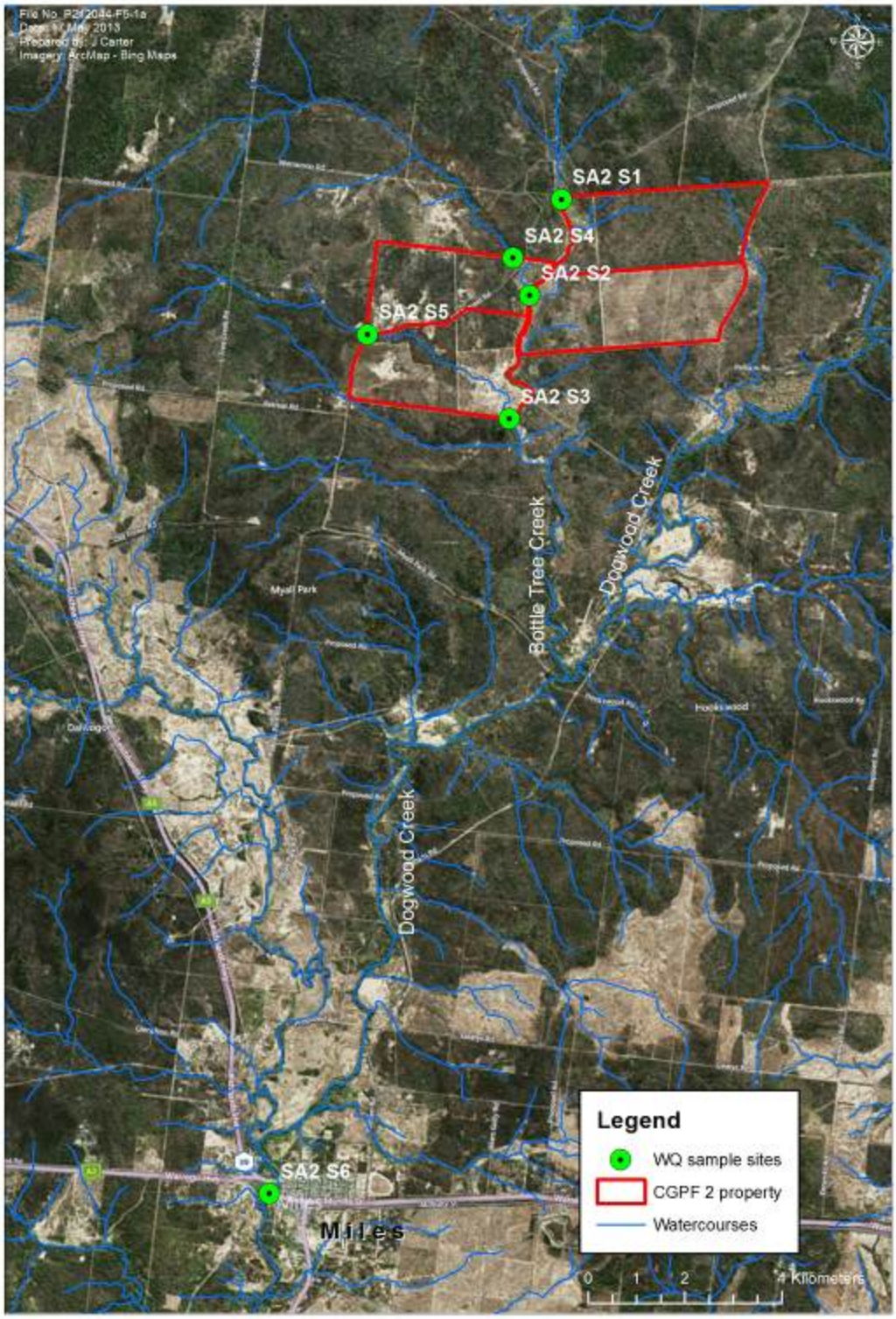

Figure 4-2. SREIS water quality sampling sites in survey area 2

Figure 4-3. SREIS water quality sampling sites in survey area 9

5 Method of Assessment

This section describes the approach that has been applied to the assessment of potential impacts from the updates to the project description as described in Section 2. The surface water quality assessment for the EIS was used as the basis for the SREIS assessment. The streams potentially affected by discharges from the proposed northern and southern water treatment facilities were assessed in greater detail with knowledge of the general location of the proposed infrastructure and the fact that discharge may now occur under normal operations.

5.1 Desk-based Assessment

The SREIS assessment considered approaches recommended in the EP Act 1994, the EPP (Water) 2009, the National Water Quality Management Strategy (NWQMS), the QWQG and ANZECC & ARMCANZ 2000 to identify environmental values and water quality objectives for the Surat Gas Project. The surface water quality assessment involved the following tasks:

- Definition of the overall management intent for the Surat Gas Project area. This involved collating information on threats and issues, determining waterbody condition, and nominating the environmental values requiring protection for each waterbody.
- Review of surface water quality in the relevant catchments and associated subcatchments (*i.e.* the headwaters of Maranoa-Balonne-Border Rivers catchment and the Condamine-Macintyre Rivers catchment). This was based on:
  - the field surveys conducted for this assessment;
  - existing data obtained from the surface water quality database maintained by the Department of Natural Resources and Mines (DNRM) (previously the Department of Environment and Resource Management (DERM)), and
  - project-specific surface water quality data supplied by Arrow.
- Confirmation of appropriate surface water quality guidelines, *i.e.* to provide guidance on how a waterbody is measured or assessed to determine if it is fit for the purpose, or if impacts are significant. This required a review of guidelines relevant to the nominated environmental values (refer to Table A1T-1, Attachment A) and their applicability to site-specific conditions.
- Definition of surface water quality objectives, *i.e.* setting measurable and achievable targets. These were derived with reference to the relevant water quality guidelines nominated in the previous task.
- Provision of recommendations for surface water quality monitoring and management responses to unacceptable water quality, *i.e.* what should be done if performance is unsatisfactory or objectives are not being met.

Concise water quality objectives based on existing threats, waterbody condition and desired outcomes assist with the development of an effective monitoring program to ensure current surface water quality is acceptable for a given end use and/or if environmental obligations are being met.

Determining Appropriate Surface Water Quality Guideline Values
Water quality monitoring is a management tool to provide an indication of on-site performance against achievable and measurable objectives or targets. The surface water quality monitoring program recommended in this document is targeted at assessing the efficacy of control strategies, and provide early warning of potentially deleterious impacts so that timely interventions can be implemented, thereby maintaining the environmental values of relevant receiving waters.

Water quality guideline values are a basic tool for assessing potential impacts and issues, however they have limitations and if applied incorrectly may lead to inappropriate decision-making and management. The following is a brief introduction to the use of guidelines.

The main sources of guideline values in Queensland are the QWQG and ANZECC & ARMCANZ 2000. The published guidelines usually separate out groups of pollutants or water quality indicators according to the following groups:

- Toxicants – heavy metals, metalloids, inorganic pollutants and/or organic pollutants (such as pesticides, PCBs *etc*) that are directly toxic to biota.
- Stressors – nutrients, electrical conductivity (EC), turbidity, pH and dissolved oxygen (DO) that may alter ecosystem processes (*e.g.* euthrophication), but are not directly toxic to biota.

Some indicators such as ammonia and nitrate can be both stressors and toxicants depending on the concentrations present. Water quality indicators for the Surat Gas Project have been nominated based on:

- Review of pre-treated water quality data for waters associated with coal seam gas wells (Table A1T-1, Attachment A);
- Review of existing Environmental Authorities (EAs) including water quality criteria for dams and evaporation ponds for coal seam gas wells;
- Review of surface water quality data for receiving environment waters; and
- Review of project description data and an understanding of the project activities and impacts.

According to both QWQG and ANZECC & ARMCANZ 2000, when deriving guideline values for ecosystem protection at a particular site, available data should be used in the following order of preference.

- Available data on local biological effects (ecotoxicological data).
- Local reference data (*i.e.* from reference sites in a very similar condition/setting but that are free of the impact being measured. For example reference data may be gathered upstream of a potential impact).
- Regional reference data *e.g.* QWQG guidelines for stressors.
- Australian generic default guidelines *i.e.* ANZECC & ARMCANZ 2000.

Therefore, the default guideline values found in ANZECC & ARMCANZ 2000 should be seen as a 'last resource'. In addition, the EPP Water states that guidelines may be taken from local documents or from ANZECC & ARMCANZ 2000, but that local guideline information (where available) shall take precedence where there are differences. It is always preferable to use local effects or local reference data where available because:

- ANZECC & ARMCANZ 2000 default guideline values are based on data derived nationally or internationally and may not represent local circumstances or conditions;
- Little of the data (even when generated in Australia) from which default guidelines values have been derived has been produced in south-east Queensland; and
- Use of default guideline values does not allow the guideline values to be set according to seasonal conditions and therefore have some limitations when used in areas of Australia with marked wet and dry seasons (such as inland Queensland).

Care and professional judgement are required if applying ANZECC & ARMCANZ 2000 default guideline values.

In practice, adequate data about local biological effects is rarely available and appropriate guideline values should be derived using available data in the following order of preference.

- Local surface water quality reference data (data from a similar reference system or upstream of impacts). Additional sampling will be required to obtain an appropriate local reference dataset for the Surat Gas Project (a minimum of 18 data points collected from each of one to two reference sites (or 12 data points for each of three or more reference sites) over a minimum period of 12 months (QWQG)).
- QWQG default guidelines for stressors.
- ANZECC & ARMCANZ 2000 default guidelines for stressors and toxicants in water.

Understanding the correct application of guideline values is simpler if the reader is aware of some common mistakes, these include the following.

- Guideline values should not be adopted as compliance limits.
- With respect to aquatic ecosystems, it is clearly stated in QWQG and ANZECC & ARMCANZ 2000 for the protection of aquatic ecosystems that the guidelines are not intended for assessing discharge water quality, stormwater quality or storm flow events in creeks. They are intended to be applied to ambient flow situations only.

The ANZECC & ARMCANZ 2000 default guideline values for aquatic ecosystems are based on chronic toxicity data, *i.e.* on the likely consequences of long-term exposure. No default guidelines are provided for critical short-term exposure (acute toxicity). ANZECC & ARMCANZ 2000 guideline values are referred to as 'trigger values', exceedance of which triggers further investigation and assessment. However, for effective management it is also important to nominate concentrations above which immediate and high level responses may be warranted (*i.e.* contaminant limits). In the absence of site-specific and species-specific information *e.g.* readily available acute toxicity data, assigning contaminant limits is random. Contaminant limits may be based on extremes of reference site data, or guideline values for a subordinate environmental value (such as drinking water or primary industries). Site-specific data is required to establish trigger values, and may also serve to progress the development of contaminant limits.

Determining Surface Water Quality Guideline Values for the Surat Gas Project
Based on the environmental values nominated for the Surat Gas Project (slightly-moderately disturbed waters, waters that may be used for drinking water, primary industries, recreation and aesthetic, industrial use purposes and possess cultural and spiritual values) (refer to Section 5.2), a set of analytes and interim site-specific guideline values have been developed for the four major catchments within the Surat Gas Project development area.

Interim site-specific water quality guideline values for the Dawson, Balonne, Condamine and Macintyre-Brook River catchments were derived for the EIS for the purpose of a catchment-scale comparison of water quality conditions in the project development area following the approach outlined in Section A2.3 of NRA 2011. All water quality data for these catchments available at the time of preparation of the EIS (*i.e.* data maintained by DNRM – previously DERM –) and collected during EIS field surveys across a range of flow and non-flow conditions) were compiled to create a representative water quality dataset that was subsequently used for the derivation of interim site-specific guideline values for the Surat Gas Project EIS water quality assessment.

The interim site-specific guideline values were retained for the SREIS assessment to compare data collected from survey areas 2 and 9 (proposed to locate water treatment facilities) against a larger set of data from the Balonne River catchment (Table A1T-2, Attachment A) and Condamine River catchment (Table A1T-3, Attachment A).

The interim site-specific guideline values are not intended to provide compliance limits. Instead they provide trigger values, allowing users of the document to assess water quality conditions and identify corrective actions where elevated results 'trigger' further investigation. The suitability of the interim site-specific guideline values for monitoring of water releases from the water treatment facilities is discussed in Section 8.

5.1.1 Nominating Environmental Values

The EPP Water contains environmental values and water quality objectives for the Fitzroy Basin (Dawson) in *Dawson River Sub-basin Environmental Values and Water Quality Objectives*, published September 2011. The *Water Resource (Fitzroy) Plan* 2011 recognises the ecological values of Dawson sub-basin rivers by way of environmental flow provisions. There have been no major changes to the project description relevant to the Fitzroy River catchment since the EIS assessment and as such, the assessment of impacts and mitigation measures to manage the potential impacts to surface water quality in the Fitzroy River catchment remain as per NRA 2011.

The EPP Water does not nominate specific environmental values or water quality objectives for the Condamine-Macintyre and Maranoa-Balonne-Border River catchments. For water quality objectives intended to protect the nominated environmental values, the EPP Water refers to the *Queensland Water Quality*

Guidelines (DERM 2009a) and ANZECC & ARMCANZ 2000. In the absence of defined environmental values, ANZECC & ARMCANZ 2000 recommends that managers and practitioners take a conservative approach and assume that all appropriate environmental values apply to the resource.

The environmental values in Table 5-1 are considered appropriate for waters of the Condamine-Macintyre and Maranoa-Balonne-Border River catchments within which the southern and northern water treatment facility sites lie respectively, along with waters of the Dawson River where limited surface water infrastructure will be located.

Table 5-1. Surface water environmental values nominated for the Surat Gas Project Area

	Waters	
Environmental value	**Upper Dawson – Taroom area Southern Tributaries**	**Condamine-Macintyre and Maranoa-Balonne-Border River catchments**
Aquatic ecosystems	Moderately disturbed	Slightly-moderately disturbed
Primary Industries	Irrigation	Irrigation
	Farm water supply	Farm water supply
	Stock watering	Stock watering
	Human consumer of aquatic foods	Human consumer of aquatic foods
	-	Aquaculture
Recreation and Aesthetic	Primary recreation	Primary recreation
	Secondary recreation	Secondary recreation
	Visual recreation	Visual recreation
Drinking water	Raw drinking water	Raw drinking water
Industrial uses	Mining and manufacture	Mining and manufacture
Cultural and spiritual values	Cultural and spiritual	Cultural and spiritual

Waters in survey areas 2 and 9 are considered to represent slightly-moderately disturbed aquatic ecosystems based on the following considerations.

- During the EIS and SREIS field surveys, watercourses were observed to be affected by human activity due to land uses upstream of sample locations. The sample locations were not sufficiently degraded to be considered highly disturbed waters.
- The project development area is located in a modified landscape. Over 60% of the project development area is devoted to primary industries including irrigated cropping, intensive livestock industries and rangeland grazing. Land use in the vicinity of the proposed northern treatment water treatment facility is mostly grazing land and forested areas, with resource industry facilities (*i.e*. coal mines and associated facilities) located nearby while irrigated cropping land dominates the Condamine River floodplain near the site of the proposed southern water treatment facility.

These environmental values have been used to determine the surface water quality guidelines, water quality objectives[1] and control strategies which are used as the basis for the monitoring requirements recommended for the Surat Gas Project.

5.1.2 Environmental Protection Objectives

In the absence of water quality objectives, either nominated for the Condamine-Macintyre and Maranoa-Balonne-Border Rivers in the EPP Water or set for rivers relevant to the Surat Gas Project through a consultative approach, environmental protection objectives were derived from the water quality guidelines necessary for the maintenance of the environmental values nominated above.

[1] Water quality objectives are established by (a) legislation (Schedule 1 Environmental Protection (Water) Policy 2009), or (b) through a consultative mechanism in accordance with the Environmental Protection (Water) Policy 2009 and with reference to the regulatory guideline - *Establishing Draft Environmental Values And Water Quality Objectives* or (c) are the set of water quality guidelines that will protect all environmental values for the water.

The environmental protection objectives for waters in the receiving environment of Arrow operations are as follows:

- Maintain the quantity of water in streams and pools so that existing and potential environmental values, including biological integrity, are protected.
- Ensure that the quality and quantity of coal seam gas water discharge does not adversely affect environmental values or the health, welfare and amenity of people and land uses and meets statutory requirements and acceptable standards.
- Ensure water resources used for public water supply are protected in accordance with the Australian Drinking Water Guidelines (NHMRC & NRMMC 2011).
- Maintain the integrity, ecological functions and environmental values of wetlands.
- Protect the integrity of the downstream marine environment, specifically the Great Barrier Reef Marine Park and World Heritage property (note that minimal disturbance is expected within the catchment of the Great Barrier Reef Marine Park, *i.e.* the Fitzroy Basin, as no water treatment facilities are planned for this basin, and these streams contribute less than 1% of the total area of the Dawson River catchment and flow approximately 700 km from the project development area before discharging to the sea).
- Maintain sufficient quality of surface waters to protect existing beneficial downstream users of those waters.

5.2 Field Assessment

Site Locations

Sample sites were selected in survey areas 2 and 9 to describe the water quality conditions in the watercourses near the proposed water treatment facility locations and where there was limited background water quality data available to inform the SREIS water quality assessment. Without knowledge of the specific location of treatment facilities and release points, sampling site locations were selected at the upstream and downstream limits of the Arrow properties (to potentially serve as ongoing monitoring sites) and at sites along the streams within the property boundary limits to provide adequate coverage of the streams in the survey areas. A sample was also collected from Dogwood Creek downstream of the CGPF2 property (*i.e.,* Site SA2 S6) in a part of the catchment that had not been sampled during the EIS. A sample was also collected from the Condamine River downstream of the CGPF9 property (*i.e.,* Site SA9 S7)Photos and descriptions of surface water sampling sites in survey area 2 and survey area 9 are presented in Table 5-2, and displayed on Figure 5-1 and 5-2.

Sampling was undertaken between 12 and 14 February 2013 by suitably trained and competent scientists from Alluvium in accordance with the Monitoring and Sampling Manual (DERM, 2010)

Analyte Selection

Analytes included in the EIS and SREIS water quality field surveys were based on an assessment of relevant Environmental Authorities and water quality results for associated coal seam gas wells and dams, and are listed in Table A1T-1 (Attachment A).

The analytes reported for the field survey were nominated with reference to the following.

- Analytes listed in the criteria for hazardous dams in existing EAs[2] for wells in the project development area.
- Analytes exceeding relevant published guideline values in water quality samples collected from wells and dams in the project development area (data provided by Arrow Energy) (Table A1T-1, Attachment A).
- Analytes identified as relevant to the activities associated with the Surat Gas Project.
- Limits of reporting (LOR) (*i.e.* laboratory detection limits) were selected to allow comparison to the most conservative values in the slightly-moderately disturbed ecosystem and drinking water published guidelines.

[2] Note that this document was prepared based on Arrow's EAs existing at the time of preparation of the EIS. Although the EAs may have been superseded, the selection of stock water quality guidelines as criteria for hazardous dams is still considered appropriate.

Water Data

The methods used to collect, analyse and validate the water quality data were guided by:

- AS5667.1:1998 Water Quality-Sampling Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.
- AS5667.6:1998 Water Quality-Sampling Part 6: Guidance on sampling of rivers and streams.
- Monitoring and Sampling Manual (DERM 2010).
- Advice from the laboratory undertaking analysis of the samples.

Water samples were collected directly from the waterbody (without disturbing bottom sediments) in sample bottles provided by SGS Environmental Services (SGS) (NATA accreditation number 2562) and ALS Laboratory Group (ALS) (NATA accreditation number 825). Field filtered water samples were collected (using Stericup™ disposable 0.45 µm filter units or disposable syringes, 0.8 µm prefilters and 0.45 µm filters) for dissolved metals analysis. Samples were stored chilled and transported to the laboratory within nominated holding times for all parameters except triethylene glycol in which the holding time was exceeded by one or two days for nine of the 15 samples[3]. Temperature, pH, electrical conductivity, turbidity and dissolved oxygen were determined *in situ* using water quality meters calibrated according to manufacturers' specifications.

The water samples were delivered to SGS and ALS depots in Brisbane and then sent to analytical laboratories in Sydney (SGS), Perth (SGS) and Melbourne (ALS). Sample analysis included the following.

- Physico-chemical: total suspended solids, hardness, fluoride, sulfate, chloride, major cations (calcium, magnesium, sodium).
- Metals and metalloids: total and filtered (0.45 µm) arsenic, boron, cadmium, cobalt, copper, lead, mercury, nickel, selenium, vanadium, zinc.
- Nutrients: nitrate, nitrite, total nitrogen, total oxidised nitrogen, total Kjeldahl nitrogen, total phosphorus, ammonia.
- Triethylene glycol (TEG).
- Monocyclic Aromatic Hydrocarbons (including BTEX).
- Polynuclear aromatic hydrocarbons.
- Phenol.
- Total recoverable hydrocarbons.
- Organochlorine pesticides.
- Organophosphate pesticides.

Laboratory documentation relating to the water samples (*e.g.* chain of custody, sample receipt notification, certificate of analysis, quality control report) is provided in Attachment B. Note that the site name prefix 'DA' (drainage area) on the laboratory document corresponds to the new site name prefix 'SA' (survey area) used in this report.

5.3 Quality Assurance (QA)

The SGS (Report No. SE115508 R0 and PE074880 R0) and ALS (Report No. EB1303907) reports (see Attachment B) indicated that laboratory data quality was good, with no method blank or duplicate outliers occurring during analysis of the samples.

The reproducibility of the water quality data was assessed using the method provided in Attachment C. Replicate samples were collected as per the Water Quality-Sampling Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS5667.1). The reproducibility for the analysis of all analytes was within prescribed thresholds.

Blank samples were used to determine if sample handling, equipment, transportation and/or laboratory analysis introduced gross contamination to the water samples. A field blank was prepared as per AS5667.1 using deionised water supplied by SGS. The analytical results of QA samples are included in Attachment C.

[3] ALS Laboratory Group apply a conservative holding time of seven days for glycols in water in the absence of a standard holding time for this analyte.

Total and dissolved boron were reported at detectable concentrations in the blank (0.016 mg/L, 0.009 mg/L, respectively). Inspection of the instrumentation read out showed that the contamination was not caused by a 'carry over' of boron from the test samples during the sample analysis run in the laboratory (*pers. comm.* H Crawford, ALS Manager Sydney, 15 February 2013). The concentrations of boron in the field blank are not considered significant as they were low (relative to other samples) and within the laboratory's reporting error. Hence, the contamination is not expected to compromise interpretation of the water quality results.

Table 5-2. Surat Gas Project surface water photographs and descriptions of sampling sites in survey area 2 and survey area 9

Site	Waterway	Sub-Catchment	Catchment	Landuse	Date Surveyed	Observations/notes	Flow conditions	Photo – upstream	Photo – downstream
SA2-S1	Bottle Tree Creek	Dogwood Creek	Balonne River	Grazing land and forested areas	13 February 2013	Water was present in a deep, turbid pool. Sand bar immediately upstream of site. Flow observed downstream of the sampled pool. Pool with algal growth. Stream banks were well-vegetated with grass and tall trees.	Flow		
SA2-S2	Bottle Tree Creek	Dogwood Creek	Balonne River	Grazing land and forested areas	12 February 2013	Turbid water flowing gently over a sand bar at the time of field work. Emergent shrubs were present on the sand bar. Stream banks were vegetated with grasses, sedges and tall trees.	Flow		
SA2-S3	Bottle Tree Creek	Dogwood Creek	Balonne River	Grazing land and forested areas	13 February 2013	Gently flowing section of stream. Flood debris on stream high bank. Stream banks were well-vegetated with grass, sedges and tall trees. Scouring to stream bank immediately downstream of the site.	Flow		
SA2-S4	Un-named tributary of Bottle Tree Creek	Dogwood Creek	Balonne River	Grazing land and forested areas	12 February 2013	Shallow pool formed by a rock bar. Flow observed over rock bar immediately downstream of the sampled pool. Vegetation debris from recent high flows in the wetted channel and on the high bank.	Flow		
SA2-S5	Un-named tributary of Bottle Tree Creek	Dogwood Creek	Balonne River	Grazing land and forested areas	12 February 2013	A chain of stagnant and turbid ponds. Pond with algal growth. Detritus was common in the stream.	No flow		

Site	Waterway	Sub-Catchment	Catchment	Landuse	Date Surveyed	Observations/notes	Flow conditions	Photo – upstream	Photo – downstream
SA2-S6	Dogwood Creek	Dogwood Creek	Balonne River	Rural residential / irrigated cropping	13 February 2013	Water was present as a turbid pool. Gentle movement of water through pool. Samples collected from a recreational area downstream of road/ railway crossing. Flotsam and jetsam common. Duck and geese waste common.	Flow		
SA9-S1	Condamine River	Condamine River (South branch)	Condamine River	Irrigated cropping	14 February 2013	Turbid water in a flowing section of stream channel. Water sample was collected at a confluence with an eroded gully system. Dispersive clays with dark brown water. Limited leaf litter against log jam.	Flow		
SA9-S2	Condamine River	Condamine River (South branch)	Condamine River	Irrigated cropping	14 February 2013	Turbid water in a flowing section of stream channel. Extensive gully erosion nearby to sampling site. Limited leaf litter observed on the channel bed.	Flow		
SA9-S3	Condamine River	Condamine River (South branch)	Condamine River	Irrigated cropping	14 February 2013	Water comprised a deep and turbid pool. Flow observed downstream of sampled pool. Small peninsula protruding into river channel at the site. Emergent stream bank grasses pushed over by recent high flows. Noticeable spreading of human sewage on paddocks nearby to sampling site.	Flow		No photo available
SA9-S4	Condamine River	Condamine River (South branch)	Condamine River	Irrigated cropping	14 February 2013	Water was present as a slow flowing turbid waterbody. Sampling sites immediately downstream of tributary.	Flow		

Site	Waterway	Sub-Catchment	Catchment	Landuse	Date Surveyed	Observations/notes	Flow conditions	Photo – upstream	Photo – downstream
SA9-S5	Condamine River	Condamine River (South branch)	Condamine River	Irrigated cropping	14 February 2013	Turbid water that was backpooling from a weir downstream of the site. Flow observed downstream of sampled pool. Pool with log jam and algal growth.	Flow		
SA9-S6	Condamine River	Condamine River (South branch)	Condamine River	Irrigated cropping	13 February 2013	Turbid water in a weir pool. Water observed flowing over weir immediately downstream of sampled pool. Samples collected from a recreational area used for picnicking and boat launching. Western stream bank supported little riparian vegetation. Flotsam and jetsam present at the site.	Flow		
SA9-S7	Condamine River	Condamine River (South branch)	Condamine River	Irrigated cropping/ rural residential	13 February 2013	Site immediately downstream of an abandoned bridge. Fast flowing and turbulent water. Flotsam and jetsam present at the site.	Flow		
SA9-S8	Crawlers Creek	Condamine River (South branch)	Condamine River	Irrigated cropping	14 February 2013	Water was present as a turbid pool downstream from a road crossing. Organic sheen from decaying vegetation. Downstream from sewerage sludge business.	No flow		

6 Existing Environment

The water quality results from the SREIS field survey are presented in Tables A1T-2 and A1T-3 of Attachment A and field data sheets are presented in Attachment D.

All sites held water at the time of the field survey following high rainfall in the project development area in January 2013 (Table 5-1).

DNRM maintains a stream flow gauge at Gil Weir on Dogwood Creek (422202B), approximately 14 km downstream of the Bottle Tree Creek and Dogwood Creek confluence. This station has monitored stream discharge from 1949 to current and the results are presented in Figure 6-1. Discharge in Dogwood Creek over the three month period leading up to the SRIES water quality survey in February 2013 was variable, with no flows in November 2012 and December 2012, below-average flows in February 2013 and above-average flows in January 2013.

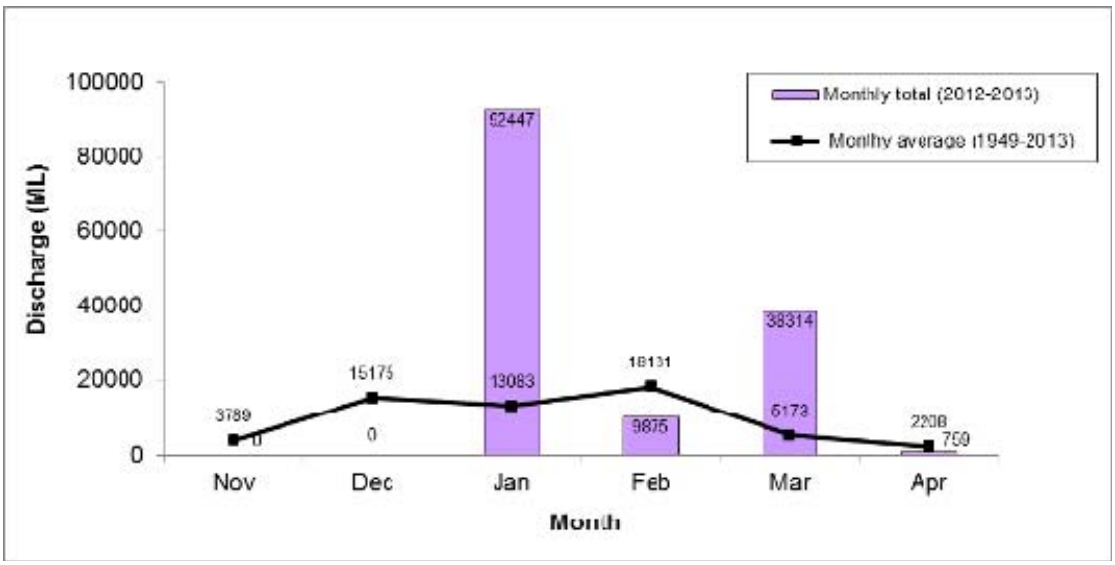

Figure 6-1. Monthly flows in Dogwood Creek at Gil Weir stream flow gauge (station 422202B)

The DNRM gauge at Cecil Plains Weir on the Condamine River (422316A), immediately downstream of Arrow property CGPF9, has monitored stream discharge from 1947 to current and the results are presented in Figure 6-2. Discharge in the Condamine River for the three month period leading up to the SREIS water quality survey generally followed the long-term average, with flows increasing from November 2012 to February 2013.

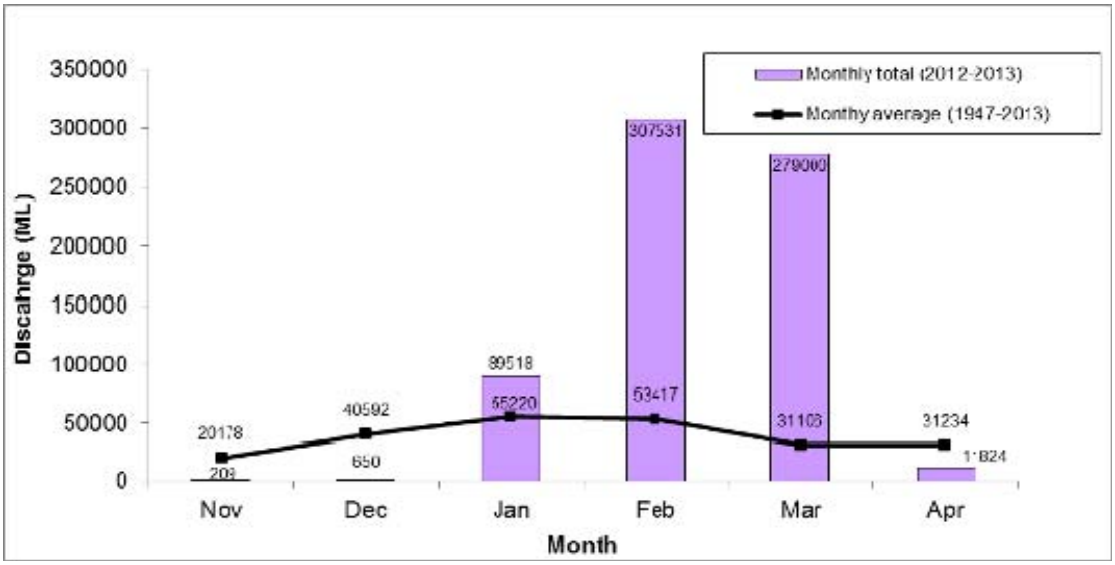

Figure 6-2. Monthly flows in the Condamine River at Cecil Plains stream flow gauge (station 422316A)

The samples were collected approximately two weeks after a high flow event in Dogtree Creek and the Condamine River (Alluvium 2013a). Options for the timing of sampling were limited to the wet season due to time constraints for completing the SREIS water quality assessment. The results from the current survey provide an indication of the water quality on the declining arm of the flood hydrograph in each stream and the conditions under which sampling occurred are considered appropriate for assessing discharge scenarios being considered by Arrow (see Section 8.2).

6.1 Survey Area 2

Water quality results collected for the SREIS were similar among sites in Bottle Tree/Dogwood Creek catchment (Table A1T-2, Attachment A). The results showed that water quality of the streams was comparable to interim site-specific water quality guideline values developed for the protection of slightly-moderately disturbed aquatic ecosystems in the Balonne River catchment, with the following exceptions.

- Electrical conductivity at five of the six sites (excluding site SA2-S1) (range: 170-200 µS/cm) was marginally above the interim site-specific guideline value (130 µS/cm).
- pH at all sites (range: pH 5.5-6.0) was below the interim site-specific guideline value range (pH 6.4-7.8).
- Total suspended solids at site SA2-S6 on Dogwood Creek (120 mg/L) was above the interim site-specific guideline value (83 mg/L).
- Chloride at all sites (range: 30-52 mg/L) was above interim site-specific guideline value (22 mg/L).
- Total nitrogen at five of the six sites (excluding site SA2-S3) (range: 1.7-1.9 mg/L) was marginally above the interim site-specific guideline (1.57 mg/L).

In summary, the SREIS results from survey area 2 showed that surface waters of the Bottle Tree/Dogwood Creek catchment were generally consistent with interim site-specific guideline values and similar to the EIS results for sites sampled in the Bottle Tree/Dogwood Creek catchment.

6.2 Survey Area 9

The SREIS surface water assessment results showed that water quality at sites in survey area 9 was similar to interim site-specific guidelines developed for protection of slightly-moderately disturbed aquatic ecosystems for the Condamine River catchment (some exceptions noted below) (Table A1T-2, Attachment A). Except for pH, nutrients and some major ions, there was limited variation in water quality conditions between sites at the time of sampling. The following is noted.

- Nutrients (nitrogen and phosphorus) were elevated in Crawlers Creek. Total nitrogen concentrations at site SA9-S8 on Crawlers Creek (3.0 mg/L) were approximately double the interim site-specific guideline (1.89 mg/L).
- Total phosphorus concentrations at site SA9-S8 on Crawlers Creek (1.2 mg/L) were above interim site-specific guideline value (0.25 mg/L).
- pH in Crawlers Creek was slightly acidic compared to Condamine River which was slightly alkaline. pH at site SA9-S6(pH 7.19) on the Condamine River and site SA9-S8 on Crawlers Creek (pH 6.62) was marginally below the interim site-specific guideline value range (pH 7.3-8.3).
- Concentrations of dissolved vanadium at all sites on Condamine River (range: 13-15 µg/L) were marginally higher than interim site-specific guideline values (10 µg/L). Dissolved boron and nickel concentrations in Crawlers Creek were also marginally above the interim site-specific guideline as were dissolved nickel concentrations at four of the six sites sampled on Condamine River.

In summary, the SREIS results from survey area 9 show that surface waters ranged from slightly acidic to slightly alkaline. Surface waters in this area contain some heavy metals/metalloids and variable concentrations of nutrients. Surface water quality results collected during the SREIS field survey in survey area 9 were generally consistent with interim site-specific guideline values and comparable to the EIS results for sites sampled in the vicinity of survey area 9.

6.3 Environmental Values

A comparison between interim site-specific guideline values and published guideline values for the protection of the nominated environmental values for the Surat Gas Project is presented in Table AT1-1 of Attachment A. The following is noted.

- Slightly-moderately disturbed waters – water quality within the Balonne and Condamine River catchments was generally of poorer quality than the ANZECC & ARMCANZ 2000 guideline values nominated for the protection of slightly-moderately disturbed ecosystems.
- Waters that may be used for drinking water – Australian Drinking Water Guidelines (ADWG) (NHMRC & NRMMC 2011) guideline values for turbidity were exceeded in the Condamine and Balonne River catchments. The heavy metals lead and nickel exceeded ADWG values in the Condamine River catchment. With the exception of these results, water quality was within the drinking water guideline values.
- Waters that may be used for recreational purposes – waters within the Balonne and Condamine River catchments were generally within the NHMRC 2008 guideline values for primary and secondary recreational use.
- Waters that may be used for agricultural purposes – waters within the Balonne and Condamine River catchments were generally within the stock watering and crop irrigation guidelines presented in ANZECC & ARMCANZ 2000.
- Waters that may be used for aquaculture purposes – the QWQG 2009 guideline value for turbidity was exceeded in the Balonne and Condamine River catchments including SREIS nominated sampling sites.
- Although cultural and spiritual values have been assigned, no applicable water quality guidelines for these values exist. In the absence of guideline values, adherence to the nominated environmental protection objectives (Section 5.1.2) aims to protect these values.

7 Potential Impacts and Risks

This section identifies the updated components of the Surat Gas Project that may potentially impact on the quality of surface waters in the receiving environment of the Surat Gas Project. Table 7-1 provides a summary of those aspects of the project that have changed between the EIS and SREIS assessments.

Table7-1. Changed project components that could potentially have impacts upon water quality aspects of surface water

EIS case	SREIS case	Potential impacts upon water quality
6 water treatment facilities (integrated) with 60 ML/d capacity. Impacts of discharge under emergency situations were considered.	2 water treatment facilities with approximately 35 ML/d and 90 ML/d capacities Discharge may occur under normal operating conditions.	Two water treatment facilities (co-located with two of the central gas processing facilities) with the potential to discharge to surface waters. The water treatment facilities are designed to process approximately 35 ML/d (northern water treatment facility in CGPF2 property) to 90 ML/d of water (southern water treatment facility in CGPF9 property). Each facility has an approximate footprint of 200 Ha, which includes treated/brine and storage (raw) water storage dams. Potential impacts include changes in downstream water quality from releases of poor quality water releases or spills of stored chemicals.
Central gas processing facilities (including CGPFs and integrated processing facilities) 12 @ 30 to 150 TJ/d	CGPFs 8 @ 75-225 TJ/d	Up to eight centralised gas processing facilities (each with an approximate footprint of 15Ha) with two being co-located with a water treatment facility. Potential impacts include changes in downstream water quality or spills of stored hydrocarbons/chemicals.
Well count 7500	Well count: approximately 6500	A reduced number of wells with a corresponding reduction in footprint of disturbance including gathering lines, tracks and well pads. Potential impacts include changes in downstream water quality or spills of stored chemicals.

For the Surat Gas Project, it is proposed that discharge of treated or untreated coal seam gas water into Bottle Tree Creek and the Condamine River will form part of Arrow's water management strategy for disposal of coal seam gas water (along with distribution to users for beneficial use and re-injection into suitable aquifers).

7.1 Discharge to Watercourses

Discharge of treated or untreated coal seam gas water is considered appropriate only where disposal to watercourses will not adversely affect the environmental values of receiving waters. In addition to elevated water quality indicators in the coal seam gas water, there is the potential for discharges from Arrow's water treatment facilities to increase levels of suspended sediments in the receiving environment where releases cause bank erosion in Bottle Tree Creek and/or the Condamine River (Alluvium 2013). Alluvium 2013 provides recommendations on the location of infrastructure within the CGPF2 and CGPF9 properties and a discharge strategy for each water treatment facility (*e.g.* continuous and not pulsed) to minimise erosion and bank scour in Bottle Tree Creek and the Condamine River associated with discharges. The mitigation measures in Alluvium 2013 are considered adequate to prevent significant increases in suspended sediment that would lead to deterioration in water quality and potentially adverse impacts on nominated environmental values.

Controlled or uncontrolled releases of untreated or inappropriately treated coal seam gas water into the receiving streams have the potential to impact on water quality in the receiving environment of the Surat Gas Project area. A summary of water quality results for Arrow's wells and dams is presented in Table A1T-1 and shows elevated electrical conductivity (30,900 µS/cm), pH (pH 9.14), turbidity (1,100 NTU), sulfate (158 mg/L), chloride (3,740 mg/L), ammonia (2.53 mg/L), total petroleum hydrocarbons (C_{29} – C_{36} fraction, 690 µg/L), boron (0.79 mg/L), cadmium (0.0009 mg/L) and lead (0.007 mg/L). The values for conductivity, pH, sulfate and chloride are within the range reported for groundwater water quality within the Walloon Coal Measures (See Table 4.10 of the Groundwater Impact Assessment Report for the SGP EIS Appendix G). These values exceed guideline values for the protection of all nominated environmental values for the Surat Gas Project indicating that water of this quality has the potential to impact on the receiving environment of the project development area if it was discharged untreated. The presence of total petroleum hydrocarbons (C_{15} – C_{36} fractions) in untreated coal seam gas waters show that there is potential for hydrocarbons to enter the Surat Gas Project

development area receiving environment without appropriate control strategies and mitigation measures. These mitigation measures are summarised in Section 8.

As part of the SREIS assessment, Alluvium 2013 has identified areas for locating potential project infrastructure that are flood-free for the 1% Annual Exceedance Probability (AEP) event (equal to the 1 in 100 year flood event). The placement of infrastructure in those areas would assist in reducing the risk of overland flows inundating infrastructure that may result in uncontrolled releases of untreated coal seam gas water to the receiving environment.

7.2 Beneficial Use

The distribution of treated water to existing and new users for beneficial use will be used to manage volumes of coal seam gas water over the yearly cycle. Beneficial use of coal seam gas water may include livestock watering and crop irrigation, urban, construction, commercial and industrial use and uses, as well as municipal water supply (NRA 2011). Table A1T-1 shows existing published guideline values for livestock watering, crop irrigation and water for human consumption. The distribution of coal seam gas water to potential users would need to be of a quality that meets the guideline value for that respective use.

7.3 Erosion and Sedimentation Mobilisation

There is potential for water quality impacts on the receiving environment of the Surat Gas Project from land disturbance for the construction of the 6,500 wells and the eight CGPFs (of which the general locations to site four are currently known). It is determined that potential impacts can be managed through the implementation of appropriate mitigation measures *e.g.* implement best practice erosion and sediment control measures as detailed in *Best Practice Erosion & Sediment Control* 2008 (International Erosion Control Association Australasia). Appropriate mitigation measures also include those described in the EIS.

7.4 Cumulative Impacts

Chapter 28 of the EIS lists the planned developments that may discharge to the same drainage basins as the Surat Gas Project. The results of this study indicate that the water quality of streams in the project development area is influenced by the human uses of the waters in this area (*i.e.* agricultural use, mining and urban development). Without appropriate control strategies and mitigation measures, the release of coal seam gas water associated with the Surat Gas Project has the potential to cause further deterioration in water quality of these streams. It was concluded in the EIS that through the implementation of appropriate mitigation measures, the potential impacts on surface water quality could be minimised. Section 8.2 of this report outlines a framework for achieving a surface water discharge strategy that satisfies water quality guidelines for the protection of all nominated environmental values during discharge. Providing that all other planned developments are managed with sufficient mitigation measures and with discharge strategies having the same objectives as that of the Surat Gas Project, significant impacts on surface water quality should not occur.

8 Proposed Mitigation and Management Measures

8.1 Standard Mitigation Measures

The EIS (Section 5 of NRA 2011) outlines standard control strategies to protect surface water quality and mitigate potential impacts to the nominated environmental values for the Surat Gas Project. These are summarised below.

- Separate clean water and impacted water from active and rehabilitated or non-disturbed areas.
- Use undercover storage for hazardous chemicals to minimise the ingress of and potential for contamination of stormwater.
- Minimise the inventory of hazardous materials stored on-site.
- Where practicable, undertake the construction of infrastructure that is near watercourses during the dry season.
- Maximise beneficial reuse of water.

The EIS also outlines mitigation measures to manage the potential for impacts associated with uncontrolled releases (or leaks) and infiltration of poor quality coal seam gas water from storages to Surat Gas Project's receiving environment). These mitigation measures are consistent with those presented in the EIS, and are summarised in Section 8.

- Design dams to a minimum 1 in 100 ARI flood level.
- Design and implement appropriate sediment retention measures for overland flow from disturbed areas.
- Manage hazardous materials with appropriate bunding and containment (refer to the *Dangerous Goods Safety Management Act* 2001, AS 1940 – 2004. *The storage and handling of flammable and combustible liquids*, and the relevant material safety data sheet (MSDS) for hazardous substances).
- Design, construct and operate appropriate storage structures in accordance with statutory requirements for raw feed water, treated water, brine and wastewater with sufficient capacity to prevent uncontrolled discharges of untreated water during high rainfall or storm events.
- Minimise seepage loss from storage structures by constructing dams in accordance with relevant guidelines
- Implement monitoring and maintenance programs, incident reporting, emergency response and corrective actions systems and procedures.

These strategies remain applicable for mitigating impacts to surface water quality from the Surat Gas project, in consideration of the project description updates. Additional strategies for managing potential surface water quality impacts resulting from updates to the project description are outlined below.

8.2 Discharge Strategy

Discharge of coal seam gas water to watercourses is a management option that addresses the variability of other coal seam gas water management options. There are currently four discharge scenarios being considered by Arrow:

1. Emergency discharge only.
2. Periodic discharge to mimic high flow events.
3. Irregular discharge to create freeboard in storages.
4. Continuous discharge at either a constant rate or varied rate (*e.g.* high in wet season, low in dry season).

This section details a framework for achieving a surface water discharge strategy that satisfies water quality requirements for protection of all nominated environmental values during discharge. The proposed framework is based on the *Queensland Water Quality Guidelines* Version 3 2009 (DERM 2009a) and the Coal Seam Gas Water Management Policy 2012 (EHP 2012A).

Regardless of the circumstance under which discharge from Arrow's two facilities would occur (i.e. discharge of treated or untreated water under emergency situations or normal operations), the Coal Seam Gas Water

Management Policy 2012 (EHP 2012A) notes that releases of coal seam gas water are only considered appropriate where discharge will not adversely affect environmental values of receiving waters. The discharged coal seam gas water would need to be of a quality that meets each of the guideline values for protection of the project's nominated environmental values (*i.e.* aquatic ecosystems (QWQG and ANZECC & ARMCANZ 2000), water for human consumption (ADWG), recreational use (NHMRC 2008), stock watering, crop irrigation and aquaculture (ANZECC & ARMCANZ 2000)) as shown in Table A1T-1. It is noteworthy that the receiving waters of the Surat Gas Project provide a source of drinking water for towns in the project development area including Cecil Plains weir pool, which has been proposed in Alluvium 2013a as a suitable location for discharge from the water treatment facility at the CGPF9 property. As the water quality guideline values for aquatic ecosystem or drinking water protection (depending on the selected indicator) are typically more stringent than for any other environmental value, the quality of water to be discharged that meets guideline values for slightly-moderately disturbed aquatic ecosystems and is fit for human consumption would achieve protection for other nominated environmental values for the Surat Gas Project.

EHP (2012) notes that the protection of environmental values from impacts associated with coal seam gas water discharges is determined by assessment against any relevant local guidelines. While the interim water quality guideline values that were calculated for the EIS water quality assessment (and used for comparative purposes in the SREIS assessment) were considered suitable for the purpose of a broad comparison of water quality conditions in the project area, it is recommended that site-specific guideline values for each water treatment facility location are determined. The QWQG defines criteria for reference sites stating that sites should be subject to minimal/limited disturbance, should have no intensive agriculture, major extractive industry, major urban area or significant point source wastewater discharge occurring within 20 km upstream, and should have a seasonal flow regime that has not been greatly altered. The streams planned to receive discharge from the Surat Gas Project water treatment facilities may already be affected by these disturbances, and reference sites that do not take the existing stream condition into account are not likely to provide an appropriate comparison for receiving waters potentially impacted by the discharge of treated or untreated coal seam gas waters.

The most appropriate location for reference sampling sites to monitor potential impacts from discharges associated with the Surat Gas Project are sites on Bottle Tree Creek and Condamine River, far enough upstream of the selected discharge points to be unaffected by releases, or in a suitable nearby stream of comparable quality. Upstream/nearby stream sites would ensure that the site-specific guideline values reflect local site conditions while being free of the impact being monitored. Once the discharge release points on Bottle Tree Creek and Condamine River have been confirmed by Arrow, monitoring sites (upstream and receiving/downstream) can be selected. The SREIS water quality sampling sites on Bottle Tree Creek and Condamine River may be suitable as references sites for ongoing monitoring if it is deemed that they are far enough upstream to be independent of water releases. It is also recommended that permanent/semi-permanent pools are selected (rather than quickly drying pools) to provide the means for monitoring dry season discharges.

To derive site-specific guideline values for the relevant nominated indicators (Table A1T-1), a minimum of 18 data points must be collected from each of one to two reference sites (or 12 data points from each of three or more reference sites) over a minimum period of 12 months (QWQG 2009), ideally under baseflow (ambient) conditions. Planning for the Surat Gas Project should factor in a minimum 12 month period over which baseline data is collected to allow the calculation of site-specific guideline values in accordance with QWQG 2009 methodology. It is recommended that prior to undertaking the baseline monitoring surveys, the DNRM watershed database is reviewed to ascertain whether there are suitable DNRM sites that could also serve as reference sites for monitoring of water discharges associated with the Surat Gas Project.

Where comparisons of water quality data collected during flood or nil-flow periods to guideline values is required, reference data collected during baseflow conditions may not be appropriate, as the water quality can differ significantly between these flow conditions. For flood or nil-flow water quality, it is considered appropriate to derive site-specific guideline values using reference data collected only under flood conditions or nil-flow conditions, respectively. Reference data collected to calculate flood or nil-flow site-specific guideline values should meet the minimum data requirements described above.

The results of the SREIS water quality field survey indicated that Bottle Tree Creek, Dogwood Creek, Crawlers Creek and the Condamine River contained nutrients and suspended solids recorded above guideline values. Waters in Bottle Tree and Dogwood Creek were marginally more acidic and lower in electrical conductivity that those of Condamine River and Crawlers Creek. The collection of 12 to 18 months of baseline water quality data specific to each water treatment facility location as recommended above would provide insight into the seasonal variation in surface water quality in Bottle Tree Creek and Condamine River to help inform the target water quality objectives for the Surat Gas Project. The characterisation of water quality in Bottle Tree/ Dogwood Creek and Condamine River under baseline conditions will also inform the target water quality for the water treatment process, recognising that emerging research on the toxicity of coal seam gas water indicates that some freshwater organisms are sensitive to certain types of treated coal seam gas waters. For example, a toxicity assessment using laboratory organisms has shown that water fleas (Cladocera) are sensitive to water with a low electrical conductivity of 50 µS/cm and an ionic composition skewed towards sodium (Takahashi *et al*. 2012). The findings of this research highlight the importance of properly characterising both the treated and receiving waters at the northern and southern water treatment facility sites and also recognising the potential impacts of discharging treated coal seam gas water with low EC and with an ionic composition different to that of the receiving environment.

The trigger for discharge, as well as the volume and duration of discharge, should be determined based on the quality of water to be discharged. Ideally discharge to the receiving environment should be limited to times of natural flow events only. When the water quality meets or is better than the water quality objectives, discharge may be permitted for several weeks after periods of flow. Where coal seam gas water does not meet water quality objectives, discharge should be limited to periods of higher flow with maximum discharge rates to achieve appropriate dilution (and will need to be authorised by the Administrating Authority and licence conditions).

8.3 Preliminary Environmental Flows Assessment

Alluvium (2013b) provides a preliminary environmental flows assessment of the coal seam gas water discharge regime required to minimise the impacts on the receiving environment of the two proposed discharge sites within the Condamine River catchment. The results of the spells analysis undertaken by Alluvium Consulting Australia was used to understand the existing flow regime of Bottle Tree/Dogwood Creek and Condamine River at the two proposed discharge sites, informing subsequent workshop discussions around acceptable volumes and quality of coal seam gas water that may be discharged into these streams without significantly altering watercourse geomorphology, water quality and aquatic ecology.

A set of guidelines for acceptable discharge, which have considered the risks and opportunities associated with discharges on the receiving environment, are presented in Alluvium (2013b). Based on experience from environmental flow studies undertaken in the Murray-Darling Basin, a 20% deviation from current flow conditions is to form the basis for further development of the Surat Gas Project coal seam gas discharge strategy pending more hydrologic analysis. More detailed flow analysis will verify whether the 20% level of deviation from existing flow conditions will not exacerbate natural rates of erosion in Bottle Tree/Dogwood Creek and Condamine River that would lead to deterioration in surface water quality in these watercourses.

9 Inspection and Monitoring

A surface water monitoring program is recommended to assist in the environmental management of the Surat Gas Project. The proposed monitoring program includes the following.

- Establish water quality monitoring stations upstream (and/or in nearby suitable streams with comparable water quality) and downstream of each proposed water treatment facility and other key infrastructure facilities (*e.g*. centralised gas processing facilities) to identify potential impacts.
- Undertake inspection and monitoring of streams during the construction and operation of transfer pipelines (gas, brine, water) at watercourse crossings.
- Collect sufficient baseline water quality data to derive site-specific water guideline values for selected indicators in accordance with QWQG 2009 methodology. Sufficient data should be collected to account for ambient, low flow and flood flows.
- Measure parameters listed in Table A1T-2 (Attachment A). Note that Table A1T-2 (Attachment A) includes parameters that should be analysed and parameters that are optional (*i.e.* the benefit of analysing the optional parameters to assist with environmental management has not been determined and should be based on site-specific conditions, or land use. These optional parameters are underlined in Appendix A, Table A1T-2).
- During operations, undertake routine monitoring at a schedule that is sufficient to identify trends in water quality which is appropriate for the seasonal and ephemeral conditions of the area, and cognisant of the characteristics of the activity to which the monitoring regime applies, as well as monitoring after discharge events at a frequency sufficient to detect potential impacts.
- Sample in accordance with methods prescribed in the *Monitoring and Sampling Manual* (DERM 2010).

10 References

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Attachment A
Tables

Table A1T-1. Surat Gas Project – Analyte Review and Guideline Values

Parameter	Unit	Published Guideline Values[1]						Interim site-specific Guideline Values[3]		Analyte Source (Reason for Inclusion)	Data range for Arrow water quality laboratory results (wells and dams)[4] and number of data points (n)	Date range of data	Comments	Recommended for inclusion in future monitoring program
		Aquatic Ecosystems[1a]	Drinking[2a] Water (and aesthetic^)	Recreational[2b]	Crop Irrigation[1b]	Livestock Watering[1c]	Aquaculture/ aquatic foods for human consumption[1d]	Condamine River (excluding Jimbour & Oakey Creek)[3]	Balonne River[3]					
Electrical conductivity	µS/cm	340[A] 325[B] 500[C] 1120[D] <370 (baseflow)[F] <210 (high flow)[F]	896^+	NV	NV~	5970 (beef cattle, horses and pigs) 3731 (dairy cattle) 7463 (sheep) 2985 (poultry)	NV	500[FG] (*n* = 738) (75th percentile)	130[F] (*n* = 48) (75th percentile)	Standard; existing EA[8]; relevant to project development area.	1160 – 30900 (*n* = >60)	May 2009 – Sep 2009	Relevant to project and local area.	Yes
pH	pH unit	6.5 – 7.5 6.5 – 8.5[F]	6.5 – 8.5^	6.5-8.5 (or 5-9 for waters with low buffering capacity)	6-9	NV	5.0-9.0	7.3 – 8.3 (*n* = 311)	6.4 – 7.8 (*n* = 39)	Standard; existing EA[8]	7.14 - 9.26 (*n* = 63)	Nov 2008 – Sep 2009	Standard	Yes
Turbidity	NTU	2 – 25 <50[F]	5^	NV	NV	NV	NV	200 (*n* = 431)	248 (*n* = 47)	Standard	1.5 – 1100 (*n* = 40)	Aug 2009 – Sep 2009	Standard	Yes
Dissolved Oxygen	% Saturation	90 – 110 85 – 110[F]	>85%^	>80%	NV	NV	>5	46 – 103 (*n* = 213)	24.2 – 80.2 (*n* = 33)	Standard	NV	NV	Standard	Yes
Temperature	°C	NV	NV	NV	NV	NV	NV	-	-	Standard	NV	NV	Standard	Yes
Total Suspended Solids (TSS)	mg/L	<30[F]	NV	NV	NV	NV	<40	152 (*n* = 492)	83 (*n* = 59)	Standard	5 – 2200 (*n* = 60)	Nov 2008 – Sep 2009	Standard	Yes
Sodium Absorption Ratio (SAR)	-	NV	NV	NV	2-102’	NV	NV	-	-	Project-specific	47.2 - 48.4 (*n* = 8)[5]	Aug 2009	Relevant to project	Yes
Sulfate	mg/L	<5[F]	500 (250^)	NV	NV	1000	NV	9 (*n* = 490)	4.9 (*n* = 39)	Standard	<1 – 158 (*n* = 58)	May 2009 – Sep 2009	Standard	Yes
Chloride	mg/L	NV	250^	NV	175-700’’	NV	NV	94 (*n* = 577)	22 (*n* = 46)	Existing EA[8]	260 – 3740 (*n* = 24)	Sep 2008 – Sep 2009	Standard	Yes

Parameter	Unit	Published Guideline Values[1]						Interim site-specific Guideline Values[3]		Analyte Source (Reason for Inclusion)	Data range for Arrow water quality laboratory results (wells and dams)[4] and number of data points (n)	Date range of data	Comments	Recommended for inclusion in future monitoring program
		Aquatic Ecosystems[1a]	Drinking[2a] Water (and aesthetic^)	Recreational[2b]	Crop Irrigation[1b]	Livestock Watering[1c]	Aquaculture/ aquatic foods for human consumption[1d]	Condamine River (excluding Jimbour & Oakey Creek)[3]	Balonne River[3]					
Fluoride	mg/L	NV	1.5	NV	1	2	NV	0.23 (*n* = 576)	0.10 (*n* = 49)	Existing EA[8]	0.4 - 9.8 (*n* = 45)	May 2009 – Sep 2009	Standard	Yes
Nitrate	mg/L	31.9[E] (0.015 – eutrophication value) (Nitrate as NO_3) 7.2[E] (Nitrate as N) <0.060[F] (for TON)	50 (Nitrate as NO_3) 11.5 (Nitrate as N)	NV	NV	400 (nitrate as N)	<50 (nitrate as N)	2.84 (as NO_3) (*n* = 208)	1.6 (as NO_3) (*n* = 35)	Existing EA[8]	<0.01 - 0.27 (as N) <0.01 - 1.19 (as NO_3) (*n* = 23)	May 2009 – Sep 2009	Possible that nitrate may be in coal seam gas waters. Recommended that TON is monitored rather than Nitrate + Nitrite as nitrite not expected and all TON could be assumed to be Nitrate.	Yes - as TON
Total Nitrogen	mg/L	0.25 <0.62[F]	NV	NV	5	NV	NV	1.89 (*n* = 143)	1.57 (*n* = 31)	Project-specific (sewage)	0.2 - 2.7 (as N) (*n* = 36)	Aug 2009 – Sep 2009	Identified in coal seam gas waters (also relevant if onsite sewage treatment sufficient to trigger ERA)	Yes
Total Phosphorus	mg/L	0.02 <0.07[F]	NV	NV	0.05	NV	NV	0.54 (*n* = 239)	0.25 (*n* = 41)	Project-specific (sewage)	<0.01 - 0.5 (*n* = 46)	May 2009 – Sep 2009	Identified in coal seam gas waters (also relevant if onsite sewage treatment sufficient to trigger ERA)	Yes
Ammonia (NH_3 as N)	mg/L	0.9 (0.013 – NH_4 as N eutrophication value) <0.020[F]	0.5^ (as NH_3)	NV	NV	NV	<0.020 (pH >8.0) (cold water) <0.030 (warm water)	0.07 (*n* = 103)	0.13 (as N) (*n* = 8)	Project-specific (identified in waters from other local coal seam gas projects)	<0.01 - 2.53 (as N) (*n* = 46)	May 2009 – Sep 2009	Possible that ammonia may be in coal seam gas waters.	Yes
Hardness (as $CaCO_3$)	mg/L	NV	200^	NV	<60 (increased corrosion potential) >350 (increased fouling potential)	NV	NV	-	-	Standard (dissolved metals interpretation)	19 – 333 (*n* = 5)[6]	Sep 2008	Aid for interpretation of dissolved metals results.	Yes
Arsenic (dissolved)	mg/L	0.013*	NV	NV	NV	NV	NV	0.001 (*n* = 30)	ID	Standard & Existing EA[8]	<0.001 - 0.005 (*n* = 40)	Aug 2009 – Sep 2009	-	Yes
Arsenic (total)	mg/L	NV	0.01	0.1	0.1	0.5	<0.050	0.004 (*n* = 31)	ID	Standard & Existing EA[8]	<0.001 – 0.01 (*n* = 50)	Aug 2009 – Sep 2009	-	Yes

Parameter	Unit	Published Guideline Values[1]						Interim site-specific Guideline Values[3]		Analyte Source (Reason for Inclusion)	Data range for Arrow water quality laboratory results (wells and dams)[4] and number of data points (n)	Date range of data	Comments	Recommended for inclusion in future monitoring program
		Aquatic Ecosystems[1a]	Drinking[2a] Water (and aesthetic^)	Recreational[2b]	Crop Irrigation[1b]	Livestock Watering[1c]	Aquaculture/ aquatic foods for human consumption[1d]	Condamine River (excluding Jimbour & Oakey Creek)[3]	Balonne River[3]					
Boron (dissolved)	mg/L	0.37	NV	NV	NV	NV	NV	0.046 (*n* = 31)	ID	Existing EA[8]	0.24 - 0.79 (*n* = 36)	Aug 2009 – Sep 2009	-	Yes
Boron (total)	mg/L	NV	4	40	0.5	NV	NV	0.1 (*n* = 137)	0.07 (*n* = 20)	Existing EA[8]	0.24 – 0.7 (*n* = 50)	Aug 2009 – Sep 2009	-	Yes
Cadmium (dissolved)	mg/L	0.0002	NV	NV	NV	NV	NV	< 0.0001 (*n* = 31)	ID	Standard & Existing EA[8]	<0.0001 - 0.0009 (dissolved) (*n* = 36)	Aug 2009 – Sep 2009	-	Yes
Cadmium (total)	mg/L	NV	0.002	0.02	0.01	0.01	<0.0002-0.0018 (varies with hardness)	0.0001 (*n* = 39)	ID	Standard & Existing EA[8]	<0.0001 - 0.0011 (*n* = 36)	Aug 2009 – Sep 2009	-	Yes
Cobalt (dissolved)	mg/L	0.0014[#]	NV	NV	NV	NV	NV	0.002 (*n* = 31)	ID	Existing EA[8]	<0.001 (*n* = 36)	Aug 2009 – Sep 2009	Not detected in August/September 2009 in: - Tipton, Kogan or Daandine dams - Meenawarra, Stratheden, Tipton, Kogan North or Daandine wells.	Yes
Cobalt (total)	mg/L	NV	NV	NV	0.05	1	NV	0.012 (*n* = 31)	ID	Existing EA[8]	<0.001 - 0.006 (*n* = 36)	Aug 2009 – Sep 2009	Not detected in August/September 2009 in: - Tipton, Kogan or Daandine dams - Meenawarra, Stratheden, Tipton, Kogan North or Daandine wells.	Yes
Copper (dissolved)	mg/L	0.0014	NV	NV	NV	NV	NV	0.020 (*n* = 171)	0.03 (*n* = 30)	Standard & Existing EA[8]	<0.001 - 0.008 (*n* = 50)	May 2009 – Sep 2009	-	Yes
Copper (total)	mg/L	NV	2 (1^)	20 (10^)	0.2	1	0.005 (varies with hardness)	0.011 (*n* = 40)	ID	Standard & Existing EA[8]	<0.001 - 0.278 (*n* = 36)	Aug 2009 – Sep 2009	-	Yes

Parameter	Unit	Published Guideline Values[1]						Interim site-specific Guideline Values[3]		Analyte Source (Reason for Inclusion)	Data range for Arrow water quality laboratory results (wells and dams)[4] and number of data points (n)	Date range of data	Comments	Recommended for inclusion in future monitoring program
		Aquatic Ecosystems[1a]	Drinking[2a] Water (and aesthetic^)	Recreational[2b]	Crop Irrigation[1b]	Livestock Watering[1c]	Aquaculture/ aquatic foods for human consumption[1d]	Condamine River (excluding Jimbour & Oakey Creek)[3]	Balonne River[3]					
Lead (dissolved)	mg/L	0.0034	NV	NV	NV	NV	NV	0.001 (*n* = 31)	ID	Standard & Existing EA[8]	<0.001 - 0.007 (*n* = 50)	May 2009 – Sep 2009		Yes
Lead (total)	mg/L	NV	0.01	0.10	2	0.1	<0.001-0.007 (varies with hardness)	0.011 (*n* = 37)	ID	Standard & Existing EA[8]	<0.001 - 0.258 (*n* = 36)	Aug 2009 – Sep 2009	-	Yes
Mercury (dissolved)	mg/L	0.00006	NV	NV	NV	NV	NV	< 0.0001 (*n* = 31)	ID	Existing EA[8]	<0.0001 (*n* = 36)	Aug 2009 – Sep 2009	Limit of reporting not sufficient for comparison to ecosystem guideline values. Note that LOR of 0.00006 not practicably achievable.	Yes
Mercury (total)	mg/L	NV	0.001	0.010	0.002	0.002	<0.001	< 0.0001 (*n* = 31)	ID	Existing EA[8]	<0.0001 - 0.0002 (*n* = 36)	Aug 2009 – Sep 2009	-	Yes
Nickel (dissolved)	mg/L	0.011	NV	NV	NV	NV	NV	0.004 (*n* = 31)	ID	Existing EA[8]	<0.001 - 0.003 (*n* = 50)	May 2009 – Sep 2009	-	Yes
Nickel (total)	mg/L	NV	0.02	0.20	0.2	NV	<0.1	0.022 (*n* = 40)	ID	Existing EA[8]	<0.001 - 0.013 (*n* = 36)	Aug 2009 – Sep 2009	-	Yes
Selenium (dissolved)	mg/L	0.005	NV	NV	NV	NV	NV	0.0003 (*n* = 31)	ID	Existing EA[8]	-	-	Limit of reporting not sufficient for comparison to ecosystem guideline values.	Yes
Selenium (total)	mg/L	NV	0.01	0.10	0.02	0.02	<0.01	0.0006 (*n* = 31)	ID	Existing EA[8]	<0.01 - 0.01 (*n* = 14)[7]	May 2009 – Sep 2009	-	Yes

Parameter	Unit	Published Guideline Values[1]						Interim site-specific Guideline Values[3]		Analyte Source (Reason for Inclusion)	Data range for Arrow water quality laboratory results (wells and dams)[4] and number of data points (n)	Date range of data	Comments	Recommended for inclusion in future monitoring program
		Aquatic Ecosystems[1a]	Drinking[2a] Water (and aesthetic^)	Recreational[2b]	Crop Irrigation[1b]	Livestock Watering[1c]	Aquaculture/ aquatic foods for human consumption[1d]	Condamine River (excluding Jimbour & Oakey Creek)[3]	Balonne River[3]					
Vanadium (dissolved)	mg/L	0.006#	NV	NV	NV	NV	NV	0.010 (*n* = 29)	ID	Identified in Arrow monitoring	<0.01 - 0.02 (*n* = 36)	Aug 2009 – Sep 2009	Limit of reporting not sufficient for comparison to ecosystem guideline values. Detected above guideline values.	Yes
Vanadium (total)	mg/L	NV	NV	NV	0.1	NV	<0.1	0.027 (*n* = 22)	ID	Identified in Arrow monitoring	<0.01 - 0.02	Aug 2009 – Sep 2009	-	Yes
Zinc (dissolved)	mg/L	0.008	NV	NV	NV	NV	NV	0.03 (*n* = 143)	0.07 (dissolved, *n* = 30)	Standard & Existing EA[8]	<0.005 - 0.089 (*n* = 36)	May 2009 – Sep 2009	-	Yes
Zinc (total)	mg/L	NV	3^	30	2	20	<0.005 (for the protection of aquaculture species) 5 (threshold for tainting of fish flesh)	0.053 (*n* = 39)	ID	Standard & Existing EA[8]	<0.005 - 0.354 (*n* = 36)	Aug 2009 – Sep 2009	-	Yes
Triethylene Glycol (TEG)	mg/L	0.33#	NV	NV	NV	NV	NV	ID	ID	Project-specific	NV	NV	Relevant to project	Yes
Aromatic Hydrocarbons (BTEX)	µg/L	NV	NV	NV	NV	NV	NV			Existing EA[8]	NV	NV	Logic for aromatic hydrocarbon inclusion unclear, unless significant petrol storage on site (note BTEX can detect most volatile components in fuels).	No, unless significant storage on site.
- Benzene		950	1	10	NV	1	NV	<1 (*n* = 23)	ID		<1 (*n* = 22)	Aug 2009	Not detected in August 2009 in: Tipton, Kogan or Daandine dams Kogan North or Daandine wells.	
- Toluene		180#	800 (25^)	8000	NV	800	250	<2 (*n* = 23)	ID		<2 (*n* = 22)	Aug 2009	Not detected in August 2009 in: Tipton, Kogan or Daandine dams Kogan North or Daandine wells.	
- Ethylbenzene		80#	300 (3^)	3000	NV	300	250	<2 (*n* = 23)	ID		<2 (*n* = 22)	Aug 2009	Not detected in August 2009 in: Tipton, Kogan or Daandine dams Kogan North or Daandine wells.	

Parameter	Unit	Published Guideline Values[1]						Interim site-specific Guideline Values[3]		Analyte Source (Reason for Inclusion)	Data range for Arrow water quality laboratory results (wells and dams)[4] and number of data points (n)	Date range of data	Comments	Recommended for inclusion in future monitoring program
		Aquatic Ecosystems[1a]	Drinking[2a] Water (and aesthetic^)	Recreational[2b]	Crop Irrigation[1b]	Livestock Watering[1c]	Aquaculture/ aquatic foods for human consumption[1d]	Condamine River (excluding Jimbour & Oakey Creek)[3]	Balonne River[3]					
- Xylene		NV	600 (20^)	6000	NV	600	NV	ID	ID		NV	NV		
- o-xylene		350	NV	NV	NV	NV	NV	<2 (*n* = 23)	ID		<2 (*n* = 22)	Aug 2009	Not detected in August 2009 in: Tipton, Kogan or Daandine dams Kogan North or Daandine wells.	
- *m*-xylene		75	NV	NV	NV	NV	NV	<2 (*n* = 23)	ID		NV	NV		
- *p*-xylene		200	NV	NV	NV	NV	NV	<2 (*n* = 23)	ID		NV	NV		
- *m*+*p*-xylene		NV	NV	NV	NV	NV	NV	ID	ID		<2 (*n* = 22)	Aug 2009	Not detected in August 2009 in: Tipton, Kogan or Daandine dams Kogan North or Daandine wells.	
- Cumene (Isopropylbenzene)		30	NV	NV	NV	NV	<250	<u>≤5 (*n* = 23)</u>	ID		NV	NV		
Polycyclic Aromatic Hydrocarbons (PAHs)	µg/L									Project-specific & Existing EA[8]	NV	NV	Present in coal. Produced as a byproduct of fuel burning. Present in diesel. PAHs may not be relevant to Arrow activities.	No, unless significant diesel storage on site.
- Naphthalene		16	NV	NV	NV	NV	1000	<0.02 (*n* = 14)	ID		NV	NV		
- Benzo(a)pyrene		0.2[#]	0.01	0.1	NV	0.01	NV	<0.005 (*n* = 14)	ID		NV	NV		

Parameter	Unit	Published Guideline Values[1]						Interim site-specific Guideline Values[3]		Analyte Source (Reason for Inclusion)	Data range for Arrow water quality laboratory results (wells and dams)[4] and number of data points (n)	Date range of data	Comments	Recommended for inclusion in future monitoring program
		Aquatic Ecosystems[1a]	Drinking[2a] Water (and aesthetic^)	Recreational[2b]	Crop Irrigation[1b]	Livestock Watering[1c]	Aquaculture/ aquatic foods for human consumption[1d]	Condamine River (excluding Jimbour & Oakey Creek)[3]	Balonne River[3]					
Total Petroleum Hydrocarbons (TPH)	µg/L	0.7#	NV	NV	NV	NV	NV	270 (*n* = 20)	ID	Existing EA[8]	<20 (C6 - C9 Fraction) (*n* = 28) <50 (C10 - C14 Fraction) (*n* = 36) <100 - 690 (C15 - C28 Fraction) (*n* = 36) < 50 - 690 (C29 - C36 Fraction) (*n* = 36)	Aug 2009 – Sep 2009, Dec 12	False positive may be due to natural organic matter. Chromatogram required to confirm presence of TPH. Associated with diesel and oil storage. May be value in screening for semi-volatile organics to identify specific compounds where TPH gives positive reading.	No, unless significant storage on site.
Total Recoverable Hydrocarbons (TRH	µg/L	NV	NV	NV	NV	NV	NV	ID	ID		230 (>C10 – C16 Fraction) 880 (>C16 – C34 Fraction) 470 (>C34-C40)	Dec 12		
Organochlorine Pesticides	µg/L									CNS Request (email dated 12/10/2009)	NV	NV	Unlikely to be present but should be confirmed with monitoring of coal seam gas water.	No, unless present in coal seam gas waters.
- Aldrin		0.001#	0.3	3	NV	0.3	<0.01	<0.002 (*n* = 15)	ID		NV	NV		
- Chlordane		0.03	2	30	NV	2	<0.01	<0.002 (*n* = 15)	ID		NV	NV		
- DDE		0.03#	NV	NV	NV	NV	<0.0015	<0.01 (*n* = 15)	ID		NV	NV		
- DDT		0.006	9	90	NV	9	<0.0015	<0.002 (*n* = 15)	ID		NV	NV		
- Dicofol		0.5#	4	40	NV	4	NV	ID	ID		NV	NV		
- Dieldrin		0.01#	0.3	3	NV	0.3	<0.005	<0.002 (*n* = 15)	ID		NV	NV		
- Endosulfan		0.03	20	200	NV	20	<0.003	<0.005 (*n* = 15)	ID		NV	NV		
- Endosulfan alpha		0.0002#	NV	NV	NV	NV	NV	<0.005 (*n* = 15)	ID		NV	NV		
- Endosulfan beta		0.007#	NV	NV	NV	NV	NV	<0.005 (*n* = 15)	ID		NV	NV		

Parameter	Unit	Published Guideline Values[1]						Interim site-specific Guideline Values[3]		Analyte Source (Reason for Inclusion)	Data range for Arrow water quality laboratory results (wells and dams)[4] and number of data points (n)	Date range of data	Comments	Recommended for inclusion in future monitoring program
		Aquatic Ecosystems[1a]	Drinking[2a] Water (and aesthetic^)	Recreational[2b]	Crop Irrigation[1b]	Livestock Watering[1c]	Aquaculture/ aquatic foods for human consumption[1d]	Condamine River (excluding Jimbour & Oakey Creek)[3]	Balonne River[3]					
- Endrin		0.01	NV	NV	NV	NV	<0.002	<0.004 (*n* = 15)	ID		NV	NV		
- Heptachlor		0.01	0.3	3	NV	0.3	<0.005	<0.01 (*n* = 15)	ID		NV	NV		
- Lindane		0.2	10	100	NV	10	<0.01	ID	ID		NV	NV		
- Methoxychlor		0.005#	300	3000	NV	300	<0.03	<0.002 (*n* = 15)	ID		NV	NV		
- Mirex		0.04#	NV	NV	NV	NV	<0.001	ID	ID		NV	NV		
- Toxaphene		0.1	NV	NV	NV	NV	<0.002	ID	ID		NV	NV		
Organophosphorus Pesticides	µg/L									CNS Request (email dated 12/10/2009)	NV	NV	Unlikely to be present but should be confirmed with monitoring of coal seam gas water.	No, unless present in coal seam gas waters.
- Azinphos methyl		0.01	30	300	NV	30	<0.01	<0.10 (*n* = 15)	ID		NV	NV		
- Chlorpyrifos		0.01	10	100	NV	10	<0.001	<0.05 (*n* = 15)	ID		NV	NV		
- Demeton		0.04#	NV	NV	NV	NV	<0.01	ID	ID		NV	NV		
- Demeton-S-methyl		4#	NV	NV	NV	NV	NV	<0.5 (*n* = 15)	ID		NV	NV		
- Diazinon		0.01	4	40	NV	4	NV	<0.10 (*n* = 15)	ID		NV	NV		
- Dimethoate		0.15	7	70	NV	7	NV	<0.15 (*n* = 15)	ID		NV	NV		
- Fenitrothion		0.2	7	70	NV	7	NV	ID	ID		NV	NV		
- Malathion		0.05	NV	NV	NV	NV	<0.1	<0.10 (*n* = 15)	ID		NV	NV		
- Parathion		0.004	20	200	NV	20	<0.04	<0.10 (*n* = 11)	ID		NV	NV		
- Profenofos		0.02#	0.3	3	NV	0.3	NV	ID	ID		NV	NV		
- Temephos		0.05#	400	4000	NV	400	NV	ID	ID		NV	NV		

A - Queensland Water Quality Guideline (QWQG) (DERM 2009a) 75th percentile values for the Fitzroy Central Rivers (Appendix G).

B - Queensland Water Quality Guideline (DERM 2009a) 75th percentile values for the Maranoa-Balonne-Border Rivers (Appendix G).

C - Queensland Water Quality Guideline (DERM 2009a) 75th percentile values for the Condamine-Macintyre Rivers (Appendix G).

D - Queensland Water Quality Guideline (DERM 2009a) 75th percentile values for the Southern Divide (tributaries of the Condamine) (Appendix G).

E - Memorandum regarding nitrate guideline values in ANZECC & ARMCANZ 2000 (Chris Hickey - NIWA, 30 September 2002).

F - Environmental Protection (Water) Policy (EPP Water) 2009 (DERM 2011). Water quality objectives to protect moderately disturbed aquatic ecosystem environmental values of Upper Dawson River Sub-basin waters.

1a - Basin (i.e. EPP Water), regional (i.e. QWQG) and national (i.e. ANZECC & ARMCANZ) guideline values/objectives for the protection of slightly-moderately disturbed aquatic freshwater ecosystems (EPP Water: Table 2; QWQG: Table G:1; ANZECC & ARMCANZ: Table 3.4.1 – 95% or 99% protection level; and Table 3.3.2/ 3.3.3 – South-east Australian upland rivers).

1b - Based on ANZECC & ARMCANZ 2000Section 4.2 Water quality for irrigation and general water use. Trigger values for phosphorous, nitrogen, heavy metals and metalloids are based on long term trigger values (ie the maximum concentration of contamination in the irrigation water which can be tolerated assuming 100 years of irrigation).

1c - Based on ANZECC & ARMCANZ 2000 Section 4.3.3 Major ions of concern for livestock drinking water quality and Table 4.3.2 Recommended water quality trigger values (low risk) for heavy metals and metalloids in livestock drinking water. In the absence of guideline values for pesticides and organic contaminants, ADWG guideline values are adopted for livestock drinking water.

1d – Based on ANZECC & ARMCANZ 2000) Table 4.4.2 Physico-chemical stressor guidelines for the protection of aquaculture species, recommended guidelines for freshwater production, Table 4.4.3 Toxicant guidelines for the protection of aquaculture species, guidelines for freshwater production, and Table 4.4.5 Guidelines for chemical compounds in water found to cause tainting of fish flesh and other aquatic organisms.

2a – Drinking water (and aesthetic) guideline values are taken from the Australian Drinking Water Guidelines (ADWG) (NHMRC & NRMMC 2011).

2b – Recreation guideline values are taken from Guidelines for Managing Risks in Recreational Water (NHMRC 2008). Waters contaminated with chemicals that are toxic or irritating to the skin or mucous membranes are unsuitable for recreational waters. In all cases, chemical and physical contaminants must be assessed on a local basis (NHMRC 2008). For chemicals, recreational guideline values have been calculated as 10 times the values stipulated in the ADWG, as recommended in NHMRC (2008).

3 - Site-specific guideline values are (unless otherwise specified) 80th percentile values (and 20th percentile values for low range pH and dissolved oxygen guideline values) calculated using data provided by the State of Queensland (Department of Environment and Resource Management) [2009 and 2011]) and baseline data collected during baseline surveys undertaken in October 2009, November 2009 and March 2010, where n is the number of values used for the calculation.

4 - Data collated from Arrow water quality laboratory results for Daandine Ponds, Tipton Ponds, Kogan Ponds, Meenawarra Wells, Daandine Wells, Tipton Wells, Kogan Wells and Stratheden Wells.

5 - Data collated from Arrow water quality laboratory results for Tipton Ponds only.

6 - Data collated from Arrow water quality laboratory results for Daandine Ponds only.

7 - Data collated from Arrow water quality laboratory results for Daandine and Tipton Ponds only.

8 - For determination if content of dam is hazardous waste – e.g. PEN200055107. Note that the analyte list included in this report was developed based on Arrow's existing EAs at the time of report preparation and it is understood that these EAs have since been superseded by the Dalby Expansion Project. Any changes incorporated into the consolidated EA are not expected to change the conclusions drawn in this report.

* ANZECC 2000 value for Arsenic V. Arsenic III trigger value is 0.024 mg/L.

^ Based on aesthetic drinking water guideline value (Australian Drinking Water Guidelines 2011) (ADWG).

Interim (low reliability) value from ANZECC & ARMCANZ 2000 Section 8.3.7.

+ Converted from ADWG value of 500 mg/L TDS using calculation provided in ANZECC/ARMCANZ (2000).

Table A1T-2. Comparison of SREIS and EIS water quality data from sampling sites in survey area 2 against interim site-specific guideline values for the Balonne River catchment

Parameter	Unit	Balonne River Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS						EIS			Median	
			Flow					No flow	No flow	Flow	No flow	Flow	No flow
			Bottle Tree Ck	Bottle Tree Ck	Bottle Tree Ck	Un-named tributary of Bottle Tree Ck	Dogwood Ck	Un-named tributary of Bottle Tree Ck	Dogwood Creek	Dogwood Creek	Rocky Creek		
			SA2S1	SA2S2	SA2S3	SA2S4	SA2S6	SA2S5	Site 20	Site 20	Site 140		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Nov 09	Mar 10	Nov 09		
Electrical conductivity	µS/cm	130[F] (*n* = 48) (75th percentile)	120	170	200	210	160	200	230	110	200	165	200
pH	pH unit	6.4 – 7.8 (*n* = 39)	5.47	5.98	5.96	5.39	5.97	6.00	6.44	6.09	6.36	5.965	6.36
Turbidity	NTU	248 (*n* = 47)	103	101	140	55.4	155	24.5	705	107	779	105	705
Dissolved Oxygen	% Saturation	24.2 – 80.2 (*n* = 33)	73.2	76	80.7	67.6	40.1	41.9	40.1	52	3.4	70.4	40.1
Temperature	° C	-	26.4	30.9	29.8	28.7	29.6	28.7	21.4	23.9	21.1	29.15	21.4
Total Suspended Solids (TSS)	mg/L	83 (*n* = 59)	18	13	15	16	120	<5	131	17	-	16.5	-
Sodium Absorption Ratio (SAR)	-	-	2.5	2.9	2.9	3.0	1.8	2.4	3.9	2	-	2.7	-
Sulfate	mg/L	4.9 (*n* = 39)	4.5	4.5	4.5	3.2	3.3	1.8	13	7	-	4.5	-
Chloride	mg/L	22 (*n* = 46)	42	48	48	55	30	53	46	22	-	45	-
Fluoride	mg/L	0.10 (*n* = 49)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.1	<0.05	-	0.02	-
Calcium	mg/L	ID	2.7	2.9	2.6	3.3	4.3	4.2	2	2.9	-	2.9	-
Magnesium	mg/L	ID	2.5	2.8	2.6	3.0	2.9	3.2	4	2.1	-	2.7	-

Parameter	Unit	Balonne River Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS						EIS			Median	
			Flow					No flow	No flow	Flow	No flow	Flow	No flow
			Bottle Tree Ck	Bottle Tree Ck	Bottle Tree Ck	Un-named tributary of Bottle Tree Ck	Dogwood Ck	Un-named tributary of Bottle Tree Ck	Dogwood Creek	Dogwood Creek	Rocky Creek		
			SA2S1	SA2S2	SA2S3	SA2S4	SA2S6	SA2S5	Site 20	Site 20	Site 140		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Nov 09	Mar 10	Nov 09		
Sodium	mg/L	ID	24	28	28	31	20	27	42	21	-	26	-
Potassium	mg/L	ID	4.1	3.6	3.3	2.2	3.1	2.8	-	3.9	-	3.45	-
Hardness (as $CaCO_3$)	mg/L	ID	17	19	17	21	23	24	22	16	-	18	-
Nitrite as N	mg/L	ID	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	-	0.005	-
Nitrate	mg/L	1.6 (as NO_3) (*n* = 35)	0.089	0.12	0.041	<0.005	0.040	<0.005	-	-	-	0.041	-
Nitrate	mg/L	0.36 (as N) (*n* = 35)	0.02	0.03	0.01	<0.005	.009	<0.005	0.07	0.11	-	0.015	-
Total Oxidised Nitrogen	mg/L	0.11 (as N) (*n* = 9)	-	-	-	-	-	-	0.07	0.11	-	-	-
Ammonia (NH_3 as N)	mg/L	0.13 (as N) (*n* = 8)	0.06	0.04	0.04	0.04	0.22	<0.01	0.12	0.16	-	0.05	0.065
Total Kjeldahl nitrogen (TKN)	mg/L	ID	1.7	1.5	1.2	1.9	1.7	1.7	-	-	-	1.7	-
Total Nitrogen	mg/L	1.57 (*n* = 31)	1.8	1.6	1.3	1.9	1.7	1.7	0.43	1.5	-	1.65	1.065
Total Phosphorus	mg/L	0.25 (*n* = 41)	0.29	0.11	0.11	0.16	0.18	0.10	1.08	0.11	-	0.135	0.59
Arsenic (dissolved)	mg/L	ID	0.001	0.002	0.002	0.002	0.001	0.002	0.0005	<0.003	-	0.002	0.00125
Arsenic (total)	mg/L	ID	0.003	0.003	0.003	0.003	0.003	0.003	0.0013	0.003	-	0.003	0.00215
Boron (dissolved)	mg/L	ID	0.050	0.058	0.057	0.060	0.056	0.058	0.015	0.042	-	0.0565	0.0365

Parameter	Unit	Balonne River Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS						EIS			Median	
			Flow					No flow	No flow	Flow	No flow	Flow	No flow
			Bottle Tree Ck	Bottle Tree Ck	Bottle Tree Ck	Un-named tributary of Bottle Tree Ck	Dogwood Ck	Un-named tributary of Bottle Tree Ck	Dogwood Creek	Dogwood Creek	Rocky Creek		
			SA2S1	SA2S2	SA2S3	SA2S4	SA2S6	SA2S5	Site 20	Site 20	Site 140		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Nov 09	Mar 10	Nov 09		
Boron (total)	mg/L	0.07 (*n* = 20)	0.054	0.053	0.050	0.055	0.051	0.052	0.010	0.048	-	0.052	0.031
Cadmium (dissolved)	mg/L	ID	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0001	-	0.0001	0.000075
Cadmium (total)	mg/L	ID	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0001	-	0.0001	0.000075
Cobalt (dissolved)	mg/L	ID	<0.001	0.002	0.003	0.002	0.004	0.002	0.0007	0.003	-	0.0025	0.00135
Cobalt (total)	mg/L	ID	0.005	0.004	0.004	0.003	0.006	0.002	0.0043	0.006	-	0.0045	0.00315
Copper (dissolved)	mg/L	0.03 (*n* = 30)	0.001	0.002	0.001	<0.001	0.001	<0.001	<0.0005	0.001	-	0.001	0.00075
Copper (total)	mg/L	ID	0.014	0.003	0.003	0.002	0.003	<0.001	0.004	0.001	-	0.003	0.0025
Lead (dissolved)	mg/L	ID	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.002	-	0.001	0.00055
Lead (total)	mg/L	ID	0.002	0.002	0.002	0.001	0.003	<0.001	0.0063	0.002	-	0.002	0.00365
Mercury (dissolved)	mg/L	ID	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	0.0001	0.0001
Mercury (total)	mg/L	ID	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	0.0001	0.0001
Nickel (dissolved)	mg/L	ID	0.002	0.002	20.002	0.002	0.002	0.001	<0.0005	0.004	-	0.002	0.00075
Nickel (total)	mg/L	ID	0.003	0.003	0.003	0.002	0.003	0.001	0.0019	0.003	-	0.003	0.00145
Selenium (dissolved)	mg/L	ID	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0002	<0.003	-	0.002	0.0011

Parameter	Unit	Balonne River Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS						EIS			Median	
			Flow					No flow	No flow	Flow	No flow	Flow	No flow
			Bottle Tree Ck	Bottle Tree Ck	Bottle Tree Ck	Un-named tributary of Bottle Tree Ck	Dogwood Ck	Un-named tributary of Bottle Tree Ck	Dogwood Creek	Dogwood Creek	Rocky Creek		
			SA2S1	SA2S2	SA2S3	SA2S4	SA2S6	SA2S5	Site 20	Site 20	Site 140		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Nov 09	Mar 10	Nov 09		
Selenium (total)	mg/L	ID	0.004	0.002	0.003	0.003	0.003	<0.002	0.0003	<0.003	-	0.003	0.00115
Vanadium (dissolved)	mg/L	ID	0.004	0.005	0.005	0.008	0.005	0.008	0.0004	0.006	-	0.005	0.0042
Vanadium (total)	mg/L	ID	0.016	0.018	0.020	0.016	0.021	0.013	0.0214	0.018	-	0.018	0.0172
Zinc (dissolved)	mg/L	0.07 (*n* = 30)	0.006	0.021	0.025	0.015	0.006	0.006	0.002	<0.005	-	0.0105	0.004
Zinc (total)	mg/L	ID	0.028	0.013	0.015	0.019	0.013	0.009	0.014	0.010	-	0.014	0.0115
Tri-Ethylene Glycol	mg/L	ID	<2	<2	<2	<2	<2	<2	<5.0	<5.0	-	2	3.5
Aromatic Hydrocarbons (BTEX)													
- Benzene	µg/L	ID	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	-	0.5	0.75
- Toluene	µg/L	ID	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	-	0.5	1.25
- Ethylbenzene	µg/L	ID	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	-	0.5	1.25
- Xylene	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-
- o-xylene	µg/L	ID	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	-	0.5	1.25
- m-xylene	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-

Parameter	Unit	Balonne River Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS						EIS			Median	
			Flow					No flow	No flow	Flow	No flow	Flow	No flow
			Bottle Tree Ck	Bottle Tree Ck	Bottle Tree Ck	Un-named tributary of Bottle Tree Ck	Dogwood Ck	Un-named tributary of Bottle Tree Ck	Dogwood Creek	Dogwood Creek	Rocky Creek		
			SA2S1	SA2S2	SA2S3	SA2S4	SA2S6	SA2S5	Site 20	Site 20	Site 140		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Nov 09	Mar 10	Nov 09		
- p-xylene	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-
- cumene (isopropylbene)zene	µg/L	ID	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	-	0.5	-
Polycyclic Aromatic Hydrocarbons (PAH)													
Naphthalene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.08	-	-	0.1	-
Acenaphthylene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Acenaphthene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Fluorene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Phenanthrene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Anthracene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Fluoranthene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Pyrene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Benz(a)anthracene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Chrysene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-

Parameter	Unit	Balonne River Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS						EIS			Median	
			Flow					No flow	No flow	Flow	No flow	Flow	No flow
			Bottle Tree Ck	Bottle Tree Ck	Bottle Tree Ck	Un-named tributary of Bottle Tree Ck	Dogwood Ck	Un-named tributary of Bottle Tree Ck	Dogwood Creek	Dogwood Creek	Rocky Creek		
			SA2S1	SA2S2	SA2S3	SA2S4	SA2S6	SA2S5	Site 20	Site 20	Site 140		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Nov 09	Mar 10	Nov 09		
Benzo(b)fluoranthene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Benzo(k)fluoranthene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Benzo(a)pyrene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.005	-	-	0.1	-
Indeno(1.2.3.cd)pyrene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Dibenz(a.h)anthracene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
Benzo(g.h.i)perylene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	-	-	0.1	-
tert-Butylbenzene	µg/L	ID	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	-	-	0.5	-
p-Isopropyltoluene	µg/L	ID	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	-	-	0.5	-
n-Butylbenzene	µg/L	ID	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	-	-	0.5	-
Total Petroleum Hydrocarbons (TPH) C10 - C36 Fraction (sum)	µg/L	ID	<450	<450	<450	<450	<450	630	290	<50	-	450	-
Organo-chlorine Pesticides													
- Aldrin	µg/L	ID	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.002	<0.01	-	0.01	-
- Chlordane	µg/L	-	-	-	-	-	-	-	-	-	-	-	-

Parameter	Unit	Balonne River Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS						EIS			Median	
			Flow					No flow	No flow	Flow	No flow	Flow	No flow
			Bottle Tree Ck	Bottle Tree Ck	Bottle Tree Ck	Un-named tributary of Bottle Tree Ck	Dogwood Ck	Un-named tributary of Bottle Tree Ck	Dogwood Creek	Dogwood Creek	Rocky Creek		
			SA2S1	SA2S2	SA2S3	SA2S4	SA2S6	SA2S5	Site 20	Site 20	Site 140		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Nov 09	Mar 10	Nov 09		
- DDE	µg/L	ID	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	-	-	0.01	-
- DDT	µg/L	ID	<0.006	<0.005	-	<0.006	<0.006	<0.006	-	-	-	0.006	-
- Dicofol	µg/L	ID	-	-	-	-	-	-	-	<0.50		-	-
- Dieldrin	µg/L	ID	<0.006	<0.005	-	<0.006	<0.006	<0.006	<0.002	<0.002	-	0.006	-
- Endosulfan	µg/L	ID	-	-	-	-	-	-	<0.002	<0.005	-	0.005	-
- Endosulfan alpha	µg/L	ID	<0.006	<0.005	-	<0.006	<0.006	<0.006	<0.002	<0.005	-	0.006	-
- Endosulfan beta	µg/L	ID	<0.006	<0.005	-	<0.006	<0.006	<0.006	<0.002	<0.005	-	0.006	-
- Endrin	µg/L	ID	<0.006	<0.005	-	<0.006	<0.006	<0.006	<0.002	<0.004	-	0.006	-
- Heptachlor	µg/L	ID	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.001	<0.01	-	0.01	-
- Lindane	µg/L	ID	<0.05	<0.05	-	<0.05	<0.05	<0.05	-	-	-	0.05	-
- Methoxychlor	µg/L	ID	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.002	-	-	0.1	-
- Mirex	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-
- Toxaphene	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-

Parameter	Unit	Balonne River Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS						EIS			Median	
			Flow					No flow	No flow	Flow	No flow	Flow	No flow
			Bottle Tree Ck	Bottle Tree Ck	Bottle Tree Ck	Un-named tributary of Bottle Tree Ck	Dogwood Ck	Un-named tributary of Bottle Tree Ck	Dogwood Creek	Dogwood Creek	Rocky Creek		
			SA2S1	SA2S2	SA2S3	SA2S4	SA2S6	SA2S5	Site 20	Site 20	Site 140		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Nov 09	Mar 10	Nov 09		
Organo-phosphorus Pesticides													
- Azinphos methyl	µg/L	ID	-	-	-	-	-	-	<0.02	<0.05	-	-	-
- Chlorpyrifos	µg/L	ID	<0.009	<0.009	-	<0.009	<0.009	<0.009	<0.010	<0.009	-	0.009	-
- Demeton	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-
- Demeton-S-methyl	µg/L	-	-	-	-	-	-	-	<0.02	<0.50	-	0.5	-
- Diazinon	µg/L	ID	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.02	<0.01	-	0.01	-
- Dimethoate	µg/L	ID	-	-	-	-	-	-	<0.02	<0.15	-	0.15	-
- Fenitrothion	µg/L	ID	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.02	-	-	0.2	-
- Malathion	µg/L	ID	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.02	<0.05	-	0.05	-
- Parathion	µg/L	ID	<0.006	<0.005	-	<0.006	<0.006	<0.006	<0.02	-	-	0.006	-
- Profenofos	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-
- Temephos	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-
Phenol	mg/L	ID	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<2	-	-	0.01	-

[1] - Site-specific guideline values are (unless otherwise specified) 80th percentile values (and 20th percentile values for low range pH and dissolved oxygen guideline values) calculated using data provided by the State of Queensland (Department of Environment and Resource Management) [2009 and 2011]) and baseline data collected during baseline surveys undertaken in October 2009, November 2009 and March 2010, where *n* is the number of values used for the calculation.

ID – Insufficient data for the calculation of a site-specific guideline value.

The site name prefix 'DA' (drainage area) on the chain of custody, sample receipt notice and certificate of analysis documentation corresponds to the new site name prefix 'SA' (survey area) used in this table.

Table A1T-3. Comparison of SREIS and EIS water quality data from sampling sites in survey area 9 against interim site-specific guideline values for the Condamine River catchment

Parameter	Unit	Condamine River (excluding Jimbour & Oakey Creek) Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS								EIS				Median	
			Flow							No flow	No flow	No flow	No flow	Unknown	Flow	No flow
			Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Crawlers Ck	Crawlers Ck	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir		
			SA9S1	SA9S2	SA9S3	SA9S4	SA9S5	SA9S6	SA9S7	SA9S8	Site 3	Site 4	Site 4	Site 4		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Oct 09	Oct 09	Nov 09	Mar 10		
Electrical conductivity	µS/cm	500[FG] (*n* = 738) (75th percentile)	310	320	310	310	310	300	310	310	170	330	370	170	310	320
pH	pH unit	7.3 – 8.3 (*n* = 311)	7.6	7.35	7.37	7.34	7.32	7.19	7.24	6.62	6.85	7.96	7.64	7.56	7.34	7.245
Turbidity	NTU	200 (*n* = 431)	88.9	103	95	89.3	87.8	92.6	98.9	133	755	24.1	23	128	92.6	78.55
Dissolved Oxygen	% Saturation	46 – 103 (*n* = 213)	51.8	61.9	62.9	61.3	67.7	65.1	97.7	36.3	29.9	94.4	62.1	82.8	62.9	49.2
Temperature	° C	-	28.3	28.1	28.1	28.1	29.4	29.1	28.4	25.6	16.9	22.1	24.3	22.6	28.3	23.2
Total Suspended Solids (TSS)	mg/L	152 (*n* = 492)	110	80	96	90	80	74	90	74	-	26	23	74	90	26
Sodium Absorption Ratio (SAR)	-	-	0.79	0.79	0.80	0.80	0.81	0.82	0.79	2.1	-	0.97	0.97	<1	0.8	0.97
Sulfate	mg/L	9 (*n* = 490)	3.8	3.8	4.2	3.6	4.3	4.0	4.5	3.7	-	3	2	4	4	3
Chloride	mg/L	94 (*n* = 577)	34	33	29	32	32	31	31	37	-	24	30	14	32	30
Fluoride	mg/L	0.23 (*n* = 576)	0.19	0.20	0.16	0.20	0.16	0.19	0.16	0.15	-	0.2	0.2	0.08	0.19	0.2
Calcium	mg/L	ID	22	22	22	21	21	21	21	8.0	-	25	27	12	21	25
Magnesium	mg/L	ID	13	13	13	12	12	12	12	8.0	-	13	14	6.5	12	13

Parameter	Unit	Condamine River (excluding Jimbour & Oakey Creek) Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS								EIS				Median	
			Flow							No flow	No flow	No flow	No flow	Unknown	Flow	No flow
			Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Crawlers Ck	Crawlers Ck	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir		
			SA9S1	SA9S2	SA9S3	SA9S4	SA9S5	SA9S6	SA9S7	SA9S8	Site 3	Site 4	Site 4	Site 4		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Oct 09	Oct 09	Nov 09	Mar 10		
Sodium	mg/L	ID	19	19	19	19	19	19	18	35	-	24	25	13	19	25
Potassium	mg/L	ID	3.7	3.8	3.8	3.9	3.9	3.9	3.8	7.7	-				3.8	-
Hardness (as $CaCO_3$)	mg/L	-	110	110	110	100	100	100	100	53	-	115	126	57	100	115
Nitrite	mg/L	ID	<0.005	0.006	0.008	0.016	0.018	0.028	0.031	<0.005	-	<0.01	<0.01	<0.005	0.016	0.01
Nitrate	mg/L	2.84 (as NO_3) (*n* = 208)	0.10	0.094	0.17	0.13	0.098	0.13	0.15	<0.005	-	0.088	0.088	0.31	0.13	0.088
Nitrate	mg/L	0.64 (as N) (*n* = 208)	0.02	0.02	0.038	0.03	0.022	0.029	0.03	<0.005	-	0.02	0.02	0.071	0.029	0.02
Total Oxidised Nitrogen	mg/L	0.44 (as N) (*n* = 102)	-	-	-	-	-	-	-	-	-	0.02	0.02	0.071	-	-
Ammonia (NH_3 as N)	mg/L	0.07 (*n* = 103)	0.03	0.05	0.03	0.03	0.06	0.04	0.04	0.04	-	0.03	0.046	0.060	0.04	0.04
Total Kjeldahl nitrogen (TKN)	mg/L	-	0.8	0.8	0.8	0.8	1.2	0.9	0.8	3.0	-	-	-	-	0.8	-
Total Nitrogen	mg/L	1.89 (*n* = 143)	1.0	0.9	1.0	1.0	1.3	1.0	1.0	3.0	-	0.34	0.57	0.91	1	0.57
Total Phosphorus	mg/L	0.54 (*n* = 239)	0.38	0.40	0.39	0.40	0.43	0.42	0.39	1.2	-	0.03	0.066	0.25	0.4	0.066
Arsenic (dissolved)	mg/L	0.001 (*n* = 30)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	-	0.0006	0.0009	<0.003	0.001	0.0009
Arsenic (total)	mg/L	0.004 (*n* = 31)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.009	-	0.0007	0.001	<0.003	0.002	0.001
Boron (dissolved)	mg/L	0.046 (*n* = 31)	0.038	0.038	0.037	0.039	0.038	0.037	0.037	0.056	-	0.022	0.018	0.019	0.038	0.022

Parameter	Unit	Condamine River (excluding Jimbour & Oakey Creek) Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS								EIS				Median	
			Flow							No flow	No flow	No flow	No flow	Unknown	Flow	No flow
			Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Crawlers Ck	Crawlers Ck	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir		
			SA9S1	SA9S2	SA9S3	SA9S4	SA9S5	SA9S6	SA9S7	SA9S8	Site 3	Site 4	Site 4	Site 4		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Oct 09	Oct 09	Nov 09	Mar 10		
Boron (total)	mg/L	0.1 (*n* = 137)	0.030	0.030	0.031	0.031	0.032	0.033	0.031	0.049	-	0.022	0.016	0.022	0.031	0.022
Cadmium (dissolved)	mg/L	< 0.0001 (*n* = 31)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.00005	<0.00005	<0.0001	0.0001	0.00005
Cadmium (total)	mg/L	0.0001 (*n* = 39)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.00005	<0.00005	<0.0001	0.0001	0.00005
Cobalt (dissolved)	mg/L	0.002 (*n* = 31)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	-	0.0002	0.0005	<0.001	0.001	0.0005
Cobalt (total)	mg/L	0.012 (*n* = 31)	0.004	0.004	0.003	0.003	0.002	0.002	0.003	0.013	-	0.0016	0.0012	0.003	0.003	0.0016
Copper (dissolved)	mg/L	0.020 (*n* = 171)	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	-	0.001	0.0006	0.002	0.003	0.001
Copper (total)	mg/L	0.011 (*n* = 40)	0.006	0.005	0.005	0.005	0.005	0.005	0.006	0.004	-	0.0016	0.0012	0.004	0.005	0.0016
Lead (dissolved)	mg/L	0.001 (*n* = 31)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.0001	<0.0001	0.003	0.001	0.0001
Lead (total)	mg/L	0.011 (*n* = 37)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	-	0.0003	0.0004	0.002	0.001	0.0004
Mercury (dissolved)	mg/L	< 0.0001 (*n* = 31)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	0.0001	0.0001
Mercury (total)	mg/L	< 0.0001 (*n* = 31)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	0.0001	0.0001
Nickel (dissolved)	mg/L	0.004 (*n* = 31)	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.005	-	0.0034	0.0035	0.003	0.005	0.0035
Nickel (total)	mg/L	0.022 (*n* = 40)	0.011	0.011	0.011	0.011	0.010	0.010	0.011	0.007	-	0.0046	0.0047	0.008	0.011	0.0047
Selenium (dissolved)	mg/L	0.0003 (*n* = 31)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.0002	<0.0002	<0.003	0.002	0.0002

Parameter	Unit	Condamine River (excluding Jimbour & Oakey Creek) Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS								EIS				Median	
			Flow							No flow	No flow	No flow	No flow	Unknown	Flow	No flow
			Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Crawlers Ck	Crawlers Ck	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir		
			SA9S1	SA9S2	SA9S3	SA9S4	SA9S5	SA9S6	SA9S7	SA9S8	Site 3	Site 4	Site 4	Site 4		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Oct 09	Oct 09	Nov 09	Mar 10		
Selenium (total)	mg/L	0.0006 (*n* = 31)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.005	-	<0.0002	<0.0002	<0.003	0.002	0.0002
Vanadium (dissolved)	mg/L	0.010 (*n* = 29)	0.014	0.015	0.014	0.014	0.014	0.013	0.014	0.003	-	0.0051	0.0048	0.010	0.014	0.0048
Vanadium (total)	mg/L	0.027 (*n* = 22)	0.022	0.022	0.021	0.021	0.020	0.020	0.020	0.016	-	-	0.0064	0.017	0.021	-
Zinc (dissolved)	mg/L	0.03 (*n* = 143)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	-	0.003	0.004	<0.005	0.001	0.003
Zinc (total)	mg/L	0.053 (*n* = 39)	0.015	0.014	0.012	0.014	0.010	0.014	0.016	0.020	-	0.003	0.002	0.012	0.014	0.003
Tri-Ethylene Glycol	mg/L	ID	<2	<2	<2	<2	<2	<2	<2	<2	-	-	-	-	2	-
Aromatic Hydrocarbons (BTEX)																
- Benzene	µg/L	<1 (*n* = 23)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<1	-	<0.5	0.5	-
- Toluene	µg/L	<2 (*n* = 23)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<2	-	<0.5	0.5	-
- Ethylbenzene	µg/L	<2 (*n* = 23)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<2	-	<0.5	0.5	-
- Xylene	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- o-xylene	µg/L	<2 (*n* = 23)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<2	-	<0.5	0.5	-
- m-xylene	µg/L	<2 (*n* = 23)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- p-xylene	µg/L	<2 (*n* = 23)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Parameter	Unit	Condamine River (excluding Jimbour & Oakey Creek) Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS								EIS				Median	
			Flow							No flow	No flow	No flow	No flow	Unknown	Flow	No flow
			Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Crawlers Ck	Crawlers Ck	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir		
			SA9S1	SA9S2	SA9S3	SA9S4	SA9S5	SA9S6	SA9S7	SA9S8	Site 3	Site 4	Site 4	Site 4		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Oct 09	Oct 09	Nov 09	Mar 10		
- cumene (isopropylbenzene)	µg/L	<5 (*n* = 23)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	-	<0.5	0.5	-
Polycyclic Aromatic Hydrocarbons (PAH)																
- Naphthalene	µg/L	<0.02 (*n* = 14)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Acenaphthylene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Acenaphthene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Fluorene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Phenanthrene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Anthracene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Fluoranthene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Pyrene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Benz(a)anthracene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Chrysene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Benzo(b)fluoranthene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Benzo(k)fluoranthene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-

Parameter	Unit	Condamine River (excluding Jimbour & Oakey Creek) Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS								EIS				Median	
			Flow							No flow	No flow	No flow	No flow	Unknown	Flow	No flow
			Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Crawlers Ck	Crawlers Ck	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir		
			SA9S1	SA9S2	SA9S3	SA9S4	SA9S5	SA9S6	SA9S7	SA9S8	Site 3	Site 4	Site 4	Site 4		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Oct 09	Oct 09	Nov 09	Mar 10		
- Benzo(a)pyrene	µg/L	<0.005 (*n* = 14)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.005	-	-	0.1	-
Indeno(1.2.3.cd)pyrene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Dibenz(a.h)anthracene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Benzo(g.h.i)perylene	µg/L	ID	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.02	-	-	0.1	-
Total Petroleum Hydrocarbons (TPH) C10 - C36 Fraction (sum)	µg/L	270 (*n* = 20)	<450	<450	<450	<450	<450	<450	<450	<450	-	<50	<50	<50	450	50
Organo-chlorine Pesticides																
- Aldrin	µg/L	<0.002 (*n* = 15)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	<0.01	0.01	-
- Chlordane	µg/L	<0.002 (*n* = 15)	-	-	-	-	-	-	-		-	-	-	-	-	-
- DDE	µg/L	<0.01 (*n* = 15)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	0.01	-
- DDT	µg/L	<0.002 (*n* = 15)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	0.002	-
- Dicofol	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-	<0.50	-	-
- Dieldrin	µg/L	<0.002 (*n* = 15)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	<0.002	0.002	-
- Endosulfan	µg/L	<0.005 (*n* = 15)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.002	-	<0.005	0.005	-
- Endosulfan alpha	µg/L	<0.005 (*n* = 15)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.002	-	<0.005	0.005	-

Parameter	Unit	Condamine River (excluding Jimbour & Oakey Creek) Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS								EIS				Median	
			Flow							No flow	No flow	No flow	No flow	Unknown	Flow	No flow
			Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Crawlers Ck	Crawlers Ck	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir		
			SA9S1	SA9S2	SA9S3	SA9S4	SA9S5	SA9S6	SA9S7	SA9S8	Site 3	Site 4	Site 4	Site 4		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Oct 09	Oct 09	Nov 09	Mar 10		
- Endosulfan beta	µg/L	<0.005 (*n* = 15)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.002	-	<0.005	0.005	-
- Endrin	µg/L	<0.004 (*n* = 15)	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.002	-	<0.004	0.004	-
- Heptachlor	µg/L	<0.01 (*n* = 15)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.001	-	<0.01	0.01	-
- Lindane	µg/L	ID	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	-	-	0.05	-
- Methoxychlor	µg/L	<0.002 (*n* = 15)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.002	-	<0.10	0.1	-
- Mirex	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Toxaphene	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organo-phosphorus Pesticides																
- Azinphos methyl	µg/L	<0.10 (*n* = 15)	-	-	-	-	-	-	-	-	-	<0.10	-	<0.05	-	-
- Chlorpyrifos	µg/L	<0.05 (*n* = 15)	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	-	<0.050	-	<0.009	0.009	-
- Demeton	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Demeton-S-methyl	µg/L	<0.5 (*n* = 15)	-	-	-	-	-	-	-	-	-	<0.10	-	<0.50	-	-
- Diazinon	µg/L	<0.10 (*n* = 15)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.10	-	<0.01	0.01	-
- Dimethoate	µg/L	<0.15 (*n* = 15)	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-

Parameter	Unit	Condamine River (excluding Jimbour & Oakey Creek) Interim Site-specific Guideline Values1 20th and/or 80th Percentile (n)	SREIS								EIS				Median	
			Flow							No flow	No flow	No flow	No flow	Unknown	Flow	No flow
			Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Condamine River	Crawlers Ck	Crawlers Ck	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir	Condamine River @ Cecil Plains weir		
			SA9S1	SA9S2	SA9S3	SA9S4	SA9S5	SA9S6	SA9S7	SA9S8	Site 3	Site 4	Site 4	Site 4		
			Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Feb 13	Oct 09	Oct 09	Nov 09	Mar 10		
- Fenitrothion	µg/L	ID	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.10	-	<0.15	0.2	-
- Malathion	µg/L	<0.10 (*n* = 15)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.10	-	<0.05	0.05	-
- Parathion	µg/L	<0.10 (*n* = 11)	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.10	-	-	0.004	-
- Profenofos	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Temephos	µg/L	ID	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol	mg/L	ID	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.20	-	-	0.01	-

[1] - Site-specific guideline values are (unless otherwise specified) 80th percentile values (and 20th percentile values for low range pH and dissolved oxygen guideline values) calculated using data provided by the State of Queensland (Department of Environment and Resource Management) [2009 and 2011]) and baseline data collected during baseline surveys undertaken in October 2009, November 2009 and March 2010, where *n* is the number of values used for the calculation.

ID – Insufficient data for the calculation of a site-specific guideline value.

The site name prefix 'DA' (drainage area) on the chain of custody, sample receipt notice and certificate of analysis documentation corresponds to the new site name prefix 'SA' (survey area) used in this table.

Attachment B
Laboratory Chain of Custody, Water Quality and Quality Control Results

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(SGS use only)*

Laboratory ID	Client SAMPLE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Analysis Required: See attached analyte list for LORs (sulfate, chloride, fluoride, hardness, SAR, TSS, NH3, NO3, NO2, TN, TP, TPH, MAH, Total and dissolved metals (As, B, Cd, Co, Cu, Pb, Hg, Ni, V, Se, Zn), OC/OP pesticides, TEG, PAH, phenol)	Comments:
1	DA2-S1	13/2/13		x			x			x x x x x x x x x x x	~~Nutrients and~~ dissolved metals field filtered. Please freeze nutrient samples if not frozen on arrival. See attached analyte list for required LORs
2	DA2-S2	12/2/13		x			x			x x x x x x x x x x x	
3	DA2-S3	13/2/13		x			x			x x x x x x x x x x x	
4	DA2-S4	12/2/13		x			x			x x x x x x x x x x x	
5	DA2-S5	12/2/13		x			x			x x x x x x x x x x x	
6	DA2-S6	13/2/13		x			x			x x x x x x x x x x x	
7	QA1	13/2/13		x			x			x x x x x x x x x x x	
8	BLANK2	13/2/13		x			x			x x x x x x x x x x x	
9	DA9-S1	14/2/13		x			x			x x x x x x x x x x x	
10	DA9-S2	14/2/13		x			x			x x x x x x x x x x x	

Nutrients not field filtered. Please lab filter.

Company Name: Alluvium Consulting/NRA
Address: .....
.....
Contact Name: Tyson Smalley (Alluvium), Jason Carter (Alluvium), Genevieve Olle (NRA), Paul Godfrey (NRA)
tyson.smalley@alluvium.com.au,
jason.carter@alluvium.com.au,
Email address: genevieve@natres.com.au, paul@natres.com.au
Telephone: 9686 3508 (Alluvium) 4034 5300 (NRA)

Client Order Number: .....
Project Name: Surat Gas Project Surface Water
Project Number: .....
Results Required By: .....

Laboratory Contact: .....
Total Number of Containers/Bottles: .....
Total Number of Samples/Sites: .....

SGS
Received 19/02/13
By S.S
Time 9.45 am/pm
Samples intact yes/no
Ice/Cooler Pack yes/no
Temperature on Receipt 3.8 °C
Storage Location W063-68
SGS REF No SE115508

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** ..... **Time:** .....

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details: Samples received @ SGS Rocklea submerged in icy water
Invoice to be sent to Jason Carter from Alluvium

Please provide client with details ☐
Consent given for subcontracting ☐

SGS

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(SGS use only)*

Laboratory ID	Client SAMPLE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Analysis Required: See attached analyte list for LORs (sulfate, chloride, fluoride, hardness, SAR, TSS, NH3, NO3, NO2, TN, TP, TPH, MAH, Total and dissolved metals (As, B, Cd, Co, Cu, Pb, Hg, Ni, V, Se, Zn), OC/OP pesticides, TEG, PAH, phenol)	Comments:
11	DA9-S3	14/2/13		x			x			x x x x x x x x x x x	Nutrients and dissolved metals field filtered. Please freeze nutrient samples if not frozen on arrival. See attached analyte list for required LORs
12	DA9-S4	14/2/13		x			x			x x x x x x x x x x x	
13	DA9-S5	14/2/13		x			x			x x x x x x x x x x x	
14	DA9-S6	13/2/13		x			x			x x x x x x x x x x x	
15	DA9-S7	13/2/13		x			x			x x x x x x x x x x x	
16	DA9-S8	14/2/13		x			x			x x x x x x x x x x x	
				x			x			x x x x x x x x x x x	
				x			x			x x x x x x x x x x x	
				x			x			x x x x x x x x x x x	
				x			x			x x x x x x x x x x x	

DA9-S1 to DA9-S8 were not field filtered for metals. Please filter in the lab.

Company Name: Alluvium Consulting/NRA
Client Order Number: .....
Laboratory Contact: .....
Address: .....
Project Name: Surat Gas Project Surface Water
Project Number: .....
Total Number of Containers/Bottles: .....
Contact Name: Tyson Smalley (Alluvium), Jason Carter (Alluvium), Genevieve Olle (NRA), Paul Godfrey (NRA)
tyson.smalley@alluvium.com.au,
jason.carter@alluvium.com.au,
Email address: genevieve@natres.com.au, paul@natres.com.au
Results Required By: .....
Total Number of Samples/Sites: .....
Telephone: 9686 3508 (Alluvium) 4034 5300 (NRA)

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** ..... **Time:** .....

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:
Invoice to be sent to Jason Carter from Alluvium

Please provide client with details ☐
Consent given for subcontracting ☐

SAMPLE RECEIPT ADVICE

SE115508

CLIENT DETAILS

Contact	Tyson Smalley
Client	Alluvium Consulting (Queensland)
Address	3/62 Walker St TOWNSVILLE QLD 4810
Telephone	07 4724 2170
Facsimile	07 4724 1639
Email	tyson.smalley@alluvium.com.au
Project	**Surat Gas Project Surface Water**
Order Number	(Not specified)
Samples	16

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Fri 15/2/2013
Report Due	Fri 1/3/2013
SGS Reference	**SE115508**

SUBMISSION DETAILS

This is to confirm that 16 samples were received on Friday 15/2/2013. Results are expected to be ready by Friday 1/3/2013. Please quote SGS reference SE115508 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	16 Waters	Type of documentation received	COC
Date documentation received	19/2/2013	Samples received in good order	No-See comments
Samples received without headspace	Yes	Sample temperature upon receipt	3.8°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice Bricks	Samples clearly labelled	No-See comments
Complete documentation received	Yes		

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

Samples received at SGS Brisbane, Pinkenba = 15/02/2013 and were receipted submerged in icy water.
Samples received at SGS Sydney, Alexandria = 19/02/2013

1 x glass vial for sample ID "DA9-S1" was received broken at SGS Sydney.
2 x 1L glass amber bottles for sample ID "DA2-S3" = SE115508-3 were received at SGS Perth broken. As such OC/OP Pesticides ultra low level analysis not possible on this sample.

1 x 1L glass amber bottle received labelled "S5". Allocation of bottle to "DA2" or "DA9" series unknown.
This bottle was received broken at SGS Perth.

OC/OP Pesticides ultra low level :subcontracted to SGS Perth Environmental, 10 Reid Rd Newburn WA, NATA Accreditation Number 2562, Site Number 898, refer to PE074880,

Filtration/Acidification of water for Dissolved Metals analysis conducted at SGS laboratory. Field Filtered container not supplied by client for samples DA9-S1 to DA9-S8..

SAMPLE RECEIPT ADVICE

SE115508

CLIENT DETAILS

Client: Alluvium Consulting (Queensland)

Project: Surat Gas Project Surface Water

SUMMARY OF ANALYSIS

No.	Sample ID	Ammonia Nitrogen by Discrete Analyser	Anions by Ion Chromatography in Water	Nitrite in Water	PAH (Polynuclear Aromatic Hydrocarbons) in	TKN Kjeldahl Digestion by Discrete Analyser	Total and Volatile Suspended Solids (TSS /	Total Phosphorus by Kjeldahl Digestion DA in	TRH (Total Recoverable Hydrocarbons) in Water	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	DA2-S1	1	4	1	22	2	1	1	9	22	8
002	DA2-S2	1	4	1	22	2	1	1	9	22	8
003	DA2-S3	1	4	1	22	2	1	1	9	22	8
004	DA2-S4	1	4	1	22	2	1	1	9	22	8
005	DA2-S5	1	4	1	22	2	1	1	9	22	8
006	DA2-S6	1	4	1	22	2	1	1	9	22	8
007	QA1	1	4	1	22	2	1	1	9	22	8
008	BLANK 2	1	4	1	22	2	1	1	9	22	8
009	DA9-S1	1	4	1	22	2	1	1	9	22	8
010	DA9-S2	1	4	1	22	2	1	1	9	22	8
011	DA9-S3	1	4	1	22	2	1	1	9	22	8
012	DA9-S4	1	4	1	22	2	1	1	9	22	8
013	DA9-S5	1	4	1	22	2	1	1	9	22	8
014	DA9-S6	1	4	1	22	2	1	1	9	22	8
015	DA9-S7	1	4	1	22	2	1	1	9	22	8
016	DA9-S8	1	4	1	22	2	1	1	9	22	8

CONTINUED OVERLEAF

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.

SAMPLE RECEIPT ADVICE

SE115508

CLIENT DETAILS

Client	Alluvium Consulting (Queensland)	Project	Surat Gas Project Surface Water

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury (dissolved) in Water	Mercury (total) in Water	Metals in Water (Dissolved) by ICPOES	Sample Subcontracted	Total Phenolics in Water	Trace Metals (Dissolved) in Water by ICPMS	Trace Metals (Total) in Water by ICPMS
001	DA2-S1	1	1	6	1	1	10	10
002	DA2-S2	1	1	6	1	1	10	10
003	DA2-S3	1	1	6	-	1	10	10
004	DA2-S4	1	1	6	1	1	10	10
005	DA2-S5	1	1	6	1	1	10	10
006	DA2-S6	1	1	6	1	1	10	10
007	QA1	1	1	6	1	1	10	10
008	BLANK 2	1	1	6	1	1	10	10
009	DA9-S1	1	1	6	1	1	10	10
010	DA9-S2	1	1	6	1	1	10	10
011	DA9-S3	1	1	6	1	1	10	10
012	DA9-S4	1	1	6	1	1	10	10
013	DA9-S5	1	1	6	1	1	10	10
014	DA9-S6	1	1	6	1	1	10	10
015	DA9-S7	1	1	6	1	1	10	10
016	DA9-S8	1	1	6	1	1	10	10

The above table represents SGS Environmental Services' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details.
Testing as per this table shall commence immediately unless the client intervenes with a correction.

ANALYTICAL REPORT

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Paul Godfrey	Manager	Huong Crawford
Client	NATURAL RESOURCE ASSESSMENTS PTY LTD	Laboratory	SGS Alexandria Environmental
Address	PO BOX 5678 CAIRNS QLD 4870	Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	61 7 40345300	Telephone	+61 2 8594 0400
Facsimile	61 7 40345301	Facsimile	+61 2 8594 0499
Email	paul@natres.com.au	Email	au.environmental.sydney@sgs.com
Project	**Surat Gas Project Surface Water**	SGS Reference	**SE115508 R0**
Order Number	(Not specified)	Report Number	0000052778
Samples	16	Date Reported	15 Mar 2013
		Date Received	15 Feb 2013

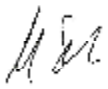
COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

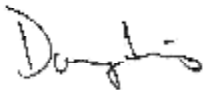
Trace Metals subcontracted to SGS Perth Environmental, 10 Reid Rd Newburn WA, NATA Accreditation Number 2562, Site Number 898, PE 075272 RO.

ULTRA LL OC/OP Pesticides subcontracted to SGS Perth Environmental, 10 Reid Rd Newburn WA, NATA Accreditation Number 2562, Site Number 898.

SIGNATORIES

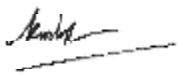


Andy Sutton
Organics Chemist

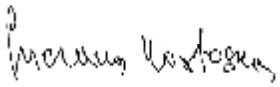


Dong Liang
Inorganics Metals Team Leader

Kamrul Ahsan
Metals Chemist



Ly Kim Ha
Organics Supervisor



Snezana Kostoska
Inorganics Chemist

Parameter	Units	LOR	Sample Number: SE115508.001 Sample Matrix: Water Sample Date: 13 Feb 2013 Sample Name: DA2-S1	SE115508.002 Water 12 Feb 2013 DA2-S2	SE115508.003 Water 13 Feb 2013 DA2-S3	SE115508.004 Water 12 Feb 2013 DA2-S4
VOCs in Water Method: AN433/AN434						
Monocyclic Aromatic Hydrocarbons						
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1	<1	<1
Styrene (Vinyl benzene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
n-propylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
tert-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
sec-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
p-isopropyltoluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
n-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Polycyclic VOCs						
Naphthalene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	**104**	**105**	**110**	**110**
d8-toluene (Surrogate)	%	-	**106**	**106**	**111**	**111**
d4-1,2-dichloroethane (Surrogate)	%	-	**84**	**83**	**80**	**83**
Bromofluorobenzene (Surrogate)	%	-	**77**	**81**	**75**	**83**
Totals						
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	<3	<3	<3
Total MAH	µg/L	0.5	<0.5	<0.5	<0.5	<0.5

Parameter	Units	LOR	Sample Number: SE115508.001 Sample Matrix: Water Sample Date: 13 Feb 2013 Sample Name: DA2-S1	SE115508.002 Water 12 Feb 2013 DA2-S2	SE115508.003 Water 13 Feb 2013 DA2-S3	SE115508.004 Water 12 Feb 2013 DA2-S4
Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434/AN410						
TRH C6-C10	µg/L	50	<50	<50	<50	<50
TRH C6-C9	µg/L	40	<40	<40	<40	<40
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	**111**	**105**	**111**	**121**
d4-1,2-dichloroethane (Surrogate)	%	-	**112**	**107**	**111**	**123**
d8-toluene (Surrogate)	%	-	**76**	**74**	**74**	**103**
Bromofluorobenzene (Surrogate)	%	-	**86**	**85**	**77**	**80**
VPH F Bands						
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50	<50
TRH (Total Recoverable Hydrocarbons) in Water Method: AN403						
TRH C10-C14	µg/L	50	<50	<50	<50	<50
TRH C15-C28	µg/L	200	<200	<200	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200	<200
TRH C10-C36	µg/L	450	<450	<450	<450	<450
TRH C10-C40	µg/L	650	<650	<650	<650	<650
TRH F Bands						
TRH >C10-C16 (F2)	µg/L	60	<60	<60	<60	<60
TRH >C16-C34 (F3)	µg/L	500	<500	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500	<500
PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: AN420						
Naphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a&h)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total PAH (18)	µg/L	1	<1	<1	<1	<1

Parameter	Units	LOR	Sample Number: SE115508.001 Sample Matrix: Water Sample Date: 13 Feb 2013 Sample Name: DA2-S1	SE115508.002 Water 12 Feb 2013 DA2-S2	SE115508.003 Water 13 Feb 2013 DA2-S3	SE115508.004 Water 12 Feb 2013 DA2-S4
PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: AN420 (continued)						
Surrogates						
d5-nitrobenzene (Surrogate)	%	-	**88**	**90**	**91**	**88**
2-fluorobiphenyl (Surrogate)	%	-	**78**	**82**	**82**	**80**
d14-p-terphenyl (Surrogate)	%	-	**102**	**107**	**94**	**93**
Anions by Ion Chromatography in Water Method: AN245						
Fluoride	mg/L	0.02	<0.02	<0.02	<0.02	<0.02
Chloride	mg/L	0.05	**42**	**48**	**48**	**55**
Sulphate, SO4	mg/L	0.1	**4.5**	**4.5**	**4.5**	**3.2**
Nitrate Nitrogen, NO3-N	mg/L	0.005	**0.089**	**0.12**	**0.041**	<0.005
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 105°C	mg/L	5	**18**	**13**	**15**	**16**
Ammonia Nitrogen by Discrete Analyser (Aquakem) Method: AN291						
Ammonia Nitrogen, NH_3 as N*	mg/L	0.01	**0.06**	**0.04**	**0.04**	**0.04**
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.2	**1.7**	**1.5**	**1.2**	**1.9**
Total Nitrogen (calc)	mg/L	0.2	**1.8**	**1.6**	**1.3**	**1.9**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	**0.29**	**0.11**	**0.11**	**0.16**
Total Phenolics in Water Method: AN289						
Total Phenols	mg/L	0.01	**0.01**	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: SE115508.001 Sample Matrix: Water Sample Date: 13 Feb 2013 Sample Name: DA2-S1	SE115508.002 Water 12 Feb 2013 DA2-S2	SE115508.003 Water 13 Feb 2013 DA2-S3	SE115508.004 Water 12 Feb 2013 DA2-S4
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Sodium Adsorption Ratio*	No unit	-	**2.5**	**2.9**	**2.9**	**3.0**
Calcium, Ca	mg/L	0.1	**2.7**	**2.9**	**2.6**	**3.3**
Magnesium, Mg	mg/L	0.1	**2.5**	**2.8**	**2.6**	**3.0**
Potassium, K	mg/L	0.2	**4.1**	**3.6**	**3.3**	**2.2**
Sodium, Na	mg/L	0.1	**24**	**28**	**28**	**31**
Total Hardness by Calculation	mg CaCO3/L	1	**17**	**19**	**17**	**21**
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	**1**	**1**	**2**	**2**
Boron, B	µg/L	5	**50**	**58**	**57**	**60**
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co	µg/L	1	<1	**2**	**3**	**2**
Copper, Cu	µg/L	1	**1**	**2**	**1**	<1
Lead, Pb	µg/L	1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	**2**	**2**	**2**	**2**
Selenium, Se	µg/L	2	<2	<2	<2	<2
Vanadium, V	µg/L	1	**4**	**5**	**5**	**8**
Zinc, Zn	µg/L	1	**6**	**21**	**25**	**15**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Trace Metals (Total) in Water by ICPMS Method: AN318						
Total Arsenic	µg/L	1	**3**	**3**	**3**	**3**
Total Boron	µg/L	5	**54**	**53**	**50**	**55**
Total Cadmium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total Cobalt	µg/L	1	**5**	**4**	**4**	**3**
Total Copper	µg/L	1	**14**	**3**	**3**	**2**
Total Lead	µg/L	1	**2**	**2**	**2**	**1**
Total Nickel	µg/L	1	**3**	**3**	**3**	**2**
Total Selenium	µg/L	2	**4**	**2**	**3**	**3**
Total Vanadium	µg/L	1	**16**	**18**	**20**	**16**
Total Zinc	µg/L	5	**28**	**13**	**15**	**19**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	SE115508.001 Water 13 Feb 2013 DA2-S1	SE115508.002 Water 12 Feb 2013 DA2-S2	SE115508.003 Water 13 Feb 2013 DA2-S3	SE115508.004 Water 12 Feb 2013 DA2-S4
Mercury (total) in Water Method: AN311/AN312							
Total Mercury	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Units	LOR	Sample Number: SE115508.005 Sample Matrix: Water Sample Date: 12 Feb 2013 Sample Name: DA2-S5	SE115508.006 Water 13 Feb 2013 DA2-S6	SE115508.007 Water 13 Feb 2013 QA1	SE115508.008 Water 13 Feb 2013 BLANK 2
VOCs in Water Method: AN433/AN434						
Monocyclic Aromatic Hydrocarbons						
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1	<1	<1
Styrene (Vinyl benzene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
n-propylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
tert-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
sec-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
p-isopropyltoluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
n-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Polycyclic VOCs						
Naphthalene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	**111**	**113**	**106**	**109**
d8-toluene (Surrogate)	%	-	**104**	**115**	**109**	**105**
d4-1,2-dichloroethane (Surrogate)	%	-	**87**	**75**	**80**	**85**
Bromofluorobenzene (Surrogate)	%	-	**87**	**88**	**84**	**72**
Totals						
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	<3	<3	<3
Total MAH	µg/L	0.5	<0.5	<0.5	<0.5	<0.5

Parameter	Units	LOR	Sample Number: SE115508.005 Sample Matrix: Water Sample Date: 12 Feb 2013 Sample Name: DA2-S5	SE115508.006 Water 13 Feb 2013 DA2-S6	SE115508.007 Water 13 Feb 2013 QA1	SE115508.008 Water 13 Feb 2013 BLANK 2
Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434/AN410						
TRH C6-C10	µg/L	50	<50	<50	<50	<50
TRH C6-C9	µg/L	40	<40	<40	<40	<40
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	**119**	**117**	**114**	**125**
d4-1,2-dichloroethane (Surrogate)	%	-	**120**	**120**	**119**	**127**
d8-toluene (Surrogate)	%	-	**81**	**70**	**83**	**103**
Bromofluorobenzene (Surrogate)	%	-	**92**	**95**	**82**	**81**
VPH F Bands						
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50	<50
TRH (Total Recoverable Hydrocarbons) in Water Method: AN403						
TRH C10-C14	µg/L	50	<50	<50	<50	<50
TRH C15-C28	µg/L	200	**630**	<200	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200	<200
TRH C10-C36	µg/L	450	**630**	<450	<450	<450
TRH C10-C40	µg/L	650	<650	<650	<650	<650
TRH F Bands						
TRH >C10-C16 (F2)	µg/L	60	**62**	<60	<60	<60
TRH >C16-C34 (F3)	µg/L	500	**730**	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500	<500
PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: AN420						
Naphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a&h)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total PAH (18)	µg/L	1	<1	<1	<1	<1

Parameter	Units	LOR	Sample Number: SE115508.005 Sample Matrix: Water Sample Date: 12 Feb 2013 Sample Name: DA2-S5	SE115508.006 Water 13 Feb 2013 DA2-S6	SE115508.007 Water 13 Feb 2013 QA1	SE115508.008 Water 13 Feb 2013 BLANK 2
PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: AN420 (continued)						
Surrogates						
d5-nitrobenzene (Surrogate)	%	-	**94**	**79**	**89**	**83**
2-fluorobiphenyl (Surrogate)	%	-	**82**	**73**	**82**	**84**
d14-p-terphenyl (Surrogate)	%	-	**101**	**94**	**93**	**112**
Anions by Ion Chromatography in Water Method: AN245						
Fluoride	mg/L	0.02	<0.02	<0.02	<0.02	<0.02
Chloride	mg/L	0.05	**53**	**30**	**49**	<0.05
Sulphate, SO4	mg/L	0.1	**1.8**	**3.3**	**4.7**	<0.1
Nitrate Nitrogen, NO3-N	mg/L	0.005	<0.005	**0.040**	**0.048**	**0.005**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 105°C	mg/L	5	<5	**120**	**16**	<5
Ammonia Nitrogen by Discrete Analyser (Aquakem) Method: AN291						
Ammonia Nitrogen, NH_3 as N*	mg/L	0.01	<0.01	**0.22**	**0.04**	**0.01**
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.2	**1.7**	**1.7**	**1.2**	<0.2
Total Nitrogen (calc)	mg/L	0.2	**1.7**	**1.7**	**1.3**	<0.2
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	**0.10**	**0.18**	**0.11**	<0.05
Total Phenolics in Water Method: AN289						
Total Phenols	mg/L	0.01	<0.01	<0.01	<0.01	**0.01**

Parameter	Units	LOR	Sample Number: SE115508.005 Sample Matrix: Water Sample Date: 12 Feb 2013 Sample Name: DA2-S5	SE115508.006 Water 13 Feb 2013 DA2-S6	SE115508.007 Water 13 Feb 2013 QA1	SE115508.008 Water 13 Feb 2013 BLANK 2
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Sodium Adsorption Ratio*	No unit	-	**2.4**	**1.8**	**2.9**	**0.07**
Calcium, Ca	mg/L	0.1	**4.2**	**4.3**	**2.6**	<0.1
Magnesium, Mg	mg/L	0.1	**3.2**	**2.9**	**2.6**	<0.1
Potassium, K	mg/L	0.2	**2.8**	**3.1**	**3.2**	<0.2
Sodium, Na	mg/L	0.1	**27**	**20**	**27**	<0.1
Total Hardness by Calculation	mg CaCO3/L	1	**24**	**23**	**17**	<1
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	**2**	**1**	**2**	<1
Boron, B	µg/L	5	**58**	**56**	**56**	**16**
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co	µg/L	1	**2**	**4**	**3**	<1
Copper, Cu	µg/L	1	<1	**1**	**2**	<1
Lead, Pb	µg/L	1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	**1**	**2**	**2**	<1
Selenium, Se	µg/L	2	<2	<2	<2	<2
Vanadium, V	µg/L	1	**8**	**5**	**4**	<1
Zinc, Zn	µg/L	1	**6**	**6**	**21**	<1
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Trace Metals (Total) in Water by ICPMS Method: AN318						
Total Arsenic	µg/L	1	**3**	**3**	**3**	<1
Total Boron	µg/L	5	**52**	**51**	**50**	**9**
Total Cadmium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total Cobalt	µg/L	1	**2**	**6**	**4**	<1
Total Copper	µg/L	1	<1	**3**	**2**	<1
Total Lead	µg/L	1	<1	**3**	**2**	<1
Total Nickel	µg/L	1	**1**	**3**	**3**	<1
Total Selenium	µg/L	2	<2	**3**	**3**	<2
Total Vanadium	µg/L	1	**13**	**21**	**18**	<1
Total Zinc	µg/L	5	**9**	**13**	**15**	<5

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name SE115508.005 Water 12 Feb 2013 DA2-S5	SE115508.006 Water 13 Feb 2013 DA2-S6	SE115508.007 Water 13 Feb 2013 QA1	SE115508.008 Water 13 Feb 2013 BLANK 2
Mercury (total) in Water Method: AN311/AN312						
Total Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Units	LOR	Sample Number / Sample Matrix / Sample Date / Sample Name: SE115508.009 / Water / 14 Feb 2013 / DA9-S1	SE115508.010 / Water / 14 Feb 2013 / DA9-S2	SE115508.011 / Water / 14 Feb 2013 / DA9-S3	SE115508.012 / Water / 14 Feb 2013 / DA9-S4
VOCs in Water Method: AN433/AN434						
Monocyclic Aromatic Hydrocarbons						
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1	<1	<1
Styrene (Vinyl benzene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
n-propylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
tert-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
sec-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
p-isopropyltoluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
n-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Polycyclic VOCs						
Naphthalene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	**111**	**114**	**115**	**118**
d8-toluene (Surrogate)	%	-	**120**	**117**	**124**	**125**
d4-1,2-dichloroethane (Surrogate)	%	-	**96**	**98**	**95**	**97**
Bromofluorobenzene (Surrogate)	%	-	**103**	**102**	**102**	**101**
Totals						
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	<3	<3	<3
Total MAH	µg/L	0.5	<0.5	<0.5	<0.5	<0.5

Parameter	Units	LOR	Sample Number: SE115508.009 Sample Matrix: Water Sample Date: 14 Feb 2013 Sample Name: DA9-S1	SE115508.010 Water 14 Feb 2013 DA9-S2	SE115508.011 Water 14 Feb 2013 DA9-S3	SE115508.012 Water 14 Feb 2013 DA9-S4
Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434/AN410						
TRH C6-C10	µg/L	50	<50	<50	<50	<50
TRH C6-C9	µg/L	40	<40	<40	<40	<40
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	**113**	**116**	**116**	**104**
d4-1,2-dichloroethane (Surrogate)	%	-	**122**	**122**	**117**	**111**
d8-toluene (Surrogate)	%	-	**100**	**101**	**99**	**85**
Bromofluorobenzene (Surrogate)	%	-	**84**	**83**	**83**	**83**
VPH F Bands						
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50	<50
TRH (Total Recoverable Hydrocarbons) in Water Method: AN403						
TRH C10-C14	µg/L	50	<50	<50	<50	<50
TRH C15-C28	µg/L	200	<200	<200	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200	<200
TRH C10-C36	µg/L	450	<450	<450	<450	<450
TRH C10-C40	µg/L	650	<650	<650	<650	<650
TRH F Bands						
TRH >C10-C16 (F2)	µg/L	60	<60	<60	<60	<60
TRH >C16-C34 (F3)	µg/L	500	<500	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500	<500
PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: AN420						
Naphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a&h)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total PAH (18)	µg/L	1	<1	<1	<1	<1

Parameter	Units	LOR	Sample Number: SE115508.009 Sample Matrix: Water Sample Date: 14 Feb 2013 Sample Name: DA9-S1	SE115508.010 Water 14 Feb 2013 DA9-S2	SE115508.011 Water 14 Feb 2013 DA9-S3	SE115508.012 Water 14 Feb 2013 DA9-S4
PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: AN420 (continued)						
Surrogates						
d5-nitrobenzene (Surrogate)	%	-	**100**	**90**	**40**	**78**
2-fluorobiphenyl (Surrogate)	%	-	**100**	**100**	**50**	**75**
d14-p-terphenyl (Surrogate)	%	-	**130**	**120**	**70**	**108**
Anions by Ion Chromatography in Water Method: AN245						
Fluoride	mg/L	0.02	**0.19**	**0.20**	**0.16**	**0.20**
Chloride	mg/L	0.05	**34**	**33**	**29**	**32**
Sulphate, SO4	mg/L	0.1	**3.8**	**3.8**	**4.2**	**3.6**
Nitrate Nitrogen, NO3-N	mg/L	0.005	**0.10**	**0.094**	**0.17**	**0.13**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 105°C	mg/L	5	**110**	**80**	**96**	**90**
Ammonia Nitrogen by Discrete Analyser (Aquakem) Method: AN291						
Ammonia Nitrogen, NH_3 as N*	mg/L	0.01	**0.03**	**0.05**	**0.03**	**0.03**
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	<0.005	**0.006**	**0.008**	**0.016**
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.2	**0.8**	**0.8**	**0.8**	**0.8**
Total Nitrogen (calc)	mg/L	0.2	**1.0**	**0.9**	**1.0**	**1.0**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	**0.38**	**0.40**	**0.39**	**0.40**
Total Phenolics in Water Method: AN289						
Total Phenols	mg/L	0.01	<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: SE115508.009 Sample Matrix: Water Sample Date: 14 Feb 2013 Sample Name: DA9-S1	SE115508.010 Water 14 Feb 2013 DA9-S2	SE115508.011 Water 14 Feb 2013 DA9-S3	SE115508.012 Water 14 Feb 2013 DA9-S4
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Sodium Adsorption Ratio*	No unit	-	**0.79**	**0.79**	**0.80**	**0.80**
Calcium, Ca	mg/L	0.1	**22**	**22**	**22**	**21**
Magnesium, Mg	mg/L	0.1	**13**	**13**	**13**	**12**
Potassium, K	mg/L	0.2	**3.7**	**3.8**	**3.8**	**3.9**
Sodium, Na	mg/L	0.1	**19**	**19**	**19**	**19**
Total Hardness by Calculation	mg CaCO3/L	1	**110**	**110**	**110**	**100**
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	<1	<1	<1	<1
Boron, B	µg/L	5	**38**	**38**	**37**	**39**
Cadmium, Cd	µg/L	0.1	<0.1	**0.1**	<0.1	<0.1
Cobalt, Co	µg/L	1	<1	<1	<1	<1
Copper, Cu	µg/L	1	**3**	**3**	**3**	**3**
Lead, Pb	µg/L	1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	**4**	**4**	**5**	**5**
Selenium, Se	µg/L	2	<2	<2	<2	<2
Vanadium, V	µg/L	1	**14**	**15**	**14**	**14**
Zinc, Zn	µg/L	1	<1	<1	<1	<1
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Trace Metals (Total) in Water by ICPMS Method: AN318						
Total Arsenic	µg/L	1	**2**	**2**	**2**	**2**
Total Boron	µg/L	5	**30**	**30**	**31**	**31**
Total Cadmium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total Cobalt	µg/L	1	**4**	**4**	**3**	**3**
Total Copper	µg/L	1	**6**	**5**	**5**	**5**
Total Lead	µg/L	1	<1	<1	<1	<1
Total Nickel	µg/L	1	**11**	**11**	**11**	**11**
Total Selenium	µg/L	2	<2	<2	<2	<2
Total Vanadium	µg/L	1	**22**	**22**	**21**	**21**
Total Zinc	µg/L	5	**15**	**14**	**12**	**14**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	SE115508.009 Water 14 Feb 2013 DA9-S1	SE115508.010 Water 14 Feb 2013 DA9-S2	SE115508.011 Water 14 Feb 2013 DA9-S3	SE115508.012 Water 14 Feb 2013 DA9-S4
Mercury (total) in Water Method: AN311/AN312							
Total Mercury	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name SE115508.013 Water 14 Feb 2013 DA9-S5	SE115508.014 Water 13 Feb 2013 DA9-S6	SE115508.015 Water 13 Feb 2013 DA9-S7	SE115508.016 Water 14 Feb 2013 DA9-S8
VOCs in Water Method: AN433/AN434						
Monocyclic Aromatic Hydrocarbons						
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1	<1	<1
Styrene (Vinyl benzene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
n-propylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
tert-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
sec-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
p-isopropyltoluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
n-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Polycyclic VOCs						
Naphthalene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	**119**	**117**	**121**	**126**
d8-toluene (Surrogate)	%	-	**126**	**117**	**116**	**119**
d4-1,2-dichloroethane (Surrogate)	%	-	**87**	**95**	**94**	**90**
Bromofluorobenzene (Surrogate)	%	-	**103**	**104**	**106**	**104**
Totals						
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	<3	<3	<3
Total MAH	µg/L	0.5	<0.5	<0.5	<0.5	<0.5

Parameter	Units	LOR	Sample Number: SE115508.013 Sample Matrix: Water Sample Date: 14 Feb 2013 Sample Name: DA9-S5	SE115508.014 Water 13 Feb 2013 DA9-S6	SE115508.015 Water 13 Feb 2013 DA9-S7	SE115508.016 Water 14 Feb 2013 DA9-S8
Volatile Petroleum Hydrocarbons in Water Method: AN433/AN434/AN410						
TRH C6-C10	µg/L	50	<50	<50	<50	<50
TRH C6-C9	µg/L	40	<40	<40	<40	<40
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	**120**	**109**	**111**	**117**
d4-1,2-dichloroethane (Surrogate)	%	-	**126**	**120**	**118**	**123**
d8-toluene (Surrogate)	%	-	**89**	**89**	**88**	**79**
Bromofluorobenzene (Surrogate)	%	-	**83**	**84**	**84**	**88**
VPH F Bands						
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50	<50
TRH (Total Recoverable Hydrocarbons) in Water Method: AN403						
TRH C10-C14	µg/L	50	<50	<50	<50	<50
TRH C15-C28	µg/L	200	<200	<200	<200	<200
TRH C29-C36	µg/L	200	<200	<200	<200	<200
TRH C37-C40	µg/L	200	<200	<200	<200	<200
TRH C10-C36	µg/L	450	<450	<450	<450	<450
TRH C10-C40	µg/L	650	<650	<650	<650	<650
TRH F Bands						
TRH >C10-C16 (F2)	µg/L	60	<60	<60	<60	<60
TRH >C16-C34 (F3)	µg/L	500	<500	<500	<500	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500	<500
PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: AN420						
Naphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a&h)anthracene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total PAH (18)	µg/L	1	<1	<1	<1	<1

Parameter	Units	LOR	Sample Number: SE115508.013 Sample Matrix: Water Sample Date: 14 Feb 2013 Sample Name: DA9-S5	SE115508.014 Water 13 Feb 2013 DA9-S6	SE115508.015 Water 13 Feb 2013 DA9-S7	SE115508.016 Water 14 Feb 2013 DA9-S8
PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: AN420 (continued)						
Surrogates						
d5-nitrobenzene (Surrogate)	%	-	**87**	**85**	**67**	**80**
2-fluorobiphenyl (Surrogate)	%	-	**80**	**80**	**65**	**67**
d14-p-terphenyl (Surrogate)	%	-	**106**	**100**	**93**	**85**
Anions by Ion Chromatography in Water Method: AN245						
Fluoride	mg/L	0.02	**0.16**	**0.19**	**0.16**	**0.15**
Chloride	mg/L	0.05	**32**	**31**	**31**	**37**
Sulphate, SO4	mg/L	0.1	**4.3**	**4.0**	**4.5**	**3.7**
Nitrate Nitrogen, NO3-N	mg/L	0.005	**0.098**	**0.13**	**0.15**	<0.005
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 105°C	mg/L	5	**80**	**74**	**90**	**74**
Ammonia Nitrogen by Discrete Analyser (Aquakem) Method: AN291						
Ammonia Nitrogen, NH_3 as N*	mg/L	0.01	**0.06**	**0.04**	**0.04**	**0.04**
Nitrite in Water Method: AN277/WC250.312						
Nitrite Nitrogen, NO_2 as N	mg/L	0.005	**0.018**	**0.028**	**0.031**	<0.005
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281/AN292						
Total Kjeldahl Nitrogen	mg/L	0.2	**1.2**	**0.9**	**0.8**	**3.0**
Total Nitrogen (calc)	mg/L	0.2	**1.3**	**1.0**	**1.0**	**3.0**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.05	**0.43**	**0.42**	**0.39**	**1.2**
Total Phenolics in Water Method: AN289						
Total Phenols	mg/L	0.01	<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: SE115508.013 Sample Matrix: Water Sample Date: 14 Feb 2013 Sample Name: DA9-S5	SE115508.014 Water 13 Feb 2013 DA9-S6	SE115508.015 Water 13 Feb 2013 DA9-S7	SE115508.016 Water 14 Feb 2013 DA9-S8
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Sodium Adsorption Ratio*	No unit	-	**0.81**	**0.82**	**0.79**	**2.1**
Calcium, Ca	mg/L	0.1	**21**	**21**	**21**	**8.0**
Magnesium, Mg	mg/L	0.1	**12**	**12**	**12**	**8.0**
Potassium, K	mg/L	0.2	**3.9**	**3.9**	**3.8**	**7.7**
Sodium, Na	mg/L	0.1	**19**	**19**	**18**	**35**
Total Hardness by Calculation	mg CaCO3/L	1	**100**	**100**	**100**	**53**
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Arsenic, As	µg/L	1	<1	<1	<1	**2**
Boron, B	µg/L	5	**38**	**37**	**37**	**56**
Cadmium, Cd	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Cobalt, Co	µg/L	1	<1	<1	<1	**2**
Copper, Cu	µg/L	1	**3**	**3**	**3**	**2**
Lead, Pb	µg/L	1	<1	<1	<1	<1
Nickel, Ni	µg/L	1	**5**	**5**	**5**	**5**
Selenium, Se	µg/L	2	<2	<2	<2	<2
Vanadium, V	µg/L	1	**14**	**13**	**14**	**3**
Zinc, Zn	µg/L	1	<1	<1	<1	**2**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Trace Metals (Total) in Water by ICPMS Method: AN318						
Total Arsenic	µg/L	1	**2**	**2**	**2**	**9**
Total Boron	µg/L	5	**32**	**33**	**31**	**49**
Total Cadmium	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Total Cobalt	µg/L	1	**2**	**2**	**3**	**13**
Total Copper	µg/L	1	**5**	**5**	**6**	**4**
Total Lead	µg/L	1	<1	<1	<1	**4**
Total Nickel	µg/L	1	**10**	**10**	**11**	**7**
Total Selenium	µg/L	2	<2	<2	<2	**5**
Total Vanadium	µg/L	1	**20**	**20**	**20**	**16**
Total Zinc	µg/L	5	**10**	**14**	**16**	**20**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	SE115508.013 Water 14 Feb 2013 DA9-S5	SE115508.014 Water 13 Feb 2013 DA9-S6	SE115508.015 Water 13 Feb 2013 DA9-S7	SE115508.016 Water 14 Feb 2013 DA9-S8
Mercury (total) in Water Method: AN311/AN312							
Total Mercury	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Ammonia Nitrogen by Discrete Analyser (Aquakem) Method: ME-(AU)-[ENV]AN291

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Ammonia Nitrogen, NH_3 as N*	LB034053	mg/L	0.01	<0.01	4 - 20%	104%	102%

Anions by Ion Chromatography in Water Method: ME-(AU)-[ENV]AN245

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MSD %RPD
Fluoride	LB034044	mg/L	0.02	<0.02	0 - 5%	88%	NA
Chloride	LB034044	mg/L	0.05	<0.05	0%	96%	NA
Sulphate, SO4	LB034044	mg/L	0.1	<0.1	0 - 2%	90%	NA
Nitrate Nitrogen, NO3-N	LB034044	mg/L	0.005	<0.005	8 - 19%	101%	NA

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB034482	mg/L	0.0001	<0.0001	0 - 108%	102%	99%

Mercury (total) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Mercury	LB034483	mg/L	0.0001	<0.0001	3 - 6%	NA	NA

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Sodium Adsorption Ratio*	LB034460	No unit	-	0.00			
Calcium, Ca	LB034460	mg/L	0.1	<0.1	0 - 1%	102%	97%
Magnesium, Mg	LB034460	mg/L	0.1	<0.1	0 - 1%	98%	93%
Potassium, K	LB034460	mg/L	0.2	<0.2	0 - 1%	89%	97%
Sodium, Na	LB034460	mg/L	0.1	<0.1	0 - 3%	98%	91%
Total Hardness by Calculation	LB034460	mg CaCO3/L	1	<1			

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Nitrite in Water Method: ME-(AU)-[ENV]AN277/WC250.312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Nitrite Nitrogen, NO_2 as N	LB034050	mg/L	0.005	<0.005	0 - 1%	104%	92%

PAH (Polynuclear Aromatic Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN420

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Naphthalene	LB034133	µg/L	0.1	<0.1	100%
2-methylnaphthalene	LB034133	µg/L	0.1	<0.1	NA
1-methylnaphthalene	LB034133	µg/L	0.1	<0.1	NA
Acenaphthylene	LB034133	µg/L	0.1	<0.1	100%
Acenaphthene	LB034133	µg/L	0.1	<0.1	100%
Fluorene	LB034133	µg/L	0.1	<0.1	NA
Phenanthrene	LB034133	µg/L	0.1	<0.1	103%
Anthracene	LB034133	µg/L	0.1	<0.1	100%
Fluoranthene	LB034133	µg/L	0.1	<0.1	98%
Pyrene	LB034133	µg/L	0.1	<0.1	98%
Benzo(a)anthracene	LB034133	µg/L	0.1	<0.1	NA
Chrysene	LB034133	µg/L	0.1	<0.1	NA
Benzo(b)fluoranthene	LB034133	µg/L	0.1	<0.1	NA
Benzo(k)fluoranthene	LB034133	µg/L	0.1	<0.1	NA
Benzo(a)pyrene	LB034133	µg/L	0.1	<0.1	113%
Indeno(1,2,3-cd)pyrene	LB034133	µg/L	0.1	<0.1	NA
Dibenzo(a&h)anthracene	LB034133	µg/L	0.1	<0.1	NA
Benzo(ghi)perylene	LB034133	µg/L	0.1	<0.1	NA
Total PAH (18)	LB034133	µg/L	1	<1	

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
d5-nitrobenzene (Surrogate)	LB034133	%	-	106%	100%
2-fluorobiphenyl (Surrogate)	LB034133	%	-	108%	102%
d14-p-terphenyl (Surrogate)	LB034133	%	-	114%	108%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281/AN292

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Kjeldahl Nitrogen	LB034184	mg/L	0.2	<0.2	5%	96%	80%
	LB034279	mg/L	0.2	<0.2	2%	95%	92%
Total Nitrogen (calc)	LB034279	mg/L	0.2		2%		

Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 105°C	LB034082	mg/L	5	<5	0%	87%
	LB034083	mg/L	5	<5	4%	100%

Total Phenolics in Water Method: ME-(AU)-[ENV]AN289

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phenols	LB034177	mg/L	0.01	<0.01	37%	94%	92%
	LB034267	mg/L	0.01	<0.01	0%	93%	95%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB034183	mg/L	0.05	<0.05	42%	99%	86%
	LB034269	mg/L	0.05	<0.05	10%	100%	98%

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB034101	µg/L	1	<1	0 - 3%	98%	96%
Boron, B	LB034101	µg/L	5	<5	2 - 5%	106%	116%
Cadmium, Cd	LB034101	µg/L	0.1	<0.1	0 - 4%	82%	86%
Cobalt, Co	LB034101	µg/L	1	<1	0 - 1%	95%	97%
Copper, Cu	LB034101	µg/L	1	<1	0 - 4%	106%	102%
Lead, Pb	LB034101	µg/L	1	<1	0%	87%	74%
Nickel, Ni	LB034101	µg/L	1	<1	2 - 3%	91%	92%
Selenium, Se	LB034101	µg/L	2	<2	0%	100%	95%
Vanadium, V	LB034101	µg/L	1	<1	1 - 3%	100%	100%
Zinc, Zn	LB034101	µg/L	1	<1	0 - 3%	101%	95%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Trace Metals (Total) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Arsenic	LB034104	µg/L	1	<1	0 - 12%	104%	115%
Total Boron	LB034104	µg/L	5	<5	2 - 3%	96%	130%
Total Cadmium	LB034104	µg/L	0.1	<0.1	0%	114%	130%
Total Cobalt	LB034104	µg/L	1	<1	0%	101%	100%
Total Copper	LB034104	µg/L	1	<1	0 - 22%	117%	45%
Total Lead	LB034104	µg/L	1	<1	0%	118%	110%
Total Nickel	LB034104	µg/L	1	<1	0%	108%	100%
Total Selenium	LB034104	µg/L	2	<2	0%	111%	120%
Total Vanadium	LB034104	µg/L	1	<1	0%	98%	95%
Total Zinc	LB034104	µg/L	5	<5	0%	109%	80%

TRH (Total Recoverable Hydrocarbons) in Water Method: ME-(AU)-[ENV]AN403

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C10-C14	LB034133	µg/L	50	<50	96%
TRH C15-C28	LB034133	µg/L	200	<200	96%
TRH C29-C36	LB034133	µg/L	200	<200	97%
TRH C37-C40	LB034133	µg/L	200	<200	NA
TRH C10-C36	LB034133	µg/L	450	<450	NA
TRH C10-C40	LB034133	µg/L	650	<650	NA

TRH F Bands

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH >C10-C16 (F2)	LB034133	µg/L	60	<60	94%
TRH >C16-C34 (F3)	LB034133	µg/L	500	<500	99%
TRH >C34-C40 (F4)	LB034133	µg/L	500	<500	100%

VOCs in Water Method: ME-(AU)-[ENV]AN433/AN434

Monocyclic Aromatic Hydrocarbons

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Benzene	LB034326	µg/L	0.5	<0.5	0%	89%	100%
Toluene	LB034326	µg/L	0.5	<0.5	0%	91%	110%
Ethylbenzene	LB034326	µg/L	0.5	<0.5	0%	90%	114%
m/p-xylene	LB034326	µg/L	1	<1	0%	93%	113%
Styrene (Vinyl benzene)	LB034326	µg/L	0.5	<0.5	0%	NA	NA
o-xylene	LB034326	µg/L	0.5	<0.5	0%	91%	112%
Isopropylbenzene (Cumene)	LB034326	µg/L	0.5	<0.5	0%	NA	NA
n-propylbenzene	LB034326	µg/L	0.5	<0.5	0%	NA	NA
1,3,5-trimethylbenzene	LB034326	µg/L	0.5	<0.5	0%	NA	NA
tert-butylbenzene	LB034326	µg/L	0.5	<0.5	0%	NA	NA
1,2,4-trimethylbenzene	LB034326	µg/L	0.5	<0.5	0%	NA	NA
sec-butylbenzene	LB034326	µg/L	0.5	<0.5	0%	NA	NA
p-isopropyltoluene	LB034326	µg/L	0.5	<0.5	0%	NA	NA
n-butylbenzene	LB034326	µg/L	0.5	<0.5	0%	NA	NA

Polycyclic VOCs

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Naphthalene	LB034326	µg/L	0.5	<0.5	0%	NA	NA

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Dibromofluoromethane (Surrogate)	LB034326	%	-	118%	2%	101%	100%
d8-toluene (Surrogate)	LB034326	%	-	102%	6%	94%	106%
d4-1,2-dichloroethane (Surrogate)	LB034326	%	-	105%	0%	106%	101%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

VOCs in Water Method: ME-(AU)-[ENV]AN433/AN434 (continued)

				MB	DUP %RPD	LCS %Recovery	MS %Recovery
Bromofluorobenzene (Surrogate)	LB034326	%	-	98%	7%	105%	104%

Totals

Parameter	QC Reference	Units	LOR	MB
Total Xylenes	LB034326	µg/L	1.5	<1.5
Total BTEX	LB034326	µg/L	3	<3

Volatile Petroleum Hydrocarbons in Water Method: ME-(AU)-[ENV]AN433/AN434/AN410

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
TRH C6-C10	LB034326	µg/L	50	<50	0%	101%	82%
TRH C6-C9	LB034326	µg/L	40	<40	0%	101%	86%

Surrogates

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Dibromofluoromethane (Surrogate)	LB034326	%	-	123%	1%	97%	107%
d4-1,2-dichloroethane (Surrogate)	LB034326	%	-	108%	6%	91%	108%
d8-toluene (Surrogate)	LB034326	%	-	117%	1%	95%	99%
Bromofluorobenzene (Surrogate)	LB034326	%	-	83%	1%	100%	101%

VPH F Bands

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Benzene (F0)	LB034326	µg/L	0.5	<0.5	0%	NA	NA
TRH C6-C10 minus BTEX (F1)	LB034326	µg/L	50	<50	0%	111%	77%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN022	The water sample is digested with Nitric Acid and made up to the original volume similar to APHA3030E.
AN083	Separatory funnels are used for aqueous samples and extracted by transferring an appropriate volume (mass) of liquid into a separatory funnel and adding 3 serial aliquots of dichloromethane. Samples receive a single extraction at pH 7 to recover base / neutral analytes and two extractions at pH < 2 to recover acidic analytes. QC samples are prepared by spiking organic free water with target analytes and extracting as per samples.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN277/WC250.312	Nitrite ions, when reacted with a reagent containing sulphanilamide and N-(1-naphthyl)-ethylenediamine dihydrochloride produce a highly coloured azo dye that is measured photometrically at 540nm.
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN289	Analysis of Total Phenols in Soil Sediment and Water: Steam distillable phenols react with 4-aminoantipyrine at pH 7.9±0.1 in the presence of potassium ferricyanide to form a coloured antipyrine dye analysed by Discrete Analyser. Reference APHA 5530 B/D.
AN291	Ammonia in solution reacts with hypochlorite ions from Sodium Dichloroisocyanuate, and salicylate in the presence of Sodium Nitroprusside to form indophenol blue and measured at 670nm by Discrete Analyser.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the Draft NEPM 2011, >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is not corrected for Naphthalene.
AN403	Additionally, the volatile C6-C9/C6-C10 fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependant on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN433/AN434/AN410	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

ANALYTICAL REPORT

CLIENT DETAILS

Contact	Paul Godfrey
Client	NATURAL RESOURCE ASSESSMENTS PTY LTD
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Email	au.environmental.sydney@sgs.com
Project	**Water Analysis_DA2 and DA9**
Order Number	(Not specified)
Samples	15

LABORATORY DETAILS

Manager	Ros Ma
Laboratory	SGS Newburn Environmental
Address	10 Reid Rd Newburn WA 6105
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Email	au.environmental.perth@sgs.com
SGS Reference	**PE074880 R0**
Report Number	0000055810
Date Reported	22 Feb 2013
Date Received	19 Feb 2013

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(898/20210).

SVOC - Due to sample emulsification on extraction, various samples required dilution thus resulting in the raising of LOR's for some analytes.

SIGNATORIES

Gary Walton
Organic Chemist

Ros Ma
Laboratory Manager

Parameter	Units	LOR	Sample Number: PE074880.001 Sample Matrix: Water Sample Date: 13 Feb 2013 Sample Name: DA2-S1	PE074880.002 Water 12 Feb 2013 DA2-S2	PE074880.003 Water 12 Feb 2013 DA2-S4	PE074880.004 Water 12 Feb 2013 DA2-S5
Low Level OC Pesticides in Water Method: AN400/AN420						
Lindane (gamma BHC)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDE	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDD	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Alpha BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Beta BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Delta BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Endrin Ketone	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	µg/L	0.02	<0.02	<0.02	<0.02	<0.02
Surrogates						
d14-p-terphenyl (Surrogate)	%	-	**41**	**40**	**57**	**63**
Ultra Low Level OC Pesticides in Water Method: AN400/AN420						
Heptachlor	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Gamma Chlordane	µg/L	0.002	<0.006↑	<0.005↑	<0.006↑	<0.006↑
Alpha Chlordane	µg/L	0.002	<0.006↑	<0.005↑	<0.006↑	<0.006↑
Alpha Endosulfan	µg/L	0.005	<0.006↑	<0.005	<0.006↑	<0.006↑
Dieldrin	µg/L	0.002	<0.006↑	<0.005↑	<0.006↑	<0.006↑
Endrin	µg/L	0.004	<0.006↑	<0.005↑	<0.006↑	<0.006↑
Beta Endosulfan	µg/L	0.005	<0.006↑	<0.005	<0.006↑	<0.006↑
Endosulfan Sulphate	µg/L	0.005	<0.006↑	<0.005	<0.006↑	<0.006↑
p,p'-DDT	µg/L	0.002	<0.006↑	<0.005↑	<0.006↑	<0.006↑
Surrogates						
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	-	-	-	-
Low Level OP Pesticides in Water Method: AN400/AN420						
Azinphos-methyl (Guthion)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Bromophos Ethyl	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Diazinon (Dimpylate)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Dichlorvos	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Ethion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Fenitrothion	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Methidathion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Surrogates						
d14-p-terphenyl (Surrogate)	%	-	**41**	**40**	**57**	**63**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE074880.001 Water 13 Feb 2013 DA2-S1	PE074880.002 Water 12 Feb 2013 DA2-S2	PE074880.003 Water 12 Feb 2013 DA2-S4	PE074880.004 Water 12 Feb 2013 DA2-S5
Ultra Low Level OP Pesticides in Water **Method: AN400/AN420**							
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.009		<0.009	<0.009	<0.009	<0.009
Parathion-ethyl (Parathion)	µg/L	0.004		<0.006↑	<0.005↑	<0.006↑	<0.006↑

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name PE074880.005 Water 13 Feb 2013 DA2-S6	PE074880.006 Water 13 Feb 2013 QA1	PE074880.007 Water 13 Feb 2013 Blank 2	PE074880.008 Water 14 Feb 2013 DA9-S1
Low Level OC Pesticides in Water Method: AN400/AN420						
Lindane (gamma BHC)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDE	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDD	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Alpha BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Beta BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Delta BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Endrin Ketone	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	µg/L	0.02	<0.02	<0.02	<0.02	<0.02
Surrogates						
d14-p-terphenyl (Surrogate)	%	-	**69**	**39**	**108**	**70**
Ultra Low Level OC Pesticides in Water Method: AN400/AN420						
Heptachlor	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Gamma Chlordane	µg/L	0.002	<0.006↑	<0.006↑	<0.002	<0.002
Alpha Chlordane	µg/L	0.002	<0.006↑	<0.006↑	<0.002	<0.002
Alpha Endosulfan	µg/L	0.005	<0.006↑	<0.006↑	<0.005	<0.005
Dieldrin	µg/L	0.002	<0.006↑	<0.006↑	<0.002	<0.002
Endrin	µg/L	0.004	<0.006↑	<0.006↑	<0.004	<0.004
Beta Endosulfan	µg/L	0.005	<0.006↑	<0.006↑	<0.005	<0.005
Endosulfan Sulphate	µg/L	0.005	<0.006↑	<0.006↑	<0.005	<0.005
p,p'-DDT	µg/L	0.002	<0.006↑	<0.006↑	<0.002	<0.002
Surrogates						
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	-	-	-	-
Low Level OP Pesticides in Water Method: AN400/AN420						
Azinphos-methyl (Guthion)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Bromophos Ethyl	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Diazinon (Dimpylate)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Dichlorvos	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Ethion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Fenitrothion	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Methidathion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Surrogates						
d14-p-terphenyl (Surrogate)	%	-	**69**	**39**	**108**	**70**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE074880.005 Water 13 Feb 2013 DA2-S6	PE074880.006 Water 13 Feb 2013 QA1	PE074880.007 Water 13 Feb 2013 Blank 2	PE074880.008 Water 14 Feb 2013 DA9-S1
Ultra Low Level OP Pesticides in Water Method: AN400/AN420							
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.009		<0.009	<0.009	<0.009	<0.009
Parathion-ethyl (Parathion)	µg/L	0.004		<0.006↑	<0.006↑	<0.004	<0.004

Parameter	Units	LOR	Sample Number: PE074880.009 Sample Matrix: Water Sample Date: 14 Feb 2013 Sample Name: DA9-S2	PE074880.010 Water 14 Feb 2013 DA9-S3	PE074880.011 Water 14 Feb 2013 DA9-S4	PE074880.012 Water 14 Feb 2013 DA9-S5
Low Level OC Pesticides in Water Method: AN400/AN420						
Lindane (gamma BHC)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDE	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDD	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Alpha BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Beta BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Delta BHC	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Endrin Ketone	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	µg/L	0.02	<0.02	<0.02	<0.02	<0.02
Surrogates						
d14-p-terphenyl (Surrogate)	%	-	**82**	**73**	**81**	**80**
Ultra Low Level OC Pesticides in Water Method: AN400/AN420						
Heptachlor	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Gamma Chlordane	µg/L	0.002	<0.002	<0.002	<0.002	<0.002
Alpha Chlordane	µg/L	0.002	<0.002	<0.002	<0.002	<0.002
Alpha Endosulfan	µg/L	0.005	<0.005	<0.005	<0.005	<0.005
Dieldrin	µg/L	0.002	<0.002	<0.002	<0.002	<0.002
Endrin	µg/L	0.004	<0.004	<0.004	<0.004	<0.004
Beta Endosulfan	µg/L	0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan Sulphate	µg/L	0.005	<0.005	<0.005	<0.005	<0.005
p,p'-DDT	µg/L	0.002	<0.002	<0.002	<0.002	<0.002
Surrogates						
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	-	-	-	-
Low Level OP Pesticides in Water Method: AN400/AN420						
Azinphos-methyl (Guthion)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Bromophos Ethyl	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Diazinon (Dimpylate)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Dichlorvos	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Ethion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Fenitrothion	µg/L	0.2	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Methidathion	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Surrogates						
d14-p-terphenyl (Surrogate)	%	-	**82**	**73**	**81**	**80**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE074880.009 Water 14 Feb 2013 DA9-S2	PE074880.010 Water 14 Feb 2013 DA9-S3	PE074880.011 Water 14 Feb 2013 DA9-S4	PE074880.012 Water 14 Feb 2013 DA9-S5
Ultra Low Level OP Pesticides in Water **Method: AN400/AN420**							
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.009		<0.009	<0.009	<0.009	<0.009
Parathion-ethyl (Parathion)	µg/L	0.004		<0.004	<0.004	<0.004	<0.004

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name PE074880.013 Water 13 Feb 2013 DA9-S6	PE074880.014 Water 13 Feb 2013 DA9-S7	PE074880.015 Water 14 Feb 2013 DA9-S8
Low Level OC Pesticides in Water Method: AN400/AN420					
Lindane (gamma BHC)	µg/L	0.05	<0.05	<0.05	<0.05
Aldrin	µg/L	0.01	<0.01	<0.01	<0.01
p,p'-DDE	µg/L	0.01	<0.01	<0.01	<0.01
p,p'-DDD	µg/L	0.01	<0.01	<0.01	<0.01
Methoxychlor	µg/L	0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	µg/L	0.01	<0.01	<0.01	<0.01
Alpha BHC	µg/L	0.05	<0.05	<0.05	<0.05
Beta BHC	µg/L	0.05	<0.05	<0.05	<0.05
Delta BHC	µg/L	0.05	<0.05	<0.05	<0.05
Endrin Ketone	µg/L	0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	µg/L	0.02	<0.02	<0.02	<0.02
Surrogates					
d14-p-terphenyl (Surrogate)	%	-	**69**	**68**	**43**
Ultra Low Level OC Pesticides in Water Method: AN400/AN420					
Heptachlor	µg/L	0.01	<0.01	<0.01	<0.01
Gamma Chlordane	µg/L	0.002	<0.002	<0.002	<0.002
Alpha Chlordane	µg/L	0.002	<0.002	<0.002	<0.002
Alpha Endosulfan	µg/L	0.005	<0.005	<0.005	<0.005
Dieldrin	µg/L	0.002	<0.002	<0.002	<0.002
Endrin	µg/L	0.004	<0.004	<0.004	<0.004
Beta Endosulfan	µg/L	0.005	<0.005	<0.005	<0.005
Endosulfan Sulphate	µg/L	0.005	<0.005	<0.005	<0.005
p,p'-DDT	µg/L	0.002	<0.002	<0.002	<0.002
Surrogates					
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	-	-	-
Low Level OP Pesticides in Water Method: AN400/AN420					
Azinphos-methyl (Guthion)	µg/L	0.05	<0.05	<0.05	<0.05
Bromophos Ethyl	µg/L	0.05	<0.05	<0.05	<0.05
Diazinon (Dimpylate)	µg/L	0.01	<0.01	<0.01	<0.01
Dichlorvos	µg/L	0.5	<0.5	<0.5	<0.5
Ethion	µg/L	0.05	<0.05	<0.05	<0.05
Fenitrothion	µg/L	0.2	<0.2	<0.2	<0.2
Malathion	µg/L	0.05	<0.05	<0.05	<0.05
Methidathion	µg/L	0.05	<0.05	<0.05	<0.05
Surrogates					
d14-p-terphenyl (Surrogate)	%	-	**69**	**68**	**43**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE074880.013 Water 13 Feb 2013 DA9-S6	PE074880.014 Water 13 Feb 2013 DA9-S7	PE074880.015 Water 14 Feb 2013 DA9-S8
Ultra Low Level OP Pesticides in Water **Method: AN400/AN420**						
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.009		<0.009	<0.009	<0.009
Parathion-ethyl (Parathion)	µg/L	0.004		<0.004	<0.004	<0.004

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Low Level OC Pesticides in Water **Method: ME-(AU)-[ENV]AN400/AN420**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Lindane (gamma BHC)	LB059169	µg/L	0.05	<0.05	98%
	LB059203	µg/L	0.05	<0.05	86%
Aldrin	LB059169	µg/L	0.01	<0.01	59%
	LB059203	µg/L	0.01	<0.01	55%
p,p'-DDE	LB059169	µg/L	0.01	<0.01	56%
	LB059203	µg/L	0.01	<0.01	58%
p,p'-DDD	LB059169	µg/L	0.01	<0.01	
	LB059203	µg/L	0.01	<0.01	
Methoxychlor	LB059169	µg/L	0.1	<0.1	
	LB059203	µg/L	0.1	<0.1	
Hexachlorobenzene	LB059169	µg/L	0.01	<0.01	80%
	LB059203	µg/L	0.01	<0.01	73%
Alpha BHC	LB059169	µg/L	0.05	<0.05	
	LB059203	µg/L	0.05	<0.05	
Beta BHC	LB059169	µg/L	0.05	<0.05	
	LB059203	µg/L	0.05	<0.05	
Delta BHC	LB059169	µg/L	0.05	<0.05	
	LB059203	µg/L	0.05	<0.05	
Endrin Ketone	LB059169	µg/L	0.05	<0.01	
	LB059203	µg/L	0.05	<0.05	
Heptachlor epoxide	LB059169	µg/L	0.02	<0.02	
	LB059203	µg/L	0.02	<0.02	

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
d14-p-terphenyl (Surrogate)	LB059169	%	-	91%	99%
	LB059203	%	-	110%	98%

Low Level OP Pesticides in Water **Method: ME-(AU)-[ENV]AN400/AN420**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Azinphos-methyl (Guthion)	LB059169	µg/L	0.05	<0.05	
	LB059203	µg/L	0.05	<0.05	
Bromophos Ethyl	LB059169	µg/L	0.05	<0.05	
	LB059203	µg/L	0.05	<0.05	
Diazinon (Dimpylate)	LB059169	µg/L	0.01	<0.01	102%
	LB059203	µg/L	0.01	<0.01	111%
Dichlorvos	LB059169	µg/L	0.5	<0.5	
	LB059203	µg/L	0.5	<0.5	
Ethion	LB059169	µg/L	0.05	<0.05	
	LB059203	µg/L	0.05	<0.05	
Fenitrothion	LB059169	µg/L	0.2	<0.2	
	LB059203	µg/L	0.2	<0.2	
Malathion	LB059169	µg/L	0.05	<0.05	
	LB059203	µg/L	0.05	<0.05	
Methidathion	LB059169	µg/L	0.05	<0.05	96%
	LB059203	µg/L	0.05	<0.05	96%

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
d14-p-terphenyl (Surrogate)	LB059169	%	-	91%	99%
	LB059203	%	-	110%	98%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Ultra Low Level OC Pesticides in Water **Method: ME-(AU)-[ENV]AN400/AN420**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Heptachlor	LB059169	µg/L	0.01	<0.00	81%
	LB059203	µg/L	0.01	<0.00	58%
Gamma Chlordane	LB059169	µg/L	0.002	<0.002	84%
	LB059203	µg/L	0.002	<0.002	62%
Alpha Chlordane	LB059169	µg/L	0.002	<0.002	
	LB059203	µg/L	0.002	<0.002	
Alpha Endosulfan	LB059169	µg/L	0.005	<0.005	
	LB059203	µg/L	0.005	<0.005	
Dieldrin	LB059169	µg/L	0.002	<0.002	82%
	LB059203	µg/L	0.002	<0.002	77%
Endrin	LB059169	µg/L	0.004	<0.004	107%
	LB059203	µg/L	0.004	<0.004	104%
Beta Endosulfan	LB059169	µg/L	0.005	<0.005	
	LB059203	µg/L	0.005	<0.005	
Endosulfan Sulphate	LB059169	µg/L	0.005	<0.005	
	LB059203	µg/L	0.005	<0.005	
p,p'-DDT	LB059169	µg/L	0.002	<0.001	
	LB059203	µg/L	0.002	<0.001	

Ultra Low Level OP Pesticides in Water **Method: ME-(AU)-[ENV]AN400/AN420**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Chlorpyrifos (Chlorpyrifos Ethyl)	LB059169	µg/L	0.009	<0.009	82%
	LB059203	µg/L	0.009	<0.009	77%
Parathion-ethyl (Parathion)	LB059169	µg/L	0.004	<0.004	77%
	LB059203	µg/L	0.004	<0.004	91%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN083	Separatory funnels are used for aqueous samples and extracted by transferring an appropriate volume (mass) of liquid into a separatory funnel and adding 3 serial aliquots of dichloromethane. Samples receive a single extraction at pH 7 to recover base / neutral analytes and two extractions at pH < 2 to recover acidic analytes. QC samples are prepared by spiking organic free water with target analytes and extracting as per samples.
AN400	OC and OP Pesticides by GC-ECD: The determination of organochlorine (OC) and organophosphorus (OP) pesticides and polychlorinated biphenyls (PCBs) in soils, sludges and groundwater. (Based on USEPA methods 3510, 3550, 8140 and 8080.)
AN400	OC and OP Pesticides by GC-ECD: The determination of organochlorine (OC) and organophosphorus (OP) pesticides and polychlorinated biphenyls (PCBs) in soils, sludges and groundwater. (Based on USEPA methods 3510, 3550, 8140 and 8080.)
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).

FOOTNOTES

IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
*	This analysis is not covered by the scope of accreditation.
^	Performed by outside laboratory.
LOR	Limit of Reporting
↑↓	Raised or Lowered Limit of Reporting
QFH	QC result is above the upper tolerance
QFL	QC result is below the lower tolerance
-	The sample was not analysed for this analyte
NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
✓☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee mail@alsglobal.com
☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townesville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: NRA/Alluvium	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	✓ Standard TAT **(List due date):**
OFFICE:		☐ Non Standard or urgent TAT **(List due date):**
PROJECT: Dalby Water Quality Study	**ALS QUOTE NO.:** N/A	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7
ORDER NUMBER: N/A		OF: 1 2 3 4 5 6 7
PROJECT MANAGER: Paul Godfrey (NRA)/Jason Carter (Alluviu	**CONTACT PH:** 07 4034 5300	
SAMPLER: Tyson Smalley (Alluvium)	**SAMPLER MOBILE:** 0429 610002	
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**	
Email Reports to (will default to PM if no other addresses are listed): paul@natres.com.au		
Email Invoice to (will default to PM if no other addresses are listed): jason.carter@alluvium.com.au>		

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Tyson Smalley			Martin
DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME: 15/2/13 15:00

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Samples are to be on-fowarded to ALS's Springvale lab, Melbourne

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS	Glycols (7 Analytes) including Triethylene glycol								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1.	DA2 - S1	13/2/13	W	100 mL Amber glass	1	X								ALS method: EP067. LOR: 2mg/L
2.	DA2 - S2	13/2/13	W		1	X								
3.	DA2 - S3	12/2/13	W		1	X								
4.	DA2 - S4	12/2/13	W		1	X								
5.	DA2 - S5	12/2/13	W		1	X								
6.	DA2 - S6	13/2/13	W		1	X								
7.	QA1	13/2/13	W		1	X								
SW8.	BLANK2	13/2/13	W		1	X								
9.	DA9 - S1	14/2/13	W		1	X								
10.	DA9 - S2	14/2/13	W		1	X								
11.	DA9 - S3	14/2/13	W		1	X								
12.	DA9 - S4	14/2/13	W		1	X								
				TOTAL										

Environmental Division
Brisbane
Work Order
EB1303907

Telephone : +61-7-3243 7222

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

(12)

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
✓☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

...: NRA/Alluvium	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	✓ Standard TAT **(List due date):**	**FOR LABORATORY USE ONLY (Circle)**
FFICE:		☐ Non Standard or urgent TAT **(List due date):**	Custody Seal Intact? Yes / No / N/A
PROJECT: Dalby Water Quality Study	**ALS QUOTE NO.:** N/A	**COC SEQUENCE NUMBER (Circle)**	Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER: N/A		COC: (1) 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Paul Godfrey (NRA)/Jason Carter (Alluvium)	**CONTACT PH:** 07 4034 5300	OF: 1 (2) 3 4 5 6 7	Other comment:
SAMPLER: Tyson Smalley (Alluvium)	**SAMPLER MOBILE:** 0429 610002		
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):**		
Email Reports to (will default to PM if no other addresses are listed): paul@natres.com.au			
Email Invoice to (will default to PM if no other addresses are listed): jason.carter@alluvium.com.au>			

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
Tyson Smalley			Martin
DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME: 15/2/13 15:00

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Samples are to be on-fowarded to ALS's Springvale lab, Melbourne

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS	Glycols (7 Analytes) including Triethylene glycol								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13.	DA9 - S5	14/2/13	W	100 mL Amber glass	1	X								ALS method: EP067. LOR: 2mg/L
14.	DA9 - S6	13/2/13	W	↓	1	X								
15.	DA9 - S7	13/2/13	W		1	X								
16.	DA9 - S8	14/2/13	W		1	X								
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB1303907**		
Client	: **ALLUVIUM CONSULTING**	Laboratory	: Environmental Division Brisbane
Contact	: MR JASON CARTER	Contact	: Customer Services
Address	: PO BOX 1581 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: jason.carter@alluvium.com.au	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 47242170	Telephone	: +61 7 3243 7222
Facsimile	: ----	Facsimile	: +61 7 3243 7218
Project	: Dalby Water Quality Study	Page	: 1 of 2
Order number	: ----		
C-O-C number	: ----	Quote number	: EB2012ALLUVI0056 (BN/385/12)
Site	: Dalby		
Sampler	: Tyson Smalley	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 15-FEB-2013	Issue Date	: 21-FEB-2013 07:17
Client Requested Due Date	: 25-FEB-2013	Scheduled Reporting Date	: **25-FEB-2013**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 6.8°C - Ice present
No. of coolers/boxes	: 1 SMALL	No. of samples received	: 15
Security Seal	: Intact.	No. of samples analysed	: 15

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.**
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- **Please be advised that we did not receive any sample containers labelled BLANK2. Also, the sample containers for sample DA2-S2 have the sampling date as 12/02/2013.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Matt Goodwin.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method / Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
EP067 : Glycols by GCMS		
DA9_S2	- Miscellaneous Glass Bottle - unpreserved	- Misc Amber VOC Vial - Unpreserved (Methane)

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP067 Glycols analysis in water by GCMS
EB1303907-001	13-FEB-2013 15:00	DA2_S1	✓
EB1303907-002	13-FEB-2013 15:00	DA2_S2	✓
EB1303907-003	12-FEB-2013 15:00	DA2_S3	✓
EB1303907-004	12-FEB-2013 15:00	DA2_S4	✓
EB1303907-005	12-FEB-2013 15:00	DA2_S5	✓
EB1303907-006	13-FEB-2013 15:00	DA2_S6	✓
EB1303907-007	13-FEB-2013 15:00	QA1	✓
EB1303907-009	14-FEB-2013 15:00	DA9_S1	✓
EB1303907-010	14-FEB-2013 15:00	DA9_S2	✓
EB1303907-011	14-FEB-2013 15:00	DA9_S3	✓
EB1303907-012	14-FEB-2013 15:00	DA9_S4	✓
EB1303907-013	14-FEB-2013 15:00	DA9_S5	✓
EB1303907-014	13-FEB-2013 15:00	DA9_S6	✓
EB1303907-015	13-FEB-2013 15:00	DA9_S7	✓
EB1303907-016	14-FEB-2013 15:00	DA9_S8	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ALL INVOICE CONTACT

- A4 - AU Tax Invoice (INV)	Email	danielle.Oldroyd@alluvium.com.au

MR JASON CARTER

- A4 - AU Tax Invoice (INV)	Email	jason.carter@alluvium.com.au

MR PAUL GODFREY

- *AU Certificate of Analysis - NATA (COA)	Email	paul@natres.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	paul@natres.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	paul@natres.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN	Email	paul@natres.com.au
- Chain of Custody (CoC) (COC)	Email	paul@natres.com.au
- EDI Format - ENMRG (ENMRG)	Email	paul@natres.com.au
- EDI Format - XTab (XTAB)	Email	paul@natres.com.au

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB1303907**	Page	: 1 of 5
Client	: **ALLUVIUM CONSULTING**	Laboratory	: Environmental Division Brisbane
Contact	: MR JASON CARTER	Contact	: Customer Services
Address	: PO BOX 1581 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: jason.carter@alluvium.com.au	E-mail	: Brisbane.Enviro.Services@alsglobal.com
Telephone	: +61 07 47242170	Telephone	: +61 7 3243 7222
Facsimile	: ----	Facsimile	: +61 7 3243 7218
Project	: Dalby Water Quality Study	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 15-FEB-2013
Sampler	: Tyson Smalley	Issue Date	: 25-FEB-2013
Site	: Dalby		
		No. of samples received	: 15
Quote number	: BN/385/12	No. of samples analysed	: 15

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Nancy Wang	Senior Semivolatile Instrument Chemist	Melbourne Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **No standard reference exists for the Holding Time of Glycols in waters. ALS takes a conservative approach and applies a holding time of 7 days for analysis.**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	DA2_S1	DA2_S2	DA2_S3	DA2_S4	DA2_S5
				Client sampling date / time	13-FEB-2013 15:00	13-FEB-2013 15:00	12-FEB-2013 15:00	12-FEB-2013 15:00	12-FEB-2013 15:00
					EB1303907-001	EB1303907-002	EB1303907-003	EB1303907-004	EB1303907-005
EP067: Glycols									
2-Ethoxyethyl acetate	111-15-9	2	mg/L		<2	<2	<2	<2	<2
2-Butoxyethanol	111-76-2	2	mg/L		<2	<2	<2	<2	<2
Propylene glycol	57-55-6	2	mg/L		<2	<2	<2	<2	<2
Ethylene glycol	107-21-1	2	mg/L		<2	<2	<2	<2	<2
Diethylene glycol monobutyl ether	112-34-5	2	mg/L		<2	<2	<2	<2	<2
Diethylene glycol	111-46-6	2	mg/L		<2	<2	<2	<2	<2
Triethylene glycol	112-27-6	2	mg/L		<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	DA2_S6	QA1	DA9_S1	DA9_S2	DA9_S3
				Client sampling date / time	13-FEB-2013 15:00	13-FEB-2013 15:00	14-FEB-2013 15:00	14-FEB-2013 15:00	14-FEB-2013 15:00
					EB1303907-006	EB1303907-007	EB1303907-009	EB1303907-010	EB1303907-011
EP067: Glycols									
2-Ethoxyethyl acetate	111-15-9	2	mg/L		<2	<2	<2	<2	<2
2-Butoxyethanol	111-76-2	2	mg/L		<2	<2	<2	<2	<2
Propylene glycol	57-55-6	2	mg/L		<2	<2	<2	<2	<2
Ethylene glycol	107-21-1	2	mg/L		<2	<2	<2	<2	<2
Diethylene glycol monobutyl ether	112-34-5	2	mg/L		<2	<2	<2	<2	<2
Diethylene glycol	111-46-6	2	mg/L		<2	<2	<2	<2	<2
Triethylene glycol	112-27-6	2	mg/L		<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	DA9_S4	DA9_S5	DA9_S6	DA9_S7	DA9_S8
				Client sampling date / time	14-FEB-2013 15:00	14-FEB-2013 15:00	13-FEB-2013 15:00	13-FEB-2013 15:00	14-FEB-2013 15:00
					EB1303907-012	EB1303907-013	EB1303907-014	EB1303907-015	EB1303907-016
EP067: Glycols									
2-Ethoxyethyl acetate	111-15-9	2	mg/L		<2	<2	<2	<2	<2
2-Butoxyethanol	111-76-2	2	mg/L		<2	<2	<2	<2	<2
Propylene glycol	57-55-6	2	mg/L		<2	<2	<2	<2	<2
Ethylene glycol	107-21-1	2	mg/L		<2	<2	<2	<2	<2
Diethylene glycol monobutyl ether	112-34-5	2	mg/L		<2	<2	<2	<2	<2
Diethylene glycol	111-46-6	2	mg/L		<2	<2	<2	<2	<2
Triethylene glycol	112-27-6	2	mg/L		<2	<2	<2	<2	<2

Attachment C
QA Summary

Reproducibility Assessment Method

NRA uses a reproducibility assessment method that is in accordance with Australian Standards (Council of Standards Australia 2005[4]) and similar to methods used by Australian NATA accredited Laboratories.

The reproducibility of analytical data is assessed using replicate sample sets. The analytical values from the sample and its replicate (duplicate) are compared by calculating the Relative Percent Difference (RPD, see equation below) for each analyte.

$$\text{RPD for Element } x = \frac{[x]_{\text{Sample}} - [x]_{\text{Replicate}}}{[x]_{\text{Mean of Sample and Replicate}}} \times 100$$

RPD is then used to assess reproducibility using the limit of reporting (LOR) to identify a threshold which the RPD must be less than for the analysis to have valid reproducibility. The thresholds are as follows.

- If values are less than 10 times the LOR, there is no RPD limit (*i.e*. reproducibility is valid).
- If values are 10 or greater, but less than 20 times the LOR, the RPD range limit is 0%–50%.
- If values are 20 or more times the LOR, the RPD range limit is 0%–20%.

Where values from the replicate set straddle two range limits, the range limit indicated by the lowest value is used.

Replicate sets that report two values below the LOR are considered to have valid reproducibility. Replicate sets that report a single value below the LOR or a value less than 10 times the LOR, and a second value 10 or more times greater than the smaller value or LOR are not considered to have valid reproducibility.

Analytical Reproducibility of Water Quality Data

Reproducibility of the water quality analytical data was measured using a replicate sample set collected at site DA2-S3 (SGS Laboratory ID SE115508.003, ALS Laboratory ID EB1303907-003) and Sample QA1 (SGS Laboratory ID SE115508.007, ALS Laboratory ID EB1303907-007). Replicate sample set data is presented in Table B1T-1. All analytes reported valid reproducibility. NRA therefore has confidence in the water quality results provided herein. Note organophosphate and organochlorine pesticides were not analysed in the replicate set as the glass sample bottle was broken in transit between SGS laboratories in Brisbane and Perth.

Table B1T-1. Reproducibility of water sample analytical data as indicated by replicate sample set (Samples QA1 and DA2-S3)

Analyte grouping/Analyte	Units	LOR	DA2-S3	QA1	RPD	RPD limit (%)	RPD
Total suspended solids	mg/L	5	15	16	6	No limit	Pass
Total Hardness as $CaCO_3$	mg/L	1	17	17	0	50	Pass
Sulfate as SO_4^{2-}	mg/L	0.1	4.5	4.7	4	20	Pass
Chloride	mg/L	0.05	48	49	2	20	Pass
Calcium	mg/L	0.1	2.6	2.6	0	20	Pass
Magnesium	mg/L	0.1	2.6	2.6	0	20	Pass
Sodium	mg/L	0.1	28	27	4	20	Pass
Fluoride	mg/L	0.02	<0.02	<0.02	0	No limit Threshold	Pass
Trace Elements - Dissolved							
Selenium	µg/L	2	<2	<2	0	No limit	Pass
Arsenic	µg/L	1	2	2	0	No limit	Pass

[4] AS4482.1-2005 *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil – Part 1: Non-Volatile and Semi-Volatile Compounds.* Council of Standards Australia, 2 November 2005.

Analyte grouping/Analyte	Units	LOR	DA2-S3	QA1	RPD	RPD limit (%)	RPD
Boron	µg/L	5	57	56	1.77	50	Pass
Cadmium	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Cobalt	µg/L	1	3	3	0	No limit	Pass
Copper	µg/L	1	1	2	66.67	No limit	Pass
Lead	µg/L	1	<1	<1	0	No limit	Pass
Mercury	mg/L	0.0001	<0.0001	<0.0001	0	No limit	Pass
Nickel	µg/L	1	2	2	0	No limit	Pass
Vanadium	µg/L	1	5	4	22.22	No limit	Pass
Zinc	µg/L	1	25	21	17.39	20	Pass
Trace Elements - Total							
Selenium	µg/L	2	3	3	0	No limit	Pass
Arsenic	µg/L	1	3	3	0	No limit	Pass
Boron	µg/L	5	50	50	0	50	Pass
Cadmium	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Cobalt	µg/L	1	4	4	0	No limit	Pass
Copper	µg/L	1	3	2	40	No limit	Pass
Lead	µg/L	1	2	2	0	No limit	Pass
Mercury	mg/L	0.0001	<0.0001	<0.0001	0	No limit	Pass
Nickel	µg/L	1	3	3	0	No limit	Pass
Vanadium	µg/L	1	20	18	10.52	50	Pass
Zinc	µg/L	1	15	15	0	50	Pass
Nutrients							
Nitrite as N	mg/L	0.005	<0.005	<0.005	0	No limit	Pass
Nitrate as N	mg/L	0.005	0.041	0.048	15.73	No limit	Pass
Ammonia as N	mg/L	0.01	0.04	0.04	0	No limit	Pass
Total Nitrogen as N	mg/L	0.20	1.3	1.3	0	No limit	Pass
Total Phosphorus as P	mg/L	0.20	0.11	0.11	0	No limit	Pass
Monocyclic Aromatic Hydrocarbons							
Benzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
Toluene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
Ethylbenzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
meta- & para-Xylene	µg/L	1	1	1	0	No limit	Pass
Styrene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
ortho-Xylene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
Isopropylbenzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
n-Propylbenzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
1.3.5-Trimethylbenzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
sec-Butylbenzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
1.2.4-Trimethylbenzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
tert-Butylbenzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
p-Isopropyltoluene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
n-Butylbenzene	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
Polynuclear Aromatic Hydrocarbons							
Naphthalene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Acenaphthylene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Acenaphthene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Fluorene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass

Analyte grouping/Analyte	Units	LOR	DA2-S3	QA1	RPD	RPD limit (%)	RPD
Phenanthrene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Anthracene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Fluoranthene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Pyrene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Benz(a)anthracene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Chrysene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Benzo(b)fluoranthene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Benzo(a)pyrene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Indeno(1.2.3.cd)pyrene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Dibenz(a.h)anthracene	µg/L	0.1	<0.1	<0.1	0	No limit	Pass
Volatile Petroleum Hydrocarbons							
C6 - C9 Fraction	µg/L	40	<40	<40	0	No limit	Pass
C6 - C10 Fraction	µg/L	50	<50	<50	0	No limit	Pass
Total Recoverable Hydrocarbons							
C10 - C14 Fraction	µg/L	50	<50	<50	0	No limit	Pass
C15 - C28 Fraction	µg/L	200	<200	<200	0	No limit	Pass
C29 - C36 Fraction	µg/L	200	<200	<200	0	No limit	Pass
C37 - C40 Fraction	µg/L	200	<200	<200	0	No limit	Pass
C10 - C36 Fraction (sum)	µg/L	450	<450	<450	0	No limit	Pass
C10 - C40 Fraction (sum)	µg/L	650	<650	<650	0	No limit	Pass
Volatile Petroleum Hydrocarbons F Bands							
Benzene (F0)	µg/L	0.5	<0.5	<0.5	0	No limit	Pass
C6 - C10 Fraction minus BTEX (F1)	µg/L	50	<50	<50	0	No limit	Pass
Total Recoverable Hydrocarbons F Bands							
>C10 - C16 Fraction (F2)	µg/L	60	<60	<60	0	No limit	Pass
>C16 - C34 Fraction (F3)	µg/L	500	<500	<500	0	No limit	Pass
>C34 - C40 Fraction (F4)	µg/L	500	<500	<500	0	No limit	Pass
Total Phenolics							
Total phenol	µg/L	0.01	<0.01	<0.01	0	No limit	Pass
Glycols							
Triethylene glycol	mg/L	2	<2	<2	0	No limit	Pass

Water Sample Contamination

Water sample contamination was measured by analysis of a field blank (Blank 2 (SGS Laboratory ID SE115508.007)). All analytes reported at concentrations less than or equal to the LOR in the field blank with the exception of dissolved boron and total boron (Table B1T-2). Both analyte concentrations were low, but detectable (16 µg/L and 9 µg/L, respectively). The concentrations of boron in the field blank are not considered significant as they are within ten times the LOR and therefore considered to be within the laboratory's reporting error. Hence, contamination is not expected to compromise interpretation of the dataset. Note triethylene glycol was not analysed in the field blank.

Table B1T-2. Water sample contamination as indicated by field blank samples

Analyte grouping/Analyte	Units	LOR	Blank
Total Hardness as $CaCO_3$	mg/L	1	<1
Sulfate as SO_4^{2-}	mg/L	0.1	<0.1
Chloride	mg/L	0.05	<0.05
Calcium	mg/L	0.1	<0.1

Analyte grouping/Analyte	Units	LOR	Blank
Magnesium	mg/L	0.1	<0.1
Sodium	mg/L	0.1	<0.1
Fluoride	mg/L	0.02	<0.02
Trace Elements - Dissolved			
Selenium	µg/L	2	<2
Arsenic	µg/L	1	<1
Boron	µg/L	5	**16**
Cadmium	µg/L	0.1	<0.1
Cobalt	µg/L	1	<1
Copper	µg/L	1	<1
Lead	µg/L	1	<1
Mercury	mg/L	0.0001	<0.0001
Nickel	µg/L	1	<1
Vanadium	µg/L	1	<1
Zinc	µg/L	1	<1
Trace Elements - Total			
Selenium	µg/L	2	<2
Arsenic	µg/L	1	<1
Boron	µg/L	5	**9**
Cadmium	µg/L	0.1	<0.1
Cobalt	µg/L	1	<1
Copper	µg/L	1	<1
Lead	µg/L	1	<1
Mercury	mg/L	0.0001	<0.0001
Nickel	µg/L	1	<1
Vanadium	µg/L	1	<1
Zinc	µg/L	1	<1
Nutrients			
Nitrite as N	mg/L	0.005	<0.005
Nitrate as N	mg/L	0.005	0.005
Ammonia as N	mg/L	0.01	0.01
Total Nitrogen as N	mg/L	0.20	<0.20
Total Phosphorus as P	mg/L	0.20	<0.20
Monocyclic Aromatic Hydrocarbons			
Benzene	µg/L	0.5	<0.5
Toluene	µg/L	0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5
meta- & para-Xylene	µg/L	1	<1
Styrene	µg/L	0.5	<0.5
ortho-Xylene	µg/L	0.5	<0.5
Isopropylbenzene	µg/L	0.5	<0.5
n-Propylbenzene	µg/L	0.5	<0.5
1.3.5-Trimethylbenzene	µg/L	0.5	<0.5
sec-Butylbenzene	µg/L	0.5	<0.5
1.2.4-Trimethylbenzene	µg/L	0.5	<0.5
tert-Butylbenzene	µg/L	0.5	<0.5
p-Isopropyltoluene	µg/L	0.5	<0.5

Analyte grouping/Analyte	Units	LOR	Blank
n-Butylbenzene	µg/L	0.5	<0.5
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1
Fluorene	µg/L	0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1
Anthracene	µg/L	0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1
Pyrene	µg/L	0.1	<0.1
Benz(a)anthracene	µg/L	0.1	<0.1
Chrysene	µg/L	0.1	<0.1
Benzo(b)fluoranthene	µg/L	0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1
Indeno(1.2.3.cd)pyrene	µg/L	0.1	<0.1
Dibenz(a.h)anthracene	µg/L	0.1	<0.1
Volatile Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	40	<40
C6 - C10 Fraction	µg/L	50	<50
Total Recoverable Hydrocarbons			
C10 - C14 Fraction	µg/L	50	<50
C15 - C28 Fraction	µg/L	200	<200
C29 - C36 Fraction	µg/L	200	<200
C37 - C40 Fraction	µg/L	200	<200
C10 - C36 Fraction (sum)	µg/L	450	<450
C10 - C40 Fraction (sum)	µg/L	650	<650
Volatile Petroleum Hydrocarbons F			
Benzene (F0)	µg/L	0.5	<0.5
C6 - C10 Fraction minus BTEX (F1)	µg/L	50	<50
Total Recoverable Hydrocarbons F			
>C10 - C16 Fraction (F2)	µg/L	60	<60
>C16 - C34 Fraction (F3)	µg/L	500	<500
>C34 - C40 Fraction (F4)	µg/L	500	<500
Total Phenolics			
Total phenol	µg/L	0.01	0.01
Glycols			
Triethylene glycol	mg/L	2	<2
Organochlorine Pesticides			
Aldrin	µg/L	0.01	<0.01
Alpha Chlordane	µg/L	0.002	<0.002
Gamma Chlordane	µg/L	0.002	<0.002
p,p'-DDD	µg/L	0.01	<0.01
p,p'-DDE	µg/L	0.01	<0.01
p,p'-DDT	µg/L	0.002	<0.002
Dieldrin	µg/L	0.002	<0.002
Alpha Endosulfan	µg/L	0.005	<0.005
Beta Endosulfan	µg/L	0.005	<0.005
Endosulfan Sulfate	µg/L	0.005	<0.005
Endrin	µg/L	0.004	<0.004
Endrin Ketone	µg/L	0.05	<0.05

Analyte grouping/Analyte	Units	LOR	Blank
Heptachlor	µg/L	0.01	<0.01
Heptachlor epoxide	µg/L	0.02	<0.02
Lindane (gamma BHC)	µg/L	0.05	<0.05
Methoxychlor	µg/L	0.1	<0.1
Hexachlorobenzene	µg/L	0.01	<0.01
Alpha BHC	µg/L	0.05	<0.05
Beta BHC	µg/L	0.05	<0.05
Delta BHC	µg/L	0.05	<0.05
Organophosphate Pesticides			
Bromophos Ethyl	µg/L	0.05	<0.05
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	0.009	<0.009
Demeton S methyl			
Diazinon (Dimpylate)	µg/L	0.01	<0.01
Dichlorvos	µg/L	0.5	<0.5
Ethion	µg/L	0.05	<0.05
Fenitrothion	µg/L	0.2	<0.2
Malathion	µg/L	0.05	<0.05
Methidathion	µg/L	0.05	<0.05
Azinphos-methyl (Guthion)	µg/L	0.05	<0.05
Parathion-ethyl (Parathion)	µg/L	0.004	<0.004

Bold values are greater than the LOR.

Attachment D
Field Sheets

SR-EIS WQ sampling of the Surat Gas Project 2013	Location: _DA9_____ Date: _13/02/2013_____ Inspection by: _Tyson Smalley_____ Sheet 1____ of 1_____ Meter Calibrated (please tick the box) pH ✓ EC ✓ DO ✓ Turbidity ✓ Sample location used for QA duplicate _N/A_____

Comments or general observations (such as weather conditions)

Fine , sunny approx. 34 degrees. Large rainfall event in preceding 2 weeks, but no rainfall for roughly 1 week.

Field data and observations	**SAMPLE LOCATION (please insert below)**							
	DA9 S6	**DA9 S7**						
GPS co-ordinates (WGS 84 **decimal degrees**)	322534 6953019	322760 6953384						
FIELD Physico-Chemical								
pH	7.19	7.24						
EC (mS/cm)	0.3	0.31						
Temperature (°C)	29.1	28.4						
DO (% satn.)	65.1	97.7						
Turbidity (NTU)	92.6	98.9						
Time of sampling	1700	1730						
FIELD Observations								
Photo taken (tick and No.)	4804-4806	4809-4814						
Floating litter, debris, scum, foam, objectionable matter	Some litter	Some litter						
Oil/petrochem (film/odour)#	No	No						
Objectionable odour	Yes, decaying fauna	No						
Algal blooms or floating vegetation mats	No	No						
Dead fauna/flora	Not visible	No						
Other observations/notes *	Picnic and boat ramp area just u/s of weir. 30m d/s from lease boundary on public land	Fast flowing and turbulent 10m d/s from old bridge.						

SR-EIS WQ sampling of the Surat Gas Project 2013	Location: _DA9_____ Date: _14/02/2013_____ Inspection by: _Tyson Smalley_____ Sheet 1____ of 1_____ Meter Calibrated (please tick the box) pH ✓ EC ✓ DO ✓ Turbidity ✓ Sample location used for QA duplicate _N/A_____

Comments or general observations (such as weather conditions)
Cloudy, light scattered rain, approx. 28 degrees. Large rainfall event in preceding 2 weeks, but no rainfall for roughly 1 week. It was discovered that the local landholders in the catchment import sewage treatment plant sludge, dry it out and spread it as a fertiliser. Very clear to see where the fertiliser has been applied. Possibly some spills or rainfall overflow from sludge drying impoundments.

Field data and observations	SAMPLE LOCATION (please insert below)							
	DA9 S8	DA9 S4	DA9 S5	DA9 S3	DA9 S2	DA9 S1		
GPS co-ordinates (WGS 84 **decimal degrees**)	316022 6950304	320527 6950073	321003 6950660	321989 6944813	321490 6946326	321188 6944420		
FIELD Physico-Chemical								
pH	6.62	7.34	7.32	7.37	7.35	7.6		
EC (mS/cm)	0.31	0.31	0.31	0.31	0.32	0.31		
Temperature (°C)	25.6	28.1	29.4	28.1	28.1	28.3		
DO (% satn.)	36.3	61.3	67.7	62.9	61.9	51.8		
Turbidity (NTU)	133	89.3	87.8	95	103	88.9		
Time of sampling	0921	1007	1044	1135	1243	1320		
FIELD Observations								
Photo taken (tick and No.)	4814-4816	4817-4819	4820-4822	4823-4829	4830-4832	4833-4837		
Floating litter, debris, scum, foam, objectionable matter	Algal sheen	Few leaves	Floating algae mat on log jam	Limited leaf litter.	Limited leaf litter	Limited leaf litter against log jam		
Oil/petrochem (film/odour)#	Organic sheen from decaying vegetation	No	No	No	No	No		
Objectionable odour	No	No	No	No	No	No		
Algal blooms or floating vegetation mats	No	No	Wind-blown algal scum	No	No	No		

Dead fauna/flora	No	No	No	Dead sheep near water edge. Flood related.	No	No		
Other observations/notes *	Standing pool downstream from road crossing. At lease boundary with rusting wire fence in water. Downstream from sewerage sludge business	Slow flowing and turbid/brown water. 60m d/s of confluence	Backpooling from weir. Turbid brown water	5m d/s ephemeral tributary. Sampled at u/s side of small peninsula sticking into river. Noticeable spreading of human sewage on paddocks.	150m u/s from fence line. Extensive gully erosion noted nearby.	Sampled at confluence with eroding gully system. Dispersive clays with dark brown water. Flow most noticeable at this upstream site.		

SR-EIS WQ sampling of the Surat Gas Project 2013	Location: _DA2_____ Date: _13/02/2013_____ Inspection by: _Tyson Smalley_____ Sheet 1____ of 1_____ Meter Calibrated (please tick the box) pH ✓ EC ✓ DO ✓ Turbidity ✓ Sample location used for QA duplicate _DA2 S3_____

Comments or general observations (such as weather conditions)

Fine , sunny approx. 34 degrees. Large rainfall event in preceding 2 weeks, but no rainfall for roughly 1 week.

Field data and observations	SAMPLE LOCATION (please insert below)							
	DA2 S1	**DA2 S3**	**DA2 S6**	**DA2 S5**	**DA2 S4**	**DA2 S2**		
GPS co-ordinates (WGS 84 **decimal degrees**)	225231 7068946	224211 7064406	219332 7048477	221518 7066058	224507 7067673	224535 **7066623**		
FIELD Physico-Chemical								
pH	5.47	5.96	5.97	6.00	5.39	5.98		
EC (mS/cm)	0.12	0.2	0.16	0.2	0.21	0.17		
Temperature (°C)	26.4	29.8	29.6	28.7	28.7	30.9		
DO (% satn.)	73.2	80.7	40.1	41.9	67.6	76		
Turbidity (NTU)	103	140	155	24.5	55.4	101		
Time of sampling	0910	1140	1350	0932	1420	1515		
FIELD Observations								
Photo taken (tick and No.)	4775-4777	4794-4800	4801-4803	4759-4761	4765-4768	4769-4772		
Floating litter, debris, scum, foam, objectionable matter	No	No	Yes, some litter	No	No	No		
Oil/petrochem (film/odour)#	No	No	No	No	No	No		
Objectionable odour	No	No	No But geese poo everywhere	No	No	No		
Algal blooms or floating vegetation mats	Brown floating wind-swept algal slime in pool	No	No	Algal slime, much detritus, stagnant	Vegetation debris in pool	No		

Dead fauna/flora	No	No	No	No	No	No		
Other observations/notes *	Deep pool that maybe be smothered by a sand slug moving downstream.	Located 2m upstream of small tributary from dam. Large channel, debris high on bank	Geese/ducks fed by locals – faeces everywhere. Litter on ground. Picnic spot with car park nearby	Brown water, chain of ponds, aquatic fauna present	Flood damage to banks. Sampled near a rock bar creating a pool	Flowing in main channel. Site used is slightly downstream from confluence with tributary		