Clarence Colliery Discharge Investigation: Appendices

Appendix 1

Appendix 2

Environment Protection Licence

Licence - 726

Licence Details	
Number:	726
Anniversary Date:	01-January

Licensee
CLARENCE COLLIERY PTY LTD
LEVEL 18, BT TOWER, 1 MARKET STREET
SYDNEY NSW 2000

Premises
CLARENCE COLLIERY
OFF BELLS LINE OF ROAD
NEWNES JUNCTION NSW 2790

Scheduled Activity
Coal Works
Mining for Coal

Fee Based Activity	Scale
Coal works	> 2000000-5000000 T handled
Mining for coal	> 2000000-3500000 T produced

Region
South - Bathurst
Lvl 2, 203-209 Russell Street BATHURST NSW 2795
Phone: (02) 6332 7600
Fax: (02) 6332 7630
PO Box 1388 BATHURST
NSW 2795

Environment Protection Licence

Licence - 726

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Licence - 726

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Licence - 726

Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Environment Protection Licence

Licence - 726

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

CLARENCE COLLIERY PTY LTD
LEVEL 18, BT TOWER, 1 MARKET STREET
SYDNEY NSW 2000

subject to the conditions which follow.

Environment Protection Licence

Licence - 726

1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Coal Works	Coal works	> 2000000 - 5000000 T handled
Mining for Coal	Mining for coal	> 2000000 - 3500000 T produced

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
CLARENCE COLLIERY
OFF BELLS LINE OF ROAD
NEWNES JUNCTION
NSW 2790
CCL705, ML 1353, ML 1354 & ML 1583

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

A3.2 Any other document and/or management plan is not to be taken as part of the documentation in condition A3.1, other than those documents and/or management plans specifically referenced in this licence.

Environment Protection Licence

Licence - 726

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

P1.2 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to waters Discharge quality monitoring	Discharge to waters Discharge quality monitoring	Discharge and monitoring point identified as LDP1 on drawing CL126 and titled "Clarence Colliery Pit Top Monitoring Locations" and dated 02/2012
2	Discharge to waters Discharge quality monitoring	Discharge to waters Discharge quality monitoring	Discharge and monitoring point identified as LDP2 on drawing CL126 and titled "Clarence Colliery Pit Top Monitoring Locations" and dated 02/2012
3	Discharge to waters Discharge quality monitoring	Discharge to waters Discharge quality monitoring	Discharge and monitoring point identified as LDP3 on drawing CL126 and titled "Clarence Colliery Pit Top Monitoring Locations" and dated 02/2012
4	Discharge to waters Discharge quality monitoring	Discharge to waters Discharge quality monitoring	Discharge and monitoring point identified as LDP4 on drawing CL126 and titled "Clarence Colliery Pit Top Monitoring Locations" and dated 02/2012

P1.3 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
5	Dust monitoring		Dust Deposition Gauge identified as DM1 on drawing CL126 and titled "Clarence Colliery Pit Top Monitoring Locations" and dated 02/2012
6	Dust monitoring		Dust Deposition Gauge identified as DM2 on drawing CL126 and titled "Clarence Colliery Pit Top Monitoring Locations" and dated 02/2012

7	Dust monitoring	Dust Deposition Gauge identified as DM3 on drawing CL126 and titled "Clarence Colliery Pit Top Monitoring Locations" and dated 02/2012
8	Meteorological monitoring	Meteorological monitoring identified as Weather Station on drawing CL126 and titled "Clarence Colliery Pit Top Monitoring Locations" and dated 02/2012

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

L2.4 Water and/or Land Concentration Limits

POINT 1,2,3,4

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Arsenic	milligrams per litre				0.01
Boron	milligrams per litre				0.1
Cadmium	milligrams per litre				0.001
Chloride	milligrams per litre				25

Chromium (hexavalent)	milligrams per litre	0.01
Copper	milligrams per litre	0.02
Filterable iron	milligrams per litre	0.3
Filterable manganese	milligrams per litre	0.5
Fluoride	milligrams per litre	1
Lead	milligrams per litre	0.005
Mercury	milligrams per litre	0.001
Oil and Grease	milligrams per litre	10
pH	pH	6-8.5
Selenium	milligrams per litre	0.01
Silver	milligrams per litre	0.001
Sulfate	milligrams per litre	250
Total suspended solids	milligrams per litre	30
Zinc	milligrams per litre	1.5

L2.5 The concentration limits stipulated by condition L2.1/L2.4 for EPA identification points 1, 3 and 4 are deemed not to apply when the discharge from the stormwater control structures occurs solely as a result of rainfall measured at the premises which exceeds:
a) a total of 56 millimetres of rainfall over any consecutive 5 day period.

Note: A 56mm rainfall event is defined by the EPA endorsed publication "Managing urban stormwater: soils and construction" (Landcom 2004) as the rainfall depth in millimetres for a 95th percentile 5 day rainfall event for Sydney/Blue Mountains which is also consistent with the storage capacity (recommended minimum design criteria) for Type D sediment basins for mines and quarries (see "Managing urban stormwater: soils and construction, Volume 2E, mines and quarries" (DECC, 2008)).

Environment Protection Licence

Licence - 726

L3 Volume and mass limits

L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:
a) liquids discharged to water; or;
b) solids or liquids applied to the area;
must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of Measure	Volume/Mass Limit
2	kilolitres per day	25000

Note: The total volume discharged from point 2 may exceed 25,000 kL/day on any day where greater than 10 mm of rainfall is recorded at the premises, for that day.

L4 Waste

L4.1 The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled “Waste” and meeting the definition, if any, in the column titled “Description” in the table below.
Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled “Activity” in the table below.
Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled “Other Limits” in the table below.
This condition does not limit any other conditions in this licence.

Code	Waste	Description	Activity	Other Limits
NA	General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the Protection of the Environment Operations (Waste) Regulation 2005	As specified in each particular resource recovery exemption	NA

L5 Noise limits

L5.1 Noise generated from the premises, excluding train loading and rail operations, must not exceed the noise limits specified in the table below.

Location	Day (LAeq 15 min)	Evening (LAeq 15 min)	Night (LAeq 15 min)
Any residence on privately owned land not subject to an agreement with the licensee	38	36	35

Note: For the purposes of condition 5.1:
a) Day is defined as:
i. the period from 7am to 6pm Monday to Saturday; and
ii. the period from 8am to 6pm Sundays and Public Holidays.
b) Evening is defined as: the period from 6pm to 10pm.
c) Night is defined as:
i. the period from 10pm to 7am Monday to Saturday; and
ii. the period from 10pm to 8am Sundays and Public Holidays.
d) The morning shoulder period is a subset of the night period between 6am to 7am Monday to Saturday.

L5.2 To determine compliance with condition L5.1, noise from the premises is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of the residence where the residence is more than 30 metres from the residential boundary to determine compliance with the noise levels in condition L5.1

L5.3 To determine compliance with condition L5.1, the modification factors in Section 4 of the NSW Industrial Noise Policy (EPA, 2000/2001) must be applied, as appropriate, to the noise levels measured by any monitoring equipment.

L5.4 The noise limits stipulated by condition L5.1 apply under all meteorological conditions except for the following:
a) wind speeds greater than 3 metres per second at ground level; and
b) temperature inversions as outlined in Section 5 of the NSW Industrial Noise Policy (EPA, 2000/2001).

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

Note: Plant is defined in the Dictionary. The type of plant and equipment that should be considered includes, but is not limited to, drainage systems; infrastructure and pollution control equipment such as (but not limited to) spill containment and clean-up equipment; dust screens and collectors; sediment collection systems, traps and sumps; waste collection, storage and disposal equipment.

O3 Dust

O3.1 Activities occurring in or on the premises must be carried out in a manner that will minimise the generation, or emission from the premises, of wind-blown or traffic generated dust.

O3.2 All trafficable areas, coal storage areas and vehicle manoeuvring areas in or on the premises must be maintained, at all times, in a condition that will minimise the generation, or emission from the premises, of wind-blown or traffic generated dust.

O3.3 Trucks transporting coal from the premises must be covered immediately after loading to prevent wind blown emissions and spillage. The covering must be maintained until immediately before unloading the trucks.

O4 Other operating conditions

O4.1 The stormwater control structures identified at EPA identification points 1, 3 and 4 must be drained or pumped out as necessary to maintain each structures design storage capacity within 5 days following rainfall.

O4.2 The licensee must undertake maintenance as necessary to desilt any stormwater control structure identified at EPA identification points 1, 3 and 4 in order to retain each structures design storage capacity.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the

frequency, specified opposite in the other columns:

M2.2 Air Monitoring Requirements

POINT 5,6,7

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	Australian Standard 3580.10.1-2003

M2.3 Water and/ or Land Monitoring Requirements

POINT 1,2,3,4

Pollutant	Units of measure	Frequency	Sampling Method
Arsenic	milligrams per litre	Monthly during discharge	Grab sample
Boron	milligrams per litre	Monthly during discharge	Grab sample
Cadmium	milligrams per litre	Monthly during discharge	Grab sample
Chloride	milligrams per litre	Monthly during discharge	Grab sample
Chromium (hexavalent)	milligrams per litre	Monthly during discharge	Grab sample
Copper	milligrams per litre	Monthly during discharge	Grab sample
Filterable iron	milligrams per litre	Monthly during discharge	Grab sample
Filterable manganese	milligrams per litre	Monthly during discharge	Grab sample
Fluoride	milligrams per litre	Monthly during discharge	Grab sample
Lead	milligrams per litre	Monthly during discharge	Grab sample
Mercury	milligrams per litre	Monthly during discharge	Grab sample
Oil and Grease	milligrams per litre	Monthly during discharge	Grab sample
pH	milligrams per litre	Monthly during discharge	Grab sample
Selenium	milligrams per litre	Monthly during discharge	Grab sample
Silver	milligrams per litre	Monthly during discharge	Grab sample
Sulfate	milligrams per litre	Monthly during discharge	Grab sample

Total suspended solids	milligrams per litre	Monthly during discharge	G
Zinc	milligrams per litre	Monthly during discharge	Grab sample

M3 Testing methods - concentration limits

M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

Note: The *Protection of the Environment Operations (Clean Air) Regulation 2010* requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".

M3.2 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with:
a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or
b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or
c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

M4 Environmental monitoring

M4.1 The licensee must undertake yearly (in-line with the reporting period) noise monitoring as outlined below, to determine compliance with the noise limits stipulated by condition L5.1:
a) 1 day attended noise monitoring covering the day, evening and night time periods; and
b) 5 days unattended noise monitoring (monitor and logger) covering each days day, evening and night time periods.

M4.2 The results of the noise monitoring required by condition M4.1, and an interpretation of these results, must be provided as an attachment to each corresponding years Annual Return.

M4.3 The licensee, following the receipt of a noise related complaint and if required by the EPA, must undertaken noise monitoring as required by the EPA to determine compliance with the noise limits stipulated by condition L5.1.

M4.4 The results of the noise monitoring required by condition M4.3, and an interpretation of these results, must must be provided to the EPA within 21 days of the completion of the noise monitoring.

M5 Weather monitoring

M5.1 For each monitoring point specified in the table below the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns.

Point 8

Parameter	Units of Measure	Frequency	Averaging Period	Sampling Method
Air temperature	°C	Continuous	1 hour	AM-4
Wind direction	°	Continuous	15 minute	AM-2 & AM-4
Wind speed	m/s	Continuous	15 minute	AM-2 & AM-4
Sigma theta	°	Continuous	15 minute	AM-2 & AM-4
Rainfall	mm	Continuous	15 minute	AM-4
Relative humidity	%	Continuous	1 hour	AM-4

M6 Recording of pollution complaints

M6.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M6.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M6.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M6.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M7 Telephone complaints line

M7.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M7.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M7.3 The preceding two conditions do not apply until 3 months after:
a) the date of the issue of this licence or
b) if this licence is a replacement licence within the meaning of the Protection of the Environment Operations (Savings and Transitional) Regulation 1998, the date on which a copy of the licence was served on the licensee under clause 10 of that regulation.

M8 Requirement to monitor volume or mass

M8.1 For each discharge point or utilisation area specified below, the licensee must monitor:
a) the volume of liquids discharged to water or applied to the area;
b) the mass of solids applied to the area;
c) the mass of pollutants emitted to the air;
at the frequency and using the method and units of measure, specified below.

POINT 1

Frequency	Unit of Measure	Sampling Method
Daily during any discharge	kilolitres	Estimate

POINT 2

Frequency	Unit of Measure	Sampling Method
Daily	kilolitres	Special Method 1

POINT 3

Frequency	Unit of Measure	Sampling Method
Daily during any discharge	kilolitres	Estimate

POINT 4

Frequency	Unit of Measure	Sampling Method
Daily during any discharge	kilolitres	Estimate

Note: "Special Method 1" means: inline bubble metre instrumentation.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
a) a Statement of Compliance; and
b) a Monitoring and Complaints Summary.
At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

Environment Protection Licence

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R1.8 A person who has been given written approval to certify a certificate of compliance under a licence issued under the Pollution Control Act 1970 is taken to be approved for the purpose of this condition until the date of first review of this licence.

R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G2 Signage

G2.1 The location of EPA identification points 1 to 8 must be clearly marked by a sign that indicates the EPA identification points used in this licence and be located as close as practical to these points.

Environment Protection Licence

Licence - 726

Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 726

flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder describe d at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

Environment Protection Licence

Licence - 726

TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible), special waste or hazardous waste

Ms Debbie Maddison

Environment Protection Authority

(By Delegation)

Date of this edition: 06-September-2000

Environment Protection Licence

Licence - 726

End Notes

1	Licence varied by change to Contact details, issued on 23-May-2001, which came into effect on 23-May-2001.
2	Licence varied by notice 1008022, issued on 24-May-2001, which came into effect on 18-Jun-2001.
3	Licence varied by notice 1016572, issued on 17-Apr-2002, which came into effect on 12-May-2002.
4	Licence varied by notice 1032803, issued on 16-Dec-2003, which came into effect on 30-Dec-2003.
5	Licence varied by notice 1033920, issued on 16-Jan-2004, which came into effect on 10-Feb-2004.
6	Licence varied by notice 1037161, issued on 23-Jun-2004, which came into effect on 18-Jul-2004.
7	Licence varied by notice 1052141, issued on 18-Oct-2005, which came into effect on 12-Nov-2005.
8	Licence varied by notice 1053964, issued on 06-Dec-2005, which came into effect on 31-Dec-2005.
9	Licence varied by notice 1055391, issued on 18-Jan-2006, which came into effect on 20-Jan-2006.
10	Licence varied by notice 1057157, issued on 09-Mar-2006, which came into effect on 17-Mar-2006.
11	Licence varied by notice 1079419, issued on 30-Oct-2007, which came into effect on 30-Oct-2007.
12	Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>
13	Licence varied by notice 1102926, issued on 09-Sep-2009, which came into effect on 09-Sep-2009.
14	Licence varied by notice 1115584, issued on 05-Jul-2010, which came into effect on 05-Jul-2010.
15	Licence varied by notice 1122407, issued on 10-Dec-2010, which came into effect on 10-Dec-2010.
16	Licence varied by notice 1502867 issued on 19-Dec-2011
17	Licence varied by notice 1514358 issued on 02-Jul-2013
18	Licence varied by notice 1521882 issued on 12-Jun-2014

Table A1: List of sampling sites

Site Code	Source	Site Description	Latitude[#]	Longitude[#]	Date Sampled
15_Db*	Johnson 1982	Rising Stage Samples; Carne West downstream, bottom	-33.3809	150.2116	1/12/1980
15_Ub*	Johnson 1982	Rising Stage Samples; Carne West upstream bottom	-33.3809	150.2116	1/12/1980
17_Db	Johnson 1982	Rising Stage Samples; Western branch Wolgan River downstream bottom	-33.3211	150.1555	1/12/1980; 15/01/1981
17_Dm	Johnson 1982	Rising Stage Samples; Western branch Wolgan River downstream middle	-33.3211	150.1555	12/02/1981
17_Dt	Toyer & Main 1981	Rising Stage Samples; Western branch Wolgan River downstream top	-33.3211	150.1555	12/02/1981
17_Ub	Johnson 1982	Rising Stage Samples; Western branch Wolgan River upstream bottom	-33.3211	150.1555	1/12/1980; 15/01/1981; 12/02/1981
17_Um	Johnson 1982	Rising Stage Samples; Western branch Wolgan River upstream middle	-33.3211	150.1555	15/01/1981
20_b*	Johnson 1982	Rising Stage Samples; Rocky Creek bottom	-33.3057	150.2719	15/01/1981; 12/02/1981
20_m*	Johnson 1982	Rising Stage Samples; Rocky Creek middle	-33.3057	150.2719	15/01/1981; 12/02/1981
20_t*	Johnson 1982	Rising Stage Samples; Rocky Creek top	-33.3057	150.2719	15/01/1981; 12/02/1981
23_Db	Johnson 1982	Rising Stage Samples; Carne Creek (Eastern Branch Wolgan River) downstream bottom	-33.2507	150.1932	15/01/1981; 12/02/1981
23_Dm	Johnson 1982	Rising Stage Samples; Carne Creek (Eastern Branch Wolgan River) downstream middle	-33.2507	150.1932	15/01/1981; 12/02/1981
23_Dt	Johnson 1982	Rising Stage Samples; Carne Creek (Eastern Branch Wolgan River) downstream top	-33.2507	150.1932	15/01/1981; 12/02/1981

Site Code	Source	Site Description	Latitude[#]	Longitude[#]	Date Sampled
23_Ub	Johnson 1982	Rising Stage Samples; Carne Creek (Eastern Branch Wolgan River) upstream bottom	-33.2507	150.1932	15/01/1981
23_Um	Johnson 1982	Rising Stage Samples; Carne Creek (Eastern Branch Wolgan River) upstream middle	-33.2507	150.1932	15/01/1981
35	Johnson 1982	Colo River junction with Hungryway Creek	-33.3759	150.6641	2/08/1980
36	Johnson 1982	Colo River junction with Hungryway Creek	-33.3759	150.6641	26/10/1980
37	Johnson 1982	Colo River upstream of Wollangambe Creek confluence	-33.3526	150.5788	14/09/1980
38	Johnson 1982	Wollangambe Creek prior to confluence with Colo River	-33.3535	150.5788	14/09/1980
39	Johnson 1982	Hungryway Creek prior to confluence with Colo River	-33.3754	150.6642	26/10/1980
40	Johnson 1982	Soak water from shale bed Wolgan River at junction with Carne Creek			
41	Johnson 1982	Solution of soak water - see Johnson 1981			
42	Johnson 1982	Leachate solution of shale near soak - see Johnson 1981			
43	Johnson 1982	Leachate solution of sand from Nine Mile Creek near N_14 - see Johnson 1981			
44	Johnson 1982	Seepage water sandstone cave near Wolgan Gap - see Johnson 1981			
45	Johnson 1982	Coxs River at Angus Place			26/04/1981
46	Johnson 1982	Pulpit Hill Creek at Blackheath Glen	-33.6743	150.2668	25/04/1981
47	Johnson 1982	Pulpit Hill Creek along Megalong Valley Rd			25/04/1981
48	Johnson 1982	Megalong Creek near Nellies Glen	-33.7126	150.2883	25/04/1981
49	Johnson 1982	Megalong Creek at Megalong Valley Road crossing			25/04/1981
50	Johnson 1982	Lett River at Reedy Creek Road crossing	-33.526	150.2263	26/04/1981
51	Johnson 1982	Kerosene Creek near old oil shale workings			26/04/1981
52	Johnson 1982	Capertee River prior to confluence with Running Stream			8/05/1981

Site Code	Source	Site Description	Latitude[#]	Longitude[#]	Date Sampled
N_1	Toyer & Main 1981	Clarence colliery; water draining swampy area above potable water dam	-33.4621	150.2417	21/03/78; 18/04/78; 10/08/78; 4/12/78; 27/03/79; 18/01/80
N_10	Toyer & Main 1981	Clarence colliery; Wollangambe Creek downstream colliery storage dam spillway	-33.4559	150.2524	18/04/78; 10/08/78; 4/12/78; 28/03/79; 17/09/79; 18/01/80; 5/03/80; 22/08/80
N_11	Toyer & Main 1981	Clarence colliery; Envirotech WTP output	33.4606	150.2457	17/09/79; 18/01/80; 5/03/80
N_12	Toyer & Main 1981	Clarence colliery; minewater before entering settling ponds	33.4605	150.2452	17/09/79; 18/01/80; 5/03/80
N_13*	Toyer & Main 1981	Bungleboori Creek tributary draining swamp in Nine Mile Pine Plantation	-33.3957	150.2261	18/09/79; 18/01/80; 5/03/80; 5/03/80; 5/05/80; 1/07/80; 20/08/80; 4/12/80
N_14*	Johnson 1982	Bungleboori Creek 8 to 10 km ds N_13	-33.4141	150.2825	5/03/80; 6/05/80
N_14a*	Johnson 1982	Small tributary of Nine Mile Creek near N_14			5/03/1980
N_15*	Johnson 1982	Carne Creek (called 'East branch tributary of Wolgan River' in TOYER & MAIN 1981)	-33.3744	150.2032	6/03/80; 5/05/80; 4/07/80; 18/08/80; 1/12/80; 15/01/81; 12/02/81
N_16*	Johnson 1982	Kangaroo Creek draining swamp, just downstream of small dam	-33.3728	150.1323	6/03/80; 6/05/80; 4/07/80; 20/08/80
N_16a	Johnson 1982	Kangaroo Creek spring just downstream N_16	-33.3728	150.1323	6/03/1980
N_16b*	Johnson 1982	Kangaroo Creek Dam above swamp near N_16	-33.3728	150.1323	6/03/1980
N_16c*	Johnson 1982	Kangaroo Creek Swamp, feeds Kangaroo Creek near N_16	-33.3728	150.1323	6/05/1980
N_17*	Johnson 1982	Wolgan River (West Branch)	-33.3193	150.1571	6/03/80; 7/05/80; 4/07/80; 20/08/80; 3/12/80; 15/01/81; 12/02/81
N_18*	Johnson 1982	Nayook Creek at Deep Pass	-33.3443	150.3067	6/03/80; 6/05/80; 4/07/80;
N_19*	Johnson 1982	Dingo Creek draining Twelve Mile Pine Plantation	-33.3619	150.268	7/03/80; 6/05/80; 4/07/80
N_2	Toyer & Main 1981	Clarence colliery; Creek on eastern side of STP above outlet drain from potable water dam	-33.4621	150.2455	21/03/78; 18/04/78; 10/08/78; 4/12/78; 27/03/79
N_20*	Johnson 1982	Rocky Creek draining Fifteen Mile Pine Plantation	-33.3048	150.2746	25/03/80; 5/05/80; 1/07/80; 19/08/80; 1/12/80; 15/01/81; 12/02/81

Site Code	Source	Site Description	Latitude[#]	Longitude[#]	Date Sampled
N_21*	Johnson 1982	Tributary of Deane's Creek draining swampy area	-33.2762	150.2449	25/03/80; 5/05/80; 1/07/80; 3/07/80; 19/08/80; 3/12/80; 15/01/81; 12/02/81
N_22	Johnson 1982	Wolgan River @ Water Resources Commission gauging station (Cape Pinnacle)	-33.2888	150.1259	26/03/80; 7/05/80; 3/07/80; 20/08/80; 2/12/80
N_23	Johnson 1982	Carne Creek before junction with Wolgan River	-33.2507	150.1921	26/03/80; 7/05/80; 3/07/80; 20/08/80; 15/01/81; 12/02/81
N_24	Johnson 1982	Wolgan River before junction with Carne Creek	-33.2507	150.1932	26/03/80; 7/05/80; 2/07/80; 20/08/80; 15/01/81; 12/02/81
N_25	Johnson 1982	Wolgan River ds N_16, 6 to 7 km us Rocky Creek	-33.1741	150.2771	26/03/80; 7/05/80; 2/07/80;
N_26	Johnson 1982	Wolgan River ds N_27 at Water Resources Commission (Wolgan) gauging station, 1 km us Newnes Hotel	-33.1862	150.2521	26/03/80; 7/05/80; 2/07/80; 20/08/80; 2/12/80
N_27	Johnson 1982	Wolgan River ds junction of Wolgan River and Carne Creek; just us ford near Wolgan Experimental Mine	-33.2221	150.2247	26/03/80; 7/05/80; 2/07/80; 20/08/80
N_28	Johnson 1982	Wolgan River us N_27, just ds junction with Barton Creek	-33.2498	150.1943	26/03/80; 7/05/80
N_29	Johnson 1982	Barton Creek us junction with Wolgan River	-33.2285	150.2078	27/03/80; 7/05/80; 2/07/80; 20/08/80
N_3	Toyer & Main 1981	Clarence colliery; Creek below outlet drain from potable water dam; 15m ds N_2	-33.4617	150.2457	28/03/79; 18/04/78; 10/08/78; 4/12/78; 4/12/78
N_30	Johnson 1982	Marrangaroo Creek at GWH	-33.4391	150.1118	27/03/80; 7/05/80; 2/07/80
N_31	Johnson 1982	Old Dam on intermittent tributary to Rocky Creek	-33.2436	150.2782	1/12/1980
N_32	Johnson 1982	Carne Creek 4 km us junction with Wolgan River	-33.268	150.2007	15/01/1981
N_33*	Johnson 1982	Tributary to Carne Creek draining swamp below proposed Birds Rock colliery site	-33.3782	150.2095	16/03/1981
N_34*	Johnson 1982	Tributary of Bungleboori Creek (Nth), below swamp in cleared area of pine plantation	-33.3769	150.2729	6/05/1980
N_4	Toyer & Main 1981	Clarence colliery; below Collection Dam No 1 and WTP	-33.4608	150.2464	18/04/78; 10/08/78; 4/12/78; 28/03/79

Site Code	Source	Site Description	Latitude[#]	Longitude[#]	Date Sampled
N_5	Toyer & Main 1981	Clarence colliery; Creek ds inflow from Collection Dam No 1	-33.4607	150.2464	18/04/78; 10/08/78; 4/12/78; 28/03/79
N_6	Toyer & Main 1981	Clarence colliery; Creek draining whole site before Colliery storage dam	-33.4584	150.2492	21/03/78; 18/04/78; 10/08/78; 4/12/78; 27/03/79; 18/01/80; 5/03/80; 2/12/80
N_7	Toyer & Main 1981	Clarence colliery; Creek draining Kables Sand quarry before Clarence Colliery dam	-33.4567	150.2496	21/03/78; 18/04/78; 10/08/78; 4/12/78; 27/03/79; 18/01/80; 5/03/80
N_8	Toyer & Main 1981	Clarence colliery; colliery storage dam spillway before Wollangambe Creek	-33.4558	150.2514	18/04/78; 10/08/78; 4/12/78; 28/03/79; 17/09/79; 18/01/80; 5/03/80
N_9	Toyer & Main 1981	Clarence colliery; Wollangambe Creek upstream colliery storage dam spillway	-33.4552	150.2518	18/04/78; 10/08/78; 4/12/78; 28/03/79; 17/09/79; 18/01/80
RW_15	Johnson 1982	Rainwater upstream of N_15			3/07/80; 18/08/80; 1/12/80; 15/01/81
RW_20	Johnson 1982	Rainwater upstream of N_20			1/07/80; 19/08/80; 1/12/80; 15/01/81
Wolgan	Johnson 1982	Rainwater on Webb's "Wolgan" Property near N_23 and N_24			2/07/80; 20/08/80; 2/12/80;
LDP002	OEH	Clarence Colliery LDP002	-33.4601	150.2472	22/10/14; 13/11/14
WGRup*	OEH	Wollangambe River upstream dam and LDP002	-33.4537	150.2531	22/10/2014
W1*	OEH	Wollangambe River upstream dam and LDP002 and upstream WGRUp	-33.4546	150.254	22/10/2014; 13/11/14
W3	OEH	Wollangambe River 1.2km downstream of dam and LDP002	-33.4556	150.2574	21/10/2014; 13/11/14
HAWK585	OEH	Wollangambe River downstream of dam and LDP002	-33.4554	150.2531	22/10/2014; 13/11/14
Bungle1*	OEH	Upstream Bungleboori Ck Reference Site 1	-33.3972	150.2268	22/10/2014
Bungle 4*	OEH	Bungleboori Ck Reference Site 4	-33.4234	150.2528	21/10/2014
Bungle 3*	OEH	Bungleboori Ck Reference Site 3	-33.4123	150.228	23/10/2014
Dingo 1*	OEH	Dingo Creek Reference Site 1	-33.3595	150.2668	23/10/2014
Dingo 2*	OEH	Dingo Creek Reference Site 2	-33.3758	150.2734	23/10/2014
W10	OEH	Wollangambe River downstream W3 (inside National Park Boundary)	-33.4612	150.2587	13/11/2014
NP 1*	OEH Newnes Plateau	Marrangaroo Swamp S1	-33.4161	150.1938	13/02/2012

Site Code	Source	Site Description	Latitude[#]	Longitude[#]	Date Sampled
NP 10*	OEH Newnes Plateau	Wolgan River @ Spanish Stairs	-33.3181	150.1568	17/02/2012
NP 11*	OEH Newnes Plateau	Kangaroo Creek Swamp at Level Pool	-33.3663	150.1326	17/02/2012
NP 12	OEH Newnes Plateau	Kangaroo Creek Swamp Spring	-33.3663	150.1326	17/02/2012
NP 13*	OEH Newnes Plateau	Kangaroo Creek Dam	-33.3712	150.1334	17/02/2012
NP 15*	OEH Newnes Plateau	Happy Valley Swamp	-33.4348	150.2216	20/02/2012
NP 2*	OEH Newnes Plateau	Nine Mile Creek	-33.3969	150.2271	13/02/2012
NP 3*	OEH Newnes Plateau	Carne West Swamp Creek	-33.3736	150.2035	14/02/2012
NP 4*	OEH Newnes Plateau	Carne Central Swamp Creek	-33.3847	150.2178	14/02/2012
NP 5*	OEH Newnes Plateau	Gang Gang East Swamp Creek	-33.3791	150.2104	14/02/2012
NP 6*	OEH Newnes Plateau	Broad (Bensons) Swamp Creek	-33.3706	150.2272	14/02/2012
NP 6a*	OEH Newnes Plateau	Upper Dingo Creek (Henson Swamp 49)	-33.3832	150.2542	15/02/2012
NP 7*	OEH Newnes Plateau	Tributary to Bungleboori Creek	-33.3759	150.2733	15/02/2012
NP 8*	OEH Newnes Plateau	Rocky Creek	-33.3262	150.2639	15/02/2012
NP 9*	OEH Newnes Plateau	Deanes Creek	-33.2897	150.2533	16/02/2012
WGRup	MPR	Upstream Wollangambe River	-33.457	150.2483	
WGRdam	MPR	Upper end main dam Wollangambe River	-33.4576	150.2503	
WGRswamp	MPR	Wollangambe River 530m below Main Dam	-33.4575	150.255	
WGRdown	MPR	Downstream Wollangambe River around 950m below Main Dam	-33.4559	150.2572	
WGRref	MPR	Reference Tributary Site, joins Wollangambe at WGRdown	-33.4545	150.2573	
WGRXdown	MPR	Downstream Wollangambe River around 2.6km below Main Dam	-33.4664	150.261	
WGRref2	MPR	Reference Tributary Site flowing in southerly direction in adjoining sub-catchment east of WGRref tributary	-33.4524	150.2638	
W1	UWS Belmer et al 2014	Wollangambe River 200m above coal mine discharge	-33.4568	150.2495	
W2	UWS Belmer et al 2014	Wollangambe River 100m below coal mine discharge	-33.4559	150.2519	
W3	UWS Belmer et al 2014	Wollangambe River 1.2km below coal mine discharge	-33.4557	150.2576	

Site Code	Source	Site Description	Latitude[#]	Longitude[#]	Date Sampled
W4	UWS Belmer et al 2014	Wollangambe River 16.5km below coal mine discharge	-33.4892	150.3538	
HAWK585	OEH Macroinvertebrates	Wollangambe River downstream of dam and LDP002	-33.4554	150.2531	27/5/99, 5/11/99
HAWK548	OEH Macroinvertebrates	Upper Farmers Creek	-33.4653	150.2489	28/4/98, 5/11/98
23129	OEH Macroinvertebrates	Wollangambe River @ Exit	-33.4869	150.3747	15/05/2009
25046	OEH Macroinvertebrates	Sunnyside Swamp Creek	-33.3625	150.1804	1/04/2011
HAWK10	OEH Macroinvertebrates	Megalong Creek @ Narrowneck	-33.7297	150.2466	12/06/2009, 30/04/2007, 12/10/2006, 28/09/1999, 3/06/1999, 5/11/1998, 9/12/1997, 28/05/1997, 29/05/1996, 1/11/1995, 12/05/1995, 31/10/1994

*Site used to calculate 80th percentiles for 'natural streams'.
[#]Coordinates approximate for older sites.

Table A2: Water quality results and comparisons with guideline levels

Analyte	EPA Limit	ADWG	ANZECC/ ARMCANZ 2000 (95% protection)	ANZECC/ ARMCANZ 2000 (99% protection)	Newnes Plateau Headwater Streams 80th Percentile	LDP002 Clarence Median (OEH data)	Wollan-gambe River Median DS (OEH data)	Wollan-gambe River 1980s Median (Toyer & Main 1981)	Cohen (2002) Average Raw Mine Water	Practical Quantific-ation Limit OEH Study	Comment
Units	**mg/L***	**mg/L***	**mg/L***	**mg/L***	**mg/L***	**mg/L***	**mg/L***	**mg/L***	**mg/L***	**mg/L***	***unless otherwise commented**
Aluminium dissolved					0.192	0.02	0.02		0.29	0.04	
Aluminium total		*	0.055#	0.027#	0.516	0.045	0.02		0.31	0.04	*Insufficient data to set a guideline value based on health considerations. Aesthetic guideline value=0.2; Guideline value based on post-flocculation problems; < 0.1 mg/L desirable. Lower levels needed for renal dialysis. No health-based guideline value can be established currently. #For pH>6.5
Ammonia N		*	0.9#	0.32	0.02	0.035	0.02			0.01	*Insufficient data to set a guideline value based on health considerations. Aesthetic guideline value=0.5. #Value=0.013 for upland river south-east Australia
Antimony dissolved					0.0006	0.00025	0.00025			0.0005	

Analyte	EPA Limit	ADWG	ANZECC/ ARMCANZ 2000 (95% protection)	ANZECC/ ARMCANZ 2000 (99% protection)	Newnes Plateau Headwater Streams 80th Percentile	LDP002 Clarence Median (OEH data)	Wollan-gambe River Median DS (OEH data)	Wollan-gambe River 1980s Median (Toyer & Main 1981)	Cohen (2002) Average Raw Mine Water	Practical Quantific-ation Limit OEH Study	Comment
Antimony total		0.003	ID	ID	0.00102	0.00025	0.00025			0.0005	
Arsenic dissolved	0.01				0.00175	0.0005	0.0005			0.001	
Arsenic total	0.01	0.01	0.024#	0.001	0.001409	0.0005	0.0005			0.001	#Value given is for As III; 95% Value=0.013 for As IV; 99% Value=0.0008 for As IV
Barium dissolved					0.01132	0.021	0.021		0.05	0.0001	
Barium total		2			0.013	0.023	0.021		0.048	0.0001	
Beryllium dissolved					0.000151	0.0000425	0.00003		0.004	0.00005	
Beryllium total		0.06	ID	ID	0.000152	0.00009	0.00003		0.004	0.00005	
Bicarbonate Alkalinity					3	32	29	12		6	Units are mg/L CaCO3
Boron dissolved	0.1				0.05	0.05	0.05		0.01	0.1	
Boron total	0.1	4	0.370#	0.09	0.05	0.05	0.05	0.025	0.013	0.1	#Figure may not protect key test species from chronic toxicity.
Cadmium dissolved	0.001				0.000117	0.00005	0.00005		<D.L.	0.0001	
Cadmium total	0.001	0.002	0.0002	0.00006	9.28E-05	0.00005	0.00005		<D.L.	0.0001	
Calcium dissolved					0.377011	38.5	37		10.5	0.08	
Calcium total					0.3	39.5	38	2.6	9.99	0.08	

Analyte	EPA Limit	ADWG	ANZECC/ ARMCANZ 2000 (95% protection)	ANZECC/ ARMCANZ 2000 (99% protection)	Newnes Plateau Headwater Streams 80th Percentile	LDP002 Clarence Median (OEH data)	Wollan-gambe River Median DS (OEH data)	Wollan-gambe River 1980s Median (Toyer & Main 1981)	Cohen (2002) Average Raw Mine Water	Practical Quantific-ation Limit OEH Study	Comment
Carbonate Alkalinity					3	3	3			6	Units are mg/L CaCO3
Chloride	25				7.5	3.65	3.9	7.5		0.6	*Insufficient data to set a guideline value based on health considerations. Aesthetic guideline value=250
Chromium dissolved	0.01				0.000503	0.0005	0.0005		<D.L.	0.001	
Chromium total	0.01		ID#	ID	0.000576	0.0005	0.0005		<D.L.	0.001	#For Cr III; 95% Value=0.001 for Cr VI; 99% Value=0.00001 for Cr VI
Cobalt dissolved					0.00167	0.015	0.014		0.39	0.00005	
Cobalt total			ID	ID	0.00199	0.0275	0.015		0.39	0.00005	
Conductivity					34.2	330	320	50		2	Units are µS/cm
Copper dissolved	0.02		0.0014	0.001	0.0005	0.000375	0.0005		0.02	0.0002	
Copper total	0.02	2			0.0005	0.0005	0.0005		0.006	0.0002	
Fluoride	1	1.5			0.15	0.15	0.15	0.1		0.3	
Free Reactive Phosphorus					0.004	0.00275	0.004			0.003	
Hardness		*			3	145	140		72		*Not necessary. Aesthetic guideline=200. Units are mg/L CaCO3
Hydroxide Alkalinity					3	3	3			6	Units are mg/L CaCO3
Iron dissolved	0.3	*			0.99	0.015	0.015		2.24	0.03	

Analyte	EPA Limit	ADWG	ANZECC/ ARMCANZ 2000 (95% protection)	ANZECC/ ARMCANZ 2000 (99% protection)	Newnes Plateau Headwater Streams 80th Percentile	LDP002 Clarence Median (OEH data)	Wollan-gambe River Median DS (OEH data)	Wollan-gambe River 1980s Median (Toyer & Main 1981)	Cohen (2002) Average Raw Mine Water	Practical Quantific-ation Limit OEH Study	Comment
Iron total					1.878	0.62	0.07	0.25	3.08	0.03	*Insufficient data to set a guideline value based on health considerations. Aesthetic guideline value=0.3
Lead dissolved	0.005				0.000583	0.00015	0.00025		<D.L.	0.0001	
Lead total	0.005	0.01	0.0034	0.001	0.000981	0.00015	0.00025		<D.L.	0.0001	
Lithium dissolved					0.00058	0.019	0.018		0.02	0.0005	
Lithium total					0.0004995	0.0195	0.018		0.022	0.0005	
Magnesium dissolved					0.56	11.5	11		7.64	0.02	
Magnesium total					0.5	11.5	11	0.8	7.5	0.02	
Manganese dissolved	0.5				0.066385	0.21	0.24		2.36	0.001	
Manganese total			1.9	1.2	0.07575	0.36	0.26		2.35	0.001	
Mercury	0.001	0.001	0.0006#	0.00006	0.000025	0.000025	0.00003			0.00005	#For inorganic mercury
Molybdenum dissolved					0.000529	0.00025	0.00025		<D.L.	0.0005	
Molybdenum total		0.05	ID	ID	0.000969	0.00025	0.00025		<D.L.	0.0005	

Analyte	EPA Limit	ADWG	ANZECC/ ARMCANZ 2000 (95% protection)	ANZECC/ ARMCANZ 2000 (99% protection)	Newnes Plateau Headwater Streams 80th Percentile	LDP002 Clarence Median (OEH data)	Wollan-gambe River Median DS (OEH data)	Wollan-gambe River 1980s Median (Toyer & Main 1981)	Cohen (2002) Average Raw Mine Water	Practical Quantific-ation Limit OEH Study	Comment
NOx N		50*	#0.015	#	0.25	0.01	0.02	1		0.02	*Value given is for Nitrate. Nitrite guideline level=3. Nitrite is rapidly oxidised to nitrate. #Under review. Value given is for upland river south-east Australia
Nickel dissolved					0.00099	0.0425	0.041		0.89	0.0005	
Nickel total		0.02	0.011	0.008	0.00085	0.075	0.046		0.89	0.0005	
Phosphorus dissolved			0.015#		0.02	0.02	0.02		<D.L.	0.04	#For upland rivers south-east Australia - Filterable Reactive Phosphorus
Phosphorus total			0.02#		0.02	0.02	0.02		<D.L.	0.04	#For upland rivers south-east Australia
Potassium dissolved					0.3	3.75	3.6		3.45	0.2	
Potassium total					0.5	3.95	3.7	2	3.49	0.2	
Selenium dissolved	0.01				0.002	0.001	0.001			0.002	
Selenium total	0.01		0.011	0.005	0.001	0.001	0.001			0.002	ID for Selenium V
Silicon dissolved					2.81823	2.5	2.3		2.74	0.06	
Silicon total					3.21257	2.65	2.4		3.36	0.06	
Silver dissolved	0.001				0.00005	0.00005	0.00005			0.00005	

Analyte	EPA Limit	ADWG	ANZECC/ ARMCANZ 2000 (95% protection)	ANZECC/ ARMCANZ 2000 (99% protection)	Newnes Plateau Headwater Streams 80th Percentile	LDP002 Clarence Median (OEH data)	Wollan-gambe River Median DS (OEH data)	Wollan-gambe River 1980s Median (Toyer & Main 1981)	Cohen (2002) Average Raw Mine Water	Practical Quantific-ation Limit OEH Study	Comment
Silver total	0.001	0.1	0.00005	0.00002	0.00005	0.00005	0.00005			0.00005	
Sodium dissolved					4.3	3.1	3.1		3.36	0.05	
Sodium total		*			4.6	3.25	3.5	4	3.36	0.05	*Not necessary. Aesthetic guideline=180 (taste threshold)
Strontium dissolved					0.0047	0.0775	0.074		0.04	0.03	
Strontium total					0.0047	0.08	0.079		0.036	0.03	
Sulfate	250	500			2.5	125	120	4.5	91	0.7	Guideline value is taste threshold. >500 mg/L can have purgative effects. 250 mg/L is aesthetic guideline
Sulfur dissolved					0.68314	38.5	35		29	0.2	
Sulfur total					0.7	38.5	37		29.01	0.2	
TKN					0.290637	0.1	0.1			0.2	
Thallium dissolved					0.00192	0.000315	0.00024			0.0001	
Thallium total					0.002418	0.000315	0.00028			0.0001	
Tin dissolved					0.000798	0.00019	0.0001			0.0002	
Tin total		*			0.001046	0.000155	0.0001			0.0002	*Not necessary
Titanium dissolved					0.005	0.005	0.005		<D.L.	0.01	
Titanium total					0.006168	0.005	0.005		<D.L.	0.01	

Analyte	EPA Limit	ADWG	ANZECC/ ARMCANZ 2000 (95% protection)	ANZECC/ ARMCANZ 2000 (99% protection)	Newnes Plateau Headwater Streams 80th Percentile	LDP002 Clarence Median (OEH data)	Wollan-gambe River Median DS (OEH data)	Wollan-gambe River 1980s Median (Toyer & Main 1981)	Cohen (2002) Average Raw Mine Water	Practical Quantific-ation Limit OEH Study	Comment
Total Alkalinity					3	32	29			6	Units are mg/L CaCO3
Total Dissolved Solids					27	225	230		154	40	
Total Nitrogen			0.25#		0.15	0.15	0.15			0.3	#For upland rivers south-east Australia
Total Phosphorus					0.023383	0.01325	0.0075			0.015	
Total Suspended Solids	30				5	3	3			3	
Vanadium dissolved					0.000685	0.0001	0.0001		<D.L.	0.0002	
Vanadium total					0.001404	0.05005	0.1		<D.L.	0.0002	
Zinc dissolved	1.5				0.0059	0.0255	0.026		2.64	0.0001	
Zinc total	1.5	*	0.008	0.0024	0.0055	0.087	0.03		2.62	0.0001	*Insufficient data to set a guideline value based on health considerations. Aesthetic guideline value=3 (Taste problems >3 mg/L)
pH	6-8.5	*	6.5-8#		5.9	7.63	7.72	6.4	4.23		*Insufficient data to set a guideline value based on health considerations. ADWG aesthetic guideline value=6.5-8.5. #For upland rivers south-east Australia - see footnote

Analyte	EPA Limit	ADWG	ANZECC/ ARMCANZ 2000 (95% protection)	ANZECC/ ARMCANZ 2000 (99% protection)	Newnes Plateau Headwater Streams 80th Percentile	LDP002 Clarence Median (OEH data)	Wollan-gambe River Median DS (OEH data)	Wollan-gambe River 1980s Median (Toyer & Main 1981)	Cohen (2002) Average Raw Mine Water	Practical Quantific-ation Limit OEH Study	Comment
											m (ANZECC/ARMCANZ 2000). Units are pH units
Oil & Grease	10									0.3	
Chlorine			0.003	0.0004						0.1	
Cyanide			0.007	0.004						0.01	
Hydrogen sulfide			0.001	0.0005						0.01	

Where analytes were reported as being less than the detection level or practical quantification level (<D.L.) then they were assigned a value of 0.5×D.L. for graphical and statistical purposes. ID=indeterminate.

Office of Environment and Heritage

Environmental Forensics

480 Weeroona Road, LIDCOMBE, NSW, 2141

Analysis Report

Report Number : **201400349**

Report Date: **12/01/2015**

Date Received: **24/10/2014 10:30:00**

Submitter: **Martin Krogh**

Office of Environment and Heritage
PO Box A290
South Sydney NSW 1232

Sample Source: **Clarence Colliery**

Report Comments: Samples 201402201 - 201402210 were sent to Sydney Water Monitoring Services Services Laboratory (NATA Accreditation no: 63) for the analysis of TOC. Please see attached report no: 130863 dated 05 Nov 2014.

Please see the attached report no: 201400349 - Ecotox 1 dated 18 Dec 2014 for toxicity analysis on samples 201402201, 201402203, 201402204, 201402205 and 201402207.

Please see the attached report no: 201400349 - Ecotox 3 dated 19 Dec 2014 for toxicity analysis on samples 201402201, 201402203, 201402204, 201402205 and 201402207.

Lab Number: **201402201** **Client Sample ID:** **LDP002**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 09:45:00

Component	Result	Date Started	Method
Toxicity 1	RC	28/10/2014	Ecotox 1

Component	Result	Date Started	Method
Toxicity 3	RC	28/10/2014	Ecotox 3

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
(p+m) Xylene	<0.02	mg/L	27/10/2014		OMSVOC
Benzene	<0.01	mg/L	27/10/2014		OMSVOC
C6 - C9	<0.1	mg/L	27/10/2014		OMSVOC
Ethylbenzene	<0.01	mg/L	27/10/2014		OMSVOC
o-Xylene	<0.01	mg/L	27/10/2014		OMSVOC
Toluene	<0.01	mg/L	27/10/2014		OMSVOC

Component	Result	Units	Date Started	Preparation Method	Method
1,2,4,5-Tetrachlorobenzene	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
1,2,4-Trichlorobenzene	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
1,2-Dichlorobenzene	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
1,4-Dichlorobenzene	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2,3,4,6-Tetrachlorophenol	<0.0005	mg/L	27/10/2014	OEXWASTE	OMSWASTE

Lab Number: **201402201** **Client Sample ID:** **LDP002**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 09:45:00

2,4,5-Trichlorophenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2,4,6-Trichlorophenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2,4-Dichlorophenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2,4-Dimethylphenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2,4-Dinitrophenol	<0.01	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2,4-Dinitrotoluene	<0.0005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2,6-Dichlorophenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2-Chlorophenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2-Methyl-4,6-dinitrophenol	<0.002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2-Methylphenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
2-Nitrophenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
3+4-Methylphenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
4-Chloro-3-methylphenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
4-Nitrophenol	<0.002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Acenaphthene	<0.0001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Acenaphthylene	<0.0001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Aldrin	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
alpha-BHC	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
alpha-Chlordane	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Anthracene	<0.0001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Aroclor 1016 (screen)	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Aroclor 1221 (Screen)	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Aroclor 1232 (screen)	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Aroclor 1242 (screen)	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Aroclor 1248 (screen)	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Aroclor 1254 (screen)	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Aroclor 1260 (screen)	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Benzo (a) anthracene	<0.0001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Benzo (a) pyrene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Benzo (b) fluoranthene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Benzo (ghi) perylene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Benzo (k) fluoranthene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
beta-BHC	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Bis-2-ethyl hexyl adipate	<0.006	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Bis-2-ethyl hexyl phthalate	<0.003	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Chlorpyrifos	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Chrysene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
delta-BHC	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Dibenzo (ah) anthracene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Dibutyl phthalate	<0.001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Dieldrin	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Endosulfan I	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE

Lab Number: **201402201** **Client Sample ID:** **LDP002**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 09:45:00

Endosulfan II	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Endosulfan sulfate	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Endrin	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Endrin aldehyde	<0.002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Endrin ketone	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Fluoranthene	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Fluorene	<0.0001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
gamma-BHC	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
gamma-Chlordane	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Heptachlor	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Heptachlor epoxide	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Hexachlorobenzene	<0.0001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Indeno (123cd) pyrene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Isodrin	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Methoxychlor	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Naphthalene	<0.0001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Nitrobenzene	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Pentachlorobenzene	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Pentachloronitrobenzene	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Pentachlorophenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Perylene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Phenanthrene	<0.0001	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Phenol	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
pp'-DDD	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
pp'-DDE	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
pp'-DDT	<0.0002	mg/L	27/10/2014	OEXWASTE	OMSWASTE
Pyrene	<0.00005	mg/L	27/10/2014	OEXWASTE	OMSWASTE

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Aluminium (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**40**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	<0.03	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**12**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.25**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	**3.8**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.6**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**42**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**

Lab Number: **201402201** **Client Sample ID:** **LDP002**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 09:45:00

Aluminium (acid extractable)	**0.04**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**40**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.62**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**12**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.39**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**4.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**40**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**21**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**18**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	**20**	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	**49**	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**86**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	**0.33**	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**33**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**23**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	**0.1**	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**29**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	**0.5**	µg/L	24/10/2014	ITOTMET	ICPMS

Lab Number: **201402201** **Client Sample ID:** **LDP002**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 09:45:00

Lead (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	**20**	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**79**	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**89**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	**0.34**	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**87**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Ammonia - N	**0.04**	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	<0.003	mg/L	29/10/2014		IFIAFRE
NOx - N	<0.02	mg/L	29/10/2014		IFIAFRE

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
TKN	<0.2	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	**0.019**	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Hardness	**150**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Total Dissolved Solids	**230**	mg/L	27/10/2014		IGR_TDS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Total Suspended Solids	<6	mg/L	27/10/2014		IGRTSS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Chloride	**3.6**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	**130**	mg/L	07/11/2014		IICAO1

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Conductivity	**340**	µS/cm	24/10/2014		IISECON

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Bicarbonate Alkalinity	**33**	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402201** **Client Sample ID:** **LDP002**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 09:45:00

Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014	ITIALKA
Total Alkalinity	**33**	mg/L CaCO3	28/10/2014	ITIALKA

Lab Number: **201402202** **Client Sample ID:** **WGRUP**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 12:25:00

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	**0.08**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**0.28**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	**0.99**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**0.56**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.15**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	**0.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**4.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**0.6**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.21**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**0.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**2.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**0.72**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.16**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**0.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**4.8**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**0.8**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**15**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS

Lab Number: **201402202** **Client Sample ID:** **WGRUP**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 12:25:00

Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**1.4**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	**0.76**	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**4.9**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**5.9**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**16**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**1.4**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	**0.51**	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	**0.12**	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**0.85**	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**5.1**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	**0.5**	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**5.6**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.03**	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	<0.003	mg/L	29/10/2014		IFIAFRE

Lab Number: **201402202** **Client Sample ID:** **WGRUP**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 12:25:00

Component	Result	Units	Date Started	Preparation Method	Method
NOx - N	<0.02	mg/L	29/10/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	**0.2**	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	<0.015	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**3.0**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**26**	mg/L	27/10/2014		IGR_TDS

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	<3	mg/L	27/10/2014		IGRTSS

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**7.4**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	**1.6**	mg/L	07/11/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**34**	µS/cm	24/10/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Total Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402203** **Client Sample ID:** **W1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 12:00:00

Component	Result	Date Started	Method
Toxicity 1	RC	28/10/2014	Ecotox 1

Component	Result	Date Started	Method
Toxicity 3	RC	28/10/2014	Ecotox 3

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method

Lab Number: **201402203** **Client Sample ID:** **W1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 12:00:00

Aluminium (dissolved)	**0.08**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**0.24**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	**0.86**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**0.56**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.14**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	**0.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**4.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**0.6**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Aluminium (acid extractable)	**0.16**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**0.23**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**1.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**0.59**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.14**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**0.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**4.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**0.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**15**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**1.2**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	**0.64**	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**4.7**	µg/L	27/10/2014	ITOTMET	ICPMS

Lab Number: **201402203** **Client Sample ID:** **W1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 12:00:00

Thallium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**5.2**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**15**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**1.3**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**0.65**	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**4.7**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	**0.3**	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**4.9**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.02**	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	<0.003	mg/L	29/10/2014		IFIAFRE
NOx - N	**0.05**	mg/L	29/10/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	<0.2	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	**0.015**	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**2.9**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**26**	mg/L	27/10/2014		IGR_TDS

Lab Number: **201402203** **Client Sample ID:** **W1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 12:00:00

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	<3	mg/L	27/10/2014		IGRTSS

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**7.5**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	**1.7**	mg/L	07/11/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**34**	µS/cm	24/10/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Total Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402204** **Client Sample ID:** **W3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 21/10/2014 12:35:00

Component	Result	Date Started	Method
Toxicity 1	RC	28/10/2014	Ecotox 1

Component	Result	Date Started	Method
Toxicity 3	RC	28/10/2014	Ecotox 3

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**37**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	<0.03	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**11**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.22**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	**3.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.5**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**35**	mg/L	27/10/2014	ITOTMET	ICPAES

Lab Number: **201402204** **Client Sample ID:** **W3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 21/10/2014 12:35:00

Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.1**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**34**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.11**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**11**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.23**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**3.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.6**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.5**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**34**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**19**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**15**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	**0.73**	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	**17**	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	**48**	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**74**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	**0.24**	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**33**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**21**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	**0.17**	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	**0.17**	µg/L	24/10/2014	ITOTMET	ICPMS

Lab Number: **201402204** **Client Sample ID:** **W3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 21/10/2014 12:35:00

Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**17**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	**0.52**	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	**0.32**	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	**18**	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	**0.67**	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**53**	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	**0.14**	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**81**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	**0.43**	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	**0.29**	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**36**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Ammonia - N	**0.02**	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	**0.003**	mg/L	29/10/2014		IFIAFRE
NOx - N	<0.02	mg/L	29/10/2014		IFIAFRE

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
TKN	<0.2	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	<0.015	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Hardness	**140**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Total Dissolved Solids	**200**	mg/L	27/10/2014		IGR_TDS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Total Suspended Solids	<6	mg/L	27/10/2014		IGRTSS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Chloride	**4.0**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	**110**	mg/L	07/11/2014		IICAO1

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Conductivity	**310**	µS/cm	24/10/2014		IISECON

Lab Number: **201402204** **Client Sample ID:** **W3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 21/10/2014 12:35:00

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	**29**	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Total Alkalinity	**29**	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402205** **Client Sample ID:** **HAWK585**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 10:45:00

Component	Result	Date Started	Method
Toxicity 1	RC	28/10/2014	Ecotox 1

Component	Result	Date Started	Method
Toxicity 3	RC	28/10/2014	Ecotox 3

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**33**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	<0.03	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**11**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.22**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	**3.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.5**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.1**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**38**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.08**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**37**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.14**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**11**	mg/L	27/10/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.25**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES

Lab Number: **201402205** **Client Sample ID:** **HAWK585**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 10:45:00

Potassium (acid extractable)	**4.1**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**37**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**21**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**17**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	**18**	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	**48**	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**81**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	**0.28**	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**29**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**21**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**19**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	**0.1**	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	**18**	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**53**	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**83**	µg/L	24/10/2014	ITOTMET	ICPMS

Lab Number: **201402205** **Client Sample ID:** **HAWK585**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 10:45:00

Thallium (acid extractable)	**0.28**	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**40**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.02**	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	**0.004**	mg/L	29/10/2014		IFIAFRE
NOx - N	<0.02	mg/L	29/10/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	**0.3**	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	**0.3**	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	<0.015	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**130**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**200**	mg/L	27/10/2014		IGR_TDS

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	<6	mg/L	27/10/2014		IGRTSS

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**3.9**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	**110**	mg/L	07/11/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**310**	µS/cm	24/10/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	**28**	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Total Alkalinity	**28**	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402206** **Client Sample ID:** **BUNGLE 1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 16:30:00

Component	Result	Method

Lab Number: **201402206** **Client Sample ID:** **BUNGLE 1**
Sample Type: LIQUID **Sample Description:**
Date Sampled: 22/10/2014 16:30:00
TOC RC External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	**0.07**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**0.33**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	**0.42**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**0.46**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**1.9**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.9**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**0.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.14**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**0.27**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.83**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**0.5**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**1.9**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**4.0**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**0.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	**0.6**	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**8.4**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**0.94**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Manganese (dissolved)	**23**	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS

Lab Number: **201402206** **Client Sample ID:** **BUNGLE 1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 16:30:00

Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**4.3**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**2.3**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**8.8**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**1.0**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	**0.14**	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Manganese (acid extractable)	**26**	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**4.3**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	**0.27**	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**2.5**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.02**	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	**0.003**	mg/L	29/10/2014		IFIAFRE
NOx - N	**0.02**	mg/L	29/10/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	<0.2	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	<0.015	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method

Lab Number: **201402206** **Client Sample ID:** **BUNGLE 1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 22/10/2014 16:30:00

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**2.7**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION
Total Dissolved Solids	**22**	mg/L	27/10/2014		IGR_TDS
Total Suspended Solids	<3	mg/L	27/10/2014		IGRTSS
Chloride	**6.7**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	<0.70	mg/L	07/11/2014		IICAO1
Conductivity	**29**	µS/cm	24/10/2014		IISECON
Bicarbonate Alkalinity	**6.7**	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Total Alkalinity	**6.7**	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402207** **Client Sample ID:** **BUNGLE 4**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 21/10/2014 15:00:00

Component	Result	Date Started	Method
Toxicity 1	RC	28/10/2014	Ecotox 1
Toxicity 3	RC	28/10/2014	Ecotox 3

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	**0.08**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**0.13**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	**0.19**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**0.37**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES

Lab Number: **201402207** **Client Sample ID:** **BUNGLE 4**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 21/10/2014 15:00:00

Silicon (dissolved)	**2.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.6**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**0.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.16**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**0.26**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.45**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**0.41**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**0.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.5**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**0.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**5.9**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**0.75**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Manganese (dissolved)	**17**	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	**0.59**	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**2.4**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**3.1**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS

Lab Number: **201402207** **Client Sample ID:** **BUNGLE 4**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 21/10/2014 15:00:00

Barium (acid extractable)	**6.7**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**0.86**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	**0.13**	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Manganese (acid extractable)	**21**	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**0.69**	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**2.9**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	**0.24**	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**2.5**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Ammonia - N	<0.01	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	<0.003	mg/L	29/10/2014		IFIAFRE
NOx - N	<0.02	mg/L	29/10/2014		IFIAFRE

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
TKN	<0.2	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	<0.015	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Hardness	**1.9**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Total Dissolved Solids	**23**	mg/L	27/10/2014		IGR_TDS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Total Suspended Solids	<3	mg/L	27/10/2014		IGRTSS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Chloride	**5.5**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1

Lab Number: **201402207** **Client Sample ID:** **BUNGLE 4**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 21/10/2014 15:00:00

Sulfate	**1.0**	mg/L	07/11/2014		IICAO1
Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Conductivity	**25**	µS/cm	24/10/2014		IISECON
Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Bicarbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Total Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402208** **Client Sample ID:** **BUNGLE 3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 09:40:00

Component	**Result**	**Method**
TOC	RC	External Methods

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Aluminium (dissolved)	**0.11**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**0.14**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	**0.24**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**0.33**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.6**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES
Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Aluminium (acid extractable)	**0.26**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**0.11**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.66**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**0.39**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.9**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.6**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**0.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Lab Number: **201402208** **Client Sample ID:** **BUNGLE 3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 09:40:00

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**4.8**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**0.43**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Manganese (dissolved)	**8.8**	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**2.1**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**1.9**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**5.7**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**0.5**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	**0.28**	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Manganese (acid extractable)	**11**	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**2.2**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	**0.5**	µg/L	24/10/2014	ITOTMET	ICPMS

Lab Number: **201402208** **Client Sample ID:** **BUNGLE 3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 09:40:00

Component	Result	Units	Date Started	Preparation Method	Method
Zinc (acid extractable)	**2.1**	µg/L	24/10/2014	ITOTMET	ICPMS
Mercury	<0.05	µg/L	03/11/2014		ICVAASW
Ammonia - N	<0.01	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	**0.004**	mg/L	29/10/2014		IFIAFRE
NOx - N	<0.02	mg/L	29/10/2014		IFIAFRE
TKN	<0.2	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	**0.018**	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Hardness	**1.7**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION
Total Dissolved Solids	**23**	mg/L	27/10/2014		IGR_TDS
Total Suspended Solids	**4**	mg/L	27/10/2014		IGRTSS
Chloride	**5.2**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	<0.70	mg/L	07/11/2014		IICAO1
Conductivity	**22**	µS/cm	24/10/2014		IISECON
Bicarbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Total Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402209** **Client Sample ID:** **DINGO 1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 13:50:00

Component	Result	Method
TOC	RC	External Methods

Lab Number: **201402209** **Client Sample ID:** **DINGO 1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 13:50:00

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	**0.06**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**0.39**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	**0.09**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**0.42**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**4.3**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.11**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**0.14**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**0.47**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.5**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**4.7**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**6.4**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**0.75**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Manganese (dissolved)	**13**	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS

Lab Number: **201402209** **Client Sample ID:** **DINGO 1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 13:50:00

Strontium (dissolved)	**2.1**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**2.3**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**6.9**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**0.91**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	**0.11**	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Manganese (acid extractable)	**17**	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**2.0**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**2.0**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	<0.01	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	**0.004**	mg/L	29/10/2014		IFIAFRE
NOx - N	**0.03**	mg/L	29/10/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	<0.2	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	<0.015	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**2.7**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION

Lab Number: **201402209** **Client Sample ID:** **DINGO 1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 13:50:00

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**23**	mg/L	27/10/2014		IGR_TDS

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	<3	mg/L	27/10/2014		IGRTSS

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**7.3**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	<0.70	mg/L	07/11/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**29**	µS/cm	24/10/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Total Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number: **201402210** **Client Sample ID:** **DINGO 2**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 12:30:00

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	**0.07**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES
Calcium (dissolved)	**0.12**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (dissolved)	**0.18**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**0.63**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (dissolved)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (dissolved)	**6.0**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**0.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.23**	mg/L	27/10/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	27/10/2014	ITOTMET	ICPAES

Lab Number: **201402210** **Client Sample ID:** **DINGO 2**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 12:30:00

Calcium (acid extractable)	**0.48**	mg/L	27/10/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.92**	mg/L	27/10/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**0.67**	mg/L	27/10/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	27/10/2014	ITOTMET	ICPAES
Potassium (acid extractable)	<0.2	mg/L	27/10/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.4**	mg/L	27/10/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**6.1**	mg/L	27/10/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**0.2**	mg/L	27/10/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	27/10/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Barium (dissolved)	**7.6**	µg/L	27/10/2014	ITOTMET	ICPMS
Beryllium (dissolved)	**0.06**	µg/L	27/10/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	27/10/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**1.2**	µg/L	27/10/2014	ITOTMET	ICPMS
Copper (dissolved)	**2.3**	µg/L	27/10/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Lithium (dissolved)	**0.58**	µg/L	27/10/2014	ITOTMET	ICPMS
Manganese (dissolved)	**17**	µg/L	27/10/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	27/10/2014	ITOTMET	ICPMS
Nickel (dissolved)	**0.99**	µg/L	27/10/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	27/10/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Strontium (dissolved)	**2.3**	µg/L	27/10/2014	ITOTMET	ICPMS
Thallium (dissolved)	<0.1	µg/L	27/10/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	27/10/2014	ITOTMET	ICPMS
Zinc (dissolved)	**5.0**	µg/L	27/10/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Barium (acid extractable)	**8.4**	µg/L	24/10/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	**0.07**	µg/L	24/10/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	24/10/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**1.4**	µg/L	24/10/2014	ITOTMET	ICPMS
Copper (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Lead (acid extractable)	**0.17**	µg/L	24/10/2014	ITOTMET	ICPMS
Lithium (acid extractable)	**0.68**	µg/L	24/10/2014	ITOTMET	ICPMS

Lab Number: **201402210** **Client Sample ID:** **DINGO 2**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 23/10/2014 12:30:00

Manganese (acid extractable)	**19**	µg/L	24/10/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	24/10/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**0.6**	µg/L	24/10/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	24/10/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**2.6**	µg/L	24/10/2014	ITOTMET	ICPMS
Thallium (acid extractable)	<0.1	µg/L	24/10/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	24/10/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	**0.45**	µg/L	24/10/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**2.7**	µg/L	24/10/2014	ITOTMET	ICPMS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Mercury	<0.05	µg/L	03/11/2014		ICVAASW

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Ammonia - N	<0.01	mg/L	29/10/2014		IFIAFRE
Free Reactive Phosphorus	**0.003**	mg/L	29/10/2014		IFIAFRE
NOx - N	<0.02	mg/L	29/10/2014		IFIAFRE

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
TKN	<0.2	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Nitrogen	<0.3	mg/L	30/10/2014	ICFAKJD	IFIAKNP
Total Phosphorus	**0.017**	mg/L	30/10/2014	ICFAKJD	IFIAKNP

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Hardness	**2.9**	mg/L CaCO3	27/10/2014	ITOTMET	CALCULATION

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Total Dissolved Solids	**29**	mg/L	27/10/2014		IGR_TDS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Total Suspended Solids	**5**	mg/L	27/10/2014		IGRTSS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Chloride	**11**	mg/L	07/11/2014		IICAO1
Fluoride	<0.3	mg/L	07/11/2014		IICAO1
Sulfate	<0.70	mg/L	07/11/2014		IICAO1

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Conductivity	**44**	µS/cm	24/10/2014		IISECON

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Bicarbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	28/10/2014		ITIALKA

Lab Number:	**201402210**	**Client Sample ID:**	**DINGO 2**
Sample Type:	LIQUID	**Sample Description:**	
Date Sampled:	23/10/2014 12:30:00		

Total Alkalinity	<6	mg/L CaCO3	28/10/2014	ITIALKA

Released by:

Andrew Symons - Senior Scientist

Anil Gautam - Senior Scientist

Moreno Julli - Team leader Ecotoxicology

Date: 12-Jan-2015

This document has been digitally signed by the name that appears on this report. Digital signing has been carried out using private key encryption code.

Samples analysed as received and non-legal samples will be discarded one month from report date.
Soil samples are reported on a dry weight basis, except when analysed in accordance with the NSW EPA Waste Guidelines.

Codes:	NR = Not Required	IS = Insufficient Sample	NS = Not Sample	UA = Unsuitable for Analysis
	SN = Sample Note	RN = Result Note	E = Estimated Results	SC = Report Comment
	RC = Report Comment			

Office of Environment and Heritage

Environmental Forensics

480 Weeroona Road, LIDCOMBE, NSW, 2141

Analysis Report

Report Number : **201400374**

Report Date: **12/01/2015**

Date Received: **13/11/2014 08:45:00**

Submitter: **Martin Krogh**

Office of Environment and Heritage
PO Box A290
South Sydney NSW 1232

Sample Source: **Clarence Colliery 2**

Report Comments: Samples 201402355 to 201402259 were sent to Sydney Water Monitoring Services Services Laboratory (NATA Accreditation no: 63) for the analysis of TOC. Please see attached report no: 131601 dated 21 Nov 2014.

Please see the attached report no: 201400374 - Ecotox 1 dated 22 Dec 2014 for toxicity analysis on samples 201402355, 201402356, 201402358 and 201402359.

Please see the attached report no: 201400374 - Ecotox 2 dated 23 Dec 2014 for toxicity analysis on samples 201402355, 201402356, 201402358 and 201402359.

Please see the attached report no: 201400374 - Ecotox 3 dated 22 Dec 2014 for toxicity analysis on samples 201402355, 201402356, 201402358 and 201402359.

Please see the attached report no: 201400374 - Ecotox 6 dated 16 Dec 2014 for toxicity analysis on samples 201402355, 201402356, 201402358 and 201402359.

Lab Number: **201402355** **Client Sample ID:** **LDPOO2**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 10:45:00

Component	Result	Date Started	Method
Toxicity 1	RC	18/11/2014	Ecotox 1

Component	Result	Date Started	Method
Toxicity 2	RC	14/11/2014	Ecotox 2

Component	Result	Date Started	Method
Toxicity 3	RC	17/11/2014	Ecotox 3

Component	Result	Date Started	Method
Toxicity 6	RC	25/11/2014	Ecotox 6

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES

Lab Number: **201402355** **Client Sample ID:** **LDPOO2**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 10:45:00

Boron (dissolved)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (dissolved)	**37**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (dissolved)	<0.03	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**11**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.17**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (dissolved)	**3.7**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.4**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.0**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**35**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.05**	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**39**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.62**	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**11**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.33**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**3.7**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.6**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.1**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**37**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (dissolved)	**21**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (dissolved)	**0.06**	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**12**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (dissolved)	**18**	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (dissolved)	**36**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (dissolved)	**69**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (dissolved)	**0.3**	µg/L	25/11/2014	ITOTMET	ICPMS

Lab Number: **201402355** **Client Sample ID:** **LDPOO2**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 10:45:00

Tin (dissolved)	**0.28**	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (dissolved)	**18**	µg/L	25/11/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (acid extractable)	**23**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	**0.08**	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**26**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (acid extractable)	**19**	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**71**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**71**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (acid extractable)	**0.29**	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (acid extractable)	**0.21**	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**87**	µg/L	25/11/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	20/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.03**	mg/L	18/11/2014		IFIAFRE
Free Reactive Phosphorus	**0.004**	mg/L	18/11/2014		IFIAFRE
NOx - N	<0.02	mg/L	18/11/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	<0.2	mg/L	27/11/2014		IFIAKNP
Total Nitrogen	<0.3	mg/L	27/11/2014		IFIAKNP
Total Phosphorus	<0.015	mg/L	27/11/2014		IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**140**	mg/L CaCO3	25/11/2014	ITOTMET	CALCULATION

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**220**	mg/L	17/11/2014		IGR_TDS

Lab Number: **201402355** **Client Sample ID:** **LDPOO2**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 10:45:00

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	<6	mg/L	17/11/2014		IGRTSS

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**3.7**	mg/L	05/12/2014		IICAO1
Fluoride	<0.3	mg/L	05/12/2014		IICAO1
Sulfate	**120**	mg/L	05/12/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**320**	µS/cm	14/11/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	**31**	mg/L CaCO3	14/11/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Total Alkalinity	**31**	mg/L CaCO3	14/11/2014		ITIALKA

Lab Number: **201402356** **Client Sample ID:** **HAWK585**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 10:15:00

Component	Result	Date Started	Method
Toxicity 1	RC	18/11/2014	Ecotox 1

Component	Result	Date Started	Method
Toxicity 2	RC	14/11/2014	Ecotox 2

Component	Result	Date Started	Method
Toxicity 3	RC	17/11/2014	Ecotox 3

Component	Result	Date Started	Method
Toxicity 6	RC	25/11/2014	Ecotox 6

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (dissolved)	**39**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (dissolved)	<0.03	mg/L	25/11/2014	ITOTMET	ICPAES

Lab Number: **201402356** **Client Sample ID:** **HAWK585**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 10:15:00

Magnesium (dissolved)	**12**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.3**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (dissolved)	**3.8**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.3**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.3**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**37**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**38**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.07**	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**11**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.31**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**3.7**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.3**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.2**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**37**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (dissolved)	**22**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**14**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (dissolved)	**19**	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (dissolved)	**41**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (dissolved)	**74**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (dissolved)	**0.3**	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (dissolved)	**26**	µg/L	25/11/2014	ITOTMET	ICPMS

Lab Number: **201402356** **Client Sample ID:** **HAWK585**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 10:15:00

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (acid extractable)	**24**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**15**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (acid extractable)	**19**	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**46**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**79**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (acid extractable)	**0.29**	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**30**	µg/L	25/11/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	20/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.02**	mg/L	18/11/2014		IFIAFRE
Free Reactive Phosphorus	**0.004**	mg/L	18/11/2014		IFIAFRE
NOx - N	**0.02**	mg/L	18/11/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	<0.2	mg/L	27/11/2014		IFIAKNP
Total Nitrogen	<0.3	mg/L	27/11/2014		IFIAKNP
Total Phosphorus	<0.015	mg/L	27/11/2014		IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**140**	mg/L CaCO3	25/11/2014	ITOTMET	CALCULATION

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**230**	mg/L	17/11/2014		IGR_TDS

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	<6	mg/L	17/11/2014		IGRTSS

Lab Number: **201402356** **Client Sample ID:** **HAWK585**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 10:15:00

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**3.9**	mg/L	05/12/2014		IICAO1
Fluoride	<0.3	mg/L	05/12/2014		IICAO1
Sulfate	**120**	mg/L	05/12/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**320**	µS/cm	14/11/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	**31**	mg/L CaCO3	14/11/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Total Alkalinity	**31**	mg/L CaCO3	14/11/2014		ITIALKA

Lab Number: **201402357** **Client Sample ID:** **W3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 12:45:00

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (dissolved)	**35**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (dissolved)	<0.03	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**11**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.24**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (dissolved)	**3.5**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.1**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.0**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**33**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**38**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.05**	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**11**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.27**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES

Lab Number: **201402357** **Client Sample ID:** **W3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 12:45:00

Potassium (acid extractable)	**4.0**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.4**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.5**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**39**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (dissolved)	**20**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**11**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (dissolved)	**18**	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (dissolved)	**36**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (dissolved)	**65**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (dissolved)	**0.23**	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (dissolved)	**19**	µg/L	25/11/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (acid extractable)	**22**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**12**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (acid extractable)	**18**	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**43**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**70**	µg/L	25/11/2014	ITOTMET	ICPMS

Lab Number: **201402357** **Client Sample ID:** **W3**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 12:45:00

Thallium (acid extractable)	**0.23**	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**27**	µg/L	25/11/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	20/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.01**	mg/L	18/11/2014		IFIAFRE
Free Reactive Phosphorus	**0.004**	mg/L	18/11/2014		IFIAFRE
NOx - N	**0.02**	mg/L	18/11/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	<0.2	mg/L	27/11/2014		IFIAKNP
Total Nitrogen	<0.3	mg/L	27/11/2014		IFIAKNP
Total Phosphorus	<0.015	mg/L	27/11/2014		IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**130**	mg/L CaCO3	25/11/2014	ITOTMET	CALCULATION

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**230**	mg/L	17/11/2014		IGR_TDS

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	<6	mg/L	17/11/2014		IGRTSS

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**3.9**	mg/L	05/12/2014		IICAO1
Fluoride	<0.3	mg/L	05/12/2014		IICAO1
Sulfate	**120**	mg/L	05/12/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**320**	µS/cm	14/11/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	**31**	mg/L CaCO3	14/11/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Total Alkalinity	**31**	mg/L CaCO3	14/11/2014		ITIALKA

Lab Number: **201402358** **Client Sample ID:** **W10**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 13:45:00

Component	Result	Date Started	Method

Lab Number: **201402358** **Client Sample ID:** **W10**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 13:45:00

Toxicity 1	RC	18/11/2014	Ecotox 1

Component	Result	Date Started	Method
Toxicity 2	RC	14/11/2014	Ecotox 2

Component	Result	Date Started	Method
Toxicity 3	RC	17/11/2014	Ecotox 3

Component	Result	Date Started	Method
Toxicity 6	RC	25/11/2014	Ecotox 6

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (dissolved)	**37**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (dissolved)	<0.03	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**11**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.24**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (dissolved)	**3.6**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.3**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.1**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**35**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**39**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (acid extractable)	**0.04**	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**11**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.26**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**3.7**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.3**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**3.2**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**38**	mg/L	25/11/2014	ITOTMET	ICPAES

Lab Number: **201402358** **Client Sample ID:** **W10**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 13:45:00

Titanium (acid extractable)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (dissolved)	**22**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**10**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (dissolved)	**20**	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (dissolved)	**37**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (dissolved)	**78**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (dissolved)	**0.24**	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (dissolved)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (dissolved)	**19**	µg/L	25/11/2014	ITOTMET	ICPMS

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (acid extractable)	**21**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**11**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (acid extractable)	**19**	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**41**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**73**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (acid extractable)	**0.24**	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (acid extractable)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**25**	µg/L	25/11/2014	ITOTMET	ICPMS

Lab Number: **201402358** **Client Sample ID:** **W10**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 13:45:00

Component	Result	Units	Date Started	Preparation Method	Method
Mercury	<0.05	µg/L	20/11/2014		ICVAASW

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.01**	mg/L	18/11/2014		IFIAFRE
Free Reactive Phosphorus	**0.004**	mg/L	18/11/2014		IFIAFRE
NOx - N	**0.02**	mg/L	18/11/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	<0.2	mg/L	27/11/2014		IFIAKNP
Total Nitrogen	<0.3	mg/L	27/11/2014		IFIAKNP
Total Phosphorus	<0.015	mg/L	27/11/2014		IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**140**	mg/L CaCO3	25/11/2014	ITOTMET	CALCULATION

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**230**	mg/L	17/11/2014		IGR_TDS

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	<6	mg/L	17/11/2014		IGRTSS

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**3.9**	mg/L	05/12/2014		IICAO1
Fluoride	<0.3	mg/L	05/12/2014		IICAO1
Sulfate	**120**	mg/L	05/12/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**320**	µS/cm	14/11/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	**29**	mg/L CaCO3	14/11/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Total Alkalinity	**29**	mg/L CaCO3	14/11/2014		ITIALKA

Lab Number: **201402359** **Client Sample ID:** **W1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 11:20:00

Component	Result	Date Started	Method
Toxicity 1	RC	18/11/2014	Ecotox 1

Component	Result	Date Started	Method

Lab Number: **201402359** **Client Sample ID:** **W1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 11:20:00

Toxicity 2	RC	14/11/2014	Ecotox 2

Component	Result	Date Started	Method
Toxicity 3	RC	17/11/2014	Ecotox 3

Component	Result	Date Started	Method
Toxicity 6	RC	25/11/2014	Ecotox 6

Component	Result	Method
TOC	RC	External Methods

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (dissolved)	**0.06**	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (dissolved)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (dissolved)	**0.48**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (dissolved)	**1.4**	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (dissolved)	**0.57**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (dissolved)	**0.25**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (dissolved)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (dissolved)	**0.2**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (dissolved)	**2.0**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (dissolved)	**3.9**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (dissolved)	**0.5**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (dissolved)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Aluminium (acid extractable)	**0.14**	mg/L	25/11/2014	ITOTMET	ICPAES
Boron (acid extractable)	<0.1	mg/L	25/11/2014	ITOTMET	ICPAES
Calcium (acid extractable)	**0.44**	mg/L	25/11/2014	ITOTMET	ICPAES
Iron (acid extractable)	**2.5**	mg/L	25/11/2014	ITOTMET	ICPAES
Magnesium (acid extractable)	**0.61**	mg/L	25/11/2014	ITOTMET	ICPAES
Manganese (acid extractable)	**0.27**	mg/L	25/11/2014	ITOTMET	ICPAES
Phosphorus (acid extractable)	<0.04	mg/L	25/11/2014	ITOTMET	ICPAES
Potassium (acid extractable)	**0.2**	mg/L	25/11/2014	ITOTMET	ICPAES
Silicon (acid extractable)	**2.2**	mg/L	25/11/2014	ITOTMET	ICPAES
Sodium (acid extractable)	**4.3**	mg/L	25/11/2014	ITOTMET	ICPAES
Sulfur (acid extractable)	**0.5**	mg/L	25/11/2014	ITOTMET	ICPAES
Titanium (acid extractable)	<0.01	mg/L	25/11/2014	ITOTMET	ICPAES

Component	Result	Units	Date Started	Preparation Method	Method
Antimony (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS

Lab Number: **201402359** **Client Sample ID:** **W1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 11:20:00

Arsenic (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (dissolved)	**12**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (dissolved)	<0.05	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (dissolved)	**1.6**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (dissolved)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (dissolved)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (dissolved)	**1.5**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (dissolved)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (dissolved)	**6.2**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (dissolved)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (dissolved)	<0.2	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (dissolved)	**0.22**	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (dissolved)	**5.6**	µg/L	25/11/2014	ITOTMET	ICPMS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Antimony (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Arsenic (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Barium (acid extractable)	**13**	µg/L	25/11/2014	ITOTMET	ICPMS
Beryllium (acid extractable)	<0.05	µg/L	25/11/2014	ITOTMET	ICPMS
Cadmium (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Chromium (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Cobalt (acid extractable)	**1.6**	µg/L	25/11/2014	ITOTMET	ICPMS
Copper (acid extractable)	<1.0	µg/L	25/11/2014	ITOTMET	ICPMS
Lead (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Lithium (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Molybdenum (acid extractable)	<0.5	µg/L	25/11/2014	ITOTMET	ICPMS
Nickel (acid extractable)	**0.87**	µg/L	25/11/2014	ITOTMET	ICPMS
Selenium (acid extractable)	<2.0	µg/L	25/11/2014	ITOTMET	ICPMS
Silver (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Strontium (acid extractable)	**6.0**	µg/L	25/11/2014	ITOTMET	ICPMS
Thallium (acid extractable)	<0.1	µg/L	25/11/2014	ITOTMET	ICPMS
Tin (acid extractable)	**0.39**	µg/L	25/11/2014	ITOTMET	ICPMS
Vanadium (acid extractable)	**0.36**	µg/L	25/11/2014	ITOTMET	ICPMS
Zinc (acid extractable)	**5.5**	µg/L	25/11/2014	ITOTMET	ICPMS

Component	**Result**	**Units**	**Date Started**	**Preparation Method**	**Method**
Mercury	<0.05	µg/L	20/11/2014		ICVAASW

Lab Number: **201402359** **Client Sample ID:** **W1**

Sample Type: LIQUID **Sample Description:**

Date Sampled: 13/11/2014 11:20:00

Component	Result	Units	Date Started	Preparation Method	Method
Ammonia - N	**0.02**	mg/L	18/11/2014		IFIAFRE
Free Reactive Phosphorus	<0.003	mg/L	18/11/2014		IFIAFRE
NOx - N	<0.02	mg/L	18/11/2014		IFIAFRE

Component	Result	Units	Date Started	Preparation Method	Method
TKN	<0.2	mg/L	27/11/2014		IFIAKNP
Total Nitrogen	<0.3	mg/L	27/11/2014		IFIAKNP
Total Phosphorus	<0.015	mg/L	27/11/2014		IFIAKNP

Component	Result	Units	Date Started	Preparation Method	Method
Hardness	**3.6**	mg/L CaCO3	25/11/2014	ITOTMET	CALCULATION

Component	Result	Units	Date Started	Preparation Method	Method
Total Dissolved Solids	**27**	mg/L	17/11/2014		IGR_TDS

Component	Result	Units	Date Started	Preparation Method	Method
Total Suspended Solids	**5**	mg/L	17/11/2014		IGRTSS

Component	Result	Units	Date Started	Preparation Method	Method
Chloride	**7.1**	mg/L	05/12/2014		IICAO1
Fluoride	<0.3	mg/L	05/12/2014		IICAO1
Sulfate	**1.1**	mg/L	05/12/2014		IICAO1

Component	Result	Units	Date Started	Preparation Method	Method
Conductivity	**32**	µS/cm	14/11/2014		IISECON

Component	Result	Units	Date Started	Preparation Method	Method
Bicarbonate Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Carbonate Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Hydroxide Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA
Total Alkalinity	<6	mg/L CaCO3	14/11/2014		ITIALKA

Released by:

Anil Gautam - Senior Scientist

Moreno Julli - Team leader Ecotoxicology

Date: 12-Jan-2015

This document has been digitally signed by the name that appears on this report. Digital signing has been carried out using private key encryption code.

This Report shall not be reproduced except in full.
Samples analysed as received and non-legal samples will be discarded one month from report date.
Soil samples are reported on a dry weight basis, except when analysed in accordance with the NSW EPA Waste Guidelines.

Codes:	NR = Not Required	IS = Insufficient Sample	NS = Not Sample	UA = Unsuitable for Analysis
	SN = Sample Note	RN = Result Note	E = Estimated Results	SC = Report Comment
	RC = Report Comment			

Analytical Report 130863

Sydney WATER
Monitoring Services

Delivery Address: Sydney Water Corporation
51 Hermitage Rd
West Ryde NSW 2114

Analysis contact: **Tel** : (02) 9800 6827
Fax : (02) 9800 6741

Issue Date: 5/11/2014

Issued By : Anita Picton
Customer Services Officer

Attention: Jo Blackman
Customer: Office of Environment & Heritage, Department of Premier and Cabinet
Customer ID: ZOEH

Address: PO BOX 29
LIDCOMBE NSW 2141
Telephone: 9995 5163
Email: jo.blackman@environment.nsw.gov.au

CONTENTS

Sydney Water Approved Signatory

Anabel Jader, Clean & Waste Water Laboratory Supervisor

NATA
WORLD RECOGNISED ACCREDITATION

Accreditation No.: 63 Chemical testing

Accredited for compliance with ISO/IEC 17025

Sydney WATER
Monitoring Services

SAMPLE SUMMARY

Client Sample ID	Sample Number	Sampling Procedure	Date Sampled	Date Received	Date Authorised	Description
201402201	L14079873	1	22/10/2014	30/10/2014	04/11/2014	
201402202	L14079874	1	22/10/2014	30/10/2014	04/11/2014	
201402203	L14079875	1	22/10/2014	30/10/2014	04/11/2014	
201402204	L14079877	1	21/10/2014	30/10/2014	04/11/2014	
201402205	L14079878	1	22/10/2014	30/10/2014	04/11/2014	
201402206	L14079879	1	22/10/2014	30/10/2014	04/11/2014	
201402207	L14079880	1	23/10/2014	30/10/2014	04/11/2014	
201402208	L14079881	1	23/10/2014	30/10/2014	04/11/2014	
201402209	L14079882	1	23/10/2014	30/10/2014	04/11/2014	
201402210	L14079883	1	23/10/2014	30/10/2014	04/11/2014	

Sampling procedures

1 Samples analysed as received.
2 Samples collected as per FSG procedures SAWI 076 / 079 / 070, Excluding Oil & Grease which is collected as per clients instructions.
3 Samples collected as per FSG procedures SAWI 076 / 079 / 070.

Sydney WATER Monitoring Services

ANALYTICAL RESULTS

Client Sample ID		201402201	201402202	201402203	201402204	201402205	201402206	201402207	201402208
Sampled Date		22/10/2014 09:45:00 AM	22/10/2014 12:25:00 PM	22/10/2014 12:00:00 PM	21/10/2014 12:35:00 PM	22/10/2014 10:45:00 AM	22/10/2014 04:30:00 PM	23/10/2014 03:00:00 PM	23/10/2014 09:40:00 AM
Sample Number		L14079873	L14079874	L14079875	L14079877	L14079878	L14079879	L14079880	L14079881
CHEMISTRY									
WC97 : APHA 5310B									
TOC	mg/L	0.8	2.1	4.3	0.7	0.6	2.1	2.0	2.5
Date of Performance	DD/MM/YYYY	31/10/2014	31/10/2014	31/10/2014	31/10/2014	31/10/2014	31/10/2014	31/10/2014	31/10/2014

Client Sample ID		201402209	201402210
Sampled Date		23/10/2014 01:50:00 PM	23/10/2014 12:30:00 PM
Sample Number		L14079882	L14079883
CHEMISTRY			
WC97 : APHA 5310B			
TOC	mg/L	2.8	1.7
Date of Performance	DD/MM/YYYY	31/10/2014	31/10/2014

COMMENTS

Sydney WATER
Monitoring Services

LABORATORY QC RESULTS

N/A - Not Applicable
PQL - Practical Quantitation Limit
LOQ - Limit of Quantification
RPD - Relative Percent Difference
SPIKE/Positive Control - Addition of a known amount and concentration

LOQ	Blank	Control *Acceptance Criteria*	Spike *Acceptance Criteria*	Duplicate1	Duplicate2	RPD *Acceptance Criteria*
WC97	**TOC**					
<0.2 mg/L	**<0.2**	**4.8** *4.5 - 5.5 mg/L*	**98.0 % Recovery** *80 - 120 % Recovery*	**1.7**	**1.7**	**B** *0 - 10 %*

Extra Note:
B: Duplicate RPD reject criteria is not applicable, results are <10 times LOQ

Analytical Report 131601

Sydney WATER
Monitoring Services

Delivery Address: Sydney Water Corporation
51 Hermitage Rd
West Ryde NSW 2114

Analysis contact: **Tel** : (02) 9800 6827
Fax : (02) 9800 6741

Issue Date: 21/11/2014

Issued By : Anita Picton
Customer Services Officer

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Sydney WATER
Monitoring Services

SAMPLE SUMMARY

Client Sample ID	Sample Number	Sampling Procedure	Date Sampled	Date Received	Date Authorised	Description
201402355	L14084404	1	13/11/2014	18/11/2014	20/11/2014	
201402356	L14084405	1	13/11/2014	18/11/2014	20/11/2014	
201402357	L14084406	1	13/11/2014	18/11/2014	20/11/2014	
201402358	L14084407	1	13/11/2014	18/11/2014	20/11/2014	
201402359	L14084408	1	13/11/2014	18/11/2014	20/11/2014	

Sampling procedures

1 Samples analysed as received.
2 Samples collected as per FSG procedures SAWI 076 / 079 / 070, Excluding Oil & Grease which is collected as per clients instructions.
3 Samples collected as per FSG procedures SAWI 076 / 079 / 070.

Sydney WATER Monitoring Services

ANALYTICAL RESULTS

Client Sample ID		201402355	201402356	201402357	201402358	201402359			
Sampled Date		13/11/2014 10:45:00 AM	13/11/2014 10:15:00 AM	13/11/2014 12:45:00 PM	13/11/2014 01:45:00 PM	13/11/2014 11:20:00 AM			
Sample Number		L14084404	L14084405	L14084406	L14084407	L14084408			
CHEMISTRY									
WC97 : APHA 5310B									
TOC	mg/L	0.6	0.5	0.5	0.5	2.5			
Date of Performance	DD/MM/YYYY	18/11/2014	18/11/2014	18/11/2014	18/11/2014	18/11/2014			

COMMENTS

Sydney WATER
Monitoring Services

LABORATORY QC RESULTS

N/A - Not Applicable
PQL - Practical Quantitation Limit
LOQ - Limit of Quantification
RPD - Relative Percent Difference
SPIKE/Positive Control - Addition of a known amount and concentration

LOQ	Blank	Control *Acceptance Criteria*	Spike *Acceptance Criteria*	Duplicate1	Duplicate2	RPD *Acceptance Criteria*
WC97	**TOC**					
<0.2 mg/L	**<0.2**	**4.7** *4.5 - 5.5 mg/L*	**111.0 % Recovery** *80 - 120 % Recovery*	**4.0**	**3.9**	**2.53 %** *0 - 10 %*

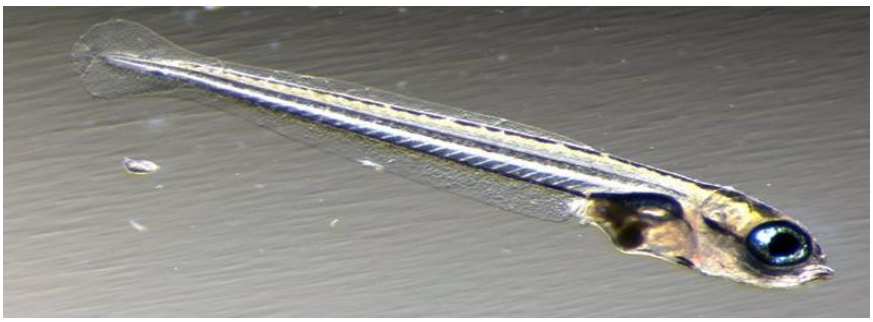
Extra Note:

Report on the Acute Toxicity of Samples from Clarence Colliery to Larvae of the Rainbowfish, *Melanotaenia duboulayi* (Castelnau,1878)

Office of Environment and Heritage
Ecotoxicology Team, Environmental Forensics, Environment Protection Science
480 Weeroona Road, Lidcombe NSW 2141

Date of Issue of Report: **19 December 2014**

Test Outline



The test was conducted to assess the potentially harmful effects of the samples to larvae of the native freshwater fish species *Melanotaenia duboulayi*. In this test the loss of balance (imbalance) is used as the endpoint as opposed to mortality, i.e. where possible, fish are removed from the test solution once they lose the ability to remain normally positioned.

Following exposure for **72** hours to various concentrations of the samples, the number of *M. duboulayi* affected was counted. This data is statistically analysed to determine sample concentrations causing a significant adverse effect to *M. duboulayi* relative to a control group

If more than 50% of exposed animals are imbalanced in any of the tested sample concentrations, a **72**-hour EC50 (imbalance) value is calculated, which is the Effective Concentration of the sample which causes imbalance in 50% of exposed *M. duboulayi.*

The lower the concentration causing a significant adverse effect, or the lower the EC50 value, the greater the observed toxicity.

Results Summary

Sample 201402201 did not cause imbalance in exposed *M. duboulayi* at the highest tested concentration of **100**%.

Sample 201402203 caused statistically significant imbalance in exposed *M. duboulayi* at a concentration of **100**% sample.

Sample 201402204 did not cause imbalance in exposed *M. duboulayi* at the highest tested concentration of **100**%.

Sample 201402205 caused minimal (statistically non-significant), imbalance in exposed *M. duboulayi* at the highest tested concentration of **100**%.

Sample 201402207 caused minimal (statistically non-significant), imbalance in exposed *M. duboulayi* at the highest tested concentration of **100**%.

Sample Information

EF Submission Number	EF Sample Number
201400349	201402201
	201402203
	201402204
	201402205
	201402207

Laboratory Accreditation does not extend to sample collection

Test Methods and Conditions

Test Commencement Date**: 28 October 2014**
Test Method Protocol No **ECOTOX 3.** The test method is based on procedures published by the USEPA (2002), Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition. EPA-821-R-02-012. It differs from this guideline in that Australian fish species are used, and animals are cultured and bred in the OEH laboratory.
The current animal research authority is (OEH AEC approval number 110620/02)
Deviations from Protocol**: None**
Test Type**:** Fish, **Acute, Static 48-h Renewal** Duration of test**: 72** hours
Test Species***: Melanotaenia duboulayi*** Age: **4 days** Source: **Tank B2**
Test Location:Room No.F.27 Test Room No.: F.29
Test Vessel Type : **100 mL beaker** Test Volume: **50 mL** Test Temperature: **25 ^{o}C**
Test Photoperiod: **16 h L: 8 h D** Light intensity at surface of Test Vessels**: <800 Lux**
Dilution Water Source:

a. Filtered thiosulphate-treated Sydney mains water with 5% mineral water and conductivity adjusted to 500µS/cm with filtered seawater

b. Filtered thiosulphate-treated Sydney mains water with 5% mineral water

Conductivity: **a. 500 µS/cm b. 220 µS/cm** pH: **a. 8.0 b. 8.0**
Hardness: **a. 87 mg/L as $CaCO_3$** Alkalinity: **a. 50 mg/L as $CaCO_3$**
b. 65 mg/L as $CaCO_3$ **b. 50 mg/L as $CaCO_3$**

Test Design

Concentrations tested:

Control - conductivity (diluent ~500 µS/cm)
Control - conductivity (diluent ~200 µS/cm)
Samples: 201402201: 50 and 100%
201402203: 12.5, 25, 50 and 100%
201402203: 100% (conductivity adjusted to ~200 µS/cm)
201402204: 100%
201402205: 12.5, 25, 50 and 100%
201402207: 12.5, 25, 50 and 100%
201402207:100% [conductivity adjusted to ~200 µS/cm)

Test Concentrations: **Nominal**
Number of replicate test vessels per concentration and control/s**: 4**
Number of animals per replicate: **5**

Statistical Methods

Data Transformation for Lowest Observed Effect Concentration (LOEC):**Angular (uncorrected)**
Statistical Analysis Method: **Steel Many-One Rank test, Cochran-Armitage Trend Step-Down Test, Fisher exact Test or Equal variance t Two-sample Test for LOEC**

Results

Table 1. Imbalance of *Melanotaenia duboulayi* in test solutions

EF Sample Number	Nominal Test Concentration (% sample)	Percentage of animals imbalanced after 24 hours exposure	Percentage of animals imbalanced after 48 hours exposure	Percentage of animals imbalanced after 72 hours exposure	Percent Minimum Significant Difference # (PMSD)
Control	~500 µS/cm	0	0	0	
Control	~50 µS/cm	0	0	0	
201402201	50	0	0	10	9
	100	0	0	0	
201402203	12.5	0	7	13	8
	25	0	0	0	
	50	0	0	5	
	100	5	5	30*	
201402203 Conductivity Adjusted	100	10	10	20*	8
201402204	100	0	5	5	-
201402205	12.5	0	0	0	6
	25	0	0	0	
	50	0	0	0	
	100	0	5	10	
201402207	12.5	0	0	5	19
	25	5	5	10	
	50	0	0	0	
	100	0	5	15	
201402207 Conductivity Adjusted	100	0	0	15	5

*Significantly different from the control ($p \leq 0.05$). 72-hour data only analysed.

PMSD is an estimation of the smallest percentage increase in imbalance (relative to the control), that could be determined as statistically significant for this test. PMSD is based on parametric test calculations and PMSD for non-parametric analyses (as used for some tests here) may differ from indicated values.

A test validity criterion of Control group survival (greater than 90%) was met.

Table 2 Lowest Observed Effect Concentrations and No Observed Effect Concentrations

Sample Number	% sample	
	LOEC	NOEC
201402201	-	100
201402203 Unadjusted	100	50
201402203adjusted	100	50
201402204	-	100
201402205	-	100
201402207 Unadjusted	-	100
201402207adjusted	-	100

"-" = Not applicable

Table 2. Physico-chemical Variables in Test Solutions

Test Conc. % mg/L	Temperature (^{0}C)			pH			Conductivity (µS/cm)			Dissolved oxygen (% saturation)		
	0 h	48h old	48h new	0 h	48h old	48h new	0 h	48h old	48h new	0 h	48h old	48h new
Control												
Con ~ 500	**24.3**	**24.9**	**24.2**	**7.6**	**7.6**	**7.6**	**500**	**520**	**510**	**99**	**100**	**100**
Control												
Con ~200	**24.0**	**24.7**	**24.1**	**7.7**	**7.8**	**7.7**	**220**	**220**	**220**	**95**	**99**	**99**
Sample 201402201												
50	**24.3**	**24.6**	**24.1**	**7.7**	**7.6**	**7.6**	**280**	**280**	**280**	**100**	**99**	**99**
100	**24.0**	**24.4**	**24.0**	**7.7**	**7.7**	**7.6**	**340**	**350**	**340**	**105**	***98***	**103**
Sample 201402203												
12.5	**24.2**	**24.4**	**24.1**	**7.8**	**7.9**	**7.8**	**190**	**190**	**191**	**100**	**98**	**101**
25	**24.2**	**24.2**	**24.3**	**7.7**	**7.9**	**7.8**	**160**	**170**	**170**	**99**	**98**	**100**
50	**24.1**	**24.2**	**24.3**	**7.6**	**7.9**	**7.8**	**120**	**130**	**120**	**99**	**98**	**101**
100	**24.2**	**24.2**	**24.1**	**6.3**	**7.0**	**6.5**	**40**	**40**	**30**	**106**	**98**	**104**
Sample 201402203 Adjusted												
100	**24.1**	**24.2**	**24.1**	**6.1**	**6.8**	**6.3**	**200**	**200**	**200**	**103**	**98**	**103**
Sample 201302204												
100	**24.2**	**24.4**	**24.6**	**7.5**	**7.5**	**7.6**	**310**	**320**	**310**	**102**	**99**	**110**
Sample 201302205												
12.5	**24.0**	**24.4**	**24.5**	**7.6**	**7.7**	**7.8**	**220**	**230**	**220**	**97**	**98**	**102**
25	**24.2**	**24.3**	**24.5**	**7.7**	**7.8**	**7.8**	**230**	**240**	**240**	**99**	**98**	**101**
50	**24.2**	**24.2**	**24.4**	**7.6**	**7.8**	**7.7**	**260**	**270**	**270**	**101**	**98**	**102**
100	**24.2**	**24.2**	**24.5**	**7.6**	**7.7**	**7.7**	**310**	**320**	**310**	**107**	**98**	**107**
Sample 201302207												
12.5	**24.2**	**24.4**	**24.7**	**7.7**	**7.9**	**7.8**	**180**	**190**	**190**	**96**	**99**	**100**
25	**24.1**	**24.4**	**24.0**	**7.7**	**7.9**	**7.8**	**160**	**170**	**160**	**97**	**99**	**99**
50	**24.2**	**24.3**	**24.0**	**7.7**	**7.9**	**7.7**	**120**	**120**	**120**	**98**	**99**	**100**
100	**24.3**	**24.3**	**24.0**	**6.9**	**7.1**	**7.0**	**30**	**30**	**30**	**103**	**99**	**102**
Sample 201402207 Adjusted												
100	**24.1**	**24.1**	**24.3**	**6.6**	**6.6**	**6.8**	**200**	**200**	**210**	**100**	**100**	**103**

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This report is issued with the approval of

M Julli

Team Leader Ecotoxicology

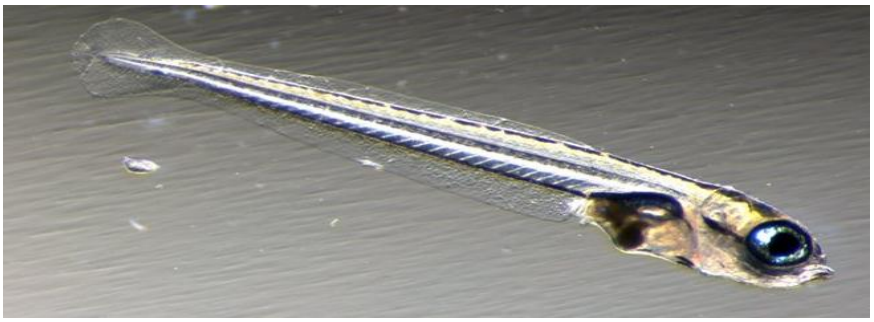
19 December 2014

Report on the Acute Toxicity of Samples from Clarence Colliery to Larvae of the Rainbowfish, *Melanotaenia duboulayi* (Castelnau,1878)

Office of Environment and Heritage
Ecotoxicology Team, Environmental Forensics, Environment Protection Science
480 Weeroona Road, Lidcombe NSW 2141

Date of Issue of Report: **22 December 2104**

Test Outline



The test was conducted to assess the potentially harmful effects of the samples to larvae of the native freshwater fish species *Melanotaenia duboulayi*. In this test the loss of balance (imbalance) is used as the endpoint as opposed to mortality, i.e. where possible, fish are removed from the test solution once they lose the ability to remain normally positioned.

Following exposure for 72 hours to various concentrations of the samples, the number of *M. duboulayi* affected was counted. This data is statistically analysed to determine sample concentrations causing a significant adverse effect to *M. duboulayi* relative to a control group

If more than 50% of exposed animals are imbalanced in any of the tested sample concentrations, a 72-hour EC50 (imbalance) value is calculated, which is the Effective Concentration of the sample which causes imbalance in 50% of exposed *M. duboulayi.*

The lower the concentration causing a significant adverse effect, or the lower the EC50 value, the greater the observed toxicity.

Results Summary

Samples 201402355, 201402356, 201402358 and 201402359 had minimal observable effect on *M. duboulayi*, in that imbalance in exposed *M. duboulayi* was not statistically different to that occurring in the Control group.

Sample Information

EF Submission Number	EF Sample Number
201400374	201402355
	201402356
	201402358
	201402359

Laboratory Accreditation does not extend to sample collection

Test Methods and Conditions

Test Commencement Date**: 17 November 2014**
Test Method Protocol No **ECOTOX 3.** The test method is based on procedures published by the USEPA (2002), Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition. EPA-821-R-02-012. It differs from this guideline in that Australian fish species are used, and animals are cultured and bred in the OEH laboratory.
The current animal research authority is (OEH AEC approval number 110620/02)
Deviations from Protocol**: None**
Test Type**:** Fish, **Acute, Static, 48-h renewal** Duration of test**: 72** hours
Test Species***: Melanotaenia duboulayi*** Age: **Three weeks** Source: Tank **B 2**
Test Location:**Room No F.27** Test Room No.: **F29**
Test Vessel Type : **100 mL beaker** Test Volume: **50 mL**
Test Temperature: **25 ^{o}C**
Test Photoperiod: **16 h L: 8 h D** Light intensity at surface of Test Vessels**: <800 Lux**
Dilution Water Source:

a. Filtered thiosulphate-treated Sydney mains water with 5% mineral water and conductivity adjusted to 500µS/cm with filtered seawater

b. Filtered thiosulphate-treated Sydney mains water with 5% mineral water

Conductivity: **a**. **530 µS/cm** pH: **a. and b**. **7.5**
b. 232 µS/cm
Hardness: **a. 78 mg/L as $CaCO_3$** Alkalinity: **50 mg/L as $CaCO_3$**
b. 65 mg/L as $CaCO_3$ **50 mg/L as $CaCO_3$**

Test Design

Concentrations tested: **Samples 201402355 and 20142356: 5, 12.5, 25, 100%**
Sample 201402358: 12.5, 25, 100%
Sample 201402359: 25, 100%
Sample 201402359[cond. adjusted ~200µS/cm]: 25, 100%
Test Concentrations: **Nominal**
Number of replicate test vessels per concentration and control/s**: 4**
Number of animals per replicate: **5**
Statistical Methods
Data Transformation for Lowest Observed Effect Concentration (LOEC): **Angular(uncorrected)**
Statistical Analysis Method: **Steel Many-One Rank or Dunnett's Test for LOEC**

Results

Table 1. Imbalance of *Melanotaenia duboulayi* in test solutions

EF Sample Number	Nominal Test concentration (% sample)	Percentage of animals imbalanced after 24 hours exposure	Percentage of animals imbalanced after 48 hours exposure	Percentage of animals imbalanced after 72 hours exposure	Percent Minimum Significant Difference # (PMSD)
Control	**~500µS/cm**	**0**	**10**	**10**	
Control	**~200µS/cm**	**0**	**0**	**15**	
201402355	**5**	**0**	**0**	**15**	**25**
	12.5	**0**	**0**	**15**	
	25	**0**	**0**	**10**	
	100	**0**	**0**	**0**	
201402356	**5**	**0**	**5**	**15**	**34**
	12.5	**0**	**10**	**20**	
	25	**5**	**15**	**15**	
	100	**5**	**10**	**15**	
201402358	**12.5**	**0**	**10**	**20**	**40**
	25	**0**	**0**	**10**	
	100	**0**	**15**	**20**	
201402359	**25**	**0**	**5**	**25**	**30**
	100	**5**	**10**	**20**	
201402359 Adjusted	**25**	**0**	**5**	**20**	**33**
	100	**5**	**5**	**10**	

*Significantly different from the control ($p \leq 0.05$). 72-h data only analysed.

PMSD is an estimation of the smallest percentage increase in imbalance (relative to the control), that could be determined as statistically significant for this test. PMSD is based on parametric test calculations and PMSD for non-parametric analyses (as used here) may differ slightly from indicated values.

A test validity criterion of Control group survival (greater than 90%) was met.

Table 2. Physico-chemical Variables in Test Solutions

Test Conc. (%)	Temperature (^{0}C)				pH				Conductivity (µS/cm)				Dissolved Oxygen (% saturation)			
	0 h	48h old	48h new	96h	0 h	48h old	48h new	96h	0 h	48h old	48h new	96h	0 h	48h old	48h new	96h
Control (Conductivity ~500µS/cm)																
Diluent	**24.0**	**24.8**	**24.3**	**24.4**	**7.5**	**7.6**	**7.5**	**7.5**	**530**	**560**	**500**	**520**	**96**	**100**	**102**	**99**
Control (Conductivity ~200µS/cm)																
Diluent	**24.2**	**25.0**	**24.3**	**24.4**	**7.5**	**7.7**	**7.6**	**7.6**	**230**	**250**	**210**	**230**	**92**	**99**	**101**	**99**
Sample 201402355																
5	**24.0**	**25.0**	**24.3**	**24.2**	**7.5**	**7.8**	**7.6**	**7.7**	**240**	**250**	**210**	**230**	**92**	**100**	**101**	**98**
12.5	**24.3**	**24.9**	**24.2**	**24.0**	**7.5**	**7.8**	**7.6**	**7.7**	**240**	**250**	**220**	**230**	**92**	**100**	**101**	**98**
25	**24.0**	**24.8**	**24.2**	**24.0**	**7.5**	**7.9**	**7.7**	**7.7**	**250**	**260**	**240**	**270**	**93**	**100**	**101**	**95**
100	**24.0**	**24.8**	**24.2**	**24.1**	**7.6**	**7.8**	**7.7**	**7.7**	**320**	**330**	**330**	**340**	**104**	**99**	**104**	**96**
Sample 201402356																
5	**24.2**	**24.9**	**24.3**	**24.0**	**7.5**	**7.9**	**7.8**	**8.0**	**250**	**240**	**210**	**220**	**94**	**99**	**101**	**97**
12.5	**24.0**	**24.9**	**24.2**	**24.0**	**7.5**	**7.9**	**7.8**	**7.8**	**240**	**250**	**220**	**230**	**93**	**99**	**101**	**97**
25	**24.1**	**24.8**	**24.3**	**24.0**	**7.5**	**7.9**	**7.8**	**7.8**	**230**	**260**	**240**	**250**	**93**	**100**	**101**	**97**
100	**24.1**	**24.8**	**24.4**	**24.0**	**7.6**	**7.9**	**7.7**	**7.8**	**320**	**330**	**320**	**340**	**101**	**100**	**103**	**96**
Sample 201402358																
12.5	**24.2**	**24.8**	**24.2**	**24.3**	**7.7**	**8.0**	**7.9**	**7.8**	**250**	**250**	**220**	**230**	**98**	**100**	**101**	**99**
25	**24.3**	**24.8**	**24.2**	**24.1**	**7.6**	**8.0**	**7.9**	**7.8**	**260**	**260**	**240**	**250**	**97**	**100**	**101**	**98**
100	**24.2**	**24.8**	**24.3**	**24.1**	**7.6**	**7.9**	**7.8**	**7.7**	**320**	**320**	**320**	**330**	**101**	**100**	**102**	**99**
Sample 201402359																
25	**24.2**	**24.9**	**24.4**	**24.1**	**7.6**	**8.0**	**7.8**	**7.8**	**190**	**190**	**160**	**170**	**101**	**100**	**101**	**99**
100	**24.8**	**24.9**	**24.4**	**24.1**	**7.3**	**8.2**	**7.2**	**7.8**	**35**	**39**	**34**	**41**	**100**	**100**	**102**	**98**
Sample 201402359 Conductivity adjusted																
25	**24.9**	**24.8**	**24.5**	**24.1**	**7.3**	**7.9**	**7.3**	**7.7**	**210**	**230**	**200**	**220**	**100**	**100**	**101**	**98**
100	**24.6**	**24.8**	**24.6**	**24.1**	**7.1**	**8.0**	**6.9**	**7.4**	**200**	**210**	**200**	**220**	**102**	**100**	**102**	**98**

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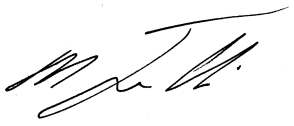

M Julli

Team Leader Ecotoxicology

22 December 2014

Accredited for compliance with ISO/IEC 17025

Accreditation No. 3040

Report on the Acute Toxicity of Clarence Colliery Samples to the Cladoceran, *Ceriodaphnia dubia* Richard 1894

Office of Environment and Heritage
Ecotoxicology Team, Environmental Forensics, Environment Protection Science
480 Weeroona Road, Lidcombe NSW 2141

Date of Issue of Report: **18 December 2014**

Test Outline

The test was conducted to assess the potentially harmful effects of the samples to juveniles of the freshwater crustacean zooplankton species *Ceriodaphnia dubia*.

Following exposure for 48 hours to various concentrations of the samples, the number of *C. dubia* immobilised was counted. In this test immobilisation is considered similar to lethality.

Immobilisation data is statistically analysed to determine sample concentrations causing a significant adverse effect to *C. dubia* relative to a control group of animals.

If more than 50% of exposed animals are immobilised in any of the tested sample concentrations, a 48-hour EC50 (immobilisation) value is calculated, which is the Effective Concentration of the sample which causes immobilisation in 50% of exposed *C. dubia*.

The lower the concentration causing a significant adverse effect, or the lower the EC50 value, the greater the observed toxicity.

Results Summary

Sample 201402201 caused significant immobilisation in exposed *C. dubia* at a concentration of **50**%, the lowest concentration tested. The sample would need to be diluted greater than two times to avoid these acute toxic effects on *C. dubia* (based on the tested concentrations). The 48-hour EC50 (immobilisation) concentration was calculated to be **71**% sample.

Sample 201402203 caused significant immobilisation in exposed *C. dubia* at a concentration of **100**%. The sample would need to be diluted approximately two times to avoid these acute toxic effects on *C. dubia* (based on the tested concentrations). The 48-hour EC50 (immobilisation) concentration was calculated to be **90**% sample. **Sample 201402203** following conductivity adjustment to 200µS/cm, had minimal observable effect on *C. dubia*, in that immobilisation in exposed *C. dubia* was not statistically different to that occurring in the conductivity control group.

Sample 201402204 caused significant immobilisation in exposed *C. dubia* at a concentration of **100**%, the only concentration tested.

Sample 201402205 caused significant immobilisation in exposed *C. dubia* at a concentration of **25**%. The sample would need to be diluted approximately 8 times to avoid these acute toxic effects on *C. dubia* (based on the tested concentrations). The 48-hour EC50 (immobilisation) concentration was calculated to be **27**% sample.

Sample 201402207 caused significant immobilisation in exposed *C. dubia* at a concentration of **100**%. The sample would need to be diluted approximately two times to avoid these acute toxic effects on *C. dubia* (based on the tested concentrations). The 48-hour EC50 (immobilisation) concentration was calculated to be **80**% sample. **Sample 201402207** following conductivity adjustment to 200µS/cm, had minimal observable effect on *C. dubia*, in that immobilisation in exposed *C. dubia* was not statistically different to that occurring in the conductivity control group.

Sample Information

EF Submission Number	EF Sample Number
201400349	**201402201**
	201402203
	201402204
	201402205
	201402207

Laboratory Accreditation does not extend to sample collection

Test Methods and Conditions

Test Commencement Date**: 28 October 2014**
Test Method Protocol No.: Test Method Protocol No.: **ECOTOX 1.** The test method is based on procedures published by the USEPA (2002), Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition. EPA-821-R-02-012. It differs from this guideline in that an Australian cladoceran species is used.
Deviations from Protocol**: None**
Test Type**:** Cladoceran, **Acute, Static** Duration of test**: 48** Hours
Test Species***: Ceriodaphnia dubia*** Age:**<24 hours** Source: **In-house Culture**
Location: **F.27** Constant Temperature Room No.: **F.29**
Test Vessel Type : **100 mL beaker** Test Volume: **50 mL**
Test Temperature: **25 ^{o}C**
Test Photoperiod: **16 h L: 8 h D** Light intensity at surface of Test Vessels**: <800 Lux**
Dilution Water Source:

a. Filtered thiosulphate-treated Sydney mains water with 5% mineral water and conductivity adjusted to 500µS/cm with filtered seawater
b. Filtered thiosulphate-treated Sydney mains water with 5% mineral water

Conductivity: **a. 504 µS/cm b. 230 µS/cm** pH: **a. 7.8 b. 7.9**

Hardness: **a. 87 mg/L as $CaCO_3$** Alkalinity: **a: 50 mg/L as $CaCO_3$**
b. 65 mg/L as $CaCO_3$ **b. 50 mg/L as $CaCO_3$**

Test Design

Concentrations tested: **Control (Diluent water)**
Conductivity adjusted control (dilution water without seawater)
Samples 201402201: 50 and 100%
201402203: 12.5, 25, 50 and 100% [plus 100% conductivity adjusted (~200 µS/cm)
201402204: 100%
201402205: 12.5, 25, 50 and 100%
201402207: 12.5, 25, 50 and 100% [plus 100% conductivity adjusted (~200 µS/cm)
Test Concentrations: **Nominal**
Number of replicate test vessels per concentration and control/s**: 4**
Number of animals per replicate: **5**
Statistical Methods
Data Transformation for Lowest Observed Effect Concentration (LOEC): **Angular uncorrected and untransformed for Fisher exact test**
Statistical Analysis Method: **Trimmed Spearman Kärber or Linear regression for EC50 Dunnett Multiple Comparison, Wilcoxin Rank Sum Two Sample t test, Equal Variance T Two Sample test or Steel Many-One Rank Test for LOEC**

Results

Table 1. Immobilisation of *Ceriodaphnia dubia* in test solutions

EF Sample Number	Nominal Test Concentration (% sample)	Percentage of animals immobilised after 24 hours exposure	Percentage of animals immobilised after 48 hours exposure	Percent Minimum Significant Difference # (PMSD)
Control(Diluent)	~500µS/cm	0	0	
Conductivity control	~200µS/cm	5	5	
201402201	50	5	35*	21
	100	0	70*	
201402203	12.5	0	0	6
	25	0	0	
	50	0	0	
	100	5	60*	
	100 (conductivity adjusted to 200µS/cm)	5	5	13
201402204	100	5	90*	16
201402205	12.5	0	0	26
	25	0	50*	
	50	15	90*	
	100	0	70*	
201402207	12.5	0	0	-
	25	0	0	
	50	0	0	
	100	10	75*	
	100 (conductivity adjusted to 200µS/cm)	0	5	

*Significantly different from the conductivity control ($p \leq 0.05$). 48-h data only analysed.

PMSD is an estimation of the smallest percentage increase in immobilisation (relative to the control), that could be determined as statistically significant for this test. PMSD is based on parametric test calculations and PMSD for non-parametric analyses (as used here) may differ slightly from indicated values.

A test validity criterion of Control group survival (greater than 90%) was met.

Sample 201402201
The lowest tested sample concentration (50%) caused 35% of exposed animals to be immobilised
The 48-Hour EC50 (Immobilisation) for sample 201402201 was 71% % (95% CL = 54 - 93%).

Sample 201402203
The Lowest Observed effect concentration (LOEC) of sample 201402203 was 100 % solution.
The No Observed Effect Concentration (NOEC) was 50%.
48-Hour EC50 (Immobilisation) for sample 201402120 was 90% (95% CL = 72 - 100%).
When 100 % solution was tested with the conductivity adjusted to 200µS/cm, there was no significant immobilisation in exposed animals.

Sample 201402204
Significant immobilisation occurred in exposed *C. dubia* at 100% solution (the lowest tested concentration).

Sample 201402205
The Lowest Observed effect concentration (LOEC) of sample 201402205 was 25 % solution.
The No Observed Effect Concentration (NOEC) was 12.5%.
48-Hour EC50 (Immobilisation) for sample 201402120 was 27% (95% CL = 20 - 37%).

Sample 201402207
The Lowest Observed effect concentration (LOEC) of sample 201402207 was 100 % solution.
The No Observed Effect Concentration (NOEC) was 50%.
48-Hour EC50 (Immobilisation) for sample 201402120 was 80% (95% CL = 70 - 90%).
When 100 % solution was tested with the conductivity adjusted to 200µS/cm, there was no significant immobilisation in exposed animals.

Table 2. Physico-chemical Variables in Test Solutions

Laboratory Accreditation does not extend to measurements of pH, conductivity or dissolved oxygen.

Test Conc.	Temperature (^{0}C)		pH		Conductivity (µS/cm)		Dissolved Oxygen (% saturation)	
	0 h	48 h	0 h	48 h	0 h	48 h	0 h	48 h
Control								
0	25.1	24.8	7.9	7.9	520	530	100	101
Conductivity control								
0	24.9	24.6	7.9	8.0	240	250	99	99
201402201								
50	25.0	24.3	7.9	8.0	290	300	106	100
100	25.1	24.3	7.8	7.9	340	350	107	99
201402203								
12.5	24.6	24.1	7.9	8.1	210	220	102	99
25	24.0	24.2	7.9	8.1	180	190	99	99
50	24.0	24.1	7.8	8.0	140	140	99	98
100	24.0	24.0	6.7	7.1	40	50	100	98
100 *	24.0	24.0	6.3	7.1	210	210	102	96
201402204								
100	24.1	24.3	7.5	7.6	310	320	104	97
201402205								
12.5	24.4	24.1	7.9	8.0	250	260	101	97
25	24.1	24.0	7.9	8.0	260	260	100	97
50	24.1	24.0	7.9	8.0	280	280	100	97
100	24.1	24.0	7.8	7.9	310	320	103	97
201402207								
12.5	24.3	24.1	7.9	8.0	210	220	100	98
25	24.1	24.1	7.9	8.0	180	190	100	98
50	24.0	24.0	7.8	8.0	130	140	100	97
100	24.2	24.0	6.8	8.2	30	30	105	97
100*	24.0	24.0	6.5	7.8	200	200	101	97

*Conductivity adjusted

Reference toxicant test No. 328

A reference toxicity test using Cr (VI) run in parallel with the above test resulted in 48-h EC50 (immobilisation) value of **300** µg/L (270 µg/L lower and 330 µg/L upper 95% CL). This value is within the 95% confidence limits of previous reference toxicity test results conducted at this laboratory, and indicates that the test animals used in the current tests were of typical sensitivity. The current percentage coefficient of variation of the reference toxicity data is **2.7**%.

This report is issued with the approval of

M Julli

Team Leader Ecotoxicology

18 December 2014

Accredited for compliance with ISO/IEC 17025

Accreditation No. 3040

Report on the Acute Toxicity of Samples from Clarence Colliery to the Cladoceran, *Ceriodaphnia dubia* Richard 1894

Office of Environment and Heritage
Ecotoxicology Team, Environmental Forensics, Environment Protection Science
480 Weeroona Road, Lidcombe NSW 2141

Date of Issue of Report: **22 December 2014**

Test Outline

The test was conducted to assess the potentially harmful effects of the samples to juveniles of the freshwater crustacean zooplankton species *Ceriodaphnia dubia*.

Following exposure for 48 hours to various concentrations of the samples, the number of *C. dubia* immobilised was counted. In this test immobilisation is considered similar to lethality.

Immobilisation data is statistically analysed to determine sample concentrations causing a significant adverse effect to *C. dubia* relative to a control group of animals.

If more than 50% of exposed animals are immobilised in any of the tested sample concentrations, a 48-hour EC50 (immobilisation) value is calculated, which is the Effective Concentration of the sample which causes immobilisation in 50% of exposed *C. dubia*.

The lower the concentration causing a significant adverse effect, or the lower the EC50 value, the greater the observed toxicity.

Results Summary

Sample 201402355 caused significant immobilisation in exposed *C. dubia* at a concentration of **25**%. The 48-hour EC50 (immobilisation) concentration was calculated to be **90**% sample.

Sample 201402356 caused significant immobilisation in exposed *C. dubia* at a concentration of **100**%. The sample would need to be diluted approximately 4 times to avoid these acute toxic effects on *C. dubia* (based on the tested concentrations). As immobilisation was below 50% in the highest tested sample concentration of 100%, an EC50 (immobilisation) value was not calculable.

Sample 201402358 caused significant immobilisation in exposed *C. dubia* at a concentration of **100**%. The sample would need to be diluted approximately 4 times to avoid these acute toxic effects on *C. dubia* (based on the tested concentrations). As immobilisation was below 50% in the highest tested sample concentration of 100%, an EC50 (immobilisation) value was not calculable.

Sample 201402359 caused significant immobilisation in exposed *C. dubia* at a concentration

of **100**%. The sample would need to be diluted approximately 4 times to avoid these acute toxic effects on *C. dubia* (based on the tested concentrations). The 48-hour EC50 (immobilisation) concentration was calculated to be **100**% sample.

Sample Information

EF Submission Number	EF Sample Number
201400374	**201402355**
	201402356
	201402358
	201402359

Laboratory Accreditation does not extend to sample collection

Test Methods and Conditions

Test Commencement Date**: 18 November 2014**
Test Method Protocol No.: Test Method Protocol No.: **ECOTOX 1.** The test method is based on procedures published by the USEPA (2002), Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition. EPA-821-R-02-012. It differs from this guideline in that an Australian cladoceran species is used.
Deviations from Protocol**: None**
Test Type**:** Cladoceran, **Acute, Static** Duration of test**: 48** Hours
Test Species***: Ceriodaphnia dubia*** Age:**<24 hours** Source: **In-house Culture**
Location: **Room No F 27** Constant Temperature Room No.: **F 29**
Test Vessel Type : **100 mL beaker** Test Volume: **50 mL**
Test Temperature: **25 ^{o}C**
Test Photoperiod: **16 h L: 8 h D** Light intensity at surface of Test Vessels**: <8000 Lux**
Dilution Water Source: **Filtered thiosulphate-treated Sydney mains water with 5% mineral water and conductivity adjusted to 500µS/cm with filtered seawater**
Conductivity: **500 µS/cm** pH: **7.9**
Hardness: **87 mg/L as $CaCO_3$** Alkalinity: **50 mg/L as $CaCO_3$**

Test Design

Concentrations tested: **Samples 201402355 and 201402356 : 12.5, 25 and 100%**
Sample 201402358: 12.5, 25 and 100
Sample 201402359: 25 and 100%
Test Concentrations: **Nominal**
Number of replicate test vessels per concentration and control/s**: 4**
Number of animals per replicate: **5**
Statistical Methods
Data Transformation for Lowest Observed Effect Concentration (LOEC): **Angular uncorrected**
Statistical Analysis Method: **Probit or Spearman-Kärber for EC50**
Cochran-Armitage Trend Step-down Test, Steel Many-One Rank test, or Dunnett Multiple Comparison Test for LOEC

Results

Table 1. Immobilisation of *Ceriodaphnia dubia* in test solutions

EF Sample Number	Nominal Test Concentration (% sample)	Percentage of animals immobilised after 24 hours exposure	Percentage of animals immobilised after 48 hours exposure	Percent Minimum Significant Difference # (PMSD)
Control	**500 µS/cm**	**0**	**0**	
Control	**500 µS/cm**	**0**	**0**	
201402355	**5**	**0**	**0**	**N/C**
	12.5	**0**	**0**	
	25	**0**	**10***	
	100	**0**	**55***	
201402356	**5**	**0**	**0**	**8**
	12.5	**5**	**5**	
	25	**0**	**0**	
	100	**0**	**45***	
201402358	**12.5**	**0**	**0**	**N/C**
	25	**0**	**0**	
	100	**0**	**15***	
201402359	**25**	**5**	**5**	**10**
	100	**0**	**50***	
201402359 Adjusted conductivity	**25**	**5**	**5**	**10**
	100	**5**	**10**	

*Significantly different from the control ($p \leq 0.05$). 48-h data only analysed.
N/C – not calculable

PMSD is an estimation of the smallest percentage increase in immobilisation (relative to the control), that could be determined as statistically significant for this test. PMSD is based on parametric test calculations and PMSD for non-parametric analyses (as used here) differs slightly from indicated values.

A test validity criterion of Control group survival (greater than 90%) was met.

Sample 201402355
The Lowest Observed effect concentration (LOEC) of 201402355 was 25% sample.
The No Observed Effect Concentration (NOEC) was 12.5% sample.
48-Hour EC50 (Immobilisation) for 201402355 was 90% sample (95%CL=60-100%).

Sample 201402356
The Lowest Observed effect concentration (LOEC) of 201402356 was 100 % sample.
The No Observed Effect Concentration (NOEC) was 25%.
48-Hour EC50 (Immobilisation) for sample 201402355 was not calculable as the immobilisation was less than 50% in 100% sample.

Sample 201402358
The Lowest Observed effect concentration (LOEC) of 201402358 was 100% sample.
The No Observed Effect Concentration (NOEC) was 25% sample.
48-Hour EC50 (Immobilisation) for sample 201402356 was not calculable as the immobilisation was less than 50% in 100% sample.

Sample 201402359
The Lowest Observed effect concentration (LOEC) of 201402359 was 100 % sample.
The No Observed Effect Concentration (NOEC) was 25 % sample.
48-Hour EC50 (Immobilisation) for sample 201402359 was 100%.

Table 2. Physico-chemical characteristics of test solutions

Laboratory Accreditation does not extend to measurements of pH, conductivity or dissolved oxygen.

Test Conc.	Temperature (^{0}C)		pH		Conductivity (µS/cm)		Dissolved Oxygen (% saturation)	
	0 h	48 h	0 h	48 h	0 h	48 h	0 h	48 h
Control (conductivity 500 µS/cm)								
Diluent	24.3	25.0	7.9	7.8	500	500	99	100
Control (conductivity 200 µS/cm)								
Diluent	24.2	24.8	7.9	7.9	250	220	99	99
Sample 201402355								
5	24.0	24.7	8.1	7.7	250	210	99	100
12.5	24.2	24.5	8.0	7.8	250	220	100	100
25	24.0	24.6	8.0	7.8	260	240	102	99
100	24.0	24.6	7.9	7.8	320	330	111	99
Sample 201402356								
5	24.4	24.5	8.0	7.9	240	210	105	99
12.5	24.3	24.5	8.1	7.9	250	220	103	99
25	24.2	24.5	8.0	7.9	260	240	103	99
100	24.4	24.5	7.9	8.0	320	320	111	99
Sample 201402358								
12.5	24.4	24.6	8.0	7.8	250	240	105	98
25	24.4	24.6	8.0	7.9	260	320	104	99
100	25.0	24.6	7.9	7.8	320	350	106	98
Sample 201402359								
25	24.1	24.6	7.2	8.0	190	160	108	99
100	24.4	24.6	7.1	8.0	34	38	106	99
Sample 201402359 adjusted conductivity								
25	24.1	24.6	7.4	7.8	230	200	102	99
100	24.2	24.6	6.2	7.7	200	200	108	98

Reference toxicant test No. 329

A reference toxicity test using Cr (VI) run in parallel with the above test resulted in 48-h EC50 (immobilisation) value of **320** µg/L (280 µg/L lower and 360 µg/L upper 95% CL). This value is within the 95% confidence limits of previous reference toxicity test results conducted at this laboratory, and indicates that the test animals used in the current tests were of typical sensitivity. The current percentage coefficient of variation of the reference toxicity data is **2.7**%

This report is issued with the approval of

M Julli

Team Leader Ecotoxicology

22 December 2014

Report on the Chronic Toxicity of the Samples from Clarence Colliery-2 to the Cladoceran *Ceriodaphnia dubia*

Office of Environment and Heritage
Ecotoxicology Team, Environmental Forensics, Environmental Protection Science
480 Weeroona Road, Lidcombe NSW 2141

Date of Issue of Report: **23 December 2014**

Test Outline

The test was conducted to assess the sub-lethal toxicity of the samples to the freshwater cladoceran zooplankton species *Ceriodaphnia dubia*.

The chronic reproduction impairment test subjects cladocerans less than 24 hours old, to a range of sample concentrations over the period of production of 3 broods. The end points of this test are parental mortality and young production. Following exposure for 7 days to various concentrations of the sample, the number of young produced by each parental *C. dubia* is assessed. Parental mortality and young production are statistically analyzed to determine sample concentrations causing a significant effect relative to a control group of animals.

The lower the value of inhibition concentration causing a significant effect, the greater the observed toxicity.

Results Summary

Sample 201402355 caused significant reproduction impairment in exposed *C. dubia* at a concentration of **12.5**%. The sample would need to be diluted approximately 20 times to avoid these sub lethal toxic effects on *C. dubia* (based on the tested concentrations).

The 7-day IC25(reproductive impairment) was calculated to be 4.5% sample and IC50% (reproductive impairment) was calculated to be 34% sample.

Sample 201402356 caused significant reproduction impairment in exposed *C. dubia* at a concentration of **100**%. A lack of dose response was evident in the lower test concentrations.

The 7-day IC25(reproductive impairment) was calculated to be 4.0% sample and IC50% (reproductive impairment) was calculated to be 38% sample.

Sample 201402358 caused significant reproduction impairment in exposed *C. dubia* at a concentration of **12.5**% (the lowest tested concentration).

The 7-day IC25(reproductive impairment) was calculated to be 5.0% sample and IC50% (reproductive impairment) was calculated to be 65% sample.

Sample 201402359 caused significant reproduction impairment in exposed *C. dubia* at a concentration of **100**%. The sample would need to be diluted approximately 4 times to avoid these sub lethal toxic effects on *C. dubia* (based on the tested concentrations).

The-7 day IC25(reproductive impairment) was calculated to be 36% sample and IC50% (reproductive impairment) was calculated to be 50% sample.

When the conductivity of this sample was increased to 230µS/cm, no impairment in reproduction or other toxic effects were evident in exposed animals.

Sample Information

EF Submission Number	EF Sample Number
201400374	201402355
	201402356
	201402358
	201402359

Test Methods and Conditions

Date of Test Commencement**: 14 November 2014**
Test Method Protocol No.: **Ecotox 2**
Deviations From Protocol**: None**
Test Method**: Cladoceran Reproduction Impairment Test**
Test Type: **Static Renewal**
Renewal periods**: 48 hours**
Duration of test**: 7 days**
Test Species***: Ceriodaphnia dubia***
Age at test start: **<24 hours** Source: **Lab culture**
Location Test Room No**. F. 27** Chamber No. **F. 29**
Test Vessel Type: **100 ml Glass beaker** Test Volume: **50 mL**
Test Temperature: **25 ^{o}C** Test Photoperiod: **16: 8 L: D**
Light intensity at surface of Test Vessels: **<800 Lux**
Dilution Water Source**:**
a. Filtered Sydney mains+$Na_2S_2O_3$ + 5% mineral water+ Sea Water
b. Filtered Sydney mains+$Na_2S_2O_3$ + 5% mineral water
Conductivity: **a. 510-530 µS/cm** pH: **a 7.8**
b. 240-260µS/cm **b. 7.9**
Hardness**: a. 87 mg/L as $CaCO_3$** Alkalinity: **a.50 mg /L as $CaCO_3$**
b. 77 mg/L as $CaCO_3$ **b. 32 mg /L as $CaCO_3$**

Test Design

Concentrations tested:
Control (Diluent water)
Conductivity adjusted control (dilution water without sea water)
Samples 201402355, 201402356: 5, 12.5, 25 and 100%
201402358: 12.5, 25 and 100%
201402359: unadjusted and conductivity adjusted (~225 µS/cm)]:25 and 100%
Test Concentrations:**Nominal**
Number of replicate test vessels per concentration and control/s**: 10**
Number of animals per replicate: **1**
Statistical Methods
Linear Interpolation (bootstrap) for point estimates (IC_{25} and IC_{50})
Data transformation for LOEC: Log(Y+Z)
LOEC: Dunnett Multiple Comparison Test or Bonferroni Adjusted t Test or
Wilcoxon Rank sum Two-Sample Test

Results of the 7-day Cladoceran Reproduction Impairment Test.

Table 1. Young production and parental survival in the 7-day *C. dubia* reproduction test

Sample Number	Test Endpoints	% Sample Concentration					PMSD #
		0	5	12.5	25	100	
Control	Mean No. of Young / surviving adult (SE)	20.2 (1.2)					
	Parental Mortalities	0					
Conductivity control	Mean No. of Young / surviving adult (SE)	18.3 (1.5)					
	Parental Mortalities	1					
201402355	Mean No. of Young / surviving adult (SE)		13.5 (2.0)	9.7* (1.7)	11.5* (1.4)	3.8* (1.1)	39
	Parental Mortalities		4	8*	4	10*	
201402356	Mean No. of Young / surviving adult (SE)		13.2 (1.9)	10.3* (1.7)	14.2 (1.3)	5.5* (1.4)	38
	Parental Mortalities		0	0	0	6*	
201402358	Mean No. of Young / surviving adult (SE)			11.8* (2.0	11.2* (1.4)	8.2* (1.6)	28
	Parental Mortalities			0	0	1	
201402359	Mean No. of Young / surviving adult (SE)				18.9 (1.9)	0*	27
	Parental Mortalities				0	10*	
201402359 Adjusted	Mean No. of Young / surviving adult (SE)				18.9 (0.8)	15.0 (1.2)	23
	Parental Mortalities				0	0	

*Significantly Different to Control ($p<0.05$)

The test validity criteria were met: (a) the control group produced >16 young per adult on average after three broods; (b) parental mortalities were <20% in control treatments.

PMSD (Percent Minimum Significant Difference) is an estimation of the smallest % decrease in reproduction from the control that could be determined as statistically significant for this test.

Table 2. Estimated NOEC, LOEC, IC_{25} and IC_{50} Values for Reproductive Impairment of *C.dubia*

Sample Number	No Observed Effect Concentration **NOEC** (% Sample)	Lowest Observed Effect Concentration **LOEC** (% Sample)	Inhibition Concentrations of sample calculated to cause a 25% or 50% reduction in reproduction in *C.dubia* (95% confidence intervals)	
			IC_{25}	IC_{50}
201402355	**5**	**12.5**	**4.5 (1.8-11)**	**34 (11-49)**
201402356	**25***	**100**	**4.1 (1.9-32)**	**48 (28-81)**
201402358	**<12.5**	**12.5 (lowest concentration tested)**	**5.2 (2.5-23)**	**65 (11-100)**
201402359	**25**	**100**	**36**	**50**
201402359 (Conductivity Adjusted)	**100**	**NA**	**NA**	**NA**

*Note significant effect at 12.5% sample NA: Not Applicable

Table 3. Physico-Chemical Variables in Test Solutions

Nominal Test Conc. (% dilution)	pH		Temperature (^{o}C)		Conductivity (µS/cm)		Dissolved Oxygen (%Saturation)	
	Fresh (0 hrs)	72/48 h old	Fresh (0 hrs)	72/48 h old	Fresh (0 hrs)	72/48 h old	Fresh (0 hrs)	72/48 h old
Control								
Diluent	**7.8**	**7.8**	**24.0**	**24.5**	**510**	**550**	**100**	**98**
	7.8	**7.9**	**25.0**	**24.7**	**520**	**530**	**99**	**100**
	7.9	**7.9**	**24.4**	**24.9**	**520**	**530**	**100**	**99**
Conductivity Control								
Diluent	**7.9**	**7.8**	**24.1**	**24.5**	**240**	**250**	**100**	**98**
	7.9	**8.0**	**25.0**	**24.5**	**240**	**260**	**98**	**99**
	8.0	**8.0**	**24.4**	**24.8**	**250**	**270**	**100**	**99**
Sample 201402355								
5	**7.8**	**8.0**	**24.1**	**24.3**	**270**	**280**	**99**	**98**
	7.8	**8.1**	**24.6**	**24.5**	**280**	**260**	**100**	**100**
	8.1	**8.0**	**24.5**	**24.6**	**250**	**250**	**100**	**99**
12.5	**7.9**	**8.0**	**24.3**	**24.3**	**250**	**260**	**99**	**98**
	7.9	**8.1**	**24.7**	**24.5**	**250**	**260**	**100**	**99**
	8.1	**8.0**	**24.5**	**24.6**	**250**	**260**	**100**	**98**
25	**7.9**	**8.0**	**24.3**	**24.3**	**260**	**270**	**99**	**98**
	7.9	**8.1**	**24.5**	**24.4**	**260**	**280**	**101**	**99**
	8.0	**8.0**	**24.4**	**24.7**	**260**	**270**	**100**	**98**
100	**7.8**	**7.9**	**24.5**	**24.3**	**320**	**340**	**100**	**98**
	7.8	**8.0**	**24.4**	**24.3**	**330**	**330**	**109**	**99**
	7.9	**7.8**	**24.3**	**24.6**	**330**	**330**	**102**	**97**

Table 3.(Cont.) Physico-Chemical Variables in Test Solutions

Nominal Test Conc. (% dilution)	pH		Temperature (^{o}C)		Conductivity (µS/cm)		Dissolved Oxygen (%Saturation)	
	Fresh (0 hrs)	72/48 h old	Fresh (0 hrs)	72/48 h old	Fresh (0 hrs)	72/48 h old	Fresh (0 hrs)	72/48 h old
Sample 201402356								
5	**7.9**	**7.9**	**24.1**	**24.4**	**240**	**250**	**98**	**91**
	7.9	**8.1**	**24.6**	**24.5**	**250**	**250**	**107**	**100**
	8.0	**7.9**	**24.4**	**24.5**	**240**	**250**	**101**	**98**
12.5	**7.9**	**8.0**	**24.1**	**24.4**	**250**	**250**	**99**	**95**
	8.0	**8.1**	**24.5**	**24.3**	**250**	**260**	**103**	**100**
	8.0	**8.0**	**24.5**	**24.4**	**250**	**250**	**101**	**98**
25	**7.9**	**8.0**	**24.3**	**24.3**	**260**	**270**	**99**	**97**
	8.0	**8.1**	**24.3**	**24.3**	**260**	**270**	**103**	**100**
	8.0	**8.0**	**24.3**	**24.3**	**260**	**270**	**100**	**98**
100	**7.8**	**7.9**	**24.7**	**24.5**	**320**	**330**	**100**	**97**
	7.8	**8.0**	**24.2**	**24.3**	**330**	**330**	**108**	**99**
	7.9	**7.7**	**24.4**	**24.4**	**320**	**330**	**100**	**98**
Sample 201402358								
12.5	**7.9**	**8.0**	**24.4**	**24.2**	**250**	**260**	**100**	**97**
	7.9	**8.1**	**24.6**	**24.4**	**250**	**260**	**106**	**99**
	8.0	**7.9**	**24.6**	**24.6**	**250**	**270**	**101**	**99**
25	**7.9**	**8.0**	**24.3**	**24.1**	**260**	**266**	**99**	**98**
	8.0	**8.1**	**24.3**	**24.4**	**260**	**270**	**104**	**99**
	8.0	**7.9**	**24.5**	**24.4**	**260**	**270**	**101**	**99**
100	**7.8**	**7.9**	**24.7**	**24.0**	**320**	**330**	**100**	**97**
	7.8	**8.0**	**24.2**	**24.4**	**320**	**330**	**105**	**99**
	7.9	**7.8**	**24.4**	**24.3**	**320**	**320**	**101**	**99**
Sample 201402359								
25	**7.6**	**8.0**	**24.4**	**24.0**	**180**	**190**	**99**	**98**
	7.8	**8.1**	**24.3**	**24.6**	**190**	**200**	**110**	**99**
	8.0	**7.9**	**24.4**	**24.4**	**190**	**200**	**102**	**99**
100	**6.8**	**7.4**	**24.3**	**24.0**	**40**	**50**	**98**	**97**
	7.0	**7.9**	**24.1**	**24.6**	**40**	**40**	**100**	**99**
	8.1	**7.3**	**24.2**	**24.3**	**40**	**40**	**101**	**99**
Sample 201402359 Adjusted								
25	**6.9**	**7.5**	**24.3**	**24.0**	**230**	**230**	**99**	**97**
	7.1	**7.9**	**24.0**	**24.5**	**230**	**230**	**105**	**99**
	7.7	**7.8**	**24.3**	**24.3**	**230**	**240**	**101**	**99**
100	**6.2**	**7.8**	**24.5**	**24.0**	**200**	**210**	**98**	**97**
	6.6	**7.9**	**24.0**	**24.5**	**210**	**230**	**103**	**99**
	6.8	**7.2**	**24.3**	**24.2**	**200**	**210**	**101**	**98**

Reference toxicant test result:

A Reference toxicity test using $ZnSO_4$ run in parallel with the above test resulted ICp25 value of **50** µg/L (30 mg/L lower and 130 µg/L upper 95% CL). This value is within the 95% confidence limitsµ of previous reference chronic toxicity test results conducted at this laboratory, and indicates that the test animals used in the current tests were of typical sensitivity.

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This report is issued with the approval of 

M Julli

Team Leader Ecotoxicology

23 December 2014

Report on the acute toxicity of samples from Clarence Colliery (collected 13 November 2014) to the unicellular green alga *Pseudokirchneriella subcapitata* Hindak

Office of Environment and Heritage
Ecotoxicology Team, Environmental Forensics, Environment Protection Science
480 Weeroona Road, Lidcombe NSW 2141

Date of issue of report: **16 December 2014**

Test Outline

The test was conducted to determine the potential inhibitory effects of water samples on the growth of the freshwater unicellular green alga *Pseudokirchneriella subcapitata* Hindak (formerly known as *Selenastrum capricornutum*).

A specific number of algal cells in exponential growth phase are exposed to various dilutions of the test sample for 72 hours under defined conditions. The growth of the algae exposed to the sample is compared with the growth of the algae in a diluent control or in a reference water sample. Typically nutrient media is added to the sample so that all sample treatments and the control/s have the same (added) nutrient concentrations. The growth of the algae is determined by cell yield which is the change in the algal density over the exposure period.

The cell yield data is statistically analysed to determine sample concentrations causing significant ($p<0.05$) inhibition of algal growth relative to the control/reference. The percent effects (reduction in cell yield) on growth rate for each treatment, and the 72-h IC50 or the sample concentration causing 50% inhibition of algal growth, are estimated. The lower the sample concentration causing significant growth inhibition effect and/or the lower the estimated IC50 value, the higher the apparent toxicity.

Results Summary

Sample 201402355 caused significant inhibitory effect on growth of *P. subcapitata* with estimated 72-hour IC50 of **46**%. The sample would need to be diluted approximately **4 times** to avoid these toxic effects on *P. subcapitata* (estimated based on tested concentrations).

Sample 201402356 caused some inhibitory effect on growth of *P. subcapitata* in that the percent inhibitory effect was limited to 61% when exposed to undiluted sample. When diluted the sample caused stimulation of algal growth.

Sample 201402358 generally stimulated or did not affected the growth of *P. subcapitata* i.e. cell yield of exposed algae was higher than or not significantly different from the cell yield of the Control group.

Sample 201402359, when EC was adjusted to match the conductiviity of the algal media, caused minimal inhibitory effect on growth of *P. subcapitata* in that the percent inhibitory effect was limited to 37% when exposed to undiluted sample. When diluted the sample caused stimulation of algal growth.

When **sample 201402359** was tested as-received (ie at the sample conductivity of 34 µS/cm) and not supplemented with nutrients for algal growth, the sample caused some inhibitory effect on growth of *P. subcapitata* in that the percent inhibitory effect was limited to 61% when exposed to undiluted sample. When diluted the sample caused stimulation of algal growth.

Sample Information

EF Submission Number	EF Sample Number
201400374	201402355
	201402356
	201402358
	201402359

Test Methods and Conditions

Test commencement date**: 25 November 2014**
Test Method Protocol No.: **ECOTOX 6.** The test method is based on procedures published by the USEPA (1994) Short-term methods for estimating the chronic toxicity of effluents and receiving water to freshwater organisms Test Method 1003.0 (USEPA-600-4-91-002) and Environment Canada (1992) Biological test method: Growth inhibition test using the freshwater alga *Selenastrum capricornutum.* Report EPS 1/RM/25 (including November 1997 amendments). The procedures had been modified slightly at the OEH Ecotoxicology Laboratories, with a smaller test volume of 6mL being used.
Deviations from Protocol**: None**
Test Type**: Chronic, static** Duration of test**: 72** hours
Test Species***: Pseudokirchneriella subcapitata*** Age: **7 days** Source: **In-house cultures**
Test conducted at: **F.32** Constant Temperature Room No.: **F.32**
Test Vessel Type : **20 mL glass vials** Test Volume: **6 mL**
Test Temperature: **24 ± 1°C** Test Photoperiod: **continuous illumination**
Light intensity at surface of Test Vessels**: 4000 ± 400 Lux (cool white fluorescent lighting)**
Dilution Water: **USEPA / Environment Canada algal culture media (Na_2SeO_4 and EDTA not included)**
Dissolved O_2: greater than **90% saturation at 24°C** pH: **7.0**

Sample Treatment

pH adjustment: **Not required**
Filtration: **0.45 µm PES**
Sample preparation: **201402359** tested with conductivity adjusted to 90 µS/cm, prior to addition of nutrients as well that of algal media
Stock nutrient solutions added: 1mL of each stock solution per litre of sample, except for 201402359 "as-received" treatment

Test Design

Concentrations tested: **10, 25, 50 and 100%**
Test Concentrations: **Nominal**
Number of replicate test vessels per concentration and control/s**: 4**
1 for blank of highest sample concentration
Initial algal cell density in test solutions: **10,000 cells/mL (±10%)**
Shaking method: **Shaker table**
Reference toxicant test: **Cu^{2+}**
Analysis of results
Cell counting method: **Laser counter**
Parameters calculated: **Cell density; Cell yield; % Effect; Control growth rate & variability**
Statistical Analysis Method: **Linear interpolation for 72-h IC25 & IC50 and Steel Many-One Rank Sum for statistical significance tests**

Results

Table 1. Mean cell yield & mean % growth inhibition of *P. subcapitata* in test solutions

EF Sample Number	Nominal Test Concentration (% sample)	Mean algal cell yield after 72 h exposure (x 10^4 cells/mL)	% growth inhibition (relative to controls)
Control	**0**	**25.7**	**-**
201402355	**10**	**20.0**	**22**
	35	**20.5**	**20**
	50	**11.8**	**54***
	100	**7.0**	**73***
201402356	**10**	**30.9**	**-20 (stimulation)**
	35	**41.7**	**-62 (stimulation)**
	50	**44.8**	**-75 (stimulation)**
	100	**10.1**	**61***
201402358	**10**	**23.3**	**9**
	35	**36.2**	**-41 (stimulation)**
	50	**23.1**	**10**
	100	**29.3**	**-14 (stimulation)**
201402359 EC adjusted to ~90 µS/cm	**10**	**62.2**	**-142 (stimulation)**
	35	**58.7**	**-128 (stimulation)**
	50	**42.4**	**-65 (stimulation)**
	100	**16.3**	**37**
Control – diluted to 35 µS/cm	**0**	**23.3**	**-**
201402359 as-received EC 33 µS/cm	**10**	**58.4**	**-150 (stimulation)**
	35	**49.3**	**-112 (stimulation)**
	50	**32.5**	**-39 (stimulation)**
	100	**6.9**	**71***

*Significantly different from the control ($p \leq 0.05$).

Test validity criteria of Control group growth (16 x 10^4 cells/mL after 72 h with ≤ 20% variability) was met.

Table 2. Estimated NOEC, LOEC and 72h IC50 values (% sample)

Sample identification	No-observed effect concentration (NOEC)	Lowest observed effect concentration (LOEC)	72-hour IC50 (95% confidence intervals)	72-hour IC20 (95% confidence intervals)
	% Sample			
201402355	35	50	46 (21 – 65)	9 (N/A-44)
201402356	50	100	81 (76 – 91)	N/C
201402358	N/C - Stimulation effect in undiluted sample			
201402359 EC adjusted to ~90 µS/cm	100	N/A	N/C	N/C
201402359 as-received (EC 33 µS/cm)	50	100	N/C	N/C

N/C = not calculable

Table 3. Physico-chemical variables in test solutions

(with nutrients added except where indicated)

EECS Sample No.	Test concentration (%)	Temperature (^{0}C)		pH		Conductivity (µS/cm)		Dissolved Oxygen (% saturation)	
		0h	72h	0h	72h	0h	72h	0h	72h
Control	0	24.0	24.5	7.0	7.8	91	140	100	98
201402355	10	29.3	23.8	6.7	7.6	120	120	106	99
	25	24.3	23.8	6.8	7.5	170	170	104	99
	50	24.2	23.7	6.8	7.5	250	250	104	97
	100	24.2	23.7	7.4	7.6	400	410	107	97
	100*	-	-	7.9	-	320	-	110	-
201402356	10	24.2	23.7	7.6	7.8	130	140	105	98
	25	24.0	23.7	7.6	7.7	170	180	104	98
	50	23.9	23.6	7.5	7.7	250	250	105	99
	100	23.9	23.5	7.4	7.6	400	400	106	98
	100*	-	-	7.9	-	320	-	110	-
201402358	10	24.5	23.5	7.6	7.8	130	140	107	98
	25	24.5	23.5	7.6	7.8	170	170	105	99
	50	24.3	23.3	7.5	7.7	250	250	104	98
	100	24.3	23.3	7.5	7.6	400	390	107	98
	100*	-	-	7.9	-	320	-	-	-
201402359 EC adjusted	10	23.4	23.8	7.2	9.7	98	125	99	98
	25	24.1	23.8	7.2	8.4	110	115	101	99
	50	23.9	23.8	7.1	9.5	130	150	103	99
	100	23.9	23.9	7.1	8.7	180	180	107	99
Control (diluted)	0	24.1	23.8	7.3	9.1	35	47	102	99
201402359 (as received)	10	24.0	24.0	7.2	9.3	34	43	101	97
	25	23.9	24.1	7.2	8.5	34	35	103	97
	50	23.8	24.1	7.0	8.2	33	36	103	97
	100*	23.8	23.8	6.9	7.9	32	35	106	98

*No added nutrients

Reference toxicant test No. 64

A Reference toxicity test using Cu^{2+} run in parallel with the above test resulted in 72-h IC50 (growth inhibition) value of **2.3** μg/L (**1.0** μg/L lower and **6.3** μg/L upper 95% CL). This value is within the 95% confidence limits of earlier reference toxicity test results conducted at this laboratory indicating that the test algae used in the current tests were of greater sensitivity. The current percentage coefficient of variation of the Reference toxicity data is 35%.

This report is issued with the approval of

M Julli

Team Leader Ecotoxicology

16 December 2014