Appendix B.

Water quality field survey report (Jacobs 2016a)

Barossa Environmental Studies

ConocoPhillips

Water Quality Field Survey Report

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Barossa Environmental Studies

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Abbreviations

ALS	Australian Laboratory Services Pty Ltd
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
AS/NZS	Australian and New Zealand Standards
BETXN	benzene, toluene, ethylbenzene, xylenes (meta-, para- and ortho-xylene) and naphthalene
Bq/L	becquerels per litre
ConocoPhillips	ConocoPhillips Australia Exploration Pty Ltd
GPS	global positioning system
LOR	limit of reporting
MAFRL	Marine and Freshwater Research Laboratory (Murdoch University)
MRL	minimum reporting limit
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure(s)
NORM	naturally occurring radioactive material
NT	Northern Territory
NTU	nephelometric turbidity unit
ppb	parts per billion
PSU	practical salinity unit
QC	quality control
SP1-S	sampling point 1 – near-surface water
SP1-M	sampling point 1 – mid-water
SP1-B	sampling point 1 – near-bottom water
spp	species (plural)
TPH	total petroleum hydrocarbon
TRH	total recoverable hydrocarbon
TSS	total suspended solids
˚C	degrees Celsius
µg/L	micrograms per litre

Executive Summary

ConocoPhillips Australia Exploration Pty Ltd (ConocoPhillips) are proposing to develop natural gas resources as part of the Barossa area development, located in waters up to 300 m deep in the Bonaparte Basin, in Commonwealth waters offshore of northern Australia. To develop a robust understanding of the existing marine environmental values of the area to inform any future approvals, a targeted baseline marine studies program is being progressed within and surrounding the Barossa field.

A key component of the baseline marine studies program is a series of water quality surveys during different seasons over a 12-month period. This report summarises the results of the final water quality survey and discusses the results of the three seasonal surveys overall. The seasonal water quality surveys took place during 26–29 June 2014 (winter, or tropical dry season), 18–20 January 2015 (summer or tropical wet season) and 12–15 April 2015 (autumn or tropical transitional).

Seventeen water quality sampling sites were positioned to provide representative coverage of the permit area and areas of regional interest such as shoals and banks. Sites were located in the permit area (five sites, labelled SP1 to SP5), around Evans Shoal (four sites, SP7 to SP10), around Tassie Shoal (four sites, SP11 to SP14), around Lynedoch Bank (three sites, SP15 to SP17) and between the permit area and Evans Shoal (one site, SP6). Sampling sites ranged in depth from around 10 m–30 m on top of shoals and banks through to approximately 280 m in the permit area.

At each site, physico-chemical profiles of the water column were obtained for dissolved oxygen, salinity, temperature, turbidity, pH, chlorophyll *a* and hydrocarbons. Water samples were collected at each site from three depths — near-surface (0–5 m), mid-water and near-bottom (within 5 m of the seabed) — for analysis of nutrients, metals/metalloids, hydrocarbons and naturally occurring radioactive materials (NORMs). Phytoplankton and zooplankton samples were obtained using 20 µm mesh (300 mm diameter) and 100 µm mesh (500 mm diameter) plankton nets, respectively. All water samples were collected, handled, preserved and had holding times in accordance with the recommendations of the Australian and New Zealand Standards (AS/NZS 5667.1:1998).

Autumn survey results were comparable to those recorded during previous (summer and winter) surveys, confirming general patterns, trends and conclusions from those surveys.

Key conclusions from the three seasonal water quality surveys include:

- The depth of the autumn thermocline was similar to winter but deeper than summer. During winter (and autumn), atmospheric cooling at the sea surface produces convective overturning of water and strong, continual winds, which cause the depth of the thermocline to be greater.
- Summer, autumn and winter conditions were similar for concentrations of nutrients (nitrate+nitrite and orthophosphate) and certain metals (arsenic, barium, chromium and nickel) increasing with depth, associated with decomposition of organic matter at depth.
- Generally, nutrients were below ANZECC & ARMCANZ (2000b) trigger values for marine tropical waters in the surface water of all sites but above trigger values in the mid-water and bottom water of the deepest sites. Nutrients are released when organic compounds decay and oxygen is consumed, which was evident in the bottom water of the deepest sites in the permit area where phosphorus and nitrate concentrations were high and oxygen levels were low.
- No dissolved metal samples exceeded the ANZECC & ARMCANZ (2000a) trigger value for 99% species protection, except for copper in four samples in winter and five samples in summer being slightly higher than the ANZECC & ARMCANZ (2000a) trigger value of 0.3 µg/L.
- Total recoverable hydrocarbons and benzene, toluene, xylenes (meta-, para- and ortho-xylene) and naphthalene were below the laboratory reporting limits at all sites and depths for each season. There was little difference in the hydrocarbon profiles between sites, which indicates a lack of hydrocarbons in the areas sampled.

- Radium^{226} and radium^{228} were above the minimum reporting limit (MRL) at a number of sites during the three surveys, while thorium^{228} was below the MRL. There are no ANZECC & ARMCANZ (2000a) trigger values associated with NORMs but the concentrations detected in these surveys were below the NHMRC & ARMCANZ (2011) drinking water guidelines.

- *Trichodesmium erythraeum* (blue-green alga) was the phytoplankton species captured in highest abundance at most sites during each season. Dinoflagellates were the most diverse group during the autumn survey, whereas diatoms were the most diverse group during summer and winter surveys. The phytoplankton assemblage composition in autumn was similar to summer and winter, although silicoflagellates were only present during winter and cryptomonads were only present during summer and autumn.

- Copepods were the most abundant zooplankton collected during each season. Copepods also displayed the highest species diversity whereas the majority of other Classes contained only one species.

Generally the data collected during the three seasonal surveys were typical of water quality in offshore environments distant from emergent reefs (Gilmour et al. 2013, Heyward et al. 1997) and consistent with our previous observations in deep, offshore waters in the Browse Basin (SKM 2014).

1. Introduction

1.1 Background

ConocoPhillips Australia Exploration Pty Ltd (ConocoPhillips), as proponent on behalf of the current and future joint ventures, are proposing to develop natural gas resources as part of the Barossa area development, located approximately 300 kilometres (km) north of Darwin, Northern Territory (NT).

To facilitate the environmental approvals process for any future development of the Barossa field and surrounds, a robust understanding of the existing state of the key environmental values and sensitivities will be necessary. This understanding will be gained from a series of studies and surveys to assess and monitor the baseline state of environmental factors such as water quality, sediment quality, noise, metocean conditions and benthic habitats within petroleum retention lease permit NT/RL5 (referred to as the 'permit area' in this report) and across a broader geographical area. The field studies assessing these factors commenced in June 2014.

1.2 Overview of existing regional environment

The Barossa area is located in the North Marine Region (Department of Sustainability, Environment, Water, Population and Communities 2012), which comprises the Commonwealth waters of the Gulf of Carpentaria, Timor Sea and Arafura Sea as far west as the NT and Western Australian border. The Northern Marine Region contains internationally significant breeding and/or feeding grounds for a number of listed threatened and migratory marine species, including nearshore dolphins, turtles, dugongs, seabirds and migratory shorebirds afforded protection under national legislation and international conventions.

The Timor and Arafura Seas support a variety of shark, pelagic finfish and crustacean species of commercial and recreational game-fishing importance, e.g. trawl and various finfish fisheries. The shelf break and slope of the Arafura Shelf is characterised by patch reefs and hard substrate pinnacles that support a diverse array of invertebrate groups, with polychaetes and crustaceans being the most prolific (Heyward et al. 1997, CEE 2002). Surveys indicate that between 50 m and 200 m depth, the seabed consists of predominantly soft, easily resuspended sediments (Heyward et al. 1997, URS 2005, 2007). The diversity and coverage of epibenthos is low and organisms present are predominantly sponges, gorgonians and soft corals (Heyward et al. 1997, URS 2005, 2007).

Numerous shoals (submerged calcareous banks or 'seamounts') exist in the broader region around the permit area; the closest being Evans Shoal, 60 km to the west and Tassie Shoal, 70 km south-west, and Lynedoch Bank, 40 km to the south-east. In addition, the new Oceanic Shoals Commonwealth marine reserve (multiple use zone) lies to the south and south-east of the permit area.

1.3 Objectives

Water quality surveys are a key component of the Barossa marine baseline studies program.

Baseline studies were undertaken with reference to the permit area, as shown in **Figure 1-1**. While this represents the area of primary interest as part of ConocoPhillips' staged field development, the broader surrounds were also characterised, including the nearest seabed features of regional interest to the Barossa area (i.e. Evans Shoal, Tassie Shoal and Lynedoch Bank).

The survey was completed during different seasonal conditions over a 12-month period. The specific objectives of the marine water quality surveys were to:

- determine the water quality of the marine waters within the permit area and in the vicinity of Evans Shoal, Tassie Shoal and Lynedoch Bank
- determine any seasonal variation in water quality.

This report summarises the results of the water quality surveys undertaken in:

- mid to late January 2015 in the northern Australian summer (tropical wet)
- mid-April 2015 during the northern Australian autumn (tropical transitional).
- end June 2014 during the northern Australian winter (tropical dry season).

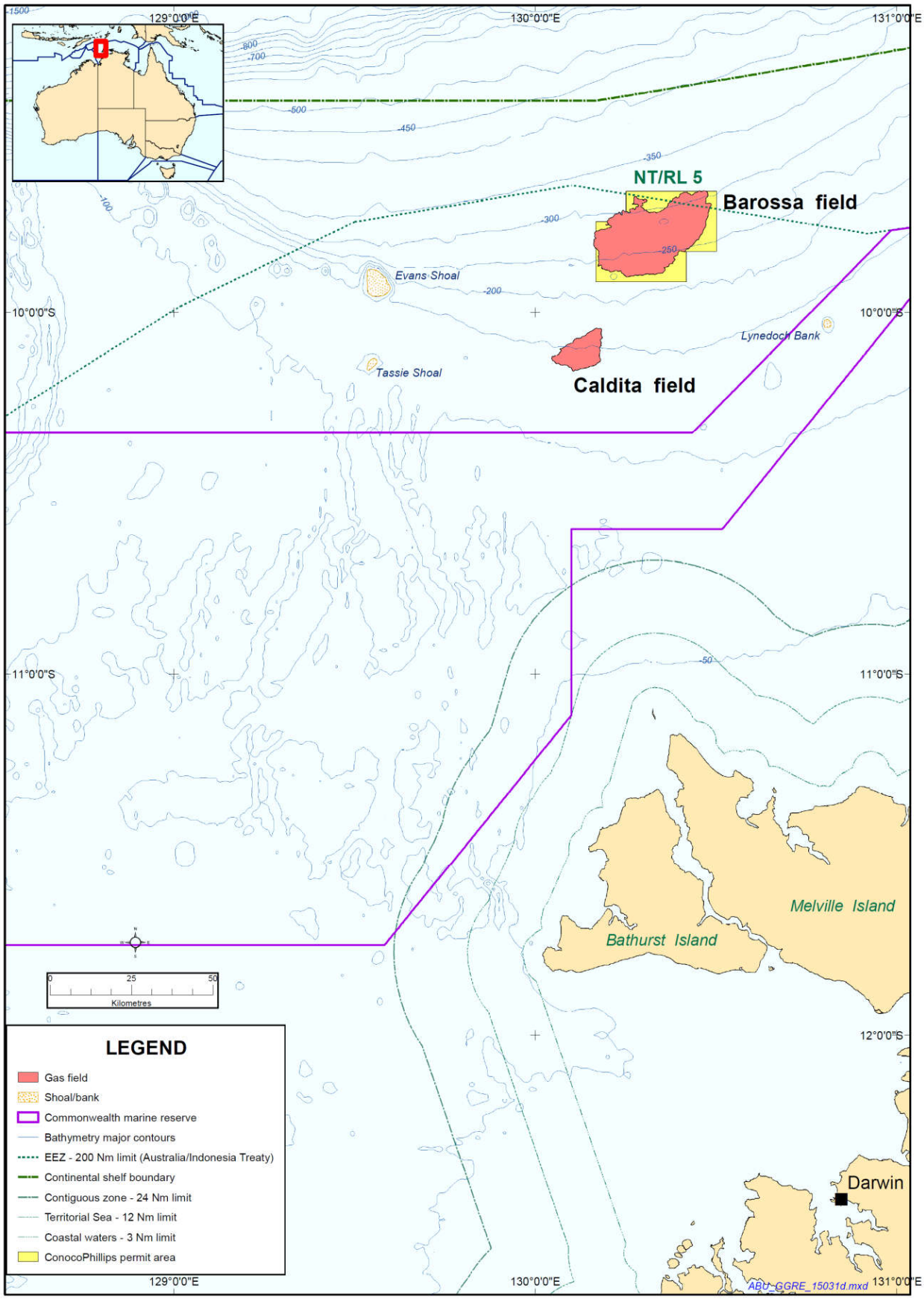


Figure 1-1: Barossa field location

2. Methods

The methods employed during the autumn water quality survey follow those detailed in the *Barossa Environmental Studies: Water Quality Field Sampling Plan Method Statement* (Jacobs 2014). A brief overview of the methods is provided in the sections below.

2.1 Water quality sampling sites

Seventeen sampling sites (**Table 2-1**, **Figure 2-1**) were positioned to provide coverage of the permit area and of areas of regional interest such as shoals and banks. Sites were located at:

- the permit area (five sites, labelled SP1 to SP5)
- Evans Shoal, approximately 60 km west of the permit area (four sites, SP7 to SP10)
- Tassie Shoal, approximately 70 km south-west of the permit area (four sites, SP11 to SP14)
- Lynedoch Bank, approximately 40 km south-east of the permit area (three sites, SP15 to SP17)
- between the permit area and Evans Shoal, approximately 20 km west of the permit area (one site, SP6).

The number of sites sampled is considered appropriate to characterise the water quality in the permit area and broader surrounds. Some sites were not able to be sampled during each survey (**Table 2-1**). Due to inclement weather during the winter water quality survey, not all of the sites listed above were able to be visited, and therefore sites SP8, SP9, and SP15 to SP17 were not sampled. Due to a malfunction in the zooplankton and phytoplankton equipment during the autumn survey, sites SP2, SP4, SP9, SP12 and SP15 were not able to be sampled.

2.2 Timing

Three water quality surveys were undertaken:

- 26 to 29 June 2014, during the northern Australian (tropical dry) winter
- 18 to 20 January 2015, during the northern Australian (tropical wet) summer
- 12 to 15 April 2015, during the northern Australian (tropical transitional) autumn.

2.3 Water column profiles

At each of the sites sampled during the surveys, physico-chemical profiles of the water column were obtained for:

- dissolved oxygen
- salinity
- temperature
- turbidity
- total suspended solids (TSS) (summer and winter surveys only)
- pH
- chlorophyll *a* (winter and autumn surveys only)
- hydrocarbons.

Parameters were measured using an SBE 19plus V2 SeaCAT profiler (Sea-Bird Electronics) with auxiliary sensors, lowered through the water column at approximately half a metre per second. All sensors were calibrated at the Marine and Freshwater Research Laboratory prior to the field survey commencing. A calibration certificate for each of the sensors can be found in **Appendix A**. Depth was recorded at all sites.

2.4 Water quality sampling

2.4.1 Sample collection

Water samples were collected from three depths at each site, from near-surface (2–5 m), mid-water (half the bottom depth) and near-bottom (within 5 m of the seabed). Samples were collected using 10 L Niskin bottles, arranged in a daisy chain to facilitate the collection of replicate mid-water and near-bottom samples. For surface water samples, a single 10 L Niskin bottle was lowered to 2–5 m below the surface. For sites <30 m deep, only surface and near-bottom water samples were collected.

Table 2-1: Water quality site coordinates and sampling overview

Site name	Sample type[1]						Coordinates (DDD° MM' SS.SSS")[2]	
	Water column profiles[3]	Nutrients	Metals	Hydrocarbons[4]	Radioactive materials[5]	Phytoplankton and zooplankton	Latitude	Longitude
Permit area								
SP1	✓	✓	✓	✓	✓	✓	9° 43' 30.129" S	130° 28' 54.041" E
SP2	✓	✓	✓	✓	✓	✓#	9° 44' 55.592" S	130° 20' 31.955" E
SP3	✓	✓	✓	✓	✓	✓	9° 45' 43.841" S	130° 10' 48.070" E
SP4	✓	✓	✓	✓	✓	✓#	9° 54' 17.419" S	130° 10' 43.252" E
SP5	✓	✓	✓	✓	✓	✓	9° 53' 17.222" S	130° 24' 19.322" E
SP6[6]	✓	✓	✓	✓	✓	✓	9° 48' 44.030" S	129° 58' 5.259" E
Evans Shoal								
SP7	✓	✓	✓	✓	✓	✓	9° 55' 2.690" S	129° 33' 38.636" E
SP8*	✓	✓	✓	✓	✓	✓	9° 57' 7.960" S	129° 32' 5.857" E
SP9*	✓	✓	✓	✓	✓	✓#	9° 56' 21.446" S	129° 36' 11.536" E
SP10	✓	✓	✓	✓	✓	✓	9° 51' 25.533" S	129° 32' 5.302" E
Tassie Shoal								
SP11	✓	✓	✓	✓	✓	✓	10° 7' 59.795" S	129° 33' 0.096" E
SP12	✓	✓	✓	✓	✓	✓#	10° 3' 49.966" S	129° 28' 40.532" E
SP13	✓	✓	✓	✓	✓	✓	10° 11' 44.040" S	129° 39' 46.178" E
SP14	✓	✓	✓	✓	✓	✓	10° 14' 57.851" S	129° 46' 5.394" E
Lynedoch Bank								
SP15*	✓	✓	✓	✓	✓	✓#	10° 0' 30.772" S	130° 46' 39.566" E
SP16*	✓	✓	✓	✓	✓	✓	10° 1' 38.218" S	130° 48' 34.785" E
SP17*	✓	✓	✓	✓	✓	✓	10° 2' 25.991" S	130° 50' 15.953" E

[1] Refer to **Section 2.4.2** for full details.

[2] Datum = GDA94.

[3] TSS was only sampled during the summer survey

[4] Total recoverable hydrocarbons, total petroleum hydrocarbons and BTEXN.

[5] Naturally occurring radioactive materials (NORMs).

[6] Located between the permit area and Evans Shoal.

* Sites were not sampled during the winter survey due to inclement weather.

Sites were not sampled during the autumn survey due to equipment malfunction.

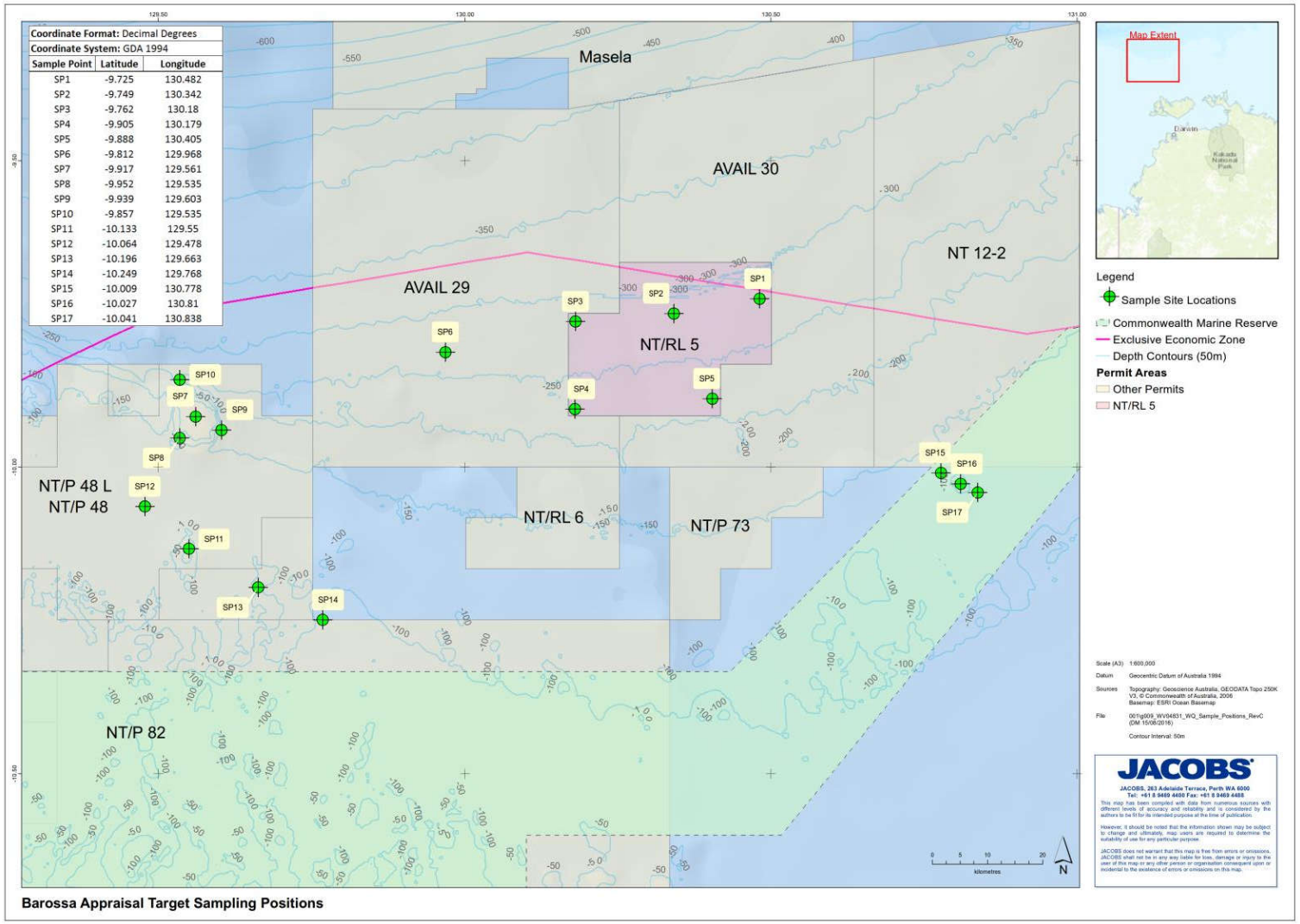


Figure 2-1: Water quality sampling site locations

2.4.2 Sample processing, preservation and storage

All samples were preserved and handled in accordance with Australian and New Zealand Standard (AS/NZS) 5667.1:1998 and with the requirements of the analytical laboratories. The location of the sampling sites was considered remote and therefore the preservation techniques were selected to achieve the maximum allowable holding times for each parameter. For example, the holding time for hydrocarbons is seven days; therefore, these samples were collected late in the survey to allow Jacobs' personnel to transport the samples back to Perth to be hand delivered to the appropriate laboratory in time to meet the holding time requirements.

Samples were stored in laboratory-supplied bottles/containers, with preservatives added where appropriate, and labelled with the site name and depth, the date and the analysis required. All samples collected were recorded on a field sheet and then stored under the required conditions and holding times until delivery to the laboratories (**Table 2-2**). Samples were delivered to the appropriate National Association of Testing Authorities (NATA) accredited laboratories (**Table 2-3**) along with a chain of custody form requesting the analysis required.

Water samples for pigments (chlorophyll *a* and phaeophytin), nutrients and dissolved metals/metalloids were filtered on board the vessel. For pigment samples, 0.2 µm GF/F filter papers were retained and frozen after a known volume of water sample had been filtered. Dissolved nutrient and dissolved metals samples were filtered directly into pre-rinsed sample containers. Nutrient samples were frozen until delivery to the laboratory whereas metals sample bottles had the appropriate acid added prior to sample collection and were then kept cool (approximately 4°C) during transportation.

Hydrocarbon samples were processed on board the vessel by filling sample bottles to the top, leaving minimal air space, and refrigerating until delivery to the laboratory. For the more volatile hydrocarbons (benzene, toluene, ethylbenzene, xylenes (meta-, para- and ortho-xylene) and naphthalene (BTEXN) and total petroleum hydrocarbon (TPH) (C_6–C_9)), sample bottles contained sulfuric acid preservative.

Samples for naturally occurring radioactive materials (NORMs) were processed on board the vessel by adding unfiltered water to sample bottles containing nitric acid as a preservative. Samples were kept cool until delivery to the laboratory.

2.4.3 Sample analysis

Analytes and their respective laboratory limits of reporting (LOR), 99% species protection guideline trigger value (ANZECC & ARMCANZ 2000a) and low reliability values for contaminants having insufficient data to derive reliable national guidelines (ANZECC & ARMCANZ 2000b) are presented in **Table 2-2**. All analyses were undertaken using standard methods at NATA-accredited laboratories.

2.4.4 Data analysis

Nutrient and pigment values were compared to ANZECC & ARMCANZ (2000b) trigger values for Western Australian tropical offshore waters, as Northern Territory values were not supplied. All other values were compared to ANZECC & ARMCANZ (2000a) trigger values for marine water with a 99% level of species protection where available. In some cases where no high reliability trigger value was available, low reliability trigger vales were used as indicative working levels.

2.4.5 Quality control procedures

To test for potential sample contamination during collection, storage or transport, low analyte concentration water samples were provided by the laboratories to be split in two ways:

- transport blank: to estimate any contamination introduced to the sample during the transportation and storage stage, low analyte water was poured directly into the sample containers at the laboratory with no filtering or handling.
- field blank: to estimate any contamination introduced to the sample during the collection procedure. This involved following the same sampling procedure using the low analyte water instead of the sample seawater.

Quality control procedures that related to the water sampling were:

- sun cream/zinc and any other potential anthropogenic contaminants were avoided by the personnel in contact with the water sampling equipment
- smoking was prohibited in the sampling area
- care was taken to not open the bottles containing nitric acid while bottling or filtering nutrient samples
- as far as possible, the insides of the sample container lids did not come in contact with any potentially contaminated surfaces or substances (such as hands, workbenches or vessel emissions)
- hands did not come into contact with the insides or lip of the bucket or sample bottles, the tip of the syringe or of the syringe filters.

Procedural and record-keeping quality control measures implemented were:

- global positioning system (GPS) waypoints were recorded for all sites sampled from the vessel
- site locations and samples collected were logged onto field sheets
- appropriate chain of custody forms to accompany samples were completed for each laboratory
- any changes to the field procedures were documented.

2.5 Phytoplankton and zooplankton

Phytoplankton and zooplankton samples were collected at selected sites within each location (**Figure 2-1**):

- permit area and surrounds – sites SP1, SP3, SP5 and SP6
- Evans Shoal – sites SP7, SP8 and SP10
- Tassie Shoal – sites SP11, SP13 and SP14
- Lynedoch Banks – sites SP16 and SP17.

At each site, a zooplankton net (100 µm mesh, 500 mm diameter) was towed at a speed of less than one knot behind the vessel along designated transects of approximately 300 m long. GPS coordinates were recorded at the start and end of every tow (**Appendix B**). A phytoplankton net (20 µm mesh, 300 mm diameter) was suspended on the vessel, as 40 L of surface seawater collected at the transect start was poured through the net. A 125 mL 'raw' (not concentrated) sample of seawater was also collected at each of these sites to aid in the identification of phytoplankton species. This phytoplankton method eliminates the potential for species to be excluded from the net due to the speed of the tow coupled with the very fine mesh size.

Once sampling was completed, the phytoplankton sample was rinsed into the cod end of the net with seawater and transferred to a labelled sample container, adding Lugol's solution to a final concentration of 1%. Lugol's was also added to the raw phytoplankton sample to achieve the same final concentration. The zooplankton sample was rinsed into the cod end of the net with seawater and concentrated by pouring the sample into a 100 µm sieve. The contents of the sieve were then washed into a labelled sample container with 75% ethanol. Phytoplankton and zooplankton samples were kept refrigerated in the dark until delivery to the laboratory for taxonomic identification. All samples were accompanied by a chain of custody form requesting the appropriate analysis. The parameters and laboratory used to undertake the analyses are summarised in **Table 2-3**.

Table 2-2: Analytical limits of reporting (LOR), trigger values and sample storage, preservation and holding times

Test parameter	Guideline (µg/L)[1]	LOR (µg/L)	Storage container	Preservation	Holding time
Total nitrogen	140[5]	50	Polypropylene	Freeze	1 month
Total phosphorus	10[6]	5	Polypropylene	Freeze	1 month
Ammonium	4[6]	3	Polypropylene	Filter on site (0.45 µm filter) and freeze	1 month
Nitrate+nitrite	4[6]	2	Polypropylene	Filter on site (0.45 µm filter) and freeze	1 month
Orthophosphate	5[6]	2	Polypropylene	Filter on site (0.45 µm filter) and freeze	1 month
Chlorophyll *a* and phaeophytin	0.5–0.9	0.1	Seed envelope	Filter on site (GFF filter) and freeze residue	1 month
TSS	—	0.5	Seed envelope	Filter on site (GFC filter) and freeze residue	1 month
Arsenic	4.5[2]	0.5	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
Barium	—	0.5	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
Cadmium	0.7	0.1	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
Chromium	7.7[4]	0.2	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
Cobalt	1.0[3]	0.05	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
Copper	0.3	0.2	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
Mercury	0.1	0.1	Amber glass with Teflon cap liner	Acidify with nitric acid to pH 1 to 2 and add potassium dichromate	1 month
Nickel	7	0.3	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
Lead	2.2	0.1	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
Zinc	7	1	Polypropylene	Acidify with nitric acid to pH 1 to 2	1 month
BTEXN	5-500[2]	1-2	Amber glass with Teflon cap liner	Acidify with sulphuric acid and chill to 4°C	1 week
TPH (C_{10}–C_{36})	7[2]	20–100	Amber glass with Teflon cap liner	Chill to 4°C	1 week
PAHs	0.01-50[2]	0.5–1.0	Amber glass with Teflon cap liner	Chill to 4°C	1 week
Radium^{226}	—	0.1 Bq/L	Polypropylene	Acidify with nitric acid to pH 1 to 2	2 months
Radium^{228}	—	0.1 Bq/L	Polypropylene	Acidify with nitric acid to pH 1 to 2	2 months
Thorium^{228}	—	0.1 Bq/L	Polypropylene	Acidify with nitric acid to pH 1 to 2	2 months

[1] ANZECC & ARMCANZ (2000a) 99% species protection value unless otherwise specified.
[2] ANZECC & ARMCANZ (2000b) Low reliability trigger value.
[3] ANZECC & ARMCANZ (2000a) 95% species protection value.
[4] ANZECC & ARMCANZ (2000a) Chromium III trigger value.
[5] ANZECC & ARMCANZ (2000b) winter values (tropical Australian offshore waters)
[6] ANZECC & ARMCANZ (2000b) summer values (tropical Australian offshore waters)

Table 2-3: Analytes and the corresponding analytical laboratory

Parameter	Laboratory[1]
Total nitrogen (TN), total phosphorus (TP)	MAFRL
Orthophosphate (FRP), nitrate+nitrite (NO_x), ammonium (NH_4)	MAFRL
Pigments (chlorophyll *a* and phaeophytin)	MAFRL
Total suspended solids (TSS)	MAFRL
Total petroleum hydrocarbons (TPHs)/total recoverable hydrocarbons (TRHs)	ALS
Benzene, toluene, ethylbenzene, xylenes (meta-, para- and ortho-xylene) and naphthalene (BTEXN)	ALS
Polycyclic aromatic hydrocarbons (PAHs; only where TPHs detected)	ALS
NORMs (radium^{226}, radium^{228} and thorium^{228})	Western Radiation
Trace metals/metalloids (As, Ba, Cd, Cr, Co, Cu, Hg, Ni, Pb, Zn) (filtered and unfiltered)	MAFRL
Phytoplankton – full count Utermohl	Dalcon Environmental
Zooplankton – lowest level Sedgwick-Rafter counting cell	Dalcon Environmental

[1] MAFRL – Marine and Freshwater Research Laboratory, ALS – Australian Laboratory Services.

3. Results

3.1 Water column profiles

3.1.1 Depth

The deepest sites were within the permit area and ranged from 204 m at SP5 in winter to 282 m at SP3 in winter (**Table 3-1**). Water depths at Evans Shoal ranged from shallow (25 m) on top of the shoal at SP7 in autumn to 207 m at SP10 in summer. Depths were generally shallower at Tassie Shoal ranging from 11 m on top of the shoal at SP11 in summer to 108 m at SP12 in winter, and at Lynedoch Bank, where sites ranged from 14 m at SP16 in autumnr to 125 m at SP15 in summer.

Table 3-1: Water depths of the various sites sampled during the water quality surveys

Permit area				Evans Shoal				Tassie Shoal				Lynedoch Bank			
Site	Depth (m)			Site	Depth (m)			Site	Depth (m)			Site	Depth (m)		
	W	S	A		W	S	A		W	S	A		W	S	A
SP1	277	271	274	SP7	27	26	25	SP11	16	11	14	SP15	NS	125	122
SP2	279	281	279	SP8	NS	78	69	SP12	108	101	102	SP16	NS	16	14
SP3	282	281	278	SP9	NS	160	113	SP13	100	99	98	SP17	NS	114	115
SP4	226	224	221	SP10	206	207	200	SP14	100	100	99				
SP5	204	211	210												
SP6	271	270	276												

W = winter, S = summer, A = autumn.

NS = no sample due to inclement weather conditions.

3.1.2 Dissolved oxygen

Winter

The percentages of dissolved oxygen in the surface water at the various sites in and near the permit area (SP1 to SP6) were approximately 96% (**Figure 3-1**). In general, the dissolved oxygen remained fairly constant at 96% to approximately 70 m depth, at which the dissolved oxygen rapidly declined to 50% at approximately 100 m. There was a gradual decline of dissolved oxygen after this point to the lowest level, which was approximately 35% in the bottom water.

The percentages of dissolved oxygen at sites around Evans Shoal and Tassie Shoal, although on the whole shallower than sites in the permit area, still exhibited a similar vertical distribution pattern according to the depth of the site (**Figure 3-1**). For example the dissolved oxygen of the very shallow sites, SP7 and SP11 in less than 30 m depth did not change from top to bottom. At other sites SP12, SP13 and SP14, at approximately 100 m depth, had similar percentages of dissolved oxygen from the surface to 80 m which then declined rapidly to the seabed.

Summer

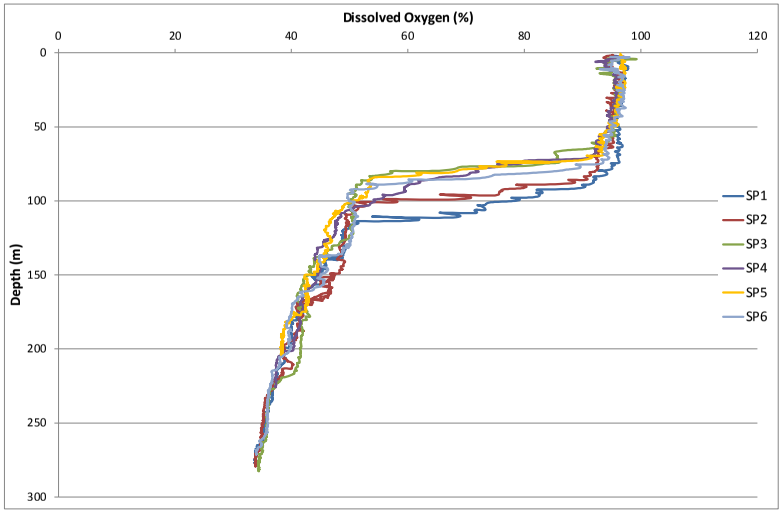
Dissolved oxygen was approximately 90% in the surface water at the various sites in and near the permit area (SP1 to SP6) (**Figure 3-2**). In general, the dissolved oxygen remained relatively constant from the surface to around 45 m deep at most sites and to 60 m deep at SP1 and SP2. There was a rapid decrease in dissolved oxygen at sites SP3, SP4 and SP6 from 90% to 70% at approximately 60 m depth, and then more gradual decline of dissolved oxygen with increasing depth to the lowest level of approximately 32% in the bottom water. Dissolved oxygen at SP5 decreased rapidly from 90% at 45 m to 42% at 80 m, remained constant until 144 m and then rapidly increased to 55% at 150 m, and then gradually declined to 35% in the bottom water. Similar dissolved oxygen profiles were recorded at sites SP5 and SP6 with the pertinent changes generally occurring in slightly deeper waters.

Although generally shallower than the permit area sites, dissolved oxygen at sites around Evans Shoal, Tassie Shoal and Lynedoch Bank exhibited a similar vertical pattern according to the depth of the site (**Figure 3-2**). For example, dissolved oxygen at the shallowest (<30 m deep) sites, SP7, SP11 and SP16, did not change from surface water to bottom water. At the remaining sites, trends in dissolved oxygen profiles were similar, with a layer of relatively constant dissolved oxygen in surface waters followed by a rapid decline from 90% to 50% over approximately 40 m, and then a further gradual decline to the seafloor.

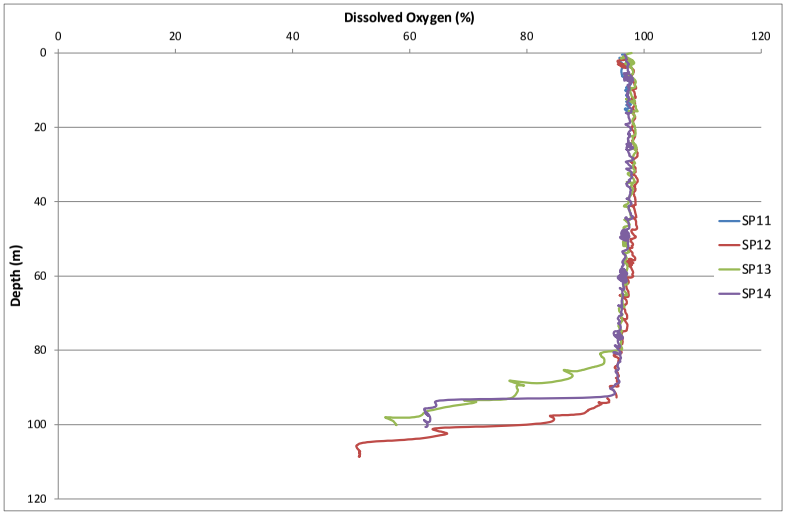
Autumn

Dissolved oxygen saturation was approximately 99% in the surface water at the various sites in and near the permit area (SP1 to SP6) (**Figure 3-3**). In general, the dissolved oxygen remained relatively constant from the surface to approximately 60 m depth at all sites. There was a rapid decrease in dissolved oxygen from 100% to 50% at approximately 100 m and then a more gradual decline of dissolved oxygen with increasing depth to the lowest saturation level of approximately 40% in the bottom water.

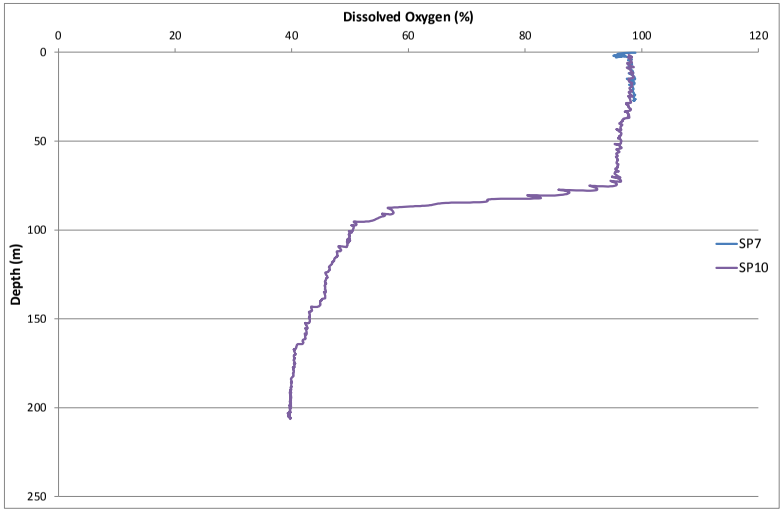
Although generally shallower than the permit area sites, dissolved oxygen at sites around Evans Shoal, Tassie Shoal and Lynedoch Bank exhibited a similar vertical distribution pattern according to the depth of the site (**Figure 3-3**). For example, dissolved oxygen at the shallowest (<30 m deep) sites, SP7, SP11 and SP16, did not change from surface water to bottom water. At the remaining sites, trends in dissolved oxygen profiles were similar to those at the permit area, with a layer of relatively constant dissolved oxygen in surface waters (approximately 60 m) followed by a rapid decline from 100% to 50% over approximately 40 m, and then a further gradual decline to the seafloor.



a) Permit area

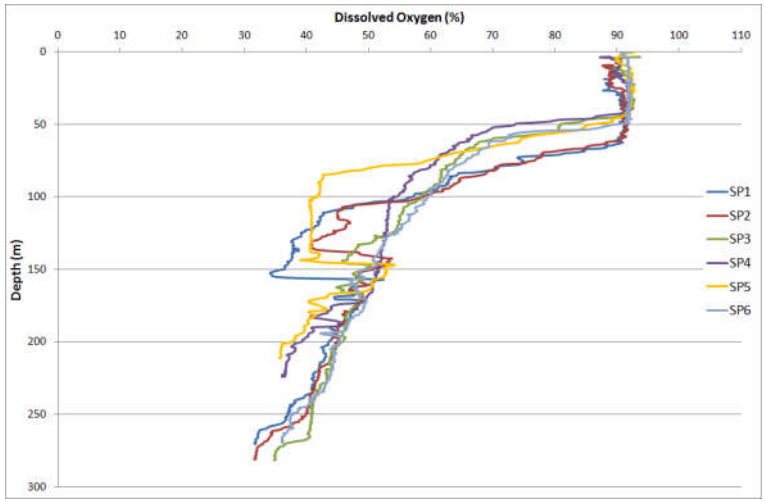


c) Tassie Shoal

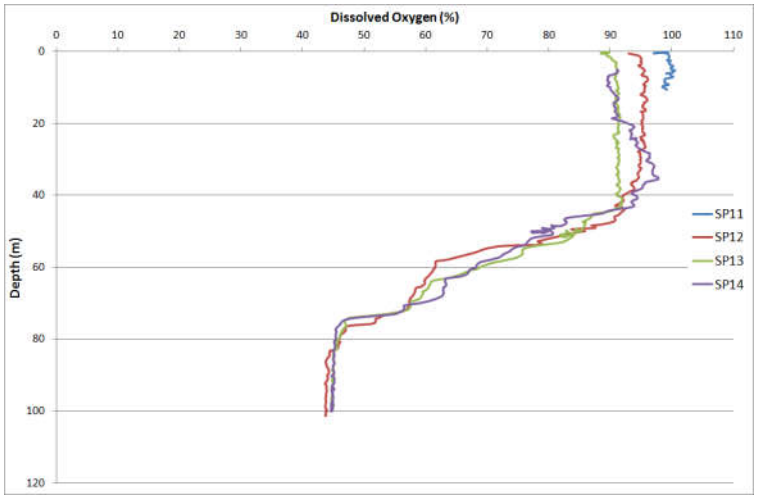


b) Evans Shoal

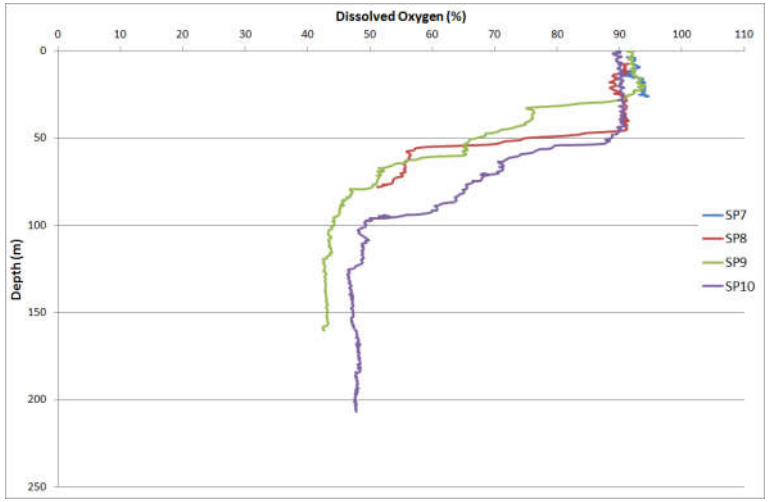
Figure 3-1: Dissolved oxygen profiles – winter



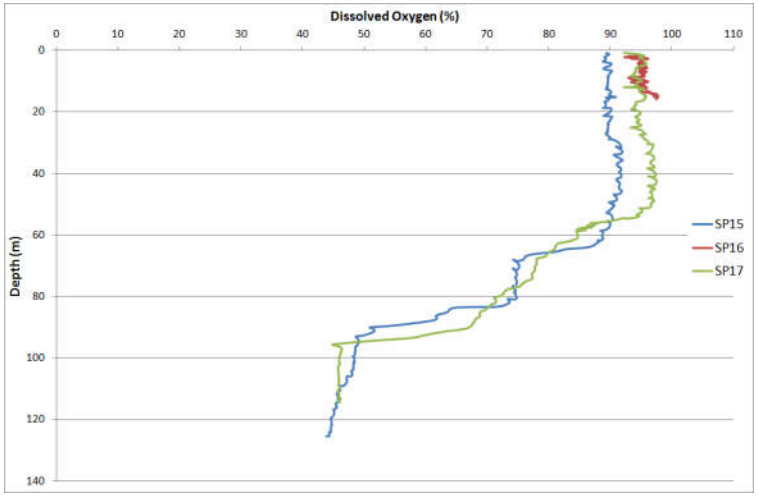
a) Permit area



c) Tassie Shoal

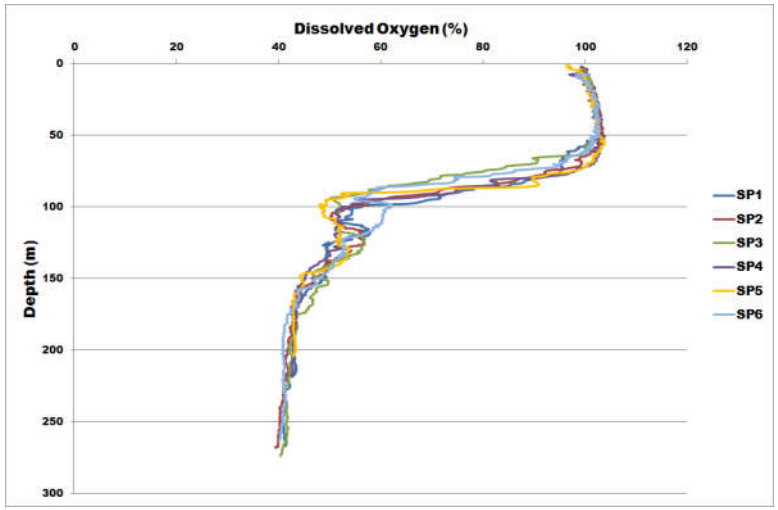


b) Evans Shoal

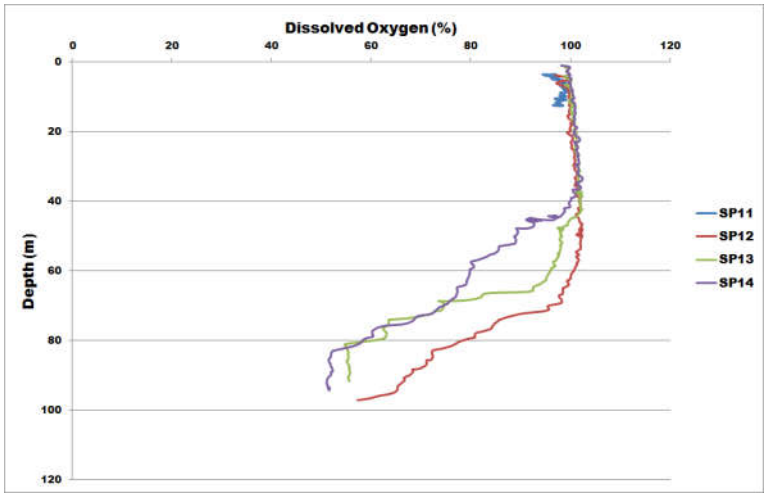


d) Lynedoch Bank

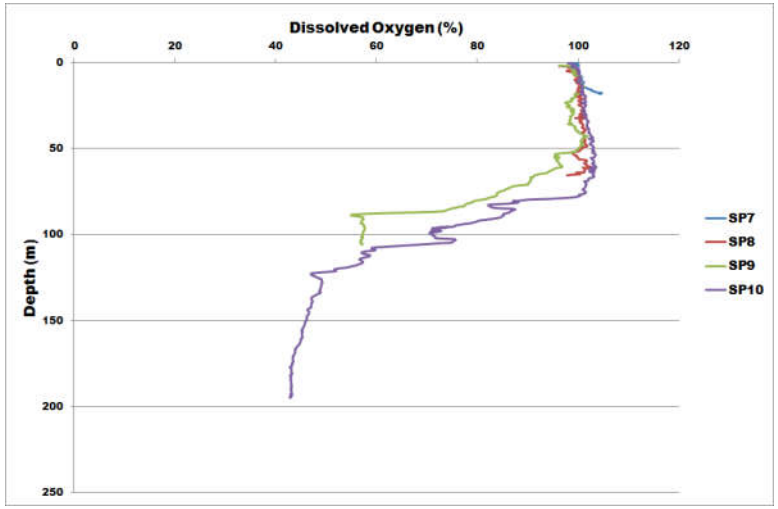
Figure 3-2: Dissolved oxygen profiles – summer



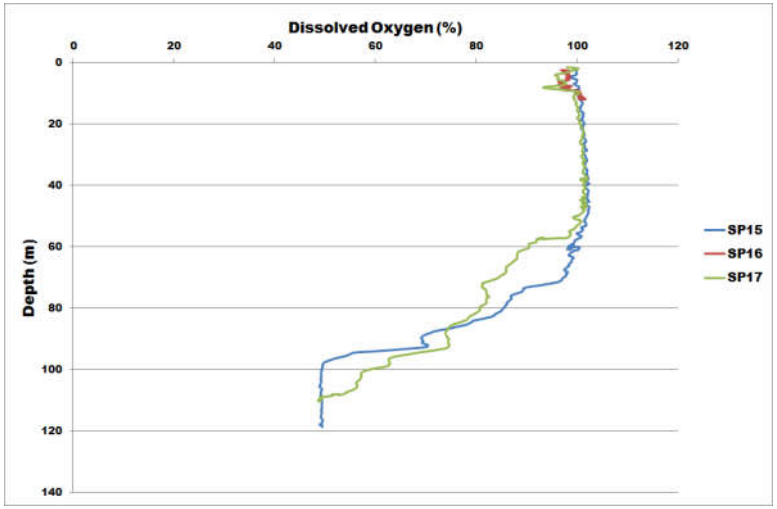
a) Permit area



c) Tassie Shoal



b) Evans Shoal



d) Lynedoch Bank

Figure 3-3: Dissolved oxygen profiles – autumn

3.1.3 Salinity

Winter

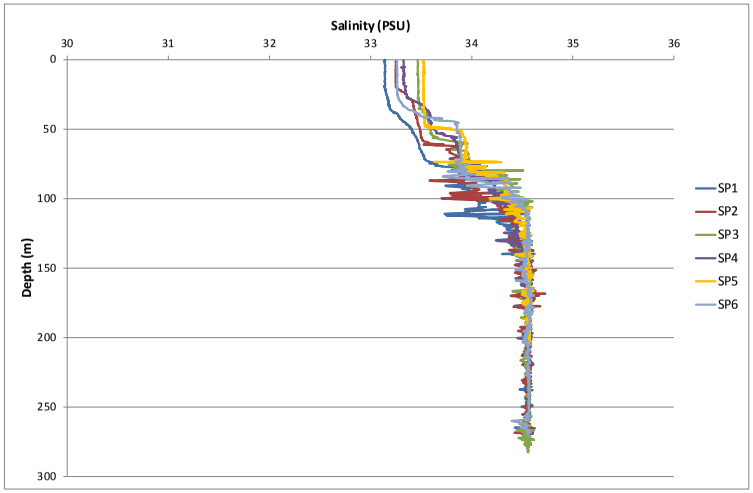
The vertical distributions of the salinity profiles of the various sites from within and around the permit area, Evans Shoal and Tassie Shoal (**Figure 3-4**) were similar depending on the depth of the individual site. Generally, the salinity was stable from the surface to the first 20 to 50 m, with a stepwise increase in salinity to approximately 75 m. After 75 m the salinity was quite erratic until 100 to 120 m then was stable to the seabed. The salinity at the surface ranged from 33.1 to 33.8 PSU depending on the site, which increased to approximately 34.5 PSU at the deepest sites.

Summer

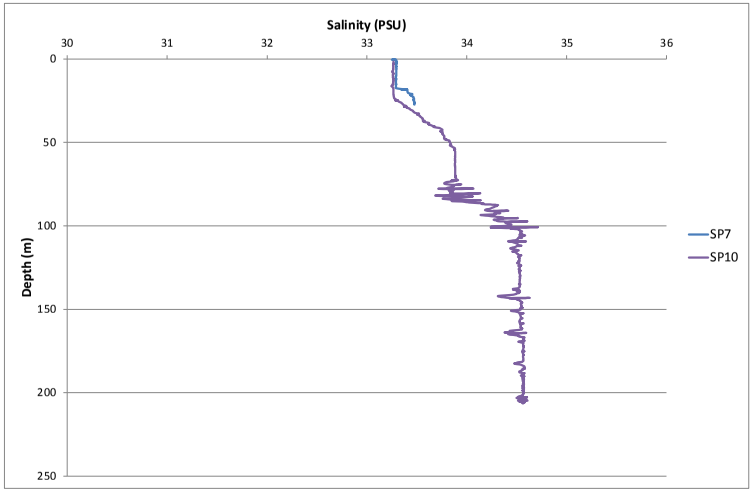
The vertical salinity profiles of the various sites within and around the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank (**Figure 3-5**) were similar and did not change markedly with depth. Generally, salinity was stable at approximately 34.0 PSU from the surface to 50 m depth and then increased slightly to the seabed. The change in salinity from surface to bottom was minor and depended on the depth of the site. At the shallowest sites (<30 m deep), there was no change in salinity from surface water to bottom water. At the mid-depth sites (approximately 100 m deep) salinity increased by approximately 0.2 PSU from surface to bottom. At the deepest sites (>200 m deep), there was an increase of 0.4 PSU from surface to bottom.

Autumn

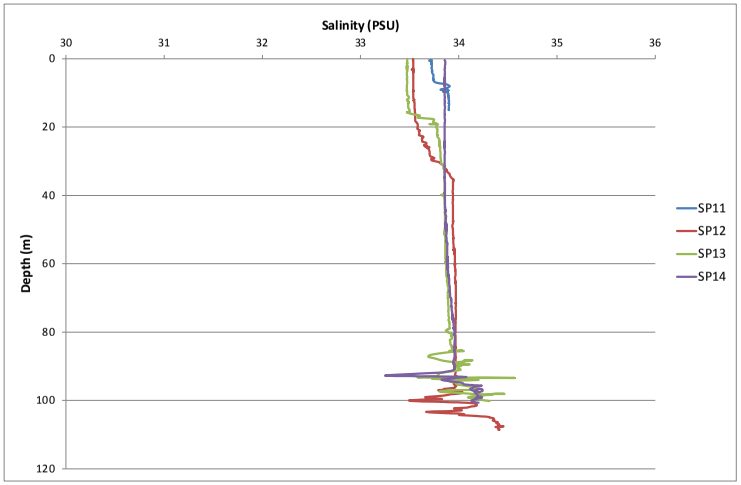
The vertical salinity profiles of the various sites within and around the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank (**Figure 3-6**) were similar and did not change markedly from surface to bottom. Generally, salinity was stable at approximately 34.0 PSU from the surface to approximately 60 m depth and then increased slightly to the seabed. The change in salinity from surface to bottom was minor and depended on the depth of the site. At the shallowest sites (<30 m depth), there was no change in salinity from surface water to bottom water. At the mid-depth sites (approximately 100 m depth), salinity increased by approximately 0.3 PSU. At the deepest sites (>200 m), there was an increase of 0.6 PSU from surface to bottom.



a) Permit area

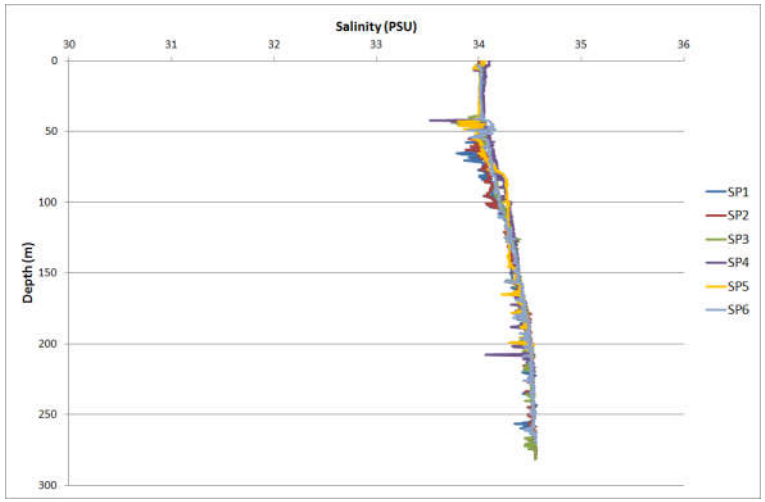


b) Evans Shoal

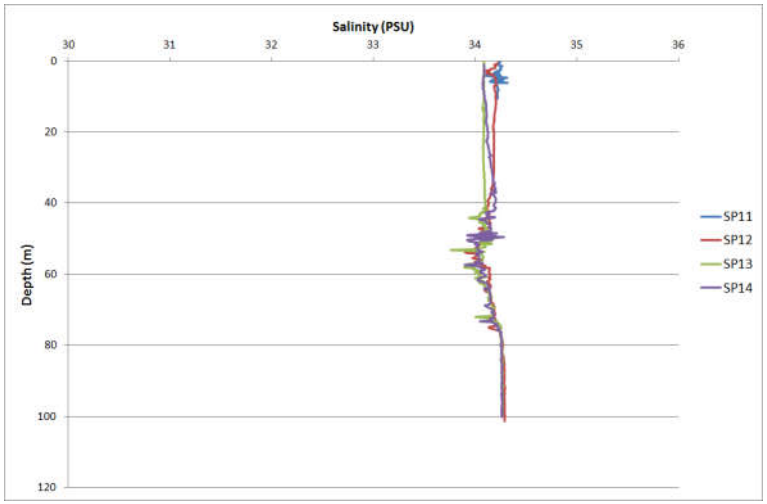


c) Tassie Shoal

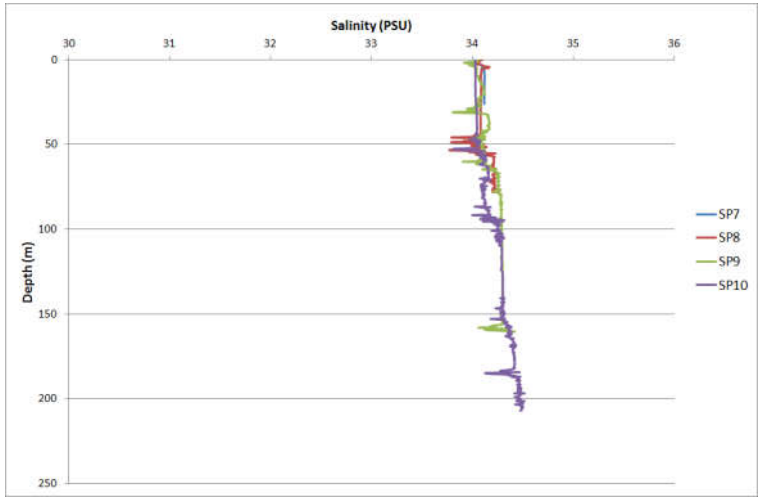
Figure 3-4: Salinity profiles – winter



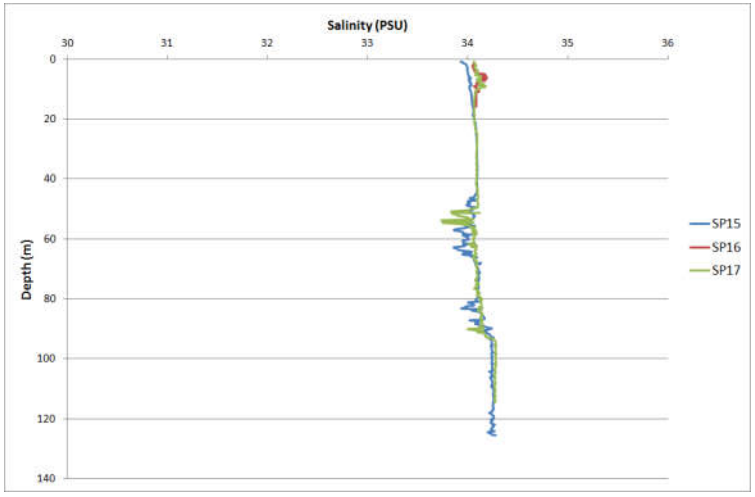
a) Permit area



c) Tassie Shoal

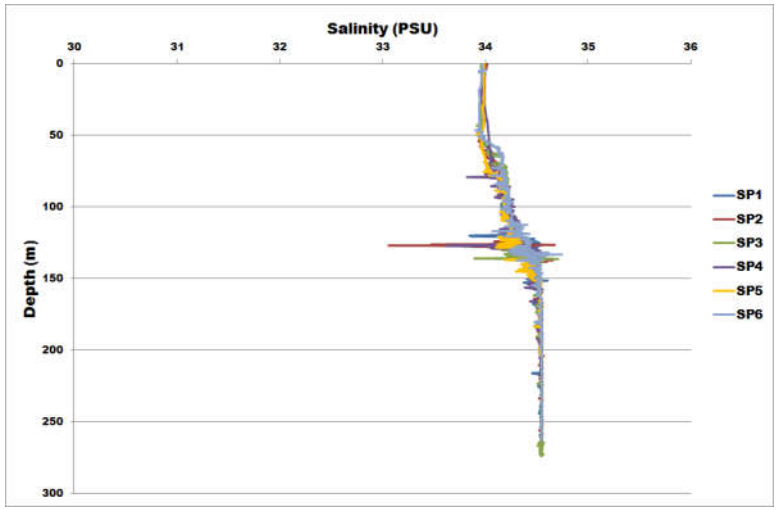


b) Evans Shoal

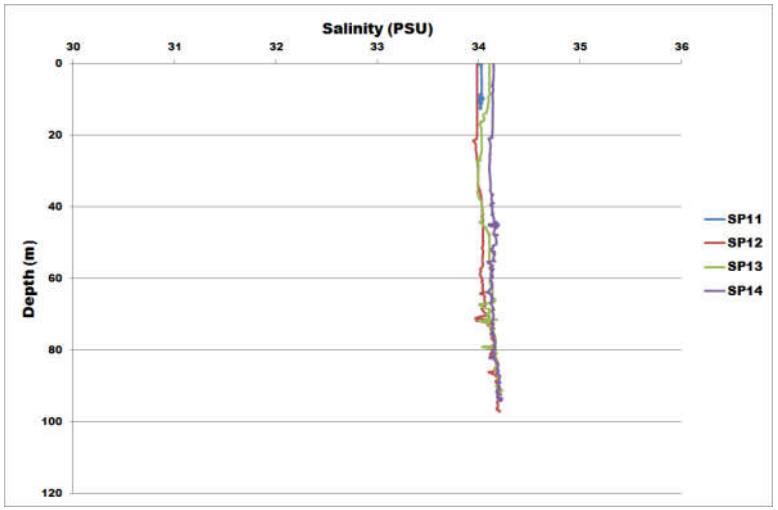


d) Lynedoch Bank

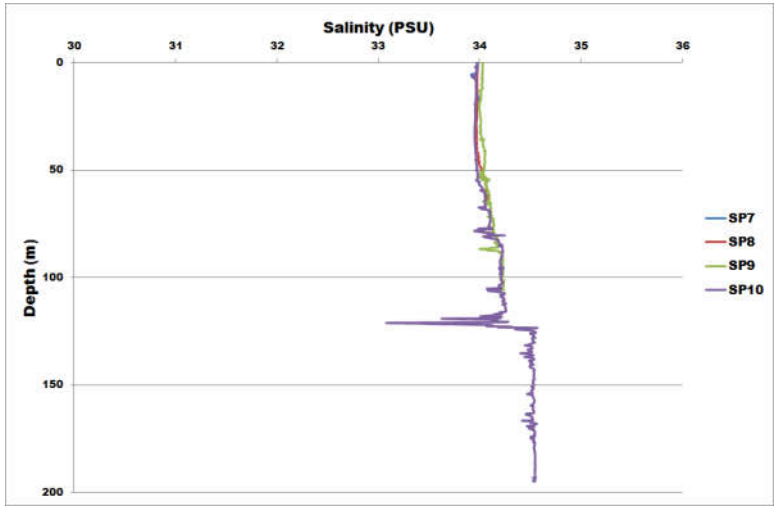
Figure 3-5: Salinity profiles – summer



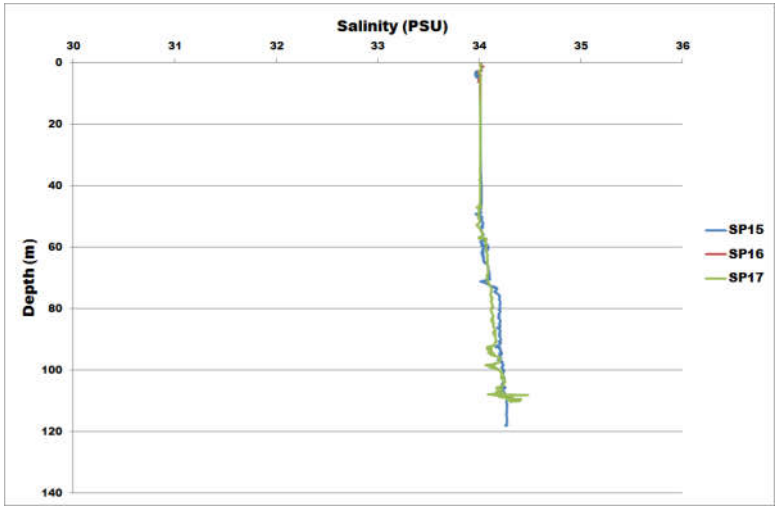
a) Permit area



c) Tassie Shoal



b) Evans Shoal



d) Lynedoch Bank

Figure 3-6: Salinity profiles – autumn

3.1.4 Water temperature

Winter

Temperature in the surface water at each of the sites in and near the permit area (**Figure 3-7**) were generally at 27ºC which stayed constant through the water column until approximately 50 m, at that point there was a slight increase in temperature to approximately 27.8ºC for approximately 20 m, then there was a rapid decline in temperature to approximately 17ºC at 150 m. The temperature continued to decline steadily to approximately 11ºC at the bottom of deepest sites.

The vertical profiles of the Evans Shoal and Tassie Shoal sites (**Figure 3-7**) were similar to the permit area sites, depending on the depth of the sample site. For example, the shallow sites SP7 and SP11 changed very little from surface to bottom, the temperature of the sites at 100 m depth (SP12, SP13 and SP14) increased slightly in the first 30 m then remained constant to 80 m from which there was a rapid decline in temperature to the bottom water. The thermocline is considered to lie in the zone in which the greatest temperature decrease occurs; in this case it occurred between approximately 70 m and 150 m. The zone above the thermocline is called 'the mixed zone' and the zone below it 'the deep zone'.

Summer

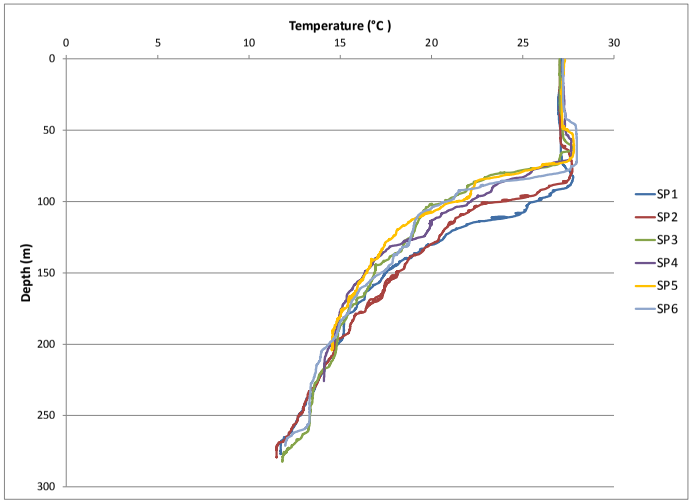
Water temperature in the surface layer at sites in and near the permit area (**Figure 3-8**) was generally around 29°C and stayed constant through the water column until approximately 40 m depth at most sites and until 50 m depth at SP1 and SP2. There was a rapid decline in temperature to approximately 25°C at 50 m at most sites and at 70 m depth at SP1 and SP2. Water temperature gradually declined to approximately 13ºC at the bottom of deepest sites.

The vertical profiles of the Evans Shoal sites, Tassie Shoal sites and Lynedoch Bank sites (**Figure 3-8**) were similar to those observed at the permit area sites, depending on the depth of the site. For example, the shallow sites SP7, SP11 and SP16 changed very little from surface to bottom. The sites that were around 100 m deep (namely SP8, SP9, SP12, SP13, SP14, SP15 and SP17) had constant water temperatures of 29°C in the upper 50 m of water, which then decreased rapidly to 25°C in the next 20 m of water and then gradually declined to the bottom water. The thermocline is considered to lie in the zone in which the greatest temperature decrease occurs; in this case it occurred between approximately 40 m and 70 m.

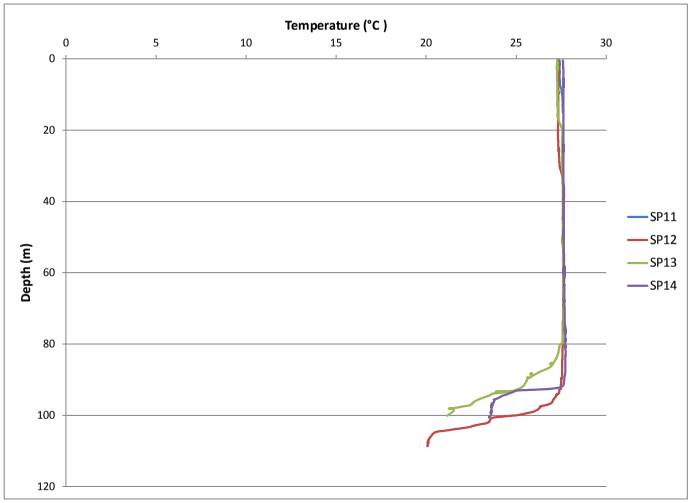
Autumn

Water temperature in the surface layer at sites in and near the permit area (**Figure 3-9)** was generally around 30ºC and stayed constant through the water column until a depth of approximately 50 m. Temperature declined to approximately 25ºC at approximately 110 m, rapidly declined to approximately 16ºC at 140 m and gradually declined to approximately 12ºC at the bottom of deepest sites.

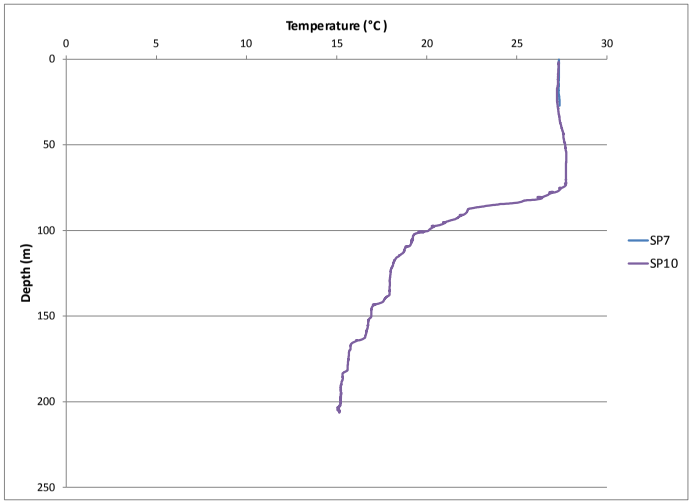
The vertical profiles of Evans Shoal, Tassie Shoal and Lynedoch Bank sites (**Figure 3-9**) were similar to those observed at the permit area sites, depending on the depth of the site. For example, the temperature of the shallow sites SP7, SP11 and SP16 changed very little from surface to bottom. The sites that were around 100 m deep (namely SP8, SP9, SP12, SP13, SP14, SP15 and SP17) had constant water temperatures of 30ºC in the upper 50 m of water, declining to approximately 25ºC in the bottom water. The thermocline is considered to lie in the zone in which the greatest temperature decrease occurs; in this case it occurred between 100 m and 150 m.



a) Permit area

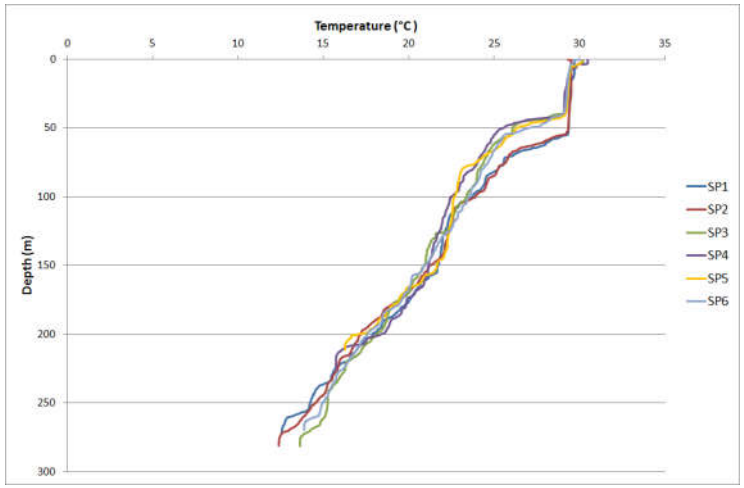


c) Tassie Shoal

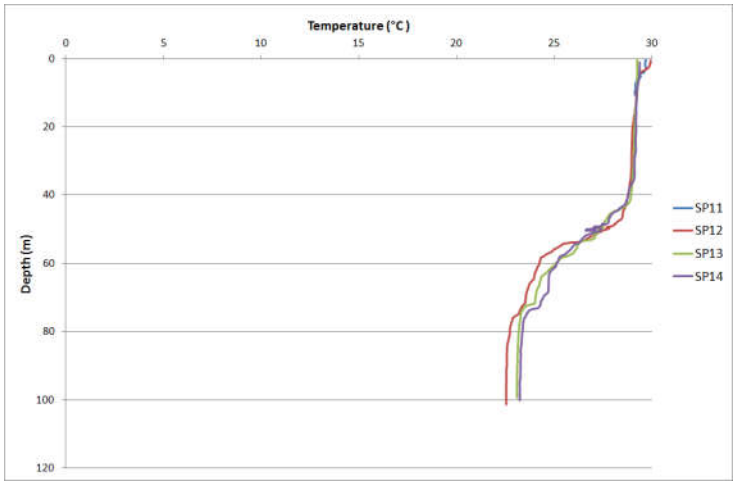


b) Evans Shoal

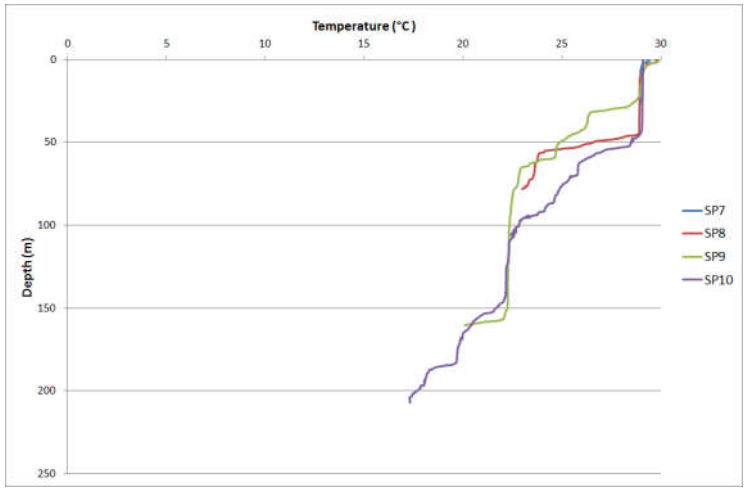
Figure 3-7: Temperature profiles – winter



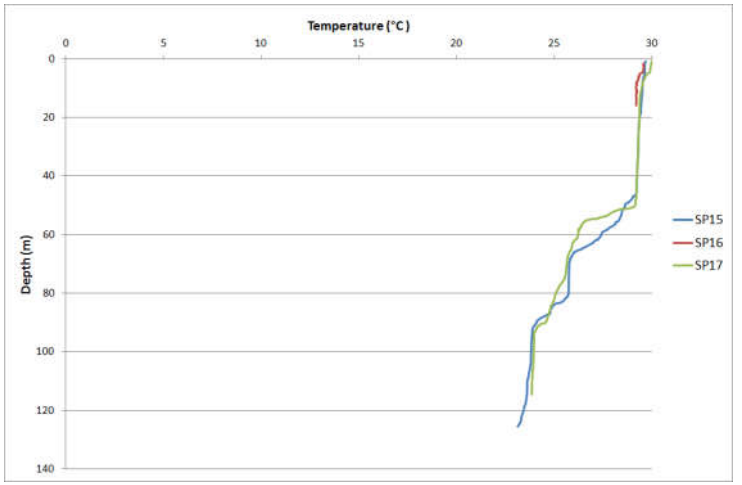
a) Permit area



c) Tassie Shoal

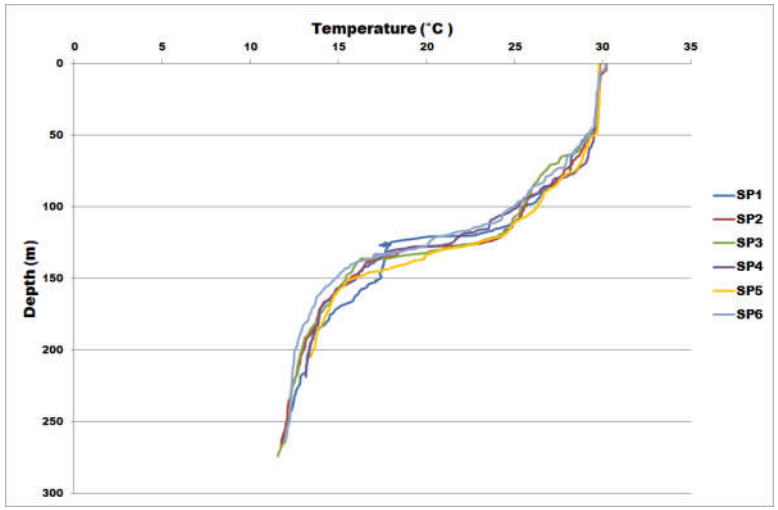


b) Evans Shoal

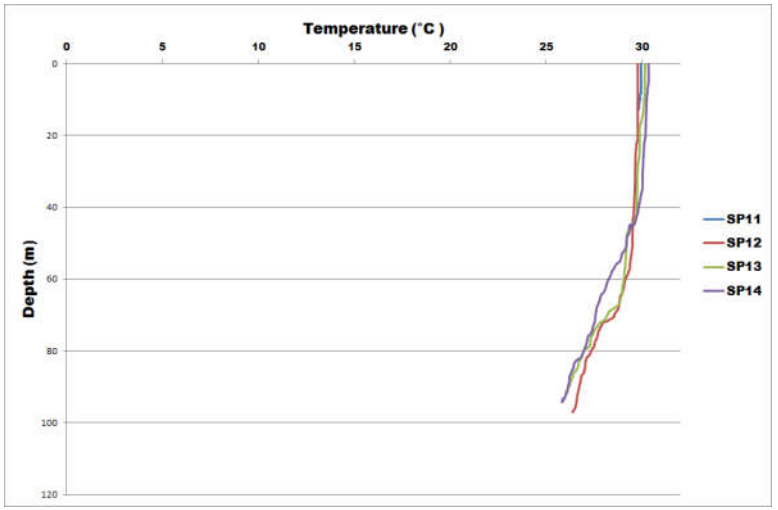


d) Lynedoch Bank

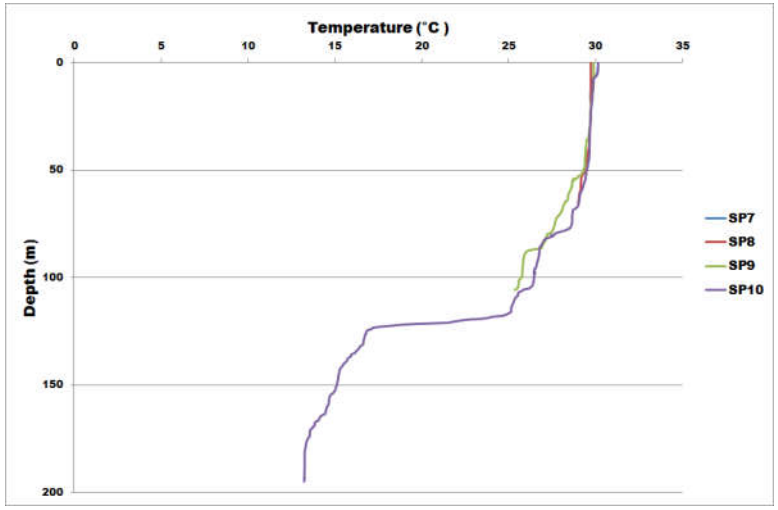
Figure 3-8: Temperature profiles – summer



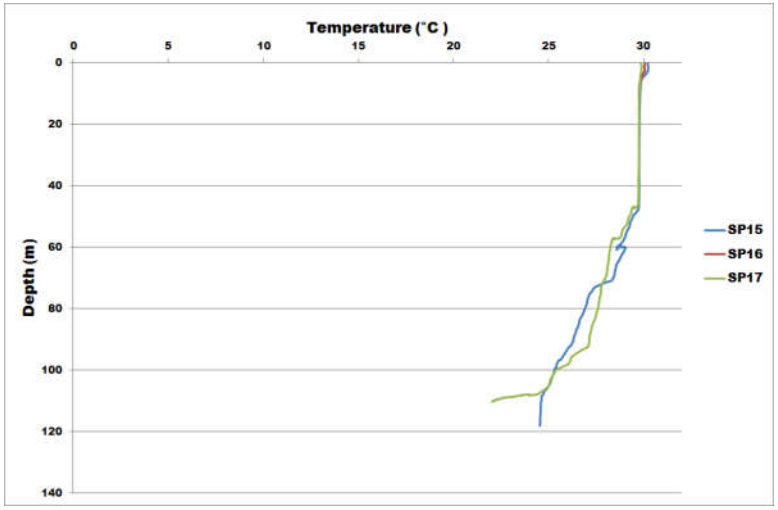
a) Permit area



c) Tassie Shoal



b) Evans Shoal



d) Lynedoch Bank

Figure 3-9: Temperature profiles – autumn

3.1.5 Turbidity

Winter

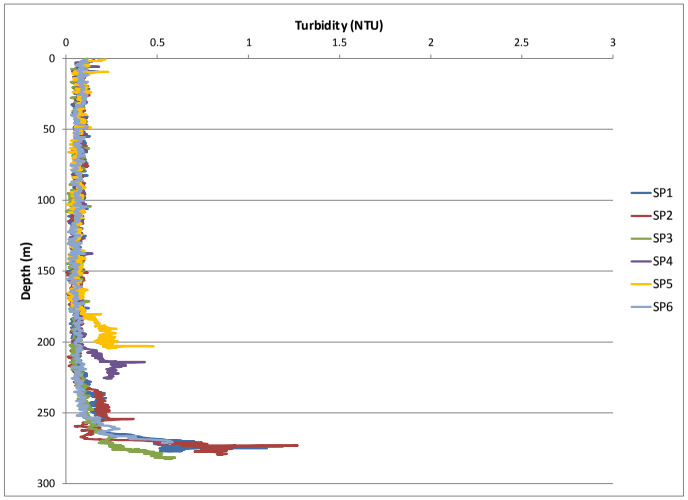
The turbidity of the water at sites in and around the permit area, Evans Shoal and Tassie Shoal were very low (<1.3 NTU) at all sites from the surface to near the seabed (**Figure 3-10**). It was constant at < 0.1 NTU from the surface to approximately 20–50 m from the bottom, at that point the turbidity increased towards the seabed; however, the increase was only minor. The exception was the shallow sites which remained similar from surface to bottom. Site SP10 had very slight increase in turbidity at 80 m.

Summer

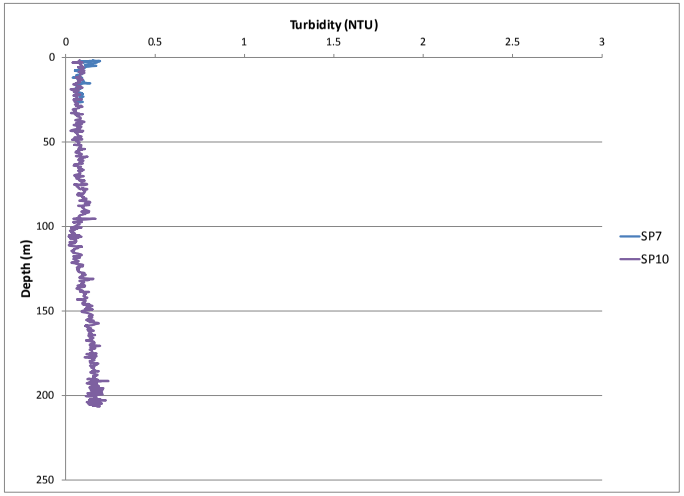
Turbidity at all sites in and around the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank was very low (<2 NTU) from the surface to near the seabed (**Figure 3-11**). At most sites, turbidity was constant at <0.1 NTU from the surface to approximately 20–50 m above the seabed, at which point the turbidity increased slightly to the bottom. The exception was at shallow sites whereby turbidity remained similar throughout the water column. Sites SP1, SP2 and SP5 had very slight increases in turbidity between 80 m and 156 m.

Autumn

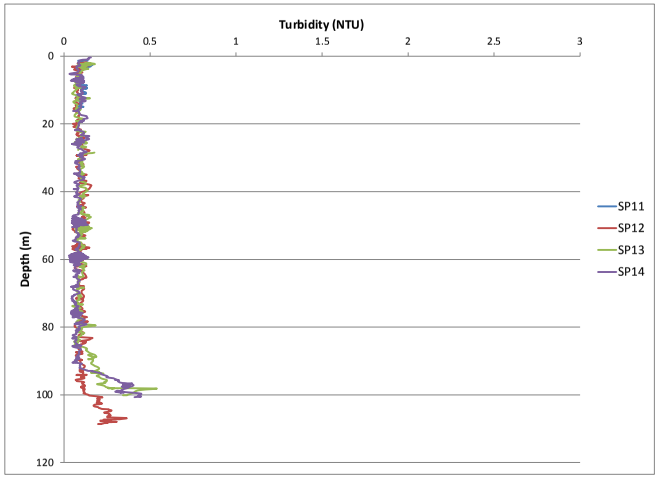
Turbidity at all sites in and around the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank were very low (<0.5 NTU) from the surface to near the seabed (**Figure 3-12**). At most sites, turbidity was constant at <0.1 NTU from the surface to approximately 20–50 m above the seabed, below which turbidity increased towards the seabed; however, this increase was slight. The exception was the shallow sites (≤25 m), where turbidity remained similar throughout the water column.



a) Permit area

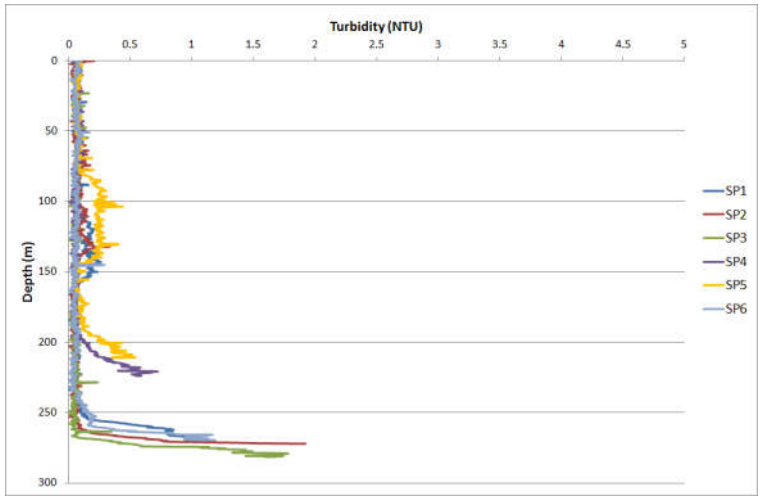


b) Evans Shoal

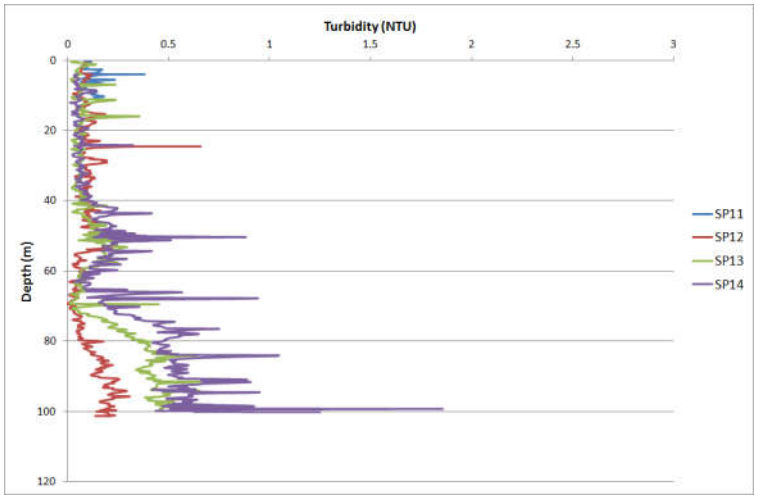


c) Tassie Shoal

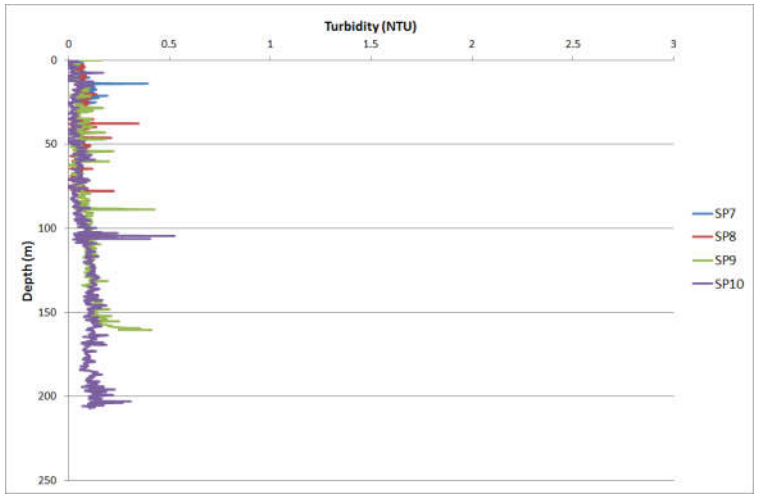
Figure 3-10: Turbidity profiles – winter



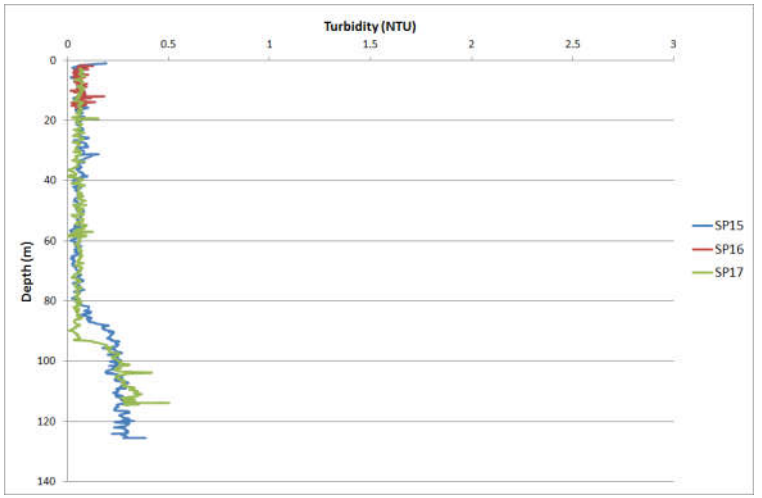
a) Permit area



c) Tassie Shoal

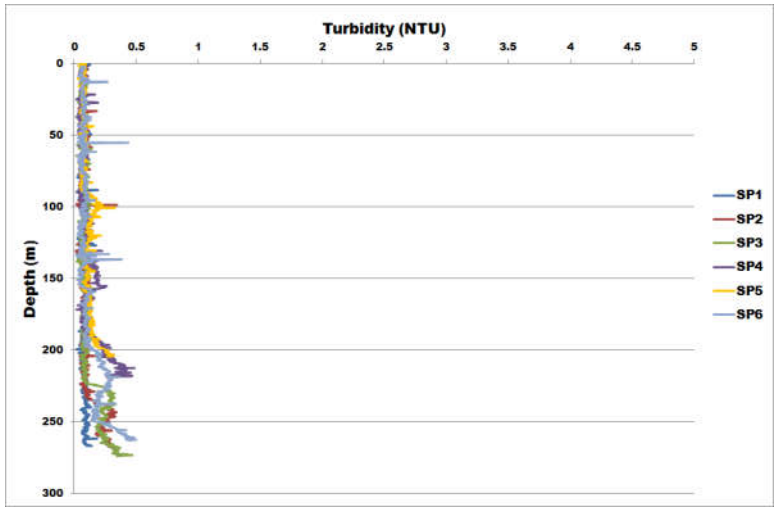


b) Evans Shoal

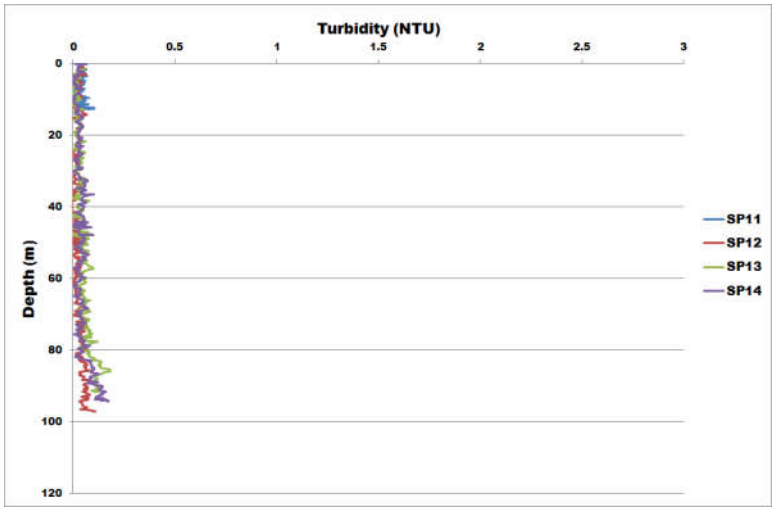


d) Lynedoch Bank

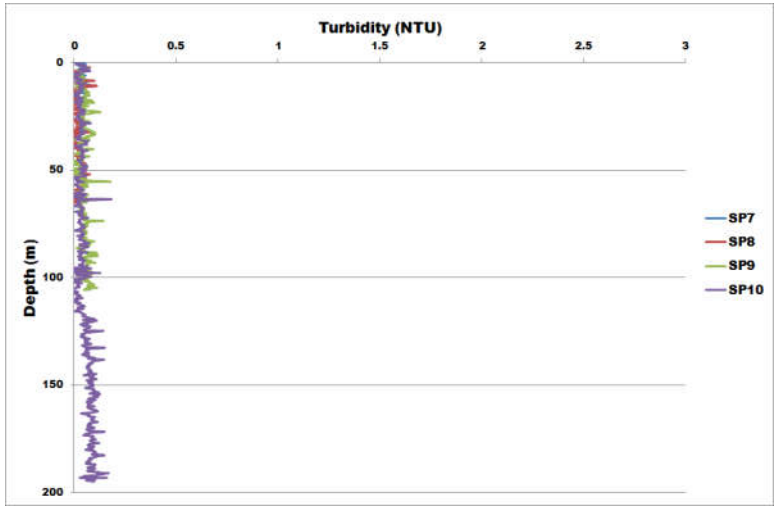
Figure 3-11: Turbidity profiles – summer



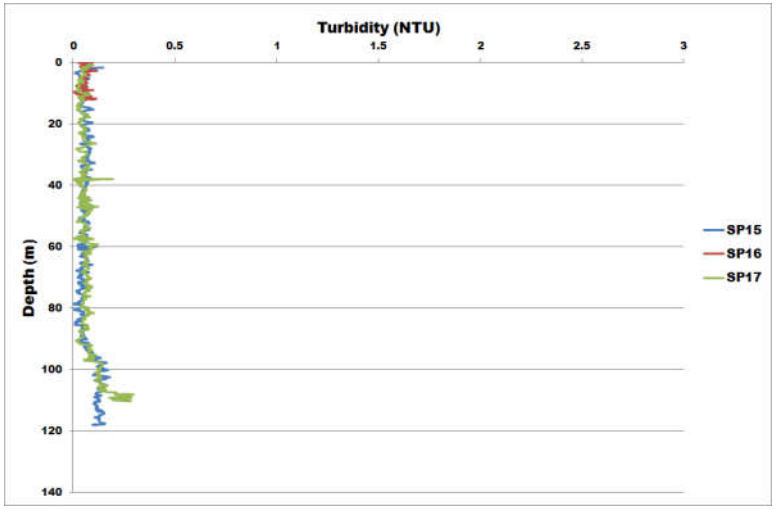
a) Permit area



c) Tassie Shoal



b) Evans Shoal



d) Lynedoch Bank

Figure 3-12: Turbidity profiles – autumn

3.1.6 TSS

Winter

TSS concentrations were below detection limit at the surface of the selected sites sampled during this survey (**Table 3-2**).

Summer

TSS concentrations were low (≤1 mg/L) at the water surface of all sites sampled during this survey, and below the laboratory detection limit at sites SP2 and SP6 (**Table 3-2**).

Autumn

No sampling of TSS was undertaken at any of the sites during the autumn survey.

Table 3-2: TSS in surface water at selected sites

Location	Sites	Turbidity (mg/L)	
		Winter	Summer
Permit area	SP2	<0.5	<0.5
	SP3	<0.5	0.8
	SP6	<0.5	<0.5
Evans Shoal	SP7	NS	0.7
Tassie Shoal	SP12	<0.5	0.8
Lynedoch Bank	SP16	NS	1.0

NS – no sample

3.1.7 pH

Winter

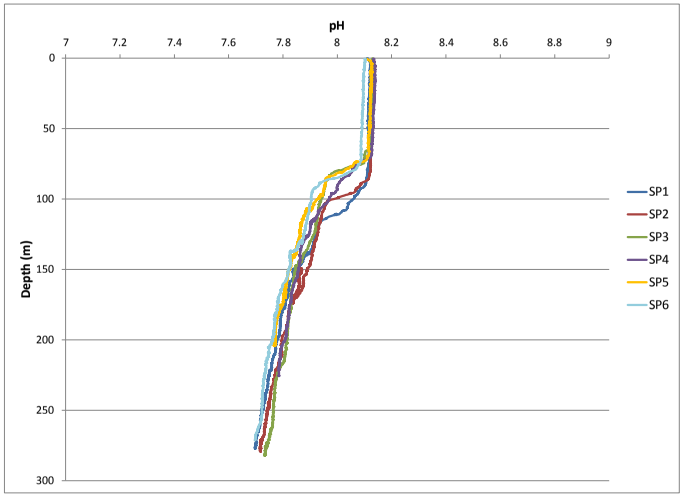
The pH of the surface water for each of the sites from in and around the permit area, Evans Shoal and Tassie Shoal (Figure 3-13) was approximately 8.1. The pH remained stable from the surface waters to approximately 80 m and then decreased rapidly to 7.9 at about 100 m of water depth. The pH decreased further to approximately 7.7 at the deepest sites.

Summer

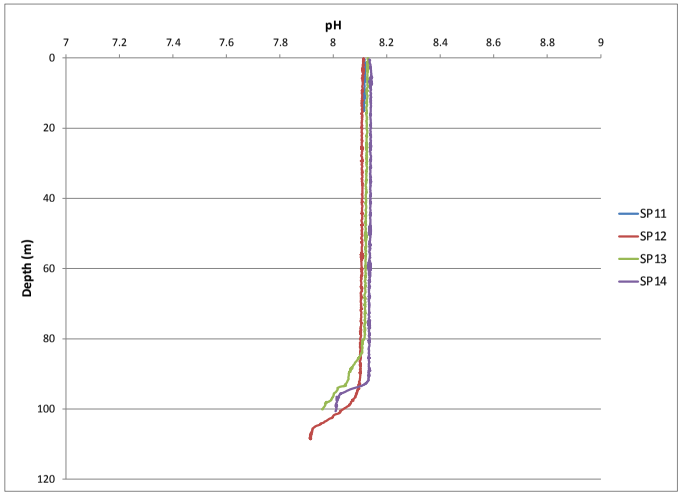
The pH of the surface water for sites within and around the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank (**Figure 3-14**) ranged from 8.15 to 8.25. The pH remained stable from the surface waters to ~50 m depth; there was a rapid decrease after this and then a more gradual decrease to the bottom water. The pH decreased to approximately 7.9 at the deepest sites. The shape of the individual pH profiles was similar to the dissolved oxygen profiles.

Autumn

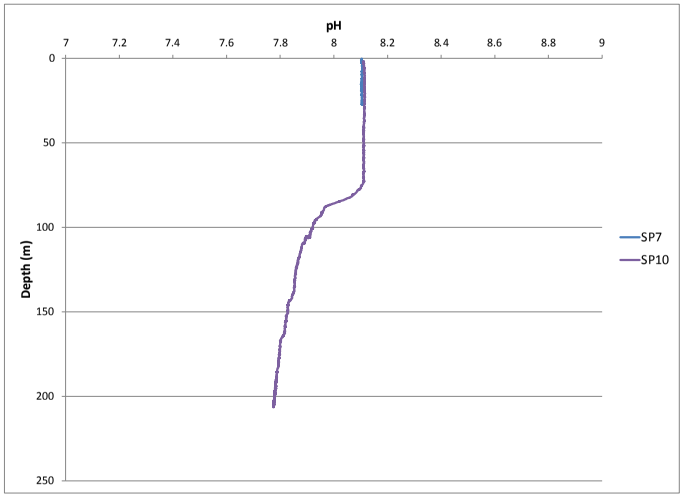
The pH of the surface water for sites within and around the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank (**Figure 3-15**) ranged from 8.19 to 8.31. The pH remained stable from the surface waters to approximately 60 m depth and then decreased rapidly to 8.0 at approximately 110 m deep, there was more gradual decrease to the seabed. The pH decreased to approximately 7.7 at the deepest sites (>200 m). The shape of the individual pH profiles was similar to that of the dissolved oxygen profiles.



a) Permit area

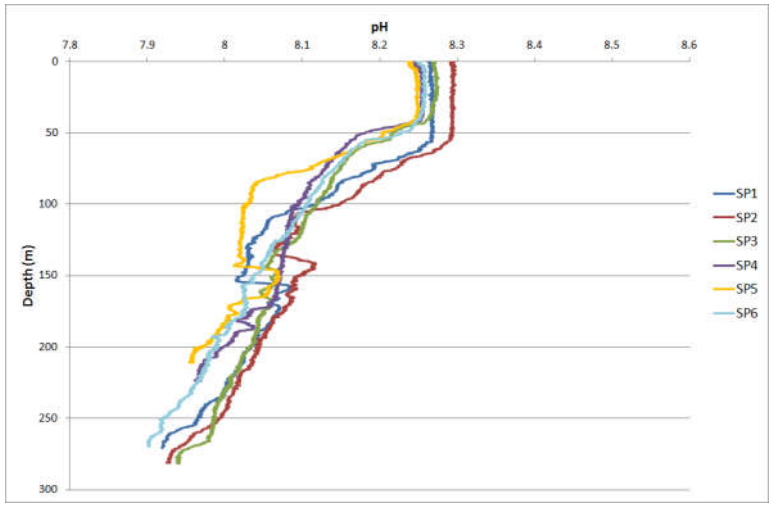


c) Tassie Shoal

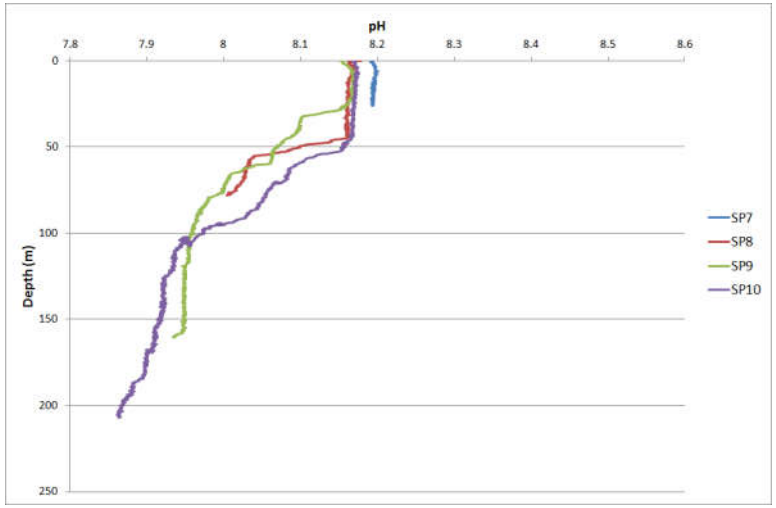


b) Evans Shoal

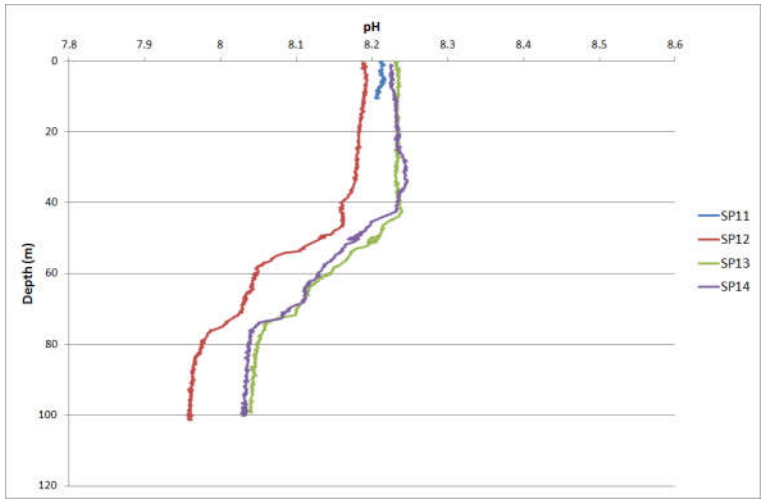
Figure 3-13: pH profiles – winter



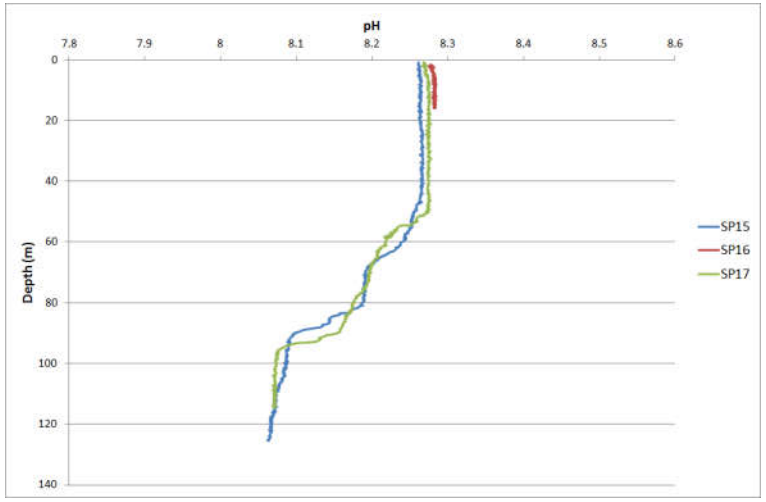
a) Permit area



b) Evans Shoal

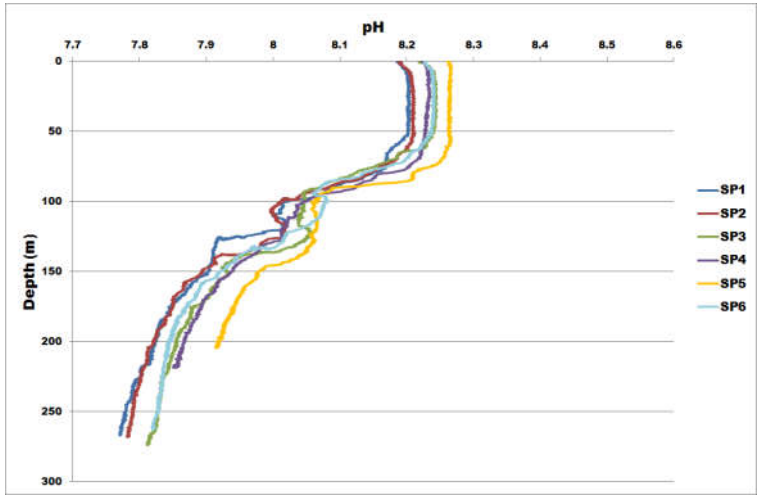


c) Tassie Shoal

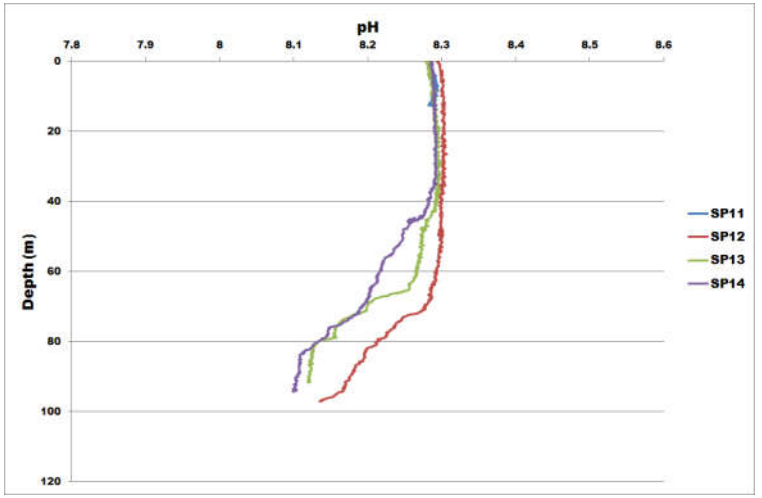


d) Lynedoch Bank

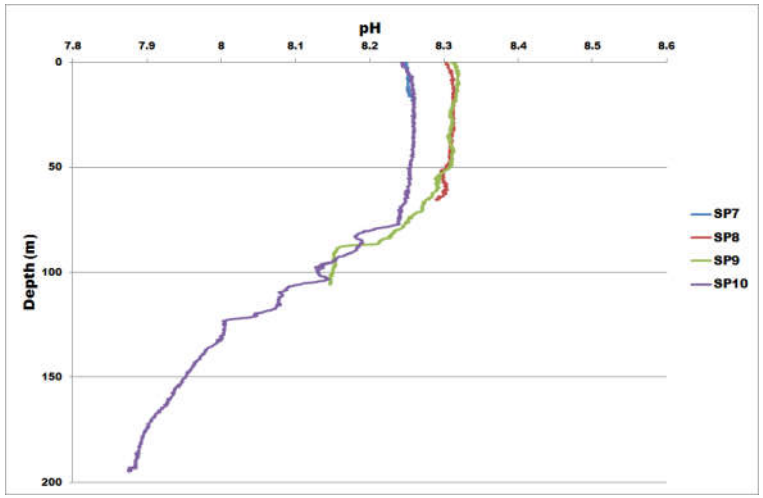
Figure 3-14: pH profiles – summer



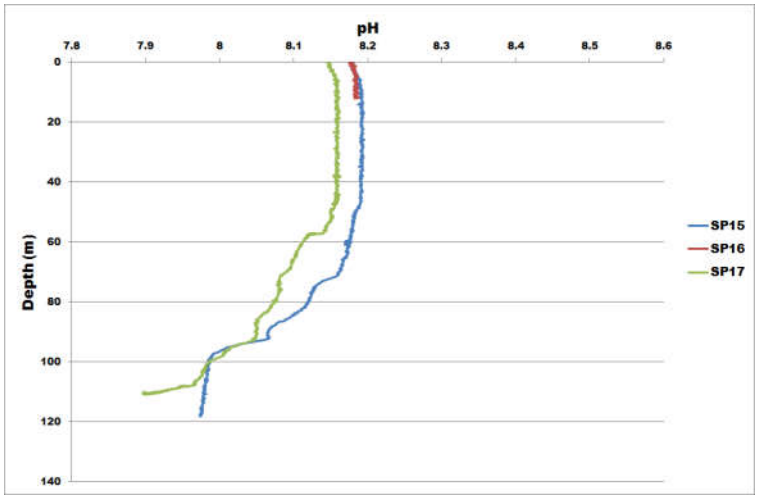
a) Permit area



c) Tassie Shoal



b) Evans Shoal



d) Lynedoch Bank

Figure 3-15: pH profiles – autumn

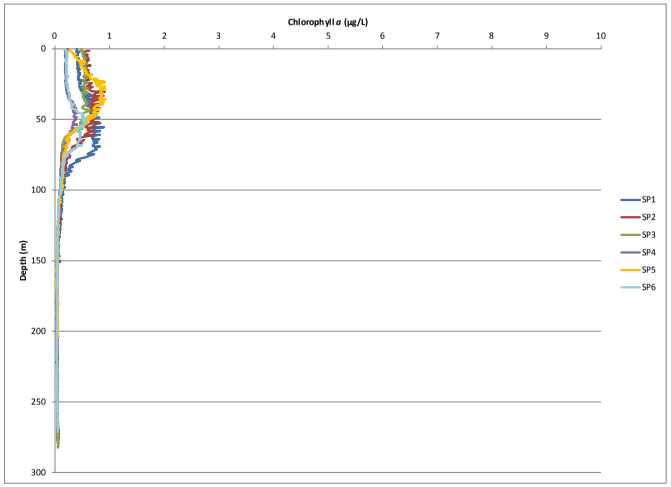
3.1.8 Chlorophyll *a*

Winter

As expected, chlorophyll *a* was highest in the surface water compared with deeper water over 100 m, where the penetration of light would be minimal. The chlorophyll *a* concentrations were very low throughout the water column (<1 µg/L) and appeared to peak at different depths for the various sites in each area (**Figure 3-16**). The chlorophyll *a* concentration at SP5 increased from the surface water to approximately 30 m. For most of the other sites the highest concentration occurred at 50–60 m.

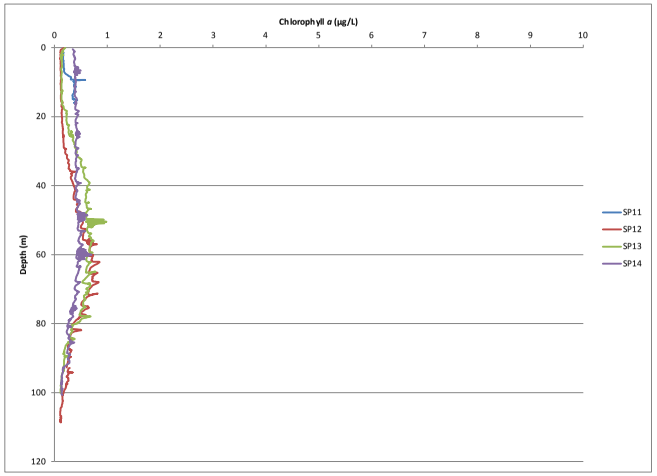
Autumn

Chlorophyll *a* concentrations of the surface water for sites in and around the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank were <0.1 µg/L (**Figure 3-17**). Chlorophyll *a* concentrations generally peaked at approximately 70 m depth and decreased to <0.1 µg/L after 100 m depth, suggesting the euphotic zone reached a depth of approximately 70 m during this survey.



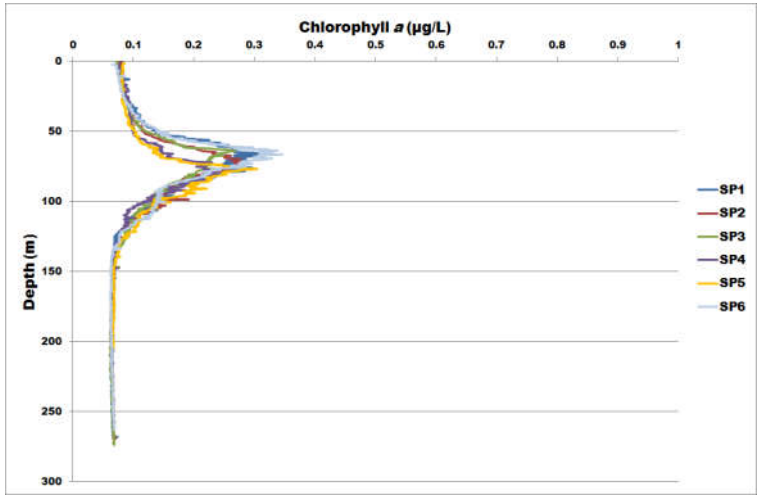
a) Permit area

b) Evans Shoal

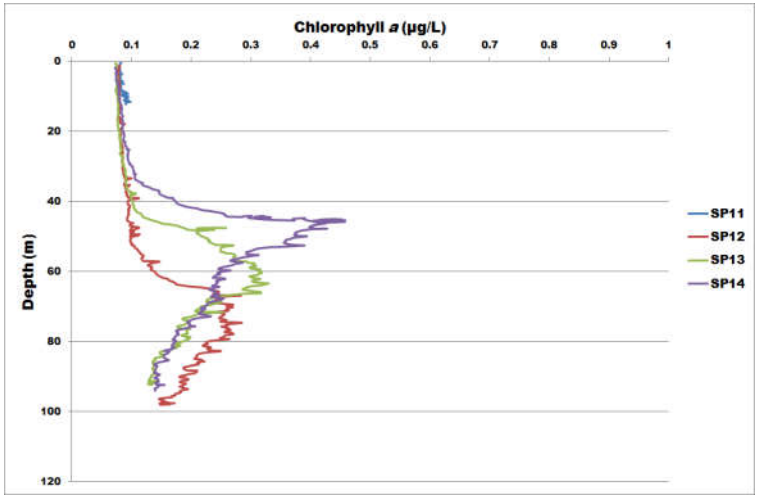


c) Tassie Shoal

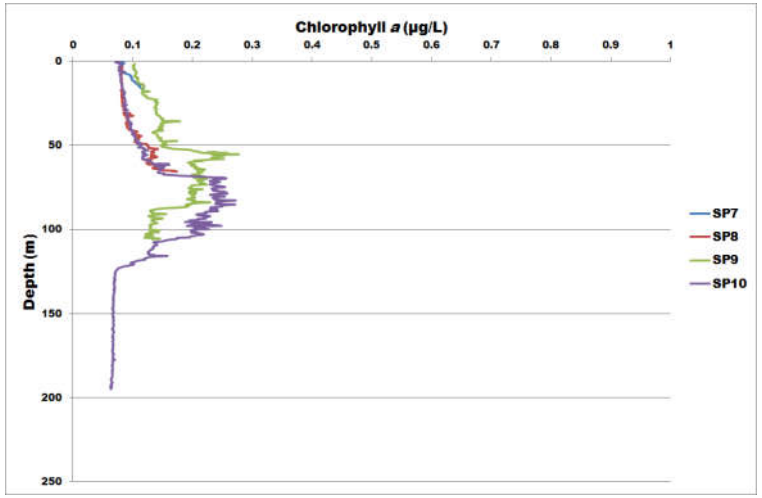
Figure 3-16: Chlorophyll *a* profile – winter



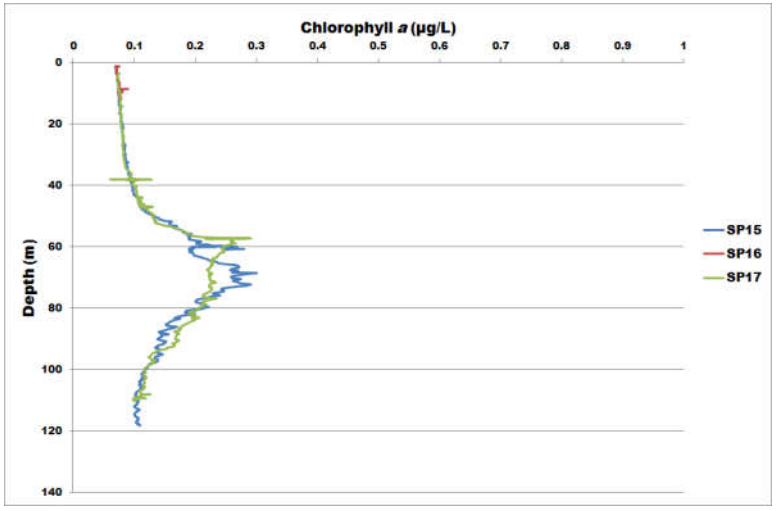
a) Permit area



c) Tassie Shoal



b) Evans Shoal



d) Lynedoch Bank

Figure 3-17: Chlorophyll *a* profile – autumn

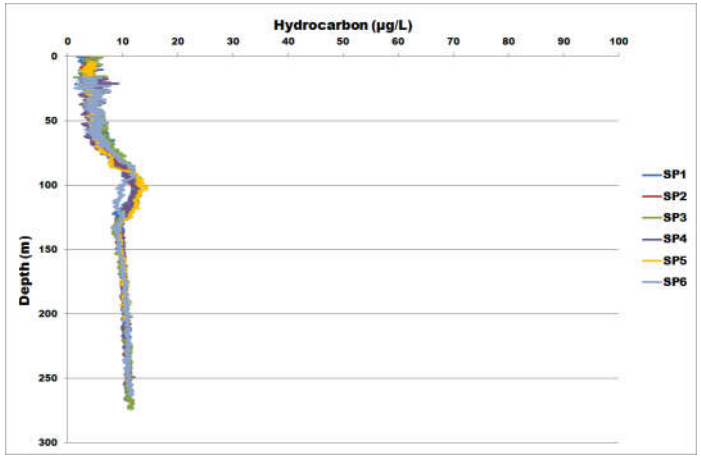
3.1.9 Hydrocarbons

The hydrocarbon profiles at all sites and for all seasons in and around the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank were similar for sites with similar depths therefore only the autumn graphs are shown (**Figure 3-18**). Generally, there was little difference in hydrocarbon readings between the top (4 µg/L) and bottom (11 µg/L) of the water column for any season. These slight differences are considered interferences on the hydrocarbon fluorescence sensor and it is unlikely that they represent changes in hydrocarbon concentrations with depth. At the surface, the sensor readings were very erratic due to high incident light levels interfering with the fluorescence readings. Hydrocarbon profiles also tend to show a reverse of dissolved oxygen profiles, albeit with a much smaller response. If oxygen molecules are present then the amount of fluorescing is reduced, referred to as fluorescence quenching. Therefore, while the oxygen is highest in the mixing zone, the fluorescence sensor had a slightly lower reading compared with deep water where dissolved oxygen is much lower.

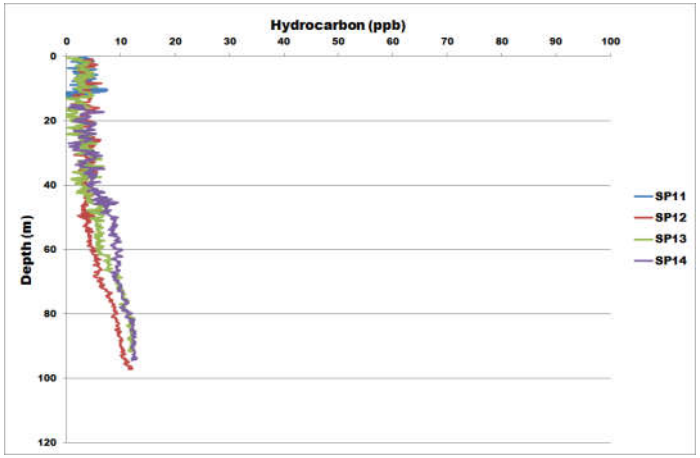
All sites for all seasons produced very similar profiles, without any spikes associated with hydrocarbon presence. It can therefore be concluded that there were no naturally occurring hydrocarbons present at any of the sites sampled during the surveys.

Verification of specific hydrocarbons in seawater can only be completed once laboratory results are available for hydrocarbons samples from the surface, middle and bottom water from each site. If results showed high and low hydrocarbon readings, a correlation coefficient could be calculated to convert the equivalent quinine sulfate concentrations (used to calibrate the sensor) into specific hydrocarbon concentrations. However, all the hydrocarbon readings from the laboratory were below the laboratory detection limit of 20 µg/L (**Section 3.2.3**) so a correlation coefficient could not be calculated.

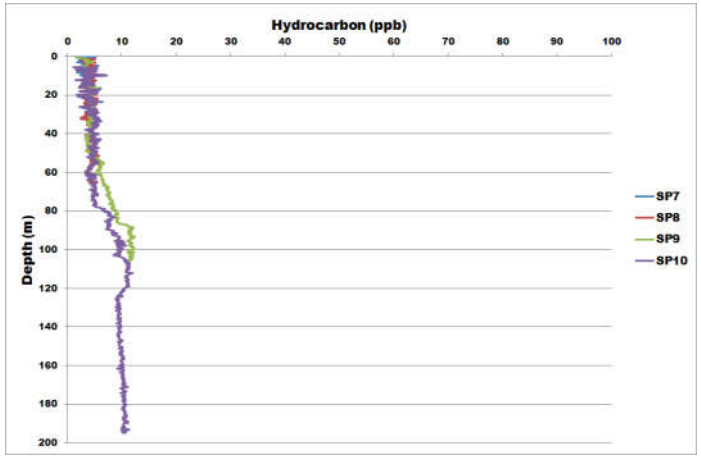
For comparative purposes, a test was conducted in the Darwin Harbour (winter) to provide an example of the readings that would be expected to occur if hydrocarbons were present. The results are presented in **Figure 3-19**.



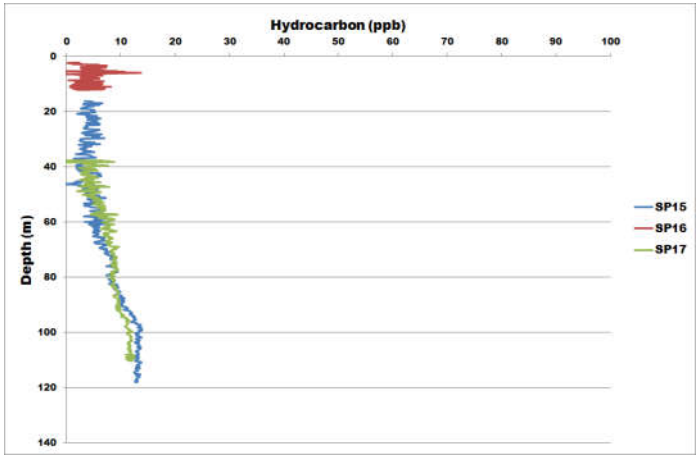
a) Permit area



c) Tassie Shoal



b) Evans Shoal



d) Lynedoch Bank

Figure 3-18: Hydrocarbon profiles – autumn

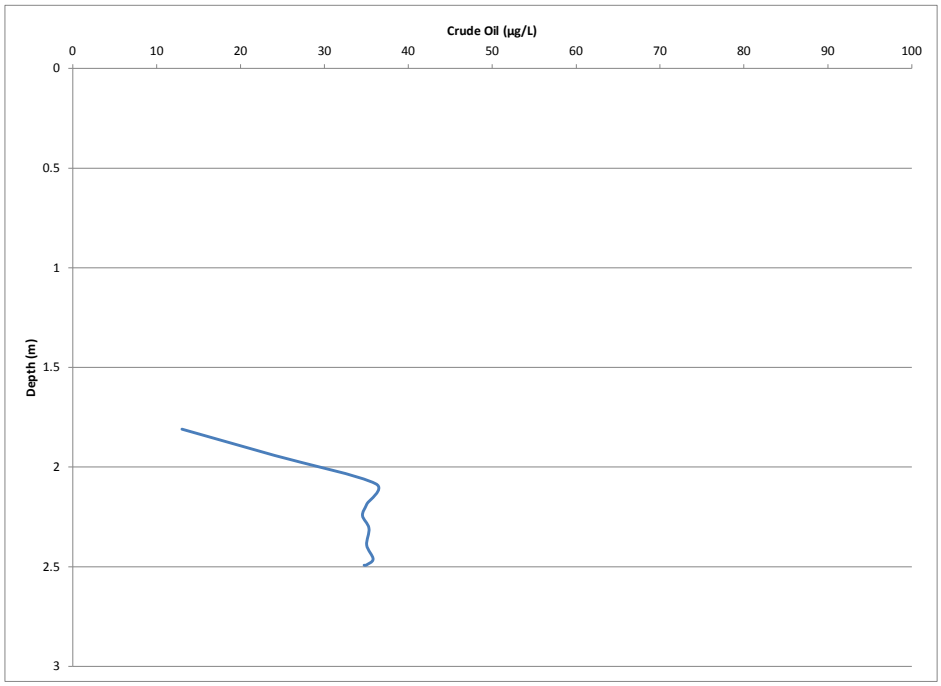


Figure 3-19: Hydrocarbon profile in Darwin Harbour (winter)

3.2 Water quality

3.2.1 Nutrients and pigments

The ANZECC & ARMCANZ (2000b) default trigger values for chemical stressors for tropical Australia for slightly disturbed offshore marine ecosystems are listed in **Table 3-3** to Table 3-6. The nutrient concentrations measured in samples from the shallow depths at each of the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sites were around the default trigger values, but most of the samples from deeper waters had nutrient concentrations that were well above the default trigger values (with the exception of ammonium concentrations which were at or below the laboratory LOR at most sites and depths).

Nitrogen

Total nitrogen is comprised of ammonium, nitrate+nitrite and organic nitrogen. At most sites there was no detectable ammonium at any depth (**Table 3-3** to Table 3-6). Nitrate+nitrite concentrations were lowest in the surface water at all sites. All results indicate increasing nitrate+nitrite concentrations with depth. In general, nitrogen concentrations in the surface layers were low and mainly comprised of organic nitrogen while the bottom layers were higher and mainly comprised of nitrate+nitrite.

The sites where total nitrogen ammonium and nitrate+nitrite were detected during each sampling event and any trends in the surveys are discussed below.

Winter

The majority of the results from the winter survey did not detect ammonium at any depth with the exceptions of sites SP2-S, SP7-B, SP11-B and SP14 (all depths). These higher results are unusual in relation to the other samples. There was contamination of both ammonium and nitrate-nitrite in the field blank, therefore it is assumed that these samples have been contaminated, possibly in the filtering process.

Nitrate+nitrite concentrations were lowest in the surface water at all sites deeper than 200 m. At these deeper sites the nitrate-nitrite concentrations in the mid water sample were comparatively high and ranged from 170 to 250 µg/L and they were higher again in the bottom water and ranged from 330 to 400 µg/L. For the sites of

approximately 100 m depth, the nitrate+nitrite concentrations in the surface and mid waters were low (< 5 µg/L), while the bottom water was higher (140 to 180 µg/L). The nitrate-nitrite concentrations at the shallow sites (< 30 m) had comparably lower nitrate-nitrite concentrations in both the surface and bottom water (≤ 7 µg/L). Therefore, the deeper the depth the sample was taken the higher the nitrate-nitrite concentration.

Total nitrogen concentrations were low in the surface samples with concentrations ranging between 80 and 110 µg/L at all sites. Again the total nitrogen concentrations increased as the depth of the sample increased, with the concentrations in the bottom water of the deepest sites (SP1, SP2, SP3 and SP6) ranged from 380 to 400 µg/L.

Summer

While just over half the sites there was little or no detectable ammonium at any depth, sites SP2-M, SP2-B, SP4-B, SP5-B, SP6-S, SP6-M, SP6-B, SP7-S, SP8-M, SP8-B, SP9-S, SP9-M, SP9-B, SP10-B, SP11-S, SP12-S, SP12-M, SP12-B, SP13-S and SP14-S had detectable results. This was unusual in relation to the other samples (in that there was no pattern to the results, e.g. only detectable results in the bottom water) and samples taken on previous occasions (in which ammonium at all depths were below laboratory detection limits). This indicates these samples have been contaminated, possibly via a connection to the Niskin bottle that enables bottles to be filled directly.

Nitrate+nitrite concentrations were lowest in the surface water at all sites. All surface water values measured during the survey were below the ANZECC & ARMCANZ (2000a) summer trigger value of 4 µg/L. At the deepest sites the nitrate+nitrite concentrations in the mid-water sample were comparatively high and ranged from 150 to 230 µg/L, and in the bottom water sample ranged from 280 to 380 µg/L. For the sites of approximately 100 m depth, the nitrate-nitrite concentrations in the surface and mid-waters were low (≤5 µg/L) and higher in bottom waters (180–210 µg/L). The nitrate+nitrite concentrations at the shallow sites (<30 m) were low and similar in both the surface and bottom water (≤2 µg/L).

Total nitrogen concentrations were low in the surface samples with concentrations ranging between 80 and 120 µg/L at all sites. Again, total nitrogen concentrations increased with depth, with the highest concentrations recorded in the bottom water of the deepest sites (SP1, SP2, SP3 and SP6), ranging from 400 to 420 µg/L.

Autumn

Detectable ammonia results were recorded at sites SP15-S, SP15-B and SP17-B. At least one of these was considered to be due to contamination in the filtering process. All surface water values measured during this survey were below this level. At the deepest sites, the nitrate+nitrite concentrations were relatively high in the mid-water samples, ranging from 64 µg/L to 200 µg/L, and even higher in the bottom water samples, ranging from 310 µg/L to 360 µg/L. For the sites of approximately 100 m depth, the nitrate+nitrite concentrations in the surface and mid-waters were low (<2 µg/L) but concentrations were higher in the bottom waters (74 µg/L to 120 µg/L). The nitrate+nitrite concentrations at the shallow sites (<30 m) were low and similar in both the surface and bottom water (<2 µg/L).

Total nitrogen concentrations were low in the surface samples with concentrations ranging between 80 and 100 µg/L at all sites. Again, total nitrogen concentrations increased with depth, with the highest concentrations recorded in the bottom water of the deepest sites (SP1, SP2, SP3 and SP6), ranging from 350 µg/L to 360 µg/L.

Phosphorus

Total phosphorus consists of orthophosphate and organic phosphate. Orthophosphate concentrations in the surface water samples at all sites were ≤5 µg/L (**Table 3-3** to **Table 3-6**).

The sites where total phosphorus was detected during each sampling event and any trends in the surveys are discussed below.

Winter

Orthophosphate concentrations in the surface water samples at all sites were ≤5 µg/L. The bottom water of the shallowest sites or the middle water of the sites in approximately 100 m water depth had orthophosphate concentrations similar to the surface those in the surface water. The middle waters of the deepest sites were higher ranging from 26 to 34 µg/L, whilst the bottom water was higher again ranging from 51 µg/L o 61 µg/L. The total phosphorus concentrations were similar to the orthophosphate concentrations in that they increased with an increase in depth. Therefore, phosphorus concentrations in the surface layers were low and mainly comprised of organic phosphorus and the bottom layers were high and mainly comprised of orthophosphate. All surface water samples collected during this survey had orthophosphate concentrations that were at or below the ANZECC & ARMCANZ (2000a) guidelines default winter trigger value of 10 µg/L.

Summer

Orthophosphate concentrations in the surface water samples at all sites were ≤5 µg/L. The bottom water of the shallowest sites and the middle water of sites in approximately 100 m water depth had orthophosphate concentrations similar to those measured in surface waters. The deepest sites had higher concentrations, ranging from 23 to 35 µg/L in the middle waters and from 39 to 56 µg/L in the bottom waters.

All surface water samples collected during this survey had orthophosphate concentrations that were at or below the ANZECC & ARMCANZ (2000a) guidelines default summer trigger value of 5 µg/L.

Autumn

Orthophosphate concentrations in the surface water samples at all sites were ≤3 µg/L. The bottom water of the shallowest sites and the middle water of sites in approximately 100 m water depth had orthophosphate concentrations similar to those measured in surface waters. The deepest sites had higher concentrations, ranging from 15 µg/L to 33 µg/L in the mid-waters and from 53 µg/L to 61 µg/L in the bottom waters.

All surface water samples collected during this survey had orthophosphate concentrations that were at or below the ANZECC & ARMCANZ (2000a) guidelines default winter trigger value.

In summary, total phosphorus concentrations showed similar patterns to the orthophosphate concentrations, increasing with depth, with low phosphorus concentrations in the surface layers (mainly comprising of organic phosphorus) and high concentrations in the bottom layers (mainly comprising of orthophosphate).

Pigments

Chlorophyll *a* concentrations (as a proxy for phytoplankton biomass) in all surface water samples from the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank were low during all surveys, in the range of ≤0.9 µg/L (**Table 3-3** to **Table 3-6**). Chlorophyll *a* concentrations in samples from water depths greater than 100 m were generally at or below the laboratory detection limits (LOR <0.1 µg/L). During the summer survey, the highest chlorophyll *a* concentrations were mid-water at sites in approximately 100 m of water, suggesting the euphotic zone reached a depth of approximately 50 m during the survey.

Chlorophyll *a* concentrations were at or below the ANZECC & ARMCANZ (2000a) default trigger value of 0.9 µg/L at all sites and all depths during all surveys.

Phaeophytin is the breakdown product of chlorophyll *a* and is analysed more frequently in lakes to determine if phytoplankton blooms are increasing or declining. Phaeophytin concentrations were below the laboratory LOR for all sites and depths during all surveys. There are no ANZECC & ARMCANZ (2000b) default trigger values for phaeophytin.

3.2.2 Metals/metalloids

The metal/metalloid samples were processed as either unfiltered or filtered, with the unfiltered generally defining the total metals in solution, including those bound to particles (considered ‘unavailable’) and those that are bioavailable or possibly toxic to organisms (depending on the type of metal and the concentration). ANZECC & ARMCANZ (2000a) guidelines recommend that unfiltered samples be taken and if metal/metalloids are found to

be above recommended concentrations, then filtered samples should also be taken to determine bioavailability of the metal/metalloids. The filtered metals/metalloids generally define those compounds that are bioavailable or possibly toxic to organisms, as all but the very fine particles (< 0.2 µm) are filtered out of the sample. If bioavailable metals/metalloids are found above recommended concentrations, then additional samples should be taken to determine if the detected concentrations are toxic.

The results from the metals/metalloids survey are presented in **Table 3-7** to **Table 3-14**. The trends and exceedences for metals/metalloids associated with each survey are discussed below.

Winter

Of the total metal/metalloids in the water sampled from the various depths at the permit area, Evans Shoal and Tassie Shoal sites, only copper was above the ANZECC & ARMCANZ (2000) trigger value for 99% species protection of 0.3 µg/L (**Table 3-7** to **Table 3-9**).

After filtering, the copper concentrations at four sites (SP2-M, SP7-B, SP10-M and SP14-B) were slightly above 0.3 µg/L (**Table 3-10** to **Table 3-13**). The copper concentrations at sites SP1-S, SP5-S and SP11-S were considered to be high and possibly due to contamination as they were higher than the unfiltered samples. Therefore, they have been excluded from the results.

Of the other total metals, lead, mercury, cadmium and cobalt were below the laboratory LORs at all depths at the permit area, Evans Shoal and Tassie Shoal sampling sites during the winter survey (**Table 3-7** to **Table 3-9**).

Total barium concentrations at all sites and depths ranged from 5.3 µg/L to 7.9 ug/L with the deepest water comprising the highest concentrations (**Table 3-7** to **Table 3-9**). Filtered barium concentrations were similar to total barium concentrations at the permit area, Evans Shoal and Tassie Shoal sampling sites and depths (**Table 3-10** to **Table 3-13**).

Total chromium concentrations were below the laboratory LOR (< 0.2 µg/L) in all surface samples at the permit area, Evans Shoal and Tassie Shoal sites and at the laboratory LOR (or slightly higher for the deepest depths) for all bottom depths greater than 100 m of water (**Table 3-7** to **Table 3-9**). Filtered chromium concentrations were similar to the total chromium concentrations (**Table 3-10** to **Table 3-13**).

Total nickel concentrations were below the laboratory LOR (< 0.3 µg/L) in all surface samples and the majority of middle depth samples that were taken in less than 100 m of water, while bottom water concentrations at all sites deeper than 100 m of water ranged from 0.3–0.4 µg/L (**Table 3-7** to **Table 3-9**). Filtered nickel concentrations were similar to the total concentrations (**Table 3-10** to **Table 3-13**).

There did not appear to be a particular pattern regarding change of total zinc concentrations with depth, as per the other metals. Total zinc concentrations at all depths ranged from below the laboratory LOR to 4 ug/L (**Table 3-7** to **Table 3-9**). Filtered zinc concentrations were similar to total zinc concentrations (**Table 3-10** to **Table 3-13**), but all were below the ANZECC & ARMCANZ (2000) trigger value of 7 µg/L.

Total arsenic and filtered arsenic concentrations were very similar at all depths of the permit area, Evans Shoal and Tassie Shoal sites and ranged from 1.5 µg/L to 2.0 µg/L (**Table 3-10** to **Table 3-13**), which is below the ANZECC & ARMCANZ (2000) trigger value of 4.5 µg/L.

Summer

Of the total metals/metalloids in the water sampled from the various depths at the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sites, only copper was above the ANZECC & ARMCANZ (2000a) trigger value of 0.3 µg/L for 99% species protection (**Table 3-7** to **Table 3-10**). After filtering, the copper concentrations at five sites (SP2-S, SP7-S, SP9-M, SP10-B and SP13-S) were slightly above 0.3 µg/L (**Table 3-11** to **Table 3-14**). The high copper concentrations at sites SP8-B, SP11-S and SP12-M were possibly due to contamination as they were higher than the unfiltered samples.

Of the other total metals, cadmium, cobalt, chromium, lead and mercury were all below the laboratory LORs at all depths at the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sampling sites during the summer survey (**Table 3-7** to **Table 3-10**).

Total barium concentrations ranged from 5.0 µg/L to 7.0 ug/L at all sites and depths, with the deepest water samples comprising the highest concentrations (**Table 3-7** to **Table 3-10**). Filtered barium concentrations were similar to total barium concentrations at each of permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sampling sites and depths (**Table 3-11** to **Table 3-14**). There is no ANZECC & ARMCANZ (2000a) trigger value for barium.

Total nickel concentrations were below the laboratory LOR (<0.3 µg/L) in all surface samples and in most mid-water samples in <100 m of water, whereas bottom water concentrations at all sites >100 m of water were 0.3 µg/L–0.5 µg/L (**Table 3-7** to **Table 3-10**). Filtered nickel concentrations were similar to the total concentrations (**Table 3-11** to **Table 3-14**). The ANZECC & ARMCANZ (2000a) trigger value for nickel in marine water protecting 99% of species is 7 µg/L.

There did not appear to be a particular pattern regarding total zinc concentrations with depth. Total zinc concentrations at all depths ranged from below the laboratory LOR to 4 ug/L (**Table 3-7** to **Table 3-10**). Filtered zinc concentrations were similar to total zinc concentrations (**Table 3-11** to **Table 3-14**), and all were below the ANZECC & ARMCANZ (2000a) trigger value of 7 µg/L.

Total arsenic and filtered arsenic concentrations were similar at all depths of all the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sites and ranged from 1.5 µg/L to 1.9 µg/L (**Table 3-7** to **Table 3-14**), below the ANZECC & ARMCANZ (2000a) trigger value of 4.5 µg/L.

Autumn

Of the total metals/metalloids in the water sampled from the various depths at the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sites, none were above the ANZECC & ARMCANZ (2000a) trigger values for 99% species protection in marine water (**Table 3-7** to **Table 3-10**), where trigger values were available

Copper concentrations were generally below the laboratory LOR for most sites and depths sampled during this survey (**Table 3-7** to **Table 3-10**). No sites had samples that were above the ANZECC & ARMCANZ (2000a) trigger value of 0.3 µg/L but filtered samples for sites SP12-S and SP12-B equalled the trigger value (**Table 3-11** to **Table 3-14**).

Total nickel concentrations were below the laboratory LOR (<0.3 µg/L) in all surface samples and most mid water samples from sites in less than 100 m of water, while bottom water concentrations at all sites deeper than 100 m of water ranged from 0.3 µg/L to 0.5 µg/L (**Table 3-7** to **Table 3-10**).

The total metals, cadmium, cobalt, lead and mercury were all below the laboratory LORs at all depths at the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sampling sites during the autumn survey (**Table 3-7** to **Table 3-10**).

Total arsenic and filtered arsenic concentrations were similar at all depths of all the permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sites and ranged from 1.3 µg/L to 2.1 µg/L (**Table 3-7** to **Table 3-14**), which is below the ANZECC & ARMCANZ (2000a) trigger value of 4.5 µg/L.

Total barium concentrations ranged from 5.0 µg/L to 8.2 µg/L at all sites and depths, with the deepest water samples comprising the highest concentrations (**Table 3-7** to **Table 3-10**). Filtered barium concentrations were similar to total barium concentrations at each of permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank sampling sites and depths (**Table 3-11** to **Table 3-14**). There is no ANZECC & ARMCANZ (2000a) trigger value for barium but there are guideline values for drinking water NHMRC & ARMCANZ (2011). Barium has a human health guideline for drinking water of 2000 µg/L, much higher than the concentrations reported in this survey. In Australian drinking water supplies, barium ranges from <2 µg /L to 1,100 µg /L.

Total chromium and filtered chromium concentrations were below LOR in the surface water of all sites in and around permit area, Evans Shoal, Tassie Shoal and Lynedoch Bank (**Table 3-7** to **Table 3-14**). Chromium concentrations were slightly above the LOR in samples from the deepest sites. All samples were below the ANZECC & ARMCANZ (2000a) trigger value of 7.7 µg/L.

Filtered nickel concentrations were similar to the total concentrations (**Table 3-11** to **Table 3-14**). The ANZECC & ARMCANZ (2000a) trigger value for nickel in marine water protecting 99% of species is 7 µg/L.

There was no trend in total zinc concentrations with depth. Total zinc concentrations at all depths ranged from below the laboratory LOR to 3 ug/L (**Table 3-7** to **Table 3-10**). Filtered zinc concentrations were similar to total zinc concentrations (**Table 3-11** to **Table 3-14**) and all were below the ANZECC & ARMCANZ (2000a) trigger value of 7 µg/L.

Table 3-3: Nutrient concentrations at permit area sites

Parameter	Ammonium			Nitrate+nitrite			Total nitrogen			Orthophosphate			Total phosphorus			Chlorophyll *a*			Phaeophytin		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
LOR	<3			<2			<50			<2			<5			<0.1			<0.2		
Guideline[1]	9[2] 4[3]			5[2] 4[3]			140[2, 3]			10[2] 5[3]			10[2] 5[3]			0.9[2, 3]			–		
Season **Site**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
SP1-S	<3	<3	<3	5	<2	<2	90	90	90	5	4	2	15	13	11	0.36	0.1	<0.1	<0.2	<0.2	<0.2
SP1-M	<3	<3	<3	250	230	200	300	300	280	33	35	33	38	42	40	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP1-B	<3	<3	<3	390	380	360	440	420	450	60	56	60	65	62	65	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP2-S	5	<3	<3	120	2	<2	220	110	90	5	4	2	15	13	12	0.43	<0.1	<0.1	<0.2	<0.2	<0.2
SP2-M	<3	3	<3	250	210	150	310	270	230	34	32	26	39	36	33	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP2-B	<3	6	<3	400	370	360	430	420	450	61	54	58	65	59	63	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP3-S	<3	<3	<3	15	<2	<2	110	90	80	5	3	<2	15	14	12	0.50	<0.1	<0.1	<0.2	<0.2	<0.2
SP3-M	<3	<3	<3	240	230	190	280	270	310	35	31	31	41	36	41	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP3-B	<3	<3	<3	380	290	360	420	400	450	59	39	61	64	58	65	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP4-S	<3	<3	<3	5	<2	<2	90	80	80	5	4	2	14	14	12	0.21	0.1	<0.1	<0.2	<0.2	<0.2
SP4-M	<3	<3	<3	180	200	140	240	240	220	28	27	27	34	33	34	0.07	<0.1	<0.1	<0.2	<0.2	<0.2
SP4-B	<3	3	<3	350	340	320	380	360	410	54	47	54	57	51	58	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP5-S	<3	<3	<3	4	<2	<2	80	100	80	4	4	2	13	13	12	0.41	0.1	<0.1	<0.2	<0.2	<0.2
SP5-M	<3	<3	<3	170	230	120	220	260	220	26	34	26	31	40	34	0.08	<0.1	<0.1	<0.2	<0.2	<0.2
SP5-B	<3	5	<3	350	330	320	390	360	420	52	46	53	55	52	58	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP6-S	<3	3	<3	6	<2	<2	90	100	100	5	3	2	14	14	12	0.16	0.1	<0.1	<0.2	<0.2	<0.2
SP6-M	<3	8	<3	220	150	200	270	260	290	34	23	33	38	35	39	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2
SP6-B	3	4	<3	390	280	350	440	400	440	60	43	59	64	57	64	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2

W – winter; S – summer; A – autumn

[1] The ANZECC & ARMCANZ (2000b) default trigger values for chemical stressors for tropical Australia for slightly disturbed offshore marine ecosystems.

[2] Winter values.

[3] Summer values.

Table 3-4: Nutrient concentrations at Evans Shoal sites

Parameter	Ammonium			Nitrate+nitrite			Total nitrogen			Orthophosphate			Total phosphorus			Chlorophyll *a*			Phaeophytin		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<3			<2			<50			<2			<5			<0.1			<0.2		
Guideline[1]	9[2] 4[3]			5[2] 4[3]			140[2, 3]			10[2] 5[3]			10[2] 5[3]			0.9[2, 3]			–		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																					
SP7-S	<3	4	<3	3	2	<2	80	100	90	5	4	2	13	12	12	0.22	0.1	<0.1	<0.2	<0.2	<0.2
SP7-B	6	<3	<3	6	2	<2	80	90	80	6	4	2	14	13	12	0.45	0.2	0.2	<0.2	<0.2	<0.2
SP8-S	NS	<3	<3	NS	<2	<2	NS	90	90	NS	4	2	NS	12	12	NS	0.2	0.3	NS	<0.2	<0.2
SP8-M	NS	5	<3	NS	<2	<2	NS	80	100	NS	5	2	NS	14	12	NS	0.3	<0.1	NS	<0.2	<0.2
SP8-B	NS	3	<3	NS	170	2	NS	240	80	NS	25	3	NS	32	12	NS	0.2	0.2	NS	<0.2	<0.2
SP9-S	NS	5	<3	NS	2	<2	NS	90	80	NS	5	3	NS	14	12	NS	0.1	0.2	NS	<0.2	<0.2
SP9-M	NS	5	<3	NS	190	<2	NS	310	80	NS	28	3	NS	35	12	NS	0.2	0.2	NS	<0.2	<0.2
SP9-B	NS	7	<3	NS	180	110	NS	320	200	NS	32	24	NS	43	31	NS	<0.1	<0.1	NS	<0.2	<0.2
SP10-S	<3	<3	<3	6	<2	<2	100	80	100	5	5	2	14	14	12	0.18	0.1	<0.1	<0.2	<0.2	<0.2
SP10-M	<3	<3	<3	200	150	64	260	220	160	31	24	15	36	30	24	0.05	0.2	0.3	<0.2	<0.2	<0.2
SP10-B	<3	8	<3	330	300	310	370	350	420	51	43	53	54	48	57	<0.05	<0.1	<0.1	<0.2	<0.2	<0.2

W – winter; S – summer; A – autumn
[1] The ANZECC & ARMCANZ (2000b) default trigger values for chemical stressors for tropical Australia for slightly disturbed offshore marine ecosystems.
[2] Winter values.
[3] Summer values.
NS = no sample due to inclement weather conditions.

Table 3-5: Nutrient concentrations at Tassie Shoal sites

Parameter	Ammonium			Nitrate+nitite			Total nitrogen			Orthophosphate			Total phosphorus			Chlorophyll *a*			Phaeophytin		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<3			<2			<50			<2			<5			<0.1			<0.2		
Guideline[1]	9[2] 4[3]			5[2] 4[3]			140[2, 3]			10[2] 5[3]			10[2] 5[3]			0.9[2, 3]			–		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																					
SP11-S	<3	4	<3	<2	<2	<2	90	90	80	4	3	3	14	13	13	0.21	0.2	<0.1	<0.2	<0.2	<0.2
SP11-B	7	<3	<3	6	<2	4	110	110	90	4	3	3	14	13	13	0.35	0.3	0.1	<0.2	<0.2	<0.2
SP12-S	<3	4	<3	2	<2	<2	90	120	80	4	4	3	14	14	12	0.17	0.2	<0.1	<0.2	<0.2	<0.2
SP12-M	<3	37	<3	<2	3	<2	90	90	90	4	7	2	12	15	13	0.42	0.8	0.1	<0.2	0.2	<0.2
SP12-B	<3	4	<3	180	210	74	240	280	180	29	33	17	34	39	28	0.07	0.2	0.2	<0.2	<0.2	<0.2
SP13-S	<3	9	<3	<2	<2	<2	100	110	80	5	5	2	14	14	13	0.16	0.2	<0.1	<0.2	<0.2	<0.2
SP13-M	<3	<3	<3	4	<2	<2	100	100	90	4	7	3	12	18	14	0.53	0.9	0.2	<0.2	0.4	<0.2
SP13-B	<3	<3	<3	150	200	110	220	260	210	24	30	24	30	38	32	0.10	0.3	0.1	<0.2	0.5	<0.2
SP14-S	7	5	<3	3	<2	<2	100	90	90	4	4	2	13	14	13	0.34	0.2	<0.1	<0.2	<0.2	<0.2
SP14-M	4	<3	<3	2	<2	<2	120	100	90	3	4	3	14	16	13	0.33	0.9	0.3	<0.2	0.4	<0.2
SP14-B	3	<3	<3	140	190	120	230	250	220	23	30	26	29	37	33	0.07	0.3	0.1	<0.2	0.5	<0.2

W – winter; S – summer; A – autumn

[1] The ANZECC & ARMCANZ (2000b) default trigger values for chemical stressors for tropical Australia for slightly disturbed offshore marine ecosystems.

[2] Winter values.

[3] Summer values.

Table 3-6: Nutrient concentrations at Lynedoch Bank sites

Parameter	Ammonium			Nitrate+nitrite			Total nitrogen			Orthophosphate			Total phosphorus			Chlorophyll *a*			Phaeophytin		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<3			<2			<50			<2			<5			<0.1			<0.2		
Guideline[1]	9[2] 4[3]			5[2] 4[3]			140[2, 3]			10[2] 5[3]			10[2] 5[3]			0.9[2, 3]			–		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																					
SP15-S	NS	<3	4	NS	2	<2	NS	100	90	NS	4	3	NS	13	12	NS	<0.1	<0.1	NS	<0.2	<0.2
SP15-M	NS	<3	<3	NS	5	<2	NS	90	120	NS	6	3	NS	15	14	NS	0.4	0.2	NS	<0.2	<0.2
SP15-B	NS	<3	8	NS	190	110	NS	260	250	NS	30	22	NS	37	36	NS	0.1	<0.1	NS	<0.2	<0.2
SP16-S	NS	<3	<3	NS	<2	<2	NS	80	100	NS	4	2	NS	14	12	NS	<0.1	<0.1	NS	<0.2	<0.2
SP16-B	NS	<3	<3	NS	<2	<2	NS	90	90	NS	4	2	NS	13	12	NS	0.2	<0.1	NS	<0.2	<0.2
SP17-S	NS	<3	<3	NS	<2	<2	NS	100	100	NS	4	2	NS	12	12	NS	<0.1	<0.1	NS	<0.2	<0.2
SP17-M	NS	<3	<3	NS	16	7	NS	100	100	NS	7	5	NS	16	14	NS	0.5	0.3	NS	0.2	<0.2
SP17-B	NS	<3	9	NS	180	150	NS	250	240	NS	30	29	NS	37	35	NS	0.1	<0.1	NS	<0.2	<0.2

W – winter; S – summer; A – autumn
[1] The ANZECC & ARMCANZ (2000b) default trigger values for chemical stressors for tropical Australia for slightly disturbed offshore marine ecosystems.
[2] Winter values.
[3] Summer values.
NS = no sample due to inclement weather conditions.

Table 3-7: Total metal concentrations at permit area sites

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0		
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
SP1-S	1.8	1.6	1.9	5.6	5.1	5.9	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.3	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	2	1
SP1-M	1.9	1.7	1.9	5.6	5.5	6.1	<0.1	<0.1	<0.1	0.2	<0.2	0.2	<0.05	<0.05	<0.05	<0.2	0.2	0.2	<0.1	<0.1	<0.1	0.4	<0.3	0.3	<0.1	<0.1	<0.1	1	<1	2
SP1-B	2.0	1.9	2.1	7.9	7.0	8.0	<0.1	<0.1	<0.1	0.3	<0.2	0.3	<0.05	<0.05	<0.05	<0.2	0.2	<0.2	<0.1	<0.1	<0.1	0.4	0.3	0.4	<0.1	<0.1	<0.1	<1	1	1
SP2-S	1.7	1.6	1.8	5.5	5.2	5.5	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	**0.5**	**0.5**	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	3	3	1
SP2-M	1.9	1.8	1.8	5.7	5.6	5.8	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	<0.05	<0.05	<0.05	**1.0**	0.3	<0.2	<0.1	<0.1	<0.1	0.3	<0.3	<0.3	<0.1	<0.1	<0.1	4	<1	1
SP2-B	1.9	1.7	2.0	7.8	6.9	8.1	<0.1	<0.1	<0.1	0.3	<0.2	0.2	<0.05	<0.05	<0.05	<0.2	0.3	0.3	<0.1	<0.1	<0.1	0.4	0.4	0.3	<0.1	<0.1	<0.1	<1	3	2
SP3-S	1.7	1.6	1.8	5.3	5.4	5.5	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.2	0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	1	<1
SP3-M	1.8	1.8	1.8	5.5	5.6	5.9	<0.1	<0.1	<0.1	<0.2	<0.2	0.2	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	<1	<1
SP3-B	1.8	1.8	2.1	7.5	6.3	8.2	<0.1	<0.1	<0.1	0.3	<0.2	0.2	<0.05	<0.05	<0.05	<0.2	0.3	<0.2	<0.1	<0.1	<0.1	0.3	0.4	0.5	<0.1	<0.1	<0.1	1	<1	<1
SP4-S	1.6	1.6	1.8	5.5	5.2	5.6	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.2	**0.5**	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	<1	<1
SP4-M	1.8	1.7	1.7	5.7	5.0	5.6	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.2	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	1	1
SP4-B	1.9	1.8	2.0	6.9	6.4	7.5	<0.1	<0.1	<0.1	0.2	<0.2	0.2	<0.05	<0.05	<0.05	0.2	**0.7**	<0.2	<0.1	<0.1	<0.1	0.4	0.5	0.3	<0.1	<0.1	<0.1	<1	4	<1
SP5-S	1.7	1.6	1.6	5.3	5.3	5.0	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.3	**0.6**	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	3	<1
SP5-M	1.8	1.8	1.8	5.5	5.6	5.8	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	<1	<1
SP5-B	1.7	1.8	1.8	6.8	6.1	6.7	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	<0.05	<0.05	<0.05	**0.4**	0.2	<0.2	<0.1	<0.1	<0.1	0.4	0.3	0.3	<0.1	<0.1	<0.1	2	<1	1
SP6-S	1.6	1.6	1.6	5.5	5.3	5.3	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	**0.4**	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	2	<1
SP6-M	1.8	1.8	1.8	5.6	5.5	5.7	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.2	0.3	<0.2	<0.1	<0.1	<0.1	0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	2	1
SP6-B	1.9	1.8	1.9	7.7	6.8	7.6	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.2	0.2	<0.2	<0.1	<0.1	<0.1	0.4	0.3	0.4	<0.1	<0.1	<0.1	1	2	<1

[1] All trigger values listed are for ANZECC & ARMCANZ (2000a) 99% species protection, while that for cobalt is 95% species protection.
[2] Low reliability trigger value.
[3] Value for Chromium III.
Values in bold are above the ANZECC & ARMCANZ (2000a) trigger value.

Table 3-8: Total metal concentrations at Evans Shoal sites

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0		
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
SP7-S	1.7	1.7	1.7	5.6	5.4	5.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.3	**0.6**	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	0.2	<0.1	1	1	<1
SP7-B	1.7	1.7	1.5	5.5	5.6	5.6	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	**0.5**	**0.4**	<0.2	<0.1	<0.1	<0.1	0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	2	<1
SP8-S	NS	1.6	1.6	NS	5.3	5.3	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	1	1
SP8-M	NS	1.7	1.7	NS	5.6	5.5	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	**0.4**	0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	2	<1
SP8-B	NS	1.8	1.7	NS	5.9	5.3	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	0.3	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	2	1
SP9-S	NS	1.8	1.7	NS	5.6	5.4	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	0.3	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	0.2	<0.1	NS	1	2
SP9-M	NS	1.8	1.8	NS	5.8	5.2	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	**0.4**	<0.2	NS	<0.1	<0.1	NS	0.3	<0.3	NS	<0.1	<0.1	NS	2	<1
SP9-B	NS	1.9	1.9	NS	6.0	5.9	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	0.3	<0.2	NS	<0.1	<0.1	NS	0.4	<0.3	NS	<0.1	<0.1	NS	2	1
SP10-S	1.6	1.7	1.7	5.5	5.6	5.5	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	0.3	0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	1	<1
SP10-M	1.8	1.9	1.8	5.8	6.0	5.6	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	<0.05	<0.05	<0.05	**0.4**	0.2	<0.2	<0.1	<0.1	<0.1	0.3	0.3	<0.3	<0.1	<0.1	<0.1	2	3	<1
SP10-B	1.8	1.9	1.9	6.7	6.4	7.4	<0.1	<0.1	<0.1	0.2	<0.2	0.2	<0.05	<0.05	<0.05	**0.4**	**0.4**	0.2	<0.1	<0.1	<0.1	0.4	0.4	0.4	<0.1	<0.1	<0.1	2	4	<1

[1] All trigger values listed are for ANZECC & ARMCANZ (2000a) 99% species protection, while that for cobalt is 95% species protection.
[2] Low reliability trigger value.
[3] Value for Chromium III.
Values in bold are above the ANZECC & ARMCANZ (2000a) trigger value.
NS = no sample due to inclement weather conditions.

Table 3-9: Total metal concentrations at Tassie Shoal sites

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0		
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
SP11-S	1.6	1.6	1.9	5.9	5.3	5.3	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	2	<1
SP11-B	1.6	1.8	1.6	5.5	5.6	5.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	0.3	<0.3	<0.1	<0.1	<0.1	1	<1	<1
SP12-S	1.6	1.7	1.6	5.4	5.2	5.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.2	0.3	0.3	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	2	2
SP12-M	1.6	1.9	1.6	5.5	5.5	5.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	0.2	0.3	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	1	<1
SP12-B	1.7	1.9	1.8	6.0	5.8	5.8	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.2	0.2	0.3	<0.1	<0.1	<0.1	<0.3	0.3	<0.3	<0.1	<0.1	<0.1	<1	3	<1
SP13-S	1.6	1.6	1.6	5.5	5.5	5.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	**0.5**	<0.2	<0.1	<0.1	<0.1	<0.3	0.3	<0.3	<0.1	<0.1	<0.1	1	4	1
SP13-M	1.6	1.7	1.6	5.5	5.8	5.3	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.4**	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	1	<1
SP13-B	1.7	1.7	1.8	5.9	5.7	6.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	<0.2	0.3	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	1	<1
SP14-S	1.7	1.6	1.7	5.4	5.4	5.5	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.2	<0.2	0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	<1	<1
SP14-M	1.7	1.7	1.8	5.5	5.8	5.5	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	<1	<1
SP14-B	1.8	1.8	2.0	6.1	5.8	6.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.4**	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	4	<1	1

[1] All trigger values listed are for ANZECC & ARMCANZ (2000a) 99% species protection, while that for cobalt is 95% species protection.
[2] Low reliability trigger value.
[3] Value for Chromium III.
Values in bold are above the ANZECC & ARMCANZ (2000a) trigger value.

Table 3-10: Total metal concentrations at Lynedoch Bank sites

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0		
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
SP15-S	NS	1.5	1.7	NS	5.6	5.5	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	3
SP15-M	NS	1.8	1.8	NS	5.7	5.7	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	<1
SP15-B	NS	1.7	1.9	NS	5.8	6.3	NS	<0.1	<0.1	NS	0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	1
SP16-S	NS	1.5	1.9	NS	5.5	5.5	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	1
SP16-B	NS	1.7	1.9	NS	5.4	5.6	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	1
SP17-S	NS	1.7	1.8	NS	5.6	5.6	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	0.2	0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	3
SP17-M	NS	1.7	1.7	NS	5.7	5.6	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	2	3
SP17-B	NS	1.8	1.9	NS	6.0	6.2	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	0.4	<0.3	NS	<0.1	<0.1	NS	1	1

[1] All trigger values listed are for ANZECC & ARMCANZ (2000a) 99% species protection, while that for cobalt is 95% species protection.
[2] Low reliability trigger value.
[3] Value for Chromium III.
Values in bold are above the ANZECC & ARMCANZ (2000a) trigger value.
NS = no sample due to inclement weather conditions.

Table 3-11: Filtered metal concentrations at permit area sites

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0		
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
SP1-S	1.7	1.6	1.6	5.4	5.0	5.4	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.4**	0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	2	1
SP1-M	1.9	1.7	1.8	5.6	5.5	6.3	<0.1	<0.1	<0.1	0.2	<0.2	0.2	< 0.05	< 0.05	< 0.05	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	0.3	<0.1	<0.1	<0.1	1	1	1
SP1-B	1.9	1.7	2.0	8.0	7.1	7.9	<0.1	<0.1	<0.1	0.2	<0.2	0.2	< 0.05	< 0.05	< 0.05	<0.2	0.2	<0.2	<0.1	<0.1	<0.1	0.4	0.3	0.4	<0.1	<0.1	<0.1	<1	1	<1
SP2-S	1.7	1.6	1.7	5.6	5.1	5.6	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	**0.4**	0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	3	2	1
SP2-M	1.9	1.6	1.9	5.5	5.5	5.7	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.4**	0.2	<0.2	<0.1	<0.1	<0.1	0.3	<0.3	<0.3	<0.1	<0.1	<0.1	3	<1	1
SP2-B	1.9	1.8	1.9	7.5	6.8	8.0	<0.1	<0.1	<0.1	0.2	<0.2	0.2	< 0.05	< 0.05	< 0.05	<0.2	0.3	<0.2	<0.1	<0.1	<0.1	0.4	0.3	0.4	<0.1	<0.1	<0.1	1	4	<1
SP3-S	1.7	1.6	1.7	5.3	5.3	5.5	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.2	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	1	<1
SP3-M	1.8	1.7	1.9	5.5	5.3	6.0	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	2	<1
SP3-B	1.8	1.8	2.0	7.5	6.2	8.1	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	0.3	0.3	0.4	<0.1	<0.1	<0.1	1	1	<1
SP4-S	1.7	1.6	1.8	5.6	5.1	5.6	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	<1	<1
SP4-M	1.7	1.7	1.7	5.6	5.3	5.6	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.2	0.3	<0.2	<0.1	<0.1	<0.1	0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	1	<1
SP4-B	1.8	1.8	1.8	7.0	6.3	7.4	<0.1	<0.1	<0.1	0.2	<0.2	0.2	< 0.05	< 0.05	< 0.05	<0.2	0.2	<0.2	<0.1	<0.1	<0.1	0.3	0.3	0.3	<0.1	<0.1	<0.1	<1	1	<1
SP5-S	1.7	1.6	1.6	5.3	5.3	5.0	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.5**	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	0.1	<0.1	<0.1	3	<1	<1
SP5-M	1.8	1.7	1.8	5.6	5.6	6.0	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	1	<1
SP5-B	1.8	1.7	1.7	6.7	6.4	6.4	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	<	<	<	0.2	0.2	<0.2	<0.1	<0.1	<0.1	0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	2	<1

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0		
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
													0.05	0.05	0.05															
SP6-S	1.6	1.6	1.6	5.4	5.2	5.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	2	<1
SP6-M	1.8	1.7	1.8	5.5	5.4	5.7	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.2	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	3	1
SP6-B	1.8	1.8	1.8	7.6	6.8	7.5	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	0.3	<0.2	<0.1	<0.1	<0.1	0.4	0.3	0.4	<0.1	<0.1	<0.1	2	3	<1

[1] All trigger values listed are for ANZECC & ARMCANZ (2000a) 99% species protection, while that for cobalt is 95% species protection.
[2] Low reliability trigger value.
[3] Value for Chromium III.

Table 3-12: Filtered metal concentrations at Evans Shoal sites

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0		
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
SP7-S	1.6	1.6	1.7	5.6	5.4	5.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	**0.4**	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	0.1	<0.1	2	1	<1
SP7-B	1.5	1.6	1.3	5.4	5.4	5.5	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.4**	0.3	<0.2	<0.1	<0.1	<0.1	0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	2	<1
SP8-S	NS	1.6	1.6	NS	5.4	5.2	NS	<0.1	<0.1	NS	<0.2	<0.2	< 0.05	< 0.05	< 0.05	NS	0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	<1
SP8-M	NS	1.6	1.6	NS	5.5	5.3	NS	<0.1	<0.1	NS	<0.2	<0.2	< 0.05	< 0.05	< 0.05	NS	0.3	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	2	<1
SP8-B	NS	1.8	1.8	NS	5.6	5.1	NS	<0.1	<0.1	NS	<0.2	<0.2	< 0.05	< 0.05	< 0.05	NS	**0.4**	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	2	<1
SP9-S	NS	1.8	1.8	NS	5.5	5.3	NS	<0.1	<0.1	NS	<0.2	<0.2	< 0.05	< 0.05	< 0.05	NS	0.3	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	0.2	<0.1	NS	1	<1
SP9-M	NS	1.8	1.8	NS	5.6	5.0	NS	<0.1	<0.1	NS	<0.2	<0.2	< 0.05	< 0.05	< 0.05	NS	**0.4**	<0.2	NS	<0.1	<0.1	NS	0.3	<0.3	NS	<0.1	<0.1	NS	2	<1
SP9-B	NS	1.9	1.7	NS	6.0	5.7	NS	<0.1	<0.1	NS	<0.2	<0.2	< 0.05	< 0.05	< 0.05	NS	0.3	<0.2	NS	<0.1	<0.1	NS	0.4	<0.3	NS	<0.1	<0.1	NS	3	1
SP10-S	1.7	1.7	1.6	5.4	5.5	5.5	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	1	<1
SP10-M	1.7	1.8	1.8	5.8	5.9	5.6	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.4**	0.3	<0.2	<0.1	<0.1	<0.1	0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	3	<1
SP10-B	1.8	1.9	1.9	6.8	6.3	7.1	<0.1	<0.1	<0.1	0.2	<0.2	0.2	< 0.05	< 0.05	< 0.05	0.3	**0.4**	<0.2	<0.1	<0.1	<0.1	0.3	0.4	0.4	<0.1	<0.1	<0.1	1	4	<1

[1] All trigger values listed are for ANZECC & ARMCANZ (2000a) 99% species protection, while that for cobalt is 95% species protection.
[2] Low reliability trigger value.
[3] Value for Chromium III.

NS = no sample due to inclement weather conditions.

Table 3-13: Filtered metal concentrations at Tassie Shoal sites

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc		
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L		
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0		
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0		
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
SP11-S	1.6	1.5	1.8	5.6	5.0	5.5	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.4**	**0.4**	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	2	<1
SP11-B	1.6	1.7	1.7	5.4	5.2	5.2	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	0.3	<0.2	<0.1	<0.1	<0.1	<0.3	0.3	<0.3	<0.1	<0.1	<0.1	3	<1	<1
SP12-S	1.6	1.7	1.7	5.5	5.2	5.2	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.2	0.3	0.3	<0.1	<0.1	<0.1	<0.3	0.3	<0.3	<0.1	<0.1	<0.1	1	1	1
SP12-M	1.6	1.8	1.7	5.4	5.5	5.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	**0.5**	0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	<1	5	1
SP12-B	1.7	1.9	1.8	6.1	5.8	5.8	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	0.3	0.3	<0.1	<0.1	<0.1	<0.3	0.3	<0.3	<0.1	<0.1	<0.1	<1	3	<1
SP13-S	1.6	1.7	1.7	5.6	5.7	5.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	**0.4**	<0.2	<0.1	<0.1	<0.1	<0.3	0.3	<0.3	<0.1	<0.1	<0.1	1	4	<1
SP13-M	1.6	1.6	1.7	5.3	5.7	5.3	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	0.3	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	<1	<1
SP13-B	1.8	1.6	1.8	6.0	5.7	6.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	<1	<1
SP14-S	1.7	1.6	1.7	5.3	5.4	5.4	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	<0.2	0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	2	<1	<1
SP14-M	1.7	1.6	1.7	5.2	5.5	5.7	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	1	<1	<1
SP14-B	1.7	1.8	2.0	6.0	5.8	6.2	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	< 0.05	< 0.05	< 0.05	**0.4**	<0.2	<0.2	<0.1	<0.1	<0.1	<0.3	<0.3	<0.3	<0.1	<0.1	<0.1	3	1	<1

[1] All trigger values listed are for ANZECC & ARMCANZ (2000a) 99% species protection, while that for cobalt is 95% species protection.
[2] Low reliability trigger value.
[3] Value for Chromium III.

Table 3-14: Filtered metal concentrations at Lynedoch Bank sites

Parameter	Arsenic			Barium			Cadmium			Chromium			Cobalt			Copper			Mercury			Nickel			Lead			Zinc	
Units	µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L			µg/L	
Limit of reporting	<0.5			<0.5			<0.1			<0.2			<0.05			<0.2			<0.1			<0.3			<0.1			<1.0	
Guideline[1]	4.5[2]			–			0.7			7.7[3]			1.0			0.3			0.1			7.0			2.2			7.0	
Season	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**	**W**	**S**	**A**
Site																														
SP15-S	NS	1.5	1.8	NS	5.6	5.5	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	2
SP15-M	NS	1.8	1.8	NS	5.6	5.7	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	1	1
SP15-B	NS	1.7	1.9	NS	5.8	6.3	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	<1
SP16-S	NS	1.6	1.7	NS	5.6	5.4	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	1	1
SP16-B	NS	1.6	1.7	NS	5.4	5.3	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	1	1
SP17-S	NS	1.6	1.7	NS	5.7	5.6	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	4
SP17-M	NS	1.7	1.7	NS	5.7	5.6	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	1
SP17-B	NS	1.7	1.9	NS	5.9	6.3	NS	<0.1	<0.1	NS	<0.2	<0.2	NS	<0.05	<0.05	NS	<0.2	<0.2	NS	<0.1	<0.1	NS	<0.3	<0.3	NS	<0.1	<0.1	NS	<1	2

[1] All trigger values listed are for ANZECC & ARMCANZ (2000a) 99% species protection, while that for cobalt is 95% species protection.
[2] Low reliability trigger value.
[3] Value for Chromium III.

NS = no sample due to inclement weather conditions.

3.2.3 Hydrocarbons

TPHs at all sites and depths in and around the permit area, Evans Shoal Tassie Shoal and Lynedoch Bank were below the laboratory LORs during the summer and autumn surveys. Consequently, PAHs were not analysed. Results for all sites can be found in **Appendix C**. However, as an example, the results for all three depths at SP1 are shown in **Table 3-15**.

During the winter survey, two sites in the permit area (SP5-S and SP6-M) and one site at Evans Shoal (SP14-M) had TPH above the LOR, the results of which are shown in **Table 3-16**. TPH was 130 µg/L for the fraction C_{15}–C_{28} at site SP5-S, 230 µg/L for the fraction C_{15}–C_{28} at site SP6-M and 190 µg/L for the fraction C_{29}–C_{36} at site SP14-M. Hydrocarbons in diesel fuel range from approximately C_{11}–C_{20} (Agency for Toxic Substances and Disease Registry 1999). It is possible that the open Niskin bottle passed through the surface water in which traces of diesel fuel from the boat had been released and contaminated the sample. However, as the TPH at SP14-M was from a higher hydrocarbon fraction it would appear that there were two sources of contamination. If there were areas of natural hydrocarbon seepage that occurred in the sampling area then hydrocarbons would be present in all fractions. In addition, there was little difference in the hydrocarbon profiles (**Section 3.1.9**) between sites, which would also indicate a lack of hydrocarbons in the areas sampled.

There is a low reliability trigger value for TPH C_{10}–C_{36} for 99% species protection of 7 µg/L (ANZECC & ARMCANZ 2000b). However, the laboratory LORs were above this value so it is difficult to determine if any exceedances have occurred. In cases where the trigger values are lower than the LOR the reporting of results should be either ‘detected’ or ‘not detected’ unless a better LOR can be achieved. In the past, TPH was analysed according to carbon chains C_6–C_9, C_{10}–C_{14}, C_{15}–C_{28} and C_{29}–C_{36} but in an attempt to incorporate health and ecological screening levels for petroleum hydrocarbons, the National Environment Protection Council released National Environment Protection Measures (NEPC 2013) which resulted in changes in the carbon chain divisions considered. This was based on analytical factors such as physical and chemical properties and the availability of toxicity data. This new analysis of hydrocarbons is called TRHs and includes BTEXN.

The BTEXN at all depths for permit area, Evans Shoal and Tassie Shoal sites were also below the LOR (**Table 3-15** and **Table 3-16**).

Table 3-15: TPHs, TRHs and BTEXN at site SP1

Compound	LOR (µg/L)	Sample[2] SP1-S (µg/L)			SP1-M (µg/L)			SP1-B (µg/L)		
Season[1]		W	S	A	W	S	A	W	S	A
TPHs										
C_6–C_9	20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C_{10}–C_{14}	50	<50	<20	<50	<50	<20	<50	<50	<20	<50
C_{15}–C_{28}	100	<100	<100	<100	<100	<100	<100	<100	<100	<100
C_{29}–C_{36}	50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C_{10}–C_{36} (sum)	50	<50	<50	<50	<50	<50	<50	<50	<50	<50
TRHs										
C_6–C_{10}	20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C_6–C_{10} minus BTEX	20	<20	<20	<20	<20	<20	<20	<20	<20	<20
>C_{10}–C_{16}	100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C_{16}–C_{34}	100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C_{34}–C_{40}	100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C_{10}–C_{40} (sum)	100	<100	<100	<100	<100	<100	<100	<100	<100	<100
BTEXN										
Benzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
meta-& para-xylene	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ortho-xylene	2	-	-	<2	-	-	<2	-	-	<2
Total xylene	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Sum of BTEX	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	5	<5	<5	<5	<5	<5	<5	<5	<5	<5

[1] W = winter, S = summer, A = autumn
[2] -S = near surface water, -M = mid-water, -B = near bottom water.

Table 3-16: TPHs, TRHs and BTEXN at sites SP5-S, SP6-M and SP14-M

Compound	LOR (µg/L)	Sample[2] SP5-S (µg/L)			SP6-M (µg/L)			SP14-M (µg/L)		
Season[1]		W	S	A	W	S	A	W	S	A
TPHs										
C_6–C_9	20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C_{10}–C_{14}	50	<50	<20	<50	<50	<20	<50	<20	<20	<50
C_{15}–C_{28}	100	**140**	<100	**140**	**310**	<100	**310**	<100	<100	<100
C_{29}–C_{36}	50	<50	<50	<50	<50	<50	<50	**190**	<50	**190**
C_{10}–C_{36} (sum)	50	**140**	<50	**140**	**310**	<50	**310**	**190**	<50	**190**
TRHs										
C_6–C_{10}	20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C_6–C_{10} minus BTEX	20	<20	<20	<20	<20	<20	<20	<20	<20	<20
>C_{10}–C_{16}	100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C_{16}–C_{34}	100	**130**	<100	**130**	**230**	<100	**230**	**180**	<100	**180**
>C_{34}–C_{40}	100	<100	<100	<100	<100	<100	<100	**220**	<100	**220**
>C_{10}–C_{40} (sum)	100	**130**	<100	**130**	**230**	<100	**230**	**400**	<100	**400**
BTEXN										
Benzene	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
meta-& para-xylene	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total xylene	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Sum of BTEX	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	5	<5	<5	<5	<5	<5	<5	<5	<5	<5

[1] W = winter, S = summer, A = autumn
[2] -S = near surface water, -M = mid-water, -B = near bottom water.

3.2.4 Naturally occurring radioactive materials

Winter

Radium^{226} was found above the laboratory minimum reporting limit (MRL) at one location during the survey, at SP4-M. Radium^{228} was above the MRL at a number of different sites including SP1-S, SP2-S, SP2-M, SP3-S and SP4-M all within the permit area and SP14-B in the Evans Shoal area. Thorium^{228} concentrations were all below the MRL at all depths for all sites (**Table 3-17**, **Table 3-18** and **Table 3-19**).

Summer

Radium^{226} was found above the laboratory MRL in four samples; SP2-B, SP4-S, SP4–M and SP15-M. Radium^{228} was slightly above the MRL for SP2-B, SP4-B and SP8-B. Thorium^{228} concentrations were all below the MRL at all depths for all sites (**Table 3-17**, **Table 3-18**, **Table 3-19** and **Table 3-20**). There are no ANZECC & ARMCANZ (2000a) trigger values for these radionuclides.

Autumn

Radium^{226} was found above the laboratory MRL in eight samples (SP2-M, SP4-S, SP5-M, SP7-B, SP8-S, SP9-S, SP11-S and SP12-M. Radium^{228} was slightly above the MRL for SP4-S. Thorium^{228} concentrations were all below the MRL at all depths for all sites (**Table 3-17**, **Table 3-18**, **Table 3-19** and **Table 3-20**). There are no ANZECC & ARMCANZ (2000a) trigger values for these radionuclides.

Table 3-17: Naturally occurring radioactive materials at permit area sites

Parameter	Radium^{226}			Radium^{228}			Thorium^{228}		
Units	(Bq/L)			(Bq/L)			(Bq/L)		
Minimum reporting limit (MRL)	0.1			0.1			0.1		
Season[1]	W	S	A	W	S	A	W	S	A
Site/sample[2]									
SP1-S	<0.1	<0.1	<0.1	0.123 ± 0.061	<0.1	<0.1	<0.1	<0.1	<0.1
SP1-M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP1-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP2-S	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP2-M	<0.1	<0.1	0.124 ± 0.014	0.493 ± 0.176	<0.1	<0.1	<0.1	<0.1	<0.1
SP2-B	<0.1	0.114 ± 0.025	<0.1	0.297 ± 0.103	0.116 ± 0.053	<0.1	<0.1	<0.1	<0.1
SP3-S	<0.1	<0.1	<0.1	0.230 ± 0.068	<0.1	<0.1	<0.1	<0.1	<0.1
SP3-M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP3-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP4-S	<0.1	0.115 ± 0.014	0.295 ± 0.053	<0.1	<0.1	0.165 ± 0.064	<0.1	<0.1	<0.1
SP4-M	0.175 ± 0.068	0.107 ± 0.048	<0.1	0.110 ± 0.050	<0.1	<0.1	<0.1	<0.1	<0.1
SP4-B	<0.1	<0.1	<0.1	<0.1	0.109 ± 0.039	<0.1	<0.1	<0.1	<0.1
SP5-S	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP5-M	<0.1	<0.1	0.104 ± 0.014	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP5-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP6-S	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP6-M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP6-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

[1] W = winter, S = summer, A = autumn.
[2] -S = near surface water, -M = mid-water, -B = near bottom water.

Table 3-18: Naturally occurring radioactive materials at Evans Shoal sites

Parameter	Radium^{226}			Radium^{228}			Thorium^{228}		
Units	(Bq/L)			(Bq/L)			(Bq/L)		
MRL	0.1			0.1			0.1		
Season[1]	W	S	A	W	S	A	W	S	A
Site/sample[2]									
SP7-S	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP7-B	<0.1	<0.1	0.141 ± 0.025	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP8-S	NS	<0.1	0.136 ± 0.019	NS	<0.1	<0.1	NS	<0.1	<0.1
SP8-M	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP8-B	NS	<0.1	<0.1	NS	0.112 ± 0.020	<0.1	NS	<0.1	<0.1
SP9-S	NS	<0.1	0.113 ± 0.022	NS	<0.1	<0.1	NS	<0.1	<0.1
SP9-M	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP9-B	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP10-S	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP10-M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP10-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

[1] W = winter, S = summer, A = autumn.
[2] -S = near surface water, -M = mid-water, -B = near bottom water.
NS = no sample due to inclement weather conditions.

Table 3-19: Naturally occurring radioactive materials at Tassie Shoal sites

Parameter	Radium^{226}			Radium^{228}			Thorium^{228}		
Units	(Bq/L)			(Bq/L)			(Bq/L)		
MRL	0.1			0.1			0.1		
Season[1]	W	S	A	W	S	A	W	S	A
Site/sample[2]									
SP11-S	<0.1	<0.1	0.172 ± 0.031	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP11-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP12-S	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP12-M	<0.1	<0.1	0.105 ± 0.015	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP12-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP13-S	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP13-M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP13-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP14-S	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP14-M	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SP14-B	<0.1	<0.1	<0.1	0.249 ± 0.097	<0.1	<0.1	<0.1	<0.1	<0.1

[1] W = winter, S = summer, A = autumn.
[2] -S = near surface water, -M = mid-water, -B = near bottom water.
NS = no sample due to inclement weather conditions.

Table 3-20: Naturally occurring radioactive materials at Lynedoch Bank sites

Parameter	Radium^{226}			Radium^{228}			Thorium^{228}		
Units	(Bq/L)			(Bq/L)			(Bq/L)		
MRL	0.1			0.1			0.1		
Season[1]	W	S	A	W	S	A	W	S	A
Site/sample[2]									
SP15-S	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP15-M	NS	0.133 ± 0.047	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP15-B	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP16-S	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP16-B	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP17-S	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP17-M	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1
SP17-B	NS	<0.1	<0.1	NS	<0.1	<0.1	NS	<0.1	<0.1

[1] W = winter, S = summer, A = autumn.
[2] -S = near surface water, -M = mid-water, -B = near bottom water.
NS = no sample due to inclement weather conditions.

3.3 Phytoplankton and zooplankton

Winter

Marine phytoplankton from the diatoms (Bacillariophyceae), the blue-green algae (Cyanobacteria), the silicoflagellates (Dictyochophyceae) and dinoflagellates (Dinophyceae) were captured in the plankton net tows in the permit area (SP3, SP5 and SP6), the Evans Shoal area (SP7 and SP10) and the Tassie Shoal area (SP14) (**Table 3-21**). Blue-green algae (comprised solely of *Trichodesmium erythraeum*) were captured in the greatest abundance (greater than 54%) at the majority of sites, however at SP14 the abundance of diatoms was much higher (greater than 92%). The diversity of the diatoms was highest at each site with up to 35 different species being identified. These Classes have been subdivided into the lowest taxonomic order possible in **Appendix C**.

Of the marine zooplankton captured in the plankton net tows, organisms from the Classes Trizonidae and Copepoda were in the highest abundance (**Table 3-22**). The greatest number of species were identified from SP3 with SP5 having the least. The Copepoda Class contain the highest number of different species whereas the majority of other Classes contained only one. These Classes have been subdivided into the lowest taxonomic order possible in **Appendix C**.

Summer

Marine phytoplankton captured at the permit area (SP1, SP3, SP5 and SP6), Evans Shoal (SP7, SP8 and SP10), Tassie Shoal (SP11, SP13 and SP14) and Lynedoch Bank (SP16 and SP17) consisted of diatoms (Bacillariophyceae), cryptomonads (Cryptophyceae), blue-green algae (Cyanobacteria) and dinoflagellates (Dinophyceae) (**Table 3-21**). Blue-green algae (comprised solely of *Trichodesmium erythraeum*) were captured in the greatest abundance (greater than 71%) at all sites. Diatoms were the most diverse group at all sites with up to 27 different species present. These (sub) Classes were identified to the lowest taxonomic order possible (**Appendix C**). This combination of species and diversity was similar to the winter survey. The phytoplankton assemblage composition and diversity in summer was similar to winter, although silicoflagellates (Dictyochophyceae) were more abundant in winter and cryptomonads (Crytophyceae) were only present in summer.

Of the marine zooplankton captured during the summer survey, copepods were the only ones present at every site (**Table 3-23**). Trizonidae, Copepoda and Polycystinea were highest in abundance. The greatest diversity of zooplankton species was observed at SP7, while the lowest diversity was observed at SP5. Copepods displayed the highest number of different species whereas most other Classes contained only one species. These Classes were subdivided into the lowest taxonomic order possible (**Appendix C**).

Autumn

Marine phytoplankton captured at the permit area (SP1, SP3, SP5 and SP6), at Evans Shoal (SP7, SP8 and SP10), at Tassie Shoal (SP11, SP13 and SP14) and at Lynedoch Bank (SP16 and SP17) consisted of diatoms (Bacillariophyceae), green algae (Chlorophyceae), cryptomonads (Cryptophyceae), blue-green algae (Cyanobacteria) and dinoflagellates (Dinophyceae) (**Table 3-21**). Blue-green algae (comprised solely of *Trichodesmium erythraeum*) were captured in the greatest abundance (greater than 44%) at most sites except at Tassie Shoal where they were not present and dinoflagellates were most abundant. These (sub) Classes were identified to the lowest taxonomic order possible (**Appendix C**).

Of all marine zooplankton captured, copepods were the only ones present at every site (**Table 3-24**). Copepoda and Gigartacontidae were highest in abundance. Copepods displayed the highest number of different species whereas the majority of other Classes contained only one species (**Appendix C**).

Table 3-21: Composition (%) of phytoplankton at each site – winter, summer and autumn

Site	Bacillariophyceae			Chlorophyceae			Cryptophyceae			Cyanobacteria			Dinophyceae			Dictyochophyceae		
Season	W	S	A	W	S	A	W	S	A	W	S	A	W	S	A	W	S	A
Permit area																		
SP1		7.17						0.14			91.68	91.67		1.00	8.33			
SP3	44.3	3.57	1.85							54.9	94.95	87.04	0.5	1.49	11.11	0.3		
SP5	28.2	2.67	25.00			50.00				70.8	95.99		0.5	1.34	25.00	0.5		
SP6	10.4	8.83	11.76							88.2	89.05	67.65	1.0	2.11	20.59	0.4		
Evans Shoal																		
SP7	27.3	5.86	4.26							70.3	92.90	82.98	1.8	1.23	12.77	0.6		
SP8		23.78	18.52								76.14	66.67		0.08	14.81			
SP10	20.1	2.10	12.50							78.6	96.50	43.75	1.0	1.40	43.75	0.3		
Tassie Shoal																		
SP11		15.27	46.67								82.00			2.73	53.33			
SP13		4.46	37.50								94.64			0.89	62.50			
SP14	92.3	4.00	12.50					0.2	12.50	6.1	94.57		0.9	1.23	75.00	0.7		
Lynedoch Bank																		
SP16		6.00						0.11			92.30	68.75		1.59	31.25			
SP17		18.37	11.63								71.43	72.09		10.20	16.28			

W – winter; S – summer; A – autumn

Table 3-22: Composition (%) of zooplankton at each site – winter

Phylum	Class	Permit area		Tassie Shoal
		SP3	SP5	SP14
Protista	Appendicularia	1.3	8.7	0.5
	Foraminifera	1.3	0.4	1.9
	Polycystinea			0.9
	Gigartacontidae			0.9
	Trizonidae	23.6	9.7	20.7
	Unknown	0.6		
Crustacea	Copepoda	66.9	80.3	73.1
	Malacostraca	1.9		0.5
	Maxillopoda	0.6		
	Ostracoda	0.6		
Chaetognatha	Sagittoidea	2.6	0.7	0.9
Echinodermata	Ophiuroidea		0.2	0.5
Chordata	Thaliacea	0.6		

Table 3-23: Composition (%) of zooplankton at each site – summer

Phylum	Class	Permit area				Evans Shoal			Tassie Shoal			Lynedoch Bank
		SP1	SP3	SP5	SP6	SP7	SP8	SP10	SP11	SP13	SP14	SP17
Protista	Foraminifera	1.07				0.87			3.85			2.90
	Polycystinea	0.27			8.20	1.74	1.60	66.92				
	Gigartacontidae					1.74	4.79		1.28			
	Spirotrichea								3.85			
	Trizonidae	62.13	56.55			71.30	75.53		34.62	74.86	75.20	33.33
	Unknown		0.69			1.74	0.53			0.18		
Annelida	Polychaeta		0.69				2.66	0.76				
Crustacea	Branchiopoda	0.80	0.69		3.28							1.45
	Cladocera	0.27										
	Copepoda	32.0	35.86	96.08	88.52	16.52	7.98	27.76	51.28	22.59	18.54	55.07
	Malacostraca									0.18		
	Maxillopoda									0.18		
Mollusca	Gastropoda					2.61			1.28	0.36	0.52	
Chaetognatha	Sagittoidea	2.93	5.52	3.92		1.74	6.38	3.42	2.56	1.28	5.74	7.25
Echinodermata	Ophiuroidea					1.74	0.53	1.14		0.36		

Table 3-24: Composition (%) of zooplankton at each site – autumn

Phylum	Class	Permit area				Evans Shoal			Tassie Shoal			Lynedoch Bank	
		SP1	SP3	SP5	SP6	SP7	SP8	SP10	SP11	SP13	SP14	SP16	SP17
Protista	Foraminifera		0.09	0.07					0.84			0.74	
	Polycystinea									3.64	1.08	0.19	1.35
	Gigartacontidae		98.06	70.32	63.07	9.18	8.42		81.84	82.89	7.53	93.60	87.58
	Unknown	0.49	0.06	0.29	0.57	0.51	1.32		0.08	5.70		0.08	0.31
Annelida	Polychaetea	3.44	0.03			13.78	5.53	0.42	0.08				
Arthropoda	Branchiopoda								0.08	0.10			
	Copepoda	93.12	1.35	28.29	19.32	69.90	81.58	95.34	17.10	7.57	88.17	1.24	7.25
	Maxillopoda					2.55							
Chaetognatha	Sagittoidea	0.25	0.13	0.43	3.98		0.26	2.54				0.50	
Urochordata	Appendicularia	2.70	0.28	0.61	13.07	4.08	2.89	1.69		0.10	3.23	3.65	3.52

4. Discussion

Three baseline water quality surveys were undertaken as part of the Barossa marine studies program with the aim of incorporating seasonality (winter, summer and a transition season (i.e. autumn)) into our understanding of marine water conditions in the permit area and broader surrounding area. In general, the sites surveyed ranged in depth from around 10 m–30 m on top of shoals and banks through to approximately 280 m in the permit area.

Dissolved oxygen was high in the surface water (90%–100% saturation at all sites and each season) decreasing to approximately 35% saturation in the bottom water of the deepest sites. The dissolved oxygen of the shallowest sites stayed constant from surface to bottom waters. Dissolved oxygen was highest near the ocean surface, where light for photosynthesis is strongest and oxygen exchange between the atmosphere and the ocean is at a maximum. Waves, wind and currents act to mix dissolved oxygen through the upper section of the water column. These processes become progressively weaker as depth increases. Below the upper mixed layer the oxygen content decreased with an increase in depth due to oxidation of organic matter resulting in the consumption of oxygen.

There was very little difference in salinity between the surface water and the bottom water at all sites during all seasons. Salinity at the surface waters were approximately 34 PSU, which was approximately 0.7 PSU lower than the bottom water of the deepest sites. As these sites were remote from any large land masses, the only potential factors affecting surface water salinity are climatic ones, i.e. precipitation or evaporation.

Surface water temperatures ranged from approximately 27°C in winter to approximately 30°C in summer and autumn, gradually decreasing with depth to approximately 11°C–13°C in the bottom water of the deepest sites. Other studies have shown that mean monthly temperatures in the central Timor Sea are typically between 26°C and 30°C decreasing to approximately 12°C at 300 m, with waters expected to be stratified all year round, but with the thermocline nearer the surface (50 m depth) in summer, compared to winter (100 m depth) (Woodside 1999). For those sites with sufficient depth, a thermocline was observed to occur with the depth changing between the surveys. The zone above the thermocline is called the ‘mixed layer’ in which horizontal and vertical mixing occurs and the zone below the thermocline is called the ‘deep zone’. Stable temperature gradients act as barriers to vertical mixing and if wind-generated turbulence is insufficient to break down this gradient then no mixing will take place across the thermocline. The depth of the thermocline was similar in the winter and autumn surveys (occurring between approximately 70 m and 150 m) and deeper than the summer survey (present between 40 m and 70 m). This is thought to be due to strong, continual winds during winter and autumn, causing the depth of the mixed layer to be greater.

Turbidity was very low throughout the water column at each site and during each season (<0.2 NTU). Approximately 20 m–50 m (depending on the site) above the seabed the turbidity was slightly elevated and increased with depth, possibly caused by the action of currents passing over the seabed causing some turbulence and resuspension of sediments.

TSS concentrations were generally low (≤1 mg/L) or below laboratory detection limits at the sites sampled during winter and summer. No sampling of TSS was undertaken during the autumn survey.

The pH in the surface waters ranged from approximately 8.1–8.3 pH units while the pH at the seabed was ranged from approximately 7.7–7.9 pH units. The shape of the profiles for pH and dissolved oxygen were similar, with a decrease in pH occurring near the top of the thermocline, due to oxidation of organic matter. When dead organisms fall from the surface layers and start decaying they liberate carbon dioxide, which dissolves into the water producing carbonic acid that undergoes almost instantaneous ionisation into hydrogen ions and thus decreasing pH (Hinga 2002). Pressure and temperature also play a part as they affect the various equilibrium constants. In surface water, photosynthesis consumes carbon dioxide and therefore less dissociation of carbon dioxide into hydrogen ions occurs.

Chlorophyll *a* concentrations were low throughout the water column at each site and during each season, less than the ANZECC & ARMCANZ (2000b) trigger value of 0.9 µg/L. Chlorophyll *a* concentrations peaked at shallower depths during winter (30–50 m) and deeper depths during summer and autumn (50 m–70 m). During

summer the zone of maximum productivity lies some distance below the surface probably due to optimising the requirement for light and nutrients. Nutrient concentrations increase with depth and light penetration is greater in summer therefore the depth of maximum productivity would be greater in summer than winter.

Trichodesmium erythraeum (a blue-green alga) was the phytoplankton species captured in highest abundance at the majority of sites during each season. *Trichodesmium* spp. occur in large numbers in tropical areas of the Indian Ocean, where their ability to fix nitrogen enables them to thrive when nutrient concentrations are low (Riley and Chester 1971). Dinoflagellates were the most diverse group during the autumn survey, whereas diatoms were the most diverse group during the summer and winter surveys. The phytoplankton assemblage composition in autumn was similar to summer and winter, although silicoflagellates were only present during winter and cryptomonads were only present during summer and autumn.

Copepods were the most abundant zooplankton collected during each season. Copepods also displayed the highest species diversity whereas the majority of other Classes contained only one species.

Inorganic nutrients orthophosphate, ammonium and nitrite+nitrate are released when organic compounds decay. Nitrification is the term given to the oxidation process which converts ammonium (formed by the bacterial decay of marine organisms or excreted by marine animals) into nitrite and then nitrate. Oxygen is consumed during these processes, which was evident in the bottom water of the deepest sites in the permit area where phosphorus and nitrate concentrations were high and oxygen levels were low.

Metals are also released when organic materials decay. Although the metal concentrations analysed in samples collected during the surveys were very low, there were slight increases in arsenic, barium chromium and nickel in the bottom waters of the deepest sites at the permit area and Evans Shoal. The distribution of some metals in seawater have been reported to be significantly influenced by the uptake of phytoplankton in the surface waters, subsequent decomposition of the organic matter produced and remineralisation in deep waters (Abe 2004). There were no dissolved metal samples collected that exceeded the ANZECC & ARMCANZ (2000a) trigger values for 99% species protection except for the copper concentrations at four sites during winter and five sites during summer, which exceeded the ANZECC & ARMCANZ (2000a) trigger value of 0.3 µg/L.

TPHs/TRHs and BTEXN were below the laboratory reporting limits at all sites and depths for each season. The only exceptions to this were the presence of hydrocarbons at two sites in the permit area and one site at Evans Shoal during the winter survey, in which the TPH was above the LOR. However, it is thought that the concentration of hydrocarbons at these sites were due to small operational releases from the vessel, as areas of natural hydrocarbon seepage would be present in all fractions, not the fractions obtained during sampling. In addition, there was little difference in the hydrocarbon profiles between sites, which would also indicate a lack of natural hydrocarbon sources in the areas sampled. Therefore, overall, there was little difference in the hydrocarbon profiles between sites, which indicates a lack of hydrocarbons in the areas sampled.

Radium^{226} and radium^{228} were above the minimum reporting limit at a number of sites during the three surveys, while thorium^{228} was not detected at any site. There are no ANZECC & ARMCANZ (2000a) trigger values associated with NORMs but there are guideline values for drinking water NHMRC & ARMCANZ (2011). Typical values for radium^{226} and radium^{228} in Australian drinking water supplies derived from groundwater sources, vary considerably depending on the aquifer and it is not uncommon in small supplies to find concentrations up to and exceeding 0.5 Bq/L. According to the guidelines, concentrations of radium^{226} should not be above 4.89 Bq/L and radium^{228} should not be above 1.98 Bq/L. All concentrations at all sites sampled during the three seasonal surveys were low (<0.49 Bq/L only slightly above the MRL of 0.10 Bq/L) and were lower than the threshold concentrations cited above.

In summary, the results of the three seasonal surveys (winter, summer and autumn) contribute to an appropriate baseline characterisation of the water quality in the study area.

5. References

Abe K (2004) Cadmium distribution in the Western Pacific. In: Shiyomi M, Kawahata H, Koizumi H, Tsuda A, Awaya Y (eds) *Global Environmental Change in the Ocean and on Land*. Terrapub, Tokyo, Japan, p 189–203

Agency for Toxic Substances and Disease Registry (1999) *Toxicological Profile for Total Petroleum Hydrocarbons (TPH)*. U.S Department of Health and Human Services, Agency for Toxic Substances and Disease Registry

ANZECC & ARMCANZ (2000a) *National Water Quality Management Strategy: Paper No 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volume 1 – The Guidelines (Chapters 1–7)*. Australian and New Zealand Environment and Conservation Council and Agricultural and Resource Management Council of Australia and New Zealand, Canberra, Australian Capital Territory, October 2000

ANZECC & ARMCANZ (2000b) *National Water Quality Management Strategy: Paper No 4 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volume 2 – Aquatic Ecosystems – Rationale and Background Information (Chapter 8)*. Australian and New Zealand Environment and Conservation Council and Agricultural and Resource Management Council of Australia and New Zealand, Canberra, Australian Capital Territory, October 2000

CEE (2002) *Environmental Impact Statement for Tassie Shoal Methanol Project*. Prepared for Methanol Australia Limited by Consulting Environmental Engineers, Richmond, Victoria

Department of Sustainability, Environment, Water, Population and Communities (2012) *Marine Bioregional Plan for the North Marine Region*. Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Capital Territory

Gilmour J, Smith L, Cook K, Pincock S (2013) *Discovering Scott Reef: 20 years of exploration and research*. Australian Institute of Marine Science, Science Communications Section, Melbourne, Victoria

Heyward A, Pinceratto E, Smith L (1997) *Big Bank Shoals of the Timor Sea: An Environmental Resource Atlas*. Australian Institute of Marine Science, Science Communications Section, Melbourne, Victoria

Hinga KR (2002) Effects of pH on coastal marine phytoplankton. *Marine Ecology Progress Series* 238:281–300

Jacobs (2014) *Barossa Environmental Studies: Water Quality Field Sampling Plan Method Statement*. Prepared for ConocoPhillips Australia Exploration Pty Ltd by Jacobs Group (Australia) Pty Ltd, Perth, Western Australia

NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999, 2013 amendment*. National Environment Protection Council, Canberra, Australian Capital Territory. Available at <http://www.scew.gov.au/nepms/assessment-site-contamination> [Accessed 27 January 2015]

NHMRC & ARMCANZ (2011) *National Water Quality Management Strategy: Paper No 6 – Australian Drinking Water Guidelines*. National Health and Medical Research Council and Agricultural and Resource Management Council of Australia and New Zealand, Canberra, Australian Capital Territory

Riley JP and Chester R (1971) *Introduction to Marine Chemistry*. Academic Press, London, UK

SKM (2014) *Browse Basin Environmental Studies: Water Quality of the Poseidon Gas Field*. Prepared for ConocoPhillips Australia Exploration Pty Ltd by Sinclair Knight Merz, Perth, Western Australia, February 2014

URS (2005) *Caldita-1 Pre-drilling Marine Environmental Survey 2005*. Prepared for ConocoPhillips Australia Exploration Pty Ltd by URS Australia Pty Ltd, December 2005

URS (2007) *Barossa-1 Pre-drilling Marine Environmental Survey 2006/2007*. Prepared for ConocoPhillips Australia Exploration Pty Ltd by URS Australia Pty Ltd, December 2007

Woodside (1999) *Evans Shoal-3 Well, NT/P48. Environment Plan*. Woodside Australian Energy, Perth, Western Australia

Appendix A. SBE 19plus V2 Calibration Certificate

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Environmental Science

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Murdoch UNIVERSITY

SBE 19 Plus V2 - 600m (19P-7123) - Salinity, Temperature, DO, pH, Turbidity and PAR check

Client: Jacobs Group (Australia) Pty Ltd
Address: 263 Adelaide Terrace, Perth WA 6000
Contact: Celeste Wilson Email: Celeste.Wilson@jacobs.com Phone: 9469 4438

Analyst: K.Wienczugow
Date: 26/03/2015
Job: Conoco Phillips Barossa

Table 1 Salinity Calibration Check

SBE 19 Plus V2 - 600m	[1]Laboratory Salinity Check Water	[2]Laboratory SBE 19 Plus V2 Comparison	SBE 19 Plus V2 - 600m	Tolerance ± 0.1psu	Date Checked / Name
Serial No: 19P-7123	Salinity (psu ± 0.1)	Salinity (psu)	Salinity Reading (psu)	Pass/Fail	
	32.7 ± 0.1	32.757	32.728	Pass	26/3/2015 K.Wienczugow

[1]Laboratory salinity check water was prepared by calibrating against IAPSO standard seawater 35.00 psu. [2]MAFRL's SBE 19 *Plus V2 - 100m* CTD was tested as an additional comparitive measure.

Table 2 Temperature Calibration Check

SBE 19 Plus V2 - 600m	[3]Laboratory Temperature Check	[2]Laboratory SBE 19 Plus V2 Comparison	SBE 19 Plus V2 - 600m	Tolerance ± 0.1°C	Date Checked / Name
Serial No: 19P-7123	Temperature (± 0.1 °C)	Temperature (°C)	Temperature Reading (°C)	Pass/Fail	
	22.7 ± 0.1	22.672	22.685	Pass	26/3/2015 K.Wienczugow

[3]Laboratory temperature check made with a NATA accredited -5.0 to 50.0°C immersion thermometer (Serial number: 0681667). [2]MAFRL's SBE 19 *Plus V2* - 100m CTD was tested as an additional comparitive measure.

Table 3 pH Calibration Check

Model: SBE 18-I	[4]Laboratory pH Check		SBE 19 Plus V2 - 600m	Tolerance ± 0.1 pH Unit	Date Calibrated / Name
Serial Number:180946	pH Standard (± 0.1)		pH Reading	Pass/Fail	
	4.01 @ 25°C		3.99	Pass	26/3/2015 K.Wienczugow
	7.00 @ 25°C		7.03	Pass	26/3/2015 K.Wienczugow
	10.01 @ 25°C		9.99	Pass	26/3/2015 K.Wienczugow

[4]pH calibration performed with pH standards (opened 11/3/2015) according to Sea-Bird Application note 18-1 for pH sensor calibration (Slope = 4.6006, Offset = 2.5179)

Table 4 DO Calibration Check

Model: SBE 43		[5]Laboratory SBE 19 Plus V2 Comparison	SBE 19 Plus V2 - 600m	Tolerance ± 2%	Date Checked / Name
Serial Number:432365		Dissolved Oxygen (%)	Dissolved Oxygen Reading (%)	Pass/Fail	
		99.9	98.8	Pass	26/3/2015 K.Wienczugow
		80.4	79.1	Pass	26/3/2015 K.Wienczugow

[5]Dissolve Oxygen calibration check performed in air saturated water and in a reduced oxygen water environment and compared against cleaned calibrated SBE 43 DO sensor from MAFRL's SBE 19 Plus V2 - 100m CTD.

Signatory:

Date: 26/3/2015

*Please note this report is not covered by NATA accreditation

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Environmental Science

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Murdoch UNIVERSITY

SBE 19 Plus V2 - 600m (19P-7123) - Salinity, Temperature, DO, pH, Turbidity and PAR check

Client: Jacobs Group (Australia) Pty Ltd
Address: 263 Adelaide Terrace, Perth WA 6000
Contact: Celeste Wilson Email: Celeste.Wilson@jacobs.com Phone: 9469 4438

Analyst: K.Wienczugow
Date: 26/03/2015
Job: Conoco Phillips Barossa

Table 5 Turbidity Calibration Check

Model: Wetlabs NTURT	[6]Laboratory Turbidity Standard		[7]SBE 19 Plus V2 - 600m	Tolerance ± 5%	Date Calibrated / Name
Serial Number: 201	Turbidity (NTU ± 0.01)		Turbidity Reading (NTU)	Pass/Fail	
	0.0		0.04	Pass	26/3/2015 K.Wienczugow
	5.0		5.11	Pass	26/3/2015 K.Wienczugow
	10.0		9.97	Pass	26/3/2015 K.Wienczugow

[6]Zero NTU standard prepared from 0.2µm filtered deionised distilled water. Freshly prepared primary formazin standard 4000 NTU was diluted for a three point check carried out in a non reflective black plastic bucket.

[7]Average readings were calculated using Sea Save software and Wetlabs calibration coefficients optimised for maximum accuracy below 20 NTU (Scale factor = 6.000, Dark output = 0.096).

Table 4 PAR Calibration Check

Model: Satlantic PAR LOG-s	[8]Laboratory Reference Lamp		[9]SBE 19 Plus V2 - 600m	Tolerance ±5%	Date Checked / Name
Serial Number:126	PAR (µmol $s^{-1}m^{-2}$)		PAR (µmol $s^{-1}m^{-2}$)	Pass/Fail	
	267		255 ±13	Pass	26/3/2015 K.Wienczugow
	0 (dark)		0	Pass	26/3/2015 K.Wienczugow

[8]Quartz Tungsten Halogen Reference Lamp operated at 3150°K from a LI-1800-02 Optical Radiation Calibrator. Reference lamp output has been corrected for the immersion effect with a multiplier of 1.322 for in-water operation.

[9]A certified LICOR LI-192SA Underwater Quantum Sensor (Serial number: 8207) was used as a control to check the output of the tungsten reference lamp used for verifying PAR against the Satlantic PAR cosine log sensor.

Signatory:

Date: 26/3/2015

*Please note this report is not covered by NATA accreditation

Appendix B. Plankton Transect Coordinates

Table B.1: GPS coordinates of the start and finish of the plankton transects – winter

Site name	Sample type	Coordinates (DDD° MM.MMM')[1]	
		Latitude	Longitude
SP3 start		9° 44' 55.592" S	130° 20' 31.955" E
SP3 finish	Phytoplankton and zooplankton	9° 45' 41.250" S	130° 10' 38.260" E
SP5 start		9° 53' 17.222" S	130° 24' 19.322" E
SP5 finish	Phytoplankton and zooplankton	9° 53' 16.390" S	130° 24' 09.370" E
SP6 start		9° 48' 44.030" S	129° 58' 5.259" E
SP6 finish	Phytoplankton and zooplankton	9° 48' 43.920" S	129° 57' 55.440" E
SP7 start		9° 55' 2.690" S	129° 33' 38.636" E
SP7 finish	Phytoplankton and zooplankton	9° 55' 02.170" S	129° 33' 28.950" E
SP10 start		9° 51' 25.533" S	129° 32' 5.302" E
SP10 finish	Phytoplankton and zooplankton	9° 51' 25.320" S	129° 31' 55.390" E
SP14 start		10° 14' 57.851" S	129° 46' 5.394" E
SP14 finish	Phytoplankton and zooplankton	10° 14' 52.570" S	129° 45' 58.170" E

Table B.2: GPS coordinates of the start and finish of the plankton transects – summer

Site name	Sample type	Coordinates (DDD° MM.MMM')[1]	
		Latitude	Longitude
SP1 start		9° 43' 30.000" S	130° 28' 54.300" E
SP1 finish	Phytoplankton and zooplankton	9° 43' 35.400" S	130° 29' 00.840" E
SP3 start		9° 45' 44.040" S	130° 10' 47.340" E
SP3 finish	Phytoplankton and zooplankton	9° 45' 47.760" S	130° 10' 56.520" E
SP5 start		9° 53' 19.320" S	130° 24' 21.300" E
SP5 finish	Phytoplankton and zooplankton	9° 53' 23.280" S	130° 24' 30.360" E
SP6 start		9° 48' 44.760" S	129° 58' 05.220" E
SP6 finish	Phytoplankton and zooplankton	9° 48' 50.520" S	129° 58' 13.200" E
SP7 start		9° 55' 06.720" S	129° 33' 37.920" E
SP7 finish	Phytoplankton and zooplankton	9° 55' 16.800" S	129° 33' 38.400" E
SP8 start		9° 57' 08.520" S	129° 32' 04.500" E
SP8 finish	Phytoplankton and zooplankton	9° 57' 13.560" S	129° 32' 13.380" E
SP10 start		9° 51' 39.600" S	129° 31' 51.840" E
SP10 finish	Phytoplankton and zooplankton	9° 51' 47.640" S	129° 31' 57.720" E
SP11 start		10° 08' 03.540" S	129° 32' 52.260" E
SP11 finish	Phytoplankton and zooplankton	10° 08' 06.180" S	129° 33' 01.440" E
SP13 start		10° 11' 40.680" S	129° 39' 42.960" E
SP13 finish	Phytoplankton and zooplankton	10° 11' 39.240" S	129° 39' 33.000" E
SP14 start		10° 14' 58.080" S	129° 46' 05.940" E
SP14 finish	Phytoplankton and zooplankton	10° 14' 48.420" S	129° 46' 03.600" E
SP16 start		10° 01' 37.120" S	130° 48' 36.420" E
SP16 finish	Phytoplankton and zooplankton	10° 01' 49.500" S	130° 48' 42.120" E
SP17 start		10° 02' 25.920" S	130° 50' 15.960" E
SP17 finish	Phytoplankton and zooplankton	10° 02' 31.680" S	130° 50' 24.120" E

Table B.3: GPS coordinates of the start and finish of the plankton transects – autumn

Site name	Sample type	Coordinates (DDD° MM.MMM')[1]	
		Latitude	Longitude
SP1 start		9° 43.999'S	130° 28.860'E
SP1 finish	Phytoplankton and zooplankton	9° 43.447'S	130° 28.706'E
SP3 start		9° 45.732'S	130° 10.800'E
SP3 finish	Phytoplankton and zooplankton	9° 45.729'S	130° 10.633'E
SP5 start		9° 53.289'S	130° 24.292'E
SP5 finish	Phytoplankton and zooplankton	9° 53.312'S	130° 24.129'E
SP6 start		9° 48.732'S	129° 57.923'E
SP6 finish	Phytoplankton and zooplankton	9° 48.726'S	129° 57.922'E
SP7 start		9° 55.061'S	129° 33.670'E
SP7 finish	Phytoplankton and zooplankton	9° 54.922'S	129° 33.580'E
SP8 start		9° 57.132'S	129° 32.098'E
SP8 finish	Phytoplankton and zooplankton	9° 57.135'S	129° 31.929'E
SP10 start		9° 51.430'S	129° 32.085'E
SP10 finish	Phytoplankton and zooplankton	9° 51.505'S	129° 31.935'E
SP11 start		10° 07.995'S	129° 33.000'E
SP11 finish	Phytoplankton and zooplankton	10° 08.025'S	129° 32.840'E
SP13 start		10° 11.727'S	129° 39.762'E
SP13 finish	Phytoplankton and zooplankton	10° 11.563'S	129° 39.759'E
SP14 start		10° 14.964'S	129° 46.090'E
SP14 finish	Phytoplankton and zooplankton	10° 14.870'S	129° 45.951'E
SP16 start		10° 01.636'S	130° 48.579'E
SP16 finish	Phytoplankton and zooplankton	10° 01.587'S	130° 48.417'E
SP17 start		10° 02.433' S	130° 50.267'E
SP17 finish	Phytoplankton and zooplankton	10° 02.428' S	130° 50.101'E

[1] Datum = GDA94.

Appendix C. Analytical Laboratory Reports

Appendix C1. Winter

CERTIFICATE OF ANALYSIS

Work Order	: **EP1404964**	Page	: 1 of 10
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: CELESTE WILSON	Contact	: Scott James
Address	: P O BOX H615 PERTH WA, AUSTRALIA 6001	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: cxxwilson@skm.com.au	E-mail	: perth.enviro.services@alsglobal.com
Telephone	: +61 08 9469 4400	Telephone	: +61-8-9209 7655
Facsimile	: +61 08 9469 4488	Facsimile	: +61-8-9209 7600
Project	: Jacobs Project Number WV04831 104	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 01-JUL-2014
Sampler	: G.C.	Issue Date	: 08-JUL-2014
Site	: ----		
		No. of samples received	: 36
Quote number	: EP/370/14	No. of samples analysed	: 34

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Agnes Szilagyi	Senior Organic Chemist	Perth Organics

General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP1-S	SP1-M	SP1-B	SP2-S	SP2-M
				Client sampling date / time	28-JUN-2014 18:10	28-JUN-2014 18:10	28-JUN-2014 18:10	28-JUN-2014 19:30	28-JUN-2014 19:30
					EP1404964-001	EP1404964-002	EP1404964-003	EP1404964-004	EP1404964-005
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**78.8**	**87.7**	**99.0**	**92.7**	**97.9**
Toluene-D8	2037-26-5	0.1	%		**113**	**110**	**106**	**105**	**105**
4-Bromofluorobenzene	460-00-4	0.1	%		**80.4**	**83.1**	**87.4**	**83.2**	**85.6**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID: SP2-B	SP3-S	SP3-M	SP3-B	SP4-S
				Client sampling date / time: 28-JUN-2014 19:30	29-JUN-2014 08:50	29-JUN-2014 08:50	29-JUN-2014 08:50	29-JUN-2014 07:15
				EP1404964-006	EP1404964-007	EP1404964-008	EP1404964-009	EP1404964-010
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**88.1**	**98.8**	**108**	**102**	**105**
Toluene-D8	2037-26-5	0.1	%	**110**	**105**	**104**	**105**	**104**
4-Bromofluorobenzene	460-00-4	0.1	%	**83.6**	**86.0**	**88.6**	**87.1**	**87.9**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP4-M	SP4-B	SP5-S	SP5-M	SP5-B
				Client sampling date / time	29-JUN-2014 07:15	29-JUN-2014 07:15	28-JUN-2014 16:30	28-JUN-2014 16:30	28-JUN-2014 16:30
					EP1404964-011	EP1404964-012	EP1404964-013	EP1404964-014	EP1404964-015
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	**140**	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	**140**	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	**130**	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	**130**	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**84.0**	**100**	**104**	**84.1**	**113**
Toluene-D8	2037-26-5	0.1	%		**113**	**106**	**104**	**112**	**106**
4-Bromofluorobenzene	460-00-4	0.1	%		**81.0**	**86.5**	**88.6**	**80.1**	**89.8**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP6-S	SP6-M	SP6-B	SP7-S	SP7-B
				Client sampling date / time	29-JUN-2014 11:00	29-JUN-2014 11:00	29-JUN-2014 11:00	29-JUN-2014 15:05	29-JUN-2014 15:05
					EP1404964-016	EP1404964-017	EP1404964-018	EP1404964-019	EP1404964-020
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	**310**	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	**310**	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	**230**	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	**230**	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**81.8**	**81.2**	**104**	**103**	**102**
Toluene-D8	2037-26-5	0.1	%		**114**	**115**	**108**	**106**	**106**
4-Bromofluorobenzene	460-00-4	0.1	%		**81.2**	**81.6**	**88.4**	**87.9**	**87.8**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP10-S	SP10-M	SP10-B	SP11-S	SP11-B
				Client sampling date / time	29-JUN-2014 15:00	29-JUN-2014 15:00	29-JUN-2014 15:00	29-JUN-2014 08:15	29-JUN-2014 08:15
					EP1404964-021	EP1404964-022	EP1404964-023	EP1404964-024	EP1404964-025
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**93.8**	**83.2**	**78.2**	**78.9**	**81.6**
Toluene-D8	2037-26-5	0.1	%		**110**	**113**	**113**	**116**	**113**
4-Bromofluorobenzene	460-00-4	0.1	%		**85.8**	**76.7**	**79.5**	**78.2**	**75.9**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SP12-S	SP12-M	SP12-B	SP13-S	SP13-M
				Client sampling date / time	29-JUN-2014 17:30	29-JUN-2014 17:30	29-JUN-2014 17:30	29-JUN-2014 19:15	29-JUN-2014 19:15
Compound	CAS Number	LOR	Unit		EP1404964-026	EP1404964-027	EP1404964-028	EP1404964-029	EP1404964-030
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**105**	**104**	**101**	**102**	**92.8**
Toluene-D8	2037-26-5	0.1	%		**106**	**105**	**108**	**105**	**109**
4-Bromofluorobenzene	460-00-4	0.1	%		**86.1**	**87.8**	**87.5**	**86.2**	**81.9**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID: SP13-B	SP14-S	SP14-M	SP14-B	----
				Client sampling date / time: 29-JUN-2014 19:15	26-JUN-2014 17:30	26-JUN-2014 17:30	26-JUN-2014 17:30	----
				EP1404964-031	EP1404964-032	EP1404964-033	EP1404964-034	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	---
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	---
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	---
C29 - C36 Fraction	----	50	µg/L	<50	<50	**190**	<50	---
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	**190**	<50	---
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	---
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	---
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	<100	<100	---
>C16 - C34 Fraction	----	100	µg/L	<100	<100	**180**	<100	---
>C34 - C40 Fraction	----	100	µg/L	<100	<100	**220**	<100	---
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	**400**	<100	---
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	---
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	---
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	---
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	---
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	---
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	---
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	---
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	---
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	---
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**103**	**82.2**	**123**	**113**	---
Toluene-D8	2037-26-5	0.1	%	**107**	**114**	**105**	**102**	---
4-Bromofluorobenzene	460-00-4	0.1	%	**87.6**	**79.0**	**89.4**	**89.7**	---

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	60.5	141.2
Toluene-D8	2037-26-5	73.4	126
4-Bromofluorobenzene	460-00-4	59.6	125.3

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Accreditation Number: 10603
Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included is this document are traceable to Australian/national standards.

Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/07/2014
Date Received: 01/07/2014
Our Reference: SKM14-24 - 2
Your Reference: WV04831.104

METHOD	Sampling	2000	4100	2100	4700	2700	3000	3000	2540D
SAMPLE CODE	Date	AMMONIA µg.N/L	ORTHO-P µg.P/L	NO3+NO2 µg.N/L	TOTAL-P µg.P/L	TOTAL-N µg.N/L	CHLOROPHYLL'a' µg/L	PHAEOPHYTIN'a' µg/L	TSS mg/L
Reporting Limit		<3	<2	<2	<5	<50	<0.05	<0.2	<1
File			14070202,0203		14070401		14070801		140703
SP1S	28/06/2014	<3	5	5	15	90	0.36	<0.2	
SP1M	28/06/2014	<3	33	250	38	300	<0.05	<0.2	
SP1B	28/06/2014	<3	60	390	65	440	<0.05	<0.2	
SP2S	28/06/2014	5	5	120	15	220	0.43	<0.2	<0.5
SP2M	28/06/2014	<3	34	250	39	310	<0.05	<0.2	
SP2B	28/06/2014	<3	61	400	65	430	<0.05	<0.2	
SP3S	29/06/2014	<3	5	15	15	110	0.50	<0.2	<0.5
SP3M	29/06/2014	<3	35	240	41	280	<0.05	<0.2	
SP3B	29/06/2014	<3	59	380	64	420	<0.05	<0.2	
SP4S	29/06/2014	<3	5	5	14	90	0.21	<0.2	
SP4M	29/06/2014	<3	28	180	34	240	0.07	<0.2	
SP4B	29/06/2014	<3	54	350	57	380	<0.05	<0.2	
SP5S	28/06/2014	<3	4	4	13	80	0.41	<0.2	
SP5M	28/06/2014	<3	26	170	31	220	0.08	<0.2	
SP5B	28/06/2014	<3	52	350	55	390	<0.05	<0.2	
SP6S	29/06/2014	<3	5	6	14	90	0.16	<0.2	<0.5
SP6M	29/06/2014	<3	34	220	38	270	<0.05	<0.2	
SP6B	29/06/2014	3	60	390	64	440	<0.05	<0.2	
SP7S	29/06/2014	<3	5	3	13	80	0.22	<0.2	
SP7B	29/06/2014	6	6	6	14	80	0.45	<0.2	

Signatory: Jamie Woodward
Date: 15/07/2014

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Marine and Freshwater
Research Laboratory
Environmental Science
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Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/07/2014
Date Received: 01/07/2014
Our Reference: SKM14-24 - 2
Your Reference: WV04831.104

METHOD	Sampling	2000	4100	2100	4700	2700	3000	3000	2540D
SAMPLE CODE	Date	AMMONIA µg.N/L	ORTHO-P µg.P/L	NO3+NO2 µg.N/L	TOTAL-P µg.P/L	TOTAL-N µg.N/L	CHLOROPHYLL'a' µg/L	PHAEOPHYTIN'a' µg/L	TSS mg/L
Reporting Limit		<3	<2	<2	<5	<50	<0.05	<0.2	<1
File			14070202,0203		14070401		14070801		140703
SP10S	29/06/2014	<3	5	6	14	100	0.18	<0.2	
SP10M	29/06/2014	<3	31	200	36	260	0.05	<0.2	
SP10B	29/06/2014	<3	51	330	54	370	<0.05	<0.2	
SP11S	29/06/2014	<3	4	<2	14	90	0.21	<0.2	
SP11B	29/06/2014	7	4	6	14	110	0.35	<0.2	
SP12S	29/06/2014	<3	4	2	14	90	0.17	<0.2	<0.5
SP12M	29/06/2014	<3	4	<2	12	90	0.42	<0.2	
SP12B	29/06/2014	<3	29	180	34	240	0.07	<0.2	
SP13S	29/06/2014	<3	5	<2	14	100	0.16	<0.2	
SP13M	29/06/2014	<3	4	4	12	100	0.53	<0.2	
SP13B	29/06/2014	<3	24	150	30	220	0.10	<0.2	
SP14S	26/06/2014	7	4	3	13	100	0.34	<0.2	
SP14M	26/06/2014	4	3	2	14	120	0.33	<0.2	
SP14B	26/06/2014	3	23	140	29	230	0.07	<0.2	
Transport Blank		<3	<2	<2	<5	<50			
Field Blank		9	<2	8	<5	<50	<0.05	<0.2	

Signatory: Jamie Woodward
Date: 15/07/2014

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Date Received: 01/07/2014
Our Reference: SKM14-24 - 2
Your Reference: WV04831.104

METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Filtered Cr µg/L	Filtered Co µg/L	Filtered Ni µg/L	Filtered Cu µg/L	Filtered Zn µg/L	Filtered As µg/L	Filtered Cd µg/L	Filtered Ba µg/L	Filtered Pb µg/L	Hg mg/L
Reporting Limit		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
File											14070401-02
SP1S	28/06/2014	<0.2	<0.05	<0.3	0.4	1	1.7	<0.1	5.4	<0.1	<0.0001
SP1M	28/06/2014	0.2	<0.05	<0.3	<0.2	1	1.9	<0.1	5.6	<0.1	<0.0001
SP1B	28/06/2014	0.2	<0.05	0.4	<0.2	<1	1.9	<0.1	8.0	<0.1	<0.0001
SP2S	28/06/2014	<0.2	<0.05	<0.3	0.3	3	1.7	<0.1	5.6	<0.1	<0.0001
SP2M	28/06/2014	0.2	<0.05	0.3	0.4	3	1.9	<0.1	5.5	<0.1	<0.0001
SP2B	28/06/2014	0.2	<0.05	0.4	<0.2	1	1.9	<0.1	7.5	<0.1	<0.0001
SP3S	29/06/2014	<0.2	<0.05	<0.3	0.2	2	1.7	<0.1	5.3	<0.1	<0.0001
SP3M	29/06/2014	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.5	<0.1	<0.0001
SP3B	29/06/2014	0.2	<0.05	0.3	<0.2	1	1.8	<0.1	7.5	<0.1	<0.0001
SP4S	29/06/2014	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.6	<0.1	<0.0001
SP4M	29/06/2014	<0.2	<0.05	0.3	0.2	<1	1.7	<0.1	5.6	<0.1	<0.0001
SP4B	29/06/2014	0.2	<0.05	0.3	<0.2	<1	1.8	<0.1	7.0	<0.1	<0.0001
SP5S	28/06/2014	<0.2	<0.05	<0.3	0.5	3	1.7	<0.1	5.3	0.1	<0.0001
SP5M	28/06/2014	0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP5B	28/06/2014	0.2	<0.05	0.3	0.2	1	1.8	<0.1	6.7	<0.1	<0.0001
SP6S	29/06/2014	<0.2	<0.05	<0.3	0.3	1	1.6	<0.1	5.4	<0.1	<0.0001
SP6M	29/06/2014	<0.2	<0.05	<0.3	0.2	<1	1.8	<0.1	5.5	<0.1	<0.0001
SP6B	29/06/2014	0.2	<0.05	0.4	0.3	2	1.8	<0.1	7.6	<0.1	<0.0001
SP7S	29/06/2014	<0.2	<0.05	<0.3	0.3	2	1.6	<0.1	5.6	<0.1	<0.0001
SP7B	29/06/2014	<0.2	<0.05	0.3	0.4	2	1.5	<0.1	5.4	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/07/2014

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Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/07/2014
Date Received: 01/07/2014
Our Reference: SKM14-24 - 2
Your Reference: WV04831.104

METHOD SAMPLE CODE	Sampling Date	MS001 Filtered Cr µg/L	MS001 Filtered Co µg/L	MS001 Filtered Ni µg/L	MS001 Filtered Cu µg/L	MS001 Filtered Zn µg/L	MS001 Filtered As µg/L	MS001 Filtered Cd µg/L	MS001 Filtered Ba µg/L	MS001 Filtered Pb µg/L	ICP006 Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**14070401-02**
SP10S	29/06/2014	<0.2	<0.05	<0.3	0.3	<1	1.7	<0.1	5.4	<0.1	<0.0001
SP10M	29/06/2014	<0.2	<0.05	0.3	0.4	2	1.7	<0.1	5.8	<0.1	<0.0001
SP10B	29/06/2014	0.2	<0.05	0.3	0.3	1	1.8	<0.1	6.8	<0.1	<0.0001
SP11S	29/06/2014	<0.2	<0.05	<0.3	0.4	1	1.6	<0.1	5.6	<0.1	<0.0001
SP11B	29/06/2014	<0.2	<0.05	<0.3	0.3	3	1.6	<0.1	5.4	<0.1	<0.0001
SP12S	29/06/2014	<0.2	<0.05	<0.3	0.2	1	1.6	<0.1	5.5	<0.1	<0.0001
SP12M	29/06/2014	<0.2	<0.05	<0.3	0.3	<1	1.6	<0.1	5.4	<0.1	<0.0001
SP12B	29/06/2014	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	6.1	<0.1	<0.0001
SP13S	29/06/2014	<0.2	<0.05	<0.3	0.3	1	1.6	<0.1	5.6	<0.1	<0.0001
SP13M	29/06/2014	<0.2	<0.05	<0.3	0.3	1	1.6	<0.1	5.3	<0.1	<0.0001
SP13B	29/06/2014	<0.2	<0.05	<0.3	<0.2	1	1.8	<0.1	6.0	<0.1	<0.0001
SP14S	26/06/2014	<0.2	<0.05	<0.3	<0.2	2	1.7	<0.1	5.3	<0.1	<0.0001
SP14M	26/06/2014	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.2	<0.1	<0.0001
SP14B	26/06/2014	<0.2	<0.05	<0.3	0.4	3	1.7	<0.1	6.0	<0.1	<0.0001
Transport Blank		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
Field Blank		<0.2	<0.05	<0.3	<0.2	1	<0.5	<0.1	<0.5	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/07/2014

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Date Received: 01/07/2014
Our Reference: SKM14-24 - 2
Your Reference: WV04831.104

METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Unfiltered Cr µg/L	Unfiltered Co µg/L	Unfiltered Ni µg/L	Unfiltered Cu µg/L	Unfiltered Zn µg/L	Unfiltered As µg/L	Unfiltered Cd µg/L	Unfiltered Ba µg/L	Unfiltered Pb µg/L	Unfiltered Hg mg/L
Reporting Limit		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
File											14070901-02
SP1S	28/06/2014	<0.2	<0.05	<0.3	0.3	1	1.8	<0.1	5.6	<0.1	<0.0001
SP1M	28/06/2014	0.2	<0.05	0.4	<0.2	1	1.9	<0.1	5.6	<0.1	<0.0001
SP1B	28/06/2014	0.3	<0.05	0.4	<0.2	<1	2.0	<0.1	7.9	<0.1	<0.0001
SP2S	28/06/2014	<0.2	<0.05	<0.3	0.5	3	1.7	<0.1	5.5	<0.1	<0.0001
SP2M	28/06/2014	0.2	<0.05	0.3	1.0	4	1.9	<0.1	5.7	<0.1	<0.0001
SP2B	28/06/2014	0.3	<0.05	0.4	<0.2	<1	1.9	<0.1	7.8	<0.1	<0.0001
SP3S	29/06/2014	<0.2	<0.05	<0.3	0.2	2	1.7	<0.1	5.3	<0.1	<0.0001
SP3M	29/06/2014	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.5	<0.1	<0.0001
SP3B	29/06/2014	0.3	<0.05	0.3	<0.2	1	1.8	<0.1	7.5	<0.1	<0.0001
SP4S	29/06/2014	<0.2	<0.05	<0.3	0.2	1	1.6	<0.1	5.5	<0.1	<0.0001
SP4M	29/06/2014	0.2	<0.05	<0.3	0.2	<1	1.8	<0.1	5.7	<0.1	<0.0001
SP4B	29/06/2014	0.2	<0.05	0.4	0.2	<1	1.9	<0.1	6.9	<0.1	<0.0001
SP5S	28/06/2014	<0.2	<0.05	<0.3	0.3	2	1.7	<0.1	5.3	<0.1	<0.0001
SP5M	28/06/2014	0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.5	<0.1	<0.0001
SP5B	28/06/2014	0.2	<0.05	0.4	0.4	2	1.7	<0.1	6.8	<0.1	<0.0001
SP6S	29/06/2014	<0.2	<0.05	<0.3	0.4	2	1.6	<0.1	5.5	<0.1	<0.0001
SP6M	29/06/2014	<0.2	<0.05	0.3	0.2	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP6B	29/06/2014	0.2	<0.05	0.4	0.2	1	1.9	<0.1	7.7	<0.1	<0.0001
SP7S	29/06/2014	<0.2	<0.05	<0.3	0.3	1	1.7	<0.1	5.6	<0.1	<0.0001
SP7B	29/06/2014	<0.2	<0.05	0.3	0.5	2	1.7	<0.1	5.5	<0.1	<0.0001

Signatory: Jamie Woodward
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Date of Issue: 15/07/2014
Date Received: 01/07/2014
Our Reference: SKM14-24 - 2
Your Reference: WV04831.104

METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Unfiltered Cr µg/L	Unfiltered Co µg/L	Unfiltered Ni µg/L	Unfiltered Cu µg/L	Unfiltered Zn µg/L	Unfiltered As µg/L	Unfiltered Cd µg/L	Unfiltered Ba µg/L	Unfiltered Pb µg/L	Unfiltered Hg mg/L
Reporting Limit		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
File											14070901-02
SP10S	29/06/2014	<0.2	<0.05	<0.3	0.3	<1	1.6	<0.1	5.5	<0.1	<0.0001
SP10M	29/06/2014	0.2	<0.05	0.3	0.4	2	1.8	<0.1	5.8	<0.1	<0.0001
SP10B	29/06/2014	0.2	<0.05	0.4	0.4	2	1.8	<0.1	6.7	<0.1	<0.0001
SP11S	29/06/2014	<0.2	<0.05	<0.3	0.3	<1	1.6	<0.1	5.9	<0.1	<0.0001
SP11B	29/06/2014	<0.2	<0.05	<0.3	0.3	1	1.6	<0.1	5.5	<0.1	<0.0001
SP12S	29/06/2014	<0.2	<0.05	<0.3	0.2	<1	1.6	<0.1	5.4	<0.1	<0.0001
SP12M	29/06/2014	<0.2	<0.05	<0.3	0.3	<1	1.6	<0.1	5.5	<0.1	<0.0001
SP12B	29/06/2014	0.2	<0.05	<0.3	0.2	<1	1.7	<0.1	6.0	<0.1	<0.0001
SP13S	29/06/2014	<0.2	<0.05	<0.3	0.3	1	1.6	<0.1	5.5	<0.1	<0.0001
SP13M	29/06/2014	<0.2	<0.05	<0.3	0.4	1	1.6	<0.1	5.5	<0.1	<0.0001
SP13B	29/06/2014	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.9	<0.1	<0.0001
SP14S	26/06/2014	<0.2	<0.05	<0.3	0.2	2	1.7	<0.1	5.4	<0.1	<0.0001
SP14M	26/06/2014	<0.2	<0.05	<0.3	0.2	2	1.7	<0.1	5.5	<0.1	<0.0001
SP14B	26/06/2014	<0.2	<0.05	<0.3	0.4	4	1.8	<0.1	6.1	<0.1	<0.0001
Transport Blank		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
Field Blank		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/07/2014

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Western Radiation Services
analytical laboratory & consulting

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Laboratory No. 14174

ABN: 64 135 436 092

15 August 2014

Ref: 7956
Contract: PB 22767

Sinclair Knight Merz – JACOBS PROJECT
7th Floor Durack Centre
PERTH WA 6000

Attn: Celeste Wilson

ANALYTICAL REPORT

The results (to 95%, 2σ confidence level) for Radium-226, Radium-228 and Thorium-228 analyses of thirty four (34) liquid samples, as received at our laboratory on 11 July 2014, are detailed on page two and three of this report.

MDL:	Radium-226	0.100Bq/l	Radium-228	0.100Bq/l
	Thorium-228	0.100Bq/l		
Method:	LTP No. 4(a)	Gamma Spectrometry Analysis		

Madassar A. Qureshi
Authorised Signatory

Realtime Group Limited solutions for today and tomorrow

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Mackay Office: Lot J Mackay Marina
Mackay Qld 4740
Tel: 61 7 4955 5944
Fax: 61 7 4955 7338

WRS No	Client Sample ID	Ra-226 (Bq/l)	Ra-228 (Bq/l)	Th-228 (Bq/l)
7956-1	SP1-S 28/06/2014	<MDL	0.123 ± 0.061	<MDL
7956-2	SP1-M 28/06/2014	<MDL	<MDL	<MDL
7956-3	SP1-B 28/06/2014	<MDL	<MDL	<MDL
7956-4	SP2-S 28/06/2014	<MDL	<MDL	<MDL
7956-5	SP2-M 28/06/2014	<MDL	0.493 ± 0.176	<MDL
7956-6	SP2-B 28/06/2014	<MDL	0.297 ± 0.103	<MDL
7956-7	SP3-S 29/06/2014	<MDL	0.230 ± 0.068	<MDL
7956-8	SP3-M 29/06/2014	<MDL	<MDL	<MDL
7956-9	SP3-B 29/06/2014	<MDL	<MDL	<MDL
7956-10	SP4-S 29/06/2014	<MDL	<MDL	<MDL
7956-10D	SP4-S 29/06/2014	<MDL	<MDL	<MDL
7956-11	SP4-M 29/06/2014	0.175 ± 0.068	0.110 ± 0.050	<MDL
7956-12	SP4-B 29/06/2014	<MDL	<MDL	<MDL
7956-13	SP5-S 28/06/2014	<MDL	0.257 ± 0.040	<MDL
7956-14	SP5-M 28/06/2014	<MDL	<MDL	<MDL
7956-15	SP5-B 28/06/2014	<MDL	<MDL	<MDL
7956-16	SP6-S 29/06/2014	<MDL	0.157 ± 0.044	<MDL
7956-17	SP6-M 29/06/2014	<MDL	<MDL	<MDL
7956-18	SP6-B 29/06/2014	<MDL	<MDL	<MDL
7956-19	SP7-S 29/06/2014	<MDL	<MDL	<MDL
7956-20	SP7-B 29/06/2014	<MDL	<MDL	<MDL
7956-20D	SP7-B 29/06/2014	<MDL	<MDL	<MDL
7956-21	SP10-S 29/06/2014	<MDL	<MDL	<MDL
7956-22	SP10-M 29/06/2014	<MDL	<MDL	<MDL
7956-23	SP10-B 29/06/2014	<MDL	<MDL	<MDL

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Mackay Office: Lot J Mackay Marina
Mackay Qld 4740
Tel: 61 7 4955 5944
Fax: 61 7 4955 7338

WRS No	Client Sample ID	Ra-226 (Bq/l)	Ra-228 (Bq/l)	Th-228 (Bq/l)
7956-24	SP11-S 29/06/2014	<MDL	<MDL	<MDL
7956-25	SP11-B 29/06/2014	<MDL	<MDL	<MDL
7956-26	SP12-S 29/06/2014	<MDL	<MDL	<MDL
7956-27	SP12-M 29/06/2014	<MDL	<MDL	<MDL
7956-28	SP12-B 29/06/2014	<MDL	<MDL	<MDL
7956-29	SP13-S 29/06/2014	<MDL	<MDL	<MDL
7956-30	SP13-M 29/06/2014	<MDL	<MDL	<MDL
7956-30D	SP13-M 29/06/2014	<MDL	<MDL	<MDL
7956-31	SP13-B 29/06/2014	<MDL	<MDL	<MDL
7956-32	SP14-S 26/06/2014	<MDL	<MDL	<MDL
7956-33	SP14-M 26/06/2014	<MDL	<MDL	<MDL
7956-34	SP14-B 26/06/2014	<MDL	0.249 ± 0.097	<MDL

The reported expanded uncertainty of measurement is stated as the standard uncertainty of the measurement ± 5.6 %, multiplied by the coverage factor k=2, which corresponds to a coverage probability of approximately 95%.

Realtime Group Limited solutions for today and tomorrow

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DATA REPORT

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WV04831.104
Timor Sea

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Analyst ID
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DSID
24338

Report Date
12/08/2014

Batch Number
140702111432

Sample ID
SP3

Date Collected
29/06/2014

Monitoring Point
SP3

Sample Type
Phytoplankton

Date Received
2/07/2014

Functional Location ID
SP3

Method (Detection Limit)
Raw Count (1)

Analysis Date
12/08/2014

Units Reported Cell Density:Cells^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Concentrated (phytoplankton net) sample.
Qualitative analysis.
Sedgewick Rafter Chamber (1 ml) - 1 Long transect analysed.

Field Data Recording

Total Density
743.0 Cells^{-1}

Total Counted
743

Uncertainty
7.3%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Asterolampra sp. 002	2		0.27
Chaetoceros spp.	131		17.63
Coscinodiscus nitidis	1		0.13
Coscinodiscus sp. 002	1		0.13
Cylindrotheca closterium	76		10.23
Detonula sp. 001	4		0.54
Fragilariopsis kergulensis	14		1.88
Guinardia striata	3		0.40
Leptocylindrus danicus	5		0.67
Leptocylindrus minimus	4		0.54
Navicula spp.	3		0.40
Nitzschia longissima	14		1.88
Nitzschia spp.	12		1.62
Planktoniella sol	1		0.13
Pseudonitzschia delicatissima group	9		1.21
Pseudonitzschia seriata group	1		0.13
Rhizosolenia spp.	1		0.13
Thalassiosira pseudonana	11		1.48
Thalassiosira sp. 004	26		3.50
Thalassiothrix sp. 001	10		1.35
	329	**0.0000**	**44.28**

Species Name	Density	BioVolume	%
Cyanobacteria			
Trichodesmium erythraeum	408		54.91
	408	**0.0000**	**54.91**
Dictyochophyceae			
Dictyocha fibula var. rhombica	1		0.13
Dictyocha octonaria	1		0.13
	2	**0.0000**	**0.27**
Dinophyceae			
Ceratium spp.	1		0.13
Prorocentrum dentatum	2		0.27
Scrippsiella trochoidea	1		0.13
	4	**0.0000**	**0.54**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Timor Sea

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stuart

DSID
24339

Report Date
12/08/2014

Batch Number
140702111615

Sample ID
SP5

Date Collected
28/06/2014

Monitoring Point
SP5

Sample Type
Phytoplankton

Date Received
2/07/2014

Functional Location ID
SP5

Method (Detection Limit)
Raw Count (1)

Analysis Date
12/08/2014

Units Reported Cell Density:Cells^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Concentrated (phytoplankton net) sample.
Qualitative analysis.
Sedgewick Rafter Chamber (1 ml) - 1 Long transect analysed.

Field Data Recording

Total Density
1,243.0 Cells^{-1}

Total Counted
1,243

Uncertainty
5.7%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Asterolampra sp. 001	1		0.08
Asterolampra sp. 002	1		0.08
Bacteriastrum hyalinum	10		0.80
Cerataulina sp. 004	9		0.72
Chaetoceros spp.	114		9.17
Climacodium frauenfeldianum	4		0.32
Coscinodiscus nitidis	5		0.40
Cylindrotheca closterium	88		7.08
Diatom 189	1		0.08
Eucampia cornuta	4		0.32
Fragilariopsis kergulensis	3		0.24
Navicula spp.	3		0.24
Nitzschia longissima	30		2.41
Nitzschia spp.	2		0.16
Pseudonitzschia delicatissima group	14		1.13
Pseudonitzschia seriata group	8		0.64
Rhizosolenia setigera	7		0.56
Rhizosolenia spp.	5		0.40
Thalassionema frauenfeldii	12		0.97
Thalassiosira pseudonana	7		0.56
Thalassiosira sp. 004	7		0.56

Species Name	Density	BioVolume	%
Thalassiothrix sp. 001	15		1.21
	350	**0.0000**	**28.16**
Cyanobacteria			
Trichodesmium erythraeum	880		70.80
	880	**0.0000**	**70.80**
Dictyochophyceae			
Dictyocha fibula var. rhombica	6		0.48
	6	**0.0000**	**0.48**
Dinophyceae			
Ceratium breve	2		0.16
Ornithocercus splendicus	3		0.24
Protoperidinium roseum	1		0.08
Protoperidinium sp. 037	1		0.08
	7	**0.0000**	**0.56**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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stuart

DSID
24340

Report Date
12/08/2014

Batch Number
140702111733

Sample ID
SP6

Date Collected
29/06/2014

Monitoring Point
SP6 - Barossa WV04831

Sample Type
Phytoplankton

Date Received
2/07/2014

Functional Location ID
SP6

Method (Detection Limit)
Raw Count (1)

Analysis Date
12/08/2014

Units Reported Cell Density:Cells^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Concentrated (phytoplankton net) sample.
Qualitative analysis.
Sedgewick Rafter Chamber (1 ml) - 1 Long transect analysed.

Field Data Recording

Total Density
1,043.0 Cells^{-1}

Total Counted
1,043

Uncertainty
6.2%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	2		0.19
Cerataulina pelagica	2		0.19
Chaetoceros spp.	45		4.31
Climacodium frauenfeldianum	6		0.58
Coscinodiscus nitidis	1		0.10
Coscinodiscus sp. 002	1		0.10
Cylindrotheca closterium	5		0.48
Eucampia sp. 001	2		0.19
Fragilariopsis kergulensis	2		0.19
Navicula spp.	1		0.10
Nitzschia longissima	5		0.48
Proboscia alata	1		0.10
Pseudonitzschia delicatissima group	2		0.19
Rhizosolenia spp.	4		0.38
Thalassiosira sp. 004	7		0.67
Thalassiothrix sp. 001	22		2.11
	108	**0.0000**	**10.35**
Cyanobacteria			
Trichodesmium erythraeum	920		88.21
	920	**0.0000**	**88.21**

Species Name	Density	BioVolume	%
Dictyochophyceae			
Dictyocha fibula var. rhombica	3		0.29
Dictyocha octonaria	1		0.10
	4	**0.0000**	**0.38**
Dinophyceae			
Ceratium buceros	2		0.19
Ceratium furca	4		0.38
Ceratium lineatum	2		0.19
Protoperidinium roseum	1		0.10
Pyrocystis lunula	1		0.10
Scrippsiella trochoidea	1		0.10
	11	**0.0000**	**1.05**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DSID
24341

Report Date
12/08/2014

Batch Number
140702111841

Sample ID
SP7

Date Collected
29/06/2014

Monitoring Point
SP6 - Barossa WV04831

Sample Type
Phytoplankton

Date Received
2/07/2014

Functional Location ID
SP6

Method (Detection Limit)
Raw Count (1)

Analysis Date
12/08/2014

Units Reported Cell Density:Cells^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Concentrated (phytoplankton net) sample.
Qualitative analysis.
Sedgewick Rafter Chamber (1 ml) - 1 Long transect analysed.

Field Data Recording

Total Density
725.0 Cells^{-1}

Total Counted
725

Uncertainty
7.4%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Asterolampra sp. 002	1		0.14
Bacteriastrum hyalinum	6		0.83
Bacteriastrum sp. 018	4		0.55
Cerataulina pelagica	8		1.10
Chaetoceros spp.	104		14.34
Climacodium frauenfeldianum	8		1.10
Coscinodiscus nitidis	10		1.38
Coscinodiscus sp. 002	4		0.55
Cylindrotheca closterium	2		0.28
Dactyliosolen antarcticus	11		1.52
Fragilariopsis kergulensis	4		0.55
Hemiaulus sp. 001	1		0.14
Lithodesmium sp. 001	2		0.28
Nitzschia longissima	4		0.55
Pseudonitzschia delicatissima group	5		0.69
Rhizosolenia spp.	10		1.38
Thalassiosira sp. 004	7		0.97
Thalassiothrix sp. 001	7		0.97
	198	**0.0000**	**27.31**
Cyanobacteria			

Species Name	Density	BioVolume	%
Trichodesmium erythraeum	510		70.34
	510	**0.0000**	**70.34**
Dictyochophyceae			
Dictyocha fibula var. rhombica	2		0.28
Dictyocha octonaria	2		0.28
	4	**0.0000**	**0.55**
Dinophyceae			
Ceratium breve	1		0.14
Ceratium buceros	1		0.14
Ceratium furca	2		0.28
Ceratium lineatum	3		0.41
Ceratium sp. 054	1		0.14
Dinophysis miles	1		0.14
Ornithocercus splendicus	1		0.14
Phalacroma rotundatum	1		0.14
Protoperidinium roseum	1		0.14
Protoperidinium sp. 032	1		0.14
	13	**0.0000**	**1.79**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DSID
24342

Report Date
12/08/2014

Batch Number
140702111947

Sample ID
SP10

Date Collected
29/06/2014

Monitoring Point
Barossa

Sample Type
Phytoplankton

Date Received
2/07/2014

Functional Location ID
SP10

Method (Detection Limit)
Raw Count (1)

Analysis Date
12/08/2014

Units Reported Cell Density:Cells^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Concentrated (phytoplankton net) sample.
Qualitative analysis.
Sedgewick Rafter Chamber (1 ml) - 1 Long transect analysed.

Field Data Recording

Total Density
1,800.0 Cells^{-1}

Total Counted
1,800

Uncertainty
4.7%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	5		0.28
Bacteriastrum sp. 018	14		0.78
Cerataulina sp. 004	3		0.17
Chaetoceros spp.	194		10.78
Climacodium frauenfeldianum	72		4.00
Coscinodiscus centralis	1		0.06
Coscinodiscus nitidis	4		0.22
Cylindrotheca closterium	3		0.17
Detonula sp. 001	2		0.11
Diatom 085	3		0.17
Diatom 189	1		0.06
Nitzschia longissima	3		0.17
Proboscia alata	3		0.17
Pseudonitzschia delicatissima group	6		0.33
Pseudonitzschia seriata group	5		0.28
Rhizosolenia setigera	3		0.17
Rhizosolenia spp.	7		0.39
Skeletonema spp.	6		0.33
Thalassiosira sp. 004	16		0.89
Thalassiothrix sp. 001	11		0.61
	362	**0.0000**	**20.11**

Species Name	Density	BioVolume	%
Cyanobacteria			
Trichodesmium erythraeum	1,415		78.61
	1,415	**0.0000**	**78.61**
Dictyochophyceae			
Dictyocha fibula var. rhombica	5		0.28
Dictyocha octonaria	1		0.06
	6	**0.0000**	**0.33**
Dinophyceae			
Ceratium breve	1		0.06
Ceratium furca	2		0.11
Ceratium lineatum	1		0.06
Ceratium sp. 027	3		0.17
Ceratium sp. 054	1		0.06
Ornithocercus splendicus	1		0.06
Oxytoxum scolopax	1		0.06
Prorocentrum mexicanum	1		0.06
Prorocentrum sp. 012	1		0.06
Protoperidinium sp. 018	1		0.06
Protoperidinium sp. 024	1		0.06
Protoperidinium steinii	2		0.11
Scrippsiella trochoidea	1		0.06
	17	**0.0000**	**0.94**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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DSID
24343

Report Date
12/08/2014

Batch Number
140702112054

Sample ID
SP14

Date Collected
26/06/2014

Monitoring Point
WV04831

Sample Type
Phytoplankton

Date Received
2/07/2014

Functional Location ID
SP14

Method (Detection Limit)
Raw Count (1)

Analysis Date
12/08/2014

Units Reported Cell Density:Cells^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Concentrated (phytoplankton net) sample.
Qualitative analysis.
Sedgewick Rafter Chamber (1 ml) - 1 Long transect analysed.

Field Data Recording

Total Density
2,327.0 Cells^{-1}

Total Counted
2,327

Uncertainty
4.1%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	336		14.44
Bacteriastrum sp. 018	54		2.32
Cerataulina pelagica	11		0.47
Cerataulina sp. 004	7		0.30
Chaetoceros spp.	1,038		44.61
Climacodium frauenfeldianum	28		1.20
Corethron criophilum	1		0.04
Corethron sp. 004	1		0.04
Coscinodiscus centralis	5		0.21
Coscinodiscus nitidis	47		2.02
Coscinodiscus sp. 002	2		0.09
Cylindrotheca closterium	11		0.47
Dactyliosolen antarcticus	2		0.09
Dactyliosolen phuketensis	2		0.09
Detonula sp. 001	3		0.13
Diatom 125	69		2.97
Diatom 301	1		0.04
Eucampia cornuta	12		0.52
Eucampia sp. 001	1		0.04
Fragilariopsis kergulensis	31		1.33
Guinardia striata	9		0.39

Species Name	Density	BioVolume	%
Hemiaulus sp. 001	41		1.76
Hemiaulus sp. 006	1		0.04
Leptocylindrus danicus	7		0.30
Meuniera membranacea	6		0.26
Navicula spp.	1		0.04
Nitzschia longissima	8		0.34
Pleurosigma salinarum	1		0.04
Proboscia alata	21		0.90
Pseudo-nitzschia "seriata group"	5		0.21
Pseudonitzschia delicatissima group	3		0.13
Rhizosolenia spp.	63		2.71
Thalassionema frauenfeldii	291		12.51
Thalassiosira sp. 004	8		0.34
Thalassiothrix sp. 001	21		0.90
	2,148	**0.0000**	**92.31**
Cyanobacteria			
Trichodesmium erythraeum	142		6.10
	142	**0.0000**	**6.10**
Dictyochophyceae			
Dictyocha fibula var. rhombica	13		0.56
Dictyocha octonaria	4		0.17
	17	**0.0000**	**0.73**
Dinophyceae			
Amphisolenia sp. 002	1		0.04
Ceratium buceros	1		0.04
Ceratium candelabrum	1		0.04
Ceratium declinatum	1		0.04
Ceratium furca	1		0.04
Ceratium lineatum	2		0.09
Ceratium sp. 032	1		0.04
Ceratium sp. 054	1		0.04
Ornithocercus splendicus	2		0.09
Oxytoxum scolopax	1		0.04
Phalacroma rotundatum	1		0.04
Prorocentrum micans	1		0.04
Prorocentrum sp. 009	2		0.09
Protoperidinium steinii	3		0.13
Scrippsiella trochoidea	1		0.04
	20	**0.0000**	**0.86**

Species Name	Density	BioVolume	%

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Project
WV04831.104
Timor Sea

Customer
Sinclair Knight Merz
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Analyst ID
stuart

DSID
24344

Report Date
8/08/2014

Batch Number
140702112203

Sample ID
SP3

Date Collected
29/06/2014

Monitoring Point
SP3

Sample Type
Zooplankton

Date Received
2/07/2014

Functional Location ID
SP3

Method (Detection Limit)
Raw Count (1)

Analysis Date
30/07/2014

Units Reported: Cell Density:Individuals^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Original sample volume = 84 ml.
Sample diluted 25x prior to analysis.
3 x 1ml sub-samples (Sedgewick-Rafter Chamber) analysed.

Field Data Recording

Total Density
157.0 Individuals^{-1}

Total Counted
157

Uncertainty
16.0%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	2		1.27
	2	**0.0000**	**1.27**
Copepoda			
Acartiidae	6		3.82
Calanidae	36		22.93
Copepod Nauplius	14		8.92
Corycaeidae	15		9.55
Macrosetella sp. 001	4		2.55
Oithonidae	12		7.64
Oncaeidae	5		3.18
Paracalanidae	8		5.10
Sulcanidae	4		2.55
Temoridae	1		0.64
	105	**0.0000**	**66.88**
Foraminifera			
Foraminiferida	2		1.27
	2	**0.0000**	**1.27**
Malacostraca			

Species Name	Density	BioVolume	%
Anomuran zoea larva	3		1.91
	3	**0.0000**	**1.91**
Maxillopoda			
Cirripede nauplius	1		0.64
	1	**0.0000**	**0.64**
Ostracoda			
Cypridinidae	1		0.64
	1	**0.0000**	**0.64**
Sagittoidea			
Chaetognath	4		2.55
	4	**0.0000**	**2.55**
Thaliacea			
Salpidae	1		0.64
	1	**0.0000**	**0.64**
Trizonidae			
Trizonidae	37		23.57
	37	**0.0000**	**23.57**
Unknown			
Protozoa 047	1		0.64
	1	**0.0000**	**0.64**

End Of Report

This report contains coloured shading. Dalcon Environmental intends that this report be viewed and/or printed in colour.

Dalcon Environmental Pty Ltd makes no claim that the taxa list provided herein is exhaustive. Some taxa, including potentially problematic taxa, may be present in the sample but not recorded during analysis, this is particularly the case for small or inconspicuous taxa or taxa present in low numbers. Guidance presented herein is based on published research , whilst Dalcon Environmental make every attempt to remain up to date, it is possible that scientific consensus may differ from that presented herein.

Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

A// 3 Yeeda Way
Malaga, WA 6090
P// (08) 9271 6776
F// (08) 9248 9120

Project
WV04831.104
Timor Sea

Customer
Sinclair Knight Merz
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
24345

Report Date
8/08/2014

Batch Number
140702112325

Sample ID
SP5

Date Collected
28/06/2014

Monitoring Point
SP5

Sample Type
Zooplankton

Date Received
2/07/2014

Functional Location ID
SP5

Method (Detection Limit)
Raw Count (1)

Analysis Date
6/08/2014

Units Reported: Cell Density:Individuals^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Original sample volume = 66 ml.
Sample diluted 10x prior to analysis.
3 x 1ml sub-samples (Sedgewick-Rafter Chamber) analysed.

Field Data Recording

Total Density
527.0 Individuals^{-1}

Total Counted
527

Uncertainty
8.7%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	46		8.73
	46	**0.0000**	**8.73**
Copepoda			
Acartiidae	145		27.51
Calanidae	113		21.44
Copepod Nauplius	97		18.41
Corycaeidae	19		3.61
Macrosetella sp. 001	5		0.95
Microsetella	9		1.71
Oithonidae	21		3.98
Oncaeidae	1		0.19
Paracalanidae	1		0.19
Pontellidae nauplius	2		0.38
Sulcanidae	10		1.90
	423	**0.0000**	**80.27**
Foraminifera			
Foraminiferida	2		0.38
	2	**0.0000**	**0.38**

Species Name	Density	BioVolume	%
Ophiuroidea			
Echinoderm Ophiopluteus Larva	1		0.19
	1	**0.0000**	**0.19**
Sagittoidea			
Chaetognath	4		0.76
	4	**0.0000**	**0.76**
Trizonidae			
Trizonidae	51		9.68
	51	**0.0000**	**9.68**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

A// 3 Yeeda Way
Malaga, WA 6090
P// (08) 9271 6776
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Project
WV04831.104
Timor Sea

Customer
Sinclair Knight Merz
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
24346

Report Date
8/08/2014

Batch Number
140702112444

Sample ID
SP14

Date Collected
26/06/2014

Monitoring Point
WV04831

Sample Type
Zooplankton

Date Received
2/07/2014

Functional Location ID
SP14

Method (Detection Limit)
Raw Count (1)

Analysis Date
30/07/2014

Units Reported: Cell Density:Individuals^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Original sample volume = 66 ml.
Sample diluted 100x prior to analysis.
3 x 1ml sub-samples (Sedgewick-Rafter Chamber) analysed.

Field Data Recording

Total Density
212.0 Individuals^{-1}

Total Counted
212

Uncertainty
13.7%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	1		0.47
	1	**0.0000**	**0.47**
Copepoda			
Acartiidae	31		14.62
Calanidae	53		25.00
Copepod Nauplius	44		20.75
Corycaeidae	2		0.94
Macrosetella sp. 001	7		3.30
Microsetella	8		3.77
Oncaeidae	1		0.47
Paracalanidae	5		2.36
Sulcanidae	4		1.89
	155	**0.0000**	**73.11**
Foraminifera			
Foraminiferida	4		1.89
	4	**0.0000**	**1.89**
Gigartacontidae			
Gigartacontidae	2		0.94

Species Name	Density	BioVolume	%
	2	**0.0000**	**0.94**
Malacostraca			
Hyperiidae	1		0.47
	1	**0.0000**	**0.47**
Ophiuroidea			
Echinoderm Ophiopluteus Larva	1		0.47
	1	**0.0000**	**0.47**
Polycystinea			
Theoperidae	2		0.94
	2	**0.0000**	**0.94**
Sagittoidea			
Chaetognath	2		0.94
	2	**0.0000**	**0.94**
Trizonidae			
Trizonidae	44		20.75
	44	**0.0000**	**20.75**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

Appendix C1. Summer

CERTIFICATE OF ANALYSIS

Work Order	: **EP1500461**	Page	: 1 of 13
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR CHRIS TEASDALE	Contact	: Scott James
Address	: P O BOX H615 PERTH WA, AUSTRALIA 6001	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: cteasdale@globalskm.com	E-mail	: perth.enviro.services@alsglobal.com
Telephone	: +61 08 9469 4400	Telephone	: +61-8-9209 7655
Facsimile	: +61 08 9469 4488	Facsimile	: +61-8-9209 7600
Project	: IW021200	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: IW021200.104		
C-O-C number	: ----	Date Samples Received	: 23-JAN-2015
Sampler	: K.R.	Issue Date	: 29-JAN-2015
Site	: ----		
		No. of samples received	: 48
Quote number	: EP/370/14	No. of samples analysed	: 48

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Agnes Szilagyi	Senior Organic Chemist	Perth Organics

General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP1-S	SP1-M	SP1-B	SP2-S	SP2-M
				Client sampling date / time	20-JAN-2015 08:25	20-JAN-2015 08:25	20-JAN-2015 08:25	20-JAN-2015 07:00	20-JAN-2015 07:00
					EP1500461-001	EP1500461-002	EP1500461-003	EP1500461-004	EP1500461-005
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**94.5**	**105**	**104**	**99.8**	**103**
Toluene-D8	2037-26-5	0.1	%		**101**	**96.6**	**98.5**	**99.2**	**98.1**
4-Bromofluorobenzene	460-00-4	0.1	%		**96.7**	**98.6**	**97.9**	**97.3**	**96.0**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP2-B	SP3-S	SP3-M	SP3-B	SP4-S
				Client sampling date / time	20-JAN-2015 07:00	19-JAN-2015 14:10	19-JAN-2015 14:10	19-JAN-2015 14:10	19-JAN-2015 15:20
					EP1500461-006	EP1500461-007	EP1500461-008	EP1500461-009	EP1500461-010
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**99.5**	**98.1**	**100**	**101**	**99.1**
Toluene-D8	2037-26-5	0.1	%		**99.3**	**101**	**99.3**	**98.3**	**99.9**
4-Bromofluorobenzene	460-00-4	0.1	%		**95.4**	**95.1**	**94.8**	**95.1**	**94.8**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SP4-M	SP4-B	SP5-S	SP5-M	SP5-B
				Client sampling date / time	19-JAN-2015 15:20	19-JAN-2015 15:20	19-JAN-2015 16:45	19-JAN-2015 16:45	19-JAN-2015 16:45
Compound	CAS Number	LOR	Unit		EP1500461-011	EP1500461-012	EP1500461-013	EP1500461-014	EP1500461-015
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**96.4**	**102**	**101**	**99.1**	**101**
Toluene-D8	2037-26-5	0.1	%		**101**	**99.1**	**99.7**	**100**	**99.2**
4-Bromofluorobenzene	460-00-4	0.1	%		**93.6**	**93.5**	**93.8**	**93.5**	**93.8**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SP6-S	SP6-M	SP6-B	SP7-S	SP7-B
				Client sampling date / time	19-JAN-2015 12:10	19-JAN-2015 12:10	19-JAN-2015 12:10	18-JAN-2015 11:30	18-JAN-2015 11:30
Compound	CAS Number	LOR	Unit		EP1500461-016	EP1500461-017	EP1500461-018	EP1500461-019	EP1500461-020
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**97.9**	**94.8**	**94.2**	**95.6**	**100**
Toluene-D8	2037-26-5	0.1	%		**101**	**102**	**102**	**101**	**99.4**
4-Bromofluorobenzene	460-00-4	0.1	%		**92.3**	**91.4**	**90.7**	**91.6**	**92.8**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP8-S	SP8-M	SP8-B	SP9-S	SP9-M
				Client sampling date / time	18-JAN-2015 14:30	18-JAN-2015 14:30	18-JAN-2015 14:30	18-JAN-2015 13:30	18-JAN-2015 13:30
					EP1500461-021	EP1500461-022	EP1500461-023	EP1500461-024	EP1500461-025
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**97.3**	**95.5**	**97.8**	**95.2**	**103**
Toluene-D8	2037-26-5	0.1	%		**101**	**101**	**101**	**101**	**98.2**
4-Bromofluorobenzene	460-00-4	0.1	%		**89.1**	**89.7**	**89.8**	**88.9**	**92.2**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SP9-B	SP10-S	SP10-M	SP10-B	SP11-S
				Client sampling date / time	18-JAN-2015 13:30	18-JAN-2015 09:16	18-JAN-2015 09:16	18-JAN-2015 09:16	18-JAN-2015 16:55
Compound	CAS Number	LOR	Unit		EP1500461-026	EP1500461-027	EP1500461-028	EP1500461-029	EP1500461-030
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**97.3**	**98.0**	**96.3**	**97.8**	**94.8**
Toluene-D8	2037-26-5	0.1	%		**101**	**101**	**100**	**102**	**102**
4-Bromofluorobenzene	460-00-4	0.1	%		**90.6**	**89.6**	**89.5**	**89.0**	**89.4**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SP11-B	SP12-S	SP12-M	SP12-B	SP13-S
				Client sampling date / time	18-JAN-2015 16:55	18-JAN-2015 15:50	18-JAN-2015 15:50	18-JAN-2015 15:50	19-JAN-2015 07:20
Compound	CAS Number	LOR	Unit		EP1500461-031	EP1500461-032	EP1500461-033	EP1500461-034	EP1500461-035
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**97.1**	**99.4**	**96.0**	**101**	**100**
Toluene-D8	2037-26-5	0.1	%		**101**	**100**	**100**	**99.4**	**99.4**
4-Bromofluorobenzene	460-00-4	0.1	%		**89.0**	**89.0**	**88.4**	**90.4**	**91.0**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP13-M	SP13-B	SP14-S	SP14-M	SP14-B
				Client sampling date / time	19-JAN-2015 07:20	19-JAN-2015 07:20	19-JAN-2015 08:40	19-JAN-2015 08:40	19-JAN-2015 08:40
					EP1500461-036	EP1500461-037	EP1500461-038	EP1500461-039	EP1500461-040
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**101**	**94.8**	**101**	**100**	**95.7**
Toluene-D8	2037-26-5	0.1	%		**99.2**	**100**	**98.7**	**99.5**	**103**
4-Bromofluorobenzene	460-00-4	0.1	%		**89.0**	**88.5**	**88.6**	**89.5**	**99.5**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP15-S	SP15-M	SP15-B	SP16-S	SP16-B
				Client sampling date / time	20-JAN-2015 11:00	20-JAN-2015 11:00	20-JAN-2015 11:00	20-JAN-2015 13:10	20-JAN-2015 13:10
					EP1500461-041	EP1500461-042	EP1500461-043	EP1500461-044	EP1500461-045
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**94.7**	**104**	**105**	**106**	**102**
Toluene-D8	2037-26-5	0.1	%		**102**	**98.6**	**101**	**100**	**101**
4-Bromofluorobenzene	460-00-4	0.1	%		**93.4**	**88.4**	**90.1**	**92.6**	**88.6**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP17-S	SP17-M	SP17-B	----	----
				Client sampling date / time	20-JAN-2015 14:35	20-JAN-2015 14:35	20-JAN-2015 14:35	----	----
					EP1500461-046	EP1500461-047	EP1500461-048	---	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	----	---
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	----	---
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	----	---
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	----	---
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	----	---
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	----	---
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	----	---
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	----	---
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	----	---
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	----	---
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	----	---
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	----	---
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	----	---
Toluene	108-88-3	2	µg/L		<2	<2	<2	----	---
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	----	---
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	----	---
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	----	---
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	----	---
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	----	---
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	----	---
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**104**	**107**	**109**	----	---
Toluene-D8	2037-26-5	0.1	%		**100**	**98.1**	**97.6**	----	---
4-Bromofluorobenzene	460-00-4	0.1	%		**88.4**	**89.4**	**86.8**	----	---

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	60.5	141.2
Toluene-D8	2037-26-5	73.4	126
4-Bromofluorobenzene	460-00-4	59.6	125.3

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Accreditation Number: 10603
Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included is this document are traceable to Australian/national standards.

Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 17/02/2015
Date Received: 22/01/2015
Our Reference: JAC14-12
Your Reference: IW021200.104

METHOD	Sampling	2000	4100	2100	4700	2700	3000	3000	2540D
SAMPLE CODE	Date	AMMONIA	ORTHO-P	NO3+NO2	TOTAL-P	TOTAL-N	CHLOROPHYLL'a'	PHAEOPHYTIN'a'	TSS
		µg.N/L	µg.P/L	µg.N/L	µg.P/L	µg.N/L	µg/L	µg/L	mg/L
Reporting Limit		<3	<2	<2	<5	<50	<0.1	<0.2	<0.5
File		15012902,020901			15020301,1201		15012803		150127
SP1-S	20/01/2015	<3	4	<2	13	90	0.1	<0.2	
SP1-M	20/01/2015	<3	35	230	42	300	<0.1	<0.2	
SP1-B	20/01/2015	<3	56	380	62	420	<0.1	<0.2	
SP2-S	20/01/2015	<3	4	2	13	110	<0.1	<0.2	<0.5
SP2-M	20/01/2015	3	32	210	36	270	<0.1	<0.2	
SP2-B	20/01/2015	6	54	370	59	420	<0.1	<0.2	
SP3-S	19/01/2015	<3	3	<2	14	90	<0.1	<0.2	0.8
SP3-M	19/01/2015	<3	31	230	36	270	<0.1	<0.2	
SP3-B	19/01/2015	<3	39	290	58	400	<0.1	<0.2	
SP4-S	19/01/2015	<3	4	<2	14	80	0.1	<0.2	
SP4-M	19/01/2015	<3	27	200	33	240	<0.1	<0.2	
SP4-B	19/01/2015	3	47	340	51	360	<0.1	<0.2	
SP5-S	19/01/2015	<3	4	<2	13	100	0.1	<0.2	
SP5-M	19/01/2015	<3	34	230	40	260	<0.1	<0.2	
SP5-B	19/01/2015	5	46	330	52	360	<0.1	<0.2	
SP6-S	19/01/2015	3	3	<2	14	100	0.1	<0.2	<0.5
SP6-M	19/01/2015	8	23	150	35	260	<0.1	<0.2	
SP6-B	19/01/2015	4	43	280	57	400	<0.1	<0.2	
SP7-S	18/01/2015	4	4	2	12	100	0.1	<0.2	0.7
SP7-B	18/01/2015	<3	4	2	13	90	0.2	<0.2	

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

Signatory: Jamie Woodward
Date: 17/02/2015

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Environmental Science
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Accreditation Number: 10603
Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included is this document are traceable to Australian/national standards.

Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 17/02/2015
Date Received: 22/01/2015
Our Reference: JAC14-12
Your Reference: IW021200.104

METHOD	Sampling	2000	4100	2100	4700	2700	3000	3000	2540D
SAMPLE CODE	Date	AMMONIA	ORTHO-P	NO3+NO2	TOTAL-P	TOTAL-N	CHLOROPHYLL'a'	PHAEOPHYTIN'a'	TSS
		µg.N/L	µg.P/L	µg.N/L	µg.P/L	µg.N/L	µg/L	µg/L	mg/L
Reporting Limit		<3	<2	<2	<5	<50	<0.1	<0.2	<0.5
File		15012902,020901			15020301,1201		15012803		150127
SP8-S	18/01/2015	<3	4	<2	12	90	0.2	<0.2	
SP8-M	18/01/2015	5	5	<2	14	80	0.3	<0.2	
SP8-B	18/01/2015	3	25	170	32	240	0.2	<0.2	
SP9-S	18/01/2015	5	5	2	14	90	0.1	<0.2	
SP9-M	18/01/2015	5	28	190	35	310	0.2	<0.2	
SP9-B	18/01/2015	7	32	180	43	320	<0.1	<0.2	
SP10-S	18/01/2015	<3	5	<2	14	80	0.1	<0.2	
SP10-M	18/01/2015	<3	24	150	30	220	0.2	<0.2	
SP10-B	18/01/2015	8	43	300	48	350	<0.1	<0.2	
SP11-S	18/01/2015	4	3	<2	13	90	0.2	<0.2	
SP11-B	18/01/2015	<3	3	<2	13	110	0.3	<0.2	
SP12-S	18/01/2015	4	4	<2	14	120	0.2	<0.2	0.8
SP12-M	18/01/2015	37	7	3	15	90	0.8	0.2	
SP12-B	18/01/2015	4	33	210	39	280	0.2	<0.2	
SP13-S	19/01/2015	9	5	<2	14	110	0.2	<0.2	
SP13-M	19/01/2015	<3	7	<2	18	100	0.9	0.4	
SP13-B	19/01/2015	<3	30	200	38	260	0.3	0.5	
SP14-S	19/01/2015	5	4	<2	14	90	0.2	<0.2	
SP14-M	19/01/2015	<3	4	<2	16	100	0.9	0.4	
SP14-B	19/01/2015	<3	30	190	37	250	0.3	0.5	

Signatory: Jamie Woodward
Date: 17/02/2015

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

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Tel: +61 8 93602907 Address: 90 South St, Murdoch, WA, 6150

Accreditation Number: 10603
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Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 17/02/2015
Date Received: 22/01/2015
Our Reference: JAC14-12
Your Reference: IW021200.104

METHOD	Sampling	2000	4100	2100	4700	2700	3000	3000	2540D
SAMPLE CODE	Date	AMMONIA	ORTHO-P	NO3+NO2	TOTAL-P	TOTAL-N	CHLOROPHYLL'a'	PHAEOPHYTIN'a'	TSS
		µg.N/L	µg.P/L	µg.N/L	µg.P/L	µg.N/L	µg/L	µg/L	mg/L
Reporting Limit		<3	<2	<2	<5	<50	<0.1	<0.2	<0.5
File			15012902,020901		15020301,1201		15012803		150127
SP15-S	20/01/2015	<3	4	2	13	100	<0.1	<0.2	
SP15-M	20/01/2015	<3	6	5	15	90	0.4	<0.2	
SP15-B	20/01/2015	<3	30	190	37	260	0.1	<0.2	
SP16-S	20/01/2015	<3	4	<2	14	80	<0.1	<0.2	1.0
SP16-B	20/01/2015	<3	4	<2	13	90	0.2	<0.2	
SP17-S	20/01/2015	<3	4	<2	12	100	<0.1	<0.2	
SP17-M	20/01/2015	<3	7	16	16	100	0.5	0.2	
SP17-B	20/01/2015	<3	30	180	37	250	0.1	<0.2	
Field Blank	20/01/2015	<3	<2	<2	<5	<50	<0.1	<0.2	
Trans Blank	20/01/2015	<3	<2	<2	<5	<50	<0.1	<0.2	

Signatory: Jamie Woodward
Date: 17/02/2015

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Our Reference: JAC14-12
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METHOD SAMPLE CODE	Sampling Date	MS001 Filtered Cr µg/L	MS001 Filtered Co µg/L	MS001 Filtered Ni µg/L	MS001 Filtered Cu µg/L	MS001 Filtered Zn µg/L	MS001 Filtered As µg/L	MS001 Filtered Cd µg/L	MS001 Filtered Ba µg/L	MS001 Filtered Pb µg/L	ICP006 Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15012901-02**
SP1-S	20/01/2015	<0.2	<0.05	<0.3	0.2	2	1.6	<0.1	5.0	<0.1	<0.0001
SP1-M	20/01/2015	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.5	<0.1	<0.0001
SP1-B	20/01/2015	<0.2	<0.05	0.3	0.2	1	1.7	<0.1	7.1	<0.1	<0.0001
SP2-S	20/01/2015	<0.2	<0.05	<0.3	0.4	2	1.6	<0.1	5.1	<0.1	<0.0001
SP2-M	20/01/2015	<0.2	<0.05	<0.3	0.2	<1	1.6	<0.1	5.5	<0.1	<0.0001
SP2-B	20/01/2015	<0.2	<0.05	0.3	0.3	4	1.8	<0.1	6.8	<0.1	<0.0001
SP3-S	19/01/2015	<0.2	<0.05	<0.3	0.3	1	1.6	<0.1	5.3	<0.1	<0.0001
SP3-M	19/01/2015	<0.2	<0.05	<0.3	<0.2	2	1.7	<0.1	5.3	<0.1	<0.0001
SP3-B	19/01/2015	<0.2	<0.05	0.3	<0.2	1	1.8	<0.1	6.2	<0.1	<0.0001
SP4-S	19/01/2015	<0.2	<0.05	<0.3	0.2	<1	1.6	<0.1	5.1	<0.1	<0.0001
SP4-M	19/01/2015	<0.2	<0.05	<0.3	0.3	1	1.7	<0.1	5.3	<0.1	<0.0001
SP4-B	19/01/2015	<0.2	<0.05	0.3	0.2	1	1.8	<0.1	6.3	<0.1	<0.0001
SP5-S	19/01/2015	<0.2	<0.05	<0.3	0.3	<1	1.6	<0.1	5.3	<0.1	<0.0001
SP5-M	19/01/2015	<0.2	<0.05	<0.3	0.2	1	1.7	<0.1	5.6	<0.1	<0.0001
SP5-B	19/01/2015	<0.2	<0.05	<0.3	0.2	2	1.7	<0.1	6.4	<0.1	<0.0001
SP6-S	19/01/2015	<0.2	<0.05	<0.3	0.3	2	1.6	<0.1	5.2	<0.1	<0.0001
SP6-M	19/01/2015	<0.2	<0.05	<0.3	0.3	3	1.7	<0.1	5.4	<0.1	<0.0001
SP6-B	19/01/2015	<0.2	<0.05	0.3	0.3	3	1.8	<0.1	6.8	<0.1	<0.0001
SP7-S	18/01/2015	<0.2	<0.05	<0.3	0.4	1	1.6	<0.1	5.4	0.1	<0.0001
SP7-B	18/01/2015	<0.2	<0.05	<0.3	0.3	2	1.6	<0.1	5.4	<0.1	<0.0001

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Signatory: Jamie Woodward
Date: 17/02/2015

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WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 17/02/2015
Date Received: 22/01/2015
Our Reference: JAC14-12
Your Reference: IW021200.104

METHOD SAMPLE CODE	Sampling Date	MS001 Filtered Cr µg/L	MS001 Filtered Co µg/L	MS001 Filtered Ni µg/L	MS001 Filtered Cu µg/L	MS001 Filtered Zn µg/L	MS001 Filtered As µg/L	MS001 Filtered Cd µg/L	MS001 Filtered Ba µg/L	MS001 Filtered Pb µg/L	ICP006 Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15012901-02**
SP8-S	18/01/2015	<0.2	<0.05	<0.3	0.2	<1	1.6	<0.1	5.4	<0.1	<0.0001
SP8-M	18/01/2015	<0.2	<0.05	<0.3	0.3	2	1.6	<0.1	5.5	<0.1	<0.0001
SP8-B	18/01/2015	<0.2	<0.05	<0.3	0.4	2	1.8	<0.1	5.6	<0.1	<0.0001
SP9-S	18/01/2015	<0.2	<0.05	<0.3	0.3	1	1.8	<0.1	5.5	0.2	<0.0001
SP9-M	18/01/2015	<0.2	<0.05	0.3	0.4	2	1.8	<0.1	5.6	<0.1	<0.0001
SP9-B	18/01/2015	<0.2	<0.05	0.4	0.3	3	1.9	<0.1	6.0	<0.1	<0.0001
SP10-S	18/01/2015	<0.2	<0.05	<0.3	0.2	1	1.7	<0.1	5.5	<0.1	<0.0001
SP10-M	18/01/2015	<0.2	<0.05	<0.3	0.3	3	1.8	<0.1	5.9	<0.1	<0.0001
SP10-B	18/01/2015	<0.2	<0.05	0.4	0.4	4	1.9	<0.1	6.3	<0.1	<0.0001
SP11-S	18/01/2015	<0.2	<0.05	<0.3	0.4	2	1.5	<0.1	5.0	<0.1	<0.0001
SP11-B	18/01/2015	<0.2	<0.05	0.3	0.3	<1	1.7	<0.1	5.2	<0.1	<0.0001
SP12-S	18/01/2015	<0.2	<0.05	0.3	0.3	1	1.7	<0.1	5.2	<0.1	<0.0001
SP12-M	18/01/2015	<0.2	<0.05	<0.3	0.5	5	1.8	<0.1	5.5	<0.1	<0.0001
SP12-B	18/01/2015	<0.2	<0.05	0.3	0.3	3	1.9	<0.1	5.8	<0.1	<0.0001
SP13-S	19/01/2015	<0.2	<0.05	0.3	0.4	4	1.7	<0.1	5.7	<0.1	<0.0001
SP13-M	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.7	<0.1	<0.0001
SP13-B	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.7	<0.1	<0.0001
SP14-S	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.4	<0.1	<0.0001
SP14-M	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.5	<0.1	<0.0001
SP14-B	19/01/2015	<0.2	<0.05	<0.3	<0.2	1	1.8	<0.1	5.8	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 17/02/2015

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Date of Issue: 17/02/2015
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METHOD SAMPLE CODE	Sampling Date	MS001 Filtered Cr µg/L	MS001 Filtered Co µg/L	MS001 Filtered Ni µg/L	MS001 Filtered Cu µg/L	MS001 Filtered Zn µg/L	MS001 Filtered As µg/L	MS001 Filtered Cd µg/L	MS001 Filtered Ba µg/L	MS001 Filtered Pb µg/L	ICP006 Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15012901-02**
SP15-S	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.5	<0.1	5.6	<0.1	<0.0001
SP15-M	20/01/2015	<0.2	<0.05	<0.3	<0.2	1	1.8	<0.1	5.6	<0.1	<0.0001
SP15-B	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.8	<0.1	<0.0001
SP16-S	20/01/2015	<0.2	<0.05	<0.3	<0.2	1	1.6	<0.1	5.6	<0.1	<0.0001
SP16-B	20/01/2015	<0.2	<0.05	<0.3	<0.2	1	1.6	<0.1	5.4	<0.1	<0.0001
SP17-S	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.7	<0.1	<0.0001
SP17-M	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.7	<0.1	<0.0001
SP17-B	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.9	<0.1	<0.0001
Field Blank	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
Trans Blank	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001

Signatory: Jamie Woodward
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METHOD SAMPLE CODE	Sampling Date	MS001 Unfiltered Cr µg/L	MS001 Unfiltered Co µg/L	MS001 Unfiltered Ni µg/L	MS001 Unfiltered Cu µg/L	MS001 Unfiltered Zn µg/L	MS001 Unfiltered As µg/L	MS001 Unfiltered Cd µg/L	MS001 Unfiltered Ba µg/L	MS001 Unfiltered Pb µg/L	ICP006 Total Ext Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15013001-02**
SP1-S	20/01/2015	<0.2	<0.05	<0.3	0.3	2	1.6	<0.1	5.1	<0.1	<0.0001
SP1-M	20/01/2015	<0.2	<0.05	<0.3	0.2	<1	1.7	<0.1	5.5	<0.1	<0.0001
SP1-B	20/01/2015	<0.2	<0.05	0.3	0.2	1	1.9	<0.1	7.0	<0.1	<0.0001
SP2-S	20/01/2015	<0.2	<0.05	<0.3	0.5	3	1.6	<0.1	5.2	<0.1	<0.0001
SP2-M	20/01/2015	<0.2	<0.05	<0.3	0.3	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP2-B	20/01/2015	<0.2	<0.05	0.4	0.3	3	1.7	<0.1	6.9	<0.1	<0.0001
SP3-S	19/01/2015	<0.2	<0.05	<0.3	0.2	1	1.6	<0.1	5.4	<0.1	<0.0001
SP3-M	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP3-B	19/01/2015	<0.2	<0.05	0.4	0.3	<1	1.8	<0.1	6.3	<0.1	<0.0001
SP4-S	19/01/2015	<0.2	<0.05	<0.3	0.5	<1	1.6	<0.1	5.2	<0.1	<0.0001
SP4-M	19/01/2015	<0.2	<0.05	<0.3	0.3	1	1.7	<0.1	5.0	<0.1	<0.0001
SP4-B	19/01/2015	<0.2	<0.05	0.5	0.7	4	1.8	<0.1	6.4	<0.1	<0.0001
SP5-S	19/01/2015	<0.2	<0.05	<0.3	0.6	3	1.6	<0.1	5.3	<0.1	<0.0001
SP5-M	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP5-B	19/01/2015	<0.2	<0.05	0.3	0.2	<1	1.8	<0.1	6.1	<0.1	<0.0001
SP6-S	19/01/2015	<0.2	<0.05	<0.3	0.3	2	1.6	<0.1	5.3	<0.1	<0.0001
SP6-M	19/01/2015	<0.2	<0.05	<0.3	0.3	2	1.8	<0.1	5.5	<0.1	<0.0001
SP6-B	19/01/2015	<0.2	<0.05	0.3	0.2	2	1.8	<0.1	6.8	<0.1	<0.0001
SP7-S	18/01/2015	<0.2	<0.05	<0.3	0.6	1	1.7	<0.1	5.4	0.2	<0.0001
SP7-B	18/01/2015	<0.2	<0.05	<0.3	0.4	2	1.7	<0.1	5.6	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 17/02/2015

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METHOD SAMPLE CODE	Sampling Date	MS001 Unfiltered Cr µg/L	MS001 Unfiltered Co µg/L	MS001 Unfiltered Ni µg/L	MS001 Unfiltered Cu µg/L	MS001 Unfiltered Zn µg/L	MS001 Unfiltered As µg/L	MS001 Unfiltered Cd µg/L	MS001 Unfiltered Ba µg/L	MS001 Unfiltered Pb µg/L	ICP006 Total Ext Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15013001-02**
SP8-S	18/01/2015	<0.2	<0.05	<0.3	0.2	1	1.6	<0.1	5.3	<0.1	<0.0001
SP8-M	18/01/2015	<0.2	<0.05	<0.3	0.4	2	1.7	<0.1	5.6	<0.1	<0.0001
SP8-B	18/01/2015	<0.2	<0.05	<0.3	0.3	2	1.8	<0.1	5.9	<0.1	<0.0001
SP9-S	18/01/2015	<0.2	<0.05	<0.3	0.3	1	1.8	<0.1	5.6	0.2	<0.0001
SP9-M	18/01/2015	<0.2	<0.05	0.3	0.4	2	1.8	<0.1	5.8	<0.1	<0.0001
SP9-B	18/01/2015	<0.2	<0.05	0.4	0.3	2	1.9	<0.1	6.0	<0.1	<0.0001
SP10-S	18/01/2015	<0.2	<0.05	<0.3	0.2	1	1.7	<0.1	5.6	<0.1	<0.0001
SP10-M	18/01/2015	<0.2	<0.05	0.3	0.2	3	1.9	<0.1	6.0	<0.1	<0.0001
SP10-B	18/01/2015	<0.2	<0.05	0.4	0.4	4	1.9	<0.1	6.4	<0.1	<0.0001
SP11-S	18/01/2015	<0.2	<0.05	<0.3	0.2	2	1.6	<0.1	5.3	<0.1	<0.0001
SP11-B	18/01/2015	<0.2	<0.05	0.3	0.3	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP12-S	18/01/2015	<0.2	<0.05	<0.3	0.3	2	1.7	<0.1	5.2	<0.1	<0.0001
SP12-M	18/01/2015	<0.2	<0.05	<0.3	0.2	1	1.9	<0.1	5.5	<0.1	<0.0001
SP12-B	18/01/2015	<0.2	<0.05	0.3	0.2	3	1.9	<0.1	5.8	<0.1	<0.0001
SP13-S	19/01/2015	<0.2	<0.05	0.3	0.5	4	1.6	<0.1	5.5	<0.1	<0.0001
SP13-M	19/01/2015	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.8	<0.1	<0.0001
SP13-B	19/01/2015	0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.7	<0.1	<0.0001
SP14-S	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.4	<0.1	<0.0001
SP14-M	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.8	<0.1	<0.0001
SP14-B	19/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.8	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 17/02/2015

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Your Reference: IW021200.104

METHOD SAMPLE CODE	Sampling Date	MS001 Unfiltered Cr µg/L	MS001 Unfiltered Co µg/L	MS001 Unfiltered Ni µg/L	MS001 Unfiltered Cu µg/L	MS001 Unfiltered Zn µg/L	MS001 Unfiltered As µg/L	MS001 Unfiltered Cd µg/L	MS001 Unfiltered Ba µg/L	MS001 Unfiltered Pb µg/L	ICP006 Total Ext Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15013001-02**
SP15-S	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.5	<0.1	5.6	<0.1	<0.0001
SP15-M	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.7	<0.1	<0.0001
SP15-B	20/01/2015	0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.8	<0.1	<0.0001
SP16-S	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.5	<0.1	5.5	<0.1	<0.0001
SP16-B	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.4	<0.1	<0.0001
SP17-S	20/01/2015	<0.2	<0.05	<0.3	0.2	<1	1.7	<0.1	5.6	<0.1	<0.0001
SP17-M	20/01/2015	<0.2	<0.05	<0.3	<0.2	2	1.7	<0.1	5.7	<0.1	<0.0001
SP17-B	20/01/2015	<0.2	<0.05	0.4	<0.2	1	1.8	<0.1	6.0	<0.1	<0.0001
Field Blank	20/01/2015	<0.2	<0.05	<0.3	<0.2	1	<0.5	<0.1	<0.5	<0.1	<0.0001
Trans Blank	20/01/2015	<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 17/02/2015

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

Western Radiation Services
analytical laboratory & consulting

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Laboratory No. 14174

ABN: 64 135 436 092

18 March 2015

Ref: 9189
Contract: MW 1725

Sinclair Knight Merz – JACOBS PROJECT
7th Floor Durack Centre
PERTH WA 6000

Attn: Celeste Wilson
Jacobs Project#:WV04831.104

ANALYTICAL REPORT

The results (to 95%, 2σ confidence level) for Radium-226, Radium-228 and Thorium-228 analyses of forty eight(48) liquid samples, as received at our laboratory on 10 February 2015, are detailed on page two and three of this report.

MDL:	Radium-226	0.100 Bq/l	Radium-228	0.100 Bq/l
	Thorium-228	0.100 Bq/l		

Method: LTP No. 4(a) Gamma Spectrometry Analysis

Madassar A. Qureshi
Authorised Signatory

WRS No	Client Sample ID	Ra-226 (Bq/l)	Ra-228 (Bq/l)	Th-228 (Bq/l)
9189-1	SP1-S 20/01/2015	<MDL	<MDL	<MDL
9189-2	SP1-M 20/01/2015	<MDL	<MDL	<MDL
9189-3	SP1-B 20/01/2015	<MDL	<MDL	<MDL
9189-4	SP2-S 20/01/2015	<MDL	<MDL	<MDL
9189-5	SP2-M 20/01/2015	<MDL	<MDL	<MDL
9189-6	SP2-B 20/01/2015	0.114 ± 0.025	0.116 ± 0.053	<MDL
9189-7	SP3-S 19/01/2015	<MDL	<MDL	<MDL
9189-8	SP3-M 19/01/2015	<MDL	<MDL	<MDL
9189-9	SP3-B 19/01/2015	<MDL	<MDL	<MDL
9189-10	SP4-S 19/01/2015	0.115 ± 0.014	<MDL	<MDL
9189-10D	SP4-S 19/01/2015	0.118 ± 0.015	<MDL	<MDL
9189-11	SP4-M 19/01/2015	0.107 ± 0.048	<MDL	<MDL
9189-12	SP4-B 19/01/2015	<MDL	0.109 ± 0.039	<MDL
9189-13	SP5-S 19/01/2015	<MDL	<MDL	<MDL
9189-14	SP5-M 19/01/2015	<MDL	<MDL	<MDL
9189-15	SP5-B 19/01/2015	<MDL	<MDL	<MDL
9189-16	SP6-S 19/01/2015	<MDL	<MDL	<MDL
9189-17	SP6-M 19/01/2015	<MDL	<MDL	<MDL
9189-18	SP6-B 19/01/2015	<MDL	<MDL	<MDL
9189-19	SP7-S 18/01/2015	<MDL	<MDL	<MDL
9189-20	SP7-B 18/01/2015	<MDL	<MDL	<MDL
9189-20D	SP7-B 18/01/2015	<MDL	<MDL	<MDL
9189-21	SP8-S 18/01/2015	<MDL	<MDL	<MDL
9189-22	SP8-M 18/01/2015	<MDL	<MDL	<MDL
9189-23	SP8-B 18/01/2015	<MDL	0.112 ± 0.020	<MDL
9189-24	SP9-S 18/01/2015	<MDL	<MDL	<MDL
9189-25	SP9-M 18/01/2015	<MDL	<MDL	<MDL
9189-26	SP9-B 18/01/2015	<MDL	<MDL	<MDL

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Email:admin@westernradiation.com.au

WRS No	Client Sample ID	Ra-226 (Bq/g)	Ra-228 (Bq/g)	Th-228 (Bq/l)
9189-27	SP10-S 18/01/2015	<MDL	<MDL	<MDL
9189-28	SP10-M 18/01/2015	<MDL	<MDL	<MDL
9189-29	SP10-B 18/01/2015	<MDL	<MDL	<MDL
9189-30	SP11-S 18/01/2015	<MDL	<MDL	<MDL
9189-30D	SP11-S 18/01/2015	<MDL	<MDL	<MDL
9189-31	SP11-B 18/01/2015	<MDL	<MDL	<MDL
9189-32	SP12-S 18/01/2015	<MDL	<MDL	<MDL
9189-33	SP12-M 18/01/2015	<MDL	<MDL	<MDL
9189-34	SP12-B 18/01/2015	<MDL	<MDL	<MDL
9189-35	SP13-S 19/01/2015	<MDL	<MDL	<MDL
9189-36	SP13-M 19/01/2015	<MDL	<MDL	<MDL
9189-37	SP13-B 19/01/2015	<MDL	<MDL	<MDL
9189-38	SP14-S 19/01/2015	<MDL	<MDL	<MDL
9189-39	SP14-M 19/01/2015	<MDL	<MDL	<MDL
9189-40	SP14-B 19/01/2015	<MDL	<MDL	<MDL
9189-40D	SP14-B 19/01/2015	<MDL	<MDL	<MDL
9189-41	SP15-S 20/01/2015	<MDL	<MDL	<MDL
9189-42	SP15-M 20/01/2015	0.133 ± 0.047	<MDL	<MDL
9189-43	SP15-B 20/01/2015	<MDL	<MDL	<MDL
9189-44	SP16-S 20/01/2015	<MDL	<MDL	<MDL
9189-45	SP16-B 20/01/2015	<MDL	<MDL	<MDL
9189-46	SP17-S 20/01/2015	<MDL	<MDL	<MDL
9189-47	SP17-M 20/01/2015	<MDL	<MDL	<MDL
9189-48	SP17-B 20/01/2015	<MDL	<MDL	<MDL

The reported expanded uncertainty of measurement is stated as the standard uncertainty of the measurement ± 5.6 %, multiplied by the coverage factor k=2, which corresponds to a coverage probability of approximately 95%.

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DATA REPORT

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Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26281

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP1-S - PHYTO

Date Collected
20/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
18/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
127,551.0 cells L^{-1}

Total Counted
697

Uncertainty
7.6%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	549		0.43
Cerataulina pelagica	366		0.29
Chaetoceros spp.	2,379		1.87
Dactyliosolen phuketensis	183		0.14
Entomoneis tenuistriata	183		0.14
Nitzschia longissima	366		0.29
Planktoniella sol	183		0.14
Pseudo-nitzschia "delicatissima group"	2,013		1.58
Pseudo-nitzschia "seriata group"	549		0.43
Rhizosolenia setigera	183		0.14
Rhizosolenia shrubsolei	183		0.14
Rhizosolenia striata	366		0.29
Skeletonema sp.	549		0.43
Thalassionema frauenfeldii	549		0.43
Thalassiothrix sp. 001	549		0.43
	9,150	**0.0000**	**7.17**
Cryptophyceae			
Cryptophyte 014	183		0.14
	183	**0.0000**	**0.14**

Species Name	Density	BioVolume	%
Cyanobacteria			
Trichodesmium erythraeum	116,937		91.68
	116,937	**0.0000**	**91.68**
Dinophyceae			
Ceratium buceros	183		0.14
Ceratium sp. 033	366		0.29
Dinophysis caudata var. pediculata	366		0.29
Protoperidinium sp. 018	366		0.29
	1,281	**0.0000**	**1.00**

End Of Report

This report contains coloured shading. Dalcon Environmental intends that this report be viewed and/or printed in colour.

Dalcon Environmental Pty Ltd makes no claim that the taxa list provided herein is exhaustive. Some taxa, including potentially problematic taxa, may be present in the sample but not recorded during analysis, this is particularly the case for small or inconspicuous taxa or taxa present in low numbers. Guidance presented herein is based on published research , whilst Dalcon Environmental make every attempt to remain up to date, it is possible that scientific consensus may differ from that presented herein.

Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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COP-Barossa WQ Trip

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Perth, WA 6000

Analyst ID
stuart

DSID
26282

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP3-S - PHYTO

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
18/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
123,159.0 cells L^{-1}

Total Counted
673

Uncertainty
7.7%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	366		0.30
Cerataulina pelagica	366		0.30
Chaetoceros spp.	1,647		1.34
Cylindrotheca closterium	366		0.30
Nitzschia longissima	366		0.30
Proboscia alata	183		0.15
Pseudo-nitzschia "seriata group"	549		0.45
Rhizosolenia setigera	183		0.15
Thalassiothrix sp. 001	366		0.30
	4,392	**0.0000**	**3.57**
Cyanobacteria			
Trichodesmium erythraeum	116,937		94.95
	116,937	**0.0000**	**94.95**
Dinophyceae			
Ceratium furca	366		0.30
Ceratium sp. 037	183		0.15
Dinophysis caudata var. pediculata	183		0.15
Protoperidinium grande	366		0.30
Protoperidinium sp. 018	549		0.45

Species Name	Density	BioVolume	%
Protoperidinium sp. 032	183		0.15
	1,830	**0.0000**	**1.49**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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COP-Barossa WQ Trip

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Perth, WA 6000

Analyst ID
stuart

Report Date
26/03/2015

DSID
26283

Batch Number
150123145338

Sample ID
SP5-S - PHYTO

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
18/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
136,884.0 cells L^{-1}

Total Counted
748

Uncertainty
7.3%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	183		0.13
Cerataulina pelagica	366		0.27
Chaetoceros spp.	1,281		0.94
Cylindrotheca closterium	183		0.13
Nitzschia longissima	366		0.27
Proboscia alata	183		0.13
Skeletonema costatum	549		0.40
Thalassiothrix sp. 001	549		0.40
	3,660	**0.0000**	**2.67**
Cyanobacteria			
Trichodesmium erythraeum	131,394		95.99
	131,394	**0.0000**	**95.99**
Dinophyceae			
Ceratium furca	183		0.13
Ceratium sp. 040	183		0.13
Ceratium sp. 048	366		0.27
Dinophysis sp. 020	183		0.13
Prorocentrum sp. 005	183		0.13
Protoperidinium sp. 018	183		0.13

Species Name	Density	BioVolume	%
Protoperidinium sp. 046	183		0.13
Scrippsiella trochoidea	366		0.27
	1,830	**0.0000**	**1.34**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Project
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COP-Barossa WQ Trip

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Perth, WA 6000

Analyst ID
stuart

DSID
26284

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP6-S - PHYTO

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
17/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
147,132.0 cells L^{-1}

Total Counted
804

Uncertainty
7.1%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	549		0.37
Cerataulina pelagica	549		0.37
Chaetoceros spp.	3,843		2.61
Climacodium frauenfeldianum	732		0.50
Cylindrotheca closterium	366		0.25
Nitzschia longissima	549		0.37
Proboscia alata	366		0.25
Pseudo-nitzschia "delicatissima group"	2,196		1.49
Thalassiothrix sp. 001	3,843		2.61
	12,993	**0.0000**	**8.83**
Cyanobacteria			
Trichodesmium erythraeum	131,028		89.05
	131,028	**0.0000**	**89.05**
Dinophyceae			
Ceratium furca	549		0.37
Ceratium sp. 040	183		0.12
Dinoflagellate 036	549		0.37
Dinophysis sp. 020	183		0.12
Gyrodinium sp. 016	183		0.12

Species Name	Density	BioVolume	%
Prorocentrum sp. 005	183		0.12
Protoperidinium sp. 018	549		0.37
Scrippsiella trochoidea	732		0.50
	3,111	**0.0000**	**2.11**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Project
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Analyst ID
stuart

DSID
26285

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP7-S - PHYTO

Date Collected
18/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
26/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
59,292.0 cells L^{-1}

Total Counted
324

Uncertainty
11.1%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	183		0.31
Chaetoceros spp.	915		1.54
Leptocylindrus danicus	732		1.23
Pseudo-nitzschia "delicatissima group"	1,647		2.78
	3,477	**0.0000**	**5.86**
Cyanobacteria			
Trichodesmium erythraeum	55,083		92.90
	55,083	**0.0000**	**92.90**
Dinophyceae			
Dinoflagellate 036	366		0.62
Gymnodinium sp. 024	183		0.31
Scrippsiella trochoidea	183		0.31
	732	**0.0000**	**1.23**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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DATA REPORT

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Project
BAROSSA
COP-Barossa WQ Trip

Customer
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Perth, WA 6000

Analyst ID

DSID
26286

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP8-S - PHYTO

Date Collected
18/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
26/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
452,559.0 cells L^{-1}

Total Counted
2,473

Uncertainty
4.0%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	2,379		0.53
Chaetoceros spp.	73,749		16.30
Climacodium sp. 002	183		0.04
Cylindrotheca closterium	183		0.04
Dactyliosolen phuketensis	183		0.04
Detonula sp. 001	1,281		0.28
Guinardia flaccida	549		0.12
Guinardia striata	366		0.08
Leptocylindrus danicus	366		0.08
Navicula transitrans var. derasa	183		0.04
Nitzschia longissima	1,098		0.24
Odontella sinensis	183		0.04
Proboscia alata	1,281		0.28
Pseudo-nitzschia "delicatissima group"	6,039		1.33
Pseudo-nitzschia "seriata group"	16,287		3.60
Rhizosolenia setigera	915		0.20
Rhizosolenia shrubsolei	183		0.04
Rhizosolenia striata	1,281		0.28
Skeletonema costatum	915		0.20
	107,604	**0.0000**	**23.78**

Species Name	Density	BioVolume	%
Cyanobacteria			
Trichodesmium erythraeum	344,589		76.14
	344,589	**0.0000**	**76.14**
Dinophyceae			
Ceratium fusus	183		0.04
Prorocentrum sp. 005	183		0.04
	366	**0.0000**	**0.08**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Project
BAROSSA
COP-Barossa WQ Trip

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Perth, WA 6000

Analyst ID
stuart

DSID
26287

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP10-S - PHYTO

Date Collected
18/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
18/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
78,324.0 cells L^{-1}

Total Counted
428

Uncertainty
9.7%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Chaetoceros spp.	549		0.70
Cylindrotheca closterium	183		0.23
Entomoneis tenuistriata	183		0.23
Navicula spp.	183		0.23
Thalassiothrix sp. 001	549		0.70
	1,647	**0.0000**	**2.10**
Cyanobacteria			
Trichodesmium erythraeum	75,579		96.50
	75,579	**0.0000**	**96.50**
Dinophyceae			
Ceratium sp. 039	183		0.23
Heterocapsa sp. 001	183		0.23
Katodinium rotundatum	183		0.23
Protoperidinium grande	366		0.47
Protoperidinium sp. 018	183		0.23
	1,098	**0.0000**	**1.40**

Species Name	Density	BioVolume	%

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Analyst ID
stuart

DSID
26288

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP11-S - PHYTO

Date Collected
18/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
18/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
180,987.0 cells L^{-1}

Total Counted
989

Uncertainty
6.4%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Amphora sp. 008	183		0.10
Amphora sp. 074	183		0.10
Bacteriastrum hyalinum	2,013		1.11
Cerataulina pelagica	549		0.30
Chaetoceros spp.	2,379		1.31
Climacodium frauenfeldianum	549		0.30
Coscinodiscus spp.	366		0.20
Cylindrotheca closterium	183		0.10
Detonula sp. 001	549		0.30
Eucampia sp. 006	549		0.30
Guinardia striata	366		0.20
Hemiaulus sinensis	549		0.30
Leptocylindrus danicus	1,098		0.61
Nitzschia longissima	1,647		0.91
Odontella sinensis	183		0.10
Paralia sulcata	183		0.10
Planktoniella sol	366		0.20
Proboscia alata	183		0.10
Pseudo-nitzschia "delicatissima group"	3,843		2.12
Pseudo-nitzschia "seriata group"	4,209		2.33
Rhizosolenia setigera	183		0.10

Species Name	Density	BioVolume	%
Rhizosolenia shrubsolei	366		0.20
Rhizosolenia striata	915		0.51
Skeletonema costatum	549		0.30
Thalassionema frauenfeldii	3,477		1.92
Thalassionema nitzschioides	1,464		0.81
Thalassiothrix sp. 001	549		0.30
	27,633	**0.0000**	**15.27**
Cyanobacteria			
Trichodesmium erythraeum	148,413		82.00
	148,413	**0.0000**	**82.00**
Dinophyceae			
Ceratium buceros	183		0.10
Ceratium furca	915		0.51
Ceratium lineatum	183		0.10
Ceratium sp. 031	183		0.10
Ceratium sp. 033	183		0.10
Ceratium sp. 048	183		0.10
Ornithocercus sp. 003	183		0.10
Prorocentrum micans	183		0.10
Protoperidinium crassipes	366		0.20
Protoperidinium grande	1,281		0.71
Protoperidinium roseum	183		0.10
Protoperidinium sp. 018	366		0.20
Protoperidinium steinii	366		0.20
Pyrophacus sp. 001	183		0.10
	4,941	**0.0000**	**2.73**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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COP-Barossa WQ Trip

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Analyst ID
stuart

DSID
26289

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP13-S - PHYTO

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
18/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
61,488.0 cells L^{-1}

Total Counted
336

Uncertainty
10.9%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Adoneis sp. 001	183		0.30
Chaetoceros spp.	1,281		2.08
Climacodium frauenfeldianum	366		0.60
Cylindrotheca closterium	366		0.60
Navicula transitrans var. derasa	183		0.30
Nitzschia longissima	366		0.60
	2,745	**0.0000**	**4.46**
Cyanobacteria			
Trichodesmium erythraeum	58,194		94.64
	58,194	**0.0000**	**94.64**
Dinophyceae			
Ceratium sp. 036	183		0.30
Ornithocercus sp. 002	183		0.30
Phalacroma rotundatum	183		0.30
	549	**0.0000**	**0.89**

End Of Report

Species Name	Density	BioVolume	%

Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DSID
26290

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP14-S - PHYTO

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
17/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
178,608.0 cells L^{-1}

Total Counted
976

Uncertainty
6.4%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	183		0.10
Cerataulina pelagica	549		0.31
Chaetoceros spp.	1,281		0.72
Guinardia striata	366		0.20
Leptocylindrus danicus	1,098		0.61
Proboscia alata	183		0.10
Pseudo-nitzschia "delicatissima group"	1,464		0.82
Rhizosolenia setigera	366		0.20
Rhizosolenia sp. 024	183		0.10
Skeletonema costatum	549		0.31
Thalassiothrix sp. 001	915		0.51
	7,137	**0.0000**	**4.00**
Cryptophyceae			
Cryptophyte 004	366		0.20
	366	**0.0000**	**0.20**
Cyanobacteria			
Trichodesmium erythraeum	168,909		94.57
	168,909	**0.0000**	**94.57**

Species Name	Density	BioVolume	%
Dinophyceae			
Dinoflagellate 036	549		0.31
Gymnodinium sp. 029	183		0.10
Heterocapsa sp. 001	183		0.10
Karenia papilionaceae	366		0.20
Prorocentrum micans	183		0.10
Protoperidinium roseum	183		0.10
Scrippsiella trochoidea	549		0.31
	2,196	**0.0000**	**1.23**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Analyst ID
stuart

DSID
26291

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP16-S - PHYTO

Date Collected
20/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
17/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
161,589.0 cells L^{-1}

Total Counted
883

Uncertainty
6.7%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Bacteriastrum hyalinum	183		0.11
Cerataulina pelagica	549		0.34
Chaetoceros spp.	2,013		1.25
Guinardia striata	366		0.23
Leptocylindrus danicus	1,281		0.79
Pseudo-nitzschia "delicatissima group"	2,196		1.36
Rhizosolenia setigera	549		0.34
Skeletonema costatum	549		0.34
Thalassiothrix sp. 001	2,013		1.25
	9,699	**0.0000**	**6.00**
Cryptophyceae			
Cryptophyte 004	183		0.11
	183	**0.0000**	**0.11**
Cyanobacteria			
Trichodesmium erythraeum	149,145		92.30
	149,145	**0.0000**	**92.30**
Dinophyceae			
Dinoflagellate 036	915		0.57

Species Name	Density	BioVolume	%
Heterocapsa sp. 001	366		0.23
Karenia papilionaceae	549		0.34
Prorocentrum micans	183		0.11
Scrippsiella trochoidea	549		0.34
	2,562	**0.0000**	**1.59**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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COP-Barossa WQ Trip

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Jacobs Group (Australia) Pty Ltd
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263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26292

Report Date
26/03/2015

Batch Number
150123145338

Sample ID
SP17-S - PHYTO

Date Collected
20/01/2015

Monitoring Point
Timor Sea

Sample Type
Phytoplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
26/03/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
8,967.0 cells L^{-1}

Total Counted
49

Uncertainty
28.6%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Chaetoceros spp.	549		6.12
Nitzschia longissima	183		2.04
Nitzschia spp.	732		8.16
Proboscia alata	183		2.04
	1,647	**0.0000**	**18.37**
Cyanobacteria			
Trichodesmium erythraeum	6,405		71.43
	6,405	**0.0000**	**71.43**
Dinophyceae			
Dinoflagellate 036	366		4.08
Gymnodinium sp. 009	183		2.04
Gymnodinium sp. 015	366		4.08
	915	**0.0000**	**10.20**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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DATA REPORT

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Analyst ID
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DSID
26293

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP1-S - ZOOP

Date Collected
20/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
26/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 60 ml

Field Data Recording

Total Density
375.0 Individuals^{-1}

Total Counted
375

Uncertainty
10.3%

Species Name	Density	BioVolume	%
Branchiopoda			
Podonidae	2		0.53
Polyphemidae	1		0.27
	3	**0.0000**	**0.80**
Cladocera			
Penilia avirostris	1		0.27
	1	**0.0000**	**0.27**
Copepoda			
Acartiidae	3		0.80
Calanidae	55		14.67
Candacidae	3		0.80
Copepod Nauplius	27		7.20
Corycaeidae	5		1.33
Macrosetella sp. 001	2		0.53
Microsetella	2		0.53
Oncaeidae	7		1.87
Paracalanidae	3		0.80
Pontellidae nauplius	11		2.93
Sulcanidae	2		0.53
	120	**0.0000**	**32.00**

Species Name	Density	BioVolume	%
Foraminifera			
Foraminiferida	4		1.07
	4	**0.0000**	**1.07**
Polycystinea			
Theoperidae	1		0.27
	1	**0.0000**	**0.27**
Sagittoidea			
Chaetognath	11		2.93
	11	**0.0000**	**2.93**
Trizonidae			
Trizonidae	233		62.13
	233	**0.0000**	**62.13**
Unknown			
Protozoa 047	2		0.53
	2	**0.0000**	**0.53**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Analyst ID
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DSID
26294

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP3-S - ZOOP

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 61 ml

Field Data Recording

Total Density
145.0 Individuals^{-1}

Total Counted
145

Uncertainty
16.6%

Species Name	Density	BioVolume	%
Branchiopoda			
Polyphemidae	1		0.69
	1	**0.0000**	**0.69**
Copepoda			
Calanidae	17		11.72
Copepod Nauplius	17		11.72
Corycaeidae	7		4.83
Oncaeidae	1		0.69
Paracalanidae	5		3.45
Pontellidae nauplius	1		0.69
Sulcanidae	4		2.76
	52	**0.0000**	**35.86**
Polychaeta			
Polychaete larva	1		0.69
	1	**0.0000**	**0.69**
Sagittoidea			
Chaetognath	8		5.52
	8	**0.0000**	**5.52**

Species Name	Density	BioVolume	%
Trizonidae			
Trizonidae	82		56.55
	82	**0.0000**	**56.55**
Unknown			
Protozoa 047	1		0.69
	1	**0.0000**	**0.69**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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DSID
26295

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP5-S - ZOOP

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 67 ml

Field Data Recording

Total Density
102.0 Individuals^{-1}

Total Counted
102

Uncertainty
19.8%

Species Name	Density	BioVolume	%
Copepoda			
Acartiidae	9		8.82
Calanidae	59		57.84
Candacidae	1		0.98
Copepod Nauplius	6		5.88
Corycaeidae	4		3.92
Macrosetella sp. 001	3		2.94
Microsetella	11		10.78
Oncaeidae	1		0.98
Paracalanidae	3		2.94
Sulcanidae	1		0.98
	98	**0.0000**	**96.08**
Sagittoidea			
Chaetognath	4		3.92
	4	**0.0000**	**3.92**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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DATA REPORT

A// 3 Yeeda Way
Malaga, WA 6090
P// (08) 9271 6776
F// (08) 9248 9120

Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26296

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP6-S - ZOOP

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 3
Total volume of sample = 121 ml

Field Data Recording

Total Density
61.0 Individuals^{-1}

Total Counted
61

Uncertainty
25.6%

Species Name	Density	BioVolume	%
Branchiopoda			
Polyphemidae	2		3.28
	2	**0.0000**	**3.28**
Copepoda			
Acartiidae	1		1.64
Calanidae	15		24.59
Copepod Nauplius	21		34.43
Corycaeidae	10		16.39
Microsetella	4		6.56
Oncaeidae	3		4.92
	54	**0.0000**	**88.52**
Polycystinea			
Theoperidae	5		8.20
	5	**0.0000**	**8.20**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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DATA REPORT

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Project
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COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26297

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP7-S - ZOOP

Date Collected
18/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 90 ml

Field Data Recording

Total Density
115.0 Individuals^{-1}

Total Counted
115

Uncertainty
18.7%

Species Name	Density	BioVolume	%
Copepoda			
Acartiidae	1		0.87
Calanidae	3		2.61
Copepod Nauplius	6		5.22
Corycaeidae	2		1.74
Microsetella	1		0.87
Oncaeidae	2		1.74
Pontellidae nauplius	1		0.87
Sulcanidae	3		2.61
	19	**0.0000**	**16.52**
Foraminifera			
Foraminiferida	1		0.87
	1	**0.0000**	**0.87**
Gastropoda			
Cavolinidae	3		2.61
	3	**0.0000**	**2.61**
Gigartacontidae			
Gigartacontidae	2		1.74
	2	**0.0000**	**1.74**

Species Name	Density	BioVolume	%
Ophiuroidea			
Echinoderm Ophiopluteus Larva	2		1.74
	2	**0.0000**	**1.74**
Polycystinea			
Theoperidae	2		1.74
	2	**0.0000**	**1.74**
Sagittoidea			
Chaetognath	2		1.74
	2	**0.0000**	**1.74**
Trizonidae			
Trizonidae	82		71.30
	82	**0.0000**	**71.30**
Unknown			
Protozoa 047	2		1.74
	2	**0.0000**	**1.74**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26298

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP8-S - ZOOP

Date Collected
18/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
26/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 125 ml

Field Data Recording

Total Density
188.0 Individuals^{-1}

Total Counted
188

Uncertainty
14.6%

Species Name	Density	BioVolume	%
Copepoda			
Calanidae	2		1.06
Copepod Nauplius	5		2.66
Macrosetella sp. 001	2		1.06
Microsetella	1		0.53
Oncaeidae	5		2.66
	15	**0.0000**	**7.98**
Gigartacontidae			
Gigartacontidae	9		4.79
	9	**0.0000**	**4.79**
Ophiuroidea			
Echinoderm Ophiopluteus Larva	1		0.53
	1	**0.0000**	**0.53**
Polychaeta			
Polychaete larva	5		2.66
	5	**0.0000**	**2.66**
Polycystinea			
Theoperidae	3		1.60

Species Name	Density	BioVolume	%
	3	**0.0000**	**1.60**
Sagittoidea			
Chaetognath	12		6.38
	12	**0.0000**	**6.38**
Trizonidae			
Trizonidae	142		75.53
	142	**0.0000**	**75.53**
Unknown			
Protozoa 047	1		0.53
	1	**0.0000**	**0.53**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Malaga, WA 6090
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Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID

DSID
26299

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP10-S - ZOOP

Date Collected
18/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
29/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 55 ml

Field Data Recording

Total Density
48,129.0 Individuals^{-1}

Total Counted
263

Uncertainty
12.3%

Species Name	Density	BioVolume	%
Copepoda			
Acartiidae	549		1.14
Calanidae	4,575		9.51
Copepod Nauplius	3,660		7.60
Corycaeidae	2,013		4.18
Oncaeidae	915		1.90
Pontellidae nauplius	366		0.76
Sulcanidae	1,281		2.66
	13,359	**0.0000**	**27.76**
Ophiuroidea			
Echinoderm Ophiopluteus Larva	549		1.14
	549	**0.0000**	**1.14**
Polychaeta			
Polychaete larva	366		0.76
	366	**0.0000**	**0.76**
Polycystinea			
Theoperidae	32,208		66.92
	32,208	**0.0000**	**66.92**

Species Name	Density	BioVolume	%
Sagittoidea			
Chaetognath	1,647		3.42
	1,647	**0.0000**	**3.42**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Malaga, WA 6090
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Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26300

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP11-S - ZOOP

Date Collected
18/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
26/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 400 ml

Field Data Recording

Total Density
78.0 Individuals^{-1}

Total Counted
78

Uncertainty
22.6%

Species Name	Density	BioVolume	%
Copepoda			
Acartiidae	1		1.28
Calanidae	1		1.28
Copepod Nauplius	37		47.44
Sulcanidae	1		1.28
	40	**0.0000**	**51.28**
Foraminifera			
Foraminiferida	3		3.85
	3	**0.0000**	**3.85**
Gastropoda			
Cavolinidae	1		1.28
	1	**0.0000**	**1.28**
Gigartacontidae			
Gigartacontidae	1		1.28
	1	**0.0000**	**1.28**
Sagittoidea			
Chaetognath	2		2.56
	2	**0.0000**	**2.56**

Species Name	Density	BioVolume	%
Spirotrichea			
Tintinnid	3		3.85
	3	**0.0000**	**3.85**
Trizonidae			
Trizonidae	27		34.62
	27	**0.0000**	**34.62**
Unknown			
Protozoa 047	1		1.28
	1	**0.0000**	**1.28**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Malaga, WA 6090
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Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26301

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP13-S - ZOOP

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
29/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 80 ml

Field Data Recording

Total Density
549.0 Individuals^{-1}

Total Counted
549

Uncertainty
8.5%

Species Name	Density	BioVolume	%
Copepoda			
Acartiidae	62		11.29
Calanidae	14		2.55
Candacidae	1		0.18
Copepod Nauplius	29		5.28
Corycaeidae	5		0.91
Macrosetella sp. 001	1		0.18
Microsetella	4		0.73
Oncaeidae	3		0.55
Sulcanidae	5		0.91
	124	**0.0000**	**22.59**
Gastropoda			
Cavoliniidae	2		0.36
	2	**0.0000**	**0.36**
Malacostraca			
Anomuran zoea larva	1		0.18
	1	**0.0000**	**0.18**
Maxillopoda			
Cirripede nauplius	1		0.18

Species Name	Density	BioVolume	%
	1	**0.0000**	**0.18**
Ophiuroidea			
Echinoderm Ophiopluteus Larva	2		0.36
	2	**0.0000**	**0.36**
Sagittoidea			
Chaetognath	7		1.28
	7	**0.0000**	**1.28**
Trizonidae			
Trizonidae	411		74.86
	411	**0.0000**	**74.86**
Unknown			
Protozoa 047	1		0.18
	1	**0.0000**	**0.18**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26302

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP14-S - ZOOP

Date Collected
19/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
29/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 90 ml

Field Data Recording

Total Density
383.0 Individuals^{-1}

Total Counted
383

Uncertainty
10.2%

Species Name	Density	BioVolume	%
Copepoda			
Acartiidae	18		4.70
Calanidae	3		0.78
Copepod Nauplius	38		9.92
Corycaeidae	4		1.04
Macrosetella sp. 001	3		0.78
Microsetella	2		0.52
Oncaeidae	2		0.52
Sulcanidae	1		0.26
	71	**0.0000**	**18.54**
Gastropoda			
Cavoliniidae	2		0.52
	2	**0.0000**	**0.52**
Sagittoidea			
Chaetognath	22		5.74
	22	**0.0000**	**5.74**
Trizonidae			
Trizonidae	288		75.20
	288	**0.0000**	**75.20**

Species Name	Density	BioVolume	%

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Malaga, WA 6090
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Project
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COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
26303

Report Date
29/03/2015

Batch Number
150123150348

Sample ID
SP17-S - ZOOP

Date Collected
20/01/2015

Monitoring Point
Timor Sea

Sample Type
Zooplankton

Date Received
23/01/2015

Functional Location ID
Timor Sea

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/03/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Sample analysed diluted 10x
Number of chambers (1 ml) counted = 1
Total volume of sample = 68 ml

Field Data Recording

Total Density
69.0 Individuals^{-1}

Total Counted
69

Uncertainty
24.1%

Species Name	Density	BioVolume	%
Branchiopoda			
Polyphemidae	1		1.45
	1	**0.0000**	**1.45**
Copepoda			
Acartiidae	1		1.45
Calanidae	4		5.80
Copepod Nauplius	28		40.58
Corycaeidae	1		1.45
Macrosetella sp. 001	1		1.45
Microsetella	1		1.45
Oncaeidae	1		1.45
Pontellidae nauplius	1		1.45
	38	**0.0000**	**55.07**
Foraminifera			
Foraminiferida	2		2.90
	2	**0.0000**	**2.90**
Sagittoidea			
Chaetognath	5		7.25
	5	**0.0000**	**7.25**

Species Name	Density	BioVolume	%
Trizonidae			
Trizonidae	23		33.33
	23	**0.0000**	**33.33**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

Appendix C1. Autumn

CERTIFICATE OF ANALYSIS

Work Order	: **EP1502864**	Page	: 1 of 14
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MR CHRIS TEASDALE	Contact	: Scott James
Address	: P O BOX H615 PERTH WA, AUSTRALIA 6001	Address	: 10 Hod Way Malaga WA Australia 6090
E-mail	: cteasdale@globalskm.com	E-mail	: perth.enviro.services@alsglobal.com
Telephone	: +61 08 9469 4400	Telephone	: +61-8-9209 7655
Facsimile	: +61 08 9469 4488	Facsimile	: +61-8-9209 7600
Project	: COP Barossa Envt l Studies Trip 4 IW021200	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: IW021200.104		
C-O-C number	: ----	Date Samples Received	: 16-APR-2015
Sampler	: AC	Issue Date	: 24-APR-2015
Site	: ----		
		No. of samples received	: 54
Quote number	: EP/286/15	No. of samples analysed	: 54

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Rassem Ayoubi	Senior Organic Chemist	Perth Organics

General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SP1-S	SP1-M	SP1-B	SP2-S	SP2-M
				Client sampling date / time	12-APR-2015 16:45	12-APR-2015 16:45	12-APR-2015 16:45	12-APR-2015 18:00	12-APR-2015 18:00
Compound	CAS Number	LOR	Unit		EP1502864-001	EP1502864-002	EP1502864-003	EP1502864-004	EP1502864-005
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**82.8**	**99.3**	**100**	**96.4**	**89.0**
Toluene-D8	2037-26-5	0.1	%		**109**	**102**	**104**	**104**	**106**
4-Bromofluorobenzene	460-00-4	0.1	%		**94.8**	**98.6**	**93.4**	**90.6**	**90.9**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP2-B	SP3-S	SP3-M	SP3-B	SP4-S
				Client sampling date / time	12-APR-2015 18:00	13-APR-2015 10:10	13-APR-2015 10:10	13-APR-2015 10:10	13-APR-2015 08:58
					EP1502864-006	EP1502864-007	EP1502864-008	EP1502864-009	EP1502864-010
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**98.7**	**102**	**99.9**	**99.8**	**97.8**
Toluene-D8	2037-26-5	0.1	%		**103**	**101**	**104**	**102**	**104**
4-Bromofluorobenzene	460-00-4	0.1	%		**91.5**	**91.9**	**92.7**	**90.6**	**90.0**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP4-M	SP4-B	SP5-S	SP5-M	SP5-B
				Client sampling date / time	13-APR-2015 08:58	13-APR-2015 08:58	13-APR-2015 07:08	13-APR-2015 07:08	13-APR-2015 07:08
					EP1502864-011	EP1502864-012	EP1502864-013	EP1502864-014	EP1502864-015
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**97.4**	**84.7**	**82.4**	**88.0**	**82.7**
Toluene-D8	2037-26-5	0.1	%		**104**	**110**	**110**	**107**	**110**
4-Bromofluorobenzene	460-00-4	0.1	%		**90.2**	**98.7**	**95.9**	**97.2**	**93.8**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP6-S	SP6-M	SP6-B	SP7-S	SP7-B
				Client sampling date / time	13-APR-2015 13:38	13-APR-2015 13:38	13-APR-2015 13:38	13-APR-2015 17:55	13-APR-2015 17:55
					EP1502864-016	EP1502864-017	EP1502864-018	EP1502864-019	EP1502864-020
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**91.6**	**87.9**	**85.6**	**88.7**	**92.6**
Toluene-D8	2037-26-5	0.1	%		**106**	**108**	**109**	**107**	**107**
4-Bromofluorobenzene	460-00-4	0.1	%		**94.7**	**94.5**	**93.4**	**91.7**	**96.5**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SP8-S	SP8-M	SP8-B	SP9-S	SP9-M
				Client sampling date / time	14-APR-2015 07:51	14-APR-2015 07:51	14-APR-2015 07:51	14-APR-2015 07:12	14-APR-2015 07:12
Compound	CAS Number	LOR	Unit		EP1502864-021	EP1502864-022	EP1502864-023	EP1502864-024	EP1502864-025
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**87.5**	**87.0**	**90.2**	**88.0**	**83.6**
Toluene-D8	2037-26-5	0.1	%		**106**	**105**	**104**	**106**	**106**
4-Bromofluorobenzene	460-00-4	0.1	%		**97.5**	**93.6**	**93.8**	**93.3**	**90.4**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP9-B	SP10-S	SP10-M	SP10-B	SP11-S
				Client sampling date / time	14-APR-2015 07:12	13-APR-2015 16:45	13-APR-2015 16:45	13-APR-2015 16:45	14-APR-2015 10:10
					EP1502864-026	EP1502864-027	EP1502864-028	EP1502864-029	EP1502864-030
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**84.6**	**87.3**	**88.3**	**88.4**	**91.6**
Toluene-D8	2037-26-5	0.1	%		**107**	**104**	**106**	**105**	**104**
4-Bromofluorobenzene	460-00-4	0.1	%		**92.4**	**93.3**	**92.4**	**92.9**	**93.0**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP11-B	SP12-S	SP12-M	SP12-B	SP13-S
				Client sampling date / time	14-APR-2015 10:10	14-APR-2015 08:55	14-APR-2015 08:55	14-APR-2015 08:55	14-APR-2015 11:06
					EP1502864-031	EP1502864-032	EP1502864-033	EP1502864-034	EP1502864-035
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**89.5**	**85.5**	**89.8**	**89.0**	**86.4**
Toluene-D8	2037-26-5	0.1	%		**106**	**106**	**105**	**108**	**105**
4-Bromofluorobenzene	460-00-4	0.1	%		**90.7**	**89.8**	**92.4**	**88.7**	**89.0**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP13-M	SP13-B	SP14-S	SP14-M	SP14-B
				Client sampling date / time	14-APR-2015 11:06	14-APR-2015 11:06	14-APR-2015 12:46	14-APR-2015 12:46	14-APR-2015 12:46
					EP1502864-036	EP1502864-037	EP1502864-038	EP1502864-039	EP1502864-040
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**88.9**	**86.5**	**81.8**	**92.9**	**89.4**
Toluene-D8	2037-26-5	0.1	%		**105**	**107**	**108**	**103**	**106**
4-Bromofluorobenzene	460-00-4	0.1	%		**89.8**	**89.8**	**87.7**	**91.1**	**87.2**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID: SP15-S	SP15-M	SP15-B	SP16-S	SP16-B
				Client sampling date / time: 12-APR-2015 14:38	12-APR-2015 14:38	12-APR-2015 14:38	12-APR-2015 13:30	12-APR-2015 13:30
				EP1502864-041	EP1502864-042	EP1502864-043	EP1502864-044	EP1502864-045
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L	<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**98.4**	**90.7**	**93.2**	**99.4**	**97.5**
Toluene-D8	2037-26-5	0.1	%	**98.9**	**103**	**101**	**99.4**	**101**
4-Bromofluorobenzene	460-00-4	0.1	%	**95.6**	**93.7**	**92.1**	**93.2**	**92.8**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP17-S	SP17-M	SP17-B	FIELD BLANK	TRANS BLANK
				Client sampling date / time	12-APR-2015 11:10	12-APR-2015 11:10	12-APR-2015 11:10	14-APR-2015 13:30	14-APR-2015 13:30
					EP1502864-046	EP1502864-047	EP1502864-048	EP1502864-049	EP1502864-050
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**102**	**100**	**104**	**102**	**98.9**
Toluene-D8	2037-26-5	0.1	%		**97.6**	**98.7**	**97.1**	**97.1**	**98.9**
4-Bromofluorobenzene	460-00-4	0.1	%		**93.7**	**90.5**	**93.7**	**93.4**	**90.9**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	SP9-S LAB BLANK	SP8-M LAB BLANK	SP12-S LAB BLANK	SP11-S LAB BLANK	----
				Client sampling date / time	14-APR-2015 07:12	14-APR-2015 07:51	14-APR-2015 08:55	14-APR-2015 10:00	----
					EP1502864-051	EP1502864-052	EP1502864-053	EP1502864-054	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	---
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	---
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	---
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	---
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	---
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	---
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	---
>C10 - C16 Fraction	>C10_C16	100	µg/L		<100	<100	<100	<100	---
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	---
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	---
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	---
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	---
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	---
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	---
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	---
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	---
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	---
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	<2	---
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	---
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	---
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		**90.3**	**90.3**	**103**	**103**	---
Toluene-D8	2037-26-5	0.1	%		**102**	**101**	**97.9**	**98.4**	---
4-Bromofluorobenzene	460-00-4	0.1	%		**85.8**	**86.8**	**90.4**	**90.2**	---

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	60.5	141.2
Toluene-D8	2037-26-5	73.4	126
4-Bromofluorobenzene	460-00-4	59.6	125.3

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WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/05/2015
Date Received: 16/04/2015
Our Reference: JAC15-6
Your Reference: IW021200.104

METHOD	Sampling	2000	4100	2100	4700	2700	3000	3000
SAMPLE CODE	Date	AMMONIA µg.N/L	ORTHO-P µg.P/L	NO3+NO2 µg.N/L	TOTAL-P µg.P/L	TOTAL-N µg.N/L	CHLOROPHYLL'a' µg/L	PHAEOPHYTIN'a' µg/L
Reporting Limit		<3	<2	<2	<5	<50	<0.1	<0.2
File			15042201		15042301		15042301	
SP1-S	12/04/2015	<3	2	<2	11	90	<0.1	<0.2
SP1-M	12/04/2015	<3	33	200	40	280	<0.1	<0.2
SP1-B	12/04/2015	<3	60	360	65	450	<0.1	<0.2
SP2-S	12/04/2015	<3	2	<2	12	90	<0.1	<0.2
SP2-M	12/04/2015	<3	26	150	33	230	<0.1	<0.2
SP2-B	12/04/2015	<3	58	360	63	450	<0.1	<0.2
SP3-S	13/04/2015	<3	<2	<2	12	80	<0.1	<0.2
SP3-M	13/04/2015	<3	31	190	41	310	<0.1	<0.2
SP3-B	13/04/2015	<3	61	360	65	450	<0.1	<0.2
SP4-S	13/04/2015	<3	2	<2	12	80	<0.1	<0.2
SP4-M	13/04/2015	<3	27	140	34	220	<0.1	<0.2
SP4-B	13/04/2015	<3	54	320	58	410	<0.1	<0.2
SP5-S	13/04/2015	<3	2	<2	12	80	<0.1	<0.2
SP5-M	13/04/2015	<3	26	120	34	220	<0.1	<0.2
SP5-B	13/04/2015	<3	53	320	58	420	<0.1	<0.2
SP6-S	13/04/2015	<3	2	<2	12	100	<0.1	<0.2
SP6-M	13/04/2015	<3	33	200	39	290	<0.1	<0.2
SP6-B	13/04/2015	<3	59	350	64	440	<0.1	<0.2
SP7-S	13/04/2015	<3	2	<2	12	90	<0.1	<0.2
SP7-B	13/04/2015	<3	2	<2	12	80	0.2	<0.2

Signatory: Jamie Woodward
Date: 15/05/2015

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Your Reference: IW021200.104

METHOD	Sampling	2000	4100	2100	4700	2700	3000	3000
SAMPLE CODE	Date	AMMONIA µg.N/L	ORTHO-P µg.P/L	NO3+NO2 µg.N/L	TOTAL-P µg.P/L	TOTAL-N µg.N/L	CHLOROPHYLL'a' µg/L	PHAEOPHYTIN'a' µg/L
Reporting Limit		<3	<2	<2	<5	<50	<0.1	<0.2
File			15042201		15042301		15042301	
SP8-S	14/04/2015	<3	2	<2	12	90	0.3	<0.2
SP8-M	14/04/2015	<3	2	<2	12	100	<0.1	<0.2
SP8-B	14/04/2015	<3	3	2	12	80	0.2	<0.2
SP9-S	14/04/2015	<3	3	<2	12	80	0.2	<0.2
SP9-M	14/04/2015	<3	3	<2	12	80	0.2	<0.2
SP9-B	14/04/2015	<3	24	110	31	200	<0.1	<0.2
SP10-S	13/04/2015	<3	2	<2	12	100	<0.1	<0.2
SP10-M	13/04/2015	<3	15	64	24	160	0.3	<0.2
SP10-B	13/04/2015	<3	53	310	57	420	<0.1	<0.2
SP11-S	14/04/2015	<3	3	<2	13	80	<0.1	<0.2
SP11--B	14/04/2015	<3	3	4	13	90	0.1	<0.2
SP12-S	14/04/2015	<3	3	<2	12	80	<0.1	<0.2
SP12-M	14/04/2015	<3	2	<2	13	90	0.1	<0.2
SP12-B	14/04/2015	<3	17	74	28	180	0.2	<0.2
SP13-S	14/04/2015	<3	2	<2	13	80	<0.1	<0.2
SP13-M	14/04/2015	<3	3	<2	14	90	0.2	<0.2
SP13-B	14/04/2015	<3	24	110	32	210	0.1	<0.2
SP14-S	13/04/2015	<3	2	<2	13	90	<0.1	<0.2
SP14-M	13/04/2015	<3	3	<2	13	90	0.3	<0.2
SP14-B	13/04/2015	<3	26	120	33	220	0.1	<0.2

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Date: 15/05/2015

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WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/05/2015
Date Received: 16/04/2015
Our Reference: JAC15-6
Your Reference: IW021200.104

METHOD	Sampling	2000	4100	2100	4700	2700	3000	3000
SAMPLE CODE	Date	AMMONIA	ORTHO-P	NO3+NO2	TOTAL-P	TOTAL-N	CHLOROPHYLL'a'	PHAEOPHYTIN'a'
		µg.N/L	µg.P/L	µg.N/L	µg.P/L	µg.N/L	µg/L	µg/L
Reporting Limit		<3	<2	<2	<5	<50	<0.1	<0.2
File			15042201		15042301		15042301	
SP15-S	12/04/2015	4	3	<2	12	90	<0.1	<0.2
SP15-M	12/04/2015	<3	3	<2	14	120	0.2	<0.2
SP15-B	12/04/2015	8	22	110	36	250	<0.1	<0.2
SP16-S	12/04/2015	<3	2	<2	12	100	<0.1	<0.2
SP16-B	12/04/2015	<3	2	<2	12	90	<0.1	<0.2
SP17-S	12/04/2015	<3	2	<2	12	100	<0.1	<0.2
SP17-M	12/04/2015	<3	5	7	14	100	0.3	<0.2
SP17-B	12/04/2015	9	29	150	35	240	<0.1	<0.2
Field Blank	14/04/2015	<3	<2	<2	<5	<50	<0.1	<0.2
Trans Blank	14/04/2015	<3	<2	<2	<5	<50	<0.1	<0.2

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Date of Issue: 15/05/2015
Date Received: 16/04/2015
Our Reference: JAC15-6
Your Reference: IW021200.104

METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Filtered Cr µg/L	Filtered Co µg/L	Filtered Ni µg/L	Filtered Cu µg/L	Filtered Zn µg/L	Filtered As µg/L	Filtered Cd µg/L	Filtered Ba µg/L	Filtered Pb µg/L	Hg mg/L
Reporting Limit		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
File											15042203-04
SP1-S	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.6	<0.1	5.4	<0.1	<0.0001
SP1-M	12/04/2015	0.2	<0.05	0.3	<0.2	1	1.8	<0.1	6.3	<0.1	<0.0001
SP1-B	12/04/2015	0.2	<0.05	0.4	<0.2	<1	2.0	<0.1	7.9	<0.1	<0.0001
SP2-S	12/04/2015	<0.2	<0.05	<0.3	0.2	1	1.7	<0.1	5.6	<0.1	<0.0001
SP2-M	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.9	<0.1	5.7	<0.1	<0.0001
SP2-B	12/04/2015	0.2	<0.05	0.4	<0.2	<1	1.9	<0.1	8.0	<0.1	<0.0001
SP3-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.5	<0.1	<0.0001
SP3-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.9	<0.1	6.0	<0.1	<0.0001
SP3-B	13/04/2015	<0.2	<0.05	0.4	<0.2	<1	2.0	<0.1	8.1	<0.1	<0.0001
SP4-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP4-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.6	<0.1	<0.0001
SP4-B	13/04/2015	0.2	<0.05	0.3	<0.2	<1	1.8	<0.1	7.4	<0.1	<0.0001
SP5-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.0	<0.1	<0.0001
SP5-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	6.0	<0.1	<0.0001
SP5-B	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	6.4	<0.1	<0.0001
SP6-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.1	<0.1	<0.0001
SP6-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.8	<0.1	5.7	<0.1	<0.0001
SP6-B	13/04/2015	<0.2	<0.05	0.4	<0.2	<1	1.8	<0.1	7.5	<0.1	<0.0001
SP7-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.1	<0.1	<0.0001
SP7-B	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.3	<0.1	5.5	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/05/2015

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Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/05/2015
Date Received: 16/04/2015
Our Reference: JAC15-6
Your Reference: IW021200.104

METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Filtered Cr µg/L	Filtered Co µg/L	Filtered Ni µg/L	Filtered Cu µg/L	Filtered Zn µg/L	Filtered As µg/L	Filtered Cd µg/L	Filtered Ba µg/L	Filtered Pb µg/L	Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15042203-04**
SP8-S	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.2	<0.1	<0.0001
SP8-M	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.3	<0.1	<0.0001
SP8-B	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.1	<0.1	<0.0001
SP9-S	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.3	<0.1	<0.0001
SP9-M	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.0	<0.1	<0.0001
SP9-B	14/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.7	<0.1	<0.0001
SP10-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.5	<0.1	<0.0001
SP10-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP10-B	13/04/2015	0.2	<0.05	0.4	<0.2	<1	1.9	<0.1	7.1	<0.1	<0.0001
SP11-S	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.5	<0.1	<0.0001
SP11--B	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.2	<0.1	<0.0001
SP12-S	14/04/2015	<0.2	<0.05	<0.3	0.3	1	1.7	<0.1	5.2	<0.1	<0.0001
SP12-M	14/04/2015	<0.2	<0.05	<0.3	0.2	1	1.7	<0.1	5.1	<0.1	<0.0001
SP12-B	14/04/2015	<0.2	<0.05	<0.3	0.3	<1	1.8	<0.1	5.8	<0.1	<0.0001
SP13-S	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.1	<0.1	<0.0001
SP13-M	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.3	<0.1	<0.0001
SP13-B	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	6.1	<0.1	<0.0001
SP14-S	13/04/2015	<0.2	<0.05	<0.3	0.2	<1	1.7	<0.1	5.4	<0.1	<0.0001
SP14-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.7	<0.1	<0.0001
SP14-B	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	2.0	<0.1	6.2	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/05/2015

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

Marine and Freshwater
Research Laboratory
Environmental Science
Tel: +61 8 93602907 Address: 90 South St, Murdoch, WA, 6150

Accreditation Number: 10603
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Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/05/2015
Date Received: 16/04/2015
Our Reference: JAC15-6
Your Reference: IW021200.104

METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Filtered Cr µg/L	Filtered Co µg/L	Filtered Ni µg/L	Filtered Cu µg/L	Filtered Zn µg/L	Filtered As µg/L	Filtered Cd µg/L	Filtered Ba µg/L	Filtered Pb µg/L	Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15042203-04**
SP15-S	12/04/2015	<0.2	<0.05	<0.3	<0.2	2	1.8	<0.1	5.5	<0.1	<0.0001
SP15-M	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.8	<0.1	5.7	<0.1	<0.0001
SP15-B	12/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.9	<0.1	6.3	<0.1	<0.0001
SP16-S	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.4	<0.1	<0.0001
SP16-B	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.3	<0.1	<0.0001
SP17-S	12/04/2015	<0.2	<0.05	<0.3	<0.2	4	1.7	<0.1	5.6	<0.1	<0.0001
SP17-M	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.6	<0.1	<0.0001
SP17-B	12/04/2015	<0.2	<0.05	<0.3	<0.2	2	1.9	<0.1	6.3	<0.1	<0.0001
Field Blank	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
Trans Blank	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/05/2015

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

Marine and Freshwater
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Environmental Science
Tel: +61 8 93602907 Address: 90 South St, Murdoch, WA, 6150

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Murdoch UNIVERSITY

WATER QUALITY DATA

Contact: Celeste Wilson
Customer: Jacobs
Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/05/2015
Date Received: 16/04/2015
Our Reference: JAC15-6
Your Reference: IW021200.104

METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Unfiltered Cr µg/L	Unfiltered Co µg/L	Unfiltered Ni µg/L	Unfiltered Cu µg/L	Unfiltered Zn µg/L	Unfiltered As µg/L	Unfiltered Cd µg/L	Unfiltered Ba µg/L	Unfiltered Pb µg/L	Total Ext Hg mg/L
Reporting Limit		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
File											15042201-03
SP1-S	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.9	<0.1	5.9	<0.1	<0.0001
SP1-M	12/04/2015	0.2	<0.05	0.3	0.2	2	1.9	<0.1	6.1	<0.1	<0.0001
SP1-B	12/04/2015	0.3	<0.05	0.4	<0.2	1	2.1	<0.1	8.0	<0.1	<0.0001
SP2-S	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.8	<0.1	5.5	<0.1	<0.0001
SP2-M	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.8	<0.1	5.8	<0.1	<0.0001
SP2-B	12/04/2015	0.2	<0.05	0.3	0.3	2	2.0	<0.1	8.1	<0.1	<0.0001
SP3-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.5	<0.1	<0.0001
SP3-M	13/04/2015	0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.9	<0.1	<0.0001
SP3-B	13/04/2015	0.2	<0.05	0.5	<0.2	<1	2.1	<0.1	8.2	<0.1	<0.0001
SP4-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP4-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.6	<0.1	<0.0001
SP4-B	13/04/2015	0.2	<0.05	0.3	<0.2	<1	2.0	<0.1	7.5	<0.1	<0.0001
SP5-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.0	<0.1	<0.0001
SP5-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.8	<0.1	<0.0001
SP5-B	13/04/2015	<0.2	<0.05	0.3	<0.2	1	1.8	<0.1	6.7	<0.1	<0.0001
SP6-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.3	<0.1	<0.0001
SP6-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.8	<0.1	5.7	<0.1	<0.0001
SP6-B	13/04/2015	<0.2	<0.05	0.4	<0.2	<1	1.9	<0.1	7.6	<0.1	<0.0001
SP7-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.1	<0.1	<0.0001
SP7-B	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.5	<0.1	5.6	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/05/2015

All test items tested as received. Spare test items will be held for two months unless otherwise requested.

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WATER QUALITY DATA

Contact: Celeste Wilson
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Address: Level 11, Durack Centre, 263 Adelaide Terrace, Perth WA 6001

Date of Issue: 15/05/2015
Date Received: 16/04/2015
Our Reference: JAC15-6
Your Reference: IW021200.104

METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Unfiltered Cr µg/L	Unfiltered Co µg/L	Unfiltered Ni µg/L	Unfiltered Cu µg/L	Unfiltered Zn µg/L	Unfiltered As µg/L	Unfiltered Cd µg/L	Unfiltered Ba µg/L	Unfiltered Pb µg/L	Total Ext Hg mg/L
Reporting Limit		<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
File											15042201-03
SP8-S	14/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.6	<0.1	5.3	<0.1	<0.0001
SP8-M	14/04/2015	<0.2	<0.05	<0.3	0.2	<1	1.7	<0.1	5.5	<0.1	<0.0001
SP8-B	14/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.7	<0.1	5.3	<0.1	<0.0001
SP9-S	14/04/2015	<0.2	<0.05	<0.3	<0.2	2	1.7	<0.1	5.4	<0.1	<0.0001
SP9-M	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.2	<0.1	<0.0001
SP9-B	14/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.9	<0.1	5.9	<0.1	<0.0001
SP10-S	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.7	<0.1	5.5	<0.1	<0.0001
SP10-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.6	<0.1	<0.0001
SP10-B	13/04/2015	0.2	<0.05	0.4	0.2	<1	1.9	<0.1	7.4	<0.1	<0.0001
SP11-S	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.9	<0.1	5.3	<0.1	<0.0001
SP11--B	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.2	<0.1	<0.0001
SP12-S	14/04/2015	<0.2	<0.05	<0.3	0.3	2	1.6	<0.1	5.2	<0.1	<0.0001
SP12-M	14/04/2015	<0.2	<0.05	<0.3	0.3	<1	1.6	<0.1	5.1	<0.1	<0.0001
SP12-B	14/04/2015	<0.2	<0.05	<0.3	0.3	<1	1.8	<0.1	5.8	<0.1	<0.0001
SP13-S	14/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.6	<0.1	5.2	<0.1	<0.0001
SP13-M	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.6	<0.1	5.3	<0.1	<0.0001
SP13-B	14/04/2015	<0.2	<0.05	<0.3	0.3	<1	1.8	<0.1	6.1	<0.1	<0.0001
SP14-S	13/04/2015	<0.2	<0.05	<0.3	0.2	<1	1.7	<0.1	5.5	<0.1	<0.0001
SP14-M	13/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.5	<0.1	<0.0001
SP14-B	13/04/2015	<0.2	<0.05	<0.3	<0.2	1	2.0	<0.1	6.2	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/05/2015

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Our Reference: JAC15-6
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METHOD	Sampling	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	MS001	ICP006
SAMPLE CODE	Date	Unfiltered Cr µg/L	Unfiltered Co µg/L	Unfiltered Ni µg/L	Unfiltered Cu µg/L	Unfiltered Zn µg/L	Unfiltered As µg/L	Unfiltered Cd µg/L	Unfiltered Ba µg/L	Unfiltered Pb µg/L	Total Ext Hg mg/L
Reporting Limit		**<0.2**	**<0.05**	**<0.3**	**<0.2**	**<1**	**<0.5**	**<0.1**	**<0.5**	**<0.1**	**<0.0001**
File											**15042201-03**
SP15-S	12/04/2015	<0.2	<0.05	<0.3	<0.2	3	1.7	<0.1	5.5	<0.1	<0.0001
SP15-M	12/04/2015	<0.2	<0.05	<0.3	<0.2	<1	1.8	<0.1	5.7	<0.1	<0.0001
SP15-B	12/04/2015	<0.2	<0.05	<0.3	0.2	1	1.9	<0.1	6.3	<0.1	<0.0001
SP16-S	12/04/2015	<0.2	<0.05	<0.3	0.2	1	1.9	<0.1	5.5	<0.1	<0.0001
SP16-B	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.9	<0.1	5.6	<0.1	<0.0001
SP17-S	12/04/2015	<0.2	<0.05	<0.3	0.2	3	1.8	<0.1	5.6	<0.1	<0.0001
SP17-M	12/04/2015	<0.2	<0.05	<0.3	<0.2	3	1.7	<0.1	5.6	<0.1	<0.0001
SP17-B	12/04/2015	<0.2	<0.05	<0.3	<0.2	1	1.9	<0.1	6.2	<0.1	<0.0001
Field Blank	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001
Trans Blank	14/04/2015	<0.2	<0.05	<0.3	<0.2	<1	<0.5	<0.1	<0.5	<0.1	<0.0001

Signatory: Jamie Woodward
Date: 15/05/2015

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Western Radiation Services
analytical laboratory & consulting

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Laboratory No. 14174

ABN: 64 135 436 092

3 June 2015

Ref: 9278
Contract: MW 1739

Sinclair Knight Merz – JACOBS PROJECT
7th Floor Durack Centre
PERTH WA 6000

Attn: Alaina Clark/Marine Scientist

ANALYTICAL REPORT

The results (to 95%, 2σ confidence level) for Radium-226, Radium-228 and Thorium-228 analyses of forty eight (48) liquid samples, as received at our laboratory on 29 April 2015, are detailed on page two and three of this report.

MDL:	Radium-226	0.100 Bq/l	Radium-228	0.100 Bq/l
	Thorium-228	0.100 Bq/l		
Method:	LTP No. 4(a)	Gamma Spectrometry Analysis		

Madassar A. Qureshi
Authorised Signatory

Perth Office: 24 Brennan Way, Belmont W.A. 6104
Tel: 61 8 9475 0099 |**Fax:** 61 8 9475 0165
A/H: 61 (0) 439 970 660

WRS No	Client Sample ID	Ra-226 (Bq/l)	Ra-228 (Bq/l)	Th-228 (Bq/l)
9278-1	SP1-S	<MDL	<MDL	<MDL
9278-2	SP1-M	<MDL	<MDL	<MDL
9278-3	SP1-B	<MDL	<MDL	<MDL
9278-4	SP2-S	<MDL	<MDL	<MDL
9278-5	SP2-M	0.124 ± 0.014	<MDL	<MDL
9278-6	SP2-B	<MDL	<MDL	<MDL
9278-7	SP3-S	<MDL	<MDL	<MDL
9278-8	SP3-M	<MDL	<MDL	<MDL
9278-9	SP3-B	<MDL	<MDL	<MDL
9278-10	SP4-S	0.295 ± 0.053	0.148 ± 0.045	<MDL
9278-10D	SP4-S	0.263 ± 0.049	0.165 ± 0.064	<MDL
9278-11	SP4-M	<MDL	<MDL	<MDL
9278-12	SP4-B	<MDL	<MDL	<MDL
9278-13	SP5-S	<MDL	<MDL	<MDL
9278-14	SP5-M	0.104 ± 0.014	<MDL	<MDL
9278-15	SP5-B	<MDL	<MDL	<MDL
9278-16	SP6-S	<MDL	<MDL	<MDL
9278-17	SP6-M	<MDL	<MDL	<MDL
9278-18	SP6-B	<MDL	<MDL	<MDL
9278-19	SP7-S	<MDL	<MDL	<MDL
9278-20	SP7-B	0.137 ± 0.024	<MDL	<MDL
9278-20D	SP7-B	0.141 ± 0.025	<MDL	<MDL
9278-21	SP8-S	0.136 ± 0.019	<MDL	<MDL
9278-22	SP8-M	<MDL	<MDL	<MDL
9278-23	SP8-B	<MDL	<MDL	<MDL
9278-24	SP9-S	0.113 ± 0.022	<MDL	<MDL
9278-25	SP9-M	<MDL	<MDL	<MDL
9278-26	SP9-B	<MDL	<MDL	<MDL

Perth Office: 24 Brennan Way, Belmont W.A. 6104
Tel: 61 8 9475 0099 |**Fax:** 61 8 9475 0165
A/H: 61 (0) 439 970 660

WRS No	Client Sample ID	Ra-226 (Bq/l)	Ra-228 (Bq/l)	Th-228 (Bq/l)
9278-27	SP10-S	<MDL	<MDL	<MDL
9278-28	SP10-M	<MDL	<MDL	<MDL
9278-29	SP10-B	<MDL	<MDL	<MDL
9278-30	SP11-S	0.136 ± 0.030	<MDL	<MDL
9278-30D	SP11-S	0.172 ± 0.031	<MDL	<MDL
9278-31	SP11-B	<MDL	<MDL	<MDL
9278-32	SP12-S	<MDL	<MDL	<MDL
9278-33	SP12-M	0.105 ± 0.015	<MDL	<MDL
9278-34	SP12-B	<MDL	<MDL	<MDL
9278-35	SP13-S	<MDL	<MDL	<MDL
9278-36	SP13-M	<MDL	<MDL	<MDL
9278-37	SP13-B	<MDL	<MDL	<MDL
9278-38	SP14-S	<MDL	<MDL	<MDL
9278-39	SP14-M	<MDL	<MDL	<MDL
9278-40	SP14-B	<MDL	<MDL	<MDL
9278-40D	SP14-B	<MDL	<MDL	<MDL
9278-41	SP15-S	<MDL	<MDL	<MDL
9278-42	SP15-M	<MDL	<MDL	<MDL
9278-43	SP15-B	<MDL	<MDL	<MDL
9278-44	SP16-S	<MDL	<MDL	<MDL
9278-45	SP16-B	<MDL	<MDL	<MDL
9278-46	SP17-S	<MDL	<MDL	<MDL
9278-47	SP17-M	<MDL	<MDL	<MDL
9278-48	SP17-B	<MDL	<MDL	<MDL

The reported expanded uncertainty of measurement is stated as the standard uncertainty of the measurement ± 5.6 %, multiplied by the coverage factor k=2, which corresponds to a coverage probability of approximately 95%.

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DATA REPORT

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P// (08) 9271 6776
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Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

Report Date
1/06/2015

DSID
27560

Batch Number
150420110337

Sample ID
SP1-S

Date Collected
12/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP1-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
29/05/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
21,960.0 cells L^{-1}

Total Counted
120

Uncertainty
18.3%

Species Name	Density	BioVolume	%
Cyanobacteria			
Trichodesmium erythraeum	20,130		91.67
	20,130	**0.0000**	**91.67**
Dinophyceae			
Dinoflagellate 003	183		0.83
Dinoflagellate 036	1,098		5.00
Gyrodinium sp. 002	183		0.83
Heterocapsa sp. 001	183		0.83
Scrippsiella trochoidea	183		0.83
	1,830	**0.0000**	**8.33**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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COP-Barossa WQ Trip

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Jacobs Group (Australia) Pty Ltd
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263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
27561

Report Date
1/06/2015

Batch Number
150420110513

Sample ID
SP3-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP3-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
9,882.0 cells L^{-1}

Total Counted
54

Uncertainty
27.2%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Nitzschia spp.	183		1.85
	183	**0.0000**	**1.85**
Cyanobacteria			
Trichodesmium erythraeum	8,601		87.04
	8,601	**0.0000**	**87.04**
Dinophyceae			
Dinoflagellate 003	183		1.85
Dinoflagellate 036	366		3.70
Dinoflagellate 081	183		1.85
Prorocentrum dentatum	183		1.85
Protoperidinium steinii	183		1.85
	1,098	**0.0000**	**11.11**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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COP-Barossa WQ Trip

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Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

Report Date
1/06/2015

DSID
27562

Batch Number
150420110600

Sample ID
SP5-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP5-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
5,856.0 cells L^{-1}

Total Counted
32

Uncertainty
35.4%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Navicula spp.	549		9.38
Nitzschia spp.	915		15.63
	1,464	**0.0000**	**25.00**
Chlorophyceae			
Chlorophyte 002	2,928		50.00
	2,928	**0.0000**	**50.00**
Dinophyceae			
Dinoflagellate 003	366		6.25
Dinoflagellate 036	732		12.50
Heterocapsa sp. 001	366		6.25
	1,464	**0.0000**	**25.00**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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COP-Barossa WQ Trip

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Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

Report Date
1/06/2015

DSID
27563

Batch Number
150420110644

Sample ID
SP6-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP6-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
6,222.0 cells L^{-1}

Total Counted
34

Uncertainty
34.3%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Chaetoceros spp.	549		8.82
Nitzschia spp.	183		2.94
	732	**0.0000**	**11.76**
Cyanobacteria			
Trichodesmium erythraeum	4,209		67.65
	4,209	**0.0000**	**67.65**
Dinophyceae			
Dinoflagellate 003	183		2.94
Dinoflagellate 036	549		8.82
Dinoflagellate 081	183		2.94
Heterocapsa sp. 001	366		5.88
	1,281	**0.0000**	**20.59**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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Report Date
1/06/2015

DSID
27564

Batch Number
150420110734

Sample ID
SP7-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP7-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
29/05/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
8,601.0 cells L^{-1}

Total Counted
47

Uncertainty
29.2%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Chaetoceros spp.	366		4.26
	366	**0.0000**	**4.26**
Cyanobacteria			
Trichodesmium erythraeum	7,137		82.98
	7,137	**0.0000**	**82.98**
Dinophyceae			
Dinoflagellate 003	549		6.38
Dinoflagellate 036	183		2.13
Heterocapsa sp. 001	183		2.13
Scrippsiella trochoidea	183		2.13
	1,098	**0.0000**	**12.77**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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DSID
27565

Report Date
1/06/2015

Batch Number
150420110817

Sample ID
SP8-S

Date Collected
14/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP8-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
29/05/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
4,941.0 cells L^{-1}

Total Counted
27

Uncertainty
38.5%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Chaetoceros spp.	366		7.41
Leptocylindrus danicus	183		3.70
Navicula spp.	366		7.41
	915	**0.0000**	**18.52**
Cyanobacteria			
Trichodesmium erythraeum	3,294		66.67
	3,294	**0.0000**	**66.67**
Dinophyceae			
Dinoflagellate 003	366		7.41
Dinoflagellate 036	183		3.70
Gyrodinium sp. 002	183		3.70
	732	**0.0000**	**14.81**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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Report Date
1/06/2015

DSID
27566

Batch Number
150420110901

Sample ID
SP10-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP10-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
2,928.0 cells L^{-1}

Total Counted
16

Uncertainty
50.0%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Cylindrotheca closterium	183		6.25
Nitzschia spp.	183		6.25
	366	**0.0000**	**12.50**
Cyanobacteria			
Trichodesmium erythraeum	1,281		43.75
	1,281	**0.0000**	**43.75**
Dinophyceae			
Dinoflagellate 003	549		18.75
Dinoflagellate 036	183		6.25
Heterocapsa sp. 001	183		6.25
Scrippsiella trochoidea	366		12.50
	1,281	**0.0000**	**43.75**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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Analyst ID
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DSID
27567

Report Date
1/06/2015

Batch Number
150420110940

Sample ID
SP11-S

Date Collected
14/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP11-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
2,745.0 cells L^{-1}

Total Counted
15

Uncertainty
51.6%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Chaetoceros spp.	549		20.00
Cylindrotheca closterium	183		6.67
Nitzschia spp.	549		20.00
	1,281	**0.0000**	**46.67**
Dinophyceae			
Dinoflagellate 003	366		13.33
Dinoflagellate 036	549		20.00
Dinoflagellate 081	366		13.33
Gyrodinium sp. 002	183		6.67
	1,464	**0.0000**	**53.33**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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Project
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Perth, WA 6000

Analyst ID
stuart

DSID
27568

Report Date
1/06/2015

Batch Number
150420111019

Sample ID
SP13-S

Date Collected
14/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP13-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
1,464.0 cells L^{-1}

Total Counted
8

Uncertainty
70.7%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Cylindrotheca closterium	366		25.00
Nitzschia spp.	183		12.50
	549	**0.0000**	**37.50**
Dinophyceae			
Dinoflagellate 003	366		25.00
Dinoflagellate 036	183		12.50
Dinoflagellate 081	183		12.50
Gyrodinium sp. 002	183		12.50
	915	**0.0000**	**62.50**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Analyst ID
stuart

Report Date
1/06/2015

DSID
27569

Batch Number
150420111058

Sample ID
SP14-S

Date Collected
14/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP14-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
1,464.0 cells L^{-1}

Total Counted
8

Uncertainty
70.7%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Nitzschia spp.	183		12.50
	183	**0.0000**	**12.50**
Cryptophyceae			
Cryptophyte 014	183		12.50
	183	**0.0000**	**12.50**
Dinophyceae			
Dinoflagellate 003	183		12.50
Dinoflagellate 036	183		12.50
Dinoflagellate 081	549		37.50
Gyrodinium sp. 002	183		12.50
	1,098	**0.0000**	**75.00**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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DATA REPORT

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Project
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263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
27570

Report Date
1/06/2015

Batch Number
150420111139

Sample ID
SP16-S

Date Collected
12/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP16-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
2,928.0 cells L^{-1}

Total Counted
16

Uncertainty
50.0%

Species Name	Density	BioVolume	%
Cyanobacteria			
Trichodesmium erythraeum	2,013		68.75
	2,013	**0.0000**	**68.75**
Dinophyceae			
Dinoflagellate 003	549		18.75
Dinoflagellate 036	183		6.25
Heterocapsa sp. 001	183		6.25
	915	**0.0000**	**31.25**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Project
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COP-Barossa WQ Trip

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Analyst ID
stuart

Report Date
1/06/2015

DSID
27571

Batch Number
150420111222

Sample ID
SP17-S

Date Collected
12/04/2015

Monitoring Point

Sample Type
Phytoplankton

Date Received
20/04/2015

Functional Location ID
SP17-S

Method (Detection Limit)
Utermohl Tube (New) (183)

Analysis Date
1/06/2015

Units Reported Cell Density:cells L^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
No exceedances of WASQAP (2011) guideline values.

Field Data Recording

Total Density
7,869.0 cells L^{-1}

Total Counted
43

Uncertainty
30.5%

Species Name	Density	BioVolume	%
Bacillariophyceae			
Chaetoceros spp.	549		6.98
Nitzschia spp.	366		4.65
	915	**0.0000**	**11.63**
Cyanobacteria			
Trichodesmium erythraeum	5,673		72.09
	5,673	**0.0000**	**72.09**
Dinophyceae			
Dinoflagellate 003	549		6.98
Dinoflagellate 036	366		4.65
Heterocapsa sp. 001	366		4.65
	1,281	**0.0000**	**16.28**

End Of Report

Shading Key

Species Name	Density	BioVolume	%

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Potentially toxic species

Potentially harmful (non-toxic) species

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DATA REPORT

A// 3 Yeeda Way
Malaga, WA 6090
P// (08) 9271 6776
F// (08) 9248 9120

Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID

DSID
27585

Report Date
1/06/2015

Batch Number
150420113150

Sample ID
SP1-S

Date Collected
12/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP1-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
29/05/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 100 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
407.0 Individuals^{-1}

Total Counted
407

Uncertainty
9.9%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	11		2.70
	11	**0.0000**	**2.70**
Copepoda			
Acartiidae	34		8.35
Calanidae	157		38.57
Copepod Nauplius	101		24.82
Corycaeidae	47		11.55
Macrosetella sp. 001	5		1.23
Microsetella	3		0.74
Oncaeidae	10		2.46
Paracalanidae	2		0.49
Pontellidae nauplius	14		3.44
Sulcanidae	6		1.47
	379	**0.0000**	**93.12**
Polychaeta			
Polychaete larva	14		3.44
	14	**0.0000**	**3.44**
Sagittoidea			

Species Name	Density	BioVolume	%
Chaetognath	1		0.25
	1	**0.0000**	**0.25**
Unknown			
Protozoa 047	1		0.25
Protozoa 056	1		0.25
	2	**0.0000**	**0.49**

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Project
BAROSSA
COP-Barossa WQ Trip

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Perth, WA 6000

Analyst ID
stuart

DSID
27586

Report Date
1/06/2015

Batch Number
150420113235

Sample ID
SP3-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP3-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/05/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 106 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
3,188.0 Individuals^{-1}

Total Counted
3,188

Uncertainty
3.5%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	9		0.28
	9	**0.0000**	**0.28**
Copepoda			
Acartiidae	13		0.41
Calanidae	2		0.06
Copepod Nauplius	9		0.28
Corycaeidae	15		0.47
Oncaeidae	3		0.09
Sulcanidae	1		0.03
	43	**0.0000**	**1.35**
Foraminifera			
Foraminiferida	3		0.09
	3	**0.0000**	**0.09**
Gigartacontidae			
Gigartacontidae	3,126		98.06
	3,126	**0.0000**	**98.06**
Polychaeta			

Species Name	Density	BioVolume	%
Polychaete larva	1		0.03
	1	**0.0000**	**0.03**
Sagittoidea			
Chaetognath	4		0.13
	4	**0.0000**	**0.13**
Unknown			
Protozoa 047	2		0.06
	2	**0.0000**	**0.06**

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Perth, WA 6000

Analyst ID
stuart

Report Date
1/06/2015

DSID
27587

Batch Number
150420113313

Sample ID
SP5-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP5-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/05/2015

Units Reported: Cell Density:Individuals^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 86 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
2,807.0 Individuals^{-1}

Total Counted
2,807

Uncertainty
3.8%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	17		0.61
	17	**0.0000**	**0.61**
Copepoda			
Acartiidae	103		3.67
Calanidae	333		11.86
Copepod Nauplius	151		5.38
Corycaeidae	55		1.96
Macrosetella sp. 001	12		0.43
Microsetella	16		0.57
Oncaeidae	56		2.00
Paracalanidae	15		0.53
Pontellidae nauplius	22		0.78
Sulcanidae	31		1.10
	794	**0.0000**	**28.29**
Foraminifera			
Foraminiferida	2		0.07
	2	**0.0000**	**0.07**
Gigartacontidae			

Species Name	Density	BioVolume	%
Gigartacontidae	1,974		70.32
	1,974	**0.0000**	**70.32**
Sagittoidea			
Chaetognath	12		0.43
	12	**0.0000**	**0.43**
Unknown			
Protozoa 047	8		0.29
	8	**0.0000**	**0.29**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Analyst ID
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DSID
27588

Report Date
1/06/2015

Batch Number
150420113358

Sample ID
SP6-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP6-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/05/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 102 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
176.0 Individuals^{-1}

Total Counted
176

Uncertainty
15.1%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	23		13.07
	23	**0.0000**	**13.07**
Copepoda			
Acartiidae	9		5.11
Calanidae	10		5.68
Copepod Nauplius	8		4.55
Corycaeidae	3		1.70
Oncaeidae	3		1.70
Sulcanidae	1		0.57
	34	**0.0000**	**19.32**
Gigartacontidae			
Gigartacontidae	111		63.07
	111	**0.0000**	**63.07**
Sagittoidea			
Chaetognath	7		3.98
	7	**0.0000**	**3.98**
Unknown			

Species Name	Density	BioVolume	%
Protozoa 047	1		0.57
	1	**0.0000**	**0.57**

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Analyst ID
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Report Date
1/06/2015

DSID
27589

Batch Number
150420113438

Sample ID
SP7-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP7-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
29/05/2015

Units Reported: Cell Density:Individuals^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 99 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
196.0 Individuals^{-1}

Total Counted
196

Uncertainty
14.3%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	8		4.08
	8	**0.0000**	**4.08**
Copepoda			
Acartiidae	6		3.06
Calanidae	56		28.57
Copepod Nauplius	13		6.63
Corycaeidae	41		20.92
Microsetella	10		5.10
Oncaeidae	9		4.59
Paracalanidae	2		1.02
	137	**0.0000**	**69.90**
Gigartacontidae			
Gigartacontidae	18		9.18
	18	**0.0000**	**9.18**
Maxillopoda			
Cirripede nauplius	5		2.55
	5	**0.0000**	**2.55**

Species Name	Density	BioVolume	%
Polychaeta			
Polychaete larva	27		13.78
	27	**0.0000**	**13.78**
Unknown			
Protozoa 047	1		0.51
	1	**0.0000**	**0.51**

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Analyst ID
stuart

DSID
27590

Report Date
1/06/2015

Batch Number
150420113516

Sample ID
SP8-S

Date Collected
14/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP8-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/05/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 91 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
380.0 Individuals^{-1}

Total Counted
380

Uncertainty
10.3%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	11		2.89
	11	**0.0000**	**2.89**
Copepoda			
Acartiidae	29		7.63
Calanidae	151		39.74
Copepod Nauplius	62		16.32
Corycaeidae	33		8.68
Microsetella	16		4.21
Oncaeidae	8		2.11
Paracalanidae	6		1.58
Pontellidae nauplius	5		1.32
	310	**0.0000**	**81.58**
Gigartacontidae			
Gigartacontidae	32		8.42
	32	**0.0000**	**8.42**
Polychaeta			
Polychaete larva	21		5.53
	21	**0.0000**	**5.53**

Species Name	Density	BioVolume	%
Sagittoidea			
Chaetognath	1		0.26
	1	**0.0000**	**0.26**
Unknown			
Protozoa 047	5		1.32
	5	**0.0000**	**1.32**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Perth, WA 6000

Analyst ID
stuart

Report Date
1/06/2015

DSID
27591

Batch Number
150420113557

Sample ID
SP10-S

Date Collected
13/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP10-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/05/2015

Units Reported: Cell Density:Individuals^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 106 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
236.0 Individuals^{-1}

Total Counted
236

Uncertainty
13.0%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	4		1.69
	4	**0.0000**	**1.69**
Copepoda			
Acartiidae	23		9.75
Calanidae	77		32.63
Copepod Nauplius	55		23.31
Corycaeidae	39		16.53
Macrosetella sp. 001	1		0.42
Microsetella	1		0.42
Oncaeidae	18		7.63
Paracalanidae	3		1.27
Sulcanidae	8		3.39
	225	**0.0000**	**95.34**
Polychaeta			
Polychaete larva	1		0.42
	1	**0.0000**	**0.42**
Sagittoidea			
Chaetognath	6		2.54

Species Name	Density	BioVolume	%
	6	**0.0000**	**2.54**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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Project
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Perth, WA 6000

Analyst ID
stuart

DSID
27592

Report Date
1/06/2015

Batch Number
150420113641

Sample ID
SP11-S

Date Collected
14/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP11-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
28/05/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 106 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
1,316.0 Individuals^{-1}

Total Counted
1,316

Uncertainty
5.5%

Species Name	Density	BioVolume	%
Branchiopoda			
Polyphemidae	1		0.08
	1	**0.0000**	**0.08**
Copepoda			
Acartiidae	21		1.60
Calanidae	73		5.55
Copepod Nauplius	45		3.42
Corycaeidae	41		3.12
Macrosetella sp. 001	16		1.22
Microsetella	12		0.91
Oncaeidae	17		1.29
	225	**0.0000**	**17.10**
Foraminifera			
Foraminiferida	11		0.84
	11	**0.0000**	**0.84**
Gigartacontidae			
Gigartacontidae	1,077		81.84
	1,077	**0.0000**	**81.84**

Species Name	Density	BioVolume	%
Polychaeta			
Polychaete larva	1		0.08
	1	**0.0000**	**0.08**
Unknown			
Protozoa 047	1		0.08
	1	**0.0000**	**0.08**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DSID
27593

Report Date
1/06/2015

Batch Number
150420113723

Sample ID
SP13-S

Date Collected
14/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP13-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
29/05/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 75 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
1,017.0 Individuals^{-1}

Total Counted
1,017

Uncertainty
6.3%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	1		0.10
	1	**0.0000**	**0.10**
Branchiopoda			
Podonidae	1		0.10
	1	**0.0000**	**0.10**
Copepoda			
Acartiidae	1		0.10
Calanidae	7		0.69
Copepod Nauplius	40		3.93
Corycaeidae	17		1.67
Microsetella	6		0.59
Oncaeidae	4		0.39
Pontellidae nauplius	2		0.20
	77	**0.0000**	**7.57**
Gigartacontidae			
Gigartacontidae	843		82.89
	843	**0.0000**	**82.89**

Species Name	Density	BioVolume	%
Polycystinea			
Theoperidae	37		3.64
	37	**0.0000**	**3.64**
Unknown			
Protozoa 047	6		0.59
Protozoa 056	52		5.11
	58	**0.0000**	**5.70**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Project
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Analyst ID
stuart

DSID
27594

Report Date
1/06/2015

Batch Number
150420113821

Sample ID
SP14-S

Date Collected
14/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP14-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
29/05/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 105 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
93.0 Individuals^{-1}

Total Counted
93

Uncertainty
20.7%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	3		3.23
	3	**0.0000**	**3.23**
Copepoda			
Acartiidae	14		15.05
Calanidae	4		4.30
Copepod Nauplius	16		17.20
Corycaeidae	37		39.78
Microsetella	6		6.45
Paracalanidae	5		5.38
	82	**0.0000**	**88.17**
Gigartacontidae			
Gigartacontidae	7		7.53
	7	**0.0000**	**7.53**
Polycystinea			
Theoperidae	1		1.08
	1	**0.0000**	**1.08**

Species Name	Density	BioVolume	%

End Of Report

This report contains coloured shading. Dalcon Environmental intends that this report be viewed and/or printed in colour.

Dalcon Environmental Pty Ltd makes no claim that the taxa list provided herein is exhaustive. Some taxa, including potentially problematic taxa, may be present in the sample but not recorded during analysis, this is particularly the case for small or inconspicuous taxa or taxa present in low numbers. Guidance presented herein is based on published research , whilst Dalcon Environmental make every attempt to remain up to date, it is possible that scientific consensus may differ from that presented herein.

Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

A// 3 Yeeda Way
Malaga, WA 6090
P// (08) 9271 6776
F// (08) 9248 9120

Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
27595

Report Date
1/06/2015

Batch Number
150420113908

Sample ID
SP16-S

Date Collected
12/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP16-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
29/05/2015

Units Reported: Cell Density:Individuals^{-1} Biovolume: mm^3 L^{-1} %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 117 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
2,577.0 Individuals^{-1}

Total Counted
2,577

Uncertainty
3.9%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	94		3.65
	94	**0.0000**	**3.65**
Copepoda			
Acartiidae	2		0.08
Calanidae	16		0.62
Copepod Nauplius	12		0.47
Microsetella	2		0.08
	32	**0.0000**	**1.24**
Foraminifera			
Foraminiferida	19		0.74
	19	**0.0000**	**0.74**
Gigartacontidae			
Gigartacontidae	2,412		93.60
	2,412	**0.0000**	**93.60**
Polycystinea			
Theoperidae	5		0.19
	5	**0.0000**	**0.19**

Species Name	Density	BioVolume	%
Sagittoidea			
Chaetognath	13		0.50
	13	**0.0000**	**0.50**
Unknown			
Protozoa 047	1		0.04
Protozoa 056	1		0.04
	2	**0.0000**	**0.08**

End Of Report

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Shading Key
Potentially toxic species
Potentially harmful (non-toxic) species

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DATA REPORT

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Malaga, WA 6090
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Project
BAROSSA
COP-Barossa WQ Trip

Customer
Jacobs Group (Australia) Pty Ltd
Level 7, Durack Centre
263 Adelaide Terrace
Perth, WA 6000

Analyst ID
stuart

DSID
27596

Report Date
1/06/2015

Batch Number
150420113957

Sample ID
SP17-S

Date Collected
12/04/2015

Monitoring Point

Sample Type
Zooplankton

Date Received
20/04/2015

Functional Location ID
SP17-S

Method (Detection Limit)
Raw Count (1)

Analysis Date
29/05/2015

Units Reported: Cell Density:Individuals^{-1} | Biovolume: mm^3 L^{-1} | %: Percentage of total cells counted

Sampler Notes

Laboratory Notes
Initial sample volume = 83 ml
Sample diluted 10x prior to analysis
3 replicate samples, 1 ml each, analysed

Field Data Recording

Total Density
966.0 Individuals^{-1}

Total Counted
966

Uncertainty
6.4%

Species Name	Density	BioVolume	%
Appendicularia			
Appendicularian	34		3.52
	34	**0.0000**	**3.52**
Copepoda			
Calanidae	3		0.31
Copepod Nauplius	29		3.00
Corycaeidae	10		1.04
Oncaeidae	21		2.17
Pontellidae nauplius	7		0.72
	70	**0.0000**	**7.25**
Gigartacontidae			
Gigartacontidae	846		87.58
	846	**0.0000**	**87.58**
Polycystinea			
Theoperidae	13		1.35
	13	**0.0000**	**1.35**
Unknown			
Protozoa 047	3		0.31

Species Name	Density	BioVolume	%
	3	**0.0000**	**0.31**

End Of Report

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