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Redland City Council

Coochiemudlo Island Former Landfill

March and May 2019 Surface Water and Groundwater Monitoring Report

June 2019

Executive Summary

GHD Pty Ltd (GHD) was commissioned by Redland City Council (RCC) to carry out an environmental assessment at the former Coochiemudlo Island landfill to characterise environmental risk associated with surface water and groundwater originating from the site. The risk review (GHD, 2018c) characterised risk to down gradient receptors including adjacent Melaleuca Wetland as low, however it recommended additional monitoring works to confirm the findings of the assessment. This report presents the results of the additional surface water and groundwater monitoring works completed in March and May 2019, as recommended in the Risk Review report (GHD, 2018c).

In addition to the environmental assessment, GHD also completed an assessment in March 2018 to document the quality and distribution of potential Wallum frog habitats within the adjacent Coochiemudlo wetland [*Coochiemudlo Island wetland: Wallum frog assessment* (GHD, 2018a)]. No Wallum frog species were recorded during the survey, however the condition of the wetland appear to be suitable for Wallum frog species.

During the March 2019 monitoring event, three groundwater wells GW3, GW5 and GW6 (two upgradient and one downgradient) were sampled; GW1 and GW2 were dry and were unable to be sampled. In May 2019, all groundwater wells were sampled. During both monitoring events only downstream CISW1 and CISW5 were sampled, with the remaining upstream locations dry. One additional background surface water location (CISW-Drain) was sampled in May 2019.

Groundwater

Groundwater laboratory results identified several parameters at concentrations in excess of the adopted assessment criteria. Most results in down gradient locations were consistent with historical results or were less than those from background locations, with the exception of new maximums at upgradient wells GW5 (chloride, sulfate and pH) and GW6 (aluminium, magnesium, sodium and chloride) and at down gradient well GW3 (pH and copper) in March 2019.

During the May 2019 event, results were mostly consistent with the historical dataset with most parameters showing decreased concentrations, except for upgradient GW6 (zinc) and down gradient wells GW1 (sulfate), GW2 (ammonia and zinc) and GW3 (zinc).

The concentrations of ammonia, a key landfill leachate indicator, is consistent between up and down-gradient wells. Concentrations of iron were reported above the adopted guideline in both up and down-gradient locations, and iron concentrations in down-gradient GW2 were reported at concentrations in excess of background conditions. Iron is naturally occurring in groundwater and displays a high degree of variation in both the up-gradient and down gradient wells. On this basis, the results from the March and May 2019 monitoring events continue to indicate that the landfill represents a low risk to the identified receptors (human and ecological, including the Melaleuca Wetland and the potential Wallum frog habitat).

Surface water

During the March monitoring round, due to dry conditions only CISW5 was sampled (15 March), with remaining locations dry. Due to notable rainfall (121 mm of rainfall in three days) reported on the following weekend, a second monitoring round was completed on 26 March to better assess surface water conditions at the Melaleuca Wetland. CISW1 was sampled, however CIS2, CISW3 and CISW4 remained dry.

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Downstream surface water results from March 2019 and May 2019 at CISW1 and CISW5 identified several parameters at concentrations in excess of the adopted assessment criteria. CISW5 results were generally consistent with historical concentrations except for new maximums in March for calcium, nitrogen (total and total oxidised), phosphorous, arsenic, copper and lead. The May 2019 results for most parameters at CISW5 have decreased to concentrations that are generally consistent with historical results prior to the March 2019 event, except for new maximums for COD, potassium, sodium, chloride, iron, manganese, zinc and a new minimum for pH.

Downstream surface water location CISW1

March 2019 results showed a greater number of WQO exceedances at CISW1 compared to CISW5 and historical results. At CISW1, concentrations increased by one or more orders of magnitude for pH (4.03 pH units), EC (4009 µS/cm), sulfate (2370 mg/L), ammonia (2.71 mg/L), aluminium (64.8 mg/L), iron (416 mg/L), manganese (2.05 mg/L) and zinc (37.8 mg/L) amongst other elevated dissolved metals.

CISW1 is coastally located, and is located in a low lying wetland area, indicating that the area may potentially host acid sulfate soils. The Melaleuca Wetland is characterised as Holocene aged coastal swampland (GHD, 2018c), characteristics that classify it as a high probability area for acid sulfate soils[1].

March 2019 sampling occurred after heavy rainfall following a prolonged dry period. Nearby groundwater concentrations (during March 2019) were inconsistent with (less than) CISW1, specifically in regards to key parameters pH, aluminium, iron, manganese and sulfate / chloride ratio. Furthermore, the concentrations of these parameters in CISW1 are inconsistent with groundwater or leachate typical of a municipal landfill setting.

It is considered that the elevated March 2019 results may be associated with the presence and oxidation of acid sulfate soils (ASS).

Prior to the March 2019 monitoring round a prolonged dry period was followed by heavy rainfall. It is considered that during the prevailing dry conditions, potential ASS were exposed, triggering oxidation. Heavy rainfall experienced at Coochiemudlo Island subsequently resulted in the mobilisation of elevated concentrations of metals.

The May 2019 results for CISW1 were generally consistent with historical results (excluding March 2019), likely to be due to the area receiving additional rainfall since March 2019.

The March 2019 monitoring results at CISW1 are considered unlikely to be associated with landfill impacts. On this basis, it is considered that the monitoring results continue to support the low risk characterisation reported in the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c). This risk characterisation is based upon the environmental risk posed by the landfill, and does not consider risk associated with ASS. Further investigation is recommended to characterise ASS in the area, confirm the potential causal link between CISW1 results and ASS, and identify if ASS need to be managed in the area.

DES have been notified of the monitoring results.

Based on the findings of this assessment the former landfill is considered to present a low risk to down gradient receptors and remedial works at the landfill are not considered to be required.

[1] State Planning Policy 1/00, Planning and management of coastal development involving acid sulfate soils (1997)

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1. Introduction

GHD Pty Ltd (GHD) was commissioned by Redland City Council (RCC) to undertake an environmental assessment at the Coochiemudlo Island former landfill (herein referred to as 'the site') to characterise environmental risk associated with surface water and groundwater originating from the site. The assessment (*Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report*, GHD, 2018c) characterised risk to down gradient receptors as low, however it recommended additional surface and groundwater monitoring works to confirm the findings of the assessment.

The Risk Review Report (GHD, 2018c) comprised of two rounds of monitoring. This report presents the results of the additional groundwater and surface water monitoring conducted in March and May 2019 to gain an updated understanding of the environmental risk to the Melaleuca Wetland posed by the former landfill and to build on the existing knowledge regarding the quality of the surface water and groundwater on and offsite.

This report is part of an ongoing monitoring program for the site. The March and May 2019 monitoring rounds comprises the fifth and sixth monitoring events.

1.1 Purpose

The purpose of this additional environmental monitoring works is to gain an updated understanding of the environmental risk to the Melaleuca Wetland posed by the former landfill and to build on the existing knowledge regarding the quality of the surface water and groundwater on and offsite by:

- Collection of data to characterise surface water and groundwater quality. The program incorporated the assessment of background water quality as well as water quality down gradient of the site.
- Completion of a review of current and past surface water and groundwater quality to characterise the potential risk posed by the former landfill on the receiving environment (i.e. the Melaleuca Wetlands and potential Wallum frog habitat)

1.2 Scope of Works

The following tasks were included in the scope:

- Completion of a surface water and groundwater monitoring event.
- Laboratory analysis of samples for specified analytes.
- Reporting and assessment of the monitoring results.

Laboratory analyses have been conducted by Australian Laboratory Services (ALS), a National Association of Testing Authorities (NATA) accredited laboratory, certified for the analysis undertaken as part of the scope of works.

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1.3 Limitations

This report:

1. Has been prepared by GHD Pty Ltd ("GHD") for Redland City Council (RCC).
2. Redland City Council may use, reproduce, communicate to the public and adapt the report for its own use, however GHD has no liability for changes in the report, or if the Report is relied on by a third party or used for a different purpose to that described in the Report.

GHD otherwise disclaims responsibility to any person other than Redland City Council arising in connection with this Report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in the Report and are subject to the scope limitations set out in the Report.

The opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the date of preparation of the Report. GHD has no responsibility or obligation to update this Report to account for rounds or changes' occurring subsequent to the date the Report was prepared.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD described in this report GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this Report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points. Investigations undertaken in respect of this Report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this Report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this Report if the site conditions change.

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2. Site setting

2.1 Site overview

The Coochiemudlo Island former landfill operated between 1972 and 1994 and was used for the disposal of municipal waste, including inert/hardfill and green waste, servicing a population of approximately 500 people on the island.

Site layout is presented in Appendix A Figure 1.

The site is currently used as a waste transfer station and recreational purposes with a park, sports field and tennis courts.

Site name:	Coochiemudlo Island Waste Transfer Facility and the Laurie Burns Recreational Reserve
Address:	Elizabeth Street, Coochiemudlo Island, QLD 4184
Lot on plans	Lot 3 on SP115493, Lot 4 on SP115493 and Lot 83 on SL9191
Waste type:	Municipal solid waste, including domestic, putrescible, and inert waste, as well as green waste.
Operating period:	1972 - 1994[2]
Waste volume:	1,000 – 5,000 m^3 [1]
Filling depth:	Filling occurred in trenches approximately 2 m deep[1]
Surface capping:	Soil cap (~0.4 – 1.0 m thick) over the site[1]
Basal liner and leachate collection	No basal liner or leachate collection system[1]
Current site use:	Recreational reserve (park, sports field, tennis court) and waste transfer station
Surrounding land use:	Residential, Melaleuca Wetlands, waste transfer station

2.2 Surrounding land use

The Coochiemudlo Island former landfill is located within an area of mixed land use, which includes nearby sensitive receptors (residential lots, wetland). The site and surrounds are presented in Appendix A Figure 1. The surrounding land use includes:

- North: Current waste transfer facility, beyond this is the northern end of the wetland
- East: Melaleuca Wetland
- South: Residential lots
- West: Elizabeth Street, beyond this residential lots

[2] Egis, 2002

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2.3 Topographical setting

The former landfill is located centrally in the eastern half of Coochiemudlo Island. In general, the site slopes towards the Melaleuca Wetlands, which is located immediately adjacent to the former landfill to the east.

Topographical considerations at Coochiemudlo Island (Appendix A Figure 5) suggest a groundwater flow to the north-east.

The site is located in a low-lying coastal area, below 5 metres Australian Height Datum (m AHD).

2.4 Geological and hydrogeological setting

2.4.1 Geology

Geological mapping of the region (1:100,000 scale) indicates that the geology of the former landfill is Triassic to Jurassic aged Woogaroo subgroup with quartzose sandstone, siltstone, shale conglomerate and coal. The Melaleuca Wetlands to the east are characterised as Holocene aged coastal swamp with quartz sand and peaty quartz sand. Refer to Appendix A Figure 1 for geological mapping.

Recent drilling works were completed by GHD in March 2018 for the installation of two new groundwater monitoring bores on-site and up gradient to the former landfill. In general, the upper material was identified as clayey sand to sandy clay to a depth of 6.5 m bgl. Underlying this, in GW5, sands were identified to a termination depth of 11.5 m bgl, with a water strike at 8 m bgl. Material in GW6, located further south, was identified as clayey silt, likely siltstone with sandy bands to a termination depth of 16 m bgl, with groundwater encountered at 15 m bgl. Refer to Appendix A Figure 2 for monitoring locations.

2.4.2 Acid sulfate soils

Queensland Government Queensland Globe (DNRME, 2003) acid sulfate soils mapping indicate that land at Coochiemudlo Island has not been assessed for acid sulfate soils, as shown below in Figure 2-1.

In the absence of assessment for acid sulfate soils, acid sulfate soils are potentially present owing to the low elevation of the site and the adjacent Melaleuca Wetland.

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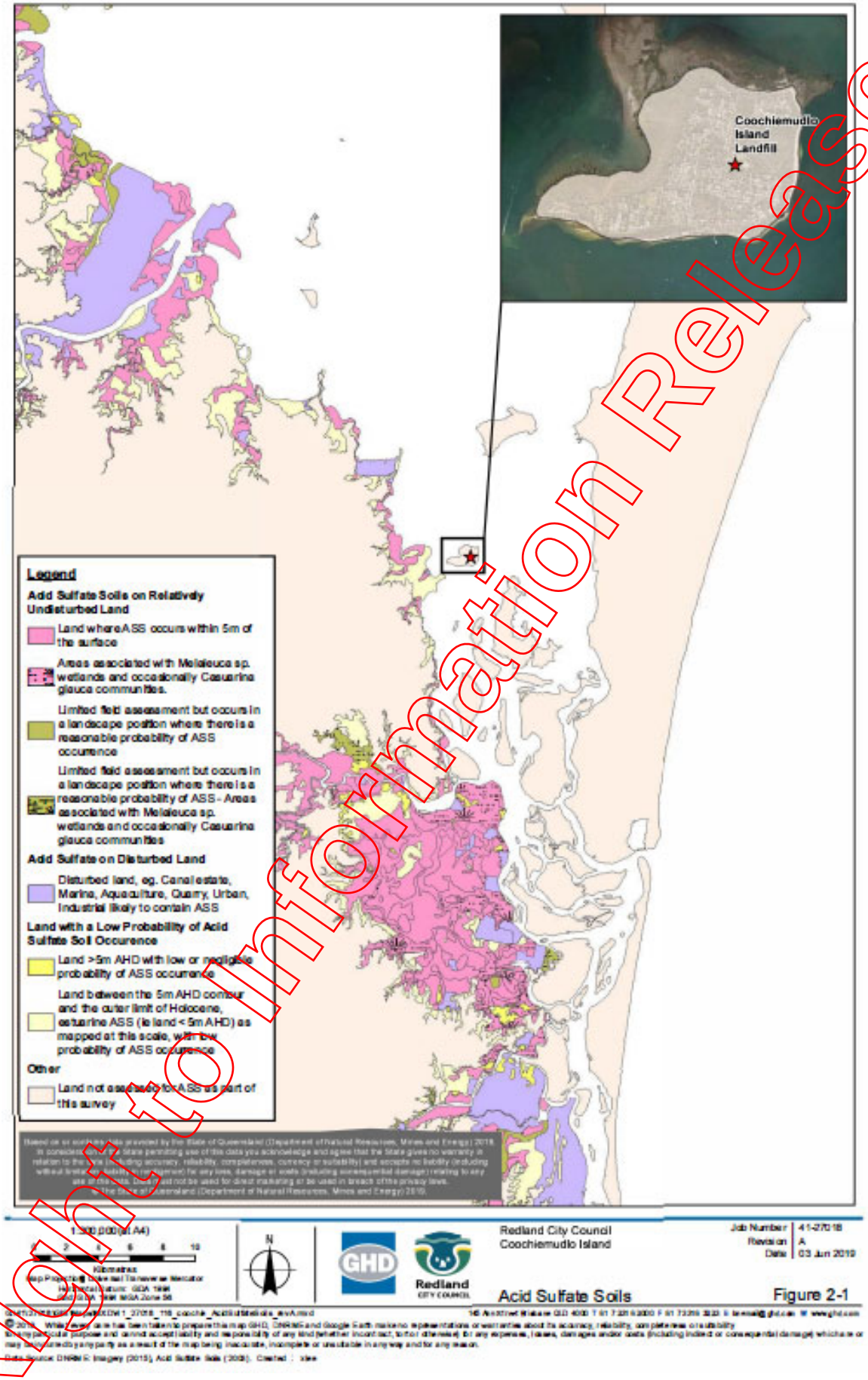

Figure 2-1 Queensland Globe acid sulfate soils mapping at Coochiemudlo Island

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2.4.3 Hydrogeology

Regional hydrogeological setting

A search of the Queensland Groundwater Database (GWDB) (DNRME, 2018) was completed to identify potential groundwater users in the area.

Appendix A Figure 1 displays registered groundwater bores located on Coochiemudlo Island, with details summarised in Table 2-1 below. Five bores were identified on the island, with all bores denoted as 'water supply'. Four of the bores are classified as existing, with one abandoned and destroyed. Available water quality records indicates electrical conductivity ranging from 220 to 270 µS/cm with low yields ranging from 0.1 to 0.75 L/s.

Table 2-1 Summary groundwater use – Coochiemudlo Island

Bore Registered Number	Total Depth (m)	Screened Strata	Standing water level (m bgl)	Quality	Yield (L/s)	Installation date	Use	Status
124247	17.35	Sand	2.5	potable	0.3	30/10/2004	Water Supply	Existing
124251	36	Weathered basalt	NA	270	0.1	14/12/2004	Water Supply	Existing
124254	36.6	Sandstone	11	220	0.1	17/01/2005	Water Supply	Abandoned & destroyed
124255	43	Sandstone	NA	230	0.18	19/01/2005	Water Supply	Existing
138454	14	Sand & clayey sand	NA	potable	0.75	26/02/2009	Water Supply	Existing

Notes: data based upon the Queensland GWDB (DNRME, 2018).

NA – Not available

Quality – recorded in µS/cm or a qualitative description based upon salinity

Based on the inferred groundwater flow direction to the east as discussed in the following section, none of the five groundwater bores identified on the island are considered to be down gradient of the former landfill. Further discussion of *current or realistic future* groundwater users is provided in Section 3.3.

Local hydrogeological setting

The local hydrogeological setting has been interpreted from the monitoring network on the site, which is summarised in section 2.5. The water-bearing profile underlying the site is interpreted to consist of sands and siltstone with sandy bands. Water levels were measured from groundwater wells GW3 and GW5 during the March 2019 monitoring round and from all groundwater wells (GW1-GW6) during the May 2019 round. The depth to groundwater varied across the site with the May 2019 SWL as follows:

- Along the eastern boundary, closest to the wetland, the groundwater standing water level (SWL) was measured as between 2.372 metres Australian Height Datum (m AHD) and 2.472 m AHD (GW2 and GW1, respectively)
- GW5, located to the west of the site, at the northern end had SWL measured at 3.115 m AHD with GW3, located in the south of the site measured at 2.046 m AHD.
- Groundwater to the south east of the site (GW6) had SWL measured at 2.352 m AHD.

Previously, in November 2018 (Appendix A Figures 4a) groundwater flow was interpreted to be to the east (i.e. GW5 and GW6 are hydraulically up gradient of the landfill), with groundwater

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flowing towards the Melaleuca Wetland. The May 2019 groundwater contour map (Appendix A and Figure 4b) infer groundwater flows to a south-easterly direction.

2.5 Site monitoring network

The site monitoring network consists of five on-site groundwater wells and six surface water monitoring locations (CISW1 on-site, with remainder off-site) as described below.

2.5.1 Groundwater monitoring network

Groundwater sampling locations include historical wells GW1 through to GW3 installed by Egis in 2001, as well as new monitoring wells GW5 and GW6, installed by GHD in 2018. GW4, installed by Egis in 2001, was formally decommissioned by GHD in 2018.

Groundwater locations are displayed on Appendix A Figure 2. Details of groundwater wells are provided in Table 2-2.

Table 2-2 Coochiemudlo Island - groundwater monitoring network

Groundwater well	Purpose	Well status	Monument status
GW1	Down gradient	Partial blockage at 3.15 m bgl, however sampling still possible	Hinges rusted, unable to be locked. New well plug (refer to Plate 1)
GW2	Down gradient	Partial blockage at 3.35 m bgl, however sampling still possible	In good condition - new lock and new well plug installed (refer to Plate 2)
GW3	Down gradient	Re-developed - in good condition	In good condition - new lock and new well plug installed (refer to Plate 3)
GW4	Up gradient	Formally decommissioned 22 March 2018	Decommissioned
GW5	Up gradient	New well - installed 22 March 2018	In good condition. Recently installed.
GW6	Up gradient	New well - installed 22 March 2018	In good condition. Recently installed.

For more information regarding the groundwater monitoring network including installation and decommissioning works, refer to the report GHD, 2018b.

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2.5.2 Surface water monitoring network

Surface water sampling locations are presented in Appendix A Figure 2 with details presented in Table 2-3.

Background location CISW-Drain was sampled for the first time during the May 2019 monitoring event following a request from DES for additional surface water data.

Table 2-3 Coochiemudlo Island - surface water monitoring locations

Surface water locations	Location	Location description
CISW1	Downstream of former landfill	Located down gradient of GW1 and GW2.
CISW2	Background, potential Wallum frog habitat	Located on the northern boundary of the Melaleuca Wetland. Non-permanent water.
CISW3	Background, potential Wallum frog habitat	Located on the north-east boundary of the Melaleuca Wetland. Non-permanent water.
CISW4	Background	Located on the south-east boundary of the Melaleuca Wetland, adjacent to residential properties on James St.
CISW5	Downstream of former landfill	Located east of the tennis court and west of the BMX track.
CISW-Drain	Background	Located upgradient of GW5 and on the north-western boundary of Lot 3.

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3. Receptors

This section considers *potential* receptors of landfill derived impact based on groundwater / surface water beneficial uses, to evaluate whether actual or potential *source-pathway-receptor* linkages associated with the site exist.

The following section is presented from part of the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report*, GHD, 2018.

3.1 NEPM schedule B(6)

Assessment of potential impact at the site is considered based on Schedule B(6) of the *National Environment Protection Measure (NEPM) Guideline on Risk-Based Assessment of Groundwater Contamination* (NEPC, 2013). While Schedule B(6) is designed for groundwater risk assessment, the general approach is also applicable for the assessment of surface water in the context of this assessment. The purpose of Schedule B(6) is to provide a framework for the risk-based assessment of water that may have been affected by site contamination.

The basis for risk assessment under the NEPM is founded on *current* and *realistic future* uses of groundwater, and five environmental values to be assessed and protected are presented in Schedule B(6):

- Aquatic ecosystems
- Aquaculture and human consumers of food
- Agricultural water (irrigation and stock water)
- Recreation and aesthetics
- Drinking water
- Industrial water

3.2 *Potential water use* – State Environmental Protection Policy (Water)

The *Environmental Protection (Water) Policy 2009 - Moreton Bay environmental values and water quality objectives* (Department of Environment and Resource Management (DERM)[3], July 2010), [referred to henceforth as EPP (Water)] defines the environmental values (EVs) for surface and groundwater quality within the region. This document also identifies the water quality objectives (WQOs) associated with each EV.

As the Coochiemudlo former landfill and the Melaleuca Wetland are situated within the coastal freshwater[4] area within Coochiemudlo Island, the site is classified as "Coochiemudlo Island" for the purpose of establishing EVs and associated WQOs (DERM, 2010). The EVs identified in Table 3-1 apply.

[3] Currently Department of Environment and Science (DES)
[4] The water type of the site is based on the *South-east Queensland Map Series Plan WQ1441 (Basin 144), Environmental Protection (Water) Policy 2009, July 2010*

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Table 3-1 Environmental Values – Coochiemudlo surface and groundwater potential receptors

Water	Environmental Values											
	Aquatic Ecosystems	Seagrass	Irrigation	Farm supply/use	Stock water	Drinking water	Human consumer	Oystering	Primary recreation	Secondary recreation	Visual recreation	Cultural and spiritual values
Groundwater	✓		✓	✓	✓	✓						
Surface water	✓	✓					✓	✓	✓	✓	✓	✓

Table modified from *Table 1* in *Environmental Protection (Water) Policy 2009 – Moreton Bay environmental values and water quality objectives Basin No. 144 (part) and adjacent basins, 141, 142, 143, 145 and 146, including Moreton Bay, North Stradbroke, South Stradbroke, Moreton and Moreton Bay Islands, Coochiemudlo Island Environmental Values and Water quality objectives (Department of Environment and Resource Management (DERM), 2010)*

3.3 Assessment of *actual* water use

The EVs listed in Table 3-1 represent *potential* receptors. Further characterisation is required to establish *current* and *realistic future* receptors. To assist with characterising actual water use in the area, additional data sources have been utilised:

- A search of the groundwater database
- A search of the water entitlements database
- Water use considerations based upon the local setting

3.3.1 Groundwater use

A search of the GWDB was completed (refer to section 2.4), with summary results presented in Table 2-1. The search results identified five bores on the island. None of these bores are within the down gradient flow path of the former landfill and hence are unlikely to experience adverse effects attributable to the landfill.

3.3.2 Water entitlements database

A search of the water entitlements database for active water licences (accessed 1 May 2018, dated 13 February 2018) was completed for Coochiemudlo Island. No licensed groundwater use was identified on the island.

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3.1 Derivation of *actual* or *likely* water use

The *potential* receptors listed in Table 3-1 are discussed below in Table 3-2 to characterise *actual* or *realistically likely* receptors.

Table 3-2 Derivation of *actual* or *likely* water use

Water	Environmental value[1]	Consideration	Current or likely receptor
Groundwater	Aquatic ecosystems	Potential exposure pathway Likelihood of groundwater discharge into the Melaleuca Wetland	✓
	Farm/Supply use	Excluded based on the local land uses	×
	Stock water		×
	Irrigation	Excluded based on water licencing information location of groundwater bores on the island	×
	Drinking water	Excluded based on the local land uses: Reticulated water supply No groundwater licences for water supply on Coochiemudlo Island	×
Surface water	Aquatic ecosystems	Potential exposure pathway Wetland adjacent to former landfill – additional consideration of potential Wallum frog habitat	✓
	Human consumer	Excluded based on the limited surface area of the water bodies, limited access, lack of evidence of recreational use	×
	Primary recreation		x
	Secondary recreation		×
	Seagrass	Incomplete exposure pathway in vicinity of site	×
	Oystering		×
	Visual Recreation	Incomplete exposure pathway in vicinity of site	×
	Cultural and Spiritual Values	Potential exposure pathway	✓

Notes:

1. As defined under the EPP (Water) (refer to Table 3-1)

The assessment of *potential* receptors identified the following receptors as *actual* or *likely* receptors for further assessment:

- Surface water: aquatic ecosystems (including Wallum frog habitat (GHD, 2018)), cultural and spiritual values
- Groundwater: aquatic ecosystems

3.2 Screening criteria

As recommended in the EPP (Water), the adopted WQOs were determined from a combination of documents, including the following:

- Environmental Protection (Water) Policy (Department of Natural Resource Management, 2010) corresponding to the following:

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  - Physico-chemical WQOs for aquatic ecosystem lowland freshwater (comprising lowland streams, Wallum/tannin-stained streams and coastal streams)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council [ANZECC] / Agriculture and Resource Management Council of Australia and New Zealand [ARMCANZ], 2000 and 2018 revision), corresponding to the following:
  - Protection of slightly to moderately disturbed ecosystems
    - Utilised as the site is in an urbanised environment
  - Protection of 99% species for surface water for metals only
    - Utilised as an indicator of metal concentrations elevated in relation to optimal concentrations for Wallum frogs habitat

Criteria are not explicitly provided for the assessment of spiritual and cultural values, so this EV has been considered implicitly included in the assessment of the aquatic ecosystems EV.

The results from the groundwater and surface water monitoring have been compared against the WQOs. Results that are less than the adopted WQO are considered to represent a low and acceptable risk.

As detailed earlier in this report, this assessment focusses upon the monitoring completed on 15 and 26 March 2019.

3.2.1 Site specific WQOs - Wallum frog species optimum habitat

The GHD 2018a report presented site-specific guidelines to improve the assessment of potential Wallum frog habitats.

The *GHD 2018 Coochiemudlo Island wetland* guideline was developed for the following parameters, as summarised in GHD (2018a):

- pH between 3.53 and 4.61 pH units
- EC < 90 µS/cm
- Tannin acid staining > 9.5 mg/L
- Calcium < 3.02 mg/L
- Low levels of monomeric aluminium consistent with siliceous sand and Wallum waters (refer to Aluminium guideline value from ANZECC FW 99%)

The *Myer et al 2006 Wallum-dependent frog species* was developed for the acidic conditions of Wallumfrog habitats were specimens tolerate of pH less than 6.

3.3 Background water quality considerations

Groundwater and surface water monitoring results have also been compared to background results to establish if observed water conditions are typical of background conditions. This assessment has been developed to identify if the former landfill represents a potential risk for identified receptors. If groundwater quality is similar between background and down gradient locations, then it indicates that the landfill represents a negligible risk.

Comparison between background and down gradient results has been completed graphically for the chemical and physicochemical parameters included in the site monitoring program (pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, chemical oxygen demand (COD), ammonia as N, nitrate as (N), nitrogen (total) phosphorus (total) and dissolved metals).

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4. Conceptual site model

The conceptual site model (CSM) provides a summary of pertinent features relating to the assessment of risk at the site and supports the *source-pathway-receptor* model for environmental risk assessment.

The following section is presented from part of the Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report, GHD, 2018c.

4.1 Hazard (contamination source)

Leachate is the liquid that drains or "leaches" from a landfill. Leachate may form via percolation of liquid (such as rainfall) through permeable waste profiles contained in the landfill. Leachate is also generated through the decomposition of organic wastes within the landfill. As leachate percolates through the waste, solutes dissolve and become mobilised.

In this risk assessment, leachate represents the hazard or potential contamination source.

4.2 Pathway

Migration of groundwater, which has been potentially impacted by leachate, is toward the east (inferred groundwater flow direction). Groundwater levels are anticipated to mirror a subdued representation of the surface elevation, as supported by site monitoring data. Groundwater flow is interpreted to be through weathered sandstone and siltstone.

Surface water flow onsite is generally directed to low-lying areas (east) into the Melaleuca Wetland. In addition, relatively shallow groundwater indicates potential surface water / groundwater interaction. Based on this, localised groundwater discharge is likely to occur to the Melaleuca Wetland.

4.3 Receptors

Potential off-site receptors include human and ecological receptors that may be exposed to impacted groundwater and surface water via ingestion (drinking), dermal contact (adsorption via skin) and inhalation (e.g. if water was to become a mist or vapour). This may include human or ecological receptors exposed to impacted:

- Surface water in down gradient Melaleuca Wetland
- Groundwater from groundwater bores or natural discharge to surface water features

4.4 Summary

A schematic conceptual site model (CSM) is presented in Appendix A Figure 3

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5. Field Monitoring Methodology

5.1 Sampling and field methodology

5.1.1 Groundwater sampling methodology

Groundwater samples were collected from the following wells:

- **March 2019**: GW3, GW5 and GW6. GW1 and GW2 (located directly down gradient of the former landfill) were dry.
- **May 2019:** All five groundwater monitoring wells were sampled during the May 2019 monitoring event.

Monitoring locations are presented in Appendix A Figure 2 and details provided in Table 2-2.

Dedicated sampling equipment was used for all groundwater locations. With the exception of GW6 which was sampled with a disposable bailer (bailed dry and then sampled with a bailer due to low recharge rate); monitoring locations were sampled using a low-flow peristaltic pump. Tubing was replaced between each well to avoid cross contamination. Sampling was completed utilising low-flow methods (with exception to GW6), with purging completed until field parameters stabilised. Sampling was completed directly after purging. Due to the slow recovery of GW6, this well was purged dry and allowed to recover prior to sampling.

5.1.2 Surface water sampling methodology

On 15 March 2019, monitoring was conducted at Coochiemudlo with several surface water monitoring locations reported dry, with exception for CISW5. Due to notable rainfall (121 mm of rainfall over three days, Redland (Alexandra Hills) Weather Station Number 140007) reported on the weekend following the first monitoring attempt, a second monitoring round was scheduled for 26 March to better assess groundwater and surface water conditions at the Melaleuca Wetland. CISW1 was successfully sampled during the second visit, however GW1, GW2, CIS2, CISW3 and CISW4 remained dry

During both the March and May 2019 monitoring rounds, surface water samples were collected from two monitoring locations CISW1 and CISW5 (both down gradient locations), with an additional upstream CISW-Drain sampled during May 2019 (location selected by RCC). Three background locations were dry during the March and May 2019 monitoring events (CISW2, CISW3 and CISW4).

Monitoring locations are presented in Appendix A Figure 2 and details provided in Table 2-3.

Surface water locations were sampled using a dedicated sampling bottle (supplied by the analytical laboratory) attached to an extendable sampling pole. The physicochemical parameters were measured *in situ* using a YSI water quality meter probe.

5.2 Analytical program

5.2.1 Laboratory analytical program

Samples were collected in laboratory supplied bottles dosed with preservative and stored on ice in a cooler. Samples were dispatched to the analytical laboratory under chain of custody documentation following collection. Laboratory analysis was completed by Australian Laboratory Services (ALS), which is a NATA accredited laboratory for the required analysis.

The analytical program included the following:

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- Major ions (alkalinity, sulphate, chloride, calcium, sodium, magnesium, potassium)
- Chemical oxygen demand (COD) and biochemical oxygen demand (BOD)
- Nutrients (ammonia, nitrate, nitrite, nitrogen (total), total phosphorous)
- Dissolved metals (aluminium, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc). Metals analysis adopted a lower LOR than the standard laboratory analytical procedure. This approach was utilised to provide greater resolution and additional detail to assist with the assessment of results
- Organochlorine and organophosphate pesticides

5.2.2 Physicochemical parameters

Field physicochemical parameters were recorded in the field using a calibrated YSI water quality meter:

- pH (pH units)
- EC (µS/cm)
- DO (mg/L)
- DO saturated (%S)
- Redox potential (mV)
- Temperature (°C).

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6. Monitoring Results

The March 2019 monitoring event was conducted on 15 and 26 March 2019, and the May 2019 monitoring event was conducted on 16 May 2019. The previous monitoring event was completed on 19 November 2018.

For the March 2019 monitoring round, SWL and field parameters were recorded on the field electronic device at GW6, which was stolen the following day. Therefore this data is not available for the March 2019 quarter.

Monitoring locations are presented in Appendix A Figure 2. Groundwater and surface water monitoring results inclusive of field and laboratory data are provided in Table B1 and Table B2 of Appendix B respectively, up gradient and down gradient comparison charts are provided in Appendix C and laboratory documentation is provided in Appendix D.

A summary of the major groundwater findings is detailed below in Section 6.1. Surface water findings are provided in Section 6.5.

6.1 Field Observations - Groundwater

Table 6-1 Groundwater monitoring location - samples description

Location ID	November 2018 sample descriptions	March 2019 sample descriptions	May 2019 sample descriptions
GW1	Clear. No odour. No suspended solids.	Well dry. Not sampled.	Clear. No odour. No suspended solids.
GW2	Well dry. Not sampled.	Well dry. Not sampled.	Clear with white suspended solids. Faint organic odour.
GW3	Pale yellow. Low turbidity. No odour.	Clear. No odour. No suspended solids.	White. Moderate turbidity. High suspended solids. No odour or sheen.
GW5	Clear. No odour. No suspended solids.	Clear. No odour. No suspended solids.	Clear. Low to no turbidity. No suspended solids.
GW6	High turbidity. Very high silt. No odour. No sheen.	White. High suspended solids[1]. No odour. Very low recharge.	Cloudy[1]. No odour or sheen.

Notes: 1 – May be due to bailer sampling method

6.2 Groundwater standing water levels

The inferred groundwater flow direction is towards the east from the landfill to the Melaleuca Wetland. Groundwater contour maps are presented in Appendix A (Figures 4a and 4b corresponding to November 2018 and May 2019). Topographical considerations suggest a north-easterly flow (refer to Figure 5 in Appendix A).

Groundwater standing water levels (SWL), converted to metres above the Australian Height Datum (m AHD) are presented in Table 6-2 and graphically presented in below in Figure 6-1

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Table 6-2 Coochiemudlo Standing Water Levels

Location ID	SWL – November 2018 (mAHD)	SWL – March 2019 (mAHD)	SWL – May 2019 (mAHD)
GW1	2.332	Dry	2.472
GW2	2.009	Dry	2.372
GW3	5.818	1.328	2.046
GW5	3.154	1.965	3.115
GW6	2.842	SWL data not available	2.352

Groundwater SWLs measured at Coochiemudlo fluctuate between monitoring events since monitoring began in June 2017. A sharp increase in SWL was recorded at GW3 in November 2018, likely correlated to higher rainfall recorded during the weeks preceding sampling. Incremental changes in SWL were recorded across two locations during the March 2019 monitoring event, which is likely to be concurrent with the prolonged dry period observed during the months preceding sampling, following by heavy rainfall experienced during the week prior to the March 2019 sampling. The SWLs recorded during the May 2019 round show water levels have increased, likely to be in associated with a greater amount of rainfall observed during the quarter.

As shown in Figure 6-1, groundwater wells GW3 and GW5 appear to be more responsive to rainfall experienced in the area than other wells in the monitoring network. Plotted cumulative rainfall departure (CRD) shows higher rainfall experienced in November 2018, followed by a prolonged dry period in March 2019 with a subsequent wetter period in May 2019.

Standing water levels are presented in Figure 6-1 along with the CRD derived from the Brisbane Aero Weather Station (WS) No. 040842. This was utilised for comparison given that rainfall records were complete for the previous months.

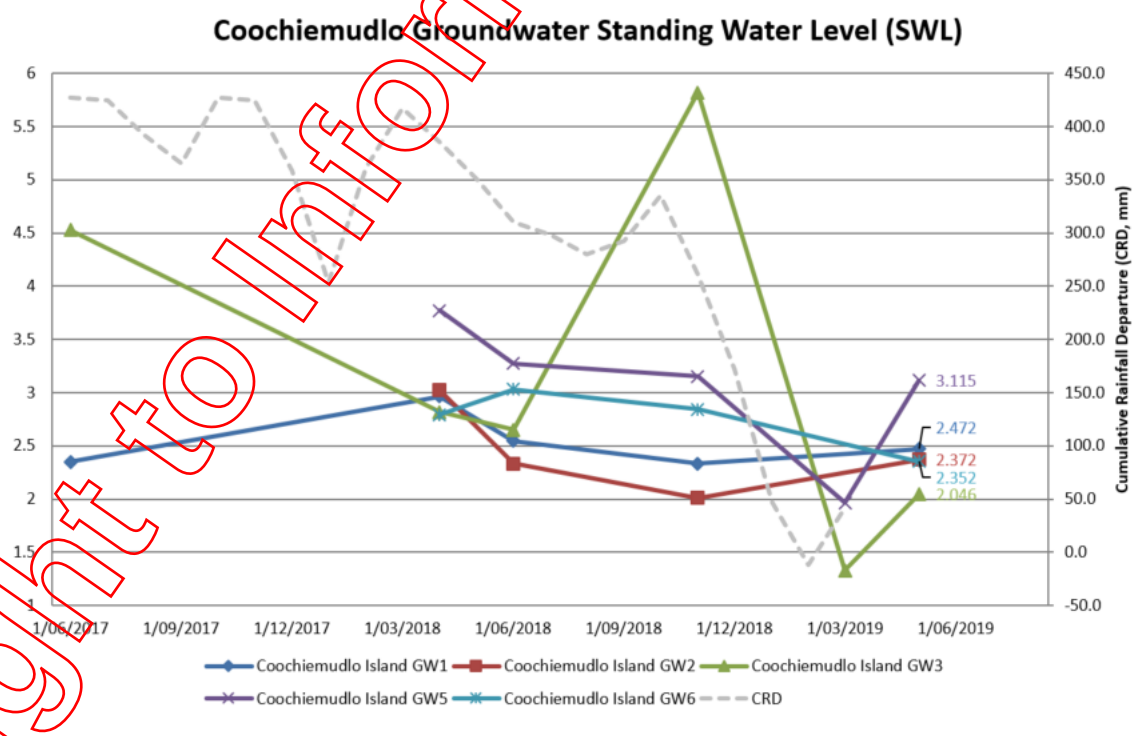

Figure 6-1 Coochiemudlo Standing Water Levels

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6.3 Rainfall

Rainfall data gathered from the Brisbane Airport Weather Station No. 040842 recorded a total of 11.2 mm of rainfall seven days prior to the surface water and groundwater monitoring on 16 May 2019.

Two monitoring visits were completed during March. The Redland (Alexandra Hill) Weather Station (Number 140007) recorded 121 mm of localised rainfall in three days, reported on the weekend following the first monitoring attempt, with the second monitoring attempt undertaken on 26 March 2019.

A total of 0.6 mm of rainfall was recorded seven days prior to monitoring completed on 15 March 2019. Sampling of surface water location CISW1 was completed on 26 March 2019 after a total of 27.2 mm of rainfall was recorded in the week preceding the sampling event.

The total rainfall recorded during the two months preceding the May monitoring program was 116.6 mm (26 March – 16 May 2019), less than the long term average of 160.6 mm. Rainfall recorded three months preceding the March monitoring program was 225.6 mm (15 November 2018 – 26 March 2019), which was less than the long-term average recorded for this period of 470 mm.

6.4 Groundwater results

6.4.1 Groundwater monitoring network characterisation

As displayed in Appendix A Figure 4, groundwater monitoring wells GW5 and GW6 are located hydraulically up gradient of the former landfill and are considered to be representative of background groundwater quality. Monitoring wells GW1 and GW2 are directly down gradient of the former landfill.

Based on topographical considerations and November 2018 groundwater flow, GW3 is not considered to be down gradient of the former landfill. The May 2019 groundwater contour infer GW3 monitoring location may potentially be located down gradient of the landfill. GW3 has been classified as a down gradient location in this assessment,

6.4.2 Monitoring results

All groundwater monitoring wells were sampled during the March and May 2019 monitoring events with the exception of GW1 and GW2 during which were dry during the March 2019 round. Groundwater results are provided in Table B1, Appendix A.

Upstream location GW5

Well GW5 is located hydraulically up gradient of the former landfill, and is considered to be representative of background conditions. Reported exceedances of adopted WQOs are summarised in Table 6-3.

There were new maximums were for GW5 in March 2019 for chloride (80 mg/L) and sulfate (17 mg/L), with a new minimum for pH (4.62 pH units). There were no new maximums for the May 2019 monitoring round.

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Table 6-3 Summary of WQO exceedances at GW5

Parameters	Results			EVs	WQO
	Nov 18	Mar 19	May 19		
pH	4.63 pH units	4.62 pH units	4.63 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	446.3 µS/cm	332.8 µS/cm	-	Aquatic ecosystems[3]	90 µS/cm
DO%sat	29.5%sat	-	-	Aquatic ecosystems[1]	85-100 %sat
Ammonia	-	-	0.03 mg/L	Aquatic ecosystems[1]	0.02 mg/L
Nitrogen (total oxidised)	3.03 mg/L	3.02 mg/L	2.91 mg/L	Aquatic ecosystems[1]	0.06 mg/L
Nitrogen (total)	3.4 mg/L	3.5 mg/L	3.2 mg/L	Aquatic ecosystems[1]	0.5 mg/L
Copper	0.003 mg/L	-	-	Aquatic ecosystems[2]	0.0014 mg/L
Zinc	0.015 mg/L	-	-	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- '-' Not in exceedance of the parameter WQOs for the relevant monitoring round

Based on its up gradient location, exceedances of WQOs reported and summarised in Table 6-3 are likely due to other environmental factors, and are not considered to be influenced by landfill impacts.

The remaining parameters were less than the adopted criteria.

All OC and OP pesticides concentrations were less than the laboratory LOR.

Upstream location GW6

Monitoring well GW6 is located hydraulically up gradient of the former landfill, and is considered to be representative of background conditions.

New maximums including aluminium (7.58 mg/L), magnesium (68 mg/L), sodium (385 mg/L) and chloride (872 mg/L) were noted at GW6 during the March 2019 monitoring event. New maximums for location GW6 were reported during March 2019 for sulfate (18 mg/L) and during May 2019 for zinc (0.129 mg/L).

Reported exceedances of adopted WQOs are summarised in Table 6-4.

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Table 6-4 Summary of WQO exceedances at GW6

Parameters	Results			EVs	WQO
	Nov 18	Mar 19	May 19		
pH	4.12 pH units	NA	3.95 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	2454 µS/cm	NA	1806 µS/cm	Aquatic ecosystems[3] Aquatic ecosystems[1]	90 µS/cm 626 µS/cm
DO%sat	45%sat	NA	9.6%sat	Aquatic ecosystems[1]	85-110%sat
Calcium	4 mg/L	4 mg/L	-	Aquatic ecosystems[3]	3.02 mg/L
Ammonia	-	-	0.04 mg/L	Aquatic ecosystems[1]	0.02 mg/L
Nitrogen (total)	0.8 mg/L	-	-	Aquatic ecosystems[1]	0.5 mg/L
Phosphorous	1.21 mg/L	-	0.08 mg/L	Aquatic ecosystems[1]	0.05 mg/L
Aluminium	7.39 mg/L	7.58 mg/L	4.12 mg/L	Aquatic ecosystems[2] Stock	0.055 mg/L 5 mg/L
Copper	0.0033 mg/L	-	-	Stock Aquatic ecosystems[2]	1.0 mg/L 0.0014 mg/L
Iron	0.078 mg/L	0.479 mg/L	0.172 mg/L	Drinking water Aquatic ecosystems[2]	0.05 mg/L 0.3 mg/L
Manganese	0.139 mg/L	0.12 mg/L	0.16 mg/L	Drinking water	0.05 mg/L
Zinc	0.033 mg/L	0.022 mg/L	0.129 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- '-' Not in exceedance of the parameter WQOs for the relevant monitoring round
- 'NA' – field parameters not available

Based on its up gradient location, exceedances of WQOs reported and summarised in Table 6-4 are likely due to other environmental factors, and are not considered to be influenced by landfill impacts.

The remaining parameters were less than the adopted criteria.

All OC and OP pesticide concentrations were less than the laboratory LOR.

Downstream location GW1

Down gradient location GW1 was dry during the March 2019 monitoring event, however it was able to be sampled during the May 2019 round. Results at GW1 were mostly consistent with background concentrations.

A new maximum at GW1 was noted for the May 2019 round, for sulfate (93 mg/L)

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Reported exceedances of adopted WQOs are summarised in Table 6-5.

Table 6-5 Summary of WQO exceedances at GW1

Parameters	Results			EVs	WQO
	Nov 18	Mar 19	May 19		
pH	5.81 pH units	Dry	6.0 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	621 µS/cm	Dry	598 µS/cm	Aquatic ecosystems[3]	90 µS/cm
DO%sat	26.7%sat	Dry	9.7%sat	Aquatic ecosystems[1]	85-110%sat
Calcium	55 mg/L	Dry	60 mg/L	Aquatic ecosystems[3]	3.02 mg/L
Ammonia	-	Dry	0.04 mg/L	Aquatic ecosystems[1]	0.02 mg/L
Nitrogen (total oxidised)	1.43 mg/L	Dry	1.74 mg/L	Aquatic ecosystems[1]	0.06 mg/L
Nitrogen (total)	1.6 mg/L	Dry	2.2 mg/L	Aquatic ecosystems[1]	0.5 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- '-' Not in exceedance of the parameter WQOs for the relevant monitoring round
- 'NA' – field parameters not available

Downstream location GW2

Down gradient location GW2 was dry during the March 2019 monitoring event, however it was sampled during the May 2019 round.

Reported exceedances of adopted WQOs are summarised in Table 6-6

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Table 6-6 Summary of WQO exceedances at GW2

Parameters	Results			EVs	WQO
	Nov 18	Mar 19	May 19		
pH	Dry	Dry	5.99 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	Dry	Dry	1059 µS/cm	Aquatic ecosystems[3] Aquatic ecosystems[1] Drinking water	90 µS/cm 626 µS/cm 1000 µS/cm
DO%sat	Dry	Dry	17.2%sat	Aquatic ecosystems[1]	85-110%sat
Calcium	Dry	Dry	47 mg/L	Aquatic ecosystems[3]	3.02 mg/L
Ammonia	Dry	Dry	0.08 mg/L	Aquatic ecosystems[1]	0.02 mg/L
Iron	Dry	Dry	7.32 mg/L	Drinking water Aquatic ecosystems[2]	0.05 mg/L 0.3 mg/L
Zinc	Dry	Dry	0.074 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- '-' Not in exceedance of the parameter WQOs for the relevant monitoring round
- 'NA' – field parameters not available

During the May 2019 monitoring round at GW2, new maximums included ammonia (0.08 mg/L) and zinc (0.074 mg/L). Chromium and zinc were also above the laboratory limit of reporting (LOR) for the first time since monitoring began at GW2.

Results at GW2 were mostly consistent with background concentrations. The May 2019 result for iron was elevated in comparison with those from other downgradient wells, however concentrations have decreased from the June 2018 maximum of 12 mg/L . Ammonia concentration at GW2 was also elevated in comparison with those from other downgradient locations.

Downstream location GW3

Topographic considerations and November 2018 groundwater flow suggest GW3 is not located down gradient of the former landfill. The May 2019 groundwater flow conditions indicate GW3 is potentially located down gradient of the landfill, and for the purpose of this assessment, GW3 is classified as down gradient.

Although GW3 reported exceedances of the adopted WQOs at GW3, most concentrations were consistent with those from up gradient locations.

A new maximum for GW3 was reported for the March 2019 monitoring round for copper (0.0024 mg/L) with a new minimum reported for pH (4.58 pH units) and for May 2019 for zinc (0.163 mg/L).

Exceedances of the adopted WQOs are summarised in Table 6-7.

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Table 6-7 Summary of WQO exceedances at GW3

Parameters	Results			EVs	WQO
	Nov 18	Mar 19	May 19		
pH	4.99 pH units	4.58 pH units	4.89 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	190.3 µS/cm	117 µS/cm	117.9 µS/cm	Aquatic ecosystems[3]	90 µS/cm
DO%sat	34.2 %sat	-	-	Aquatic ecosystems[1]	85-110%sat
Ammonia	0.03 mg/L	-	0.04 mg/L	Aquatic ecosystems[1]	0.02 mg/L
Nitrogen (total oxidised)	0.12 mg/L	0.11 mg/L	-	Aquatic ecosystems[1]	0.06 mg/L
Phosphorous	0.32 mg/L	0.08 mg/L	0.1 mg/L	Aquatic ecosystems[1]	0.05 mg/L
Aluminium	-	0.163 mg/L	0.108 mg/L	Aquatic ecosystems[2] Stock watering	0.055 mg/L 5 mg/L
Copper	-	0.0024 mg/L	0.0015 mg/L	Aquatic ecosystems[2]	0.0014 mg/L
Iron	0.063 mg/L	0.231 mg/L	0.148 mg/L	Drinking water Aquatic ecosystems[2]	0.05 mg/L 0.3 mg/L
Zinc	0.016 mg/L	0.011 mg/L	0.163 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island Wetland
- '-' Not in exceedance of the parameter WQOs for the relevant monitoring round
- 'NA' – field parameters not available

The remaining parameters were less than the adopted criteria.

All OC and OP pesticides concentrations were less than the laboratory LOR.

6.4.3 Background and down gradient comparison

Groundwater monitoring results from the March and May 2019 monitoring events have been compared to background results to establish if groundwater conditions are typical of background conditions.

Topographical considerations and inferred groundwater flow in November 2018 suggest GW3 is not down gradient of the former landfill. The May 2019 groundwater contour indicated GW3 is potentially located down gradient of the former landfill. The location was assessed as down gradient.

Comparison between background and down gradient results for all monitoring rounds has been completed graphically for pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, COD, ammonia, nitrate, total nitrogen, total phosphorus and dissolved metals. Charts are provided in Appendix C. This approach enables results from down gradient

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locations to be compared with background locations, with each dot representing a discrete sample.

Examination of the charts in Appendix C identifies that background concentrations are consistent with or greater than down gradient concentrations for EC, DO, COD, sodium, chloride, nitrate, nitrogen (total), BOD, ammonia, magnesium, aluminium, cadmium, copper, iron, arsenic, mercury, lead, manganese, zinc and nickel. On the basis that down gradient concentrations are mostly consistent with background, the former landfill does not appear to be adversely affecting the down gradient groundwater quality in terms of impact by these parameters. Consequently, site impacts on these parameters are considered to present a low risk to down gradient receptors.

Slight variations between background and down gradient concentrations were identified in the March and May 2019 monitoring rounds for:

- pH. Background measurements were slightly more acidic than down gradient measurements (pH ranged between 3.95 pH units and 6 pH units for the March and May 2019 monitoring rounds).
- Alkalinity (total as $CaCO_3$). Down gradient GW1 (132 mg/L) concentrations were elevated in comparison to background (<3 mg/L)
- Sulfate. Down gradient GW1 (93 mg/L) concentrations were elevated in comparison to background (<16mg/L)
- Calcium. Down gradient GW1 (60 mg/L) concentrations were elevated in comparison to background (<3 mg/L)
- Potassium. Down gradient GW1 (12 mg/L) concentrations were elevated in comparison to background (<3 mg/L)
- Phosphorus. In May 2019, down gradient GW1 concentration was elevated (0.5 mg/L) in comparison to background (<0.3 mg/L).
- Chromium. Down gradient GW3 concentration was elevated (0.0004 mg/L) in comparison to background (<0.129 mg/L).
- Zinc. In May 2019, down gradient GW3 concentration was elevated (0.163 mg/L) in comparison to background (0.0001 mg/L).

The groundwater analysis results are consistent with those from historical monitoring events and support the low risk characterisation reported in the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c).

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6.5 Surface water results

6.5.1 Surface water monitoring network characterisation

Surface water monitoring locations are presented in Appendix A Figure 2. CISW1 and CISW5 are located hydraulically downstream of the site and are potentially impacted by site groundwater discharge. Locations CISW2, CISW3 and CISW4 are not hydraulically down gradient of the site and have been characterised as background / reference sites. CISW2 and CISW3 are within an area that has been characterised as potential habitat for Wallum frogs based upon a habitat survey completed by GHD in 2018 (GHD, 2018a).

During the May 2019 monitoring round, an additional location CISW-Drain was sampled on the request of DES for additional surface water data. The location was selected by RCC. CISW-Drain has been classified as background data as it is considered hydraulically upstream of the former landfill.

6.5.2 Surface water monitoring results

Two of five surface water monitoring locations (CISW1 and CISW5) were sampled during the March and May 2019 monitoring events, with additional CISW-Drain also sampled (May 2019 event).

On 15 March 2019, groundwater and surface water monitoring was conducted at Coochiemudlo with several monitoring locations reported dry (GW1, GW2, CISW1, CISW2, CISW3 and CISW4). Due to notable rainfall (121 mm of rainfall in three days, Redland (Alexandra Hills) Weather Station Number 140007) reported on the weekend following the first monitoring attempt, a second monitoring round was scheduled for 26 March to better assess groundwater and surface water conditions at the Melaleuca Wetland. CISW1 was then successfully sampled, however GW1, GW2, CIS2, CISW3 and CISW4 remained dry.

Surface water results are provided in Table B2, Appendix A.

The ANZECC 2000 FW 99% adopted criteria, and the GHD 2018 Coochiemudlo Island wetland criteria are applied to CISW2 and CISW3 only, as these locations were identified as within potential Wallum frog habitat, whereas CISW1, CISW4 and CISW5 were considered too disturbed for Wallum frog species and are assessed against the ANZECC 2000 slightly to moderately disturbed criteria.

Upstream location CISW4

Up gradient location CISW4 was dry during the March and May 2019 monitoring events and was therefore not sampled. Previous results at CISW4 were consistent with background concentrations.

Upstream location CISW2 (potential Wallum frog habitat)

Up gradient location CISW2 was dry during the March and May 2019 monitoring events and was therefore not sampled. Previous results at CISW2 were consistent with background concentrations.

Upstream location CISW3 (potential Wallum frog habitat)

Up gradient location CISW3 was dry during the March and May 2019 monitoring events and was therefore not sampled. Previous results at CISW3 were consistent with background concentrations.

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Upstream location CISW-Drain

Up gradient location CISW-Drain is a new location and was first sampled during the May 2019 monitoring round as shown in Appendix A Figure 2. CISW-Drain is considered hydraulically up stream and is considered to be representative of background conditions.

Exceedances of the adopted WQOs are reported in Table 6-8

Table 6-8 Summary of WQOs exceedances at CISW-Drain

Parameters	Results May 19	EVs	WQO
pH	5.55 pH units	Aquatic ecosystems1	6.5-8 pH units
DO%sat	9.2 %sat	Aquatic ecosystems1	85-110 %sat
Ammonia	0.04 mg/L	Aquatic ecosystems1	0.02
Nitrogen (total oxidised)	0.11 mg/L	Aquatic ecosystems1	0.06 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed

On the basis that CISW-Drain is considered to be up stream of the former landfill, exceedances reported are likely due to other environmental factors, and are not considered to be influenced by the former landfill. As the May 2019 monitoring round is only the first sampling event at CISW-Drain, trends cannot yet be identified, however CISW-Drain results were consistent with historical results of other background locations.

The remaining nutrients and metal concentrations were less than the adopted criteria, and all OC and OP pesticide concentrations were less than the laboratory LOR.

Downstream location CISW5

Down gradient location CISW5 was sampled during the March and May 2019 monitoring events. Exceedances are reported in Table 6-9.

Table 6-9 Summary of WQO exceedances at CISW5

Parameters	Results			EVs	WQO
	Nov 18	Mar 18	May 18		
pH	Dry	NA	5.47 pH units	Aquatic ecosystems[1]	6.5-8 pH units
DO%sat	Dry	NA	9.7 %sat	Aquatic ecosystems[1]	85-110 %sat
Nitrogen (total)	Dry	0.8 mg/L	0.8 mg/L	Aquatic ecosystems[1]	0.5 mg/L
Phosphorous	Dry	0.2 mg/L	-	Aquatic ecosystems[1]	0.05 mg/L
Aluminium	Dry	0.221 mg/L	0.142 mg/L	Aquatic ecosystems[2]	0.055 mg/L
Chromium	Dry	-	0.0014 mg/L	Aquatic ecosystems[2]	0.001 mg/L
Copper	Dry	0.0039 mg/L	-	Aquatic ecosystems[2]	0.0014 mg/L
Zinc	Dry	0.009 mg/L	0.09 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- '-' Not in exceedance of the parameter WQOs for the relevant monitoring round

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- 'NA' – field parameters not available, field records stolen

Although exceedances were reported at CISW5, most were consistent with concentrations previously reported with the exception for March 2019 round which reported new maximums for calcium, nitrogen (total and total oxidised), phosphorous, arsenic, copper and lead.

May 2019 round reported a new minimum for pH (5.47 pH units) and new maximums for COD, potassium, sodium, chloride, iron, manganese and zinc.

However, as the May monitoring round is only the fourth round, trends are yet to be identified.

The concentrations of remaining parameters were less than the adopted criteria.

All OC and OP pesticides concentrations were less than the laboratory LOR.

Downstream location CISW1

Down gradient location CISW1 was sampled during the March and May 2019 monitoring rounds. Exceedances of the adopted WQOs are summarised in Table 6-10.

Table 6-10 Summary of WQO exceedances at CISW1

Parameters	Results			EVs	WQO
	Nov 18	Mar 19	May 19		
pH	6.32 pH units	4.03 pH units	5.03 pH units	Aquatic ecosystems[1]	6.5-8 pH units
EC	1033 µS/cm	4009 µS/cm	3743 µS/cm	Aquatic ecosystems[1]	626 µS/cm
DO%sat	26.2 %sat	-	2.6 %sat	Aquatic ecosystems[1]	85-110%sat
Ammonia	-	2.71 mg/L	-	Aquatic ecosystems[1] Aquatic ecosystems[2]	0.02 mg/L 0.9 mg/L
Nitrogen (total)	0.9 mg/L	6.8 mg/L	1.4 mg/L	Aquatic ecosystems[1]	0.5 mg/L
Phosphorous (total)	-	0.08 mg/L	0.06 mg/L	Aquatic ecosystems[1]	0.05 mg/L
Aluminium	-	64.8 mg/L	-	Aquatic ecosystems[2]	0.055 mg/L
Cadmium	-	0.0271 mg/L	-	Aquatic ecosystems[2]	0.0002 mg/L
Chromium	-	0.011 mg/L	-	Aquatic ecosystems[2]	0.001 mg/L
Copper	-	0.0072 mg/L	-	Aquatic ecosystems[2]	0.0014 mg/L
Lead	-	0.0195 mg/L	-	Aquatic ecosystems[2]	0.0034 mg/L
Manganese	-	2.05 mg/L	-	Aquatic ecosystems[2]	1.9 mg/L
Nickel	-	0.232 mg/L	-	Aquatic ecosystems[2]	0.011 mg/L
Zinc	-	37.8 mg/L	0.32 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed

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- '-' Not in exceedance of the parameter WQOs for the relevant monitoring round

New maximums were reported at CISW1 during the March 2019 round for a number of parameters including EC, COD, TOC, magnesium, calcium, sulfate, ammonia, nitrogen (total and total oxidised), phosphorous, aluminium, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel and zinc. During March 2019, numerous dissolved metal concentrations increased by one or more orders of magnitude, including aluminium, iron, manganese and zinc. A new minimum was reported for pH during the March 2019 event (4.03 pH units).

During the May 2019 round, most parameter results decreased to concentrations prior to the March 2019 event.

CISW1 results are further discussed in Section 6.6.2

The remaining nutrients and metal concentrations were less than the adopted criteria.

All OC and OP pesticides were less than the laboratory LOR.

6.6 Discussion of surface water results

6.6.1 Background and downstream comparison

Surface water monitoring has been completed since March 2018 in the Melaleuca Wetland. During the March and May 2019 monitoring round, all background / upstream surface water locations were dry and unable to be sampled with the exception for new location CISW- Drain (May 2019). Down gradient parameter concentrations have been compared with CISW-Drain as well as background concentrations from previous monitoring events.

Comparison between background and down gradient results has been completed graphically for pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, COD, ammonia as N, nitrate as (N), nitrogen (total), phosphorus (total) and dissolved metals. The charts are provided in Appendix C. This approach enables results from downstream locations to be compared with background locations.

During the May 2019 monitoring round, the concentrations of pH, EC, DO%sat, nitrogen (total), phosphorous (total) and zinc at downstream CISW1 were greater than the adopted assessment criteria. For downstream CISW5, exceedances were associated with pH, EC, DO%sat, aluminium, chromium and zinc.

Examination of the charts in Appendix C identified slight variations between background and down gradient concentrations for:

- EC, DO, alkalinity, BOD, sulfate, chloride, sodium, potassium, calcium, magnesium, ammonia, nitrogen (total), aluminium, cadmium, iron, chromium, lead, manganese, zinc and nickel: Down gradient CISW1 concentrations were elevated in comparison to background.
- pH. Down gradient CISW1 was more acidic than background locations.
- Copper: Down gradient CISW5 concentrations were elevated in comparison to background.
- Phosphorous and dissolved oxygen: Down gradient CISW1 and CISW5 were elevated in comparison to background

6.6.2 Potential source of impact at CISW1

The March 2019 results showed a greater number of exceedances at CISW1 compared to CISW5 and historical results. At CISW1, concentrations have increased by one or more orders of magnitude for pH (4.03 pH units), EC (4009 µS/cm), sulfate (2370 mg/L), ammonia (2.71 mg/L), aluminium (64.8 mg/L), iron (416 mg/L), manganese (2.05 mg/L) and zinc (37.8 mg/L) amongst other elevated dissolved metals.

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On 15 March 2019, only surface water location CISW5 was sampled, with remaining locations dry. Due to notable rainfall (121 mm of rainfall in three days, Redland (Alexandra Hills) Station 140007) reported on the weekend following the first monitoring attempt, a second monitoring round was completed on 26 March to better assess surface water conditions at the Melaleuca Wetland. CISW1 was sampled, however CIS2, CISW3 and CISW4 remained dry.

CISW1 is coastally located, has an elevation of less than 5 mAHD, and is located in a low lying wetland area, indicating that the area may potentially host acid sulfate soils. Queensland Globe ASS mapping indicates that land at Coochiemudlo Island has not been assessed for ASS (as shown in Figure 2-1). The Melaleuca Wetland is characterised as Holocene aged coastal swampland (GHD, 2018c), characteristics that classify it as a high probability area for acid sulfate soils[5]. When ASS are exposed to oxygen, the iron sulfides break down, releasing sulfuric acid, soluble iron and additional metals mobilised by the released acid, including aluminium and manganese[6]. ASS can be found or can form in any anoxic, aqueous environment where sulfate-reducing bacteria are provided with organic matter and available sulfate ions[7].

Water quality indicators of CISW1 also suggest the presence of ASS[5]:

- Soluble chloride : soluble sulfate (Cl^- : SO_4^{2-}) ratio (by mass) of less than 2 is a strong indication of an extra source of sulfate from previous sulfide oxidation. The March 2019 results reported chloride (99 mg/L) and sulfate (2370 mg/L) concentration ratios of 0.04.
- Water pH of less than 4.5 pH units may also be an indicator for the presence of ASS. CISW1 reported a pH of 4.03 pH units during March 2019, however, low pH is not a definitive indicator of ASS as environments such as Melaleuca wetlands are generally slightly acidic from other contributing non-sulfidic acids including organic acids[8].

The March 2019 sampling occurred after heavy rainfall following a prolonged dry period. Nearby groundwater concentrations (during March 2019) were inconsistent with (less than) CISW1, specifically in regards to key parameters aluminium, iron, manganese and sulfate / chloride ratio. Furthermore, the concentrations of these parameters are inconsistent with groundwater or leachate in a municipal landfill setting.

The March 2019 results in CISW1 were inconsistent with historical results, and it is considered that the elevated results may be associated with the presence and oxidation of acid sulfate soils (ASS). Prior to the March 2019 monitoring round a prolonged dry period was followed by heavy rainfall. It is considered that during the prevailing dry conditions, areas of the Melaleuca Wetland containing potential ASS were exposed, allowing oxygen ingress, triggering the oxidation of sulfidic materials. Heavy rainfall experienced at Coochiemudlo Island subsequently resulted in the mobilisation of elevated concentrations of metals including iron, aluminium and manganese, which was likely flushed into CISW1.

Excluding the March 2019 findings, the results for CISW1 in the subsequent monitoring event in May 2019 reported results that were generally consistent with historical results. Key parameter concentrations include: increased pH (5.03 pH units) and chloride (124 mg/L), and decreased sulfate (131 mg/L), aluminium (0.544 mg/L), iron (0.868 mg/L), manganese (0.0532 mg/L) and zinc (0.32 mg/L). The concentrations of most parameters were less than the relevant WQOs with the exception for pH, EC, DO% sat, nitrogen (total), phosphorous and zinc.

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[5] State Planning Policy 1/00, Planning and management of coastal development involving acid sulfate soils (1997)
[6] Queensland Government, Acid sulfate soils and estuarine water quality of the Mackay district (2005)
[7] Queensland Government, Department of Science, Information Technology, Innovation and the Arts. Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines v4.0
[8] Draft State Planning Policy, Planning and Managing Development Involving Acid Sulfate Soils (1997)

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The similarity in the May 2019 results relative to the historical results is likely to be due to the area receiving additional rainfall since March 2019. A total of 105.2 mm (26 March – 16 May 2019) of rainfall was recorded between the March and May 2019 sampling events, allowing buffering and dilution to take place. Flushing may also have occurred during the wetter period.

Based on the above, the March 2019 monitoring results are not considered to be associated with landfill impacts. This is further supported by the findings of the (May 2019) groundwater event, in that groundwater and surface water results had returned to the historical concentration ranges. On this basis, it is considered that the monitoring results continue to support the low risk characterisation reported in the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c). This risk characterisation is based upon the environmental risk posed by the landfill, and does not consider risk associated with ASS. Further investigation is recommended to characterise ASS in the area, confirm the potential causal link between CISW1 results and ASS, and identify if ASS need to be managed in the area.

DES have been notified of the monitoring results.

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7. Quality Assurance / Quality Control

7.1 Field QA/QC

A field QA / QC program was completed for each monitoring event. During the March 2019 monitoring round, one blind duplicate, one rinsate and one field blank was collected and submitted for laboratory analysis. During the May 2019 event, one duplicate was collected. Duplicate results confirm the repeatability of the laboratory assessment.

Only dedicated equipment was used for surface water and groundwater sampling.

As part of the RCC landfill EMP field QA/QC procedures, field QA/QC analysis is conducted at one of the closed landfills sites per quarter with three quality control samples collected (field duplicate, rinsate and field blank). QA/QC was undertaken at Redland Bay (CLR Site 10) at groundwater monitoring location RB1 on 16 May 2019. Refer to the Redland Bay Quarterly Report for the field QA/QC results (GHD, 2019b).

7.2 Laboratory QA/QC

Surrogate spikes, laboratory blanks and laboratory control samples were used by ALS for the water analytical program. Validation of the analytical and laboratory QA / QC results are summarised below and are detailed within official laboratory documentation.

7.2.1 March 2019

EB1906684 and EB1907826

- All water samples were submitted to a NATA accredited laboratory in appropriately pre-treated and preserved containers.
- All water samples were extracted within holding times as recommended by analytical laboratories for all analytes (based on holding times set out in Schedule B(3) of the *NEPM* (2013)).
- Matrix spike (MS) and laboratory control spike (LCS) outliers exist:
  - EB1907826
    - Matrix spike recovery for sulfate and chloride. MS recovery was not determined, background level greater than or equal to 4x spike level
- No outliers occurred for the method blanks, laboratory duplicate and surrogates recovery in the QA / QC program.
- Quality control sample frequency outliers exist:
  - EB1906684

    Pesticides laboratory duplicates were less (6.67%) than expected rate (10%)
  - EB1907826

    Pesticide laboratory duplicates were less (7.14% and 0%) than expected rate (10%)

7.2.2 May 2019

EB1912523

- All water samples were submitted to a NATA accredited laboratory in appropriately pre-treated and preserved containers.

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- All water samples were extracted within holding times as recommended by analytical laboratories for all analytes (based on holding times set out in Schedule B(3) of the *NEPM* (2013)).
- No Matrix spike (MS) or laboratory control spike (LCS) outliers existed
- No outliers occurred for the method blanks, laboratory duplicate and surrogates recovery in the QA / QC program.
- No quality control sample frequency outliers existed

7.3 Summary of Quality Control Results

In summary, GHD considers that the field, laboratory and analytical QA / QC water results for samples collected and analysed as part of laboratory documentation EB1906684, EB1907826 and EB1912523 are generally within the specified requirements. The data is considered to be valid and of sufficient quality to meet the data quality objectives for this assessment.

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8. Conclusions

An assessment was completed by GHD in September 2018 at the former Coochiemudlo Island landfill to characterise the environmental risk posed by this facility (*Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c)). The review characterised risk to down gradient receptors including adjacent Melaleuca Wetland as low, however it recommended additional monitoring works to confirm the findings of the assessment.

GHD completed an assessment in March 2018 at the former Coochiemudlo Island landfill to document the quality and distribution of potential Wallum frog habitats within the adjacent Coochiemudlo wetland *Coochiemudlo Island wetland: Wallum frog assessment* (GHD, 2019a). No Wallum frog species were recorded, however condition of the wetland appear to be suitable for Wallum frog species.

The March and May 2019 monitoring events forms part of the ongoing monitoring programme for this site as recommended in the risk review report (GHD, 2018c). The Melaleuca Wetland is located adjacent to and downstream of the former landfill. The purpose of the additional environmental monitoring works is to gain an updated understanding of the environmental risk to the Melaleuca Wetland posed by the former landfill and to build on the existing knowledge regarding the quality of the surface water and groundwater on and offsite.

During the March 2019 monitoring round, three groundwater wells GW3, GW5 and GW6 (two up-gradient and one down-gradient) were sampled; GW1 and GW2 were dry and were unable to be sampled. During the May 2019 event, all groundwater wells were sampled. During both monitoring events only downstream CISW1 and CISW5 were sampled, with the remaining background locations dry. A new location (CISW-Drain) was sampled in May 2019, on the request of RCC. The location was selected by RCC, as shown in Appendix A Figure 2.

8.1 Groundwater

Topographical considerations suggest the groundwater flows towards to north-east, whilst groundwater contour mapping from SWL data in November 2018 and May 2019 suggest the groundwater flows in an east to south-easterly direction.

New maximum concentrations were recorded at up-gradient wells GW5 (chloride, sulfate and pH) and GW6 (aluminium, magnesium, sodium and chloride) and at down gradient well GW3 (pH and copper) in March 2019. During the May 2019 event, results were mostly consistent with the historical dataset with most parameters showing decreased concentrations, except for up-gradient GW6 (zinc) and down-gradient wells GW1 (sulfate), GW2 (ammonia and zinc) and GW3 (zinc).

Groundwater laboratory results identified several parameters at concentrations in excess of the adopted assessment criteria. Most results in down gradient locations were consistent with historical results or were less than those reported in background locations.

The concentrations of ammonia, a key landfill leachate indicator, is consistent between up and down-gradient wells. Concentrations of iron were reported above the adopted guideline in both up and down-gradient locations, and iron concentrations in down-gradient GW2 were reported at concentrations in excess of background conditions. Iron is naturally occurring in groundwater and displays a high degree of variation in both the up-gradient and down gradient wells. On this basis, the results from the March and May 2019 monitoring events continue to indicate that the landfill represents a low risk to the identified receptors (human and ecological, including the Melaleuca Wetland and the potential Wallum frog habitat).

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8.2 Surface water

Downstream surface water results from March 2019 and May 2019 at CISW1 and CISW5 identified several parameters at concentrations in excess of the adopted assessment criteria. CISW5 results were generally consistent with historical concentrations except for new maximums for calcium, nitrogen (total and total oxidised), phosphorous, arsenic, copper and lead. The May 2019 results for most parameter results at CISW5 have decreased to concentrations that are generally consistent with historical results prior to the March 2019 event, except for new maximums for COD, potassium, sodium, chloride, iron, manganese, zinc and new minimum for pH.

CISW1 results for both March and May 2019 monitoring rounds are discussed further below in Section 8.2.1.

CISW2 and CISW3 (considered background), located on the boundary of the Melaleuca Wetland and within potential Wallum frog habitat, were dry during the March and May 2019 monitoring round and data was not available to indicate the water quality of the potential Wallum frog habitat (C*oochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report*, GHD, 2018c).. However, during previous monitoring events, it was determined that the water quality is outside the optimal ranges for Wallum frog species; however, this is not considered to be attributable to the former landfill.

8.2.1 Downstream surface water location CISW1

The March 2019 results showed a greater number of exceedances at CISW1 compared to CISW5 and historical results. At CISW1, concentrations have increased by one or more orders of magnitude for numerous parameters including pH (4.03 pH units), EC (4009 µS/cm), sulfate (2370 mg/L), ammonia (2.71 mg/L), aluminium (64.8 mg/L), iron (416 mg/L), manganese (2.05 mg/L) and zinc (37.8 mg/L) amongst other elevated dissolved metals.

During the March monitoring round, due to dry conditions only CISW5 was sampled (15 March), with remaining locations dry. Due to notable rainfall (121 mm of rainfall in three days, Redland (Alexandra Hills) Station 140007) reported on the following weekend, a second monitoring round was completed on 26 March to better assess surface water conditions at the Melaleuca Wetland. CISW1 was sampled, however CIS2, CISW3 and CISW4 remained dry.

CISW1 is coastally located, has an elevation of less than 5 mAHD, and is located in a low lying wetland area, indicating that the area may potentially host acid sulfate soils. The Melaleuca Wetland is characterised as Holocene aged coastal swampland (GHD, 2018c), characteristics that classify it as a high probability area for acid sulfate soils[9].

Nearby groundwater concentrations (during March 2019) were inconsistent with (less than) CISW1, specifically in regards to key parameters pH, iron, manganese, and sulfate / chloride ratio. Furthermore, the concentrations of these parameters are inconsistent with groundwater or leachate in a municipal landfill setting.

It is considered that the elevated March 2019 results may be associated with the presence and oxidation of acid sulfate soils (ASS). Prior to the March 2019 monitoring round a prolonged dry period was followed by heavy rainfall. It is considered that during the prevailing dry conditions, areas of the Melaleuca wetland containing potential ASS were exposed, triggering oxidation. Heavy rainfall experienced at Coochiemudlo Island subsequently resulted in the mobilisation of elevated concentrations of metals, which was likely flushed into CISW1.

[9] State Planning Policy 1/00, Planning and management of coastal development involving acid sulfate soils (1997)

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The results for CISW1 in the subsequent monitoring event in May 2019 reported results that were generally consistent with historical results (excluding March 2019), likely to be due to the area receiving additional rainfall since March 2019, allowing buffering and dilution to take place. Flushing may also have occurred during the wetter period.

Based on the above, the March 2019 monitoring results are not considered to be associated with landfill impacts. This is further supported by the findings of the (May 2019) groundwater event, in that groundwater and surface water results had returned to the historical concentration ranges. On this basis, it is considered that the monitoring results continue to support the low risk characterisation reported in the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c). This risk characterisation is based upon the environmental risk posed by the landfill, and does not consider risk associated with ASS. Further investigation is recommended to characterise ASS in the area, confirm the potential causal link between CISW1 results and ASS, and identify if ASS need to be managed in the area.

DES have been notified of the monitoring results.

Based on the findings of this assessment the former landfill is considered to present a low risk to down gradient receptors and remedial works at the landfill are not considered to be required.

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9. Recommendations

The following recommendations are provided in support of this assessment:

- Further surface water and groundwater monitoring is recommended. While this assessment has characterised the risk posed by the landfill to identified receptors to be low, it is noted that limited monitoring (five complete events) has been completed and further surface water and groundwater monitoring is recommended for trend analysis, and to support characterisation of potential risks over differing climatic and seasonal conditions.
- Regular inspections are recommended to identify if site conditions change. It is understood that Council currently implements a program of routine inspections and it is recommended that this program continue.
- The former landfill is effectively capped and maintained. Vegetative cover helps stabilise the landfill cap. It is recommended that maintenance of the site be continued.
- Any earthworks on site should be appropriately managed to prevent leachate or soil release into the adjacent Melaleuca Wetlands.
- An acid sulfate soils investigation is recommended to characterise ASS in the area, confirm the potential causal link between CISW1 results and ASS, and identify if ASS need to be managed in the area.

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10. References

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Appendices

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Appendix A - Figures

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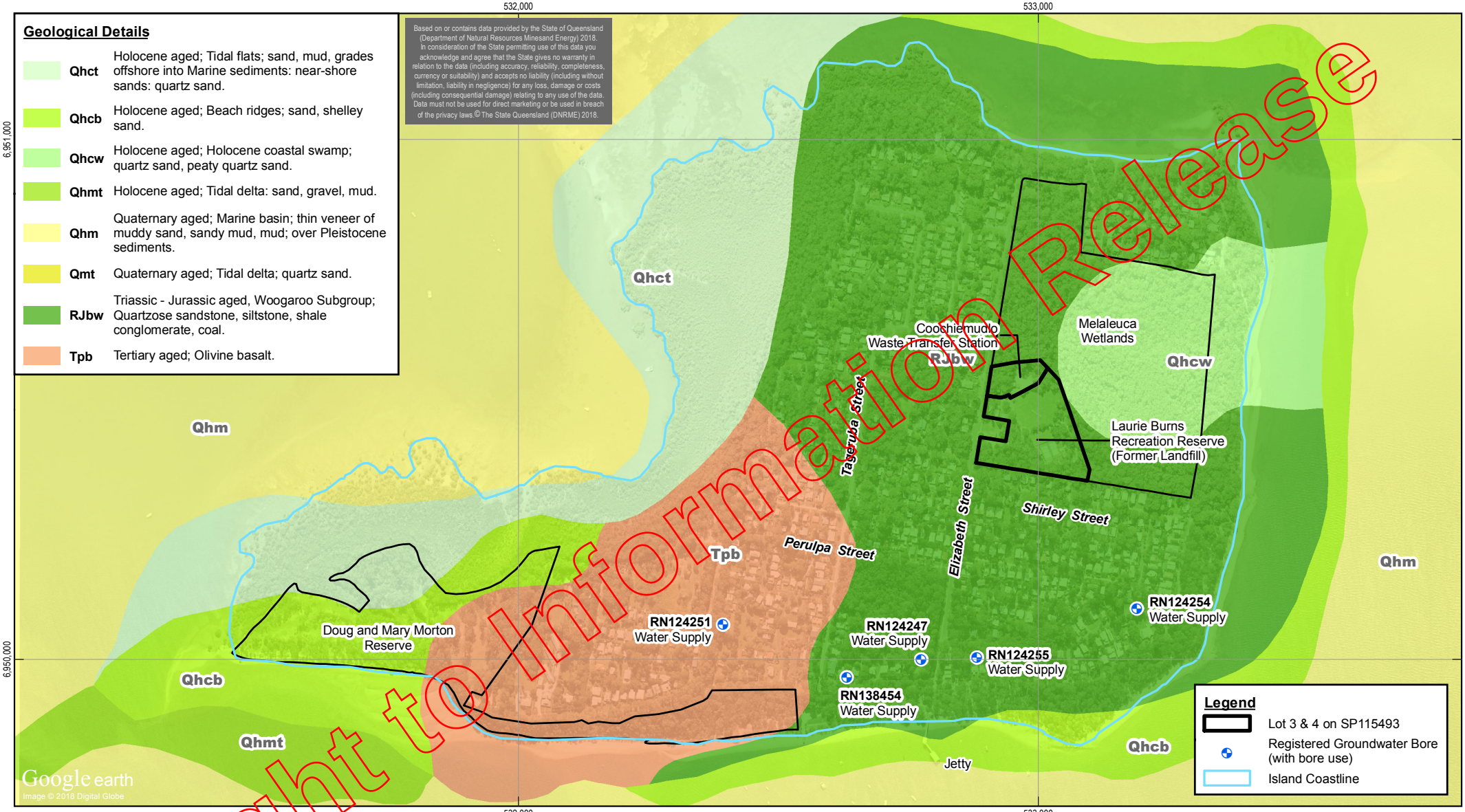

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0 100 200 300 400 metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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REDLAND CITY COUNCIL

Coochiemudlo Island Former Landfill

Job Number	41-27018
Revision	A
Date	09 Aug 2018

Geology and Registered Groundwater Bores

Figure 1

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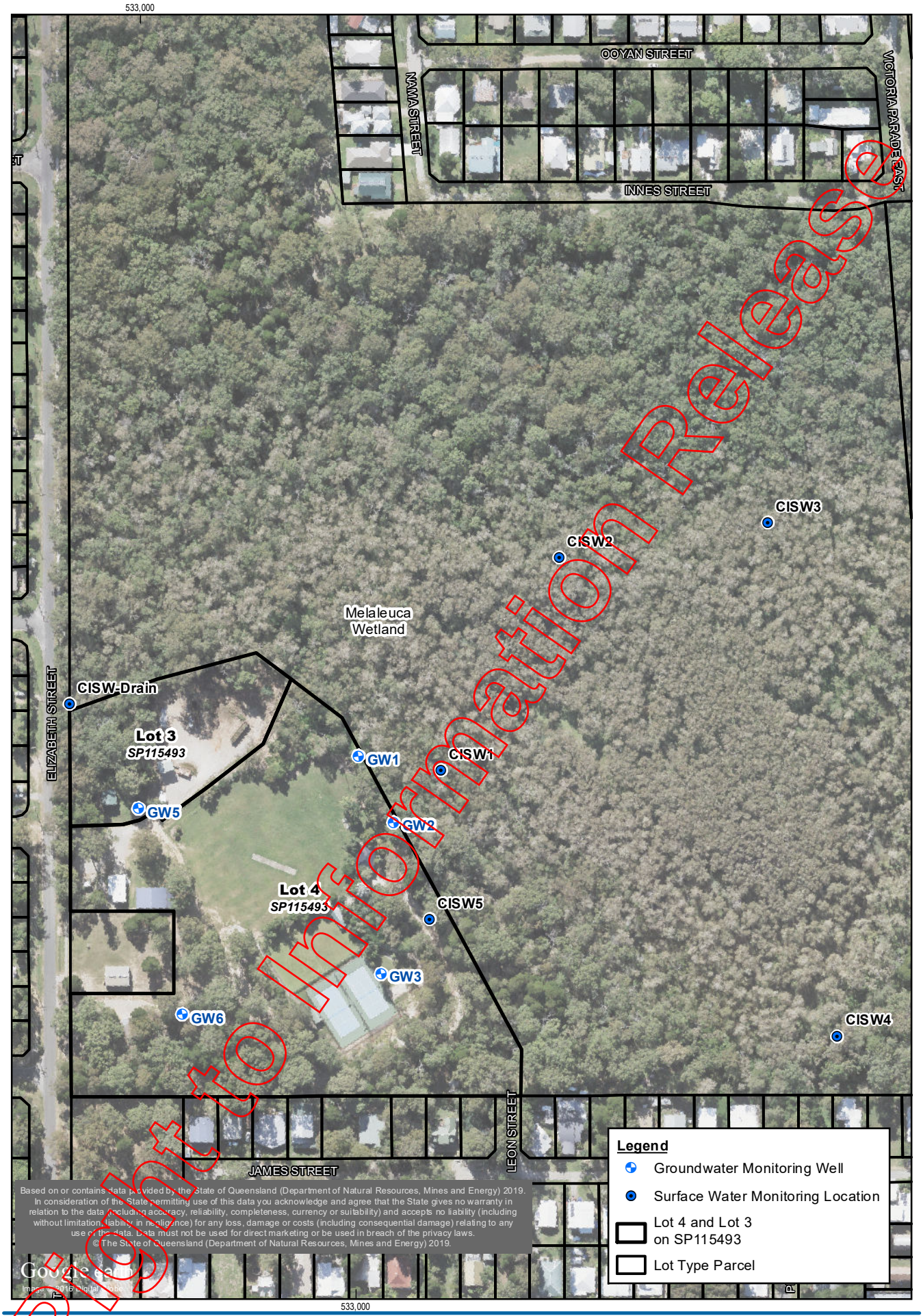

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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
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Redland City Council
Coochiemudlo Island

Groundwater Monitoring Well and Surface Water Monitoring Locations

Job Number	41-27018
Revision	B
Date	03 Jun 2019

Figure 2

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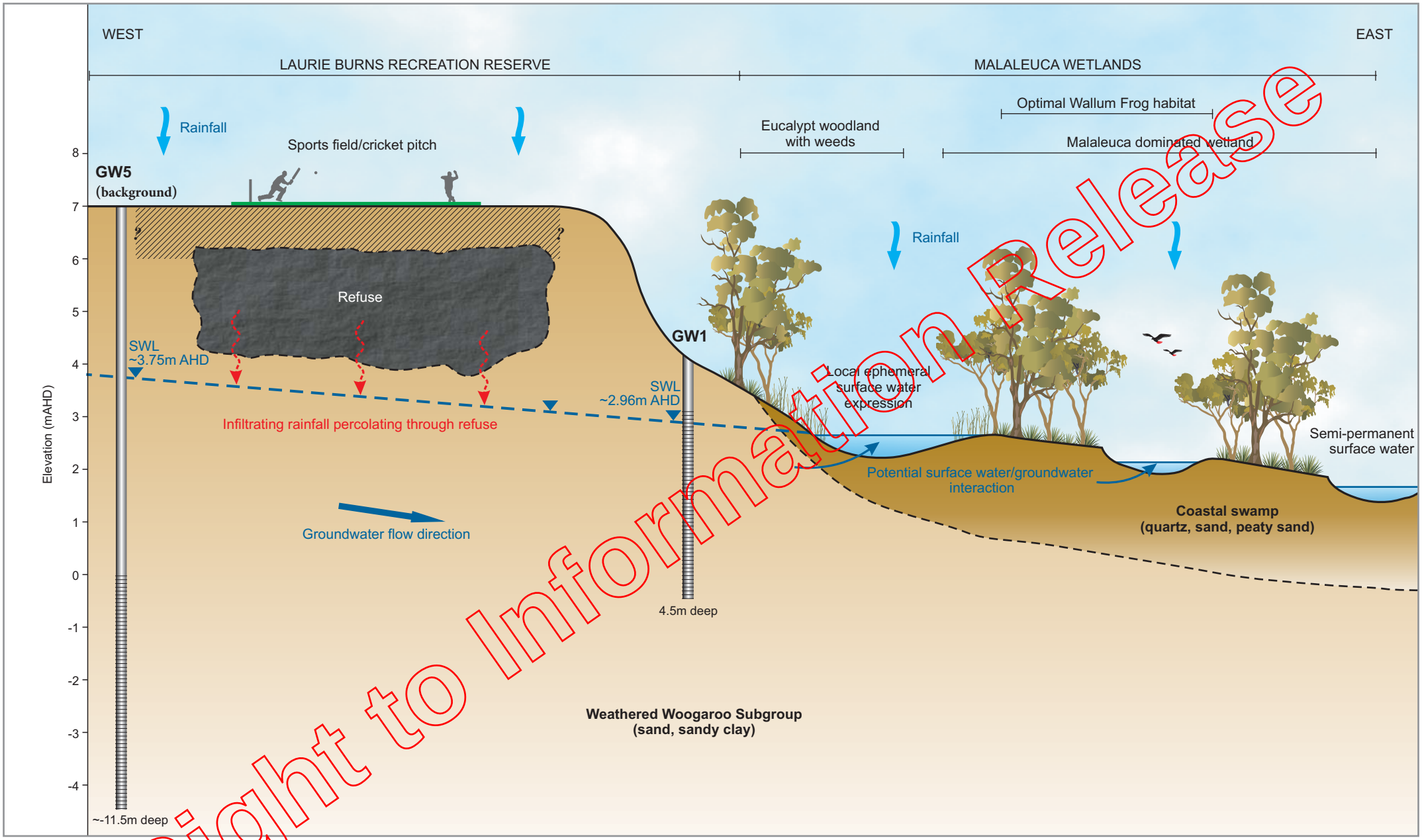
Data Source: GHD: Groundwater Well, Surface Water Sample Location (2019); DNRME: cadastre (2018), Google Earth: aerial imagery (Jun 2017, extracted Nov 2017). Created : jvc/klee



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LEGEND

Soil cover

Refuse

Groundwater level

Conceptual diagram only - not to scale.
Vertical exaggeration x10

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Conceptual Site Model

Job Number	41-27018
Revision	A
Date	10 Sep 2018

Figure 3

AU\Launceston\Projects\41\27018\4127018_LTN_05.cdr

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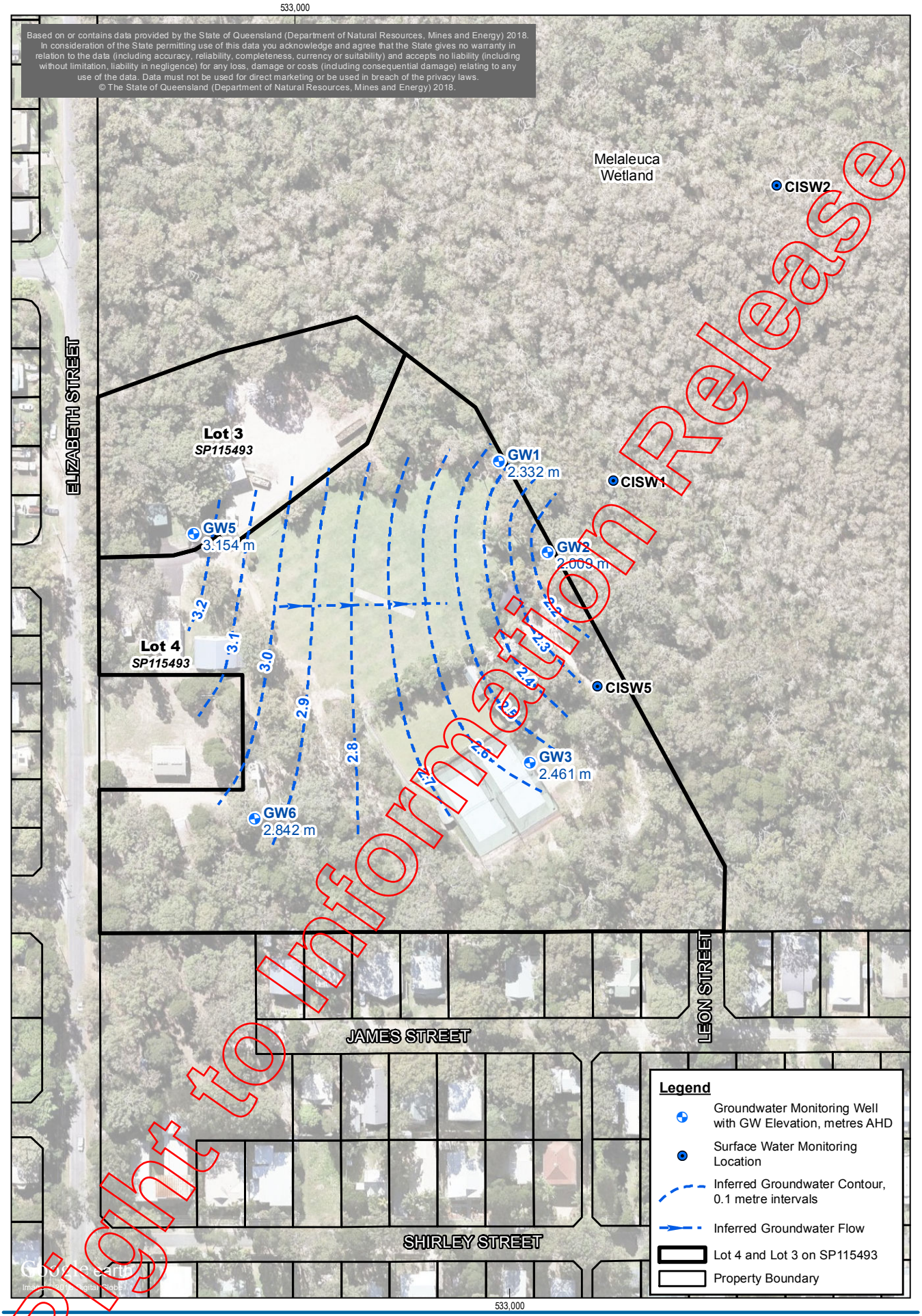

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0 20 40 60 80

Metres

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Coochiemudlo Island

Job Number	41-27018
Revision	A
Date	21 Dec 2018

Groundwater Monitoring Contouring November 2018

Figure 4a

G:\41\27018\GIS\Maps\MXD\41_27018_109_coochieGME_Nov2018_revA.mxd

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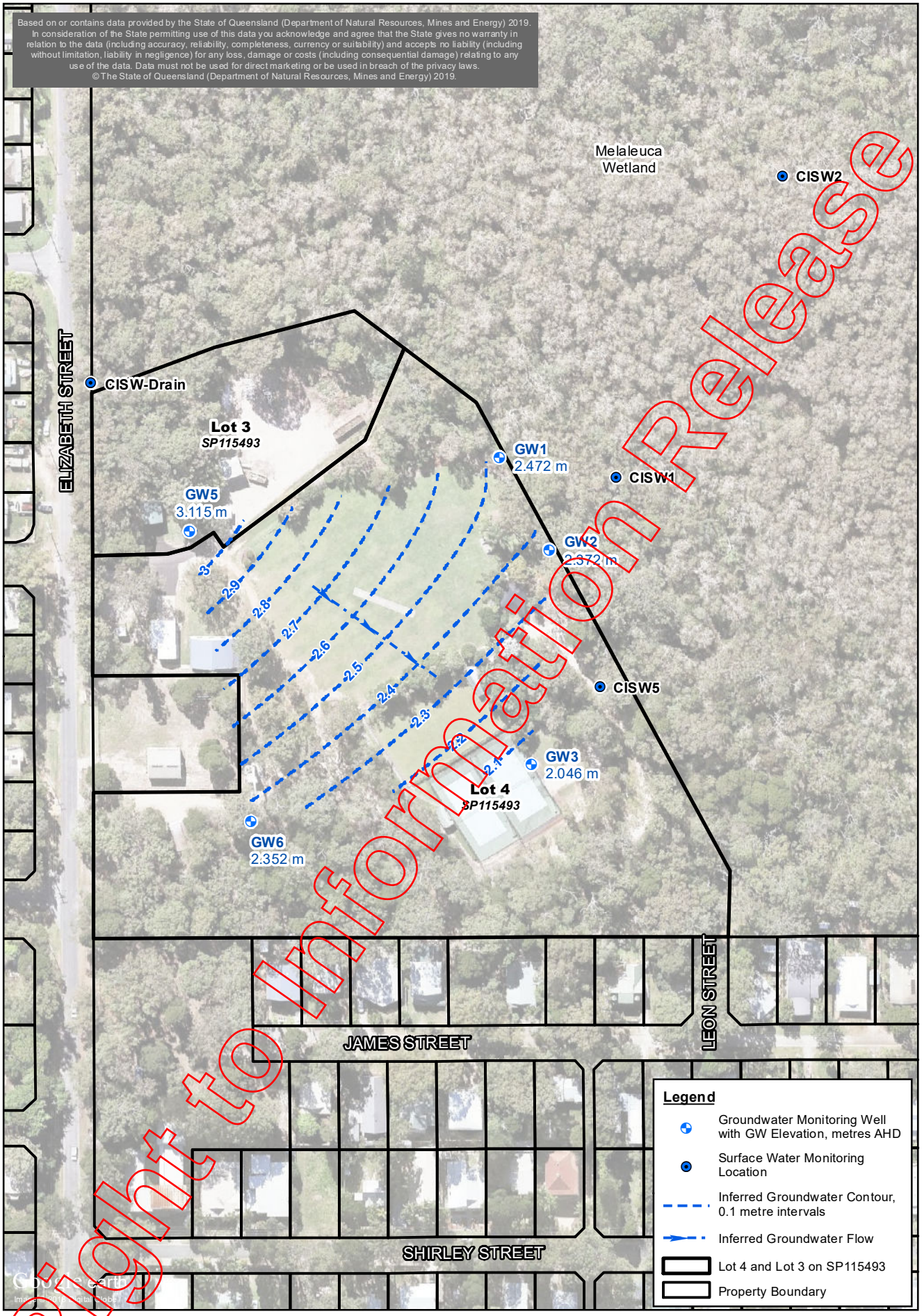
Data Source: GHD: Groundwater Well, Surface Water Sample Location (2018); DNRME: cadastre (2018), Google Earth: aerial imagery (Jun 2017, extracted Nov 2017). Created : jvc



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1:1,800 (at A4)

0 20 40 60 80

Metres
Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Redland City Council
Coochiemudlo Island

Job Number	41-27018
Revision	A
Date	12 Jun 2019

Groundwater Monitoring Contouring May 2019

Figure 4b

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Data Source: GHD: Groundwater Well, Surface Water Sample Location (2018), Groundwater Contours (2019); DNRME: cadastre (2018), Google Earth: aerial imagery (Jun 2017, extracted Nov 2017). Created : jvc/xlee

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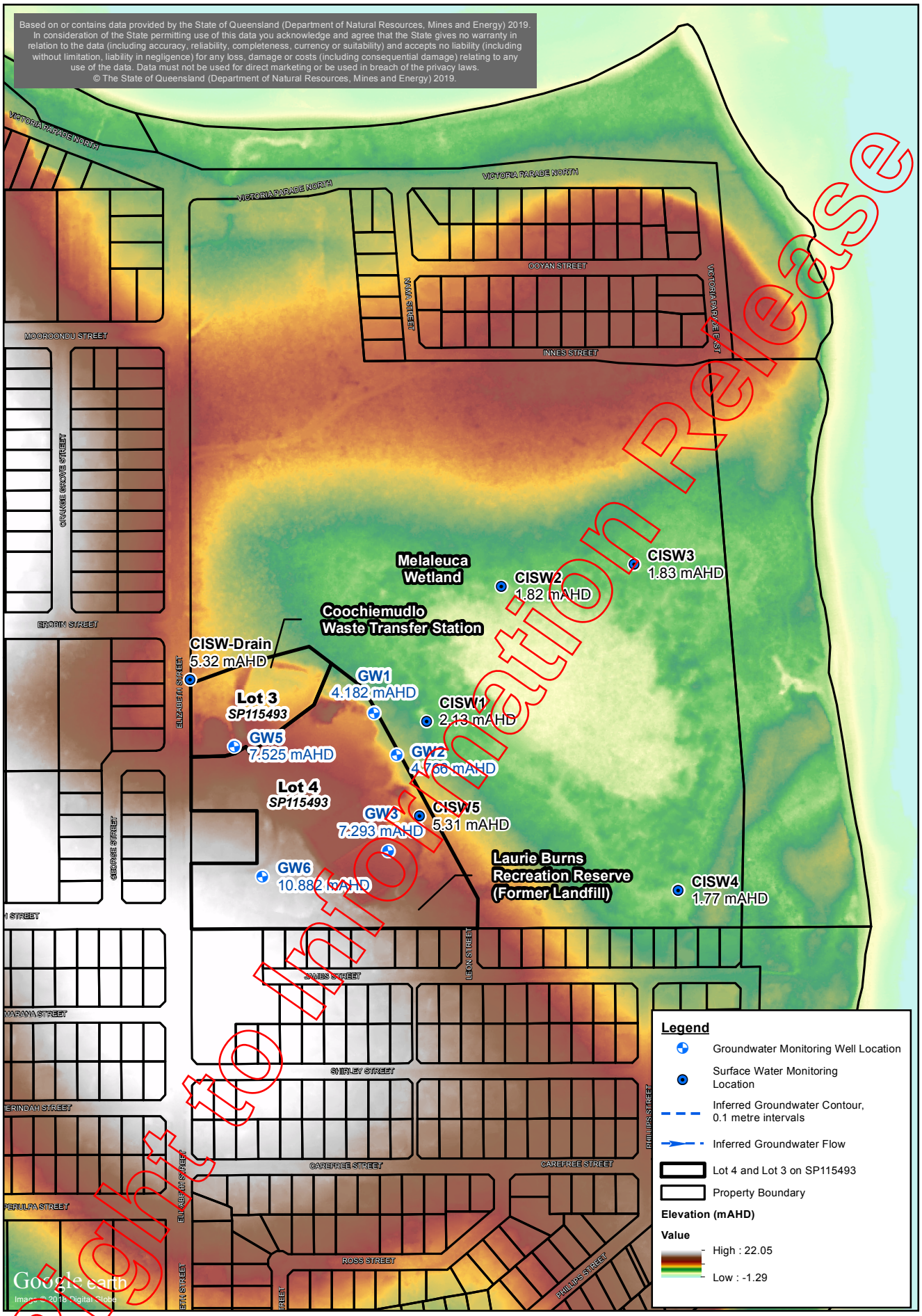

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1:4,000 (at A4)
0 20 40 60 80
Metres
Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Redland City Council
Coochiemudlo Island

Job Number	41-27018
Revision	A
Date	17 Jun 2019

Topographical Setting - Coochiemudlo Island Former Landfill

Figure 5

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Data Source: GHD: Groundwater Well, Surface Water Sample Location (2018), Groundwater Contours (2019); DNRME: cadastre (2018), Elevation(2014) Google Earth: aerial imagery (Jun 2017, extracted Nov 2017). Created : jvc/knoble

Appendix B – Results

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Appendix B
Table B1
Groundwater monitoring results

				Field Parameters							Inorganics		Acidity & Alkalinity				Major Ions										TOC	Nutrients							Organic Indicators	Metals										
				pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field)	Dissolved Oxygen (Field) (Filtered)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total	Anions Total	Ionic Balance	Total Organic Carbon	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)	BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
				pH Units	µS/cm	mg/L	mg/L	%S	mV	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL											1	10	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	2	0.005	0.0002	0.00005	0.0002	0.0005	0.002	0.0001	0.0005	0.00004	0.0005	0.001
ANZECC 2000 - Stock Watering																	**1000**					**1000**						**90**	**9.1**							**5**	**0.5**	**0.01**	**1**	**1**		**0.1**		**0.002**	**1**	**20**
ANZECC 2000 FW Slight-Mod. Disturbed																												0.9	7.2							0.055	0.013	0.0002	0.001	0.0014		0.0034	1.9	0.00006	0.011	0.008
GHD 2018 Coochiemudlo Island wetland				3.53-4.61	90												3.02																														
Morton Bay - Schedule 1 EPP (water) - Drinking Water					*1000*	*4*	*4*																																		*0.05*			*0.05*			
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater				6.5-8	626			85-110																				0.02			0.06	0.5		0.05												
Purpose	**Location_Code**	**Sampled_Date_Time**	**Field_ID**																																												
Down gradient	GW1	14/06/2017	GW1-0617-1	6.2	664	*4.09*	-	-	-39.6	21	133	23	<1	121	<1	121	64	24	13	42	97	-	7.33	7.92	3.9	3	0.03	<0.01	<0.01	<0.01	0.4	0.4	0.04	<2	0.01	<0.001	<0.0001	<0.001	<0.001	*0.16*	<0.001	0.016	<0.0001	<0.001	<0.005
		6/04/2018	GW1-0418-1	6.03	746	2	-	24.2	135	25.1	137	<10	<1	145	<1	145	78	25	15	25	26	-	7.42	6.75	4.73	3	0.02	3.74	0.01	3.75	4.2	0.5	<0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0117	<0.0001	<0.0005	<0.001
		8/06/2018	GW1-0618-1	6.11	643	1.13	-	-	178.4	22	108	<10	<1	153	<1	153	67	21	13	32	57	-	6.8	6.91	0.86	7	0.07	0.28	<0.01	0.28	0.3	<0.1	<0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0151	<0.00004	<0.0005	<0.001
		15/11/2018	GW1-1118-1	5.81	621	-	2.27	26.7	201.1	24	-	20	<1	142	<1	142	55	18	12	30	43	86	5.84	5.84	0.02	2	0.02	1.41	0.02	1.43	1.6	0.2	0.05	2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	0.013	<0.0001	0.0221	<0.0001	<0.0005	0.003
		15/03/2019		Unable to be sampled - dry																																											
		16/05/2019	GW1-0519-1	6	598	-	0.84	9.7	90	22.6	-	<10	<1	132	<1	132	60	19	12	37	59	93	6.47	6.24	1.86	<1	0.04	1.74	<0.01	1.74	2.2	0.5	0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	0.006	<0.0001	0.0034	<0.0001	<0.0005	0.002
	GW2	14/06/2017		Unable to be sampled - dry																																											
		6/04/2018	GW2-0418-1	6.65	607	1.97	-	23.3	-17.1	24.4	44	<10	<1	138	<1	138	48	18	10	38	64	-	5.78	5.48	2.72	2	0.03	0.14	<0.01	0.14	0.2	0.1	<0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	*0.317*	<0.0001	<0.0005	<0.0001	<0.0005	<0.001
		8/06/2018	GW2-0618-1	5.91	*1167*	1.1	-	-	-53.6	22	26	13	<1	79	<1	79	43	31	9	116	341	-	9.97	11.7	8.13	8	0.06	0.02	<0.01	0.02	0.2	0.2	0.01	4	0.013	0.0005	<0.00005	<0.0002	<0.0005	*12.9*	<0.0001	0.0026	<0.00004	<0.0005	<0.001
		15/11/2018		Unable to be sampled - dry																																											
		15/03/2019		Unable to be sampled - dry																																											
		16/05/2019	GW2-0519-1	5.99	*1059*	-	1.48	17.2	-37	22.7	-	16	<1	116	<1	116	47	23	10	72	169	41	7.62	7.94	2.01	7	0.08	0.01	<0.01	0.01	0.5	0.5	0.05	6	0.01	0.0025	<0.00005	0.0003	<0.0005	*7.32*	<0.0001	0.0036	<0.0001	<0.0005	0.074
	GW3	14/06/2017	GW3-0617-1	5.06	81.3	*5.07*	-	-	23.8	23.8	12	272	<1	2	<1	2	<1	2	1	10	14	-	0.62	0.68	-	8	0.04	0.69	<0.01	0.69	6.5	5.8	6.13	<2	1.47	<0.001	<0.0001	0.002	0.002	*0.59*	<0.001	0.007	<0.0001	<0.001	0.014
		6/04/2018	GW3-0418-1	5.31	125.6	*4.33*	-	52.7	215.5	26.3	5	<10	<1	13	<1	13	2	2	<1	14	17	-	0.87	0.84	-	3	0.02	0.12	<0.01	0.12	0.5	0.4	0.15	<2	0.026	<0.0002	<0.00005	0.0009	0.0015	*0.263*	0.0004	0.0032	<0.0001	0.0006	0.007
		8/06/2018	GW3-0618-1	5.52	80.7	*5.07*	-	-	150	22.6	5	14	<1	13	<1	13	2	2	<1	10	12	-	0.7	0.7	-	3	0.04	0.11	<0.01	0.11	0.3	0.2	0.03	<2	0.922	0.0002	<0.00005	0.001	0.0013	*0.344*	0.0009	0.0032	<0.00004	<0.0005	0.01
		15/11/2018	GW3-1118-1	4.99	190.3	-	2.76	34.2	220.4	25	-	16	<1	6	<1	6	2	2	<1	25	33	9	1.35	1.24	-	2	0.03	0.12	<0.01	0.12	0.5	0.4	0.33	<2	0.018	<0.0002	<0.00005	<0.0002	0.0014	*0.063*	0.0001	0.0074	<0.0001	0.0006	0.016
		15/03/2019	GW3-0319-1	4.58	117	-	1.42	-	296.3	25.7	-	12	<1	10	<1	10	1	2	<1	20	25	9	1.08	1.09	-	4	<0.01	0.11	<0.01	0.11	0.5	0.4	0.08	<2	0.163	<0.0002	<0.00005	<0.001	0.0024	*0.231*	<0.001	0.0045	<0.0001	<0.0005	0.011
		16/05/2019	GW3-0519-1	4.89	117.9	-	1.5	-	218.2	25.3	-	<10	<1	11	<1	11	2	2	<1	19	22	9	1.09	1.03	-	3	0.04	0.05	<0.01	0.05	0.4	0.3	0.1	<2	0.108	<0.0002	<0.00005	0.0004	0.0015	*0.148*	0.0001	0.0048	<0.0001	<0.0005	0.163
Up gradient	GW5	6/04/2018	GW5-0418-1	5.21	408.2	4	-	50.6	200	25.2	22	<10	<1	15	<1	15	2	5	<1	63	79	-	3.25	3.23	0.31	1	0.03	3.38	0.01	3.39	3.5	0.4	<0.01	<2	0.006	<0.0002	<0.00005	<0.0002	0.0011	<0.002	0.0005	0.0038	<0.0001	0.001	<0.001
		8/06/2018	GW5-0618-1	4.82	224.8	2.2	-	-	224.8	23	15	<10	<1	5	<1	5	<1	4	<1	48	74	-	2.42	2.5	-	1	0.03	3.08	<0.01	3.08	3.1	<0.1	<0.05	<2	0.012	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	0.0001	0.0018	<0.00004	<0.0005	<0.001
		15/11/2018	GW5-1118-1	4.63	446.3	-	2.33	29.5	246.5	25.4	-	<10	<1	6	<1	6	1	3	<1	45	55	16	2.25	2.22	-	1	0.02	3.03	<0.01	3.03	3.4	0.4	<0.01	2	0.011	<0.0002	<0.00005	<0.0002	0.003	0.009	0.0002	0.0035	<0.0001	0.0005	0.015
		15/03/2019	GW5-0319-1	4.62	332.8	-	2.97	-	329.8	23.9	-	<10	<1	3	<1	3	1	5	<1	55	80	17	2.85	2.67	-	<1	<0.01	3.02	<0.01	3.02	3.5	0.5	<0.01	<2	0.01	<0.0002	<0.00005	<0.001	<0.0005	<0.05	<0.0001	0.002	<0.0001	<0.0005	<0.001
		16/05/2019	GW5-0519-1	4.63	290.7	-	1.4	-	265.1	23.7	-	<10	<1	3	<1	3	1	4	<1	50	74	16	2.55	2.48	-	<1	0.03	2.91	<0.01	2.91	3.2	0.3	<0.01	<2	0.009	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0026	<0.0001	<0.0005	0.001
	GW6	6/04/2018	GW6-0418-1	3.89	*2282*	*4.69*	-	55.3	422	24.4	13	<10	<1	<1	<1	<1	7	57	3	314	704	-	18.8	20.1	3.48	1	0.01	0.03	<0.01	0.03	0.1	0.1	0.03	<2	**5.7**	<0.0002	0.00006	0.0002	0.0069	*0.153*	0.0012	*0.214*	<0.0001	0.0071	0.096
		8/06/2018	GW6-0618-1	3.83	*2112*	2.63	-	-	295.9	21.8	14	<10	<1	<1	<1	<1	4	54	2	305	732	-	18	20.9	7.66	3	0.06	0.05	<0.01	0.03	<0.1	<0.1	0.09	<2	**5.58**	<0.0002	<0.00005	<0.0002	0.0027	*0.34*	0.0008	*0.148*	<0.00004	0.0036	0.035
		15/11/2018	GW6-1118-1	4.12	*2454*	-	3.67	45	273	24.9	-	22	<1	<1	<1	<1	4	60	2	345	779	16	20.2	22.3	4.97	1	0.02	0.02	<0.01	0.02	0.8	0.8	1.21	<2	**7.39**	0.0002	<0.00005	<0.0002	0.0033	*0.078*	0.0008	*0.139*	<0.0001	0.0032	0.033
		15/03/2019	GW6-0319-1	Field parameters not available							-	<50	<1	<1	<1	<1	4	68	2	385	872	18	22.6	25	8	1	0.01	0.02	<0.01	0.02	<0.1	<0.1	<0.01	<2	**7.58**	<0.0002	<0.00005	<0.001	<0.001	*0.479*	<0.001	*0.12*	<0.0001	0.003	0.022
		16/05/2019	GW6-0519-1	3.95	*1806*	-	0.83	9.6	278.9	22.6	-	<10	<1	<1	<1	<1	3	50	3	292	669	13	17	19.1	5.6	<1	0.04	0.03	<0.01	0.03	0.2	0.2	0.08	<2	**4.12**	<0.0002	<0.00005	<0.0002	0.0008	*0.172*	0.001	*0.16*	<0.0001	0.002	0.129
Statistical Summary																																															
Number of Results				23	23	12	11	12	23	23	12	24	24	24	24	24	24	24	24	24	24	12	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Number of Detects				23	23	12	11	12	23	23	12	9	0	19	0	19	22	24	14	24	24	12	24	24	14	20	21	23	3	23	22	20	15	4	19	4	1	6	12	18	11	23	0	9	16
Minimum Concentration				#VALUE!	80.7	1.1	0.83	9.6	-53.6	21	5	<10	<1	<1	<1	<1	<1	2	<1	10	12	9	0.62	0.68	0.02	<1	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	<0.0005	<0.00004	<0.0005	<0.001
Minimum Detect				#VALUE!	80.7	1.1	0.83	9.6	ND	21	5	12	ND	2	ND	2	1	2	1	10	12	9	0.62	0.68	0.02	1	0.02	0.01	0.01	0.01	0.1	0.1	0.01	2	0.006	0.0002	0.00006	0.0002	0.0008	0.006	0.0001	0.0018	ND	0.0005	0.001
Maximum Concentration				6.65	2454	5.07	3.67	55.3	422	26.3	137	272	<1	153	<1	153	78	68	15	385	872	93	22.6	25	8.13	8	0.08	3.74	0.02	3.75	6.5	5.8	6.13	6	7.58	0.0025	<0.0001	0.002	0.0069	12.9	0.0012	0.214	<0.0001	0.0071	0.163
Maximum Detect				6.65	2454	5.07	3.67	55.3	422	26.3	137	272	ND	153	ND	153	78	68	15	385	872	93	22.6	25	8.13	8	0.08	3.74	0.02	3.75	6.5	5.8	6.13	6	7.58	0.0025	0.00006	0.002	0.0069	12.9	0.0012	0.214	ND	0.0071	0.163
Average Concentration				#VALUE!	747	3.2	2	32	179	24	45	21	0.5	46	0.5	46	21	21	4.7	100	212	29	7.2	7.7	3.7	2.8	0.033	1	0.006	1	1.5	0.54	0.35	1.4	1.4	0.00026	0.000029	0.00034	0.0013	0.98	0.00036	0.037	0.000044	0.0011	0.027
Median Concentration				#VALUE!	598	3.315	1.5	28.1	215.5	23.9	18.5	5	0.5	10.5	0.5	10.5	3.5	18	5	43.5	69	16	5.81	5.66	3.69	2	0.03	0.12	0.005	0.12	0.5	0.35	0.03	1	0.015	0.0001	0.000025	0.0001	0.00065	0.1505	0.00015	0.00465	0.00005	0.00025	0.0085
Standard Deviation				#VALUE!	734	1.5	0.92	16	130	1.4	51	54	0	61	0	61	28	22	5.3	123	292	30	6.9	7.8	2.5	2.4	0.019	1.4	0.0033	1.4	1.8	1.1	1.3	1.2	2.5	0.0005	0.0000097	0.00044	0.0015	2.9	0.00036	0.064	0.000012	0.0016	0.044
Number of Guideline Exceedances				#VALUE!	21	6	0	12	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	21	0	0	15	14	0	10	0	10	0	0	2	9	15	0	5	19	0	12
Number of Guideline Exceedances(Detects Only)				#VALUE!	21	6	0	12	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	21	0	0	15	14	0	10	0	10	0	0	2	9	15	0	5	0	0	12

Right to Know Release

201905 Coochie GW Results , 27/05/2019
Site_ID = 'Coochiemudlo Island' AND

Location_Code In('GW1' , 'GW2' , 'GW3' , 'GW5' , 'GW6') AND

Sampled_Date In('14/06/2017' , '06/04/2018' , '08/06/2018' , '15/11/2018' , '15/03/2019' , '16/05/2

Appendix B
Table B1
Groundwater monitoring results

OC Pesticides

Purpose	Location_Code	Sampled_Date_Time	Field_ID	4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2
ANZECC 2000 - Stock Watering																											
ANZECC 2000 FW Slight-Mod. Disturbed									0.03					0.006						0.01			0.2	0.01			
GHD 2018 Coochiemudlo Island wetland																											
Morton Bay - Schedule 1 EPP (water) - Drinking Water																											
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																											
Down gradient	GW1	14/06/2017	GW1-0617-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		6/04/2018	GW1-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		8/06/2018	GW1-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/11/2018	GW1-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/03/2019																									
		16/05/2019	GW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	GW2	14/06/2017																									
		6/04/2018	GW2-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		8/06/2018	GW2-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/11/2018																									
		15/03/2019																									
		16/05/2019	GW2-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	GW3	14/06/2017	GW3-0617-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		6/04/2018	GW3-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		8/06/2018	GW3-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/11/2018	GW3-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/03/2019	GW3-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		16/05/2019	GW3-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Up gradient	GW5	6/04/2018	GW5-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		8/06/2018	GW5-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/11/2018	GW5-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/03/2019	GW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		16/05/2019	GW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	GW6	6/04/2018	GW6-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		8/06/2018	GW6-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/11/2018	GW6-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		15/03/2019	GW6-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		16/05/2019	GW6-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2

Statistical Summary

Statistic	4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
Number of Results	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
Median Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	0	0	0	0	0	24	0	0	0	0	24	0	0	0	0	0	24	0	0	24	24	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

OP Pesticides

Purpose	Location_Code	Sampled_Date_Time	Field_ID	Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	0.5	0.5
ANZECC 2000 - Stock Watering																						
ANZECC 2000 FW Slight-Mod. Disturbed				0.1				0.01			0.01		0.15				0.05			0.004		
GHD 2018 Coochiemudlo Island wetland																						
Morton Bay - Schedule 1 EPP (water) - Drinking Water																						
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																						
Down gradient	GW1	14/06/2017	GW1-0617-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		6/04/2018	GW1-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018	GW1-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018	GW1-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/03/2019																				
		16/05/2019	GW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	GW2	14/06/2017																				
		6/04/2018	GW2-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018	GW2-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018																				
		15/03/2019																				
		16/05/2019	GW2-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	GW3	14/06/2017	GW3-0617-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		6/04/2018	GW3-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018	GW3-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018	GW3-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/03/2019	GW3-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW3-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Up gradient	GW5	6/04/2018	GW5-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018	GW5-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018	GW5-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/03/2019	GW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	GW6	6/04/2018	GW6-0418-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018	GW6-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018	GW6-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/03/2019	GW6-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW6-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5

Statistical Summary

Statistic	Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
Number of Results	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Median Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	24	0	0	0	24	0	0	24	0	24	0	0	0	24	0	0	24	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

201905 Coochie GW Results , 27/05/2019
Site_ID = 'Coochiemudlo Island' AND

Location_Code In('GW1' , 'GW2' , 'GW3' , 'GW5' , 'GW6') AND

Sampled_Date In('14/06/2017' , '06/04/2018' , '08/06/2018' , '15/11/2018' , '15/03/2019' , '16/05/2

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Appendix B
Table B2
Surface water monitoring results

Purpose	Location_Code	Sampled_Date_Time	Field_ID	pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field)	Dissolved Oxygen (Field) (Filtered)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total	Anions Total	Ionic Balance	Total Organic Carbon	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)	BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
				Field Parameters							Inorganics		Acidity & Alkalinity				Major Ions									TOC	Nutrients							Organic Indicators	Metals										
				pH Units	µS/cm	mg/L	mg/L	%S	mV	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL											1	10	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	0.1	0.1	0.01	2	0.005	0.0002	0.00005	0.0002	0.0005	0.002	0.0001	0.0005	0.00004	0.0005	0.001
ANZECC 2000 FW 99% - applicable to CISW2 and CISW3 only as potential frog habitat areas																											0.32	4.9							0.027	0.0008	0.00006	0.00001	0.001		0.001	1.2	0.00006	0.008	0.0024
ANZECC 2000 FW Slight-Mod. Disturbed																											0.9	7.2							0.055	0.013	0.0002	0.001	0.0014		0.0034	1.9	0.00006	0.011	0.008
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2 and CISW3 only as potential frog habitat areas				3.53-4.61	90												3.02																												
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater				*6.5-8*	*626*			*85-110*																			*0.02*			*0.06*	*0.5*		*0.05*												
Myer et al 2006 Wallum-dependent frog species				**0-6**																																										
Background	CISW-Drain	16/05/2019	CISW-Drain-0519-1	*5.55*	156.6	-	0.78	*9.2*	48.5	22.9	-	42	<1	15	<1	15	5	5	<1	32	50	15	2.05	2.02	-	2	*0.04*	0.11	<0.01	*0.11*	0.1	<0.1	<0.01	<2	<0.005	0.0002	<0.00005	<0.0002	<0.0005	0.27	<0.0001	0.0204	<0.0001	<0.0005	0.003
	CISW4	22/03/2018	CISW4-0318-1	*5.96*	218.3	0.1	-	*1.2*	-81.3	23.6	4	48	<1	23	<1	23	5	4	1	20	27	-	1.47	1.3	-	17	*0.03*	<0.01	<0.01	<0.01	*0.7*	0.7	0.05	4	0.981	0.0114	<0.00005	0.0031	0.0008	10.4	0.0004	0.0436	<0.00004	0.0012	0.004
		8/06/2018		Unable to sample - dry																																										
		15/11/2018		Unable to sample - dry																																										
		15/03/2019		Unable to sample - dry																																										
		16/05/2019		Unable to sample - dry																																										
Background potential frog habitat	CISW2	22/03/2018	CISW2-0318-1	*5.95*	301.3	0.01	-	*0.1*	-47	24.1	19	260	<1	27	<1	27	12	8	8	36	62	-	3.03	2.68	-	83	<0.01	<0.05	<0.05	<0.05	*3.2*	3.2	*0.37*	12	0.919	0.0041	<0.00005	0.0034	0.0012	12.1	0.0003	0.0533	<0.00004	0.0024	0.006
		8/06/2018	CISW2-0618-1	*5.86*	273	1.16	-	*12*	-24.1	16.9	23	118	<1	6	<1	6	8	5	7	36	71	-	2.56	2.6	-	34	<0.01	<0.01	<0.01	<0.01	*1.5*	1.5	*0.15*	4	0.254	0.0012	<0.00005	0.0026	0.0006	4.21	0.0001	0.0201	<0.00004	0.0005	0.002
		15/11/2018		Unable to sample - dry																																										
		15/03/2019		Unable to sample - dry																																										
		16/05/2019		Unable to sample - dry																																										
	CISW3	22/03/2018	CISW3-0318-1	*4.63*	362.7	0.23	-	*2.8*	207.8	26.8	116	270	<1	<1	<1	<1	15	21	13	77	112	-	6.16	5.57	4.98	105	<0.01	<0.02	<0.01	<0.02	*2.3*	2.3	*0.25*	12	0.751	0.0024	<0.00005	0.0036	0.0013	17.2	0.0001	0.106	<0.00004	0.0041	0.015
		15/11/2018		Unable to sample - dry																																										
		26/03/2019		Unable to sample - dry																																										
		16/05/2019		Unable to sample - dry																																										
Downstream	CISW1	22/03/2018	CISW1-0318-1	*5.86*	238.5	0.31	-	*3.5*	-120.3	22.5	27	77	<1	24	<1	24	8	7	7	23	40	-	2.15	2.17	-	25	0.02	0.02	<0.01	0.02	*1*	1	0.04	<2	13.4	0.0012	<0.00005	0.0104	0.0011	4.62	0.002	0.008	<0.00004	0.0031	0.012
		8/06/2018	CISW1-0618-1	*6.31*	*780*	3.67	-	*37.3*	84.1	16.4	175	29	<1	52	<1	52	49	33	17	56	133	-	3.03	8.49	2.44	9	<0.01	<0.01	<0.01	<0.01	0.3	0.3	<0.01	2	0.233	0.0005	<0.00005	0.0004	<0.0005	0.534	<0.0001	0.0061	<0.00004	<0.0005	0.001
		15/11/2018	CISW1-1118-1	*6.32*	*1033*	-	2.12	*26.2*	-51.9	25.5	-	69	<1	132	<1	132	52	42	18	70	171	126	9.56	10.1	2.69	23	<0.01	<0.01	<0.01	<0.01	*0.9*	0.9	0.02	<2	0.036	0.0008	<0.00005	0.0005	<0.0005	2.38	<0.0001	0.0205	<0.0001	<0.0005	<0.001
		26/03/2019	CISW1-0319-1	*4.03*	*4009*	-	0	-	141.4	26.5	-	205	<1	<1	<1	<1	272	141	15	86	99	2370	60.1	52.1	7.13	44	*2.71*	<0.1	<0.1	0.04	*6.8*	6.8	*0.08*	24	64.8	0.0034	*0.0271*	0.011	0.0072	416	0.0195	2.05	<0.00004	0.232	37.8
		16/05/2019	CISW1-0519-1	*5.03*	*3743*	-	0.23	*2.6*	0.4	-0.9	-	102	<1	<1	<1	<1	36	25	13	52	124	131	6.45	6.22	1.76	23	0.01	<0.01	<0.01	<0.01	*1.4*	1.4	*0.06*	3	0.032	0.0007	<0.00005	0.0008	0.0008	0.723	<0.0001	0.0532	<0.0001	0.0006	0.32
	CISW5	22/03/2018	CISW5-0318-1	*6.1*	155.2	0.53	-	*6.1*	87.3	23.1	4	34	<1	20	<1	20	5	3	2	13	18	-	1.11	0.99	-	10	<0.01	<0.01	<0.01	<0.01	0.5	0.5	0.04	<2	1.95	0.0026	<0.00005	0.0021	0.0022	1.22	0.0007	0.0133	<0.00004	0.0009	0.004
		8/06/2018	CISW5-0618-1	*6.1*	57.4	2.66	-	*27*	161	16	1	26	<1	10	<1	10	3	1	2	7	10	-	0.59	0.5	-	8	*0.03*	<0.01	<0.01	<0.01	0.4	0.4	0.05	<2	0.544	0.0015	<0.00005	0.0007	0.0008	0.868	0.0005	0.0104	<0.00004	<0.0005	0.003
		15/11/2018		Unable to sample - dry																																										
		15/03/2019	CISW5-0319-1	Field parameters not available							-	48	<1	14	<1	14	3	1	2	6	9	<5	0.54	0.53	-	17	<0.01	0.02	<0.01	0.02	*0.8*	0.8	*0.2*	5	0.221	0.0077	<0.00005	0.001	0.0039	1.26	0.001	0.04	<0.0001	<0.001	0.009
		16/05/2019	CISW5-0519-1	*5.47*	101.5	-	0.85	*9.7*	138.2	19.2	-	52	<1	17	<1	17	6	2	2	14	22	<1	1.15	0.96	-	19	0.02	<0.01	<0.01	<0.01	*0.8*	0.8	0.05	2	0.142	0.0043	<0.00005	0.0014	<0.0005	1.93	0.0001	0.0496	<0.0001	0.0009	0.09
Statistical Summary																																														
Number of Results				13	13	8	5	12	13	13	8	14	14	14	14	14	14	14	14	14	14	6	14	14	5	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Number of Detects				13	13	8	5	12	13	13	8	14	0	11	0	11	14	14	13	14	14	4	14	14	5	14	7	3	0	4	14	13	12	9	13	14	1	13	10	14	10	14	0	9	13
Minimum Concentration				#VALUE!	57.4	0.01	0	0.1	-120.3	-0.9	1	26	<1	<1	<1	<1	3	1	<1	6	9	<1	0.54	0.5	1.76	2	<0.01	<0.01	<0.01	<0.01	0.1	<0.1	<0.01	<2	<0.005	0.0002	<0.00005	<0.0002	<0.0005	0.27	<0.0001	0.0061	<0.00004	<0.0005	<0.001
Minimum Detect				#VALUE!	57.4	0.01	0.23	0.1	ND	ND	1	26	ND	6	ND	6	3	1	1	6	9	15	0.54	0.5	1.76	2	0.01	0.02	ND	0.02	0.1	0.3	0.02	2	0.032	0.0002	0.0271	0.0004	0.0006	0.27	0.0001	0.0061	ND	0.0005	0.001
Maximum Concentration				6.32	4009	3.67	2.12	37.3	207.8	26.8	175	270	<1	132	<1	132	272	141	18	86	171	2370	60.1	52.1	7.13	105	2.71	0.11	<0.1	0.11	6.8	6.8	0.37	24	64.8	0.0114	0.0271	0.011	0.0072	416	0.0195	2.05	<0.0001	0.232	37.8
Maximum Detect				6.32	4009	3.67	2.12	37.3	207.8	26.8	175	270	ND	132	ND	132	272	141	18	86	171	2370	60.1	52.1	7.13	105	2.71	0.11	ND	0.11	6.8	6.8	0.37	24	64.8	0.0114	0.0271	0.011	0.0072	416	0.0195	2.05	ND	0.232	37.8
Average Concentration				#VALUE!	879	1.1	0.8	11	42	20	46	99	0.5	24	0.5	24	34	21	7.8	38	68	441	7.5	6.9	3.8	30	0.21	0.02	0.0096	0.019	1.5	1.5	0.098	5.2	6	0.003	0.002	0.0029	0.0015	34	0.0018	0.18	0.000031	0.018	2.7
Median Concentration				#VALUE!	273	0.42	0.78	7.65	48.5	22.9	21	60.5	0.5	16	0.5	16	8	6	7	34	56	70.5	2.355	2.385	2.69	21	0.008	0.005	0.005	0.005	0.85	0.85	0.05	2.5	0.399	0.00195	0.000025	0.00175	0.0008	2.155	0.0002	0.03025	0.00002	0.00075	0.005
Standard Deviation				#VALUE!	1359	1.4	0.82	12	104	7.4	84	85	0	34	0	34	71	37	6.3	27	52	947	15	13	2.2	30	0.72	0.029	0.013	0.028	1.7	1.7	0.11	6.6	17	0.0032	0.0072	0.0035	0.0019	110	0.0051	0.54	0.000015	0.062	10
Number of Guideline Exceedances				#VALUE!	12	0	0	12	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	6	0	0	1	11	0	9	0	13	11	1	14	6	0	3	1	5	1	11
Number of Guideline Exceedances(Detects Only)				#VALUE!	12	0	0	12	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	6	0	0	1	11	0	9	0	13	11	1	13	6	0	3	1	0	1	11

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Appendix B
Table B2
Surface water monitoring results

Purpose	Location_Code	Sampled_Date_Time	Field_ID	4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
				OC Pesticides																								OP Pesticides																			
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	0.5	0.5
ANZECC 2000 FW 99% - applicable to CISW2 and CISW3 only as potential frog habitat areas									0.03					0.006						0.01			0.07	0.01				0.01				0.00004			0.00003		0.1				0.002			0.0007		
ANZECC 2000 FW Slight-Mod. Disturbed									0.03					0.006						0.01			0.2	0.01				0.1				0.01			0.01		0.13				0.05			0.004		
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2 and CISW3 only as potential frog habitat areas																																															
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																																															
Myer et al 2006 Wallum-dependent frog species																																															
Background	CISW-Drain	16/05/2019	CISW-Drain-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	CISW4	22/03/2018	CISW4-0318-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018																																													
		15/11/2018																																													
		15/03/2019																																													
		16/05/2019																																													
Background potential frog habitat	CISW2	22/03/2018	CISW2-0318-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018	CISW2-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018																																													
		15/03/2019																																													
		16/05/2019																																													
	CISW3	22/03/2018	CISW3-0318-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018																																													
		26/03/2019																																													
		16/05/2019																																													
Downstream	CISW1	22/03/2018	CISW1-0318-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018	CISW1-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018	CISW1-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		26/03/2019	CISW1-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	CISW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	CISW5	22/03/2018	CISW5-0318-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		8/06/2018	CISW5-0618-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/11/2018																																													
		15/03/2019	CISW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	CISW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Statistical Summary																																															
Number of Results				14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Median Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				0	0	0	0	0	14	0	0	0	0	14	0	0	0	0	0	14	0	0	14	14	0	0	0	14	0	0	0	14	0	0	14	0	14	0	0	0	14	0	0	14	0	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Appendix C – Background – down gradient charts

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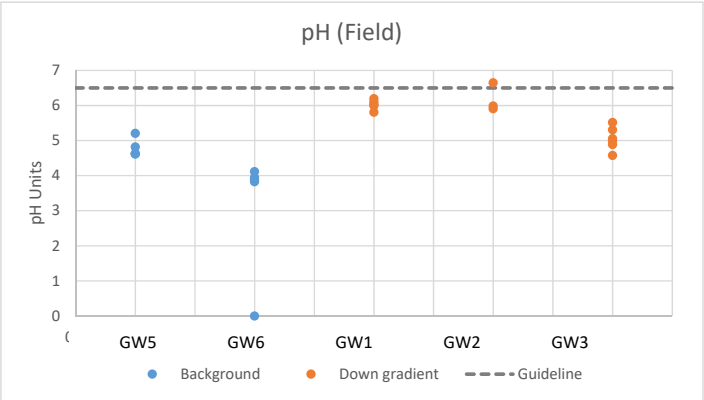

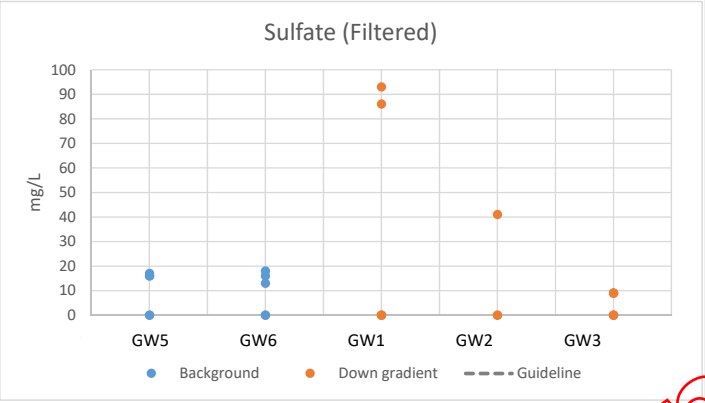

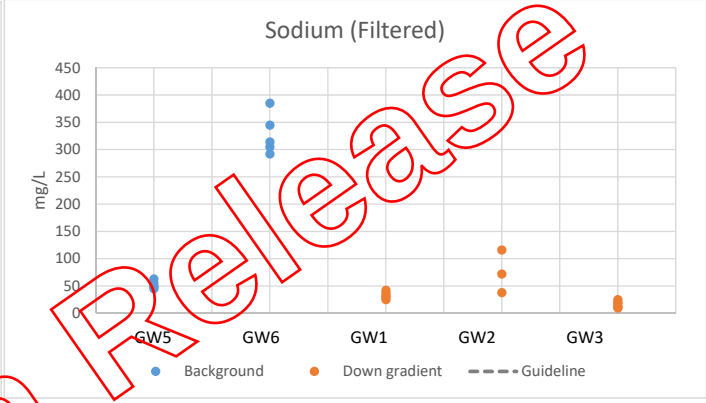

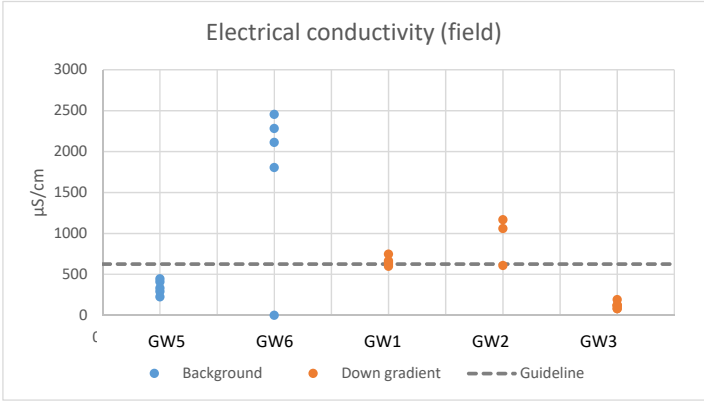

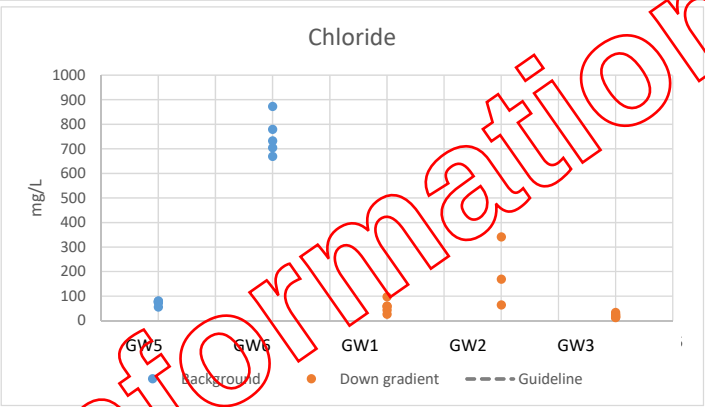

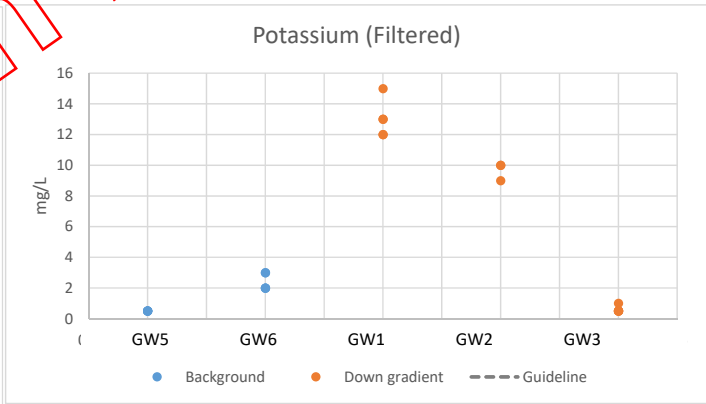

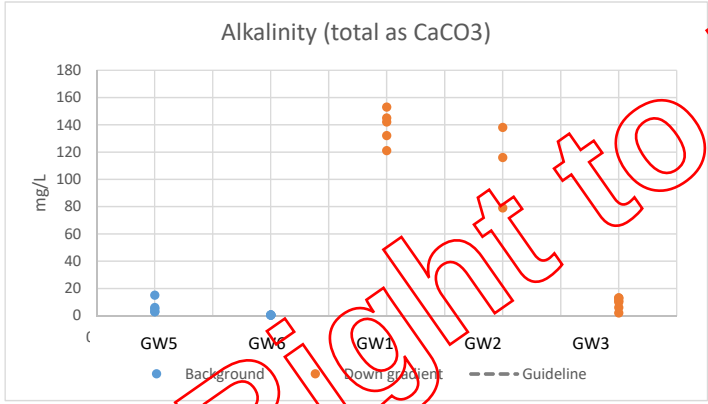

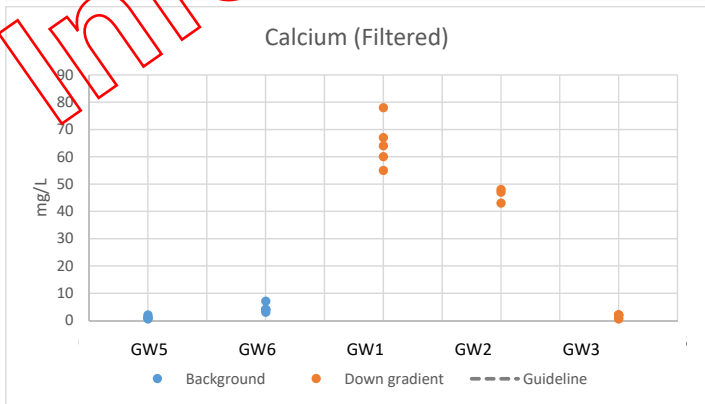

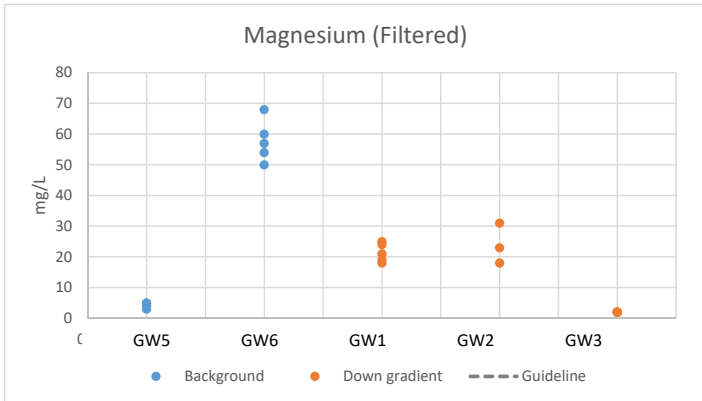

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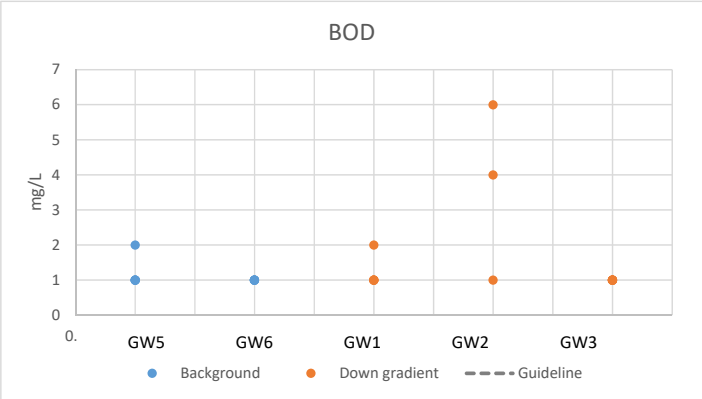

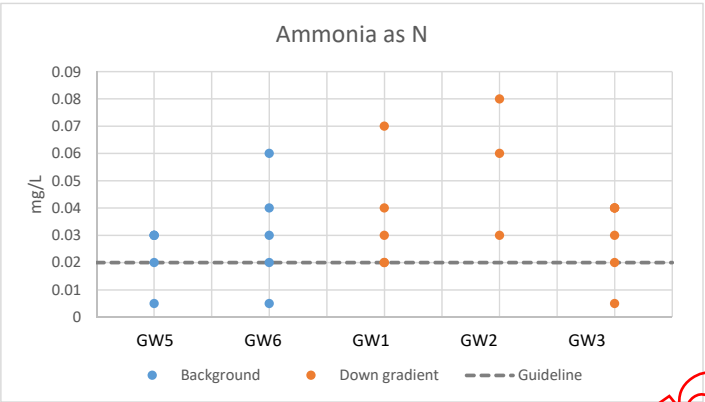

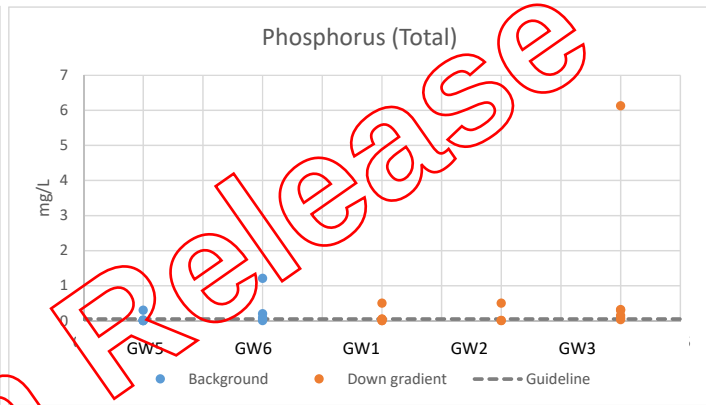

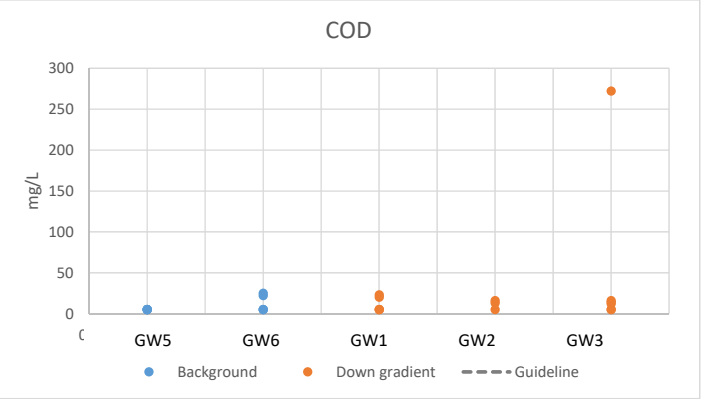

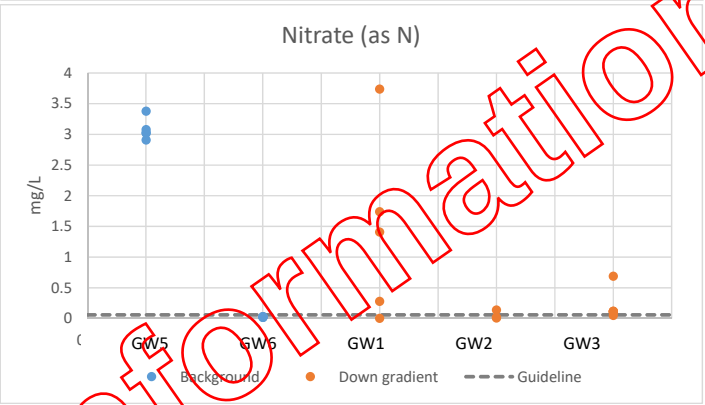

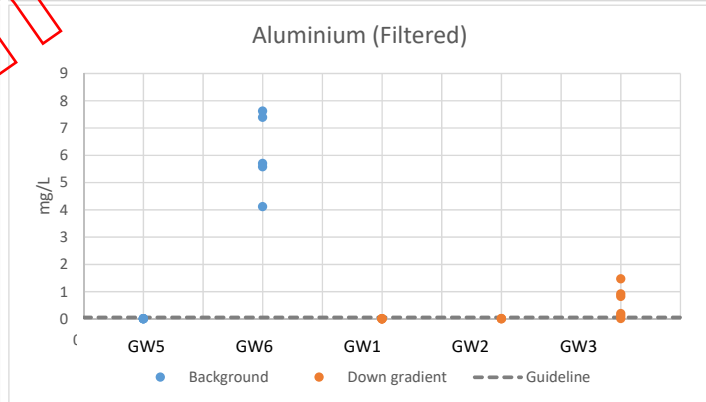

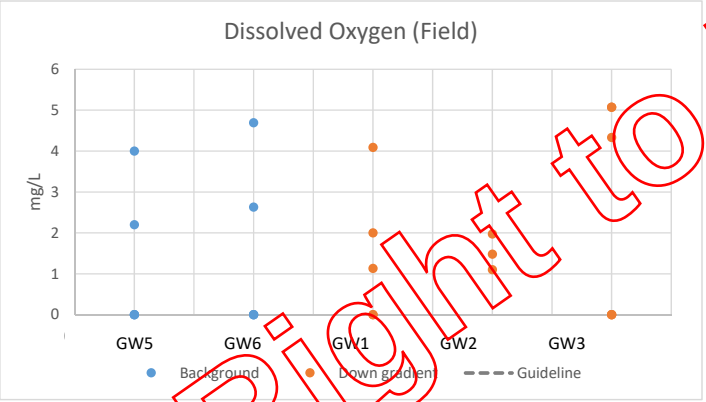

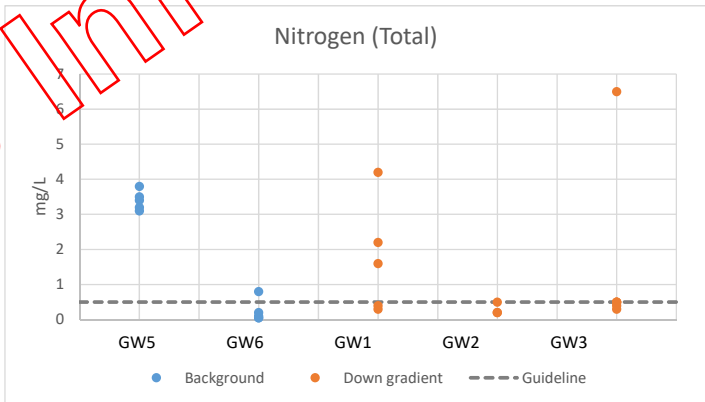

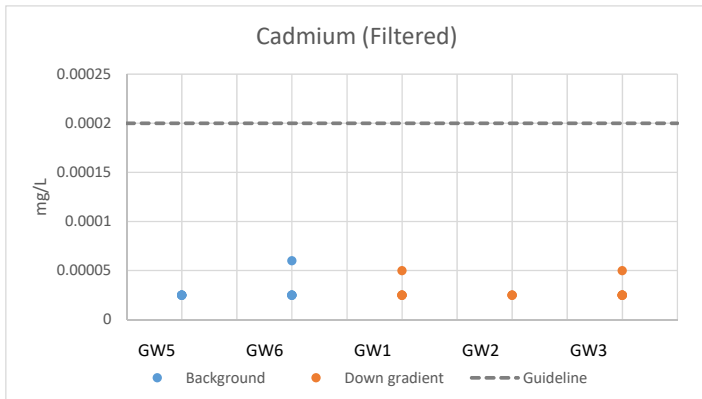

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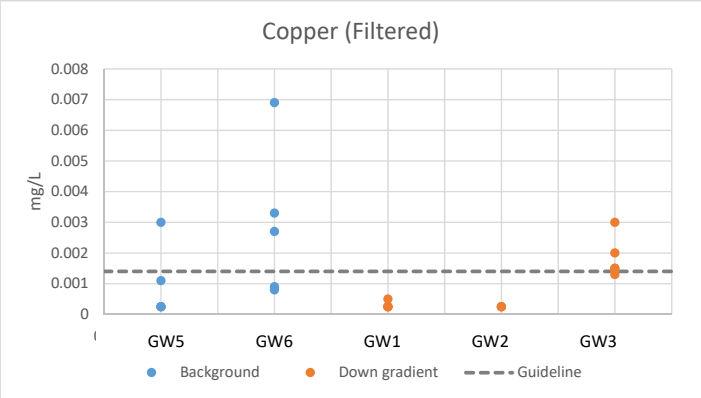

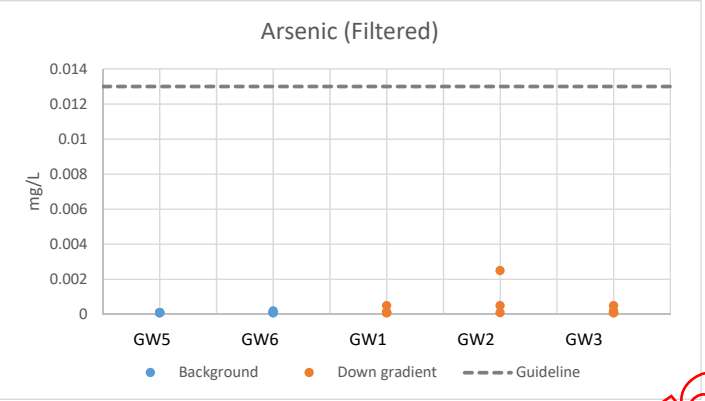

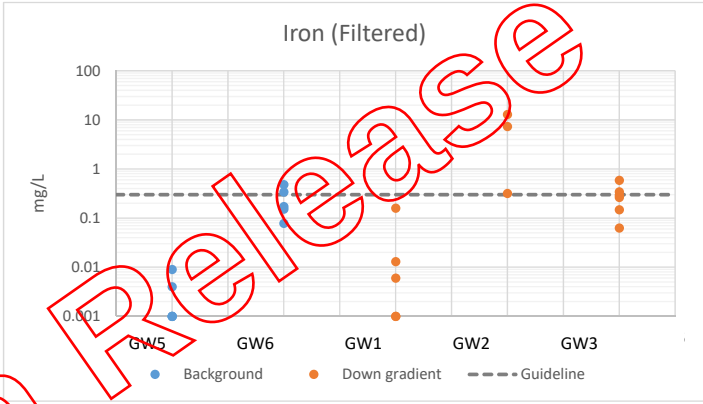

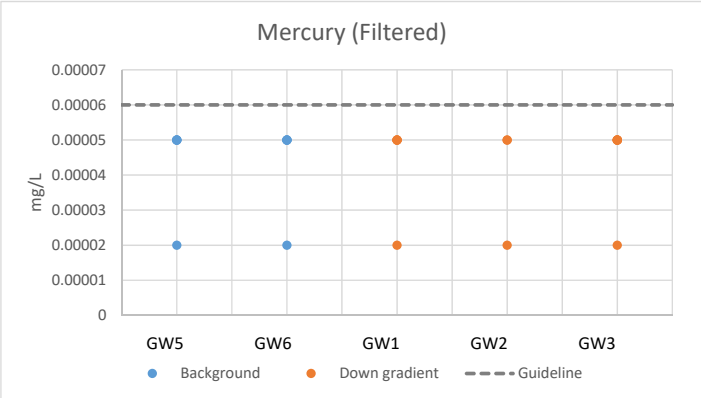

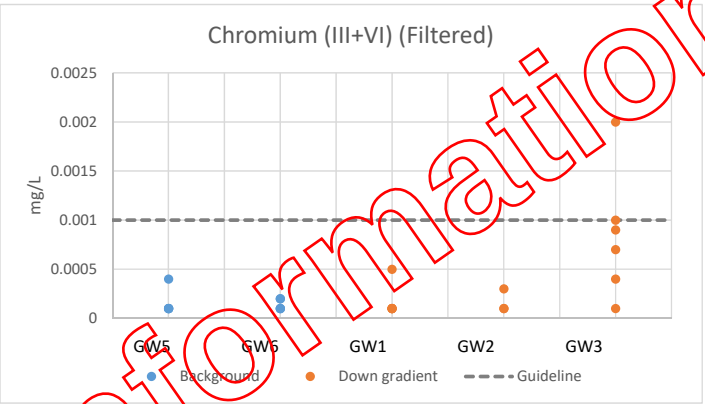

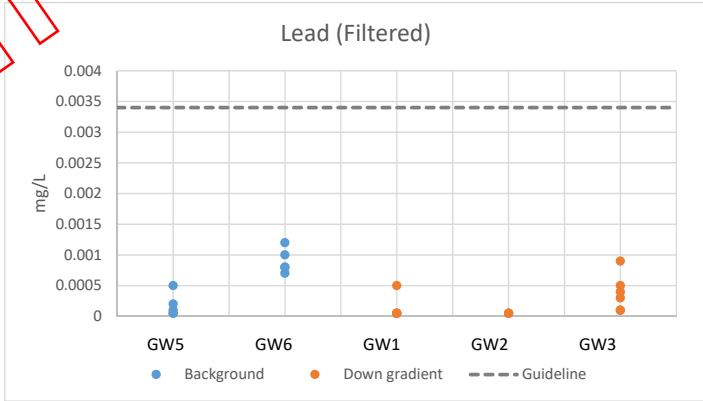

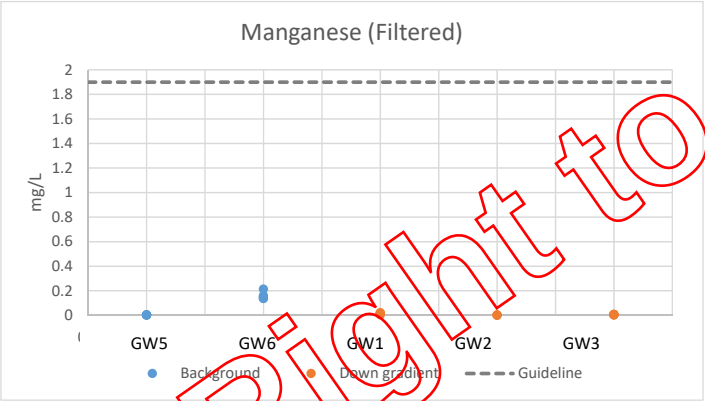

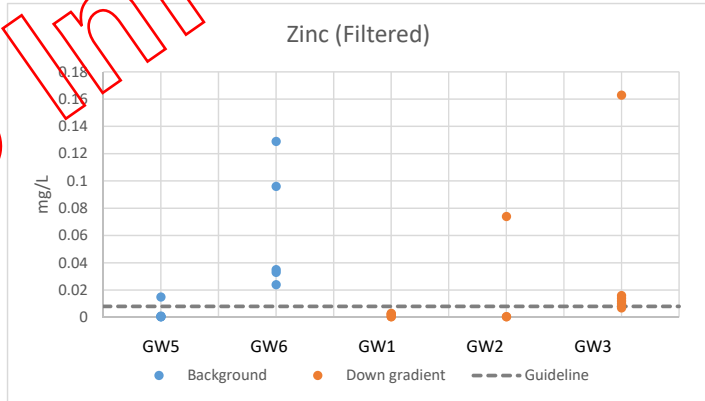

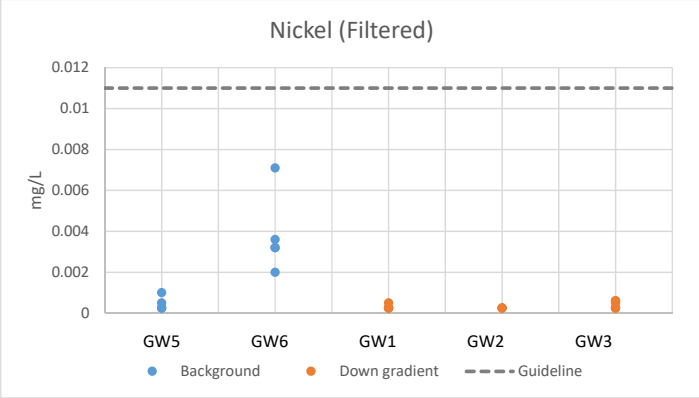

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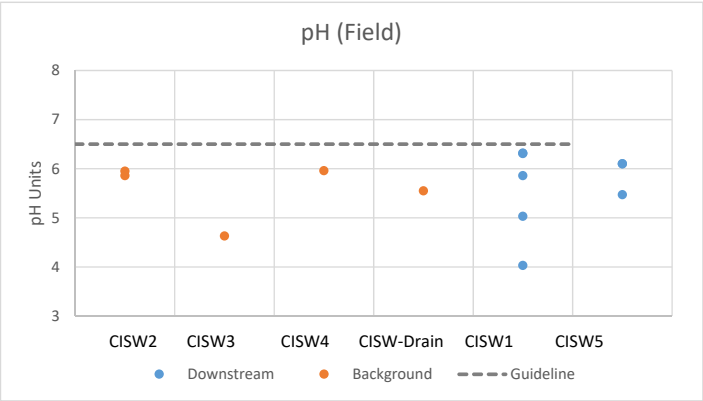
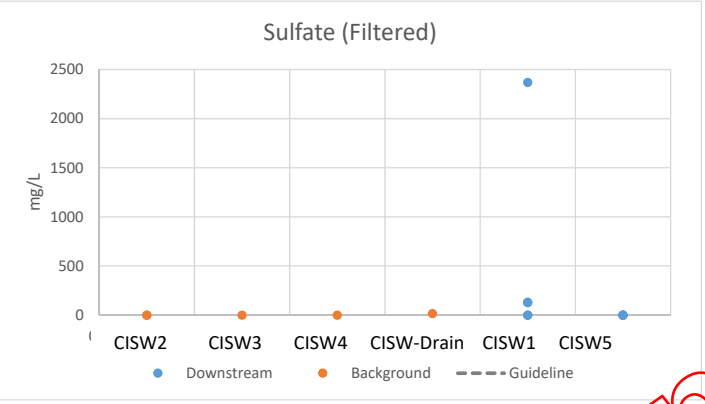
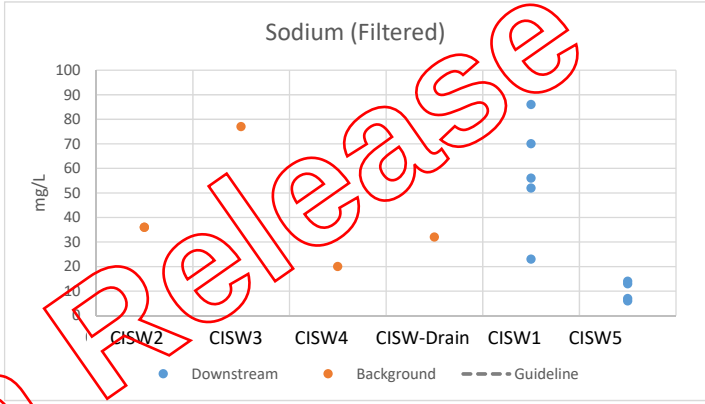
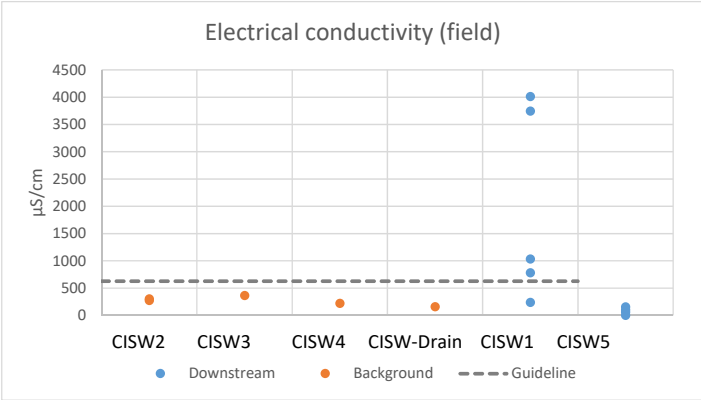
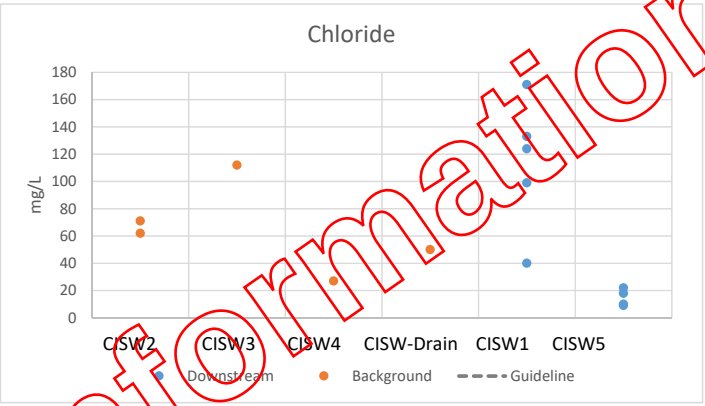
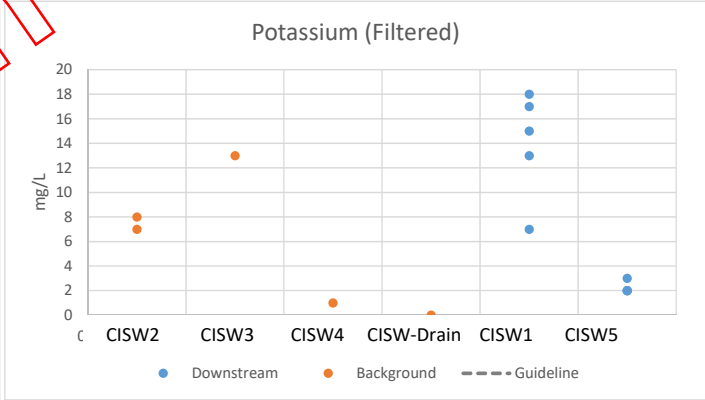


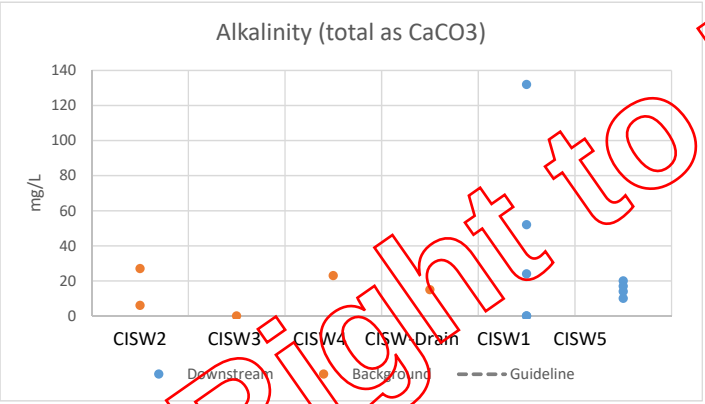


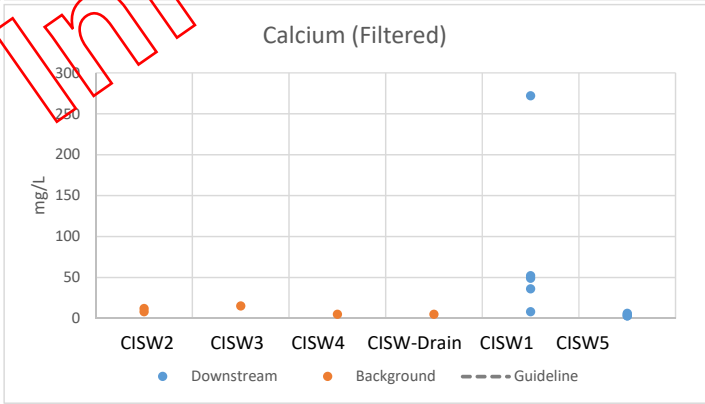


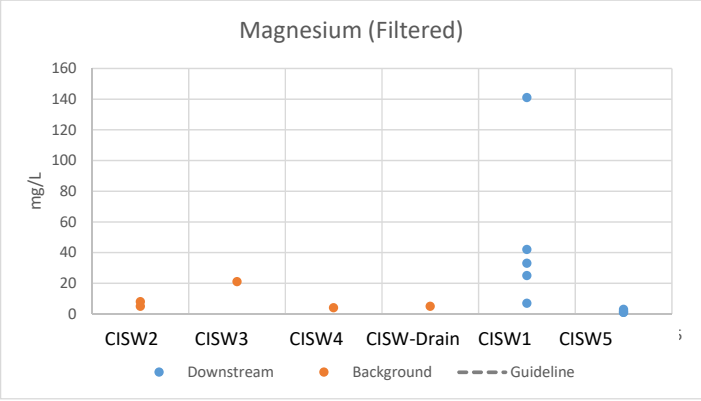




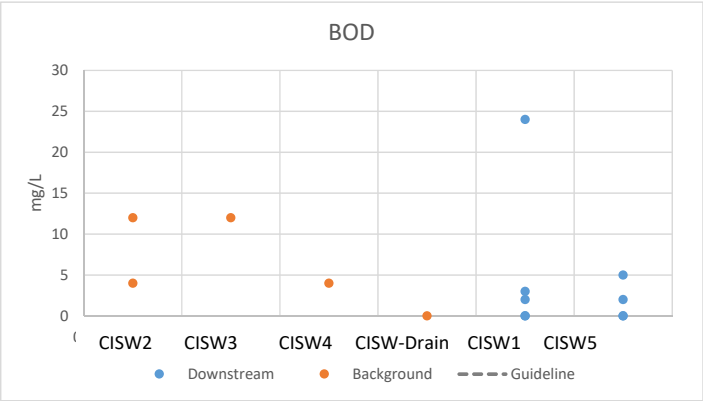


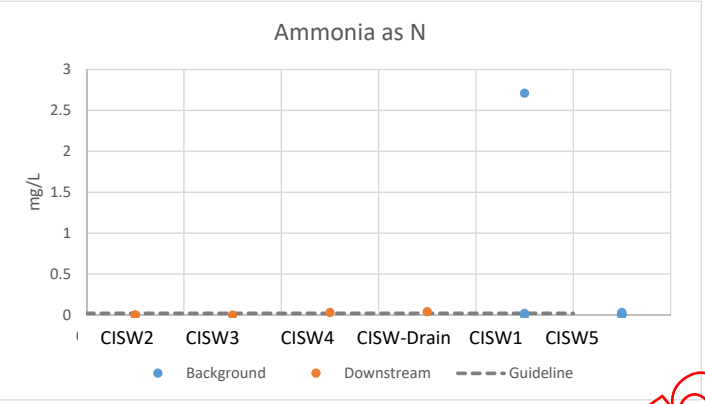


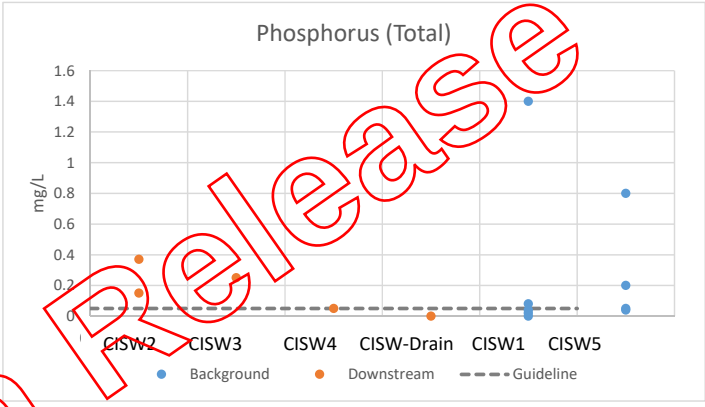


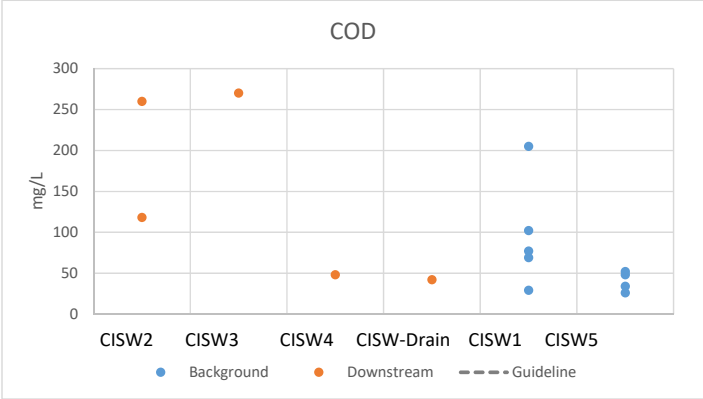


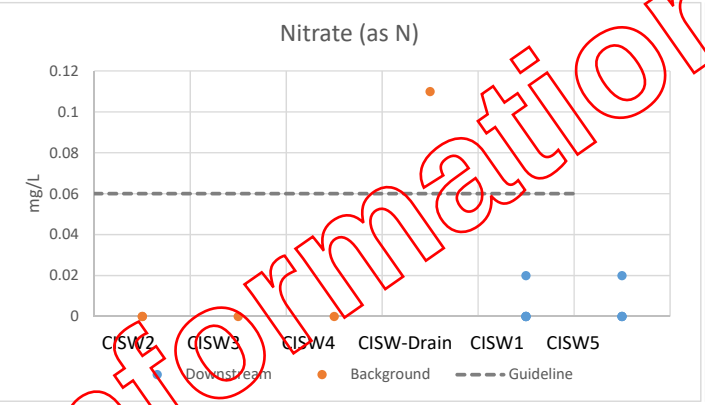
Right to Information Release

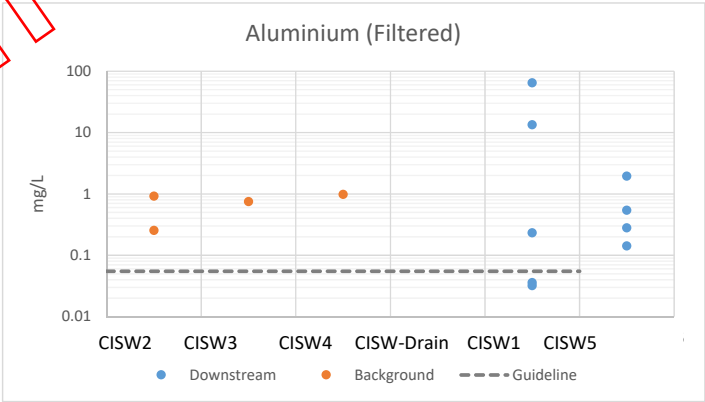


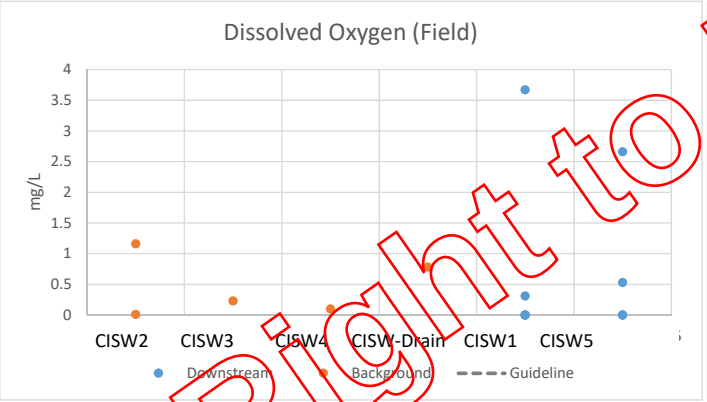


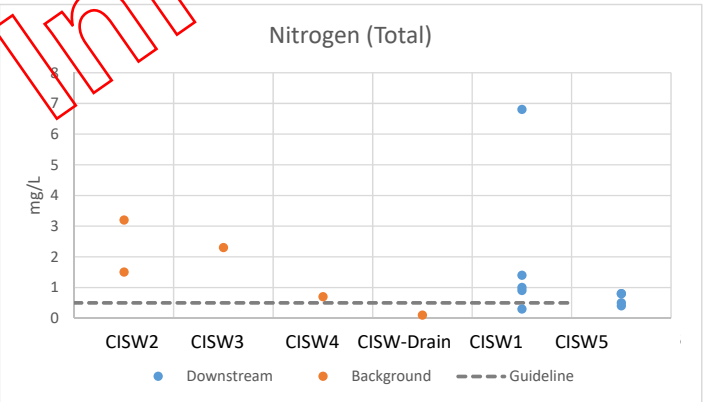


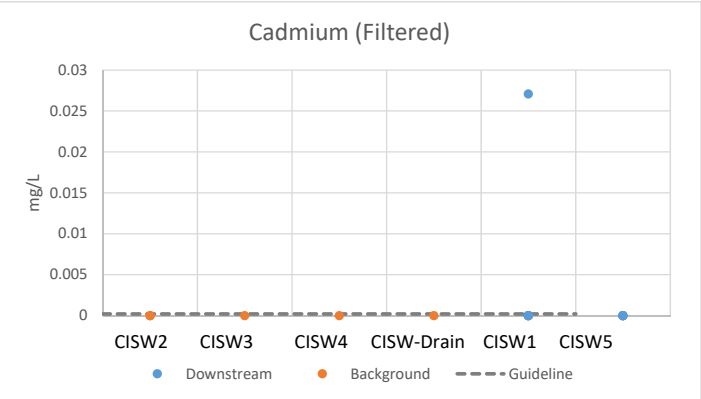












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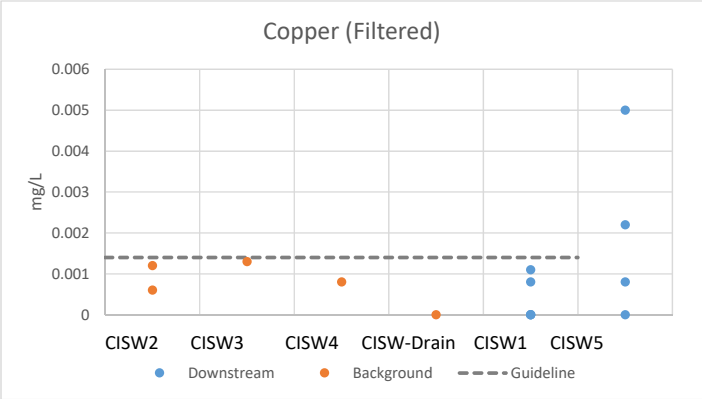

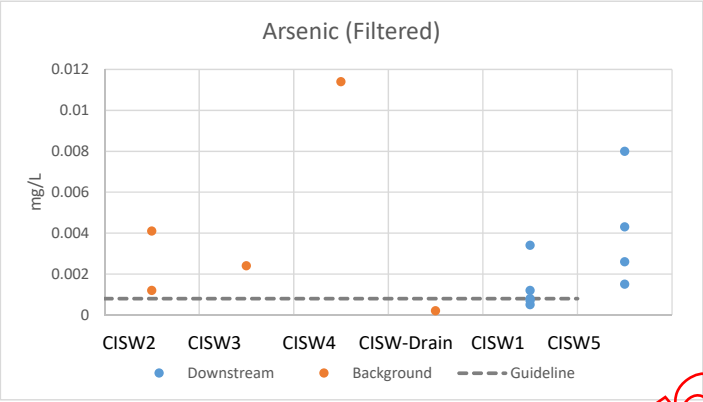

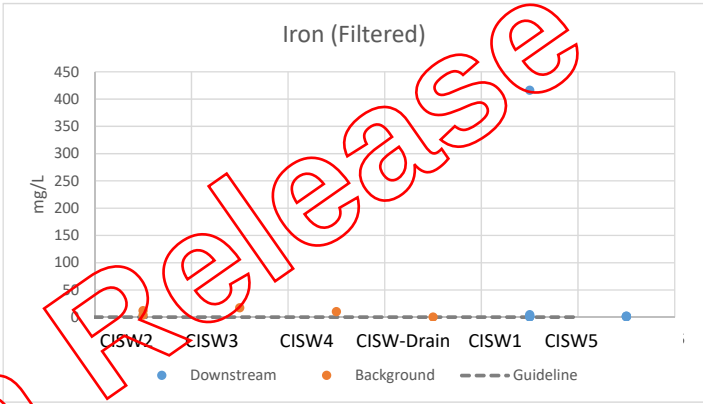

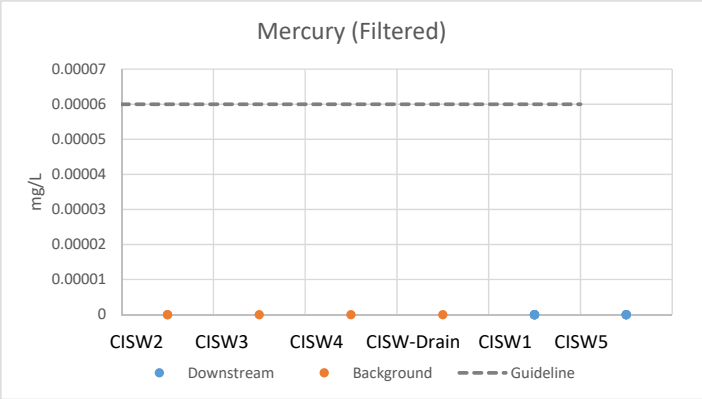

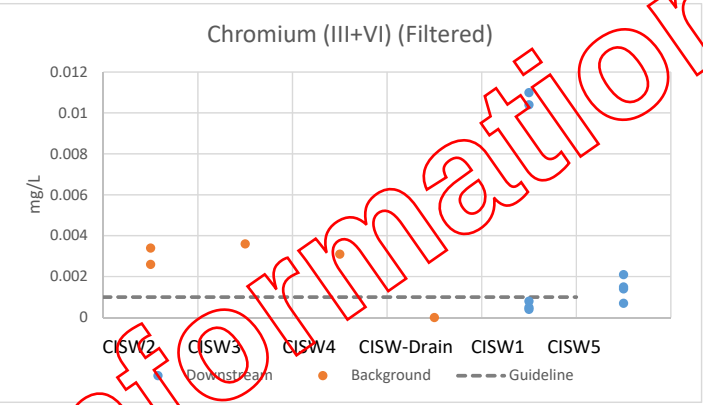

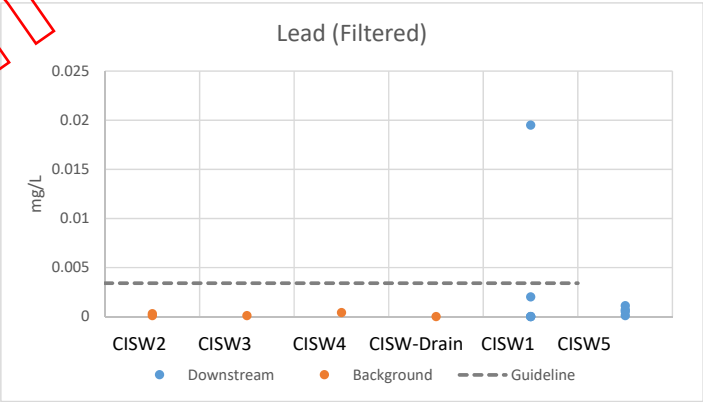

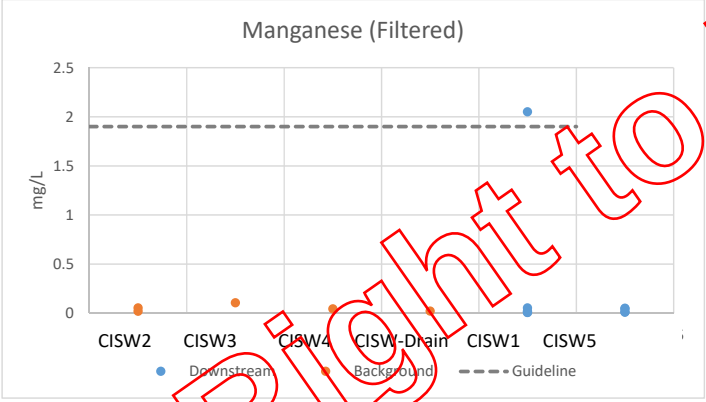

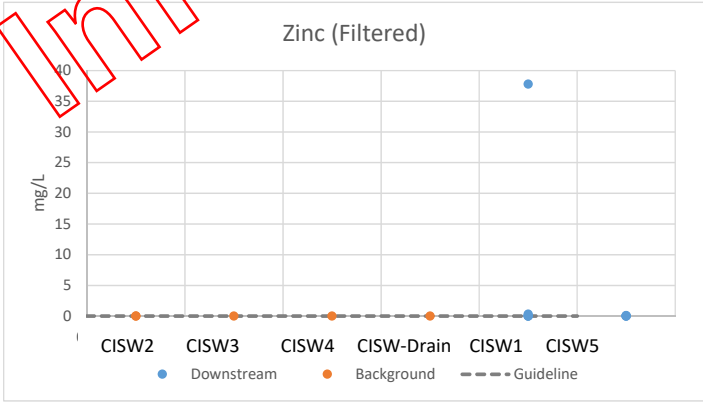

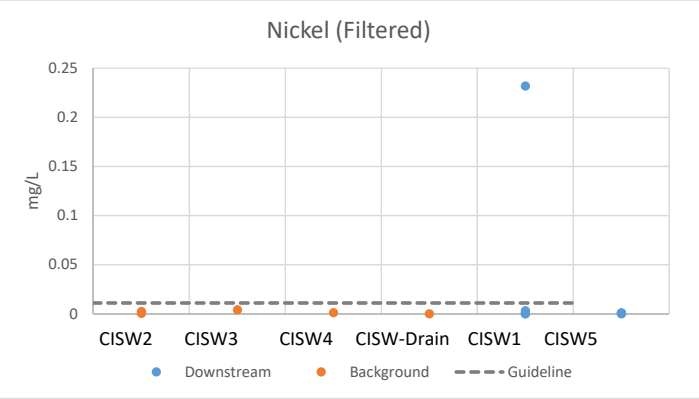

Right to Information Release

Appendix D – Official laboratory documentation

Right to Information Release

ALS Environmental

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8260 9000 E: adelaide@alsglobal.com
BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
CAIRNS 1/5 Kenworthy St Caravan Park Cairns QLD 4870 Ph: 07 4031 9600 E: cairns@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 3-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4958 9433 E: samples.newcastle@alsglobal.com
TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
NOWRA 4/13 Leary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

Environmental Division Brisbane
Work Order Reference
EB1907826

Telephone : + 61-7-3243 7222

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle):
OFFICE:		☐ Non Standard or urgent TAT (List due date): 5 Day TAT	Custody Seal Intact? Yes No N/A
Location: Coochiemudlo Island	ALS QUOTE NO.: EN/667/13 V4		Free ice / frozen ice bricks present upon receipt? Yes No N/A
JOB NUMBER: 4127018		1 2 3 4 5 6 7	Random Sample Temperature on receipt: C
PROJECT MANAGER: James Dowdeswell	CONTACT PH: 3316 3458	1 2 3 4 5 6 7	Cooling Method: Other sample(s):
SAMPLER: Jeremy GANARD	SAMPLER MOBILE		
	EDD FORMAT: EXCEL ESDAT & PDF		
Email Reports to:		RELINQUISHED BY: Rachel Hughes	RELINQUISHED BY:
Email Invoice to:AP-FSS@ghd.com /		DATE/TIME: 27/03/2019	DATE/TIME:
Reference to ALS Quote No with Table / Suite No's...			RECEIVED BY: DAN B
			DATE/TIME: 27/3/19 @ 8:50

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Note Limited holding times on: Ammonia, Nitrate and Nitrite

ALS USE | SAMPLE DETAILS | CONTAINER INFORMATION | ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required). | Additional Information

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Major Cations (Calcium, Magnesium, Sodium, Potassium)	Major Anions (Chloride, Sulfate, Alkalinity)	Ammonia as N, Nitrite, Nitrate, Total Nitrogen as N inc NOX & TKN, Total Phosphorus	Dissolved Metals: (Mn, Al, Fe, As, Cu, Pb, Zn, Ni, Cd, Cr, Hg) ULTRA TRACE	Total Organic Carbon (TOC)	BOD	COD	Oil / GP		Dissolved Metals: (Mn, Al, Fe, As, Cu, Pb, Zn, Ni, Cd, Cr, Hg)						Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
						NT-1	NT-2	NT-8	W-2 EG094F	EP003	EP033	EP026SP	W-12		W-2 EG020F						
	CISW1-0319-1	28/03/2019	WATER	ANZECC		X	X	X	X	X	X	X	X								
	~~CISW2-0319-1~~	~~Not Sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								DRY
	~~CISW3-0319-1~~	~~Not Sampled~~	~~WATER~~	ANZECC		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								DRY
	~~CISW4-0319-1~~	~~Not Sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								DRY
	~~CISW5-0319-1~~	~~Not Sampled~~	WATER	ANZECC		X	X	X	X	X	X	X	X		X						Already sampled
	~~GW1-0319-1~~	~~Not Sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
	~~GW2-0319-1~~	~~Not Sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
	~~GW3-0319-1~~	~~Not Sampled~~	~~WATER~~	ANZECC		X	X	X	X	X	X	X	X		X						
	~~GW5-0319-1~~	~~Not Sampled~~	WATER	ANZECC		X	X	X	X	X	X	X	X		X						
	~~GW6-0319-1~~	~~Not Sampled~~	WATER	ANZECC		X	X	X	X	X	X	X	X		X						
	~~QA3-0319-1~~	~~Not Sampled~~	~~WATER~~	ANZECC		X	X	X	X	X	X	X	X		X						
	~~QA1-0319-1~~	~~Not Sampled~~	WATER	ANZECC	4 bottles			X		X			X		X						
	~~QA4-0319-1~~	~~Not Sampled~~	WATER	ANZECC	4 bottles			X		X			X		X						
					TOTAL																

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

Right to Information Release

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1907826**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	:	E-mail	:
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8639
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 4127018	Page	: 1 of 3
Order number	: 4127018	Quote number	: EB2013GHDSER0700 (BN/587/13 V4)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Coochiemudlo Island		
Sampler	: JEREMY CANARD		

Dates

Date Samples Received	: 27-Mar-2019 08:50	Issue Date	: 27-Mar-2019
Client Requested Due Date	: 02-Apr-2019	Scheduled Reporting Date	: **02-Apr-2019**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 10.9°C, 8.8°C - Ice present
Receipt Detail	: MED ESKY	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please be advised that where "W-2 EG094F" has been submitted, only ultra-trace metals have been assigned as per previous submissions. If this is incorrect, please contact Client Services at ALSEnviro.Brisbane@alsglobal.com.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **COD analysis will be conducted by ALS Environmental, Melbourne, NATA accreditation No. 825, Site No. 13778.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**

Right to Information Release

Sample Container(s)/Preservation Non-Compliances

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

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

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

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP026SP Chemical Oxygen Demand (COD)	WATER - EP030 BOD	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-08 Total Nitrogen + NO2 + NO3 + NH3 + Total P
EB1907826-001	26-Mar-2019 00:00	CISW1-0319-1	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG035F Dissolved Mercury	WATER - EG094-F Dissolved Metals by ORC - Ultra Trace in Fresh	WATER - W-12 OC/OP Pesticides
EB1907826-001	26-Mar-2019 00:00	CISW1-0319-1	✓	✓	✓

Proactive Holding Time Report

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

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Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)		
- A4 - AU Tax Invoice (INV)	Email	ap-fss@ghd.com
GHD LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	GHDLabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	GHDLabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	GHDLabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	GHDLabreports@ghd.com
- Chain of Custody (CoC) (COC)	Email	GHDLabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	GHDLabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	GHDLabreports@ghd.com
JAMES DOWDESWELL		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- A4 - AU Tax Invoice (INV)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
JEMILA DARR		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
JEREMY CANARD		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
LEMUEL CABAHUG		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	

Right to Information Release

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1907826**	Page	: 1 of 6
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 27-Mar-2019 08:50
Order number	: 4127018	Date Analysis Commenced	: 27-Mar-2019
C-O-C number	: ----	Issue Date	: 08-Apr-2019 13:29
Sampler	: JEREMY CANARD		
Site	: Coochiemudlo Island		
Quote number	: BN/587/13 V4		
No. of samples received	: 1		
No. of samples analysed	: 1		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

Right to Information Release

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EK057G (Nitrite as N): Sample EB1907826_001 (CISW1-0319-1) was diluted due to matrix interference. LOR adjusted accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-0319-1	----	----	----	----
			Client sampling date / time	26-Mar-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1907826-001	--------	--------	--------	--------
				Result	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2370	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	99	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	272	----	----	----	----
Magnesium	7439-95-4	1	mg/L	141	----	----	----	----
Sodium	7440-23-5	1	mg/L	86	----	----	----	----
Potassium	7440-09-7	1	mg/L	15	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	64800	----	----	----	----
Arsenic	7440-38-2	0.2	µg/L	3.4	----	----	----	----
Cadmium	7440-43-9	0.05	µg/L	27.1	----	----	----	----
Chromium	7440-47-3	0.2	µg/L	11.0	----	----	----	----
Iron	7439-89-6	2	µg/L	416000	----	----	----	----
Lead	7439-92-1	0.1	µg/L	19.5	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	2050	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	232	----	----	----	----
Zinc	7440-66-6	1	µg/L	37800	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	2.71	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.10	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.04	----	----	----	----

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-0319-1	----	----	----	----
			Client sampling date / time	26-Mar-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1907826-001	--------	--------	--------	--------
				Result	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	6.8	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	6.8	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.08	----	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	52.1	----	----	----	----
Total Cations	----	0.01	meq/L	60.1	----	----	----	----
Ionic Balance	----	0.01	%	7.13	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	44	----	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	205	----	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	24	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	----	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	----	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	----	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	----	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	----	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	----	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	----	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	----	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	----	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	----	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	----	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	----	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	----	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	----	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	----	----	----	----

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-0319-1	----	----	----	----
			Client sampling date / time	26-Mar-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1907826-001	--------	--------	--------	--------
				Result	----	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	----	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	----	----	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	----	----	----	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	----	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	----	----	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	----	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	----	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	----	----	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	----	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	----	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	----	----	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	----	----	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	----	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	----	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	----	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	----	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	----	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	----	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**61.6**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**66.6**	----	----	----	----

Right to Information Release

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	45	139
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	45	139

Right to Information Release

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1907826**	Page	: 1 of 8
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 27-Mar-2019
Order number	: 4127018	Date Analysis Commenced	: 27-Mar-2019
C-O-C number	: ----	Issue Date	: 03-Apr-2019
Sampler	: JEREMY CANARD		
Site	: Coochiemudlo Island		
Quote number	: BN/587/13 V4		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

Right to Information Release

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 2269898)									
EB1907814-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	3810	3810	0.00	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2160	2230	2.98	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	5970	6040	1.09	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2262323)									
EB1907833-008	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	16	16	0.00	0% - 50%
EB1907775-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2590	2550	1.65	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 2262324)									
EB1907833-008	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	47	47	0.00	0% - 20%
EB1907775-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	18600	18500	0.332	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 2262372)									
EB1907794-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	25	25	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	18	18	0.00	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	46	47	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	6	6	0.00	No Limit
EB1907809-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	15	17	12.6	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	8	8	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	50	53	4.63	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	6	6	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2262373)									
EB1907794-008	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EB1907826-001	CISW1-0319-1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2262301)									
EB1907650-001	Anonymous	EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2262301) - continued									
EB1907650-001	Anonymous	EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	1.6	1.4	12.5	No Limit
		EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.0005 mg/L	<0.5	0.00	No Limit
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	<1	<1	0.00	No Limit
		EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	<5	0.00	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2262303)									
EB1907826-001	CISW1-0319-1	EG094B-F: Iron	7439-89-6	2	µg/L	416000	414000	0.496	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2268704)									
EB1907812-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.01	0.02	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2262325)									
EB1907824-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1907775-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2268703)									
EB1907836-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1907812-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.01	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2262591)									
EB1907677-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	64.0	65.1	1.66	0% - 20%
EB1907809-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.6	0.7	0.00	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2262590)									
EB1907677-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	12.1	12.0	0.969	0% - 20%
EB1907809-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.12	0.12	0.00	0% - 50%
EP005: Total Organic Carbon (TOC) (QC Lot: 2262887)									
EB1907736-003	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	1	3	93.0	No Limit
EB1907833-004	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	3	5	42.4	No Limit
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 2270047)									
EB1907823-001	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	6020	5700	5.63	0% - 20%
EM1904478-003	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	11	<10	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2262043)									
EB1907824-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	242	222	8.35	0% - 20%
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2266948)									
EB1907826-001	CISW1-0319-1	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2266948) - continued									
EB1907826-001	CISW1-0319-1	EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.00	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2266948)									
EB1907826-001	CISW1-0319-1	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.00	No Limit

Right to Information Release

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 2269898)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	50 mg/L	106	80	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2262323)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	85	118
				<1	100 mg/L	95.6	85	118
ED045G: Chloride by Discrete Analyser (QCLot: 2262324)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	100	90	115
				<1	1000 mg/L	103	90	115
ED093F: Dissolved Major Cations (QCLot: 2262372)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 2262373)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	88.1	84	118
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2262301)								
EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	50 µg/L	117	80	120
EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	10 µg/L	112	80	120
EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	10 µg/L	112	80	120
EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	10 µg/L	99.5	80	120
EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	10 µg/L	99.4	80	120
EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	108	80	120
EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	107	80	120
EG094A-F: Zinc	7440-66-6	1	µg/L	<1	20 µg/L	105	80	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2262303)								
EG094B-F: Iron	7439-89-6	2	µg/L	<2	50 µg/L	106	80	120
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2268704)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	101	86	112
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2262325)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	99.0	90	110
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2268703)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	96.8	89	115
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2262591)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	1 mg/L	91.0	70	108

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2262590)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.442 mg/L	94.4	79	105
EP005: Total Organic Carbon (TOC) (QCLot: 2262887)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	80.0	79	113
				<1	100 mg/L	89.0	79	113
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2270047)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	500 mg/L	101	92	108
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2262043)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	96.6	77	115
EP068A: Organochlorine Pesticides (OC) (QCLot: 2266948)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	88.9	60	131
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	85.6	45	126
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	85.0	63	128
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	90.2	60	130
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	79.9	59	120
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	93.1	48	132
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	84.6	54	120
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	80.4	57	122
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	85.1	56	121
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	82.7	57	123
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	85.9	56	122
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	86.7	55	124
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	91.5	53	122
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	89.4	49	131
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	89.8	50	121
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	90.1	47	123
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	85.2	42	122
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	95.0	50	130
EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	5 µg/L	97.1	39	134
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	98.0	51	129
EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	5 µg/L	90.1	46	139
EP068: Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2266948)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	92.8	53	133
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	84.1	44	158

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Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2266948) - continued								
EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	5 µg/L	11.9	5	33
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	66.2	28	153
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	83.9	56	141
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	79.5	58	130
EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	5 µg/L	73.1	45	139
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	90.7	48	135
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	83.8	53	133
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	85.9	56	125
EP068: Parathion	56-38-2	2	µg/L	<2.0	5 µg/L	81.9	37	144
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	95.2	50	131
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	101	37	131
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	93.6	47	127
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	78.2	16	150
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	92.1	46	128
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	91.4	39	129
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	96.0	38	134
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	58.6	28	146

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2262323)							
EB1907775-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	# Not Determined	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 2262324)							
EB1907775-002	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	# Not Determined	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2262373)							
EB1907794-009	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	89.5	70	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2262301)							
EB1907650-002	Anonymous	EG094A-F: Arsenic	7440-38-2	50 µg/L	114	70	130
		EG094A-F: Cadmium	7440-43-9	50 µg/L	128	70	130
		EG094A-F: Chromium	7440-47-3	50 µg/L	112	70	130
		EG094A-F: Lead	7439-92-1	50 µg/L	95.7	70	130

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2262301) - continued							
EB1907650-002	Anonymous	EG094A-F: Manganese	7439-96-5	50 µg/L	120	70	130
		EG094A-F: Nickel	7440-02-0	50 µg/L	116	70	130
		EG094A-F: Zinc	7440-66-6	100 µg/L	109	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2268704)							
EB1907817-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	103	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2262325)							
EB1907775-002	Anonymous	EK057G: Nitrite as N	14797-65-0	0.4 mg/L	96.6	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2268703)							
EB1907817-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	128	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2262591)							
EB1907677-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	105	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2262590)							
EB1907677-002	Anonymous	EK067G: Total Phosphorus as P	----	5 mg/L	100.0	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 2262887)							
EB1907740-004	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	92.2	70	130
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2270047)							
EB1907823-002	Anonymous	EP026SP: Chemical Oxygen Demand	----	2500 mg/L	89.2	70	130

Right to Information Release

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1907826**	Page	: 1 of 8
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 27-Mar-2019
Site	: Coochiemudlo Island	Issue Date	: 03-Apr-2019
Sampler	: JEREMY CANARD	No. of samples received	: 1
Order number	: 4127018	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Right to Information Release

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EB1907775--002	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EB1907775--002	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Pesticides by GCMS	1	14	7.14	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Pesticides by GCMS	0	14	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**01-Apr-2019**	09-Apr-2019	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**28-Mar-2019**	23-Apr-2019	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**28-Mar-2019**	23-Apr-2019	✓
ED093F: Dissolved Major Cations							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (ED093F) CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**29-Mar-2019**	23-Apr-2019	✓

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)							
CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**29-Mar-2019**	23-Apr-2019	✓
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG094B-F)							
CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**29-Mar-2019**	22-Sep-2019	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**01-Apr-2019**	23-Apr-2019	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**28-Mar-2019**	28-Mar-2019	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**01-Apr-2019**	23-Apr-2019	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
CISW1-0319-1	**26-Mar-2019**	**28-Mar-2019**	23-Apr-2019	✓	**28-Mar-2019**	23-Apr-2019	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
CISW1-0319-1	**26-Mar-2019**	**28-Mar-2019**	23-Apr-2019	✓	**28-Mar-2019**	23-Apr-2019	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**28-Mar-2019**	23-Apr-2019	✓
EP026SP: Chemical Oxygen Demand (Spectrophotometric)							
Clear Plastic Bottle - Sulfuric Acid (EP026SP)							
CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**01-Apr-2019**	23-Apr-2019	✓
EP030: Biochemical Oxygen Demand (BOD)							
Clear Plastic Bottle - Natural (EP030)							
CISW1-0319-1	**26-Mar-2019**	**----**	----	----	**27-Mar-2019**	28-Mar-2019	✓
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068)							
CISW1-0319-1	**26-Mar-2019**	**29-Mar-2019**	02-Apr-2019	✓	**29-Mar-2019**	08-May-2019	✓
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068)							
CISW1-0319-1	**26-Mar-2019**	**29-Mar-2019**	02-Apr-2019	✓	**29-Mar-2019**	08-May-2019	✓

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Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	1	100.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	14	7.14	10.00	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	0	14	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

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Analytical Methods	Method	Matrix	Method Descriptions
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloued and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)

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Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

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ALS Environmental

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
CAIRNS 16 Callinan Drive Cairns QLD 4680 Ph: 07 4011 9600 E: cairnsinfo@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
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PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7555 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WODLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Brisbane		☐ Non Standard or urgent TAT (List due date): 5 Day TAT	Custody seal intact? Yes / No / N/A
Location: Doochiemudlo Island	ALS QUOTE NO.: EN/687/19 V4		Freeze / frozen ice bricks present upon receipt? Yes / No / N/A
JOB NUMBER: 4127018		1 2 3 4 5 6 7	Random Sample Temperature on Receipt:
PROJECT MANAGER: James Dowdeswell	CONTACT PH: 3316 3459	1 2 3 4 5 6 7	Other comments:
SAMPLER: Jeremy CANARD / Kyra O'Sullivan	SAMPLER MOBILE:		
	EDD FORMAT: EXCEL ESDAT & PDF		
Email Reports to:			
Email Invoice to: AP-FSS@ghd.com			
Reference to ALS Quote No with Table / Suite No's...			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Jet Courier	Liam C		
DATE/TIME: 15/03/2019	DATE/TIME: 15/03/19 15:31	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Note Limited holding times on: Ammonia, Nitrate and Nitrite

ALS USE — SAMPLE DETAILS — CONTAINER INFORMATION — ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price). Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required). — Additional Information

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Major Cations (Calcium, Magnesium, Sodium, Potassium) NT-1	Major Anions (Chloride, Sulfate, Alkalinity) NT-2	Ammonia as N, Nitrite, Nitrate, Total Nitrogen as N inc NOX & TKN, Total Phosphorus NT-8	Dissolved Metals (Mn, Al, Fe, As, Cu, Pb, Zn, Ni, Cd, Cr, Hg) ULTRA TRACE W-2 EG094F	Total Organic Carbon (TOC) EP005	BOD EP030	COD EP025R	OC / OP W-12		Dissolved Metals (Mn, Al, Fe, As, Cu, Pb, Zn, Ni, Cd, Cr, Hg) W-2 EG020F						Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	CISW1-0319-1	Not Sampled	WATER	ANZECC		X	X	X	X	X	X	X	X								DRY
	CISW2-0319-1	Not Sampled	WATER	ANZECC		X	X	X	X	X	X	X	X								DRY
	CISW3-0319-1	Not Sampled	WATER	ANZECC		X	X	X	X	X	X	X	X								DRY
	CISW4-0319-1	Not Sampled	WATER	ANZECC		X	X	X	X	X	X	X	X								DRY
1	CISW5-0319-1	15/03/2019	WATER	ANZECC		X	X	X	X	X	X	X	X		X						
	GW4-0319-1	Not Sampled	WATER	ANZECC		X	X	X	X	X	X	X	X								DRY
	GW2-0319-1	Not Sampled	WATER	ANZECC		X	X	X	X	X	X	X	X								DRY
2	GW3-0319-1	15/03/2019	WATER	ANZECC		X	X	X	X	X	X	X	X		X						
3	GW5-0319-1	15/03/2019	WATER	ANZECC		X	X	X	X	X	X	X	X		X						
4	GW6-0319-1	15/03/2019	WATER	ANZECC		X	X	X	X	X	X	X	X		X						Attention - high suspended solids in amber glass and 2 green plastics
5	QA3-0319-1	15/03/2019	WATER	ANZECC		X	X	X	X	X	X	X	X		X						
6	QA1-0319-1	15/03/2019	WATER	ANZECC	4 bottles			X		X			X		X						
7	QA4-0319-1	15/03/2019	WATER	ANZECC	4 bottles			X		X			X		X						
					TOTAL																

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

HT

Environmental Division
Brisbane
Work Order Reference
EB1906684

Telephone : + 61-7-3243 7222

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ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1906684**	Page	: 1 of 10
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 15-Mar-2019 15:31
Order number	: 4127018	Date Analysis Commenced	: 16-Mar-2019
C-O-C number	: ----	Issue Date	: 22-Mar-2019 17:18
Sampler	: JEREMY CANARD		
Site	: Coochiemudlo Island		
Quote number	: BN/587/13 V4		
No. of samples received	: 7		
No. of samples analysed	: 7		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Organics, Stafford, QLD
Santusha Pandra	Organic Chemist	Brisbane Organics, Stafford, QLD

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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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ED041G (Sulfate (Turbidimetric) as SO4 2-): Sample EB1906684_001 (CISW5-0319-1) was diluted due to matrix interference. LOR adjusted accordingly.
- EP026SP(COD) Particular sample required dilution prior to analysis due to matrix interferences. LOR values have been adjusted accordingly.
- EP005: Result for sample 'QA3-0319-1' may bias low due to large amounts of sediment. The sample was decanted before analysis.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW5-0319-1	GW3-0319-1	GW5-0319-1	GW6-0319-1	QA3-0319-1
			Client sampling date / time	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EB1906684-001	EB1906684-002	EB1906684-003	EB1906684-004	EB1906684-005
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	14	10	3	<1	6
Total Alkalinity as CaCO3	----	1	mg/L	14	10	3	<1	6
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<5	9	17	18	8
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	9	25	80	872	22
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	3	1	1	4	1
Magnesium	7439-95-4	1	mg/L	1	2	5	68	1
Sodium	7440-23-5	1	mg/L	6	20	55	385	18
Potassium	7440-09-7	1	mg/L	2	<1	<1	2	<1
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.28	0.20	0.01	7.62	0.16
Arsenic	7440-38-2	0.001	mg/L	0.008	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.005	0.003	<0.001	<0.001	0.003
Lead	7439-92-1	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.044	0.005	0.002	0.136	0.005
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	0.003	<0.001
Zinc	7440-66-6	0.005	mg/L	0.011	0.012	<0.005	0.024	0.010
Iron	7439-89-6	0.05	mg/L	1.37	0.29	<0.05	0.48	0.21
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	221	163	10	7580	274
Arsenic	7440-38-2	0.2	µg/L	7.7	<0.2	<0.2	<0.2	<0.2
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.2	µg/L	1.5	0.7	0.4	0.2	1.1
Copper	7440-50-8	0.5	µg/L	3.9	2.4	<0.5	0.9	2.8
Iron	7439-89-6	2	µg/L	1260	231	4	479	356
Lead	7439-92-1	0.1	µg/L	1.1	0.3	<0.1	0.7	0.4

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW5-0319-1	GW3-0319-1	GW5-0319-1	GW6-0319-1	QA3-0319-1
			Client sampling date / time	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EB1906684-001	EB1906684-002	EB1906684-003	EB1906684-004	EB1906684-005
				Result	Result	Result	Result	Result
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS - Continued								
Manganese	7439-96-5	0.5	µg/L	40.0	4.5	2.2	120	4.3
Nickel	7440-02-0	0.5	µg/L	0.6	<0.5	<0.5	3.2	0.6
Zinc	7440-66-6	1	µg/L	9	11	<1	22	11
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.02	0.11	3.02	0.02	0.09
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.02	0.11	3.02	0.02	0.09
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.8	0.4	0.5	<0.1	0.4
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.8	0.5	3.5	<0.1	0.5
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.20	0.08	<0.01	<0.01	0.11
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	0.53	1.09	2.67	25.0	0.91
Total Cations	----	0.01	meq/L	0.54	1.08	2.85	22.6	0.92
Ionic Balance	----	0.01	%	----	----	----	5.00	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	17	4	<1	2	5
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	48	12	<10	<50	15
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	5	<2	<2	<2	<2
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW5-0319-1	GW3-0319-1	GW5-0319-1	GW6-0319-1	QA3-0319-1
			Client sampling date / time	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EB1906684-001	EB1906684-002	EB1906684-003	EB1906684-004	EB1906684-005
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW5-0319-1	GW3-0319-1	GW5-0319-1	GW6-0319-1	QA3-0319-1
			Client sampling date / time	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00	15-Mar-2019 00:00
Compound	CAS Number	LOR	Unit	EB1906684-001	EB1906684-002	EB1906684-003	EB1906684-004	EB1906684-005
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**96.7**	**104**	**93.8**	**84.1**	**82.4**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**92.7**	**96.1**	**82.4**	**74.9**	**72.1**

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	QA1-0319-1	QA4-0319-1	----	----	----
			Client sampling date / time	15-Mar-2019 00:00	15-Mar-2019 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1906684-006	EB1906684-007	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	<1	<1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	----	----	----

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	QA1-0319-1	QA4-0319-1	----	----	----
			Client sampling date / time	15-Mar-2019 00:00	15-Mar-2019 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1906684-006	EB1906684-007	--------	--------	--------
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	----	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	----	----	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	----	----	----

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	QA1-0319-1	QA4-0319-1	----	----	----
			Client sampling date / time	15-Mar-2019 00:00	15-Mar-2019 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EB1906684-006	EB1906684-007	--------	--------	--------
				Result	Result	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	82.2	80.2	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	70.9	63.6	----	----	----

Right to Information Release

Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	45	139
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	45	139

Right to Information Release

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1906684**	Page	: 1 of 11
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
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Project	: 4127018	Date Samples Received	: 15-Mar-2019
Order number	: 4127018	Date Analysis Commenced	: 16-Mar-2019
C-O-C number	: ----	Issue Date	: 22-Mar-2019
Sampler	: JEREMY CANARD		
Site	: Coochiemudlo Island		
Quote number	: BN/587/13 V4		
No. of samples received	: 7		
No. of samples analysed	: 7		

ilac-MRA NATA

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ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Organics, Stafford, QLD
Santusha Pandra	Organic Chemist	Brisbane Organics, Stafford, QLD

Right to Information Release

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 2239101)									
EB1906684-001	CISW5-0319-1	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	14	14	0.00	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	14	14	0.00	0% - 50%
EB1906634-011	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	398	411	3.36	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	398	411	3.36	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2239044)									
EB1906031-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	428	426	0.367	0% - 20%
EB1906126-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	111	111	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2239052)									
EB1906684-003	GW5-0319-1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	17	17	0.00	0% - 50%
ED045G: Chloride by Discrete Analyser (QC Lot: 2239043)									
EB1906031-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	2540	2550	0.753	0% - 20%
EB1906126-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	4010	4000	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 2239051)									
EB1906684-003	GW5-0319-1	ED045G: Chloride	16887-00-6	1	mg/L	80	81	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 2238939)									
EB1906645-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	23	22	6.60	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	31	29	8.36	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	850	795	6.72	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	4	0.00	No Limit
EB1906632-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	3	0.00	No Limit

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
ED093F: Dissolved Major Cations (QC Lot: 2238939) - continued									
EB1906632-001	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	629	614	2.36	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	13	12	0.00	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 2238944)									
EB1906684-001	CISW5-0319-1	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.008	0.007	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.005	0.005	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.044	0.045	0.00	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.011	0.011	0.00	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.28	0.28	0.00	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	1.37	1.38	1.35	0% - 20%
EB1906689-003	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.910	0.919	1.05	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.016	0.016	0.00	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.023	0.024	0.00	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.04	0.04	0.00	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2238943)									
EB1906689-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EB1906684-001	CISW5-0319-1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2239000)									
EB1906684-001	CISW5-0319-1	EG094B-F: Iron	7439-89-6	2	µg/L	1260	1280	0.973	0% - 20%
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2239001)									
EB1906684-001	CISW5-0319-1	EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Lead	7439-92-1	0.1	µg/L	1.1	1.0	0.00	0% - 50%
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	7.7	7.6	1.50	0% - 20%
		EG094A-F: Chromium	7440-47-3	0.2	µg/L	1.5	1.5	0.00	No Limit
		EG094A-F: Copper	7440-50-8	0.5	µg/L	3.9	3.8	0.00	No Limit
		EG094A-F: Manganese	7439-96-5	0.5	µg/L	40.0	40.4	1.13	0% - 20%
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	0.6	0.6	0.00	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	9	10	0.00	No Limit
		EG094A-F: Aluminium	7429-90-5	5	µg/L	221	228	3.14	0% - 20%

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2242665)									
EB1906021-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.03	0.02	0.00	No Limit
EB1906033-005	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	1.36	1.35	0.00	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2242667)									
EB1906684-005	QA3-0319-1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2245490)									
EB1906632-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.12	0.12	0.00	0% - 50%
EB1906679-005	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	1.42	1.51	5.66	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2239050)									
EB1906671-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1906684-003	GW5-0319-1	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2242664)									
EB1906021-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.69	0.69	0.00	0% - 20%
EB1906033-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.80	0.79	0.00	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2242666)									
EB1906684-005	QA3-0319-1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.09	0.10	10.3	0% - 50%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2245491)									
EB1906632-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.04	0.04	0.00	No Limit
EB1906679-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2245346)									
EB1906682-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.3	2.3	0.00	0% - 20%
EB1906453-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	47.9	47.8	0.297	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2245347)									
EB1906684-002	GW3-0319-1	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.08	0.08	0.00	No Limit
EB1906453-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	6.49	6.26	3.58	0% - 20%
EP005: Total Organic Carbon (TOC) (QC Lot: 2240375)									
EB1906682-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	29	28	3.52	0% - 20%
EB1906684-005	QA3-0319-1	EP005: Total Organic Carbon	----	1	mg/L	5	6	0.00	No Limit
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 2242861)									
EB1905817-001	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	<50	<50	0.00	No Limit
EB1906684-004	GW6-0319-1	EP026SP: Chemical Oxygen Demand	----	10	mg/L	<50	<50	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2239178)									
EB1906649-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	249	255	2.55	0% - 20%
EB1906684-004	GW6-0319-1	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2247489)									
EB1906684-001	CISW5-0319-1	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2247489) - continued									
EB1906684-001	CISW5-0319-1	EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.00	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2247489)									
EB1906684-001	CISW5-0319-1	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.00	No Limit

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Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 2239101)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	97.3	80	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2239044)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	105	85	118
				<1	100 mg/L	96.6	85	118
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2239052)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	106	85	118
				<1	100 mg/L	97.7	85	118
ED045G: Chloride by Discrete Analyser (QCLot: 2239043)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	100	90	115
				<1	1000 mg/L	105	90	115
ED045G: Chloride by Discrete Analyser (QCLot: 2239051)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	98.9	90	115
				<1	1000 mg/L	105	90	115
ED093F: Dissolved Major Cations (QCLot: 2238939)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS (QCLot: 2238944)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	103	79	118
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	104	88	116
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	98.3	88	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	103	87	113
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.2 mg/L	112	88	114
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	101	89	110
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	102	89	120
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	104	89	113
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.2 mg/L	101	87	113
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	103	82	114
EG035F: Dissolved Mercury by FIMS (QCLot: 2238943)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	92.8	84	118
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2239000)								
EG094B-F: Iron	7439-89-6	2	µg/L	<2	50 µg/L	93.6	80	120

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2239001)								
EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	50 µg/L	94.7	80	120
EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	10 µg/L	99.2	80	120
EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	10 µg/L	97.4	80	120
EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	10 µg/L	96.8	80	120
EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	20 µg/L	92.7	80	120
EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	10 µg/L	95.8	80	120
EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	89.0	80	120
EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	98.5	80	120
EG094A-F: Zinc	7440-66-6	1	µg/L	<1	20 µg/L	90.7	80	120
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2242665)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	101	86	112
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2242667)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	99.2	86	112
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2245490)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	98.9	86	112
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2239050)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	100	90	110
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2242664)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	97.2	89	115
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2242666)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	98.2	89	115
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2245491)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	95.5	89	115
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2245346)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	1 mg/L	96.0	70	108
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2245347)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.442 mg/L	95.5	79	105
EP005: Total Organic Carbon (TOC) (QCLot: 2240376)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	97.5	79	113
				<1	100 mg/L	102	79	113
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2242861)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	50 mg/L	94.5	86	112
				<10	500 mg/L	97.6	86	112
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2239178)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	103	77	115
EP068A: Organochlorine Pesticides (OC) (QCLot: 2247489)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	104	60	131

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2247489) - continued								
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	100	45	126
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	99.1	63	128
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	101	60	130
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	92.5	59	120
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	101	48	132
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	95.4	54	120
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	99.5	57	122
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	99.2	56	121
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	93.5	57	123
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	99.4	56	122
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	93.0	55	124
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	99.1	53	122
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	104	49	131
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	95.0	50	121
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	99.6	47	123
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	98.9	42	122
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	95.9	50	130
EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	5 µg/L	100	39	134
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	107	51	129
EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	5 µg/L	95.9	46	139
EP068: Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2247489)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	60.5	53	133
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	116	44	158
EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	5 µg/L	17.2	5	33
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	79.6	28	153
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	101	56	141
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	101	58	130
EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	5 µg/L	94.6	45	139
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	112	48	135
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	108	53	133
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	101	56	125
EP068: Parathion	56-38-2	2	µg/L	<2.0	5 µg/L	102	37	144
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	110	50	131
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	109	37	131

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2247489) - continued								
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	104	47	127
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	112	16	150
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	106	46	128
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	106	39	129
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	110	38	134
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	65.7	28	146

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2239044)							
EB1906031-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	113	70	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2239052)							
EB1906684-004	GW6-0319-1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	101	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 2239043)							
EB1906031-004	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	96.5	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 2239051)							
EB1906684-004	GW6-0319-1	ED045G: Chloride	16887-00-6	400 mg/L	74.1	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 2238944)							
EB1906684-002	GW3-0319-1	EG020A-F: Aluminium	7429-90-5	0.5 mg/L	116	70	130
		EG020A-F: Arsenic	7440-38-2	0.1 mg/L	114	70	130
		EG020A-F: Cadmium	7440-43-9	0.1 mg/L	107	70	130
		EG020A-F: Chromium	7440-47-3	0.1 mg/L	106	70	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	114	70	130
		EG020A-F: Lead	7439-92-1	0.1 mg/L	110	70	130
		EG020A-F: Manganese	7439-96-5	0.1 mg/L	110	70	130
		EG020A-F: Nickel	7440-02-0	0.1 mg/L	109	70	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	116	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2238943)							
EB1906684-002	GW3-0319-1	EG035F: Mercury	7439-97-6	0.01 mg/L	81.8	70	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2239001)							
EB1906684-002	GW3-0319-1	EG094A-F: Arsenic	7440-38-2	50 µg/L	101	70	130
		EG094A-F: Cadmium	7440-43-9	50 µg/L	100	70	130

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2239001) - continued							
EB1906684-002	GW3-0319-1	EG094A-F: Chromium	7440-47-3	50 µg/L	94.4	70	130
		EG094A-F: Copper	7440-50-8	100 µg/L	93.6	70	130
		EG094A-F: Lead	7439-92-1	50 µg/L	94.3	70	130
		EG094A-F: Manganese	7439-96-5	50 µg/L	89.6	70	130
		EG094A-F: Nickel	7440-02-0	50 µg/L	95.2	70	130
		EG094A-F: Zinc	7440-66-6	100 µg/L	93.7	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2242665)							
EB1906021-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	98.8	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2245490)							
EB1906632-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	80.1	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2239050)							
EB1906684-004	GW6-0319-1	EK057G: Nitrite as N	14797-65-0	0.4 mg/L	94.2	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2242664)							
EB1906021-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	91.7	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2245491)							
EB1906632-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	95.8	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2245346)							
EB1906600-084	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	105	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2245347)							
EB1906628-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	94.6	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 2240376)							
EB1906682-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	106	70	130
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2242861)							
EB1905817-003	Anonymous	EP026SP: Chemical Oxygen Demand	----	48 mg/L	105	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2247489)							
EB1906684-003	GW5-0319-1	EP068: gamma-BHC	58-89-9	20 µg/L	113	70	130
		EP068: Heptachlor	76-44-8	20 µg/L	112	70	130
		EP068: Aldrin	309-00-2	20 µg/L	99.0	70	130
		EP068: Dieldrin	60-57-1	20 µg/L	106	70	130
		EP068: Endrin	72-20-8	20 µg/L	104	70	130
		EP068: 4.4`-DDT	50-29-3	20 µg/L	91.0	70	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2247489)							
EB1906684-003	GW5-0319-1	EP068: Diazinon	333-41-5	10 µg/L	122	70	130
		EP068: Chlorpyrifos-methyl	5598-13-0	10 µg/L	110	70	130
		EP068: Pirimphos-ethyl	23505-41-1	10 µg/L	101	70	130

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2247489) - continued							
EB1906684-003	GW5-0319-1	EP068: Bromophos-ethyl	4824-78-6	10 µg/L	110	70	130
		EP068: Prothiofos	34643-46-4	10 µg/L	106	70	130

Right to Information Release

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1906684**	Page	: 1 of 9
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES DOWDESWELL	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 15-Mar-2019
Site	: Coochiemudlo Island	Issue Date	: 22-Mar-2019
Sampler	: JEREMY CANARD	No. of samples received	: 7
Order number	: 4127018	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Right to Information Release

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Pesticides by GCMS	1	15	6.67	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1	**15-Mar-2019**	**----**	----	----	**16-Mar-2019**	29-Mar-2019	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1	**15-Mar-2019**	**----**	----	----	**16-Mar-2019**	12-Apr-2019	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1	**15-Mar-2019**	**----**	----	----	**16-Mar-2019**	12-Apr-2019	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1	**15-Mar-2019**	**----**	----	----	**19-Mar-2019**	12-Apr-2019	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1, QA1-0319-1, QA4-0319-1	**15-Mar-2019**	**----**	----	----	**19-Mar-2019**	11-Sep-2019	✓

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1, QA1-0319-1, QA4-0319-1	**15-Mar-2019**	----	----	----	**19-Mar-2019**	12-Apr-2019	✓
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG094B-F) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1	**15-Mar-2019**	----	----	----	**18-Mar-2019**	11-Sep-2019	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1, QA1-0319-1, QA4-0319-1	**15-Mar-2019**	----	----	----	**21-Mar-2019**	12-Apr-2019	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1	**15-Mar-2019**	----	----	----	**16-Mar-2019**	17-Mar-2019	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1, QA1-0319-1, QA4-0319-1	**15-Mar-2019**	----	----	----	**21-Mar-2019**	12-Apr-2019	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1, QA1-0319-1, QA4-0319-1	**15-Mar-2019**	**21-Mar-2019**	12-Apr-2019	✓	**21-Mar-2019**	12-Apr-2019	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) CISW5-0319-1, GW3-0319-1, GW5-0319-1, GW6-0319-1, QA3-0319-1, QA1-0319-1, QA4-0319-1	**15-Mar-2019**	**21-Mar-2019**	12-Apr-2019	✓	**21-Mar-2019**	12-Apr-2019	✓

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Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
CISW5-0319-1, GW5-0319-1, QA3-0319-1, QA4-0319-1	GW3-0319-1, GW6-0319-1, QA1-0319-1,	**15-Mar-2019**	**----**	----	----	**18-Mar-2019**	12-Apr-2019	✓
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Clear Plastic Bottle - Sulfuric Acid (EP026SP)								
CISW5-0319-1, GW5-0319-1, QA3-0319-1	GW3-0319-1, GW6-0319-1,	**15-Mar-2019**	**----**	----	----	**19-Mar-2019**	12-Apr-2019	✓
EP030: Biochemical Oxygen Demand (BOD)								
Clear Plastic Bottle - Natural (EP030)								
CISW5-0319-1, GW5-0319-1, QA3-0319-1	GW3-0319-1, GW6-0319-1,	**15-Mar-2019**	**----**	----	----	**16-Mar-2019**	17-Mar-2019	✓
EP068A: Organochlorine Pesticides (OC)								
Amber Glass Bottle - Unpreserved (EP068)								
CISW5-0319-1, GW5-0319-1, QA3-0319-1, QA4-0319-1	GW3-0319-1, GW6-0319-1, QA1-0319-1,	**15-Mar-2019**	**21-Mar-2019**	22-Mar-2019	✓	**21-Mar-2019**	30-Apr-2019	✓
EP068B: Organophosphorus Pesticides (OP)								
Amber Glass Bottle - Unpreserved (EP068)								
CISW5-0319-1, GW5-0319-1, QA3-0319-1, QA4-0319-1	GW3-0319-1, GW6-0319-1, QA1-0319-1,	**15-Mar-2019**	**21-Mar-2019**	22-Mar-2019	✓	**21-Mar-2019**	30-Apr-2019	✓

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Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	5	40	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	23	13.04	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	6	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	6	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	5	40	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	6.67	10.00	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	3	21	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	3	40	7.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	23	17.39	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	3	40	7.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	21	19.05	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	3	40	7.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Biochemical Oxygen Demand (BOD)	EP030	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	3	40	**7.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)

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Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloued and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)

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Analytical Methods	Method	Matrix	Method Descriptions
Pesticides by GCMS	EP068	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

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Environmental Division Brisbane
Work Order Reference
EB1912523

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CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date): 5 Day TAT	FOR LABORATORY USE ONLY (Circle): Custody Seal Intact? Yes No N/A; Free ice / frozen ice bricks present upon receipt? Yes No N/A; Random Sample Temperature on Receipt: °C; Other comment:
OFFICE:			
Location: Coochiemudlo Island	ALS QUOTE NO.: EN / 567 / 13 V4		
JOB NUMBER: 4127018		1 2 3 4 5 6 7	
PROJECT MANAGER: James Dowdeswell	CONTACT PH: 3316 3458	1 2 3 4 5 6 7	
SAMPLER: Jeremy CANARD	SAMPLER MOBILE	RELINQUISHED BY:	RELINQUISHED BY: / RECEIVED BY:
	EDD FORMAT: EXCEL ESDAT & PDF		
Email Reports to:		DATE/TIME:	DATE/TIME: / DATE/TIME:
Email Invoice to: AP-FSS@ghd.com		16/05/2019 - 5.15pm	
Reference to ALS Quote No with Table / Suite No's...		Table 5 - GW / Table 6 - SW	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Note Limited holding times on: Ammonia, Nitrate and Nitrite

ALS USE | SAMPLE DETAILS | CONTAINER INFORMATION | ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required). | Additional Information

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	Major Cations (Calcium, Magnesium, Sodium, Potassium)	Major Anions (Chloride, Sulfate, Alkalinity)	Ammonia as N, Nitrite, Nitrate, Total Nitrogen as N inc NOX & TKN, Total Phosphorus	Dissolved Metals: (Mn, Al, Fe, As, Cu, Pb, Zn, Ni, Cd, Cr, Hg) ULTRA TRACE	Total Organic Carbon (TOC)	BOD	COD	OC+OP							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
						NT-1	NT-2	NT-8	M-2 EP5044F	EP005	EP030	EP026SP	W-12							
	CISW1-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	~~CISW2-0519-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~							
	~~CISW3-0519-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~							
	~~CISW4-0519-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~							
	CISW5-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	CISW-Drain-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	GW1-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	GW2-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	GW3-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	GW5-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	GW6-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	DUP1-0519-1	16/05/2019	WATER	ANZECC		X	X	X	X	X	X	X	X							
	~~QA1-0519-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~				~~X~~		~~X~~			~~X~~							
	~~QA4-0519-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~				~~X~~		~~X~~			~~X~~							
					TOTAL															

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

Right to Information Release

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1912523**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	:	E-mail	:
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8639
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 4127018	Page	: 1 of 5
Order number	:	Quote number	: EB2013GHDSER0700 (BN/587/13 V4)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Coochiemudlo Island		
Sampler	: JEREMY CANARD		

Dates

Date Samples Received	: 16-May-2019 17:10	Issue Date	: 16-May-2019
Client Requested Due Date	: 24-May-2019	Scheduled Reporting Date	: **24-May-2019**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 3.9°C, 11.7°C, 1.5°C, 7.6°C - Ice present
Receipt Detail	: MED ESKY	No. of samples received / analysed	: 9 / 9

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please be advised that where "W-2 EG994F" has been requested on the Chain of Custody, only the ultra-trace metals have been assigned. If this is incorrect, please contact Client Services at ALSEnviro.Brisbane@alsglobal.com.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Right to Information Release

Sample Container(s)/Preservation Non-Compliances

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

Method / Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Dissolved Mercury by FIMS : EG035F		
CISW1-0519-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
CISW-Drain-0519-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered
GW6-0519-1	- Clear Plastic Bottle - Natural	- Clear Plastic Bottle - Nitric Acid; Filtered

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG035F Dissolved Mercury	WATER - EG094-F Dissolved Metals by ORC - Ultra Trace in Fresh	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP005 Total Organic Carbon (TOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-08 Total Nitrogen + NO2 + NO3 + NH3 - Total P
EB1912523-001	16-May-2019 00:00	CISW1-0519-1	✓	✓	✓	✓	✓	✓	✓
EB1912523-002	16-May-2019 00:00	CISW-0519-1	✓	✓	✓	✓	✓	✓	✓
EB1912523-003	16-May-2019 00:00	CISW-Drain-0519-1	✓	✓	✓	✓	✓	✓	✓
EB1912523-004	16-May-2019 00:00	GW1-0519-1	✓	✓	✓	✓	✓	✓	✓
EB1912523-005	16-May-2019 00:00	GW2-0519-1	✓	✓	✓	✓	✓	✓	✓
EB1912523-006	16-May-2019 00:00	GW3-0519-1	✓	✓	✓	✓	✓	✓	✓
EB1912523-007	16-May-2019 00:00	GW5-0519-1	✓	✓	✓	✓	✓	✓	✓
EB1912523-008	16-May-2019 00:00	GW6-0519-1	✓	✓	✓	✓	✓	✓	✓
EB1912523-009	16-May-2019 00:00	DUP1-0519-1	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP026SP Chemical Oxygen Demand (COD)	WATER - EP030 BOD	WATER - W-12 OC/OP Pesticides
EB1912523-001	16-May-2019 00:00	CISW1-0519-1	✓	✓	✓
EB1912523-002	16-May-2019 00:00	CISW-0519-1	✓	✓	✓
EB1912523-003	16-May-2019 00:00	CISW-Drain-0519-1	✓	✓	✓
EB1912523-004	16-May-2019 00:00	GW1-0519-1	✓	✓	✓
EB1912523-005	16-May-2019 00:00	GW2-0519-1	✓	✓	✓
EB1912523-006	16-May-2019 00:00	GW3-0519-1	✓	✓	✓
EB1912523-007	16-May-2019 00:00	GW5-0519-1	✓	✓	✓
EB1912523-008	16-May-2019 00:00	GW6-0519-1	✓	✓	✓
EB1912523-009	16-May-2019 00:00	DUP1-0519-1	✓	✓	✓

Proactive Holding Time Report

Right to Information Release

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

Right to Information Release

Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)		
- A4 - AU Tax Invoice (INV)	Email	ap-fss@ghd.com
GHD LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	GHDLabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	GHDLabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	GHDLabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	GHDLabreports@ghd.com
- Chain of Custody (CoC) (COC)	Email	GHDLabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	GHDLabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	GHDLabreports@ghd.com
JAMES DOWDESWELL		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- A4 - AU Tax Invoice (INV)	Email	
- Attachment - Report (SUBCO)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
JEMILA DARR		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Attachment - Report (SUBCO)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
JEREMY CANARD		
- *AU Certificate of Analysis - NATA (COA)	Email	
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- EDI Format - XTab (XTAB)	Email	
LEMUEL CABAHUG		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
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PASCALE LIN		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Attachment - Report (SUBCO)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	

Right to Information Release

PASCALE LIN

- EDI Format - XTab (XTAB) Email

Right to Information Release

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1912523**	Page	: 1 of 9
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8630
Project	: 4127018	Date Samples Received	: 16-May-2019 17:10
Order number	:	Date Analysis Commenced	: 17-May-2019
C-O-C number	: ----	Issue Date	: 24-May-2019 10:50
Sampler	: JEREMY CANARD		
Site	: Coochiemudlo Island		
Quote number	: BN/587/13 V4		
No. of samples received	: 9		
No. of samples analysed	: 9		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Santusha Pandra	Organic Chemist	Brisbane Organics, Stafford, QLD

Right to Information Release

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **Amendment 24/5/19: This report has been amended as a result of misinterpretation of sample identification numbers (IDs). All analysis results are as per the previous report**
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-0519-1	CISW5-0519-1	CISW-Drain-0519-1	GW1-0519-1	GW2-0519-1
			Client sampling date / time	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00
Compound	CAS Number	LOR	Unit	EB1912523-001	EB1912523-002	EB1912523-003	EB1912523-004	EB1912523-005
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	17	15	132	116
Total Alkalinity as CaCO3	----	1	mg/L	<1	17	15	132	116
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	131	<1	15	93	41
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	124	22	50	59	169
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	36	6	5	60	47
Magnesium	7439-95-4	1	mg/L	25	2	5	19	23
Sodium	7440-23-5	1	mg/L	52	14	32	37	72
Potassium	7440-09-7	1	mg/L	13	3	<1	12	10
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	32	142	<5	<5	10
Arsenic	7440-38-2	0.2	µg/L	0.7	4.3	0.2	<0.2	2.5
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.2	µg/L	0.8	1.4	<0.2	<0.2	0.3
Copper	7440-50-8	0.5	µg/L	0.8	<0.5	<0.5	<0.5	<0.5
Iron	7439-89-6	2	µg/L	723	1930	270	6	7320
Lead	7439-92-1	0.1	µg/L	<0.1	0.1	<0.1	<0.1	<0.1
Manganese	7439-96-5	0.5	µg/L	53.2	49.6	20.4	3.4	3.6
Nickel	7440-02-0	0.5	µg/L	0.6	0.9	<0.5	<0.5	<0.5
Zinc	7440-66-6	1	µg/L	320	90	3	2	74
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.01	0.02	0.04	0.04	0.08
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	0.11	1.74	0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.11	1.74	0.01

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-0519-1	CISW5-0519-1	CISW-Drain-0519-1	GW1-0519-1	GW2-0519-1
			Client sampling date / time	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00
Compound	CAS Number	LOR	Unit	EB1912523-001	EB1912523-002	EB1912523-003	EB1912523-004	EB1912523-005
				Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.4	0.8	<0.1	0.5	0.5
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	1.4	0.8	0.1	2.2	0.5
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.06	0.05	<0.01	0.01	0.05
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	6.22	0.96	2.02	6.24	7.94
ø Total Cations	----	0.01	meq/L	6.45	1.15	2.05	6.47	7.62
ø Ionic Balance	----	0.01	%	1.76	----	----	1.86	2.01
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	23	19	2	<1	7
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	102	52	42	<10	16
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	3	2	<2	<2	6
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-0519-1	CISW5-0519-1	CISW-Drain-0519-1	GW1-0519-1	GW2-0519-1
			Client sampling date / time	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00
Compound	CAS Number	LOR	Unit	EB1912523-001	EB1912523-002	EB1912523-003	EB1912523-004	EB1912523-005
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**75.8**	**77.8**	**86.1**	**84.7**	**69.4**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**91.7**	**95.6**	**98.4**	**95.0**	**84.4**

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW3-0519-1	GW5-0519-1	GW6-0519-1	DUP1-0519-1	----
			Client sampling date / time	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	----
Compound	CAS Number	LOR	Unit	EB1912523-006	EB1912523-007	EB1912523-008	EB1912523-009	--------
				Result	Result	Result	Result	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	11	3	<1	9	----
Total Alkalinity as CaCO3	----	1	mg/L	11	3	<1	9	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	9	16	13	10	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	22	74	669	20	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	1	3	2	----
Magnesium	7439-95-4	1	mg/L	2	4	50	2	----
Sodium	7440-23-5	1	mg/L	19	50	292	19	----
Potassium	7440-09-7	1	mg/L	<1	<1	3	<1	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	108	9	4120	126	----
Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	----
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
Chromium	7440-47-3	0.2	µg/L	0.4	<0.2	<0.2	0.5	----
Copper	7440-50-8	0.5	µg/L	1.5	<0.5	0.8	1.4	----
Iron	7439-89-6	2	µg/L	148	<2	172	160	----
Lead	7439-92-1	0.1	µg/L	0.1	<0.1	1.0	0.2	----
Manganese	7439-96-5	0.5	µg/L	4.8	2.6	160	4.8	----
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	2.0	<0.5	----
Zinc	7440-66-6	1	µg/L	163	1	129	174	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.03	0.04	0.04	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.05	2.91	0.03	0.05	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.05	2.91	0.03	0.05	----

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW3-0519-1	GW5-0519-1	GW6-0519-1	DUP1-0519-1	----
			Client sampling date / time	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	----
Compound	CAS Number	LOR	Unit	EB1912523-006	EB1912523-007	EB1912523-008	EB1912523-009	--------
				Result	Result	Result	Result	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.3	0.2	0.3	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.4	3.2	0.2	0.4	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.10	<0.01	0.08	0.10	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	1.03	2.48	19.1	0.95	----
ø Total Cations	----	0.01	meq/L	1.09	2.55	17.0	1.09	----
ø Ionic Balance	----	0.01	%	----	----	5.80	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	3	<1	<1	3	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	<10	<10	<10	<10	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	<2	<2	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW3-0519-1	GW5-0519-1	GW6-0519-1	DUP1-0519-1	----
			Client sampling date / time	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	16-May-2019 00:00	----
Compound	CAS Number	LOR	Unit	EB1912523-006	EB1912523-007	EB1912523-008	EB1912523-009	--------
				Result	Result	Result	Result	----
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**89.4**	**94.5**	**88.6**	**86.4**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**93.4**	**95.3**	**91.6**	**90.8**	----

Right to Information Release

Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	45	139
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	45	139

Right to Information Release

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1912523**	Page	: 1 of 11
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 16-May-2019
Order number	:	Date Analysis Commenced	: 17-May-2019
C-O-C number	: ----	Issue Date	: 24-May-2019
Sampler	: JEREMY CANARD		
Site	: Coochiemudlo Island		
Quote number	: BN/587/13 V4		
No. of samples received	: 9		
No. of samples analysed	: 9		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Santusha Pandra	Organic Chemist	Brisbane Organics, Stafford, QLD

Right to Information Release

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 2353500)									
EB1912506-014	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	27	27	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	27	27	0.00	0% - 20%
EB1912506-021	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	51	51	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	51	51	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2351807)									
EB1912523-001	CISW1-0519-1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	131	130	0.00	0% - 20%
EB1912524-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	686	697	1.62	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 2351804)									
EB1912253-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	<1	<1	0.00	No Limit
EB1912253-012	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	<1	<1	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 2351808)									
EB1912524-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	5450	5470	0.430	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 2351966)									
EB1912522-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	64	65	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	42	43	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	334	340	1.70	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.00	No Limit
EB1912523-001	CISW1-0519-1	ED093F: Calcium	7440-70-2	1	mg/L	36	37	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	25	25	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	52	53	2.11	0% - 20%

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
ED093F: Dissolved Major Cations (QC Lot: 2351966) - continued									
EB1912523-001	CISW1-0519-1	ED093F: Potassium	7440-09-7	1	mg/L	13	13	0.00	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 2351967)									
EB1912523-001	CISW1-0519-1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2351810)									
EB1912282-001	Anonymous	EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	1.3	1.2	0.00	No Limit
		EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Copper	7440-50-8	0.5	µg/L	0.7	0.7	0.00	No Limit
		EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.0005 mg/L	<0.5	0.00	No Limit
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	<1	<1	0.00	No Limit
		EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	<5	0.00	No Limit
EB1912523-009	DUP1-0519-1	EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Lead	7439-92-1	0.1	µg/L	0.2	0.2	0.00	No Limit
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Chromium	7440-47-3	0.2	µg/L	0.5	0.5	0.00	No Limit
		EG094A-F: Copper	7440-50-8	0.5	µg/L	1.4	1.5	0.00	No Limit
		EG094A-F: Manganese	7439-96-5	0.5	µg/L	4.8	4.8	0.00	No Limit
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	174	174	0.00	0% - 20%
		EG094A-F: Aluminium	7429-90-5	5	µg/L	126	127	0.840	0% - 20%
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2351811)									
EB1912522-001	Anonymous	EG094B-F: Iron	7439-89-6	2	µg/L	143	144	0.00	0% - 20%
EB1912522-010	Anonymous	EG094B-F: Iron	7439-89-6	2	µg/L	446	445	0.390	0% - 20%
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2351812)									
EB1912523-009	DUP1-0519-1	EG094B-F: Iron	7439-89-6	2	µg/L	160	169	5.09	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2352378)									
EB1912523-001	CISW1-0519-1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.01	<0.01	0.00	No Limit
EB1912525-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.04	<0.01	116	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2351805)									
EB1912520-005	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1912523-001	CISW1-0519-1	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2352379)									
EB1912523-001	CISW1-0519-1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1912525-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2357130)									
EB1909582-003	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	3.0	2.9	0.00	No Limit
EB1912523-008	GW6-0519-1	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.1	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2357129)									
EB1909582-003	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.81	0.81	0.00	0% - 50%
EB1912523-008	GW6-0519-1	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.08	0.10	20.4	0% - 50%
EP005: Total Organic Carbon (TOC) (QC Lot: 2351695)									
EB1912523-001	CISW1-0519-1	EP005: Total Organic Carbon	----	1	mg/L	23	23	0.00	0% - 20%
EB1912524-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.00	No Limit
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 2355685)									
EB1912523-001	CISW1-0519-1	EP026SP: Chemical Oxygen Demand	----	10	mg/L	102	101	0.00	0% - 50%
EB1912525-010	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	39	39	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2354731)									
EB1912428-003	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	13	14	7.66	No Limit
EB1912523-004	GW1-0519-1	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2353051)									
EB1912523-001	CISW1-0519-1	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.00	No Limit
EB1912523-003	CISW-Drain-0519-1	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2353051) - continued									
EB1912523-003	CISW-Drain-0519-1	EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.00	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2353051)									
EB1912523-001	CISW1-0519-1	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.00	No Limit
EB1912523-003	CISW-Drain-0519-1	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2353051) - continued									
EB1912523-003	CISW-Drain-0519-1	EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.00	No Limit

Right to Information Release

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 2353500)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	97.4	80	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2351807)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	106	85	118
				<1	100 mg/L	102	85	118
ED045G: Chloride by Discrete Analyser (QCLot: 2351804)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	102	90	115
				<1	1000 mg/L	107	90	115
ED045G: Chloride by Discrete Analyser (QCLot: 2351808)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	104	90	115
				<1	1000 mg/L	107	90	115
ED093F: Dissolved Major Cations (QCLot: 2351966)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 2351967)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	103	84	118
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2351810)								
EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	50 µg/L	102	80	120
EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	10 µg/L	104	80	120
EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	10 µg/L	102	80	120
EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	10 µg/L	99.1	80	120
EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	20 µg/L	103	80	120
EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	10 µg/L	101	80	120
EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	105	80	120
EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	103	80	120
EG094A-F: Zinc	7440-66-6	1	µg/L	<1	20 µg/L	100	80	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2351811)								
EG094B-F: Iron	7439-89-6	2	µg/L	<2	50 µg/L	103	80	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2351812)								
EG094B-F: Iron	7439-89-6	2	µg/L	<2	50 µg/L	103	80	120
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2352378)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	101	86	112

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2351805)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	102	90	110
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2352379)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	94.2	89	115
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2357130)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	1 mg/L	81.3	70	108
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2357129)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.442 mg/L	91.1	79	105
EP005: Total Organic Carbon (TOC) (QCLot: 2351695)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	88.2	79	113
				<1	100 mg/L	95.7	79	113
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2355685)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	50 mg/L	95.0	86	112
				<10	500 mg/L	98.8	86	112
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2354731)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	101	77	115
EP068A: Organochlorine Pesticides (OC) (QCLot: 2353051)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	85.5	60	131
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	85.5	45	126
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	84.1	63	128
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	84.9	60	130
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	85.8	59	120
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	87.4	48	132
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	85.9	54	120
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	88.1	57	122
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	90.4	56	121
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	87.6	57	123
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	89.7	56	122
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	88.8	55	124
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	87.0	53	122
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	89.9	49	131
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	88.1	50	121
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	79.1	47	123
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	79.5	42	122
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	81.9	50	130
EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	5 µg/L	78.5	39	134
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	85.6	51	129
EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	5 µg/L	101	46	139
EP068: Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2353051) - continued								
EP068: Sum of DDD + DDE + DDT	72-54-8/72-5 5-9/50-2	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2353051)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	91.9	53	133
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	102	44	158
EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	5 µg/L	8.51	5	33
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	89.2	28	153
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	88.7	56	141
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	86.9	58	130
EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	5 µg/L	103	45	139
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	103	48	135
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	91.4	53	133
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	87.8	56	125
EP068: Parathion	56-38-2	2	µg/L	<2.0	5 µg/L	88.3	37	144
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	94.6	50	131
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	92.1	37	131
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	94.3	47	127
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	84.3	16	150
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	88.9	46	128
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	83.3	39	129
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	83.8	38	134
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	114	28	146

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2351807)							
EB1912523-006	GW3-0519-1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	101	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 2351804)							
EB1912253-002	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	108	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 2351808)							
EB1912523-006	GW3-0519-1	ED045G: Chloride	16887-00-6	400 mg/L	112	70	130

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%) MS	Recovery Limits (%) Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 2351967)							
EB1912523-002	CISW5-0519-1	EG035F: Mercury	7439-97-6	0.01 mg/L	97.8	70	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2351810)							
EB1912282-002	Anonymous	EG094A-F: Arsenic	7440-38-2	50 µg/L	106	70	130
		EG094A-F: Cadmium	7440-43-9	50 µg/L	102	70	130
		EG094A-F: Chromium	7440-47-3	50 µg/L	97.7	70	130
		EG094A-F: Copper	7440-50-8	100 µg/L	101	70	130
		EG094A-F: Lead	7439-92-1	50 µg/L	98.3	70	130
		EG094A-F: Manganese	7439-96-5	50 µg/L	102	70	130
		EG094A-F: Nickel	7440-02-0	50 µg/L	100	70	130
		EG094A-F: Zinc	7440-66-6	100 µg/L	104	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2352378)							
EB1912523-002	CISW5-0519-1	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	82.1	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2351805)							
EB1912520-006	Anonymous	EK057G: Nitrite as N	14797-65-0	0.4 mg/L	96.9	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2352379)							
EB1912523-002	CISW5-0519-1	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	79.7	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2357130)							
EB1909582-004	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	94.7	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2357129)							
EB1909582-004	Anonymous	EK067G: Total Phosphorus as P	----	5 mg/L	95.7	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 2351695)							
EB1912523-002	CISW5-0519-1	EP005: Total Organic Carbon	----	100 mg/L	97.0	70	130
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2355685)							
EB1912523-002	CISW5-0519-1	EP026SP: Chemical Oxygen Demand	----	50 mg/L	84.5	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2353051)							
EB1912523-002	CISW5-0519-1	EP068: gamma-BHC	58-89-9	20 µg/L	71.5	70	130
		EP068: Heptachlor	76-44-8	20 µg/L	74.5	70	130
		EP068: Aldrin	309-00-2	20 µg/L	70.1	70	130
		EP068: Dieldrin	60-57-1	20 µg/L	77.2	70	130
		EP068: Endrin	72-20-8	20 µg/L	72.3	70	130
		EP068: 4.4`-DDT	50-29-3	20 µg/L	76.2	70	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2353051)							
EB1912523-002	CISW5-0519-1	EP068: Diazinon	333-41-5	10 µg/L	79.7	70	130
		EP068: Chlorpyrifos-methyl	5598-13-0	10 µg/L	75.6	70	130
		EP068: Pirimphos-ethyl	23505-41-1	10 µg/L	71.0	70	130

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2353051) - continued							
EB1912523-002	CISW5-0519-1	EP068: Bromophos-ethyl	4824-78-6	10 µg/L	80.7	70	130
		EP068: Prothiofos	34643-46-4	10 µg/L	70.5	70	130

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ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1912523**	Page	: 1 of 10
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 16-May-2019
Site	: Coochiemudlo Island	Issue Date	: 24-May-2019
Sampler	: JEREMY CANARD	No. of samples received	: 9
Order number	:	No. of samples analysed	: 9

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

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Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
CISW1-0519-1,	CISW5-0519-1,	**16-May-2019**	----	----	----	**20-May-2019**	30-May-2019	✓
CISW-Drain-0519-1,	GW1-0519-1,							
GW2-0519-1,	GW3-0519-1,							
GW5-0519-1,	GW6-0519-1,							
DUP1-0519-1								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
CISW1-0519-1,	CISW5-0519-1,	**16-May-2019**	----	----	----	**17-May-2019**	13-Jun-2019	✓
CISW-Drain-0519-1,	GW1-0519-1,							
GW2-0519-1,	GW3-0519-1,							
GW5-0519-1,	GW6-0519-1,							
DUP1-0519-1								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
CISW1-0519-1,	CISW5-0519-1,	**16-May-2019**	----	----	----	**17-May-2019**	13-Jun-2019	✓
CISW-Drain-0519-1,	GW1-0519-1,							
GW2-0519-1,	GW3-0519-1,							
GW5-0519-1,	GW6-0519-1,							
DUP1-0519-1								
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
CISW1-0519-1,	CISW-Drain-0519-1,	**16-May-2019**	----	----	----	**21-May-2019**	23-May-2019	✓
GW6-0519-1								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)								
CISW5-0519-1,	GW1-0519-1,	**16-May-2019**	----	----	----	**21-May-2019**	13-Jun-2019	✓
GW2-0519-1,	GW3-0519-1,							
GW5-0519-1,	DUP1-0519-1							

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Natural (EG035F) CISW1-0519-1, CISW-Drain-0519-1, GW6-0519-1	**16-May-2019**	**----**	----	----	**21-May-2019**	13-Jun-2019	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) CISW5-0519-1, GW1-0519-1, GW2-0519-1, GW3-0519-1, GW5-0519-1, DUP1-0519-1	**16-May-2019**	**----**	----	----	**21-May-2019**	13-Jun-2019	✓
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG094B-F) CISW1-0519-1, CISW5-0519-1, CISW-Drain-0519-1, GW1-0519-1, GW2-0519-1, GW3-0519-1, GW5-0519-1, GW6-0519-1, DUP1-0519-1	**16-May-2019**	**----**	----	----	**21-May-2019**	12-Nov-2019	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) CISW1-0519-1, CISW5-0519-1, CISW-Drain-0519-1, GW1-0519-1, GW2-0519-1, GW3-0519-1, GW5-0519-1, GW6-0519-1, DUP1-0519-1	**16-May-2019**	**----**	----	----	**17-May-2019**	13-Jun-2019	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) CISW1-0519-1, CISW5-0519-1, CISW-Drain-0519-1, GW1-0519-1, GW2-0519-1, GW3-0519-1, GW5-0519-1, GW6-0519-1, DUP1-0519-1	**16-May-2019**	**----**	----	----	**17-May-2019**	18-May-2019	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) CISW1-0519-1, CISW5-0519-1, CISW-Drain-0519-1, GW1-0519-1, GW2-0519-1, GW3-0519-1, GW5-0519-1, GW6-0519-1, DUP1-0519-1	**16-May-2019**	**----**	----	----	**17-May-2019**	13-Jun-2019	✓

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G)								
CISW1-0519-1, CISW-Drain-0519-1, GW2-0519-1, GW5-0519-1, DUP1-0519-1	CISW5-0519-1, GW1-0519-1, GW3-0519-1, GW6-0519-1,	**16-May-2019**	**21-May-2019**	13-Jun-2019	✓	**21-May-2019**	13-Jun-2019	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G)								
CISW1-0519-1, CISW-Drain-0519-1, GW2-0519-1, GW5-0519-1, DUP1-0519-1	CISW5-0519-1, GW1-0519-1, GW3-0519-1, GW6-0519-1,	**16-May-2019**	**21-May-2019**	13-Jun-2019	✓	**21-May-2019**	13-Jun-2019	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
CISW1-0519-1, CISW-Drain-0519-1, GW2-0519-1, GW5-0519-1, DUP1-0519-1	CISW5-0519-1, GW1-0519-1, GW3-0519-1, GW6-0519-1,	**16-May-2019**	**----**	----	----	**17-May-2019**	13-Jun-2019	✓
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Clear Plastic Bottle - Sulfuric Acid (EP026SP)								
CISW1-0519-1, CISW-Drain-0519-1, GW2-0519-1, GW5-0519-1, DUP1-0519-1	CISW5-0519-1, GW1-0519-1, GW3-0519-1, GW6-0519-1,	**16-May-2019**	**----**	----	----	**20-May-2019**	13-Jun-2019	✓
EP030: Biochemical Oxygen Demand (BOD)								
Clear Plastic Bottle - Natural (EP030)								
CISW1-0519-1, CISW-Drain-0519-1, GW2-0519-1, GW5-0519-1, DUP1-0519-1	CISW5-0519-1, GW1-0519-1, GW3-0519-1, GW6-0519-1,	**16-May-2019**	**----**	----	----	**18-May-2019**	18-May-2019	✓
EP068A: Organochlorine Pesticides (OC)								
Amber Glass Bottle - Unpreserved (EP068)								
CISW1-0519-1, CISW-Drain-0519-1, GW2-0519-1, GW5-0519-1, DUP1-0519-1	CISW5-0519-1, GW1-0519-1, GW3-0519-1, GW6-0519-1,	**16-May-2019**	**17-May-2019**	23-May-2019	✓	**20-May-2019**	26-Jun-2019	✓

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP068B: Organophosphorus Pesticides (OP)								
Amber Glass Bottle - Unpreserved (EP068)								
CISW1-0519-1,	CISW5-0519-1,	**16-May-2019**	**17-May-2019**	23-May-2019	✓	**20-May-2019**	26-Jun-2019	✓
CISW-Drain-0519-1,	GW1-0519-1,							
GW2-0519-1,	GW3-0519-1,							
GW5-0519-1,	GW6-0519-1,							
DUP1-0519-1								

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Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	3	9	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	9	22.22	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	29	13.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	2	9	22.22	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Right to Information Release

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Chloride by Discrete Analyser	ED045G	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	2	9	**22.22**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

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Analytical Methods	Method	Matrix	Method Descriptions
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloued and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)

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Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

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Appendix E – Calibration certificates

Right to Information Release

Instrument Service Record

YSI Pro Plus

Client: Jeremy Canard, GHD

Thank you for choosing to have your equipment serviced with Streamline Hydro.

Our guarantee to you: *You receive clean, calibrated and functioning equipment each and every time.*

Calibration Record

Parameter	Units	Calibration Standard	Pre-Calibration Reading	Post-Calibration Reading
Temperature	°C	20.7	20.5	-
pH	units	4.00	-	4.01
pH	units	7.02	-	7.00
pH	units	-	-	-
SP Conductivity	µS/cm	2760	2704	2764
DO	%	100	See below	100.4
ORP	mV	240	256.2	239.9

Item	Shipped	Serial Number
YSI Pro Plus handheld instrument	Yes	17K104481
Quatro cable & probe assembly (4 m)	Yes	17K100601
Cond/Temp Sensor	Yes	17D100524
DO Sensor	Yes	17J100352
pH Sensor	Yes	18K
ORP Sensor	Yes	17J
Carrying Case, (Pelican) Hard Sided	Yes	

Comments:

- Battery OK.
- Date & time OK.
- Sanded DO Sensor and replaced cap and fluid using caps in pelican case.
- pH slow to stabilise. Replaced 17K with new sensor 18K/10-17-18.
- Recommend changing cable as when cable is flexed it interferes with DO reading. When cable is wound on cable tidy the DO was reading -0.90% and was out of range to calibrate. When unwound the DO reading jumped straight up to 102.6% and was able to be calibrated.

Checked by:	R Swan
Date:	13/05/2019

Client's ref / PO No.:	

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Calibration Record

YSI Water Quality Meter

This water quality meter has been performance checked/calibrated as follows

Parameter	Units	Standards value	Pre calibration	Post calibration
Conductivity	µs/cm	2444 (19°C)	2461 @ 19.3	✓
pH		4.0	3.98	4.00
		7.0	7.00	✓
ORP	mV	240@20°C	244.5 @ 19.5	✓
Dissolved Oxygen	mg/L	0	0.43	0 ✓
	%	100		

Serial Number: 17D106114

Equipment checklist

[ ] YSI hand held control unit

Sensor probes

- [x] pH
- [x] Conductivity
- [ ] Salinity
- [ ] TDS(Total Dissolved Solid)
- [ ] Seawater specific gravity
- [x] Temperature
- [ ] Turbidity (LED)
- [ ] Water depth
- [x] ORP (Oxidation Reduction Potential)
- [x] Dissolved Oxygen NEW DO MEMBRANE
- [ ] pH (mV)

Date: 21/05/19 Checked By: J. C

Signed: [redacted]

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Calibration Record

YSI Water Quality Meter

This water quality meter has been performance checked/calibrated as follows

Parameter	Units	Standards value	Pre calibration	Post calibration
Conductivity	µS/cm	~~1507 @ 28.5°C~~ 1521 @ 29.0°C	1525	✓
pH		4 7	4.09 6.99	4.01 ✓
REDOX — ~~Temperature~~	mV	218 @ 29°C	226.4	✓
Dissolved Oxygen	%	0 %	-0.7%	0.0 %

Serial Number: 17K104481

Equipment checklist

[ ] YSI hand held control unit

Sensor probes

- ☑ pH
- ☑ Conductivity
- ☐ Salinity
- ☐ TDS(Total Dissolved Solid)
- ☐ Seawater specific gravity
- ☑ Temperature
- ☐ Turbidity (LED)
- ☐ Water depth
- ☑ ORP (Oxidation Reduction Potential)
- ☑ Dissolved Oxygen
- ☐ pH (mV)

Date: 18/3/19 Checked By: JC + KOS

Signed: .....

Right to Information Release

Calibration Record

YSI Water Quality Meter

This water quality meter has been performance checked/calibrated as follows

Parameter	Units	Standards value	Pre calibration	Post calibration
Conductivity	uS/cm	1467 @ 27	1494 @ 26.9	1467 @ 26.9
pH	pH	7 4	6.79 4.06	7.01 4.00
Redox **~~Temperature~~**	mV	229 @ 25°C	232 @ 26.8	225 @ 26.7
Dissolved Oxygen	%	0 100	0 97.9	✓ 100.2

Serial Number: 17K104481

Equipment checklist

[ ] YSI hand held control unit

Sensor probes

- [x] pH
- [x] Conductivity
- [ ] Salinity
- [ ] TDS(Total Dissolved Solid)
- [ ] Seawater specific gravity
- [x] Temperature
- [ ] Turbidity (LED)
- [ ] Water depth
- [x] ORP (Oxidation Reduction Potential)
- [x] Dissolved Oxygen
- [ ] pH (mV)

Date: 20/03/19 Checked By: Rachel Hughes

Signed: .....

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Appendix F – Field notes

Right to Information Release

Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 16-05-2019 12:26
Site Name:	Coochiemudlo Island	Monitoring Location: CISW1	Sampled by: JC PL
Sample ID:	CISW1-0519-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.568833,153.335185
GPS accuracy:	5 metres

CISW1 sampling location

Final Stabilised WQ Parameters	Results
Time:	12:27
Dissolved Oxygen (%sat):	2.6
Dissolved Oxygen (mg/L):	0.23
Conductivity (microS/cm):	3743
pH:	5.03
Redox (mV):	0.4
Temp (deg C):	-0.9

Notes:	Pond. 5*5m. 1m deep. Grass on edges. Tannin colour. Turbidity 2/5. High suspended solids. No odour. Foam on surface?.
Additional Comments:	Sunny.

Right to Information Release

Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 16-05-2019 11:31
Site Name:	Coochiemudlo Island	Monitoring Location: CISW5	Sampled by: JC PL
Sample ID:	CISW5-0519-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.569504,153.334845
GPS accuracy:	5 metres

CISW5 sample location.

Tannin colour.

Final Stabilised WQ Parameters	Results
Time:	12:10
Dissolved Oxygen (%sat):	9.7
Dissolved Oxygen (mg/L):	0.85
Conductivity (microS/cm):	101.5
pH:	5.47
Redox (mV):	138.2
Temp (deg C):	19.2

Notes:	Pond, +20m, 0.2m deep. Heavy vegetation and fern within pond. Turbidity 2/5. Moderate suspended solids. No odour.
Additional Comments:	Overcast.

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 16-05-2019 14:05
Site Name:	Coochiemudlo Island	Monitoring Location: CISW-Drain	Sampled by: JC PL
Sample ID:	CISW-Drain-0519-	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.568303,153.333505
GPS accuracy:	5 metres

Sample location.

Toward the street.

Final Stabilised WQ Parameters	Results
Time:	14:07
Dissolved Oxygen (%sat):	9.2
Dissolved Oxygen (mg/L):	0.78
Conductivity (microS/cm):	156.6
pH:	5.55
Redox (mV):	48.5
Temp (deg C):	22.9

Notes:	Very low. 0.5 m wide. 0.1m deep. Ferns and grass on sides. Clear. No colour. No SS.
Additional Comments:	Sunny. Temporary surface water location from drain along road heading toward the wetlands.

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GHD MANAGEMENT ENGINEERING ENVIRONMENT

Job Number: 4127018

Surface Water

Site: Cooche **Date:** 26/03/19 **Monitoring Personnel:** SC + RH

Field Measurements

Location	Time/ date	Sample ID	DO (mg/L)	DO (%)	EC (µS/cm)	pH	Redox (ORP or mV)	Temp (°C)
CISW1	26/03	CISW1-0319-1	0	0	4009	4.03	141.4	26.5
CISW2	DRY							
3								
4								
CISW5	=> SAMPLED 10 days ago.							

Location	Flow, width, depth, erosion, vegetation, colour, turbidity, suspended solids, odour, sheen
CISW1	Pond. 0.2 m deep, 2 m wide, Sheen on top. Orange suspended solids. Tannin colour. Turbidity 2/5.

General Comments (weather, visual observations, non-compliance etc):

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GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	
Project Number: 4127018	Borehole ID: GW03
Project Name: RCC LEMP	Sample ID: GW03-0319-1
Client: Redland City Councils	Date: ~~05/04/2018~~ 15/03/2019
Site: Coochiemudlo	Sampler: Jeremy Canard + Kyla O'Sullivan
Well Condition (i.e road box, locked etc): Locked	Purge Method: Peristatic pump
Depth to Water Table Pre-purge (from TOC): 5.965	Sample Method: Peristatic pump
Depth of PSH (from TOC):	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 11.46	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 6.655	QA Collected: QA03-0319-1

FIELD PARAMETERS (RECORDED USING YSI)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
10:30	0.3L	6.450	4.35	92.7	4.43	274.7	25.9	
10:34	0.6L	6.580	4.28	93.9	4.01	318.3	25.7	
10:38	1L	6.672	4.06	92.9	4.12	316.4	25.6	Slowed down pump from 8.5 to 7.5L
10:41	1.4L	6.685	3.43	95.1	4.39	304.3	25.6	
10:45	1.8L	6.667	2.98	98.5	4.52	299.4	25.8	
10:48	2L	6.660	2.73	100.9	4.53	298.6	25.8	
10:51	2.3L	6.662	1.86	109.3	4.54	298.3	25.8	
10:55	2.6L	6.655	1.42	117.0	4.58	296.3	25.7	

Comments: Rinsate + Rinsate blank; QA01 + QA04

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

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GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	
Project Number: 4127018	Borehole ID: GW05
Project Name: RCC LEMP	Sample ID: GW05 - 0319-1
Client: Redland City Councils	Date: ~~05/04/2018~~ 15/03/2019
Site: Coochiemudlo	Sampler: Jeremy Canard + Kyra O'sullivan
Well Condition (i.e road box, locked etc): OK	Purge Method: Peristatic Pump
Depth to Water Table Pre-purge (from TOC): 5.56	Sample Method: Peristatic Pump
Depth of PSH (from TOC):	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 12.068	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 5.581	QA Collected: No

FIELD PARAMETERS (RECORDED USING YSI)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Eh (mv)	Temp (°C)	Comments
8:58	0.8L	5.58	~~30.6~~ ~~3.06~~ 3.06	296.3	6.17	244.4	24.0	
9:02	0.8L	5.575	3.69	296.5	5.37	277.4	24.0	
9:05	1L	5.580	3.06	304.5	5.01	294.2	24.0	
9:10	1.5	5.58	2.82	319.7	4.83	307.5	24.0	
9:15	2	5.582	2.94	322.6	4.72	318.4	24	
9:18	2.3	5.58	2.86	325.2	4.67	324.6	24	
9:22	2.8	5.581	2.97	332.8	4.62	329.8	23.9 ~~24~~	

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 16-05-2019 12:57
Site Name:	Coochiemudlo Island	Monitoring Location: GW1	Sampled by: PL
Sample ID:	GW1-0519-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.568777,153.334761
GPS accuracy:	5 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	Clear sample.
Standing Water Level Depth (m BTOC):	3.23
Purge Method:	Bailer

Monument in poor condition. No lock. Rust and ants.

Clear sample.

Final Stabilised WQ Parameters	Results
Time:	12:57
Volume Purged L:	11
Dissolved Oxygen (%sat):	9.7
Dissolved Oxygen (mg/L):	0.84
Conductivity (microS/cm):	598
pH:	6
Redox (mV):	90
Temp (deg C):	22.6

Notes:	Overcast
Observations during purging:	11L purged not dry. Clear. No SS. No odour.

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 16/05/2019 10:48
Site Name:	Coochiemudlo Island	Monitoring Location: GW2	Sampled by: JC
Sample ID:	GW2-0519-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.569086,153.334856
GPS accuracy:	5 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	
Standing Water Level Depth (m BTOC):	3.34
Purge Method:	Bailer

Monument OK.

Final Stabilised WQ Parameters	Results
Time:	13:22
Volume Purged L:	6.5
Dissolved Oxygen (%sat):	17.2
Dissolved Oxygen (mg/L):	1.48
Conductivity (microS/cm):	1059
pH:	5.99
Redox (mV):	-37
Temp (deg C):	22.7

Notes:	Overcast
Observations during purging:	Bailed dry. Clear with white SS, faint organic odour

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 16-05-2019 12:58
Site Name:	Coochiemudlo Island	Monitoring Location: GW3	Sampled by: PL
Sample ID:	GW3-0519-1	QAQC sample collected: Yes	QAQC sample ID: DUP1-0519-1

GPS co-ordinates:	
GPS accuracy:	metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	Cloudy sample
Standing Water Level Depth (m BTOC):	11.46
Purge Method:	Peristaltic Pump

Rust but overall in good condition

Cloudy sample

Final Stabilised WQ Parameters	Results
Time:	12:05
Volume Purged L:	7
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	1.5
Conductivity (microS/cm):	117.9
pH:	4.89
Redox (mV):	218.2
Temp (deg C):	25.3

Notes:	Overcast. No rain.
Observations during purging:	Turbidity 3/5. White. No odour. No sheen. High SS.

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 16-05-2019 08:24
Site Name:	Coochiemudlo Island	Monitoring Location: GW5	Sampled by: PL
Sample ID:	GW5-0519-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.568892,153.333657
GPS accuracy:	5 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	Clear, no SS, low to no turbidity
Standing Water Level Depth (m BTOC):	12.07
Purge Method:	Peristaltic Pump

Monument in good condition

Clear, no SS, low to no turbidity

Final Stabilised WQ Parameters	Results
Time:	08:27
Volume Purged L:	3.5
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	1.4
Conductivity (microS/cm):	290.7
pH:	4.63
Redox (mV):	265.1
Temp (deg C):	23.7

Notes: Sunny day. Light breeze.

Observations during purging:

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 16-05-2019 09:48
Site Name:	Coochiemudlo Island	Monitoring Location: GW6	Sampled by: PL
Sample ID:	GW6-0519-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	
GPS accuracy:	metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	
Standing Water Level Depth (m BTOC):	16.6
Purge Method:	Peristaltic Pump

Monitoring well in good condition

Final Stabilised WQ Parameters	Results
Time:	09:47
Volume Purged L:	50
Dissolved Oxygen (%sat):	9.6
Dissolved Oxygen (mg/L):	0.83
Conductivity (microS/cm):	1806
pH:	3.95
Redox (mV):	278.9
Temp (deg C):	22.6

Notes:

Observations during purging: First bailer clear. Second bailer cloudy for sample. No odour. No sheen.

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GHD

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	P Lin	V Lam			J Dowdeswell	17/06/2019

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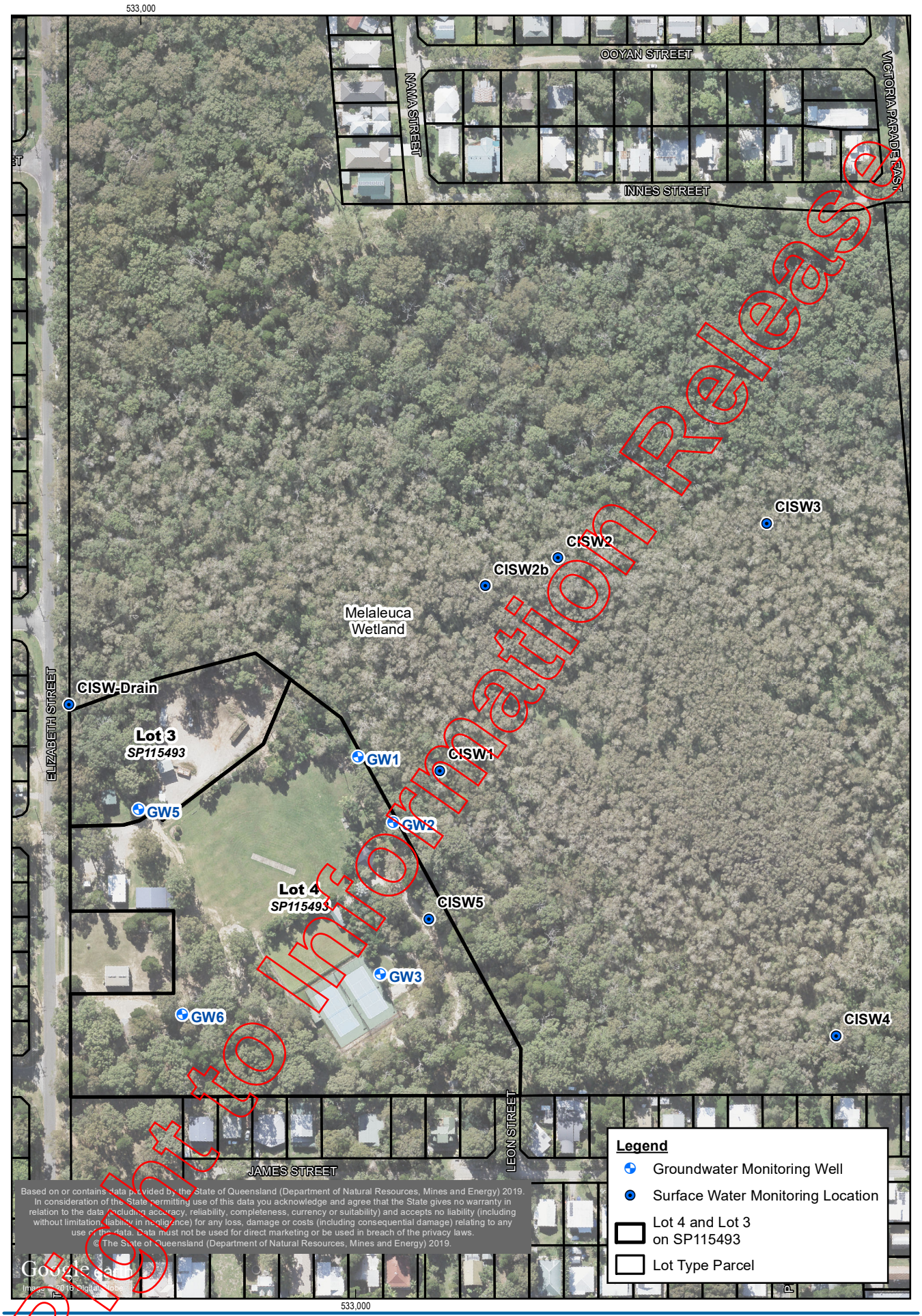
Redland City Council

Coochiemudlo Island Former Landfill

Tabulated Surface Water and Groundwater Monitoring Results

Sampling date: 09 July 2019



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1:2,500 (at A4)

0 15 30 45 60 75 90

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Redland City Council
Coochiemudlo Island

Groundwater Monitoring Well and Surface Water Monitoring Locations

Job Number	41-27018
Revision	B
Date	19 Jul 2019

Figure 1

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145 Ann Street Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

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Data Source: GHD: Groundwater Well, Surface Water Sample Location (2019); DNRME: cadastre (2018), Google Earth: aerial imagery (Jun 2017, extracted Nov 2017). Created : jvc/xlee

Summary of Coochiemudlo Island Groundwater Results
July 2019

				Field Parameters					Inorganics		Acidity & Alkalinity				Major Ions								TOC
				pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field) (Filtered)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Cations Total	Anions Total	Ionic Balance	Total Organic Carbon
				pH Units	µS/cm	mg/L	mV	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L
EQL									1	10	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1
ANZECC 2000 - Stock Watering															**1000**								
ANZECC 2000 FW Slight-Mod. Disturbed																							
GHD 2018 Coochiemudlo Island wetland				3.53-4.61	90										3.02								
Morton Bay - Schedule 1 EPP (water) - Drinking Water					*1000*	*4*																	
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater				6.5-8	626																		
Site_ID	**Purpose**	**Location_Code**	**Field_ID**																				
Coochiemudlo Island	Down gradient	GW1	GW1-0719-1	6.16	604	1.91	53.6	20.7	119	<10	<1	138	<1	138	65	21	13	28	38	6.52	6.31	1.68	6
		GW2	GW2-0719-1	6.46	738	2.05	7.2	21	42	13	<1	134	<1	134	48	20	10	54	100	6.64	6.37	2.1	7
		GW3	GW3-0719-1	5.44	125.5	2.79	158.3	23.9	8	<10	<1	14	<1	14	2	2	<1	14	15	0.87	0.87	-	3
	Up gradient	GW5	GW5-0719-1	4.77	391.7	2.17	269	23	17	<10	<1	4	<1	4	<1	5	<1	51	72	2.63	2.46	-	1
		GW6	GW6-0719-1	3.99	*2225*	2.09	249	22.2	17	13	<1	<1	<1	<1	3	60	2	338	760	19.8	21.8	4.69	2

Statistical Summary

Number of Results	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	5
Number of Detects	5	5	5	5	5	5	2	0	4	0	4	4	5	3	5	5	5	5	5	3	5
Minimum Concentration	3.99	125.5	1.91	7.2	20.7	8	<10	<1	<1	<1	<1	<1	2	<1	14	15	0.87	0.87	1.68	1
Minimum Detect	3.99	125.5	1.91	7.2	20.7	8	13	ND	4	ND	4	2	2	2	14	15	0.87	0.87	1.68	1
Maximum Concentration	6.46	2225	2.79	269	23.9	119	13	<1	138	<1	138	65	60	13	338	760	19.8	21.8	4.69	7
Maximum Detect	6.46	2225	2.79	269	23.9	119	13	ND	138	ND	138	65	60	13	338	760	19.8	21.8	4.69	7
Average Concentration	5.4	817	2.2	147	22	41	8.2	0.5	58	0.5	58	24	22	5.2	97	197	7.3	7.6	2.8	3.8
Median Concentration	5.44	604	2.09	158.3	22.2	17	5	0.5	14	0.5	14	3	20	2	51	72	6.52	6.31	2.1	3
Standard Deviation	1	821	0.34	116	1.3	46	4.4	0	71	0	71	31	23	5.9	136	316	7.4	8.3	1.6	2.6
Number of Guideline Exceedances	5	5	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	5	5	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0

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Summary of Coochiemudlo Island Groundwater Results
July 2019

				Nutrients							Organic Indicators	Metals										
				Nitrite + Nitrate as N	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)	BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL				0.01	0.01	0.01	0.01	0.1	0.1	0.01	2	0.005	0.0002	0.00005	0.0002	0.0005	0.002	0.0001	0.0005	0.0001	0.0005	0.001
ANZECC 2000 - Stock Watering						**90**	**9.1**					**5**	**0.5**	**0.01**	**1**	**1**		**0.1**		**0.002**	**1**	**20**
ANZECC 2000 FW Slight-Mod. Disturbed					0.9	7.2						0.055	0.013	0.0002	0.001	0.0014	0.3	0.0034	1.9	0.00006	0.011	0.008
GHD 2018 Coochiemudlo Island wetland																						
Morton Bay - Schedule 1 EPP (water) - Drinking Water																	*0.05*		*0.05*			
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater					0.02			0.5		0.05												
Site_ID	**Purpose**	**Location_Code**	**Field_ID**																			
Coochiemudlo Island	Down gradient	GW1	GW1-0719-1	2.74	<0.01	2.74	<0.01	3.2	0.5	0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	0.005	<0.0001	0.0087	<0.0001	<0.0005	0.002
		GW2	GW2-0719-1	0.09	0.01	0.09	<0.01	0.3	0.2	0.03	3	<0.005	0.0003	<0.00005	<0.0002	<0.0005	*1.25*	<0.0001	0.0008	<0.0001	<0.0005	0.003
		GW3	GW3-0719-1	0.06	<0.01	0.06	<0.01	0.3	0.2	0.05	<2	0.033	<0.0002	<0.00005	<0.0002	0.0007	0.046	0.0001	0.004	<0.0001	<0.0005	0.008
	Up gradient	GW5	GW5-0719-1	2.93	0.01	2.93	<0.01	3.2	0.3	<0.01	<2	0.018	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0019	<0.0001	<0.0005	<0.001
		GW6	GW6-0719-1	0.02	<0.01	0.02	<0.01	<0.1	<0.1	0.01	<2	**6.97**	<0.0002	<0.00005	0.0002	0.0009	*0.153*	0.001	*0.13*	<0.0001	0.0027	0.018

Statistical Summary

Number of Results	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Number of Detects	5	2	5	0	4	4	4	1	3	1	0	1	2	4	2	5	0	1	4
Minimum Concentration	0.02	<0.01	0.02	<0.01	<0.1	<0.1	<0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0008	<0.0001	<0.0005	<0.001
Minimum Detect	0.02	0.01	0.02	ND	0.3	0.2	0.01	3	0.018	0.0003	ND	0.0002	0.0007	0.005	0.0001	0.0008	ND	0.0027	0.002
Maximum Concentration	2.93	0.01	2.93	<0.01	3.2	0.5	0.05	3	6.97	0.0003	<0.00005	0.0002	0.0009	1.25	0.001	0.13	<0.0001	0.0027	0.018
Maximum Detect	2.93	0.01	2.93	ND	3.2	0.5	0.05	3	6.97	0.0003	ND	0.0002	0.0009	1.25	0.001	0.13	ND	0.0027	0.018
Average Concentration	1.2	0.007	1.2	0.005	1.4	0.25	0.021	1.4	1.4	0.00014	0.000025	0.00012	0.00047	0.29	0.00025	0.029	0.00005	0.00074	0.0063
Median Concentration	0.09	0.005	0.09	0.005	0.3	0.2	0.01	1	0.018	0.0001	0.000025	0.0001	0.00025	0.046	0.00005	0.004	0.00005	0.00025	0.003
Standard Deviation	1.5	0.0027	1.5	0	1.6	0.17	0.019	0.89	3.1	0.000089	0	0.000045	0.00031	0.54	0.00042	0.056	0	0.0011	0.0071
Number of Guideline Exceedances	0	0	0	0	2	0	1	0	1	0	0	0	0	2	0	1	5	0	2
Number of Guideline Exceedances(Detects Only)	0	0	0	0	2	0	1	0	1	0	0	0	0	2	0	1	0	0	2

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Summary of Coochiemudlo Island Groundwater Results
July 2019

				OC Pesticides																							
				4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2
ANZECC 2000 - Stock Watering																											
ANZECC 2000 FW Slight-Mod. Disturbed									0.03					0.006						0.01			0.2	0.01			
GHD 2018 Coochiemudlo Island wetland																											
Morton Bay - Schedule 1 EPP (water) - Drinking Water																											
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																											
Site_ID	**Purpose**	**Location_Code**	**Field_ID**																								
Coochiemudlo Island	Down gradient	GW1	GW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		GW2	GW2-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		GW3	GW3-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Up gradient	GW5	GW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		GW6	GW6-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2

Statistical Summary

Number of Results	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
Median Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	0	0	0	0	0	5	0	0	0	0	5	0	0	0	0	0	5	0	0	5	5	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Summary of Coochiemudlo Island Groundwater Results
July 2019

				OP Pesticides																			
				Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	0.5	0.5
ANZECC 2000 - Stock Watering																						
ANZECC 2000 FW Slight-Mod. Disturbed				0.1				0.01			0.01		0.15				0.05			0.004		
GHD 2018 Coochiemudlo Island wetland																						
Morton Bay - Schedule 1 EPP (water) - Drinking Water																						
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																						
Site_ID	**Purpose**	**Location_Code**	**Field_ID**																			
Coochiemudlo Island	Down gradient	GW1	GW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		GW2	GW2-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		GW3	GW3-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	Up gradient	GW5	GW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		GW6	GW6-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Statistical Summary																						
Number of Results				5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Median Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				5	0	0	0	5	0	0	5	0	5	0	0	0	5	0	0	5	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Summary of Coochiemudlo Island Surface Water Results
July 2019

Site_ID	Purpose	Location_Code	Field_ID	pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field) (Filtered)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Cations Total	Anions Total	Ionic Balance	Total Organic Carbon
				Field Parameters						Inorganics		Acidity & Alkalinity				Major Ions								TOC
				pH Units	µS/cm	mg/L	%S	mV	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L
EQL										1	10	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1
ANZECC 2000 FW 99% - applicable to CISW2 and CISW3 only as potential frog habitat areas																								
ANZECC 2000 FW Slight-Mod. Disturbed																								
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2 and CISW3 only as potential frog habitat areas				3.53-4.61	90											3.02								
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater				*6.5-8*	*626*		*85-110*																	
Myer et al 2006 Wallum-dependent frog species				**0-6**																				
Coochiemudlo Island	Background	CISW-Drain	CISW-Drain-0719-1	*5.77*	210.8	2.98	*33.5*	243.7	20.6	14	<10	<1	16	<1	16	3	4	<1	26	40	1.61	1.74	-	3
		CISW4	CISW4-0719-1	*5.71*	264.4	2.51	*26.7*	100.9	18.4	22	346	<1	3	<1	7	4	5	<1	35	53	2.13	2.09	-	84
	Downstream	CISW1	CISW1-0719-1	***6.45***	*800*	3.64	*37.9*	148.7	17.1	170	40	<1	49	<1	49	50	40	17	66	169	9.09	9.28	1.05	16
		CISW2b	CISW2b-0719-1	*5.74*	315.4	1.06	*10.7*	-88.9	16.4	3	114	<1	8	<1	8	3	4	4	34	59	2.06	1.89	-	35
		CISW5	CISW5-0719-1	***6***	105.6	2.46	*26*	154.3	17.9	2	56	<1	12	<1	12	4	2	3	11	18	0.92	0.79	-	15

Statistical Summary

	pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field) (Filtered)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Cations Total	Anions Total	Ionic Balance	Total Organic Carbon
Number of Results	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	1	5
Number of Detects	5	5	5	5	5	5	5	4	0	5	0	5	5	5	3	5	5	5	5	1	5
Minimum Concentration	5.71	105.6	1.06	10.7	-88.9	16.4	2	<10	<1	7	<1	7	3	2	<1	11	18	0.92	0.79	1.05	3
Minimum Detect	5.71	105.6	1.06	10.7	ND	16.4	2	40	ND	7	ND	7	3	2	3	11	18	0.92	0.79	1.05	3
Maximum Concentration	6.45	800	3.64	37.9	243.7	20.6	170	346	<1	49	<1	49	50	40	17	66	169	9.09	9.28	1.05	84
Maximum Detect	6.45	800	3.64	37.9	243.7	20.6	170	346	ND	49	ND	49	50	40	17	66	169	9.09	9.28	1.05	84
Average Concentration	5.9	339	2.5	27	112	18	42	112	0.5	18	0.5	18	13	11	5	34	68	3.2	3.2		31
Median Concentration	5.77	264.4	2.51	26.7	148.7	17.9	14	56	0.5	12	0.5	12	4	4	3	34	53	2.06	1.89	1.05	16
Standard Deviation	0.31	269	0.95	10	123	1.6	72	136	0	17	0	17	21	16	6.9	20	59	3.3	3.5		32
Number of Guideline Exceedances	5	5	0	5	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	5	5	0	5	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0

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Summary of Coochiemudlo Island Surface Water Results
July 2019

Site_ID	Purpose	Location_Code	Field_ID	Nitrite + Nitrate as N	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)	BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
				Nutrients							Organic Indicators	Metals										
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL				0.01	0.01	0.01	0.01	0.1	0.1	0.01	2	0.005	0.0002	0.00005	0.0002	0.0005	0.002	0.0001	0.0005	0.0001	0.0005	0.001
ANZECC 2000 FW 99% - applicable to CISW2 and CISW3 only as potential frog habitat areas					0.32	4.9						0.027	0.0008	0.00006	0.00001	0.001		0.001	1.2	0.00006	0.008	0.0024
ANZECC 2000 FW Slight-Mod. Disturbed					0.9	7.2						0.055	0.013	0.0002	0.001	0.0014	0.3	0.0034	1.9	0.00006	0.011	0.008
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2 and CISW3 only as potential frog habitat areas																						
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater					*0.02*			*0.5*		*0.05*												
Myer et al 2006 Wallum-dependent frog species																						
Coochiemudlo Island	Background	CISW-Drain	CISW-Drain-0719-1	0.08	<0.01	0.08	<0.01	<0.1	<0.1	<0.01	<2	0.039	0.0002	<0.00005	0.0003	0.0005	0.134	<0.0001	0.0182	<0.0001	<0.0005	0.004
		CISW4	CISW4-0719-1	0.02	<0.05	0.02	<0.01	*4.3*	4.3	*0.29*	8	0.057	0.0036	<0.00005	0.0012	<0.0005	4.15	<0.0001	0.0325	<0.0001	0.001	0.121
	Downstream	CISW1	CISW1-0719-1	<0.01	<0.01	<0.01	<0.01	0.5	0.5	0.01	<2	0.042	0.0004	<0.00005	0.0008	<0.0005	0.645	0.0001	0.0109	<0.0001	<0.0005	0.005
		CISW2b	CISW2b-0719-1	<0.01	<0.01	<0.01	<0.01	*1.5*	1.5	*0.08*	3	0.686	0.0018	<0.00005	0.0033	<0.0005	4.51	0.0002	0.0103	<0.0001	0.001	0.002
		CISW5	CISW5-0719-1	<0.01	<0.01	<0.01	<0.01	*0.8*	0.8	*0.08*	2	0.322	0.0037	<0.00005	0.0012	0.0006	2.61	0.0002	0.0471	<0.0001	0.0009	0.004

Statistical Summary

	Nitrite + Nitrate as N	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)	BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
Number of Results	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Number of Detects	2	0	2	0	4	4	4	3	5	5	0	5	2	5	3	5	0	3	5
Minimum Concentration	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<2	0.039	0.0002	<0.00005	0.0003	<0.0005	0.134	<0.0001	0.0103	<0.0001	<0.0005	0.002
Minimum Detect	0.02	ND	0.02	ND	0.5	0.5	0.01	2	0.039	0.0002	ND	0.0003	0.0005	0.134	0.0001	0.0103	ND	0.0009	0.002
Maximum Concentration	0.08	<0.05	0.08	<0.01	4.3	4.3	0.29	8	0.686	0.0037	<0.00005	0.0033	0.0006	4.51	0.0002	0.0471	<0.0001	0.001	0.121
Maximum Detect	0.08	ND	0.08	ND	4.3	4.3	0.29	8	0.686	0.0037	ND	0.0033	0.0006	4.51	0.0002	0.0471	ND	0.001	0.121
Average Concentration	0.023	0.009	0.023	0.005	1.4	1.4	0.093	3	0.23	0.0019	0.000025	0.0014	0.00037	2.4	0.00012	0.024	0.00005	0.00068	0.027
Median Concentration	0.005	0.005	0.005	0.005	0.8	0.8	0.08	2	0.057	0.0018	0.000025	0.0012	0.00025	2.61	0.0001	0.0182	0.00005	0.0009	0.004
Standard Deviation	0.033	0.0089	0.033	0	1.7	1.7	0.12	2.9	0.28	0.0017	0	0.0011	0.00017	2	0.000076	0.016	0	0.00039	0.052
Number of Guideline Exceedances	0	1	0	0	4	0	3	0	5	3	0	5	0	4	0	0	5	0	4
Number of Guideline Exceedances(Detects Only)	0	0	0	0	4	0	3	0	5	3	0	5	0	4	0	0	0	0	4

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Summary of Coochiemudlo Island Surface Water Results
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				OC Pesticides																							
				4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2
ANZECC 2000 FW 99% - applicable to CISW2 and CISW3 only as potential frog habitat areas									0.03					0.006						0.01			0.07	0.01			
ANZECC 2000 FW Slight-Mod. Disturbed									0.03					0.006						0.01			0.2	0.01			
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2 and CISW3 only as potential frog habitat areas																											
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																											
Myer et al 2006 Wallum-dependent frog species																											
Site_ID	**Purpose**	**Location_Code**	**Field_ID**																								
Coochiemudlo Island	Background	CISW-Drain	CISW-Drain-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		CISW4	CISW4-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	Downstream	CISW1	CISW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		CISW2b	CISW2b-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		CISW5	CISW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Statistical Summary																											
Number of Results				5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
Median Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				0	0	0	0	0	5	0	0	0	0	5	0	0	0	0	0	5	0	0	5	5	0	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Summary of Coochiemudlo Island Surface Water Results
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				OP Pesticides																			
				Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	0.5	0.5
ANZECC 2000 FW 99% - applicable to CISW2 and CISW3 only as potential frog habitat areas				0.01				0.00004			0.00003		0.1				0.002			0.0007		
ANZECC 2000 FW Slight-Mod. Disturbed				0.1				0.01			0.01		0.15				0.05			0.004		
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2 and CISW3 only as potential frog habitat areas																						
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																						
Myer et al 2006 Wallum-dependent frog species																						
Site_ID	**Purpose**	**Location_Code**	**Field_ID**																			
Coochiemudlo Island	Background	CISW-Drain	CISW-Drain-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		CISW4	CISW4-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	Downstream	CISW1	CISW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		CISW2b	CISW2b-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		CISW5	CISW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Statistical Summary																						
Number of Results				5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Median Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				5	0	0	0	5	0	0	5	0	5	0	0	0	5	0	0	5	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Right to Information Release

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ALSCompass SAMPLING Intelligence

ALS

Environmental Division Brisbane
Work Order Reference
EB1917841

Telephone : + 61-7-3243 7222

Custody Document

ALS USE ONLY (Circle)			
Custody Seal Intact?	YES	NO	N/A
Free ice / frozen ice bricks present upon receipt?	YES	NO	N/A
Random Sample Temperature on receipt		°C	

Project: RCC LEMP **Client:** GHD **Project Manager:** James Dowdswell
Phone: (

ALS Compass COC Ref: 2290 **# Samples:** **Sampler:**
Phone:

Turnaround Requirements Standard ✓ Urgent

Special Instructions: All barcodes didn't work; Samples ID on bottles or on ziplock bags. ALL TOC bottles unfiltered.

HT

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
Jeremy Cameron	JBotinu		
Date / Time:	**Date / Time:**	**Date / Time:**	**Date / Time:**
5.20pm	10/7 11:20		

Right to Information Release

Contrary to Public Interest

CHAIN OF CUSTODY

ALS COC#: 2290 ALS Laboratory: EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: GHDSER - GHD PTY LTD

PROJECT: RCC LEMP - 2

SITE: Coochiemudlo Island

ORDER NO:

PROJECT MANAGER: Jeremy Canard CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Jeremy Canard QUOTE NO: BN/587/13 V5 / EB2019GHDSER0017

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Table 16: Suite 6: Coochiemudlo Island Ground & Surface Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	CISW1-0719-1	Barcode doesnt work		Water	ALS: 0 Non ALS: 0	No	X		
002	CISW4-0719-1	Barcode not working	09/07/2019 03:25 PM	Water	ALS: 0 Non ALS: 0	No	X		
003	CISW5-0719-1	Barcode doesn't work - all bottles collected		Water	ALS: 0 Non ALS: 0	No	X		
004	CISW-Drain-0719-1		09/07/2019 10:21 AM	Water	ALS: 0 Non ALS: 0	No	X		
005	GW1-0719-1	Barcode not working		Water	ALS: 0 Non ALS: 0	No	X		
006	GW2-0719-1	Barcode not working		Water	ALS: 0 Non ALS: 0	No	X		
007	GW3-0719-1	Barcode doesn't work on all bottle	09/07/2019 12:15 PM	Water	ALS: 0 Non ALS: 0	No	X		
008	GW5-0719-1		09/07/2019 10:07 AM	Water	ALS: 0 Non ALS: 0	No	X		All barcodes not recognised. Labelled as GW5-0719-1
009	GW6-0719-1	Barcode not working	09/07/2019 03:24 PM	Water	ALS: 0 Non ALS: 0	No	X		Barcode not working

Right to Information Release

Contrary to Public Interest

CHAIN OF CUSTODY

ALS COC#: 2290 *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: GHDSER - GHD PTY LTD

PROJECT: RCC LEMP - 2

SITE: Coochiemudlo Island

ORDER NO:

PROJECT MANAGER: Jeremy Canard CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Jeremy Canard QUOTE NO: BN/587/13 V5 / EB2019GHDSER0017

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS / **ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Table 16: Suite 6: Coochiemudlo Island Ground & Surface Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	QA2-0719-1	Barcode doesnt work	09/07/2019 12:21 PM	Water	ALS: 0 Non ALS: 0	No	X		
011	QA1-0719-1			Water	ALS: 0 Non ALS: 0	No	Partial 6/9		
012	CISW2b-0719-1	Barcode not working	09/07/2019 03:22 PM	Water	ALS: 0 Non ALS: 0	No	X		No barcode. Sample for all suite.

Right to Information Release

Contrary to Public Interest

CHAIN OF CUSTODY

COC#: **2290** *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: GHDSER - GHD PTY LTD

PROJECT: RCC LEMP - 2

SITE: Coochiemudlo Island

ORDER NO:

PROJECT MANAGER: Jeremy Canard CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Jeremy Canard QUOTE NO: BN/587/13 V5 / EB2019GHDSER0017

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
011	QA1-0719-1	Table 16: Suite 6: Coochiemudlo Island Ground & Surface Waters WATER	Water	- W-12 OC/OP Pesticides - EP005 Total Organic Carbon (TOC) - EG094-F Dissolved Metals by ORC - Ultra Trace in Fresh Water (inc. Fe & Se) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - NT-08 Total Nitrogen + NO2 + NO3 + NH3 + Total P

Total Bottle Count: ALS: 0, Non ALS: 0

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Contrary to Public Interest

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1917841**
Amendment : **1**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JEREMY CANARD	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	:	E-mail	:
Telephone	: ----	Telephone	: +61 7 3552 8639
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: RCC LEMP - 2	Page	: 1 of 5
Order number	:	Quote number	: EB2019GHDSER0017 (BN/587/13 V5)
C-O-C number	: 2290	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: DOMINIC RIDER, JEREMY CANARD		

Dates

Date Samples Received	: 10-Jul-2019 11:20	Issue Date	: 22-Jul-2019
Client Requested Due Date	: 23-Jul-2019	Scheduled Reporting Date	: **23-Jul-2019**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 0.3°, 4.8°, 1.7°C - Ice present
Receipt Detail	: MEDIUM ESKY	No. of samples received / analysed	: 12 / 12

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **22/07/2019: SRN has been resent to acknowledge additional of dissolved aluminium, iron and manganese on all samples as requested by Pascale Lin on 22/07/2019.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Right to Information Release

Contrary to Public Interest

Sample Container(s)/Preservation Non-Compliances

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

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

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

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG094-F Dissolved Metals by ORC - Ultra Trace in Fresh	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP030 BOD	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-03 Total Nitrogen + NO2 + NO3 + NH3 + Total P	WATER - W-12 OC/OP Pesticides
EB1917841-001	09-Jul-2019 14:53	CISW1-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-002	09-Jul-2019 15:25	CISW4-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-003	09-Jul-2019 14:53	CISW5-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-004	09-Jul-2019 10:24	CISW-Drain-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-005	09-Jul-2019 17:13	GW1-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-006	09-Jul-2019 17:13	GW2-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-007	09-Jul-2019 12:15	GW3-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-008	09-Jul-2019 10:07	GW5-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-009	09-Jul-2019 15:24	GW6-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-010	09-Jul-2019 12:21	QA2-0719-1	✓	✓	✓	✓	✓	✓	✓
EB1917841-011	09-Jul-2019 17:13	QA1-0719-1	✓	✓		✓	✓	✓	✓
EB1917841-012	09-Jul-2019 15:22	CISW2b-0719-1	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EG035F Dissolved Mercury	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP026SP Chemical Oxygen Demand (COD)
EB1917841-001	09-Jul-2019 14:53	CISW1-0719-1	✓	✓	✓	✓
EB1917841-002	09-Jul-2019 15:25	CISW4-0719-1	✓	✓	✓	✓
EB1917841-003	09-Jul-2019 14:53	CISW5-0719-1	✓	✓	✓	✓
EB1917841-004	09-Jul-2019 10:24	CISW-Drain-0719-1	✓	✓	✓	✓
EB1917841-005	09-Jul-2019 17:13	GW1-0719-1	✓	✓	✓	✓
EB1917841-006	09-Jul-2019 17:13	GW2-0719-1	✓	✓	✓	✓
EB1917841-007	09-Jul-2019 12:15	GW3-0719-1	✓	✓	✓	✓
EB1917841-008	09-Jul-2019 10:07	GW5-0719-1	✓	✓	✓	✓
EB1917841-009	09-Jul-2019 15:24	GW6-0719-1	✓	✓	✓	✓
EB1917841-010	09-Jul-2019 12:21	QA2-0719-1	✓	✓	✓	✓
EB1917841-011	09-Jul-2019 17:13	QA1-0719-1			✓	
EB1917841-012	09-Jul-2019 15:22	CISW2b-0719-1	✓	✓	✓	✓

Right to Information Release

Proactive Holding Time Report

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

Right to Information Release

Requested Deliverables

Accounts Payable Australia		
- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com
DOMINIC RIDER		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Attachment - Report (SUBCO)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
GHD LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	
JAMES DOWDESWELL		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- A4 - AU Tax Invoice (INV)	Email	
- Attachment - Report (SUBCO)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
JEREMY CANARD		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Attachment - Report (SUBCO)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
LEMUEL CABAHUG		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Attachment - Report (SUBCO)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
PASCALE LIN		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Attachment - Report (SUBCO)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	

Right to Information Release

PASCALE LIN

- EDI Format - XTab (XTAB) Email

Right to Information Release

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1917841**	Page	: 1 of 13
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JEREMY CANARD	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8630
Project	: RCC LEMP - 2	Date Samples Received	: 10-Jul-2019 11:20
Order number	:	Date Analysis Commenced	: 10-Jul-2019
C-O-C number	: 2290	Issue Date	: 22-Jul-2019 16:04
Sampler	: DOMINIC RIDER, JEREMY CANARD		
Site	: ----		
Quote number	: BN/587/13 V5		
No. of samples received	: 12		
No. of samples analysed	: 12		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Santusha Pandra	Organic Chemist	Brisbane Organics, Stafford, QLD
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD

Right to Information Release

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Amendment 1 (22/07/2019): This report has been amended and re-released to allow the reporting of additional analytical data. The specific data include dissolved aluminium, iron and manganese on all samples, except sample no. 011.
- EK055G (Ammonia as N): Sample EB1917841_002 was diluted due to matrix interference. LOR adjusted accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Right to Information Release

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	CISW1-0719-1	CISW4-0719-1	CISW5-0719-1	CISW-Drain-0719-1	GW1-0719-1
			Client sampling date / time	09-Jul-2019 14:53	09-Jul-2019 15:25	09-Jul-2019 14:53	09-Jul-2019 10:24	09-Jul-2019 17:13
Compound	CAS Number	LOR	Unit	EB1917841-001	EB1917841-002	EB1917841-003	EB1917841-004	EB1917841-005
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	49	7	12	16	138
Total Alkalinity as CaCO3	----	1	mg/L	49	7	12	16	138
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	170	22	2	14	119
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	169	53	18	40	38
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	50	4	4	3	65
Magnesium	7439-95-4	1	mg/L	40	5	2	4	21
Sodium	7440-23-5	1	mg/L	66	35	11	26	28
Potassium	7440-09-7	1	mg/L	17	<1	3	<1	13
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	42	57	322	39	<5
Arsenic	7440-38-2	0.2	µg/L	0.4	3.6	3.7	0.2	<0.2
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.2	µg/L	0.8	1.2	1.2	0.3	<0.2
Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	0.6	0.5	<0.5
Iron	7439-89-6	2	µg/L	645	4150	2610	134	5
Lead	7439-92-1	0.1	µg/L	0.1	<0.1	0.2	<0.1	<0.1
Manganese	7439-96-5	0.5	µg/L	10.9	32.5	47.1	18.2	8.7
Nickel	7440-02-0	0.5	µg/L	<0.5	1.0	0.9	<0.5	<0.5
Zinc	7440-66-6	1	µg/L	5	121	4	4	2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.05	<0.01	<0.01	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.02	<0.01	0.08	2.74
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.02	<0.01	0.08	2.74

Right to Information Release

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	CISW1-0719-1	CISW4-0719-1	CISW5-0719-1	CISW-Drain-0719-1	GW1-0719-1
			Client sampling date / time	09-Jul-2019 14:53	09-Jul-2019 15:25	09-Jul-2019 14:53	09-Jul-2019 10:24	09-Jul-2019 17:13
Compound	CAS Number	LOR	Unit	EB1917841-001	EB1917841-002	EB1917841-003	EB1917841-004	EB1917841-005
				Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.5	4.3	0.8	<0.1	0.5
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.5	4.3	0.8	<0.1	3.2
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.01	0.29	0.08	<0.01	0.01
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	9.28	2.09	0.79	1.74	6.31
ø Total Cations	----	0.01	meq/L	9.09	2.13	0.92	1.61	6.52
ø Ionic Balance	----	0.01	%	1.05	----	----	----	1.68
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	16	84	15	3	6
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	40	346	56	<10	<10
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	8	2	<2	<2
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

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Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	CISW1-0719-1	CISW4-0719-1	CISW5-0719-1	CISW-Drain-0719-1	GW1-0719-1
			Client sampling date / time	09-Jul-2019 14:53	09-Jul-2019 15:25	09-Jul-2019 14:53	09-Jul-2019 10:24	09-Jul-2019 17:13
Compound	CAS Number	LOR	Unit	EB1917841-001	EB1917841-002	EB1917841-003	EB1917841-004	EB1917841-005
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**82.4**	**73.7**	**80.3**	**94.0**	**84.6**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**85.3**	**67.4**	**81.8**	**79.0**	**76.2**

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Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	GW2-0719-1	GW3-0719-1	GW5-0719-1	GW6-0719-1	QA2-0719-1
			Client sampling date / time	09-Jul-2019 17:13	09-Jul-2019 12:15	09-Jul-2019 10:07	09-Jul-2019 15:24	09-Jul-2019 12:21
Compound	CAS Number	LOR	Unit	EB1917841-006	EB1917841-007	EB1917841-008	EB1917841-009	EB1917841-010
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	134	14	4	<1	14
Total Alkalinity as CaCO3	----	1	mg/L	134	14	4	<1	14
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	42	8	17	17	8
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	100	15	72	760	15
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	48	2	<1	3	2
Magnesium	7439-95-4	1	mg/L	20	2	5	60	2
Sodium	7440-23-5	1	mg/L	54	14	51	338	14
Potassium	7440-09-7	1	mg/L	10	<1	<1	2	<1
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	<5	33	18	6970	43
Arsenic	7440-38-2	0.2	µg/L	0.3	<0.2	<0.2	<0.2	<0.2
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	<0.2	0.2	0.2
Copper	7440-50-8	0.5	µg/L	<0.5	0.7	<0.5	0.9	0.7
Iron	7439-89-6	2	µg/L	1250	46	<2	153	53
Lead	7439-92-1	0.1	µg/L	<0.1	0.1	<0.1	1.0	0.3
Manganese	7439-96-5	0.5	µg/L	0.8	4.0	1.9	130	4.1
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	<0.5	2.7	<0.5
Zinc	7440-66-6	1	µg/L	3	8	<1	18	8
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.01	<0.01	0.01	<0.01	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.09	0.06	2.93	0.02	0.06
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.09	0.06	2.93	0.02	0.06

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Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	GW2-0719-1	GW3-0719-1	GW5-0719-1	GW6-0719-1	QA2-0719-1
			Client sampling date / time	09-Jul-2019 17:13	09-Jul-2019 12:15	09-Jul-2019 10:07	09-Jul-2019 15:24	09-Jul-2019 12:21
Compound	CAS Number	LOR	Unit	EB1917841-006	EB1917841-007	EB1917841-008	EB1917841-009	EB1917841-010
				Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.2	0.3	<0.1	0.2
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.3	0.3	3.2	<0.1	0.3
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.03	0.05	<0.01	0.01	0.07
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	6.37	0.87	2.46	21.8	0.87
ø Total Cations	----	0.01	meq/L	6.64	0.87	2.63	19.8	0.87
ø Ionic Balance	----	0.01	%	2.10	----	----	4.69	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	7	3	1	2	2
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	13	<10	<10	13	<10
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	3	<2	<2	<2	<2
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

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Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	GW2-0719-1	GW3-0719-1	GW5-0719-1	GW6-0719-1	QA2-0719-1
			Client sampling date / time	09-Jul-2019 17:13	09-Jul-2019 12:15	09-Jul-2019 10:07	09-Jul-2019 15:24	09-Jul-2019 12:21
Compound	CAS Number	LOR	Unit	EB1917841-006	EB1917841-007	EB1917841-008	EB1917841-009	EB1917841-010
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**77.8**	**93.5**	**89.9**	**78.3**	**80.2**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**76.8**	**82.0**	**78.0**	**73.8**	**68.8**

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Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	QA1-0719-1	CISW2b-0719-1	----	----	----
			Client sampling date / time	09-Jul-2019 17:13	09-Jul-2019 15:22	----	----	----
Compound	CAS Number	LOR	Unit	EB1917841-011	EB1917841-012	--------	--------	--------
				Result	Result	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	8	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	4	8	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	3	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	<1	59	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	3	----	----	----
Magnesium	7439-95-4	1	mg/L	<1	4	----	----	----
Sodium	7440-23-5	1	mg/L	<1	34	----	----	----
Potassium	7440-09-7	1	mg/L	<1	4	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	<0.0001	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	<5	686	----	----	----
Antimony	7440-36-0	0.2	µg/L	<0.2	----	----	----	----
Arsenic	7440-38-2	0.2	µg/L	<0.2	1.8	----	----	----
Barium	7440-39-3	0.5	µg/L	<0.5	----	----	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	----	----	----	----
Boron	7440-42-8	5	µg/L	27	----	----	----	----
Bismuth	7440-69-9	0.05	µg/L	<0.05	----	----	----	----
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	----	----	----
Chromium	7440-47-3	0.2	µg/L	<0.2	3.3	----	----	----
Cobalt	7440-48-4	0.1	µg/L	<0.1	----	----	----	----
Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	----	----	----
Iron	7439-89-6	2	µg/L	<2	4510	----	----	----
Lead	7439-92-1	0.1	µg/L	<0.1	0.2	----	----	----
Lithium	7439-93-2	0.5	µg/L	<0.5	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	<0.5	10.3	----	----	----
Molybdenum	7439-98-7	0.1	µg/L	<0.1	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	1.0	----	----	----
Selenium	7782-49-2	0.2	µg/L	<0.2	----	----	----	----

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Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	QA1-0719-1	CISW2b-0719-1	----	----	----
			Client sampling date / time	09-Jul-2019 17:13	09-Jul-2019 15:22	----	----	----
Compound	CAS Number	LOR	Unit	EB1917841-011	EB1917841-012	--------	--------	--------
				Result	Result	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS - Continued								
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
Strontium	7440-24-6	1	µg/L	<1	----	----	----	----
Tellurium	22541-49-7	0.2	µg/L	<0.2	----	----	----	----
Thallium	7440-28-0	0.02	µg/L	<0.02	----	----	----	----
Thorium	7440-29-1	0.1	µg/L	<0.1	----	----	----	----
Tin	7440-31-5	0.2	µg/L	<0.2	----	----	----	----
Titanium	7440-32-6	1	µg/L	<1	----	----	----	----
Uranium	7440-61-1	0.05	µg/L	<0.05	----	----	----	----
Vanadium	7440-62-2	0.2	µg/L	<0.2	----	----	----	----
Zinc	7440-66-6	1	µg/L	<1	2	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	**1.5**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	<0.1	**1.5**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.08**	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**0.08**	**1.89**	----	----	----
ø Total Cations	----	0.01	meq/L	<0.01	**2.06**	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	<1	**35**	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	----	**114**	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	----	**3**	----	----	----

Right to Information Release

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	QA1-0719-1	CISW2b-0719-1	----	----	----
			Client sampling date / time	09-Jul-2019 17:13	09-Jul-2019 15:22	----	----	----
Compound	CAS Number	LOR	Unit	EB1917841-011	EB1917841-012	--------	--------	--------
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	----	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	----	----	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	----	----	----

Right to Information Release

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Client sample ID	QA1-0719-1	CISW2b-0719-1	----	----	----
			Client sampling date / time	09-Jul-2019 17:13	09-Jul-2019 15:22	----	----	----
Compound	CAS Number	LOR	Unit	EB1917841-011	EB1917841-012	--------	--------	--------
				Result	Result	----	----	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**86.0**	**82.9**	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**67.8**	**77.3**	----	----	----

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Surrogate Control Limits

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	45	139
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	45	139

Right to Information Release

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1917841**	Page	: 1 of 12
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JEREMY CANARD	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8639
Project	: RCC LEMP - 2	Date Samples Received	: 10-Jul-2019
Order number	:	Date Analysis Commenced	: 10-Jul-2019
C-O-C number	: 2290	Issue Date	: 22-Jul-2019
Sampler	: DOMINIC RIDER, JEREMY CANARD		
Site	: ----		
Quote number	: BN/587/13 V5		
No. of samples received	: 12		
No. of samples analysed	: 12		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Santusha Pandra	Organic Chemist	Brisbane Organics, Stafford, QLD
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD

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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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 2463658)									
EB1917697-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	128	132	3.32	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	128	132	3.32	0% - 20%
EB1917841-010	QA2-0719-1	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	14	14	0.00	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	14	14	0.00	0% - 50%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2458223)									
EB1917841-001	CISW1-0719-1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	170	170	0.00	0% - 20%
EB1917841-010	QA2-0719-1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	8	8	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 2458325)									
EB1917841-001	CISW1-0719-1	ED045G: Chloride	16887-00-6	1	mg/L	169	174	2.77	0% - 20%
EB1917841-010	QA2-0719-1	ED045G: Chloride	16887-00-6	1	mg/L	15	15	0.00	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 2458672)									
EB1917841-005	GW1-0719-1	ED093F: Calcium	7440-70-2	1	mg/L	65	65	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	21	21	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	28	29	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	13	13	0.00	0% - 50%
EB1916226-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	69	70	1.45	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	112	110	1.08	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2200	2080	5.60	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2458673)									

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG035F: Dissolved Mercury by FIMS (QC Lot: 2458673) - continued									
EB1917841-005	GW1-0719-1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EB1916226-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.0002	76.5	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2458686)									
EB1917614-001	Anonymous	EG094A-F: Thallium	7440-28-0	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EG094A-F: Bismuth	7440-69-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Uranium	7440-61-1	0.05	µg/L	0.05	0.05	0.00	No Limit
		EG094A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Cobalt	7440-48-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Molybdenum	7439-98-7	0.1	µg/L	0.6	0.5	0.00	No Limit
		EG094A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Thorium	7440-29-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Antimony	7440-36-0	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	1.1	1.0	0.00	No Limit
		EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Tellurium	22541-49-7	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Tin	7440-31-5	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Vanadium	7440-62-2	0.2	µg/L	0.9	1.0	0.00	No Limit
		EG094A-F: Barium	7440-39-3	0.5	µg/L	11.0	10.8	1.38	0% - 20%
		EG094A-F: Copper	7440-50-8	0.5	µg/L	0.7	0.7	0.00	No Limit
		EG094A-F: Lithium	7439-93-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.0005 mg/L	<0.5	0.00	No Limit
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Strontium	7440-24-6	1	µg/L	144	146	1.54	0% - 20%
		EG094A-F: Titanium	7440-32-6	1	µg/L	<1	<1	0.00	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	1	2	0.00	No Limit
		EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	<5	0.00	No Limit
		EG094A-F: Boron	7440-42-8	5	µg/L	32	33	3.57	No Limit
EB1917841-011	QA1-0719-1	EG094A-F: Thallium	7440-28-0	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EG094A-F: Bismuth	7440-69-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Uranium	7440-61-1	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Cobalt	7440-48-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Molybdenum	7439-98-7	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Thorium	7440-29-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Antimony	7440-36-0	0.2	µg/L	<0.2	<0.2	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2458686) - continued									
EB1917841-011	QA1-0719-1	EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Tellurium	22541-49-7	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Tin	7440-31-5	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Vanadium	7440-62-2	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Barium	7440-39-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Lithium	7439-93-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Strontium	7440-24-6	1	µg/L	<1	<1	0.00	No Limit
		EG094A-F: Titanium	7440-32-6	1	µg/L	<1	<1	0.00	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	<1	<1	0.00	No Limit
		EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	<5	0.00	No Limit
		EG094A-F: Boron	7440-42-8	5	µg/L	27	26	4.21	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2458687)									
EB1917841-011	QA1-0719-1	EG094B-F: Selenium	7782-49-2	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094B-F: Iron	7439-89-6	2	µg/L	<2	<2	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2460333)									
EB1911870-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.10	0.10	0.00	0% - 50%
EB1917841-010	QA2-0719-1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2458224)									
EB1917841-001	CISW1-0719-1	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1917841-010	QA2-0719-1	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2460332)									
EB1911870-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	13.4	13.4	0.499	0% - 20%
EB1917841-010	QA2-0719-1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.06	0.06	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2461818)									
EB1911870-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	3.1	2.8	10.9	0% - 20%
EB1917841-005	GW1-0719-1	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.5	0.4	0.00	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2461817)									
EB1911870-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	4.16	4.30	3.44	0% - 20%
EB1917841-005	GW1-0719-1	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.01	<0.01	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 2466852)									
EB1916229-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	8	8	0.00	No Limit
EB1917841-003	CISW5-0719-1	EP005: Total Organic Carbon	----	1	mg/L	15	14	0.00	0% - 50%
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 2467174)									
EB1917841-001	CISW1-0719-1	EP026SP: Chemical Oxygen Demand	----	10	mg/L	40	42	3.06	No Limit
EB1917841-012	CISW2b-0719-1	EP026SP: Chemical Oxygen Demand	----	10	mg/L	114	115	1.10	0% - 50%

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2460197)									
EB1917770-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	1150	1140	0.616	0% - 20%
EB1917841-007	GW3-0719-1	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2461322)									
EB1917841-001	CISW1-0719-1	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.00	No Limit
EB1917841-009	GW6-0719-1	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2461322) - continued									
EB1917841-009	GW6-0719-1	EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.00	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2461322)									
EB1917841-001	CISW1-0719-1	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.00	No Limit
EB1917841-009	GW6-0719-1	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2461322) - continued									
EB1917841-009	GW6-0719-1	EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.00	No Limit

Right to Information Release

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 2463658)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	50 mg/L	111	80	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2458223)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	108	85	118
				<1	100 mg/L	111	85	118
ED045G: Chloride by Discrete Analyser (QCLot: 2458225)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	93.6	90	115
				<1	1000 mg/L	101	90	115
ED093F: Dissolved Major Cations (QCLot: 2458672)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 2458673)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	104	84	118
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2458686)								
EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	50 µg/L	100	80	120
EG094A-F: Antimony	7440-36-0	0.2	µg/L	<0.2	10 µg/L	80.0	80	120
EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	10 µg/L	103	80	120
EG094A-F: Barium	7440-39-3	0.5	µg/L	<0.5	50 µg/L	96.9	80	120
EG094A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	111	80	120
EG094A-F: Boron	7440-42-8	5	µg/L	<5	50 µg/L	109	80	120
EG094A-F: Bismuth	7440-69-9	0.05	µg/L	<0.05	10 µg/L	102	80	120
EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	10 µg/L	103	80	120
EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	10 µg/L	106	80	120
EG094A-F: Cobalt	7440-48-4	0.1	µg/L	<0.1	10 µg/L	100	80	120
EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	20 µg/L	105	80	120
EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	10 µg/L	118	80	120
EG094A-F: Lithium	7439-93-2	0.5	µg/L	<0.5	----	----	----	----
EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	101	80	120
EG094A-F: Molybdenum	7439-98-7	0.1	µg/L	<0.1	10 µg/L	117	80	120
EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	106	80	120
EG094A-F: Silver	7440-22-4	0.1	µg/L	<0.1	10 µg/L	94.0	80	120
EG094A-F: Strontium	7440-24-6	1	µg/L	<1	50 µg/L	117	80	120
EG094A-F: Tellurium	22541-49-7	0.2	µg/L	<0.2	----	----	----	----

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2458686) - continued								
EG094A-F: Thallium	7440-28-0	0.02	µg/L	<0.02	10 µg/L	109	80	120
EG094A-F: Thorium	7440-29-1	0.1	µg/L	<0.1	----	----	----	----
EG094A-F: Tin	7440-31-5	0.2	µg/L	<0.2	10 µg/L	97.8	80	120
EG094A-F: Titanium	7440-32-6	1	µg/L	<1	10 µg/L	102	80	120
EG094A-F: Uranium	7440-61-1	0.05	µg/L	<0.05	----	----	----	----
EG094A-F: Vanadium	7440-62-2	0.2	µg/L	<0.2	10 µg/L	103	80	120
EG094A-F: Zinc	7440-66-6	1	µg/L	<1	20 µg/L	104	80	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2458687)								
EG094B-F: Iron	7439-89-6	2	µg/L	<2	50 µg/L	100	80	120
EG094B-F: Selenium	7782-49-2	0.2	µg/L	<0.2	10 µg/L	105	80	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2479393)								
EG094B-F: Iron	7439-89-6	2	µg/L	<2	50 µg/L	100	80	120
EG094B-F: Selenium	7782-49-2	0.2	µg/L	<0.2	10 µg/L	105	80	120
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2460333)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	94.9	86	112
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2458224)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	99.7	90	110
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2460332)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	92.1	89	115
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2461818)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	92.0	70	108
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2461817)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	98.6	79	105
EP005: Total Organic Carbon (TOC) (QCLot: 2466852)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	91.2	79	113
				<1	100 mg/L	96.7	79	113
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2467174)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	50 mg/L	97.5	86	112
				<10	500 mg/L	98.4	86	112
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2460197)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	97.2	77	115
EP068A: Organochlorine Pesticides (OC) (QCLot: 2461322)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	79.9	60	131
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	83.4	45	126
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	78.4	63	128
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	79.2	60	130
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	74.8	59	120

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2461322) - continued								
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	89.3	48	132
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	78.9	54	120
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	87.6	57	122
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	87.1	56	121
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	77.5	57	123
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	87.8	56	122
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	78.3	55	124
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	78.0	53	122
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	81.0	49	131
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	75.5	50	121
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	77.9	47	123
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	79.0	42	122
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	78.7	50	130
EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	5 µg/L	87.0	39	134
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	87.7	51	129
EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	5 µg/L	88.6	46	139
EP068: Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2461322)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	74.1	53	133
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	76.8	44	158
EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	5 µg/L	5.90	5	33
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	67.1	28	153
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	86.2	56	141
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	84.8	58	130
EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	5 µg/L	79.2	45	139
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	88.0	48	135
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	86.5	53	133
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	79.9	56	125
EP068: Parathion	56-38-2	2	µg/L	<2.0	5 µg/L	87.7	37	144
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	90.5	50	131
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	86.1	37	131
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	86.2	47	127
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	85.2	16	150
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	84.0	46	128
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	80.8	39	129

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2461322) - continued								
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	95.4	38	134
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	78.0	28	146

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2458223)							
EB1917841-002	CISW4-0719-1	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	87.1	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 2458225)							
EB1917841-002	CISW4-0719-1	ED045G: Chloride	16887-00-6	400 mg/L	106	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2458673)							
EB1916226-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	87.2	70	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2458686)							
EB1917614-002	Anonymous	EG094A-F: Arsenic	7440-38-2	50 µg/L	113	70	130
		EG094A-F: Barium	7440-39-3	250 µg/L	108	70	130
		EG094A-F: Beryllium	7440-41-7	50 µg/L	116	70	130
		EG094A-F: Cadmium	7440-43-9	50 µg/L	107	70	130
		EG094A-F: Chromium	7440-47-3	50 µg/L	107	70	130
		EG094A-F: Cobalt	7440-48-4	50 µg/L	103	70	130
		EG094A-F: Copper	7440-50-8	100 µg/L	108	70	130
		EG094A-F: Lead	7439-92-1	50 µg/L	121	70	130
		EG094A-F: Manganese	7439-96-5	50 µg/L	106	70	130
		EG094A-F: Nickel	7440-02-0	50 µg/L	107	70	130
		EG094A-F: Vanadium	7440-62-2	50 µg/L	108	70	130
		EG094A-F: Zinc	7440-66-6	100 µg/L	110	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2460333)							
EB1917841-001	CISW1-0719-1	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	96.9	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2458224)							
EB1917841-002	CISW4-0719-1	EK057G: Nitrite as N	14797-65-0	0.4 mg/L	105	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2460332)							
EB1917841-001	CISW1-0719-1	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	88.0	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2461818)							

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2461818) - continued							
EB1911870-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	99.3	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2461817)							
EB1911870-002	Anonymous	EK067G: Total Phosphorus as P	----	5 mg/L	104	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 2466852)							
EB1916229-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	83.2	70	130
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2467174)							
EB1917841-002	CISW4-0719-1	EP026SP: Chemical Oxygen Demand	----	291 mg/L	119	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2461322)							
EB1917841-002	CISW4-0719-1	EP068: gamma-BHC	58-89-9	20 µg/L	60.8	60	130
		EP068: Heptachlor	76-44-8	20 µg/L	69.0	48	132
		EP068: Aldrin	309-00-2	20 µg/L	59.2	54	120
		EP068: Dieldrin	60-57-1	20 µg/L	62.0	55	124
		EP068: Endrin	72-20-8	20 µg/L	61.0	49	131
		EP068: 4.4`-DDT	50-29-3	20 µg/L	64.1	39	134
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2461322)							
EB1917841-002	CISW4-0719-1	EP068: Diazinon	333-41-5	10 µg/L	70.9	56	141
		EP068: Chlorpyrifos-methyl	5598-13-0	10 µg/L	67.5	58	130
		EP068: Pirimphos-ethyl	23505-41-1	10 µg/L	62.4	50	131
		EP068: Bromophos-ethyl	4824-78-6	10 µg/L	69.1	47	127
		EP068: Prothiofos	34643-46-4	10 µg/L	61.9	46	128

Right to Information Release

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1917841**	Page	: 1 of 10
Amendment	: **1**		
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JEREMY CANARD	Telephone	: +61 7 3552 8639
Project	: RCC LEMP - 2	Date Samples Received	: 10-Jul-2019
Site	: ----	Issue Date	: 22-Jul-2019
Sampler	: DOMINIC RIDER, JEREMY CANARD	No. of samples received	: 12
Order number	:	No. of samples analysed	: 12

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Right to Information Release

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	1	12	8.33	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*		*Sample Date*	*Extraction / Preparation* Date extracted	Due for extraction	Evaluation	*Analysis* Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**14-Jul-2019**	23-Jul-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**10-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**10-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Filtered; Lab-acidified (ED093F)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**13-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**15-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
CISW2b-0719-1								
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Clear Plastic Bottle - Filtered; Lab-acidified (EG094A-F)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**13-Jul-2019**	05-Jan-2020	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
Clear Plastic Bottle - Filtered; Lab-acidified (EG094B-F)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**22-Jul-2019**	05-Jan-2020	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
CISW2b-0719-1								
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**11-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**10-Jul-2019**	11-Jul-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**11-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**12-Jul-2019**	06-Aug-2019	✓	**12-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**12-Jul-2019**	06-Aug-2019	✓	**12-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**16-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Clear Plastic Bottle - Sulfuric Acid (EP026SP)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**16-Jul-2019**	06-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
CISW2b-0719-1								
EP030: Biochemical Oxygen Demand (BOD)								
Clear Plastic Bottle - Natural (EP030)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**----**	----	----	**11-Jul-2019**	11-Jul-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
CISW2b-0719-1								
EP068A: Organochlorine Pesticides (OC)								
Amber Glass Bottle - Unpreserved (EP068)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**12-Jul-2019**	16-Jul-2019	✓	**12-Jul-2019**	21-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							
EP068B: Organophosphorus Pesticides (OP)								
Amber Glass Bottle - Unpreserved (EP068)								
CISW1-0719-1,	CISW4-0719-1,	**09-Jul-2019**	**12-Jul-2019**	16-Jul-2019	✓	**12-Jul-2019**	21-Aug-2019	✓
CISW5-0719-1,	CISW-Drain-0719-1,							
GW1-0719-1,	GW2-0719-1,							
GW3-0719-1,	GW5-0719-1,							
GW6-0719-1,	QA2-0719-1,							
QA1-0719-1,	CISW2b-0719-1							

Right to Information Release

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	12	8.33	10.00	×	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	2	12	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Chloride by Discrete Analyser	ED045G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	2	12	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

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Analytical Methods	Method	Matrix	Method Descriptions
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloued and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)

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Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time:
Site Name:	Coochiemudlo Island	Monitoring Location: CISW1	Sampled by: JC DR
Sample ID:	CISW1-0719-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	37.9
Dissolved Oxygen (mg/L):	3.64
Conductivity (microS/cm):	800
pH:	6.45
Redox (mV):	148.7
Temp (deg C):	17.1

Notes: Cloudy. Muddy colour. Low SS. No flow. +1m deep. Vegetation on side. No odour.
Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018			Date and Time:	
Site Name:	Coochiemudlo Island	Monitoring Location:	CISW2b	Sampled by:	JC DR
Sample ID:	CISW2b-0719-1	QAQC sample collected:	No	QAQC sample ID:	

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	10.7
Dissolved Oxygen (mg/L):	1.06
Conductivity (microS/cm):	315.4
pH:	5.74
Redox (mV):	-88.9
Temp (deg C):	16.4

Notes: Water up to our knees, flooded swamp. No flow. Organic odour. Low to moderate turbidity. Low SS. No sheen.
Additional Comments:

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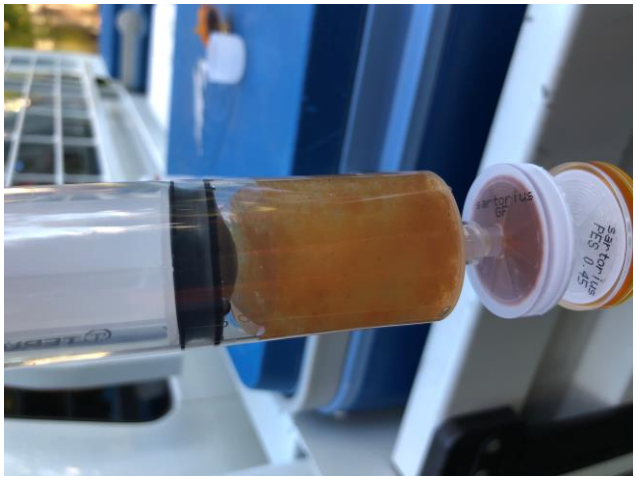
Surface Water Monitoring Sheet

Job Number:	4127018			Date and Time:	
Site Name:	Coochiemudlo Island	Monitoring Location:	CISW4	Sampled by:	JC DR
Sample ID:	CISW4-0719-1	QAQC sample collected:	No	QAQC sample ID:	

GPS co-ordinates:
GPS accuracy: metres



Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	26.7
Dissolved Oxygen (mg/L):	2.51
Conductivity (microS/cm):	264.4
pH:	5.71
Redox (mV):	100.9
Temp (deg C):	18.4

Notes: Sample location flooded. Water up to ankles. Low organic odour. No sheen. Orange flocs. Moderate suspended solids. Turbidity 4/5

Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018			Date and Time:	
Site Name:	Coochiemudlo Island	Monitoring Location:	CISW5	Sampled by:	JC DR
Sample ID:	CISW5-0719-1	QAQC sample collected:	No	QAQC sample ID:	

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	26
Dissolved Oxygen (mg/L):	2.46
Conductivity (microS/cm):	105.6
pH:	6.00
Redox (mV):	154.3
Temp (deg C):	17.9

Notes: No flow (pond) 0.2m deep. 7m wide. O erosion. Vegetation within pond (fern).
Additional Comments: Sunny.

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time:
Site Name:	Coochiemudlo Island	Monitoring Location: CISW-Drain	Sampled by: JC DR
Sample ID:	CISW-Drain-0719-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	33.5
Dissolved Oxygen (mg/L):	2.98
Conductivity (microS/cm):	210.8
pH:	5.77
Redox (mV):	243.7
Temp (deg C):	20.6

Notes: Low level. Low flow. Clear. No odour. No Suspended solids. No vegetation.
Additional Comments:

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 11-07-2019 11:32
Site Name:	Coochiemudlo Island	Monitoring Location: GW1	Sampled by: JC DR
Sample ID:	GW1-0719-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.467731,153.024398
GPS accuracy:	65.0 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	
Standing Water Level Depth (m BTOC):	3.04
Purge Method:	Bailer

Final Stabilised WQ Parameters	**Results**
Time:	11:32
Volume Purged L:	15
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	1.91
Conductivity (microS/cm):	604
pH:	6.16
Redox (mV):	53.6
Temp (deg C):	20.7

Notes:	Ant nest. Well unlocked
Observations during purging:	Clear. No odour. No suspended solids.

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time:
Site Name:	Coochiemudlo Island	Monitoring Location: GW2	Sampled by: JC DR
Sample ID:	GW2-0719-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	
GPS accuracy:	metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	
Standing Water Level Depth (m BTOC):	3.40
Purge Method:	Bailer

Final Stabilised WQ Parameters	**Results**
Time:	11:35
Volume Purged L:	10
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	2.05
Conductivity (microS/cm):	738
pH:	6.46
Redox (mV):	7.2
Temp (deg C):	21

Notes:	Ant nest
Observations during purging:	Moderate organic odour. Moderate Suspended solids. Yellow.

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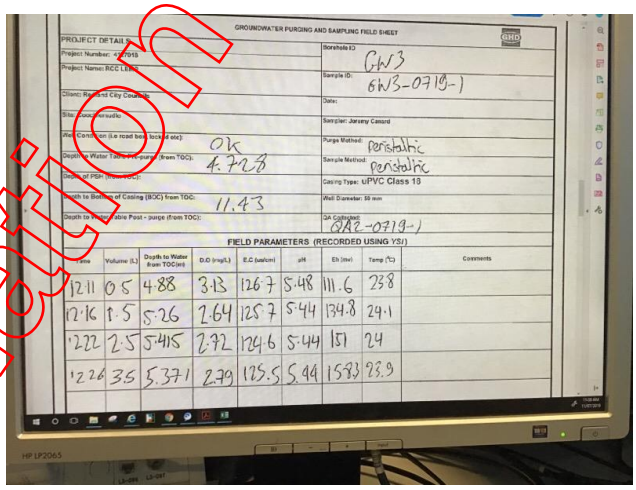
Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 11-07-2019 11:36
Site Name:	Coochiemudlo Island	Monitoring Location: GW3	Sampled by: JC DR
Sample ID:	GW3-0719-1	QAQC sample collected: Yes	QAQC sample ID: QA2-0719-1 (field duplicates) / QA1-0719-1 (ri sate on dip meter)

GPS co-ordinates:	
GPS accuracy:	metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	
Standing Water Level Depth (m BTOC):	11.43
Purge Method:	Peristaltic Pump



Final Stabilised WQ Parameters	**Results**
Time:	
Volume Purged L:	3.5
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	2.79
Conductivity (microS/cm):	125.5
pH:	5.44
Redox (mV):	158.3
Temp (deg C):	23.9

Notes:	Ok.
Observations during purging:	Clear. No odour. No suspended solids.

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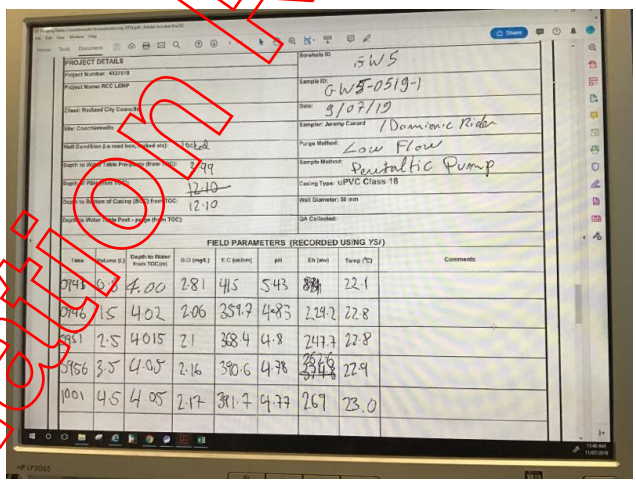
Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time:
Site Name:	Coochiemudlo Island	Monitoring Location: GW5	Sampled by: JC DR
Sample ID:	GW5-0719-1	QAQC sample collected:	QAQC sample ID:

GPS co-ordinates:	
GPS accuracy:	metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	
Standing Water Level Depth (m BTOC):	12.1
Purge Method:	Peristaltic Pump



Final Stabilised WQ Parameters	Results
Time:	
Volume Purged L:	4.5
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	2.17
Conductivity (microS/cm):	391.7
pH:	4.77
Redox (mV):	269
Temp (deg C):	23.0

Notes:	Ok
Observations during purging:	Clear. No odour. No suspended solids.

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time:
Site Name:	Coochiemudlo Island	Monitoring Location: GW6	Sampled by: JC DR
Sample ID:	GW6-0719-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	
GPS accuracy:	metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	
Standing Water Level Depth (m BTOC):	16.68
Purge Method:	Bailer

Final Stabilised WQ Parameters	**Results**
Time:	
Volume Purged L:	26
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	2.09
Conductivity (microS/cm):	2225
pH:	3.99
Redox (mV):	249
Temp (deg C):	22.2

Notes:	Ok
Observations during purging:	Cloudy white. Low suspended solids. No odour.

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Redland City Council

Coochiemudlo Island Former Landfill

August 2019 - Surface Water and Groundwater Monitoring Report

October 2019

Executive Summary

GHD Pty Ltd (GHD) was commissioned by Redland City Council (RCC) to carry out an environmental assessment at the former Coochiemudlo Island landfill to characterise environmental risk associated with surface water and groundwater originating from the site. The risk review (GHD, 2018c) characterised risk to down gradient receptors including adjacent Melaleuca Wetland as low, however it recommended additional monitoring works to confirm the findings of the assessment. This report presents the results of the quarterly surface water and groundwater monitoring works completed in August 2019, as recommended in the Risk Review report (GHD, 2018c).

During the August 2019 monitoring event, all five groundwater wells were sampled, however, only downstream location CISW1 was sampled as all other locations were dry.

New maximums were reported at downgradient monitoring location GW2 during August 2019 for EC (1219 µS/cm), COD (41 mg/L), magnesium (37 mg/L), sodium (149 mg/L), chloride (408 mg/L), nitrogen total (1.3 mg/L), arsenic (0.0035 mg/L), manganese (0.0041 mg/L) and zinc (0.147 mg/L).

Groundwater laboratory results identified several parameters at concentrations in excess of the adopted assessment criteria. Most results in down gradient locations were consistent with historical results or were less than those reported in background locations.

The concentrations of ammonia, a key landfill leachate indicator, is consistent between up and down-gradient wells. Concentrations of iron were reported above the adopted guideline in both up and down-gradient locations, and iron concentrations in down-gradient GW2 were reported at concentrations in excess of background conditions. Iron is naturally occurring in groundwater and displays a high degree of variation in both the up-gradient and down gradient wells. On this basis, the groundwater results from the August 2019 monitoring event continue to indicate that the landfill represents a low risk to the identified receptors (human and ecological, including the Melaleuca Wetland and the potential Wallum frog habitat).

Downstream surface water results from August 2019 at CISW1 identified several parameters at concentrations in excess of the adopted assessment criteria. The other surface water monitoring locations during August 2019 monitoring round were all dry, including the newly implemented location CISW-Drain. Potential acid sulfate soils (ASS) impacts (GHD, 2019c), observed during the March 2019 monitoring round were not observed in the following monitoring events, May, July and August 2019.

New maximums were reported at CISW1 during the August 2019 round for potassium (19 mg/L) and chloride (239 mg/L). Down gradient parameter concentrations from CISW1 have been compared with historical background concentrations from previous monitoring events.

Reported concentrations for EC, sulfate, chloride, sodium, potassium, calcium and magnesium at CISW1 were elevated compared to historical results from upstream locations.

Based on the findings of this assessment the former landfill is considered to present a low risk to down gradient receptors and remedial works at the landfill are not considered to be required.

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1. Introduction

GHD Pty Ltd (GHD) was commissioned by Redland City Council (RCC) to undertake an environmental assessment at the Coochiemudlo Island former landfill (herein referred to as 'the site') to characterise environmental risk associated with surface water and groundwater originating from the site. The assessment (*Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report*, GHD, 2018c) characterised risk to down gradient receptors as low, however it recommended additional surface and groundwater monitoring works to confirm the findings of the assessment.

Two rounds of surface and groundwater monitoring conducted in September and November 2018 formed part of the Risk Review report. This report presents the results of the quarterly groundwater and surface water monitoring conducted in August 2019.

This report is part of an ongoing monitoring program for the site. The August 2019 monitoring rounds comprises the seventh monitoring events for the Site.

1.1 Purpose

The purpose of this ongoing environmental monitoring works is to gain an updated understanding of the environmental risk to the Melaleuca Wetland and potential Wallum frog habitat posed by the former landfill and to build on the existing knowledge regarding the quality of the surface water and groundwater on and offsite by:

- Collection of data to characterise surface water and groundwater quality. The program incorporated the assessment of background water quality as well as water quality down gradient of the site.
- Completion of a review of current and past surface water and groundwater quality to characterise the potential risk posed by the former landfill on the receiving environment (i.e. the Melaleuca Wetlands and potential Wallum frog habitat)

1.2 Scope of Works

The following tasks were included in the scope:

- Completion of a surface water and groundwater monitoring event.
- Laboratory analysis of samples for specified analytes.
- Reporting and assessment of the monitoring results.

Laboratory analyses have been conducted by Australian Laboratory Services (ALS), a National Association of Testing Authorities (NATA) accredited laboratory, certified for the analysis undertaken as part of the scope of works.

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1.3 Limitations

This report:

1. Has been prepared by GHD Pty Ltd ("GHD") for Redland City Council (RCC).
2. Redland City Council may use, reproduce, communicate to the public and adapt the report for its own use, however GHD has no liability for changes in the report, or if the Report is relied on by a third party or used for a different purpose to that described in the Report.

GHD otherwise disclaims responsibility to any person other than Redland City Council arising in connection with this Report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in the Report and are subject to the scope limitations set out in the Report.

The opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the date of preparation of the Report. GHD has no responsibility or obligation to update this Report to account for rounds or changes' occurring subsequent to the date the Report was prepared.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD described in this report GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this Report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points. Investigations undertaken in respect of this Report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this Report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this Report if the site conditions change.

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2. Site setting

2.1 Site overview

The Coochiemudlo Island former landfill operated between 1972 and 1994 and was used for the disposal of municipal waste, including inert/hardfill and green waste, servicing a population of approximately 500 on the island.

Site locality is presented in Appendix A Figure 1.

The site is currently used as a waste transfer station and recreational purposes with a park, sports field and tennis courts.

Site name:	Coochiemudlo Island Waste Transfer Facility and the Laurie Burns Recreational Reserve
Address:	Elizabeth Street, Coochiemudlo Island, QLD 4184
Lot on plans	Lot 3 on SP115493, Lot 4 on SP115493 and Lot 83 on SL9191
Waste type:	Municipal solid waste, including domestic, putrescible, and inert waste, as well as green waste.
Operating period:	1972 - 1994[1]
Waste volume:	1,000 – 5,000 m^3 [1]
Filling depth:	Filling occurred in trenches approximately 2 m deep[1]
Surface capping:	Soil cap (~0.4 – 1.0 m thick) over the site[1]
Basal liner and leachate collection	No basal liner or leachate collection system[1]
Current site use:	Recreational reserve (park, sports field, tennis court) and waste transfer station
Surrounding land use:	Residential, Melaleuca Wetlands, waste transfer station

2.2 Surrounding land use

The Coochiemudlo Island former landfill is located within an area of mixed land use, which includes nearby sensitive receptors (residential lots, wetland). The site and surrounds are presented in Appendix A Figure 2. The surrounding land use includes:

- North: Current waste transfer facility (Lot 3 SP115493), beyond this is the northern end of the wetland
- East: Melaleuca Wetland
- South: Residential lots
- West: Elizabeth Street, beyond this residential lots

[1] Egis, 2002

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2.3 Topographical setting

The former landfill is located centrally in the eastern half of Coochiemudlo Island. In general, the site slopes towards the Melaleuca Wetlands, which is located immediately adjacent to the former landfill to the east.

Topographical considerations at Coochiemudlo Island (Appendix A Figure 4) suggest a groundwater flow to the south-east.

The site is located in a low-lying coastal area, below 5 metres Australian Height Datum (m AHD).

2.4 Geological and hydrogeological setting

2.4.1 Geology

Geological mapping of the region (1:100,000 scale) indicates that the geology of the former landfill is Triassic to Jurassic aged Woogaroo subgroup with quartzose sandstone, siltstone, shale conglomerate and coal. The Melaleuca Wetlands to the east are largely characterised as Holocene aged coastal swamp with quartz sand and peaty quartz sand. Refer to Appendix A Figure 1 for geological mapping.

Recent drilling works were completed by GHD in March 2018 for the installation of two additional groundwater monitoring bores on-site and up gradient to the former landfill. In general, the upper material was identified as clayey sand to sandy clay to a depth of 6.5 m bgl. Underlying this, in GW5, sands were identified to a termination depth of 11.5 m bgl, with a water strike at 8 m bgl. Material in GW6, located further south, was identified as clayey silt, likely siltstone with sandy bands to a termination depth of 16 m bgl, with groundwater encountered at 15 m bgl. Refer to Appendix A Figure 2 for monitoring locations.

2.4.2 Acid sulfate soils

Queensland Government Queensland Globe (DNRME, 2003) acid sulfate soils mapping indicate that land at Coochiemudlo Island has not been assessed for acid sulfate soils.

In the absence of assessment for acid sulfate soils, acid sulfate soils are potentially present owing to the low elevation of the site and the adjacent Melaleuca Wetland.

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2.4.3 Hydrogeology

Regional hydrogeological setting

A search of the Queensland Groundwater Database (GWDB) (DNRME, 2018) was completed on 1 May 2018 to identify potential groundwater users in the area.

Appendix A Figure 1 displays registered groundwater bores located on Coochiemudlo Island, with details summarised in Table 2-1 below. Five bores were identified on the island, with all bores denoted as 'water supply'. Four of the bores are classified as existing, with one abandoned and destroyed. Available water quality records indicates electrical conductivity ranging from 220 to 270 µS/cm with low yields ranging from 0.1 to 0.75 L/s.

Table 2-1 Summary groundwater use – Coochiemudlo Island

Bore Registered Number	Total Depth (m)	Screened Strata	SWL (m bgl)	Quality	Yield (L/s)	Installation date	Use	Status
124247	17.35	Sand	2.5	potable	0.3	30/10/2004	Water Supply	Existing
124251	36	Weathered basalt	NA	270	1	14/12/2004	Water Supply	Existing
124254	36.6	Sandstone	11	220	0.1	17/01/2005	Water Supply	Abandoned & destroyed
124255	43	Sandstone	NA	230	0.18	19/01/2005	Water Supply	Existing
138454	14	Sand & clayey sand	NA	potable	0.75	26/02/2009	Water Supply	Existing

Notes: data based upon the Queensland GWDB (DNRME, 2018).

NA – Not available

Quality – recorded in µS/cm or a qualitative description based upon salinity

Based on the inferred groundwater flow direction to the south-east as discussed in the following section, none of the five groundwater bores identified on the island are considered to be hydraulically down gradient of the former landfill. Further discussion of *current or realistic future* groundwater users is provided in Section 3.4.

Local hydrogeological setting

The local hydrogeological setting has been interpreted from the monitoring network on the site, which is summarised in section 2.5. The water-bearing profile underlying the site is interpreted to consist of sands and siltstone with sandy bands. Water levels were measured from all groundwater wells (GW1-GW3, GW5 and GW6) during the August 2019 round. The depth to groundwater varied across the site with the August 2019 SWL as follows:

- Along the eastern boundary, closest to the wetland, the groundwater standing water level (SWL) was measured as between 2.106 metres Australian Height Datum (m AHD) and 2.262 m AHD (GW2 and GW1, respectively).
- GW5, located to the west of the site, at the northern end had SWL measured at 3.025 m AHD with GW3, located in the south of the site measured at 2.133 m AHD.
- Groundwater to the south east of the site (GW6) had SWL measured at 2.602 m AHD.

The August 2019 groundwater contour map (Appendix A and Figure 4) infer groundwater flows to a south-easterly direction.

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2.5 Site monitoring network

The site monitoring network consists of five on-site groundwater wells and six surface water monitoring locations (CISW1 on-site, with remainder off-site) as described below.

2.5.1 Groundwater monitoring network

Groundwater sampling locations include historical wells GW1 through to GW3 installed by Egis in 2001, as well as new monitoring wells GW5 and GW6, installed by GHD in 2018. GW4, installed by Egis in 2001, was formally decommissioned by GHD in 2018.

Groundwater locations are displayed on Appendix A Figure 2. Details of groundwater wells are provided in Table 2-2.

Table 2-2 Coochiemudlo Island - groundwater monitoring network

Groundwater well	Purpose	Well status	Monument status
GW1	Down gradient	Partial blockage at 3.15 m bgl, however sampling still possible	Hinges rusted, unable to be locked. New well plug installed March 2018.
GW2	Down gradient	Partial blockage at 3.35 m bgl, however sampling still possible	In good condition - new lock and new well plug installed March 2018.
GW3	Down gradient	Re-developed in March 2018 - in good condition	In good condition - new lock and new well plug installed March 2018.
GW5	Up gradient	New well - installed 22 March 2018	In good condition. Installed 22 March 2018.
GW6	Up gradient	New well - installed 22 March 2018	In good condition. Installed 22 March 2018.

For more information regarding the groundwater monitoring network including installation and decommissioning works, refer to the report GHD, 2018b.

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2.5.2 Surface water monitoring network

Surface water sampling locations are presented in Appendix A Figure 2 with details presented in Table 2-3.

Background location CISW-Drain was sampled for the first time during the May 2019 monitoring event following a request from Department of Environment and Science (DES) for additional surface water data.

Table 2-3 Coochiemudlo Island - surface water monitoring locations

Surface water locations	Location	Location description
CISW1	Downstream of former landfill	Located down gradient of GW1 and GW2.
CISW2	Background, potential Wallum frog habitat	Located on the northern boundary of the Melaleuca Wetland. Non-permanent water.
CISW2b	Temporary location	CISW2b was sampled during July 2019 monitoring event as the Melaleuca swamp was flooded and it was unsafe to access CISW2 and CISW3. CISW2b is considered as potential Wallum frog habitat for the purpose of this report.
CISW3	Background, potential Wallum frog habitat	Located on the north-east boundary of the Melaleuca Wetland. Non-permanent water.
CISW4	Background	Located on the south-east boundary of the Melaleuca Wetland, adjacent to residential properties on James St.
CISW5	Downstream of former landfill	Located east of the tennis court and west of the BMX track.
CISW-Drain	Background	Located upgradient of GW5 and on the north-western boundary of Lot 3.

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3. Receptors

This section considers *potential* receptors of landfill derived impact based on groundwater / surface water beneficial uses, to evaluate whether actual or potential *source-pathway-receptor* linkages associated with the site exist.

The following section is taken from the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report*, GHD, 2018 (GHD, 2018c)

3.1 NEPM schedule B(6)

Assessment of potential impact at the site is considered based on Schedule B(6) of the *National Environment Protection Measure (NEPM) Guideline on Risk-Based Assessment of Groundwater Contamination* (NEPC, 2013). While Schedule B(6) is designed for groundwater risk assessment, the general approach is also applicable for the assessment of surface water in the context of this assessment. The purpose of Schedule B(6) is to provide a framework for the risk-based assessment of water that may have been affected by site contamination.

The basis for risk assessment under the NEPM is founded on *current* and *realistic future* uses of groundwater, and five environmental values to be assessed and protected are presented in Schedule B(6):

- Aquatic ecosystems
- Aquaculture and human consumers of food
- Agricultural water (irrigation and stock water)
- Recreation and aesthetics
- Drinking water
- Industrial water

3.2 *Potential water use* – State Environmental Protection Policy (Water)

The *Environmental Protection (Water) Policy 2009 - Moreton Bay environmental values and water quality objectives* (Department of Environment and Resource Management (DERM)[2], July 2010), [referred to henceforth as EPP (Water)] defines the environmental values (EVs) for surface and groundwater quality within the region. This document also identifies the water quality objectives (WQOs) associated with each EV.

As the Coochiemudlo former landfill and the Melaleuca Wetland are situated within the coastal freshwater[3] area within Coochiemudlo Island, the site is classified as "Coochiemudlo Island" for the purpose of establishing EVs and associated WQOs (DERM, 2010). The EVs identified in Table 3-1 apply.

[2] Currently Department of Environment and Science (DES)
[3] The water type of the site is based on the *South-east Queensland Map Series Plan WQ1441 (Basin 144), Environmental Protection (Water) Policy 2009, July 2010*

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Table 3-1 Environmental Values – Coochiemudlo surface and groundwater potential receptors

Water	Environmental Values											
	Aquatic Ecosystems	Seagrass	Irrigation	Farm supply/use	Stock water	Drinking water	Human consumer	Oystering	Primary recreation	Secondary recreation	Visual recreation	Cultural and spiritual values
Groundwater	✓		✓	✓	✓	✓						
Surface water	✓	✓					✓	✓	✓	✓	✓	✓

Table modified from *Table 1* in *Environmental Protection (Water) Policy 2009 – Moreton Bay environmental values and water quality objectives Basin No. 144 (part) and adjacent basins, 141, 142, 143, 145 and 146, including Moreton Bay, North Stradbroke, South Stradbroke, Moreton and Moreton Bay Islands, Coochiemudlo Island Environmental Values and Water quality objectives (Department of Environment and Resource Management (DERM), 2010)*

3.3 Assessment of *actual* water use

The EVs listed in Table 3-1 represent *potential* receptors. Further characterisation is required to establish *current* and *realistic future* receptors. To assist with characterising actual water use in the area, additional data sources have been utilised:

- A search of the groundwater database
- A search of the water entitlements database
- Water use considerations based upon the local setting

3.3.1 Groundwater use

A search of the GWDB was completed (refer to section 2.4), with summary results presented in Table 2-1. The search results identified five bores on the island. None of these bores are within the down gradient flow path of the former landfill and hence are unlikely to experience adverse effects attributable to the landfill.

3.3.2 Water entitlements database

A search of the water entitlements database for active water licences (accessed 1 May 2018, dated 13 February 2018) was completed for Coochiemudlo Island. No licensed groundwater use was identified on the island.

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3.4 Derivation of *actual* or *likely* water use

The *potential* receptors listed in Table 3-1 are discussed below in Table 3-2 to characterise *actual* or *realistically likely* receptors.

Table 3-2 Derivation of *actual* or *likely* water use

Water	Environmental value[1]	Consideration	Current or likely receptor
Groundwater	Aquatic ecosystems	Potential exposure pathway Likelihood of groundwater discharge into the Melaleuca Wetland	✓
	Farm/Supply use	Excluded based on the local land uses	×
	Stock water		×
	Irrigation	Excluded based on water licencing information location of groundwater bores on the island	×
	Drinking water	Excluded based on the local land uses: Reticulated water supply No groundwater licences for water supply on Coochiemudlo Island	×
Surface water	Aquatic ecosystems	Potential exposure pathway Wetland adjacent to former landfill – additional consideration of potential Wallum frog habitat	✓
	Human consumer	Excluded based on the limited surface area of the water bodies, limited access, lack of evidence of recreational use	×
	Primary recreation		x
	Secondary recreation		×
	Seagrass	Incomplete exposure pathway in vicinity of site	×
	Oystering		×
	Visual Recreation	Incomplete exposure pathway in vicinity of site	×
	Cultural and Spiritual Values	Potential exposure pathway	✓

Notes:

1. As defined under the EPP (Water) (refer to Table 3-1)

The assessment of *potential* receptors identified the following receptors as *actual* or *likely* receptors for further assessment:

- Surface water: aquatic ecosystems (including Wallum frog habitat (GHD, 2018a)), cultural and spiritual values
- Groundwater: aquatic ecosystems

3.5 Screening criteria

As recommended in the EPP (Water), the adopted WQOs were determined from a combination of documents, including the following:

- Environmental Protection (Water) Policy (Department of Natural Resource Management, 2010) corresponding to the following:

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  - Physico-chemical WQOs for aquatic ecosystem lowland freshwater (comprising lowland streams, Wallum/tannin-stained streams and coastal streams)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council [ANZECC] / Agriculture and Resource Management Council of Australia and New Zealand [ARMCANZ], 2000 and 2018 revision), corresponding to the following:
  - Protection of slightly to moderately disturbed ecosystems
    - Utilised as the site is in an urbanised environment
  - Protection of 99% species for surface water for metals only
    - Utilised as an indicator of metal concentrations elevated in relation to optimal concentrations for Wallum frogs habitat

Criteria are not explicitly provided for the assessment of spiritual and cultural values, so this EV has been considered implicitly included in the assessment of the aquatic ecosystems EV.

The results from the groundwater and surface water monitoring have been compared against the WQOs. Results that are less than the adopted WQO are considered to represent a low and acceptable risk.

As detailed earlier in this report, this assessment focusses upon the monitoring completed on 29 August 2019.

3.5.1 Site specific WQOs - Wallum frog species optimum habitat

The GHD 2018a report presented site-specific guidelines to improve the assessment of potential Wallum frog habitats.

The *GHD 2018 Coochiemudlo Island wetland* guideline was developed for the following parameters, as summarised in GHD (2018a):

- pH between 3.53 and 4.61 pH units
- EC < 90 µS/cm
- Tannin acid staining > 9.5 mg/L
- Calcium < 3.02 mg/L
- Low levels of monomeric aluminium consistent with siliceous sand and Wallum waters (refer to Aluminium guideline value from ANZECC FW 99%)

The *Myer et al 2006 Wallum-dependent frog species* was developed for the acidic conditions of Wallum frog habitats were specimens tolerate of pH less than 6.

3.6 Background water quality considerations

Groundwater and surface water monitoring results have also been compared to background results to establish if observed water conditions are typical of background conditions. This assessment has been developed to identify if the former landfill represents a potential risk for identified receptors. If groundwater quality is similar between background and down gradient locations, then it indicates that the landfill represents a negligible risk.

Comparison between background and down gradient results has been completed graphically for the chemical and physicochemical parameters included in the site monitoring program (pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, chemical oxygen demand (COD), ammonia as N, nitrate as (N), nitrogen (total) phosphorus (total) and dissolved metals).

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4. Conceptual site model

The conceptual site model (CSM) provides a summary of pertinent features relating to the assessment of risk at the site and supports the *source-pathway-receptor* model for environmental risk assessment.

The following section is taken from the Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report, GHD, 2018c.

4.1 Hazard (contamination source)

Leachate is the liquid that drains or "leaches" from a landfill. Leachate may form via percolation of liquid (such as rainfall) through permeable waste profiles contained in the landfill. Leachate is also generated through the decomposition of organic wastes within the landfill. As leachate percolates through the waste, solutes dissolve and become mobilised.

In this risk assessment, leachate represents the hazard or potential contamination source.

4.2 Pathway

Migration of groundwater, which has been potentially impacted by leachate, is toward the east (inferred groundwater flow direction). Groundwater levels are anticipated to mirror a subdued representation of the surface elevation, as supported by site monitoring data. Groundwater flow is interpreted to be through weathered sandstone and siltstone.

Surface water flow onsite is generally directed to low-lying areas (east) into the Melaleuca Wetland. In addition, relatively shallow groundwater indicates potential surface water / groundwater interaction. Based on this, localised groundwater discharge is likely to occur to the Melaleuca Wetland.

4.3 Receptors

Potential off-site receptors include human and ecological receptors that may be exposed to impacted groundwater and surface water via ingestion (drinking), dermal contact (adsorption via skin) and inhalation (e.g. if water was to become a mist or vapour). This may include human or ecological receptors exposed to impacted:

- Surface water in down gradient Melaleuca Wetland
- Groundwater from groundwater bores or natural discharge to surface water features

4.4 Summary

A schematic conceptual site model (CSM) is presented in Appendix A Figure 3.

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5. Field Monitoring Methodology

5.1 Sampling and field methodology

5.1.1 Groundwater sampling methodology

Groundwater samples were collected from all five groundwater monitoring wells in August 2019 monitoring round.

Monitoring locations are presented in Appendix A Figure 2 and details provided in Table 2-2.

GW3 and GW5 were sampled using dedicated sampling equipment (low-flow peristaltic pump) and GW1, GW2 and GW6 were sampled using disposable bailer (bailed dry and then sampled with a bailer). GW1 and GW2 have very shallow water columns (1.1 m and 0.7 m respectiviely) and GW6 has a very low water recharge which prevents the use of the low flow sampling method for these locations. GW3 and GW5 sampling was completed utilising low-flow methods with purging completed until field parameters stabilised. Sampling was completed directly after purging. Due to the slow recovery of GW6, this well was bailed dry and allowed to recover prior to sampling.

5.1.2 Surface water sampling methodology

During August 2019 monitoring round, five out of the six surface water monitoring locations were dry with only surface water samples collected from downstream monitoring location CISW1.

The surface water location was sampled using a dedicated sampling bottle (supplied by the analytical laboratory) attached to an extendable sampling pole. The physicochemical parameters were measured *in situ* using a YSI water quality meter probe.

Monitoring locations are presented in Appendix A Figure 2 and details provided in Table 2-3.

5.2 Analytical program

5.2.1 Laboratory analytical program

Samples were collected in laboratory supplied bottles dosed with preservative and stored on ice in a cooler. Samples were dispatched to the analytical laboratory under chain of custody documentation following collection. Laboratory analysis was completed by Australian Laboratory Services (ALS), which is a NATA accredited laboratory for the required analysis.

The analytical program included the following:

- Major ions (alkalinity, sulphate, chloride, calcium, sodium, magnesium, potassium)
- Chemical oxygen demand (COD) and biochemical oxygen demand (BOD)
- Nutrients (ammonia, nitrate, nitrite, nitrogen (total), total phosphorous)
- Dissolved metals (aluminium, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc). Metals analysis adopted a lower LOR than the standard laboratory analytical procedure. This approach was utilised to provide greater resolution and additional detail to assist with the assessment of results
- Organochlorine and organophosphate pesticides

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5.2.2 Physicochemical parameters

Field physicochemical parameters were recorded in the field using a calibrated YSI water quality meter:

- pH (pH units)
- EC (µS/cm)
- DO (mg/L)
- DO saturated (%S)
- Redox potential (mV)
- Temperature (°C).

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6. Monitoring Results

The groundwater monitoring was conducted on 29 August 2019. The previous monitoring event was completed on 9 July 2019.

For the March 2019 monitoring round, SWL and field parameters were recorded on the field electronic device at GW6, which was stolen the following day. Therefore this data is not available for the March 2019 quarter.

Monitoring locations are presented in Appendix A Figure 2. Groundwater and surface water monitoring results inclusive of field and laboratory data are provided in Table B1 and Table B2 of Appendix B respectively, up gradient and down gradient comparison charts are provided in Appendix C and laboratory documentation is provided in Appendix D.

A summary of the groundwater conditions is detailed below in Section 6.1. Surface water findings are provided in Section 6.5.

6.1 Field observations - Groundwater

Table 6-1 Groundwater monitoring location - samples description

Location ID	Location description	Sample description
GW1 (DG)	Located 10 m west of the waste transfer station.	Clear, no suspended solids, organic odour and no sheen.
GW2 (DG)	Located 10 m west of the closed landfill.	Cloudy white with high silt at the bottom of bailer. Organic odour, moderate turbidity and no sheen.
GW3 (DG)	Located 50 m south-west of the former landfill, adjacent to the tennis court.	Pale brown, moderate to high turbidity, no suspended solids, no odour and no sheen.
GW5 (UG)	Located 5 m east of the waste transfer station.	Clear, no suspended solids, no odour and no sheen.
GW6 (UG)	Located 60 m south of the waste transfer station.	Clear, white suspended solids, faint organic odour and no sheen.

Notes: UG – up gradient; DG – down gradient;

6.2 Groundwater standing water levels

The inferred groundwater flow direction is towards the south-east from the landfill to the Melaleuca Wetland. Groundwater contour map from the August 2019 gauging is presented in Appendix A (Figures 4). Topographical considerations suggest a north-easterly flow (refer to Figure 5 in Appendix A).

Groundwater standing water levels (SWL), converted to metres above the Australian Height Datum (m AHD) are graphically presented in Figure 6-1.

Groundwater SWLs measured at Coochiemudlo fluctuate between monitoring events since monitoring began in June 2017. A sharp increase in SWL was recorded at GW3 in November 2018, likely correlated to higher rainfall recorded during the weeks preceding sampling. Incremental changes in SWL were recorded across two locations during the March 2019 monitoring event, which is likely to be concurrent with the prolonged dry period observed during the months preceding sampling, following by heavy rainfall experienced during the week prior to the March 2019 sampling. The SWLs recorded during the August 2019 round, with the exception of GW3 and GW6 which show a slight rise, have shown a slight decrease compared

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to the May 2019 SWLs as dry conditions were observed during the month preceding the monitoring event.

As shown in Figure 6-1, groundwater well GW5 appear to be more responsive to rainfall experienced in the area than other wells in the monitoring network. Plotted cumulative rainfall departure (CRD) shows a prolonged dry period in March 2019 with a subsequent wetter period in May 2019 and July 2019, followed by dry conditions in August 2019.

Standing water levels are presented in Figure 6-1 along with the CRD derived from the Brisbane Aero Weather Station (WS) No. 040842. This was utilised for comparison given that rainfall records were complete for the previous months.

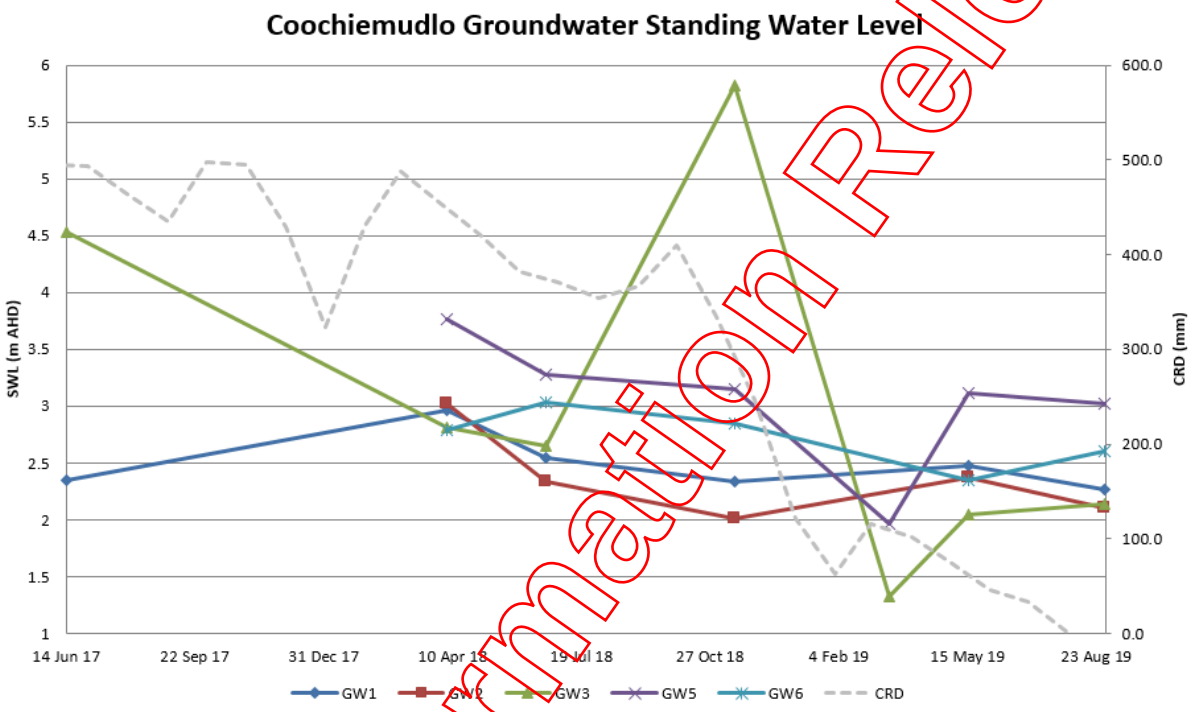

Figure 6-1 Coochiemudlo Standing Water Levels

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6.3 Rainfall

Rainfall data gathered from the Brisbane Airport Weather Station No. 040842 recorded a total of 0.2 mm of rainfall seven days prior to the surface water and groundwater monitoring on 29 August 2019.

The total rainfall recorded during the three months preceding the August monitoring program was 77 mm (16 May – 29 August 2019), significantly less than the long term average of 168 mm. Rainfall recorded three months preceding the May monitoring program was 116 mm (26 March 2019 – 16 May 2019), which was equivalent of the long-term average.

6.4 Groundwater results

6.4.1 Groundwater monitoring network characterisation

As displayed in Appendix A Figure 4, groundwater monitoring wells GW5 and GW6 are located hydraulically up gradient of the former landfill and are considered to be representative of background groundwater quality. Monitoring wells GW1 and GW2 are directly down gradient of the former landfill.

Based on topographical considerations and November 2018 groundwater flow, GW3 is not considered to be down gradient of the former landfill. The May and August 2019 groundwater contour infer GW3 monitoring location may potentially be located down gradient of the landfill. GW3 has been classified as a down gradient location in this assessment.

6.4.2 Monitoring results

All groundwater monitoring wells were sampled during the August 2019 monitoring events and groundwater results are provided in Table B1, Appendix A.

Upstream location GW5

Well GW5 is located hydraulically up gradient of the former landfill, and is considered to be representative of background conditions. Reported exceedances of adopted WQOs are summarised in Table 6-2.

No new maximums were reported for GW5 during August 2019 monitoring round.

Table 6-2 Summary of WQO exceedances at GW5

Parameter	Current results	Exceeded EVs	WQO
pH	4.74 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	321 µS/cm	Aquatic ecosystems[3]	90 µS/cm
DO (saturated)	31 %sat	Aquatic ecosystems[1]	85-100 %sat
DO (mg/L)	2.34	Aquatic ecosystems[4]	> 4 mg/L
Nitrogen (total oxidised)	2.62 mg/L	Aquatic ecosystems[1]	0.06 mg/L
Nitrogen (total)	2.9 mg/L	Aquatic ecosystems[1]	0.5 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [3] – GHD 2018 Coochiemudlo Island wetland
- [4] – Moreton Bay – Drinking Water

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Based on its up gradient location, exceedances of WQOs reported and summarised in Table 6-2 are likely due to other environmental factors, and are not considered to be influenced by landfill impacts.

The remaining parameters were less than the adopted criteria.

All OC and OP pesticides concentrations were less than the laboratory LOR.

Upstream location GW6

Monitoring well GW6 is located hydraulically up gradient of the former landfill, and is considered to be representative of background conditions.

New minimum was recorded for pH (3.83 pH units) with the current result the most acidic condition reported across all the groundwater monitoring locations. Recorded pH at this location has been historically more acidic than GW5 and all other downgradient locations.

Reported exceedances of adopted WQOs are summarised in Table 6-3.

Table 6-3 Summary of WQO exceedances at GW6

Parameter	Current results	Exceeded EVs	WQO
pH	3.83 pH units	Aquatic ecosystems[1]	6.5-8 pH units
EC	2368 µS/cm	Aquatic ecosystems[3] Aquatic ecosystems[2] Aquatic ecosystems[3]	90 µS/cm 626 µS/cm 1000 µS/cm
DO (saturated)	13.9 %sat	Aquatic ecosystems[1]	85-100 %sat
DO (mg/L)	1.21 mg/L	Aquatic ecosystems[4]	> 4 mg/L
Ammonia	0.02 mg/L	Aquatic ecosystems[1]	0.02 mg/L
Aluminium	6.87 mg/L	Aquatic ecosystems[2]	0.055 mg/L
Zinc	0.05 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- [4] – Moreton Bay – Drinking Water

Based on its up gradient location, exceedances of WQOs reported and summarised in Table 6-3 are likely due to other environmental factors, and are not considered to be influenced by landfill impacts.

The remaining parameters were less than the adopted criteria.

All OC and OP pesticide concentrations were less than the laboratory LOR.

Downstream location GW1

Monitoring well GW1 is located hydraulically down gradient of the former landfill.

No new maximums were reported during August 2019 monitoring round.

Reported exceedances of adopted WQOs are summarised in Table 6-4.

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Table 6-4 Summary of WQO exceedances at GW1

Parameter	Current results	Exceeded EVs	WQO
pH	6.11 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	559 µS/cm	Aquatic ecosystems[3]	90 µS/cm
DO (saturated)	26.9 %sat	Aquatic ecosystems[1]	85-100 %sat
DO (mg/L)	2.42 mg/L	Aquatic ecosystems[4]	> 4 mg/L
Calcium	55 mg/L	Aquatic ecosystems[3]	3.02 mg/L
Nitrogen (total oxidised)	1.54 mg/L	Aquatic ecosystems[1]	0.06 mg/L
Nitrogen (total)	1.8 mg/L	Aquatic ecosystems[1]	0.5 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [3] – GHD 2018 Coochiemudlo Island wetland
- [4] – Moreton Bay – Drinking Water

Results at GW1 were mostly consistent with background concentrations. Iron and ammonia, key parameters for potential landfill impacts, decreased significantly since June 2018 and concentrations were less than LOR in August 2019. Sulfate, potassium, total alkalinity and calcium concentrations were elevated compared to background and other downgradient locations.

Downstream location GW2

Monitoring well GW2 is located hydraulically down gradient of the former landfill.

New maximum were reported for EC (1219 µS/cm), COD (41 mg/L), magnesium (37 mg/L), sodium (149 mg/L), chloride (408 mg/L), nitrogen total (1.3 mg/L), arsenic (0.0035 mg/L), manganese (0.0041 mg/L) and zinc (0.147 mg/L) in August 2019 monitoring round.

Reported exceedances of adopted WQOs are summarised in Table 6-5.

Table 6-5 Summary of WQO exceedances at GW2

Parameter	Current results	Exceeded EVs	WQO
pH	5.73 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	1219 µS/cm	Aquatic ecosystems[3]	90 µS/cm
DO (saturated)	16.7 %sat	Aquatic ecosystems[1]	85-100 %sat
DO (mg/L)	1.49 mg/L	Aquatic ecosystems[4]	> 4 mg/L
Calcium	32 mg/L	Aquatic ecosystems[3]	3.02 mg/L
Ammonia	0.05 mg/L	Aquatic ecosystems[1]	0.02 mg/L
Nitrogen (total)	1.3 mg/L	Aquatic ecosystems[1]	0.5 mg/L
Phosphorus (total)	0.19 mg/L	Aquatic ecosystems[1]	0.05 mg/L
Zinc	0.147 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- [4] – Moreton Bay – Drinking Water

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Results at GW2 were mostly consistent with background concentrations. Iron concentration (10 mg/L) at GW2 was two order of magnitude greater than background locations GW5 and GW6, however, ammonia concentration at GW2 (0.05 mg/L) were equivalent to concentrations reported at GW6 (0.02 – 0.04 mg/L).

Downstream location GW3

Topographic considerations and November 2018 groundwater flow suggest GW3 is not located down gradient of the former landfill, however, the May 2019 groundwater flow conditions indicated GW3 is potentially located down gradient of the landfill. The August 2019 groundwater flow conditions also support the May 2019 findings and for the purpose of this assessment, GW3 continues to be classified as a down gradient well.

Although there were exceedances of the adopted WQOs at GW3, most concentrations were consistent with those from up gradient locations. No new maximums were reported at GW3 during the August 2019 monitoring round.

Exceedances of the adopted WQOs are summarised in Table 6-6.

Table 6-6 Summary of WQO exceedances at GW3

Parameter	Current results	Exceeded EVs	WQO
pH	4.95 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	259.3 µS/cm	Aquatic ecosystems[3]	90 µS/cm
DO (saturated)	16.9 %sat	Aquatic ecosystems[1]	85-100 %sat
DO (mg/L)	1.4 mg/L	Aquatic ecosystems[4]	> 4 mg/L
Nitrogen (total oxidised)	0.06 mg/L	Aquatic ecosystems[1]	0.06 mg/L
Zinc	0.059 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- [4] – Moreton Bay – Drinking Water

The remaining parameters were less than the adopted criteria.

All OC and OP pesticides concentrations were less than the laboratory LOR.

6.4.3 Background and down gradient comparison

Groundwater monitoring results for the August 2019 monitoring events have been compared to background results to establish if groundwater conditions are typical of background conditions.

Comparison between background and down gradient results for all monitoring rounds has been completed graphically for pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, COD, ammonia, nitrate, total nitrogen, total phosphorus and dissolved metals. Charts are provided in Appendix C. This approach enables results from down gradient locations to be compared with background locations, with each dot representing a discrete sample.

Examination of the charts in Appendix C identifies that background concentrations are consistent with or greater than down gradient concentrations for EC, DO, sodium, chloride, nitrate, nitrogen (total), BOD, ammonia, magnesium, aluminium, cadmium, copper, iron, arsenic, mercury, lead, manganese, zinc and nickel. On the basis that down gradient concentrations are mostly consistent with background, the former landfill does not appear to be adversely affecting

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the down gradient groundwater quality in terms of impact by these parameters. Consequently, site impacts on these parameters are considered to present a low risk to down gradient receptors.

New maximum were reported at downgradient monitoring location GW2 for EC (1219 µS/cm), COD (41 mg/L), magnesium (37 mg/L), sodium (149 mg/L), chloride (408 mg/L), nitrogen total (1.3 mg/L), arsenic (0.0035 mg/L), manganese (0.0041 mg/L) and zinc (0.147 mg/L) in the August 2019 monitoring round.

Slight variations between background and down gradient concentrations were identified in the August 2019 monitoring rounds for:

- pH. Background measurements were more acidic than down gradient measurements (pH ranged between 3.83 pH units (GW6) and 6.11 pH units (GW1).
- Alkalinity (total as $CaCO_3$). Down gradient locations GW1 (137 mg/L) and GW2 (61 mg/L) concentrations were elevated in comparison to background (<4 mg/L)
- Sulfate. Down gradient location GW1 (88 mg/L) concentrations were elevated in comparison to background (16 mg/L)
- Calcium. Down gradient GW1 (55 mg/L) and GW2 (32 mg/L) concentrations were elevated in comparison to background (<3 mg/L)
- Potassium. Down gradient GW1 (11 mg/L) concentrations were elevated in comparison to background (<3 mg/L)
- Phosphorus. Down gradient GW2 concentration was elevated (0.19 mg/L) in comparison to background (<0.01 mg/L).
- Arsenic. Down gradient GW2 concentration was elevated (0.0035 mg/L) in comparison to background (<0.0002 mg/L)
- Iron. Down gradient GW2 concentration (10 mg/L) was two order of magnitude great than GW6 (0.745 mg/L).
- Zinc. Down gradient GW2 concentration was elevated (0.147 mg/L) in comparison to background (0.05 mg/L).

The groundwater analysis results are consistent with those from historical monitoring events and support the low risk characterisation reported in the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c).

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6.5 Surface water monitoring network characterisation

Surface water monitoring locations are presented in Appendix A Figure 2. CISW1 and CISW5 are located hydraulically downstream of the site and are potentially impacted by site groundwater discharge. Locations CISW2, CISW3 and CISW4 are not hydraulically down gradient of the site and have been characterised as background / reference sites. CISW2 and CISW3 are within an area that has been characterised as potential habitat for Wallum frogs based upon a habitat survey completed by GHD in 2018 (GHD, 2018a).

During the May 2019 monitoring round, an additional location CISW-Drain was sampled on the request of DES for additional surface water data. The location was selected by RCC. CISW-Drain has been classified as background data as it is considered hydraulically upstream of the former landfill.

During the additional July 2019 monitoring round, following heavy rainfall event, attempt to conduct surface water sampling and swamp survey was unsuccessful due to water levels preventing access to the usual monitoring locations. CISW2b was sampled 100 m west of CISW2 and CISW3 was not accessible as the overall area was flooded.

6.6 Field observations – Surface water

Table 6-7 Groundwater monitoring location - samples description

Location ID	Location description	Sample description
CISW1	Downstream of former landfill	No flow, pond 5*5 m wide. 5 m deep, vegetation around edges. Slight sheen at edges, no odour, clear and no suspended solids. No staining on edge of pond.
CISW2	Background, potential Wallum frog habitat	Dry.
CISW2b	Temporary location	Dry.
CISW3	Background, potential Wallum frog habitat	Dry.
CISW4	Background	Dry.
CISW5	Downstream of former landfill	Dry.
CISW-Drain	Background	Dry.

6.7 Surface water monitoring results

On 29 August 2019 monitoring round, CISW2, CISW3, CISW4, CISW5 and CISW-Drain monitoring locations were found to be dry and no samples were collected.

CISW1 was successfully sampled and surface water results related to the last monitoring round are provided in Table B2, Appendix B.

The ANZECC 2000 FW 99% adopted criteria, and the GHD 2018 Coochiemudlo Island wetland criteria are applied to CISW2 and CISW3 only, as these locations were identified as within potential Wallum frog habitat, whereas CISW1, CISW4 and CISW5 were considered too disturbed for Wallum frog species and are assessed against the ANZECC 2000 slightly to moderately disturbed criteria.

Upstream location CISW4

Up gradient location CISW4 was dry during the August 2019 monitoring events and was therefore not sampled. Previous results at CISW4 were consistent with background concentrations.

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Upstream location CISW2 (potential Wallum frog habitat)

Up gradient location CISW2 was dry during the August 2019 monitoring events and was therefore not sampled. Previous results at CISW2 were consistent with background concentrations.

Upstream location CISW3 (potential Wallum frog habitat)

Up gradient location CISW3 was dry during the August 2019 monitoring events and was therefore not sampled. Previous results at CISW3 were consistent with background concentrations.

Upstream location CISW-Drain

CISW-Drain is considered hydraulically up stream and is considered to be representative of background conditions. CISW-Drain was dry during August 2019 monitoring round.

Downstream location CISW5

Down gradient location CISW5 was dry during the August 2019 monitoring round.

Downstream location CISW1

Down gradient location CISW1 was sampled during the August monitoring round. Exceedances of the adopted WQOs are summarised in Table 6-8.

Table 6-8 Summary of WQO exceedances at CISW1

Parameter	Current results	Exceeded EVs	WQO
pH	5.75 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	3456 µS/cm	Aquatic ecosystems[4]	1000 µS/cm
DO (saturated)	1.3 %sat	Aquatic ecosystems[1]	85-100 %sat
DO (mg/L)	0.12 mg/L	Drinking water[4]	> 4 mg/L
Calcium	71 mg/L	Aquatic ecosystems[3]	3.02 mg/L
Iron	1.33 g/L	Drinking water[4]	0.05 mg/L
Zinc	0.015 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [4] – Moreton Bay – Drinking Water

New maximums were reported at CISW1 during the August 2019 round for potassium (19 g/L) and chloride (239 mg/L).

CISW1 results are further discussed in Section 6.8.2.

The remaining nutrients and metal concentrations were less than the adopted criteria.

All OC and OP pesticides were less than the laboratory LOR.

6.8 Discussion of surface water results

6.8.1 Background and downstream comparison

Surface water monitoring has been completed since March 2018 in the Melaleuca Wetland. During the August 2019 monitoring round, all background / upstream surface water locations

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were dry and unable to be sampled. Down gradient parameter concentrations from CISW1 have been compared with historical background concentrations from previous monitoring events.

Comparison between background and down gradient results has been completed graphically for pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, COD, ammonia as N, nitrate as (N), nitrogen (total), phosphorus (total) and dissolved metals. The charts are provided in Appendix C. This approach enables results from downstream locations to be compared with background locations.

Examination of the charts in Appendix C identified parameters from CISW1 that were elevated compared to historical results from upstream locations included:

- EC, sulfate, chloride, sodium, potassium, calcium and magnesium

6.8.2 Assessment of potential ASS impacts at CISW1 – March 2019

The March 2019 results showed a greater number of exceedances at CISW1 compared to CISW5 and historical results. At CISW1 during March 2019 concentrations increased by one or more orders of magnitude for pH (4.03 pH units), EC (4009 µS/cm), sulfate (2370 mg/L), ammonia (2.71 mg/L), aluminium (64.8 mg/L), iron (416 mg/L), manganese (2.05 mg/L) and zinc (37.8 mg/L) amongst other elevated dissolved metals.

On 15 March 2019, only surface water location CISW5 was sampled, with remaining locations dry. Due to notable rainfall (121 mm of rainfall in three days, Redland (Alexandra Hills) Station 140007) reported on the weekend following the first monitoring attempt, a second monitoring round was completed on 26 March to better assess surface water conditions at the Melaleuca Wetland. CISW1 was sampled, however CISW2, CISW3 and CISW4 remained dry.

CISW1 is coastally located, has an elevation of less than 5 m AHD, and is located in a low lying wetland area, indicating that the area may potentially host acid sulfate soils (ASS). Queensland Globe ASS mapping indicates that land at Coochiemudlo Island has not been assessed for ASS. The Melaleuca Wetland is characterised as Holocene aged coastal swampland (GHD, 2018c), characteristics that classify it as a high probability area for acid sulfate soils[4]. When ASS are exposed to oxygen, the iron sulfides break down, releasing sulfuric acid, soluble iron and additional metals mobilised by the released acid, including aluminium and manganese[5]. ASS can be found or can form in any anoxic, aqueous environment where sulfate-reducing bacteria are provided with organic matter and available sulfate ions[6].

Water quality indicators of CISW1 also suggest the presence of ASS[4]:

- Soluble chloride: soluble sulfate (Cl^- : SO_4^{2-}) ratio (by mass) of less than 2 is a strong indication of an extra source of sulfate from previous sulfide oxidation. The March 2019 results reported chloride (99 mg/L) and sulfate (2370 mg/L) concentration ratios of 0.04.
- Water pH of less than 4.5 pH units may also be an indicator for the presence of ASS. CISW1 reported a pH of 4.03 pH units during March 2019, however, low pH is not a definitive indicator of ASS as environments such as Melaleuca wetlands are generally slightly acidic from other contributing non-sulfidic acids including organic acids[7].

The March 2019 sampling occurred after heavy rainfall following a prolonged dry period. Nearby groundwater concentrations (during March 2019) were inconsistent with (less than) CISW1,

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[4] State Planning Policy 1/00, Planning and management of coastal development involving acid sulfate soils (1997)
[5] Queensland Government, Acid sulfate soils and estuarine water quality of the Mackay district (2005)
[6] Queensland Government, Department of Science, Information Technology, Innovation and the Arts. Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines v4.0
[7] Draft State Planning Policy, Planning and Managing Development Involving Acid Sulfate Soils (1997)

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specifically in regards to key parameters aluminium, iron, manganese and sulfate / chloride ratio. Furthermore, the concentrations of these parameters are inconsistent with groundwater or leachate in a municipal landfill setting.

The March 2019 results in CISW1 were inconsistent with historical results, and it is considered that the elevated results may be associated with the presence and oxidation of ASS. Prior to the March 2019 monitoring round a prolonged dry period was followed by heavy rainfall. It is considered that during the prevailing dry conditions, areas of the Melaleuca Wetland containing potential ASS were exposed, allowing oxygen ingress, triggering the oxidation of sulfidic materials. Heavy rainfall experienced at Coochiemudlo Island subsequently resulted in the mobilisation of elevated concentrations of metals including iron, aluminium and manganese, which was likely flushed into CISW1.

Excluding the March 2019 findings, the results for CISW1 in the subsequent monitoring events in May, July and August 2019 reported results that were generally consistent with historical results (prior to March 2019). Water quality parameters indicating potential ASS impacts were not observed with less acidic pH, increase chloride concentration and significant decrease in sulfate and dissolved metals (especially aluminium, nickel and iron) concentrations.

The concentrations of most parameters were less than the relevant WQOs with the exception for pH, EC, DO (saturated and in situ), iron and zinc.

On 11 July 2019, further rainfall was observed prior to the monitoring round, with 91.6 mm recorded in the preceding two weeks. This impacted the site conditions at the Melaleuca swamp with large portions of the swamp between CISW Drain and CISW2 being flooded (>0.3 m deep). As per May 2019, flushing may have occurred during this period. However, drier conditions reported during late July and August had a direct effect on the surface water conditions with all monitoring locations reported as dry, with the exception of CISW1. Further monitoring of CISW1 is recommended for September as dry conditions are expected to continue.

Based on the above, the March 2019 monitoring results are more likely to be the result of oxidation of ASS under dry conditions than associated with landfill impacts. This is further supported by the findings of the (May 2019) groundwater event, in that groundwater and surface water results had returned to the historical concentration ranges. On this basis, it is considered that the monitoring results continue to support the low risk characterisation reported in the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c). This risk characterisation is based upon the environmental risk posed by the landfill, and does not consider risk associated with ASS. Further investigation is recommended to characterise ASS in the area, confirm the potential causal link between CISW1 results and ASS, and identify if ASS need to be managed in the area.

DES have been notified of the March 2019 monitoring results.

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7. Quality Assurance / Quality Control

7.1 Field QA/QC

As part of the RCC LEMP field QA/QC procedures, field equipment is calibrated for each monitoring event, field QA/QC analysis is conducted at one of the closed landfills sites per quarter with three samples collected (field duplicate, rinsate and field blank). QA/QC was undertaken at Giles Road (CLR Site 30 at monitoring well GRB2) in August 2019. Refer to the Giles Road Quarterly Report for the field QA/QC results (GHD, 2019b).

7.2 Laboratory QA/QC

Surrogate spikes, laboratory blanks and laboratory control samples were used by ALS for the water analytical program. Validation of the analytical and laboratory QA / QC results are summarised below and are detailed within official laboratory documentation.

7.2.1 August 2019

EB1922725

- All water samples were submitted to a NATA accredited laboratory in appropriately pre-treated and preserved containers.
- All water samples were extracted within holding times as recommended by analytical laboratories for all analytes (based on holding times set out in Schedule B(3) of the *NEPM* (2013)).
- Matrix spike (MS) recovery outlier exist for one anonymous sample for sulfate with the background level greater than or equal to 4 times the spike level.
- Analysis holding time outlier occurred for TOC parameter at GW5 with the sample analysis one day overdue.
- No outliers occurred for the method blanks, laboratory duplicate and surrogates recovery in the QA / QC program.
- One quality control sample frequency outliers existed for pesticides with a quality control rate of 0% instead of 5%.

7.3 Summary of Quality Control Results

In summary, GHD considers that the field, laboratory and analytical QA / QC water results for samples collected and analysed as part of laboratory documentation EB1922725 are generally within the specified requirements. The data is considered to be valid and of sufficient quality to meet the data quality objectives for this assessment.

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8. Conclusions

An assessment was completed by GHD in September 2018 at the former Coochiemudlo Island landfill to characterise the environmental risk posed by this facility (*Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c)). The review characterised risk to down gradient receptors including adjacent Melaleuca Wetland as low, however it recommended additional monitoring works to confirm the findings of the assessment.

The August 2019 monitoring event is the 5th monitoring rounds and forms part of the quarterly monitoring programme for this site as recommended in the risk review report (GHD, 2018c). The Melaleuca Wetland is located adjacent to and downstream of the former landfill. The purpose of the quarterly monitoring programme is to gain an updated understanding of the environmental risk to the Melaleuca Wetland posed by the former landfill and to build on the existing knowledge regarding the quality of the surface water and groundwater on and offsite.

During the August 2019 monitoring round, all groundwater wells were sampled, however, only surface water monitoring location CISW1 was sampled as CISW2, CISW3, CISW4, CISW5 and CISW-Drain were dry.

Groundwater

Topographical considerations suggest the groundwater flows towards to north-east, whilst groundwater contour mapping from SWL data in November 2018 and May 2019 suggest the groundwater flows in an east to south-easterly direction.

New maximum concentrations were reported at downgradient monitoring location GW2 during the August 2019 monitoring round for EC (1219 uS/cm), COD (41 mg/L), magnesium (37 mg/L), sodium (149 mg/L), chloride (408 mg/L), nitrogen total (1.3 mg/L), arsenic (0.0035 mg/L), manganese (0.0041 mg/L) and zinc (0.147 mg/L).

The concentrations of several parameters were in excess of the adopted assessment criteria. Most results in down gradient locations were consistent with the historical dataset or were less than those reported in background locations.

The concentrations of ammonia, a key landfill leachate indicator, is consistent between up and down-gradient wells. Concentrations of iron were reported above the adopted guideline in both up and down-gradient locations, and iron concentrations in down-gradient GW2 were reported at concentrations in excess of background conditions. Iron is naturally occurring in groundwater and displays a high degree of variation in both the up-gradient and down gradient wells. On this basis, the results from the August 2019 monitoring event continue to indicate that the landfill represents a low risk to the identified receptors (human and ecological, including the Melaleuca Wetland and the potential Wallum frog habitat).

Surface water

Downstream surface water results from August 2019 at CISW1 identified several parameters at concentrations in excess of the adopted assessment criteria. The other surface water monitoring locations during August 2019 monitoring round were all dry, including the newly implemented location CISW-Drain.

New maximums were reported at CISW1 during the August 2019 round for potassium (19 g/L) and chloride (239 mg/L). During the following monitoring rounds (May, July and August), most parameter results decreased to concentrations prior to the March 2019 event and pH returns to less acidic concentrations.

Excluding the March 2019 findings, the results for CISW1 in the subsequent monitoring events in May, July and August 2019 reported results that were generally consistent with historical

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results (prior to March 2019). Water quality parameters indicating potential ASS impacts (GHD, 2019c) were not observed with less acidic pH, increase chloride concentration and significant decrease in sulfate and dissolved metals (especially aluminium, nickel and iron) concentrations.

The concentrations of most parameters were less than the relevant WQOs with the exception for pH, EC, DO (saturated and in situ), iron and zinc. Of these parameters, only EC was elevated compared to background locations. The groundwater monitoring program has identified EC in down-gradient locations to be consistent with background groundwater quality. These results indicate that the landfill represents a low risk to the identified receptors.

Risk-based conclusion

Based on the findings of this assessment the former landfill is considered to present a low risk to down gradient receptors and remedial works at the landfill are not considered to be required.

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9. Recommendations

The following recommendations are provided in support of this assessment:

- Further surface water and groundwater quarterly monitoring is recommended. While this assessment has characterised the risk posed by the landfill to identified receptors to be low, it is noted that limited monitoring (seven complete events) has been completed and further surface water and groundwater monitoring is recommended for trend analysis, and to support characterisation of potential risks over differing climatic and seasonal conditions.
- Regular inspections are recommended to identify if site conditions change. It is understood that Council currently implements a program of routine inspections and it is recommended that this program continue.
- The former landfill is effectively capped and maintained. Vegetative cover helps stabilise the landfill cap. It is recommended that maintenance of the site be continued.
- Any earthworks on site should be appropriately managed to prevent leachate or soil release into the adjacent Melaleuca Wetlands.
- An acid sulfate soils investigation is recommended to characterise ASS in the area, confirm the potential causal link between CISW1 results and ASS, and identify if ASS need to be managed in the area.

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10. References

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Appendices

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Appendix A - Figures

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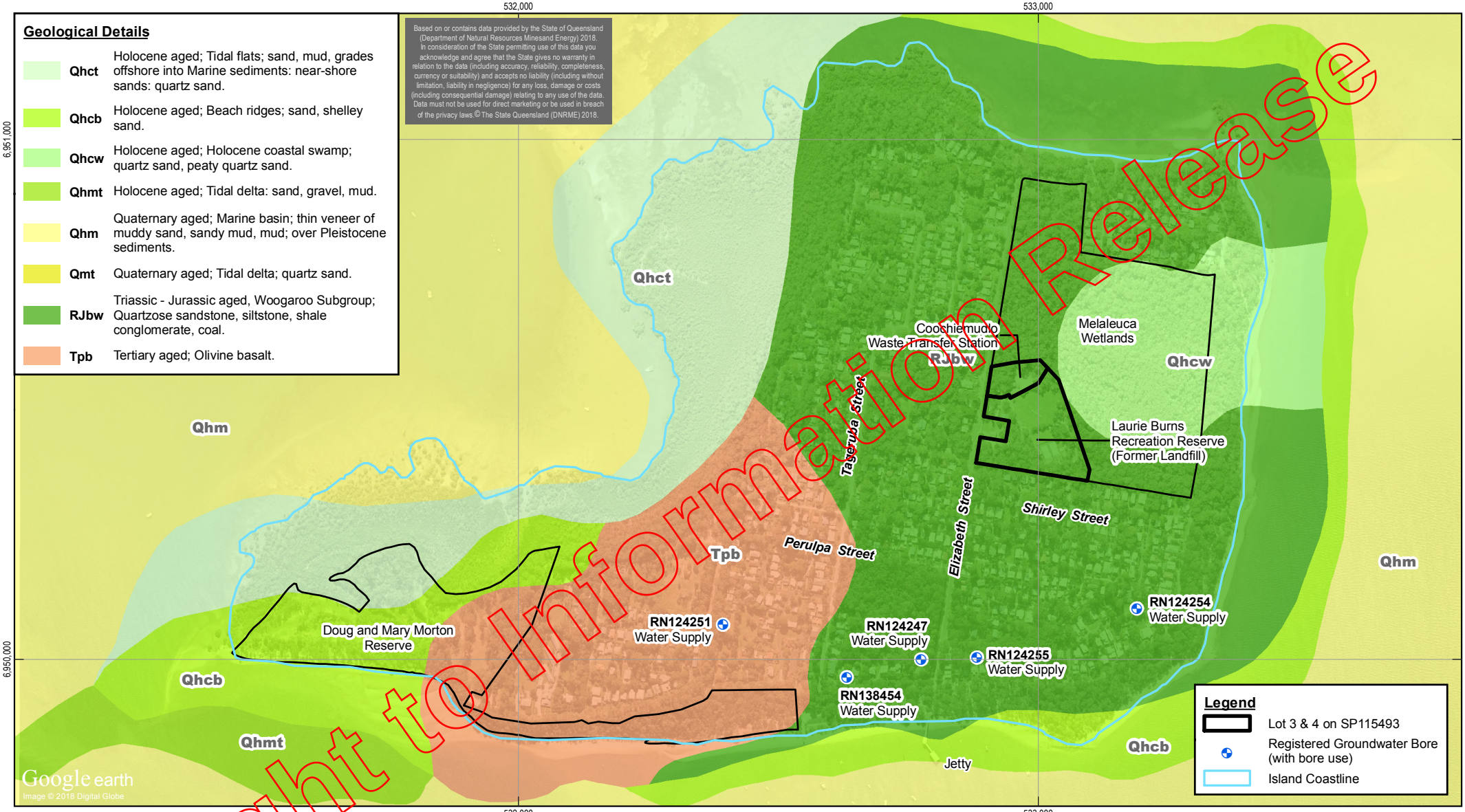

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Map Projection: Universal Transverse Mercator
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REDLAND CITY COUNCIL

Coochiemudlo Island Former Landfill

Job Number	41-27018
Revision	A
Date	09 Aug 2018

Geology and Registered Groundwater Bores

Figure 1

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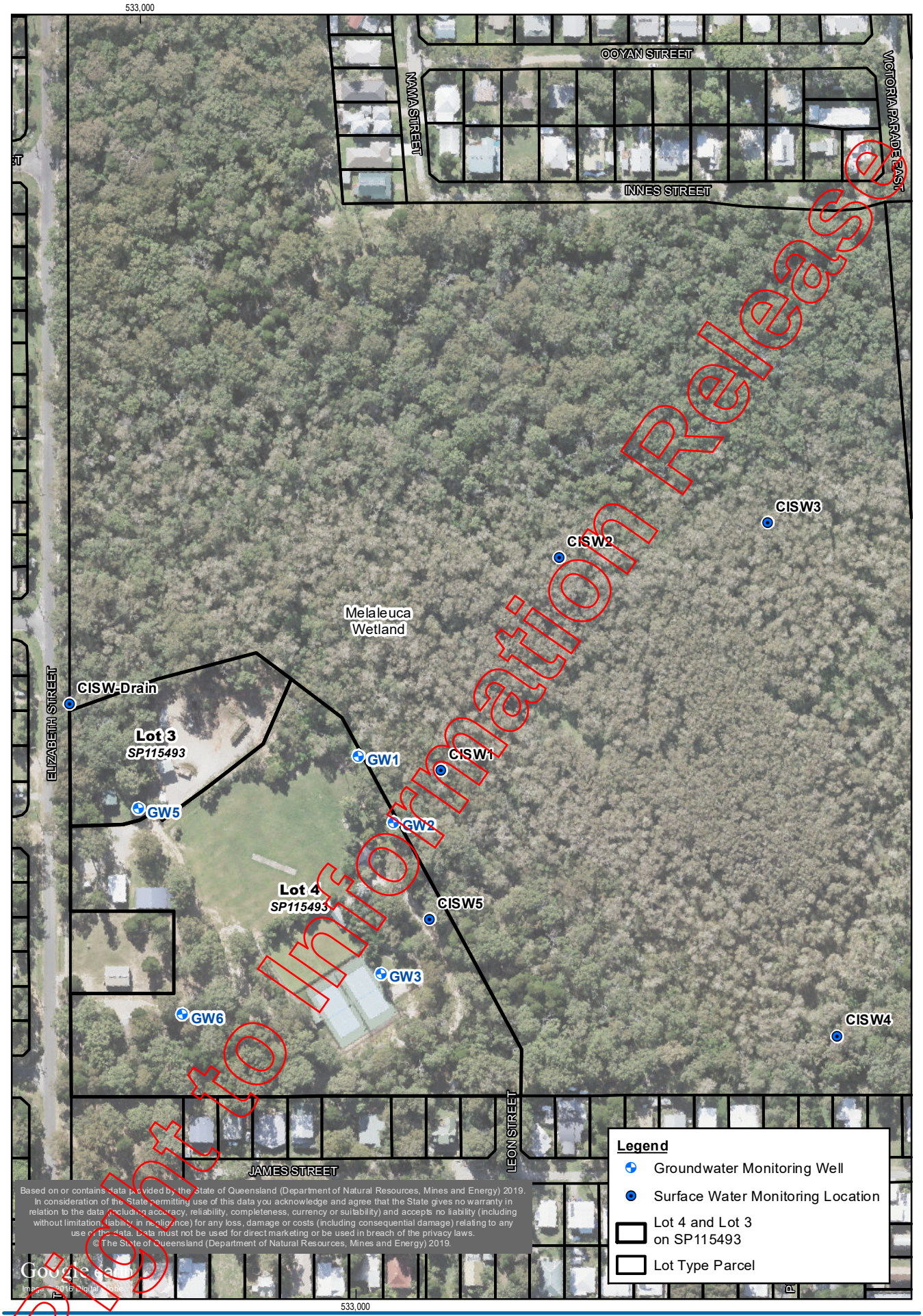

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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Redland City Council
Coochiemudlo Island

Groundwater Monitoring Well and Surface Water Monitoring Locations

Job Number	41-27018
Revision	B
Date	03 Jun 2019

Figure 2

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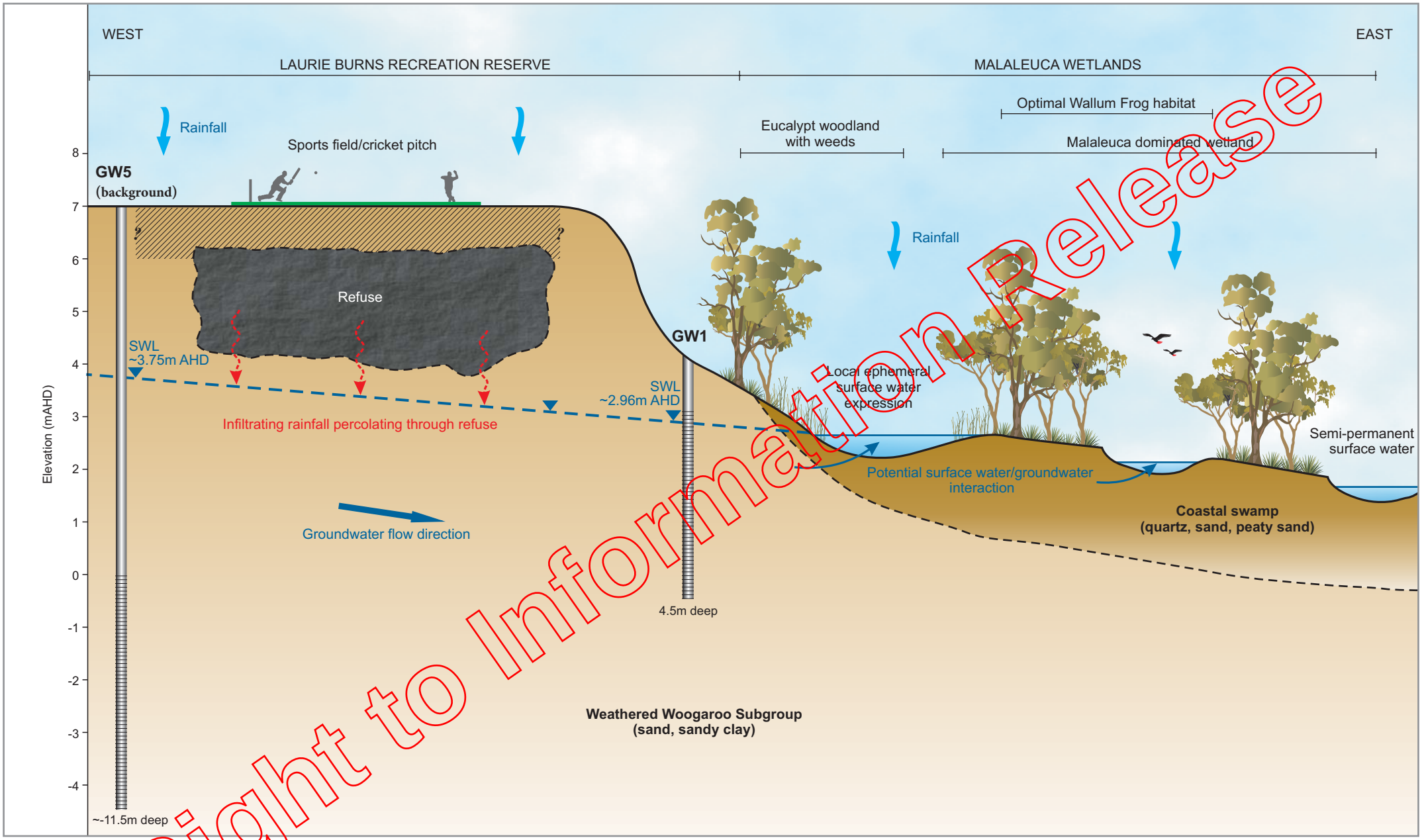
Data Source: GHD: Groundwater Well, Surface Water Sample Location (2019); DNRME: cadastre (2018), Google Earth: aerial imagery (Jun 2017, extracted Nov 2017). Created : jvc/klee



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LEGEND

Soil cover

Refuse

Groundwater level

Conceptual diagram only - not to scale.
Vertical exaggeration x10

REDLAND CITY COUNCIL
Coochiemudlo Island

Conceptual Site Model

Job Number	41-27018
Revision	A
Date	10 Sep 2018

Figure 3

AU\Launceston\Projects\41\27018\4127018_LTN_05.cdr

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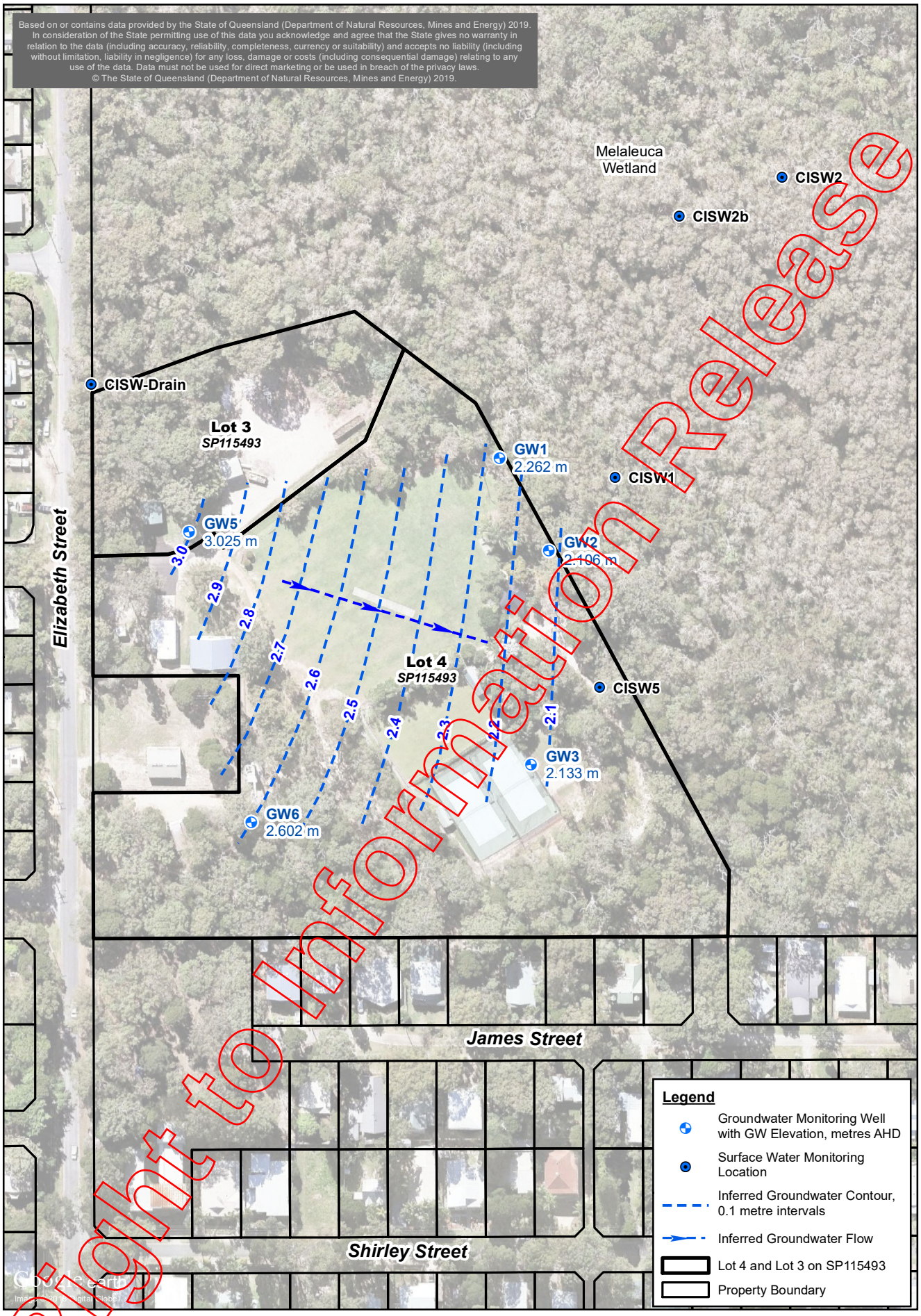

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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Redland City Council
Coochiemudlo Island

Job Number	41-27018
Revision	A
Date	12 Sep 2019

Groundwater Monitoring Contouring August 2019

Figure 4

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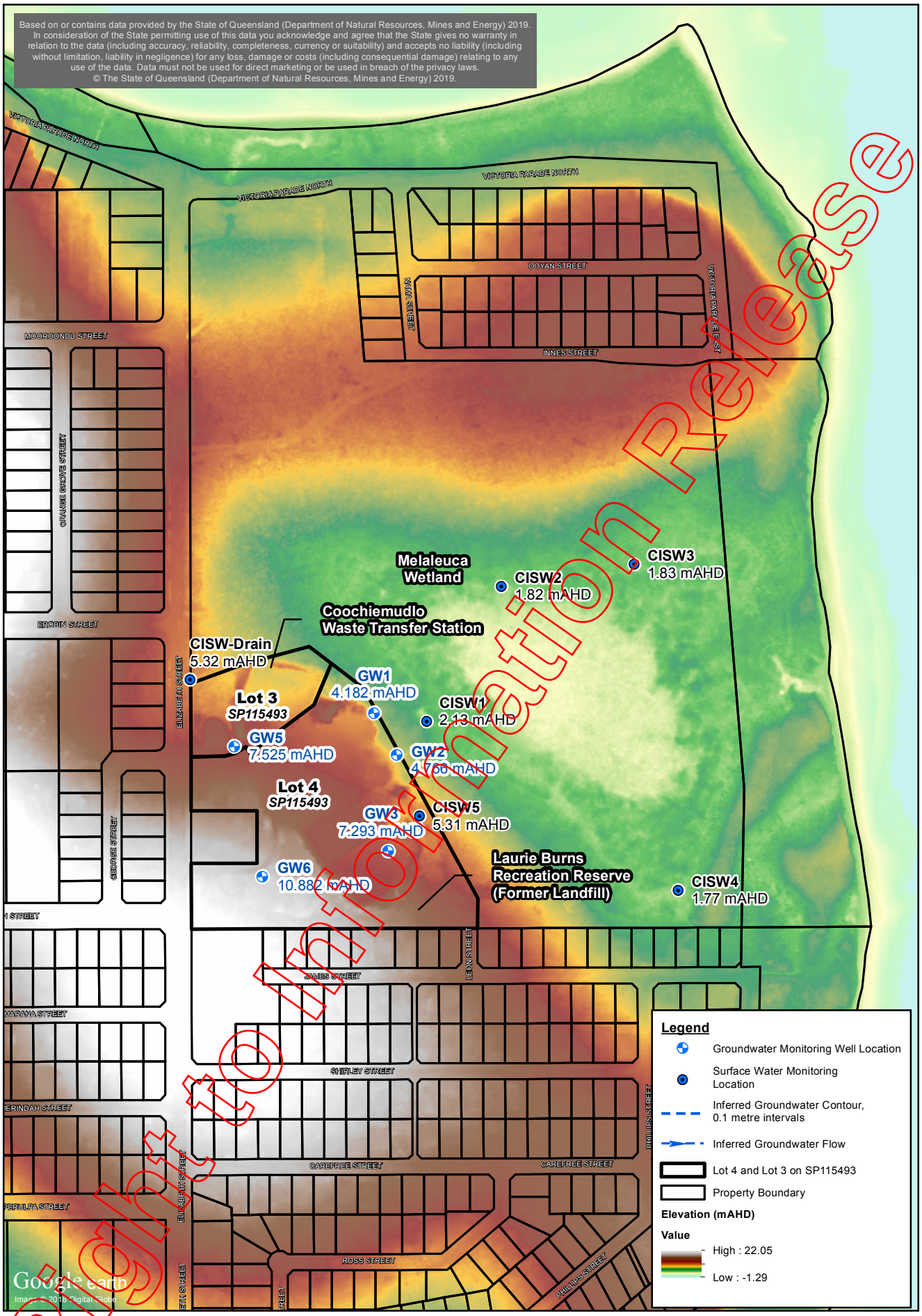

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Metres
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Redland City Council
Coochiemudlo Island

Job Number 41-27018
Revision A
Date 17 Jun 2019

Topographical Setting - Coochiemudlo Island Former Landfill

Figure 5

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Data Source: GHD: Groundwater Well, Surface Water Sample Location (2018), Groundwater Contours (2019); DNRME: cadastre (2018), Elevation(2014) Google Earth: aerial imagery (Jun 2017, extracted Nov 2017). Created : jvc/knoble

Appendix B – Results

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Appendix B
Table B1
Groundwater monitoring results

Purpose	Location_Code	Sampled_Date_Time	Field_ID	pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total	Anions Total	Ionic Balance	Total Organic Carbon	Nitrite + Nitrate as N	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)	BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
				Field Parameters						Inorganics		Acidity & Alkalinity				Major Ions									TOC	Nutrients								Organic Indicators	Metals										
				pH Units	µS/cm	mg/L	%S	mV	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL										1	10	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	0.01	0.1	0.1	0.01	2	0.005	0.0002	0.00005	0.0002	0.0005	0.002	0.0001	0.0005	0.00004	0.0005	0.001
ANZECC 2000 - Stock Watering																**1000**					**1000**							**90[#1]**	**9.1[#2]**					**5**	**0.5**	**0.01**	**1**	**1[#3]**		**0.1**		**0.002**	**1**	**20**
ANZECC 2000 FW Slight-Mod. Disturbed																											0.9	7.2[#4]							0.055[#5]	0.013[#6]	0.0002	0.001[#7]	0.0014	0.9	0.0034	1.9	0.00006	0.011	0.008
GHD 2018 Coochiemudlo Island wetland				3.53-4.61[#8]	90[#9]											3.02[#9]																													
Morton Bay - Schedule 1 EPP (water) - Drinking Water					*1000*	*4[#10]*																																		*0.05*		*0.05*			
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater				6.5-8[#11]	628[#12]		85-110[#11]																				0.02[#11]			0.08[#11]	0.5[#11]		0.05[#11]												
Down gradient	GW1	15/11/2018	GW1-1118-1	5.81	621	2.27	26.7	201.1	24	-	20	<1	142	<1	142	55	18	12	30	43	86	5.84	5.84	0.02	2	-	0.02	1.41	0.02	1.43	1.6	0.2	0.05	2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	0.013	<0.0001	0.0221	<0.0001	<0.0005	0.003
		15/03/2019	Dry - Not sampled																																											
		16/05/2019	GW1-0519-1	6	598	0.84	9.7	90	22.6	-	<10	<1	132	<1	132	60	19	12	37	59	93	6.47	6.24	1.86	<1	-	0.04	1.74	<0.01	1.74	2.2	0.5	0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	0.006	<0.0001	0.0034	<0.0001	<0.0005	0.002
		9/07/2019	GW1-0719-1	6.16	604	1.91	-	53.6	20.7	119	<10	<1	138	<1	138	65	21	13	28	38	-	6.52	6.31	1.68	6	2.74	<0.01	2.74	<0.01	-	3.2	0.5	0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	0.005	<0.0001	0.0087	<0.0001	<0.0005	0.002
		29/08/2019	GW1-0819-1	6.11	559	2.42	26.9	251.7	19.2	-	<10	<1	137	<1	137	55	20	11	28	41	88	5.89	5.73	1.41	3	-	<0.01	1.54	<0.01	1.54	1.8	0.3	0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0123	<0.00004	<0.0005	0.002
	GW2	15/11/2018	Dry - Not sampled																																											
		15/03/2019	Dry - Not sampled																																											
		16/05/2019	GW2-0519-1	5.99	1059	1.48	17.2	-37	22.7	-	16	<1	116	<1	116	47	23	10	72	169	41	7.62	7.94	2.01	7	-	0.08	0.01	<0.01	0.01	0.5	0.5	0.05	6	0.01	0.0025	<0.00005	0.0003	<0.0005	7.32	<0.0001	0.0036	<0.0001	<0.0005	0.074
		9/07/2019	GW2-0719-1	6.46	738	2.05	-	7.2	21	42	13	<1	134	<1	134	48	20	10	54	100	-	6.64	6.37	2.1	7	0.09	0.01	0.09	<0.01	-	0.3	0.2	0.03	3	<0.005	0.0003	<0.00005	<0.0002	<0.0005	1.25	<0.0001	0.0008	<0.0001	<0.0005	0.003
		29/08/2019	GW2-0819-1	5.73	1219	1.49	16.7	150.7	20.6	-	41	<1	61	<1	61	32	37	7	149	408	21	11.3	13.2	7.61	9	-	0.05	<0.01	<0.01	<0.01	1.3	1.3	0.19	4	0.007	0.0035	<0.00005	<0.0002	<0.0005	10	<0.0001	0.0041	<0.00004	0.0006	0.147
	GW3	15/11/2018	GW3-1118-1	4.99	190.3	2.76	34.2	220.4	25	-	16	<1	6	<1	6	2	2	<1	25	33	9	1.35	1.24	-	2	-	0.03	0.12	<0.01	0.12	0.5	0.4	0.32	<2	0.016	<0.0002	<0.00005	<0.0002	0.0014	0.063	0.0001	0.0074	<0.0001	0.0006	0.016
		15/03/2019	GW3-0319-1	4.58	117	1.42	-	296.3	25.7	-	12	<1	10	<1	10	1	2	<1	20	25	9	1.08	1.09	-	4	-	<0.01	0.11	<0.01	0.11	0.5	0.4	0.08	<2	0.163	<0.0002	<0.00005	0.0007	0.0024	0.231	0.0003	0.0045	<0.0001	<0.0005	0.011
		16/05/2019	GW3-0519-1	4.89	117.9	1.5	-	218.2	25.3	-	<10	<1	11	<1	11	2	2	<1	19	22	9	1.09	1.03	-	3	-	0.04	0.05	<0.01	0.05	0.4	0.3	0.1	<2	0.108	<0.0002	<0.00005	0.0004	0.0015	0.148	0.0001	0.0048	<0.0001	<0.0005	0.163
		9/07/2019	GW3-0719-1	5.44	125.5	2.79	-	158.3	23.9	8	<10	<1	14	<1	14	2	2	<1	14	15	-	0.87	0.87	-	3	0.06	<0.01	0.06	<0.01	-	0.3	0.2	0.05	<2	0.033	<0.0002	<0.00005	<0.0002	0.0007	0.046	0.0001	0.004	<0.0001	<0.0005	0.008
		29/08/2019	GW3-0819-1	4.95	259.3	1.4	16.9	259.3	23	-	<10	<1	9	<1	9	2	2	<1	32	43	18	1.66	1.77	-	3	-	<0.01	0.06	<0.01	0.06	0.3	0.2	0.03	<2	0.024	<0.0002	<0.00005	<0.0002	0.0009	0.324	<0.0001	0.0076	<0.00004	0.0006	0.059
Up gradient	GW5	15/11/2018	GW5-1118-1	4.63	446.3	2.33	29.5	246.5	25.4	-	<10	<1	6	<1	6	1	3	<1	45	55	16	2.25	2.22	-	1	-	0.02	3.03	<0.01	3.03	3.4	0.4	<0.01	2	0.011	<0.0002	<0.00005	<0.0002	0.003	0.009	0.0002	0.0035	<0.0001	0.0005	0.015
		15/03/2019	GW5-0319-1	4.62	332.8	2.97	-	329.8	23.9	-	<10	<1	3	<1	3	1	5	<1	55	80	17	2.85	2.67	-	<1	-	<0.01	3.02	<0.01	3.02	3.5	0.5	<0.01	<2	0.01	<0.0002	<0.00005	0.0004	<0.0005	0.004	<0.0001	0.0022	<0.0001	<0.0005	<0.001
		16/05/2019	GW5-0519-1	4.63	290.7	1.4	-	265.1	23.7	-	<10	<1	3	<1	3	1	4	<1	50	74	16	2.55	2.48	-	<1	-	0.03	2.91	<0.01	2.91	3.2	0.3	<0.01	<2	0.009	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0026	<0.0001	<0.0005	0.001
		9/07/2019	GW5-0719-1	4.77	391.7	2.17	-	269	23	17	<10	<1	4	<1	4	<1	5	<1	51	72	-	2.63	2.46	-	1	2.93	0.01	2.93	<0.01	-	3.2	0.3	<0.01	<2	0.018	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0019	<0.0001	<0.0005	<0.001
		29/08/2019	GW5-0819-1	4.74	321	2.34	31	331.5	22.6	-	<10	<1	4	<1	4	<1	5	<1	48	73	16	2.5	2.47	-	<1	-	<0.01	2.62	<0.01	2.62	2.9	0.3	<0.01	<2	0.022	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0019	<0.00004	<0.0005	<0.001
	GW6	15/11/2018	GW6-1118-1	4.12	2454	3.67	45	273	24.9	-	22	<1	<1	<1	<1	4	60	2	345	779	16	20.2	22.3	4.97	1	-	0.02	0.02	<0.01	0.02	0.6	0.8	1.21	<2	7.39	0.0002	<0.00005	<0.0002	0.0033	0.078	0.0008	0.139	<0.0001	0.0032	0.033
		15/03/2019	GW6-0319-1	Field parameters not available						-	<50[#1]	<1	<1	<1	<1	4	68	2	385	872	18	22.6	25	5	2	-	<0.01	0.02	<0.01	0.02	<0.1	<0.1	<0.01	<2	7.58	<0.0002	<0.00005	0.0002	0.0009	0.479	0.0007	0.12	<0.0001	0.0032	0.022
		16/05/2019	GW6-0519-1	3.95	1806	0.83	9.6	278.9	22.6	-	<10	<1	<1	<1	<1	3	50	3	292	669	13	17	19.1	5.8	<1	-	0.04	0.03	<0.01	0.03	0.2	0.2	0.08	<2	4.12	<0.0002	<0.00005	<0.0002	0.0008	0.172	0.001	0.16	<0.0001	0.002	0.129
		9/07/2019	GW6-0719-1	3.99	2225	2.09	-	249	22.2	17	13	<1	<1	<1	<1	3	60	2	338	760	-	19.8	21.8	4.69	2	0.02	<0.01	0.02	<0.01	-	<0.1	<0.1	0.01	<2	6.97	<0.0002	<0.00005	0.0002	0.0009	0.153	0.001	0.13	<0.0001	0.0027	0.018
		29/08/2019	GW6-0819-1	3.83	2368	1.21	13.9	315.5	21.9	-	<10	<1	<1	<1	<1	3	62	2	321	793	16	19.3	22.7	8.19	2	-	0.02	<0.01	<0.01	<0.01	0.1	0.1	<0.01	<2	6.87	<0.0002	<0.00005	0.0002	0.0007	0.745	0.0007	0.128	<0.00004	0.003	0.05

Statistical Summary

Number of Results	21	21	21	12	21	21	5	22	22	22	22	22	22	22	22	22	22	22	22	17	22	22	12	22	5	22	22	22	17	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Number of Detects	21	21	21	12	21	21	5	8	0	17	0	17	20	22	12	22	22	17	22	22	12	17	5	13	20	20	15	5	17	4	0	7	11	18	10	22	0	9	19
Minimum Concentration	3.83	117	0.83	9.6	-37	19.2	8	<10	<1	<1	<1	<1	<1	2	<1	14	15	9	0.87	0.87	0.02	<1	0.02	<0.01	<0.01	<0.01	<0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0008	<0.00004	<0.0005	<0.001
Minimum Detect	3.83	117	0.83	9.6	ND	19.2	8	12	ND	3	ND	3	1	2	2	14	15	9	0.87	0.87	0.02	1	0.02	0.01	0.01	0.02	0.01	2	0.007	0.0002	ND	0.0002	0.0007	0.004	0.0001	0.0008	ND	0.0005	0.001
Maximum Concentration	6.46	2454	3.67	45	331.5	25.7	119	<50	<1	142	<1	142	65	68	13	385	872	93	22.6	25	8.19	9	2.93	0.08	3.03	0.02	3.03	6	7.58	0.0035	<0.00005	0.0007	0.0033	10	0.001	0.16	<0.0001	0.0032	0.163
Maximum Detect	6.46	2454	3.67	45	331.5	25.7	119	41	ND	142	ND	142	65	68	13	385	872	93	22.6	25	8.19	9	2.93	0.08	3.03	0.02	3.03	6	7.58	0.0035	ND	0.0007	0.0033	10	0.001	0.16	ND	0.0032	0.163
Average Concentration	5.1	802	2	23	211	23	41	11	0.5	42	0.5	42	18	22	4.1	111	237	30	7.6	8.2	3.8	2.8	1.2	0.04	1	0.0057	0.98	1.4	0.36	0.1	1.5	1.5	0.00038	0.000025	0.00018	0.00088	0.96	0.00025	0.035	0.000043	0.00089	0.035
Median Concentration	4.89	559	2.05	21.95	249	23	17	5	0.5	7.5	0.5	7.5	3	18.5	2	49	72.5	16	5.865	5.785	3.395	2	0.09	0.015	0.1	0.005	0.11	0.65	0.3	0.02	1	0.018	0.0001	0.000025	0.0001	0.000475	0.0705	0.00005	0.00465	0.00005	0.00025	0.013
Standard Deviation	0.81	765	0.73	11	104	1.7	46	9.3	0	58	0	58	24	23	4.8	129	310	29	7.3	8.3	2.5	2.4	1.5	0.02	1.3	0.0032	1.2	1.3	0.27	0.26	1.3	2.9	0.00086	0	0.00015	0.00092	2.5	0.00034	0.056	0.000013	0.0011	0.05
Number of Guideline Exceedances	21	21	0	12	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	11	0	0	10	14	0	9	0	7	0	0	0	5	12	0	5	17	0	13			
Number of Guideline Exceedances(Detects Only)	21	21	0	12	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	11	0	0	10	14	0	9	0	7	0	0	0	5	12	0	5	0	0	13			

Env Stds Comments

#1:400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.
#2:30 mg/L divided by molecular weight
#3:>0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poulty
#4:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anzecc-nitrate-correction-sep02.pdf
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trigger value of 0.8 ug/L (0.0008 mg/L) has been derived
#6:As (V) used as conservative value
#7:Cr(VI) guideline has been adopted
#8:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmental limits of threatened species: the example of the wallum sedgefrog Litoria olongburensis. Ecosphere 7(6):e01384. 10.1002/ecs2.1384
#9:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog assessment
#10:At water surface
#11:Moreton Bay - Wallum/Tannin Freshwater
#12:QWQG 2009 - Sandy Coastal

Data Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

Right to Information Release

Table B1 - Groundwater monitoring results August 2019.xlsm , 17/09/2019
(Site_ID = 'Coochiemudlo Island' AND

Location_Code In('GW1' , 'GW2' , 'GW3' , 'GW5' , 'GW6') AND

Sampled_Date_Time In('29 Aug 2019' , '09 Jul 2019' , '16 May 2019' , '1

Appendix B
Table B1
Groundwater monitoring results

				OC Pesticides																							OP Pesticides																		
				4,4' DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	0.5	0.5
ANZECC 2000 - Stock Watering																																															
ANZECC 2000 FW Slight-Mod. Disturbed									0.03					0.006						0.01			0.2	0.01				0.1				0.01			0.01		0.15				0.05			0.004		
GHD 2018 Coochiemudlo Island wetland																																															
Morton Bay - Schedule 1 EPP (water) - Drinking Water																																															
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																																															
Purpose	**Location_Code**	**Sampled_Date_Time**	**Field_ID**																																												
Down gradient	GW1	15/11/2018	GW1-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/03/2019	Dry - Not samplec																																												
		16/05/2019	GW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW1-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	GW2	15/11/2018	Dry - Not samplec																																												
		15/03/2019	Dry - Not samplec																																												
		16/05/2019	GW2-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW2-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW2-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	GW3	15/11/2018	GW3-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/03/2019	GW3-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW3-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW3-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW3-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Up gradient	GW5	15/11/2018	GW5-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/03/2019	GW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW5-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	GW6	15/11/2018	GW6-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		15/03/2019	GW6-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW6-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW6-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW6-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Statistical Summary																																															
Number of Results				22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Median Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				0	0	0	0	0	22	0	0	0	0	22	0	0	0	0	0	22	0	0	22	22	0	0	0	22	0	0	22	0	0	22	0	0	22	0	0	0	22	0	0	22	0	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments
#1:400 mg/L divided by molecular weight, stock may tolerate higher nitrate conc
#2:30 mg/L divided by molecular weight
#3:>0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poulty
#4:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anz
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trig
#6:As (V) used as conservative value
#7:Cr(VI) guideline has been adopted
#8:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmenta
#9:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog asses
#10:At water surface
#11:Moreton Bay - Wallum/Tannin Freshwater
#12:QWQG 2009 - Sandy Coastal

Data Comments
#1 Reported Analyte LOR is higher than Requested Analyte LOR

Table B1 - Groundwater monitoring results August 2019.xlsm , 17/09/2019
(Site_ID = 'Coochiemudlo Island' AND

Location_Code In('GW1' , 'GW2' , 'GW3' , 'GW5' , 'GW6') AND

Sampled_Date_Time In('29 Aug 2019' , '09 Jul 2019' , '16 May 2019' , '1

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Appendix B
Table B2
Surface water monitoring results

				Field Parameters						Inorganics		Acidity & Alkalinity				Major Ions										TOC	Nutrients							
				pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total	Anions Total	Ionic Balance	Total Organic Carbon	Nitrite + Nitrate as N	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)
				pH Units	µS/cm	mg/L	%S	mV	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL										1	10	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	1	0.01	0.01	0.01	0.01	0.01	0.1	0.1	0.01
ANZECC 2000 FW 99% - applicable to CISW2, CISW2b and CISW3 only																											0.32	4.9[#2]						
ANZECC 2000 FW Slight-Mod. Disturbed																											0.9	7.2[#2]						
GHD 2018 Coochiemudlo Island wetland				3.53-4.61[#7]	90[#8]											3.02[#8]																		
Morton Bay - Schedule 1 EPP (water) - Drinking Water					*1000*	*4[#9]*																												
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater				**6.5-8[#10]**	**626[#11]**		**85-110[#10]**																				**0.02[#10]**			**0.06[#10]**	**0.5[#10]**		**0.05[#10]**
Purpose	**Location_Code**	**Sampled_Date_Time**	**Field_ID**																															
Background (potential frog habitat)	CISW2b	11/07/2019	CISW2b-0719-1	**5.74**	315.4	1.06	**10.7**	-88.9	16.4	3	114	<1	8	<1	8	3	4	4	34	59	-	2.06	1.89	-	35	<0.01	<0.01	<0.01	<0.01	-	**1.5**	**1.5**	**0.08**
Background	CISW-Drain	16/05/2019	CISW-Drain-0519-1	**5.55**	156.6	0.78	**9.2**	48.5	22.9	-	42	<1	15	<1	15	5	5	<1	32	50	15	2.05	2.02	-	2	-	**0.04**	0.11	<0.01	**0.11**	0.1	<0.1	<0.01
		11/07/2019	CISW-Drain-0719-1	**5.77**	210.8	2.98	**33.5**	243.7	20.6	14	<10	<1	16	<1	16	3	4	<1	26	40	-	1.61	1.74	-	3	0.08	<0.01	0.08	<0.01	-	0.1	<0.1	<0.01
	CISW4	11/07/2019	CISW4-0719-1	**5.71**	264.4	2.51	**26.7**	100.9	18.4	22	346	<1	7	<1	7	4	5	<1	35	53	-	2.13	2.09	-	84	0.02	<0.05[#1]	0.02	<0.01	-	**4.3**	4.3	**0.29**
Downstream	CISW1	15/11/2018	CISW1-1118-1	**6.32**	***1033***	2.12	**26.2**	-51.9	25.5	-	69	<1	132	<1	132	52	42	18	70	171	126	9.56	10.1	2.69	23	-	<0.01	<0.01	<0.01	<0.01	**0.9**	0.9	0.02
		26/03/2019	CISW1-0319-1	**4.03**	***4009***	0	-	141.4	26.5	-	205	<1	<1	<1	<1	272	141	15	86	99	2370	60.1	52.1	7.13	44	-	**2.71**	<0.1[#1]	<0.1[#1]	0.04	**6.8**	6.8	**0.08**
		16/05/2019	CISW1-0519-1	**5.03**	***3743***	0.23	**2.6**	0.4	-0.9	-	102	<1	<1	<1	<1	36	25	13	52	124	131	6.45	6.22	1.76	23	-	0.01	<0.01	<0.01	<0.01	**1.4**	1.4	**0.06**
		11/07/2019	CISW1-0719-1	**6.45**	**800**	3.64	**37.9**	148.7	17.1	170	40	<1	49	<1	49	50	40	17	66	169	-	9.09	9.28	1.05	16	<0.01	<0.01	<0.01	<0.01	-	**0.5**	0.5	0.01
		29/08/2019	CISW1-0819-1	**5.75**	***3456***	0.12	**1.3**	-5.6	17.5	-	24	<1	9	<1	9	71	62	19	84	239	308	12.8	13.3	2.1	10	-	<0.01	<0.01	<0.01	<0.01	0.4	0.4	<0.01
	CISW5	15/03/2019	CISW5-0319-1	Field parameters not available						-	48	<1	14	<1	14	3	1	2	6	9	<5[#1]	0.54	0.53	-	17	-	<0.01	0.02	<0.01	0.02	**0.8**	0.8	**0.2**
		16/05/2019	CISW5-0519-1	**5.47**	101.5	0.85	**9.7**	138.2	19.2	-	52	<1	17	<1	17	6	2	3	14	22	<1	1.15	0.96	-	19	-	**0.02**	<0.01	<0.01	<0.01	**0.8**	0.8	**0.05**
		11/07/2019	CISW5-0719-1	**6**	105.6	2.46	**26**	154.3	17.9	2	56	<1	12	<1	12	4	2	3	11	18	-	0.92	0.79	-	15	<0.01	<0.01	<0.01	<0.01	-	**0.8**	0.8	**0.08**
Statistical Summary																																		
Number of Results				11	11	11	10	11	11	5	12	12	12	12	12	12	12	12	12	12	7	12	12	5	12	5	12	12	12	7	12	12	12
Number of Detects				11	11	11	10	11	11	5	11	0	10	0	10	12	12	9	12	12	5	12	12	5	12	2	4	4	0	3	11	10	9
Minimum Concentration				4.03	101.5	0	1.3	-88.9	-0.9	2	<10	<1	<1	<1	<1	3	1	<1	6	9	<1	0.54	0.53	1.05	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01
Minimum Detect				4.03	101.5	0.12	1.3	ND	ND	2	24	ND	7	ND	7	3	1	2	6	9	15	0.54	0.53	1.05	2	0.02	0.01	0.02	ND	0.02	0.1	0.4	0.01
Maximum Concentration				6.45	4009	3.64	37.9	243.7	26.5	170	346	<1	132	<1	132	272	141	19	86	239	2370	60.1	52.1	7.13	84	0.08	2.71	0.11	<0.1	0.11	6.8	6.8	0.29
Maximum Detect				6.45	4009	3.64	37.9	243.7	26.5	170	346	ND	132	ND	132	272	141	19	86	239	2370	60.1	52.1	7.13	84	0.08	2.71	0.11	ND	0.11	6.8	6.8	0.29
Average Concentration				5.6	1290	1.5	18	75	18	42	92	0.5	23	0.5	23	42	28	8	43	88	422	9	8.4	2.9	24	0.023	0.24	0.026	0.0088	0.027	1.5	1.5	0.074
Median Concentration				5.74	315.4	1.06	18.35	100.9	18.4	14	54	0.5	13	0.5	13	5.5	5	3.5	34.5	56	126	2.095	2.055	2.1	18	0.005	0.005	0.005	0.005	0.005	0.8	0.8	0.055
Standard Deviation				0.65	1602	1.3	13	102	7.2	72	96	0	36	0	36	76	41	7.7	28	73	866	17	14	2.4	22	0.033	0.78	0.035	0.013	0.039	2	2	0.088
Number of Guideline Exceedances				11	11	0	10	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	4	0	0	1	9	0	7
Number of Guideline Exceedances(Detects Only)				11	11	0	10	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	3	0	0	1	9	0	7

Env Stds Comments

#1:Guideline value calculated by dividing Ammonia (as Ammonia) value by 1.216
#2:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anzecc-nitrate-correction-sep02.pdf
#3:As (V) used as conservative value
#4:In absence of Total Cr guideline Cr(VI) guideline has been adopted
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trigger value of 0.8 ug/L (0.0008 mg/L) has been derived
#6:Cr(VI) guideline has been adopted
#7:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmental limits of threatened species: the example of the wallum sedgefrog Litoria olongburensis. Ecosphere, 7(6):e01384. 10.1002/ecs2.1384 #8:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog assessment. Applicable to CISW2 and CISW3 only.
#9:At water surface
#10:Moreton Bay - Wallum/Tannin Freshwater
#11:QWQG 2009 - Sandy Coastal

Data Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

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Appendix B
Table B2
Surface water monitoring results

				Organic Indicators	Metals											
				BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL				2	0.005	0.0002	0.00005	0.0002	0.0005	0.002	0.0001	0.0005	0.00004	0.0005	0.001
ANZECC 2000 FW 99% - applicable to CISW2, CISW2b and CISW3 only					0.027	0.0008[#3]	0.00006	0.00001	0.001		0.001	1.2	0.00006	0.008	0.0024
ANZECC 2000 FW Slight-Mod. Disturbed					0.055[#5]	0.013[#3]	0.0002	0.001[#6]	0.0014	0.3	0.0034	1.9	0.00006	0.011	0.008
GHD 2018 Coochiemudlo Island wetland															
Morton Bay - Schedule 1 EPP (water) - Drinking Water										*0.05*		*0.05*			
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater															
Purpose	**Location_Code**	**Sampled_Date_Time**	**Field_ID**												
Background (potential frog habitat)	CISW2b	11/07/2019	CISW2b-0719-1	3	0.686	0.0018	<0.00005	0.0033	<0.0005	*4.51*	0.0002	0.0103	<0.0001	0.001	0.002
Background	CISW-Drain	16/05/2019	CISW-Drain-0519-1	<2	<0.005	0.0002	<0.00005	<0.0002	<0.0005	*0.27*	<0.0001	0.0204	<0.0001	<0.0005	0.003
		11/07/2019	CISW-Drain-0719-1	<2	0.039	0.0002	<0.00005	0.0003	0.0005	*0.134*	<0.0001	0.0182	<0.0001	<0.0005	0.004
	CISW4	11/07/2019	CISW4-0719-1	8	0.057	0.0036	<0.00005	0.0012	<0.0005	*4.15*	<0.0001	0.0325	<0.0001	0.001	0.121
Downstream	CISW1	15/11/2018	CISW1-1118-1	<2	0.036	0.0008	<0.00005	0.0005	<0.0005	*2.38*	<0.0001	0.0205	<0.0001	<0.0005	<0.001
		26/03/2019	CISW1-0319-1	24	64.8	0.0034	0.0271	0.011	0.0072	*416*	0.0195	*2.05*	<0.00004	0.232	37.8
		16/05/2019	CISW1-0519-1	3	0.032	0.0007	<0.00005	0.0008	0.0008	*0.723*	<0.0001	*0.0532*	<0.0001	0.0006	0.32
		11/07/2019	CISW1-0719-1	<2	0.042	0.0004	<0.00005	0.0008	<0.0005	*0.645*	0.0001	0.0109	<0.0001	<0.0005	0.005
		29/08/2019	CISW1-0819-1	<2	0.01	0.0003	<0.00005	<0.0002	<0.0005	*1.33*	<0.0001	0.0463	<0.00004	<0.0005	0.015
	CISW5	15/03/2019	CISW5-0319-1	5	0.221	0.0077	<0.00005	0.0015	0.0039	*1.26*	0.0011	0.04	<0.0001	0.0006	0.009
		16/05/2019	CISW5-0519-1	2	0.142	0.0043	<0.00005	0.0014	<0.0005	*1.93*	0.0001	0.0496	<0.0001	0.0009	0.09
		11/07/2019	CISW5-0719-1	2	0.322	0.0037	<0.00005	0.0012	0.0006	*2.61*	0.0002	0.0471	<0.0001	0.0009	0.004
Statistical Summary															
Number of Results				12	12	12	12	12	12	12	12	12	12	12	12
Number of Detects				7	11	12	1	10	5	12	6	12	0	7	11
Minimum Concentration				<2	<0.005	0.0002	<0.00005	<0.0002	<0.0005	0.134	<0.0001	0.0103	<0.00004	<0.0005	<0.001
Minimum Detect				2	0.01	0.0002	0.0271	0.0003	0.0005	0.134	0.0001	0.0103	ND	0.0006	0.002
Maximum Concentration				24	64.8	0.0077	0.0271	0.011	0.0072	416	0.0195	2.05	<0.0001	0.232	37.8
Maximum Detect				24	64.8	0.0077	0.0271	0.011	0.0072	416	0.0195	2.05	ND	0.232	37.8
Average Concentration				4.3	5.5	0.0023	0.0023	0.0019	0.0012	36	0.0018	0.2	0.000045	0.02	3.2
Median Concentration				2	0.0495	0.0013	0.000025	0.001	0.00025	1.63	0.000075	0.03625	0.00005	0.0006	0.007
Standard Deviation				6.5	19	0.0023	0.0078	0.003	0.0021	120	0.0056	0.58	0.000012	0.067	11
Number of Guideline Exceedances				0	10	7	1	12	2	12	2	2	10	1	10
Number of Guideline Exceedances(Detects Only)				0	10	7	1	10	2	12	2	2	0	1	10

Env Stds Comments
#1:Guideline value calculated by dividing Ammonia (as Ammonia) value by 1.216
#2:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anzecc-nitrate-correction-sepC
#3:As (V) used as conservative value
#4:In absence of Total Cr guideline Cr(VI) guideline has been adopted
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trigger value of 0.8 ug/L (0.00
#6:Cr(VI) guideline has been adopted
#7:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmental limits of threatened speci
#8:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog assessment
#9:At water surface
#10:Moreton Bay - Wallum/Tannin Freshwater
#11:QWQG 2009 - Sandy Coastal

Data Comments
#1 Reported Analyte LOR is higher than Requested Analyte LOR

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Appendix B
Table B2
Surface water monitoring results

Purpose	Location_Code	Sampled_Date_Time	Field_ID	4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
				OC Pesticides																							
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2
ANZECC 2000 FW 99% - applicable to CISW2, CISW2b and CISW3 only									0.03					0.006						0.01			0.07	0.01			
ANZECC 2000 FW Slight-Mod. Disturbed									0.03					0.006						0.01			0.2	0.01			
GHD 2018 Coochiemudlo Island wetland																											
Morton Bay - Schedule 1 EPP (water) - Drinking Water																											
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																											
Background (potential frog habitat)	CISW2b	11/07/2019	CISW2b-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Background	CISW-Drain	16/05/2019	CISW-Drain-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		11/07/2019	CISW-Drain-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	CISW4	11/07/2019	CISW4-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Downstream	CISW1	15/11/2018	CISW1-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		26/03/2019	CISW1-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		16/05/2019	CISW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		11/07/2019	CISW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		29/08/2019	CISW1-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
	CISW5	15/03/2019	CISW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		16/05/2019	CISW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
		11/07/2019	CISW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Statistical Summary																											
Number of Results				12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
Median Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				0	0	0	0	0	12	0	0	0	0	12	0	0	0	0	0	12	0	0	12	12	0	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Purpose	Location_Code	Sampled_Date_Time	Field_ID	Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
				OP Pesticides																		
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	0.5	0.5
ANZECC 2000 FW 99% - applicable to CISW2, CISW2b and CISW3 only				0.01				0.00004			0.00003		0.1				0.002			0.0007		
ANZECC 2000 FW Slight-Mod. Disturbed				0.1				0.01			0.01		0.15				0.05			0.004		
GHD 2018 Coochiemudlo Island wetland																						
Morton Bay - Schedule 1 EPP (water) - Drinking Water																						
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																						
Background (potential frog habitat)	CISW2b	11/07/2019	CISW2b-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Background	CISW-Drain	16/05/2019	CISW-Drain-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		11/07/2019	CISW-Drain-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	CISW4	11/07/2019	CISW4-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Downstream	CISW1	15/11/2018	CISW1-1118-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		26/03/2019	CISW1-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	CISW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		11/07/2019	CISW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	CISW1-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	CISW5	15/03/2019	CISW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	CISW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		11/07/2019	CISW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Statistical Summary																						
Number of Results				12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Median Concentration				0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25
Standard Deviation				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances				12	0	0	0	12	0	0	12	0	12	0	0	0	12	0	0	12	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments

#1:Guideline value calculated by dividing Ammonia (as Ammonia) value by 1.216
#2:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anzecc-nitrate-correction-sepC
#3:As (V) used as conservative value
#4:In absence of Total Cr guideline Cr(VI) guideline has been adopted
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trigger value of 0.8 ug/L (0.00
#6:Cr(VI) guideline has been adopted
#7:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmental limits of threatened speci
#8:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog assessment
#9:At water surface
#10:Moreton Bay - Wallum/Tannin Freshwater
#11:QWQG 2009 - Sandy Coastal

Data Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

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Appendix C – Background – down gradient charts

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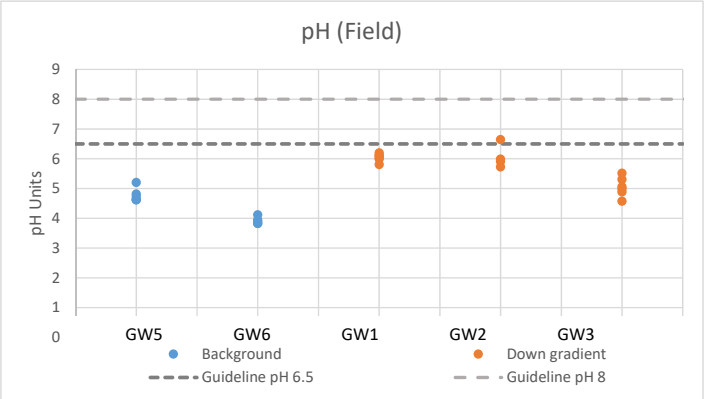

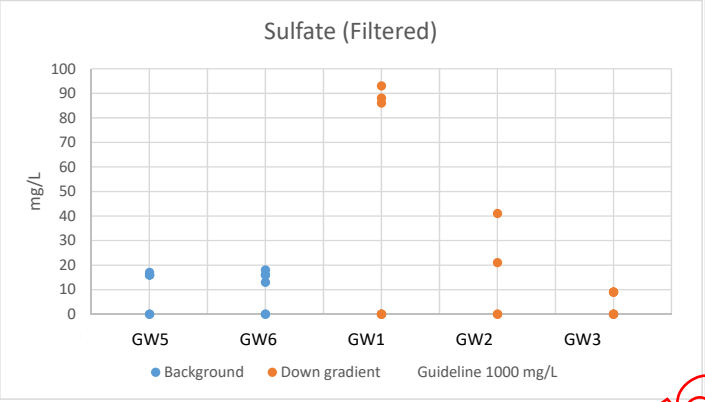

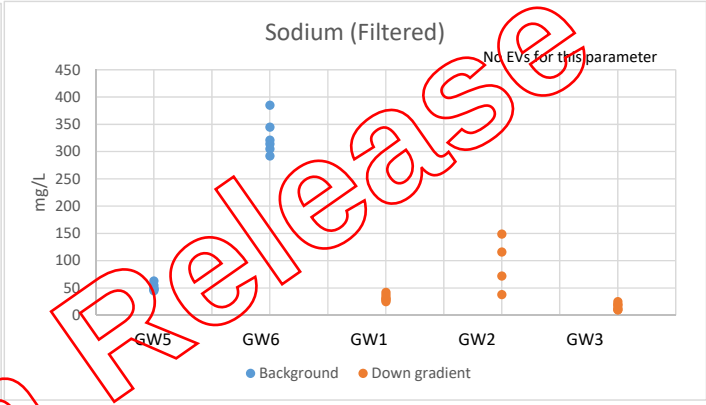

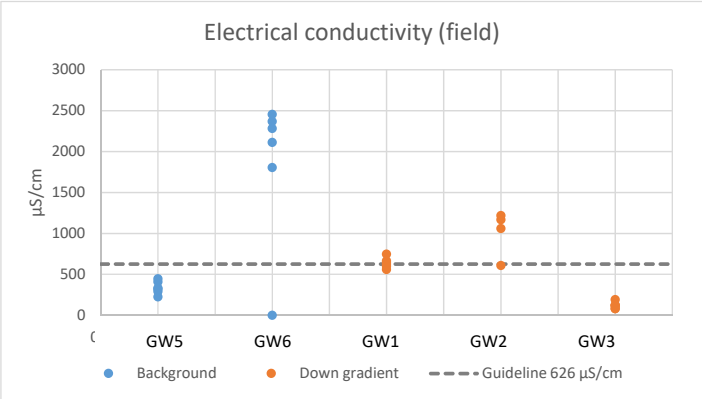

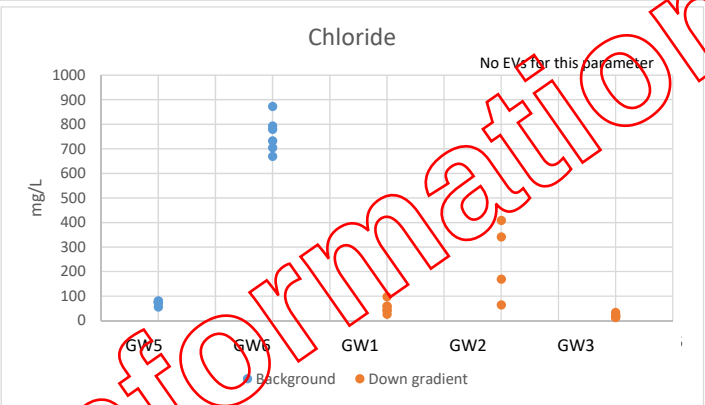

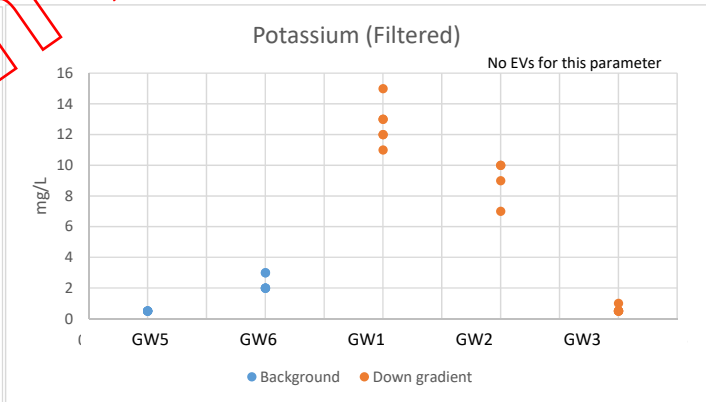

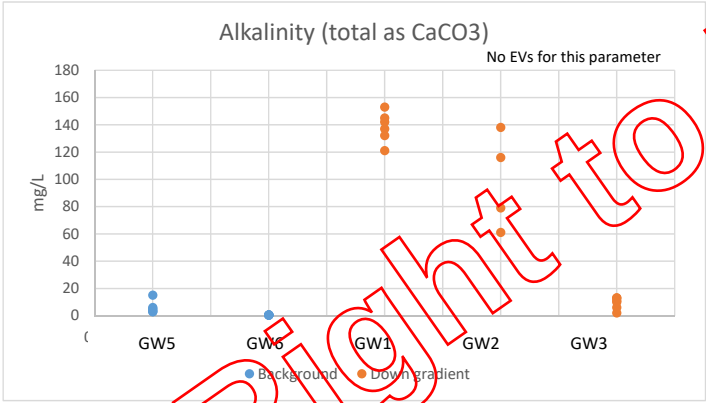

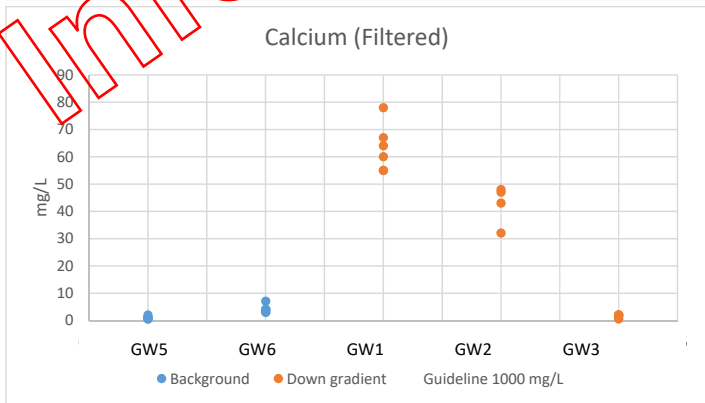

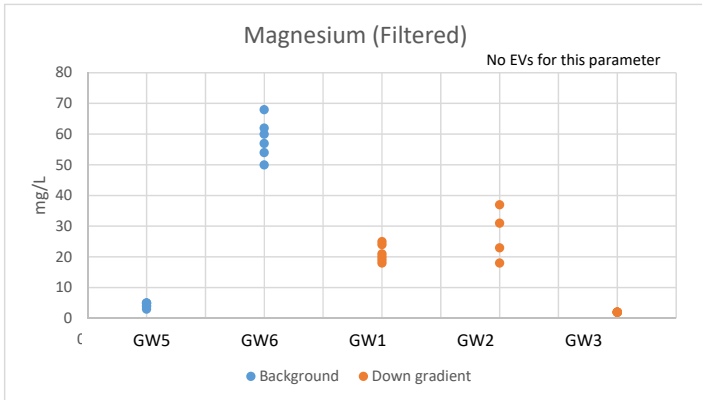

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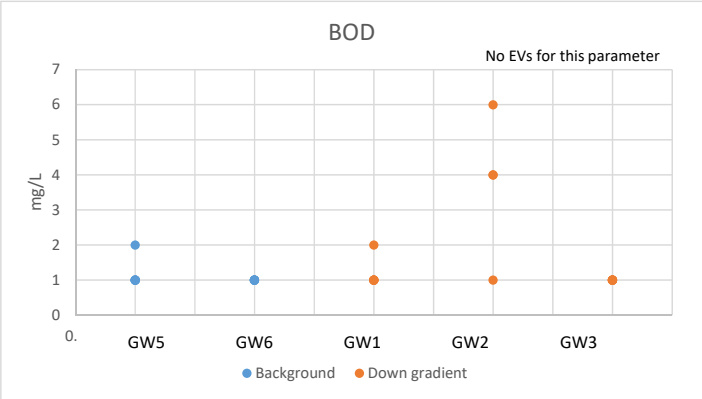

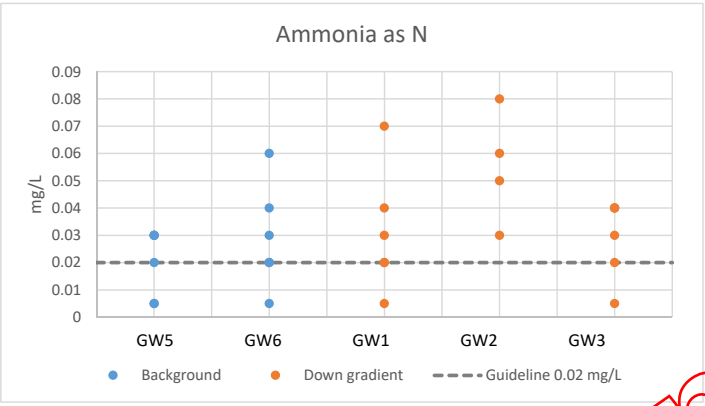

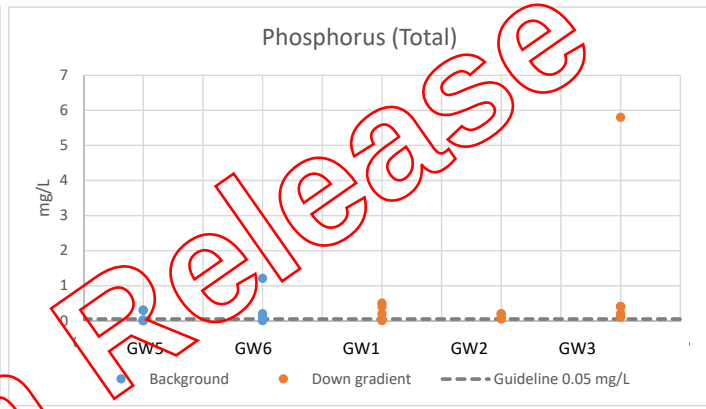

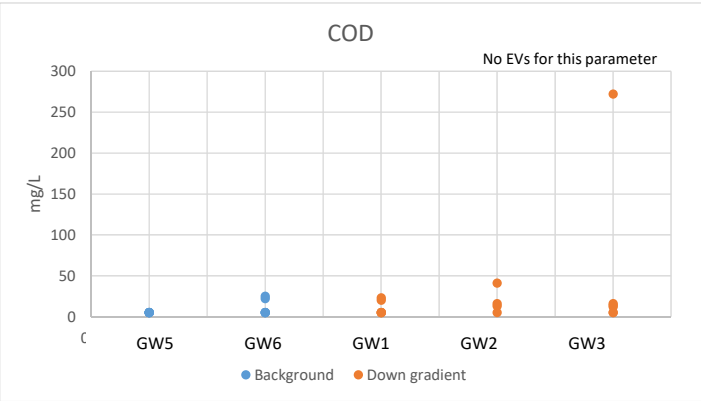

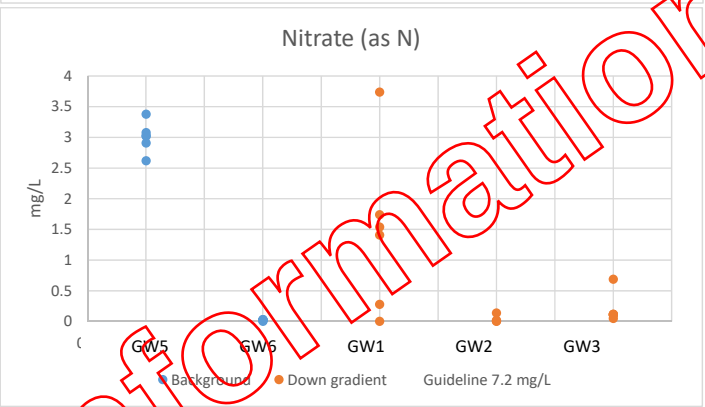

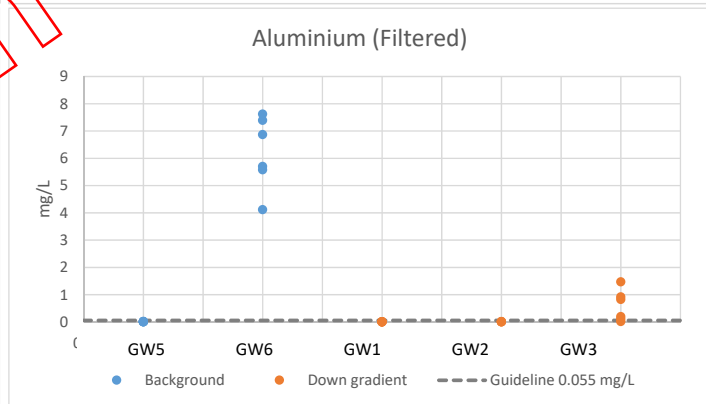

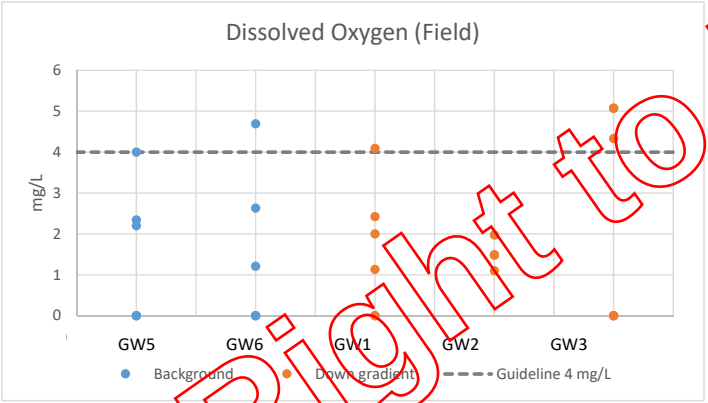

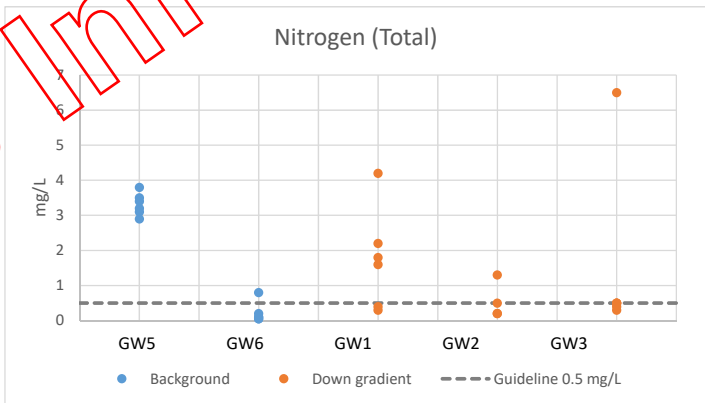

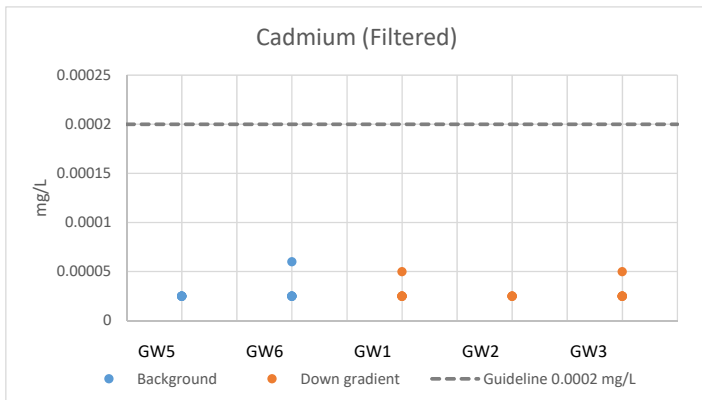

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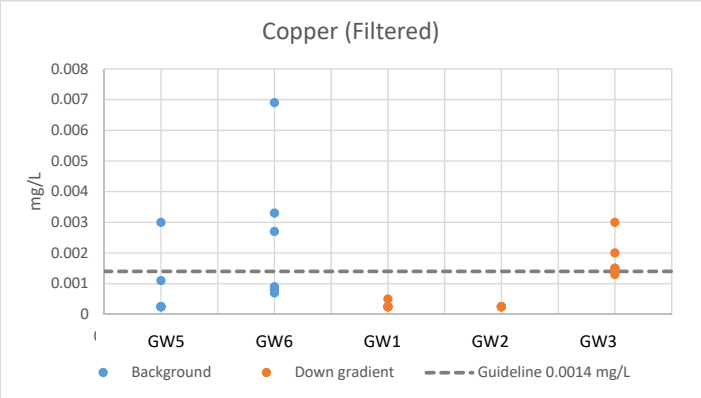

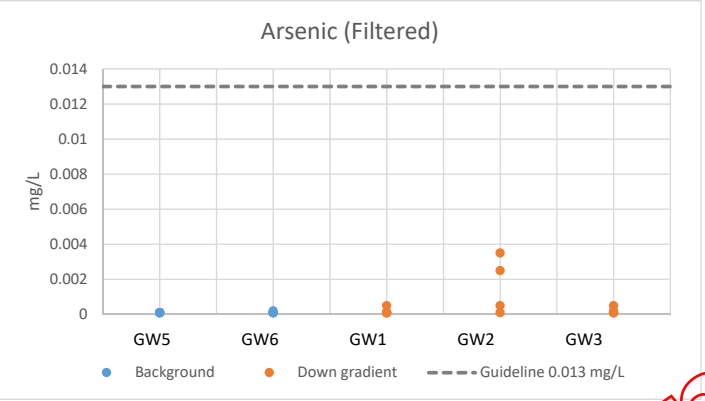

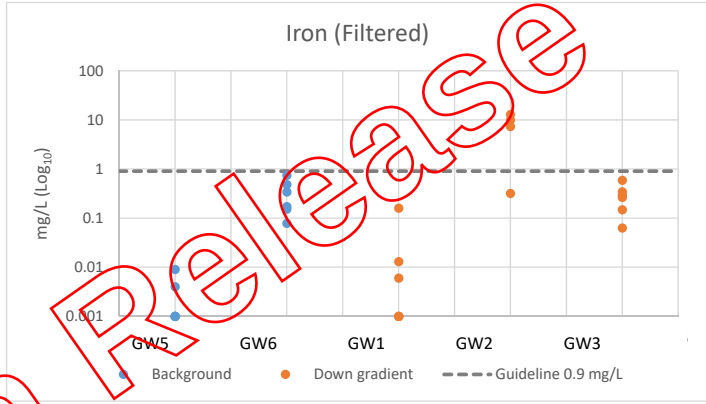

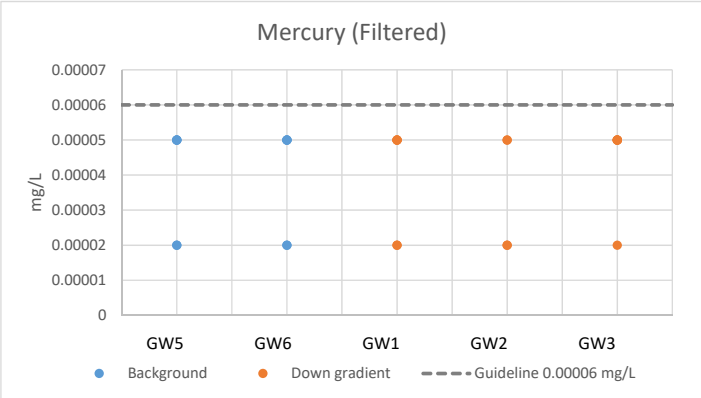

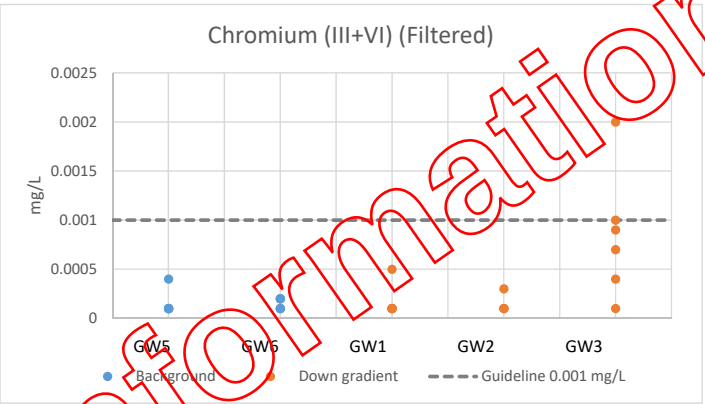

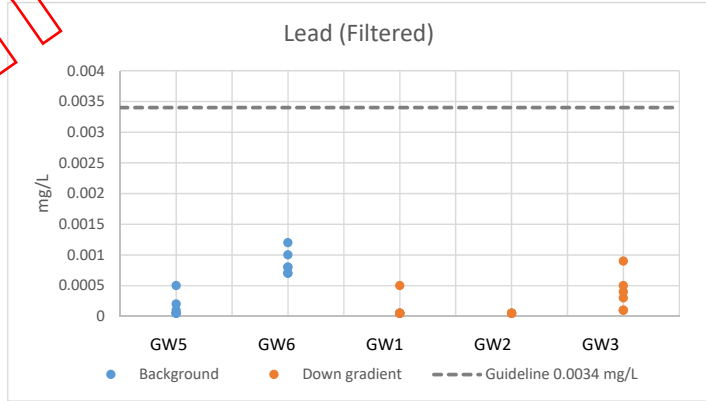

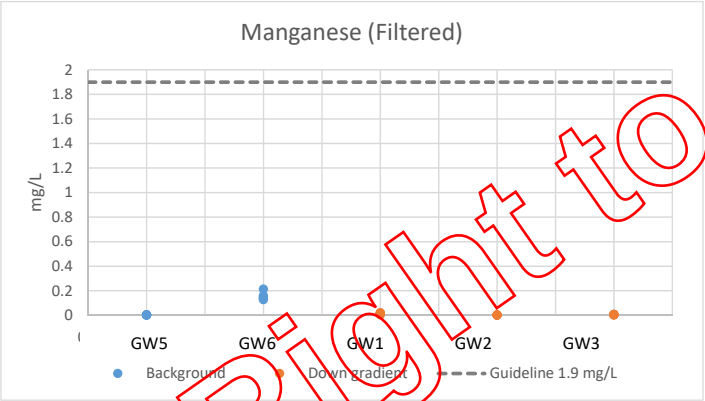

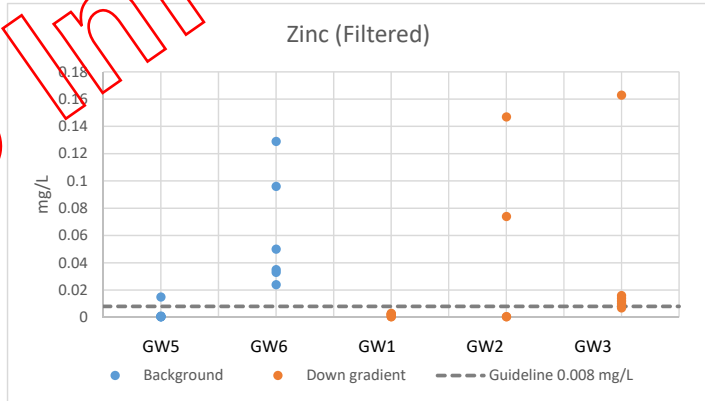

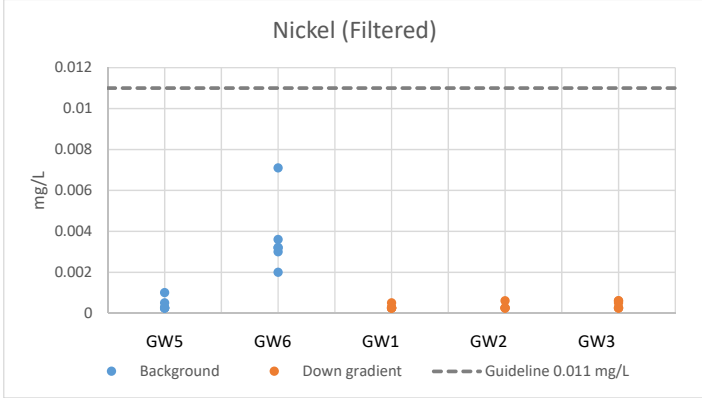

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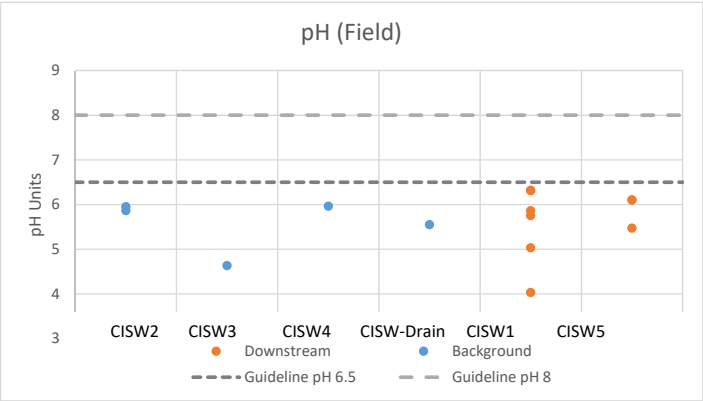

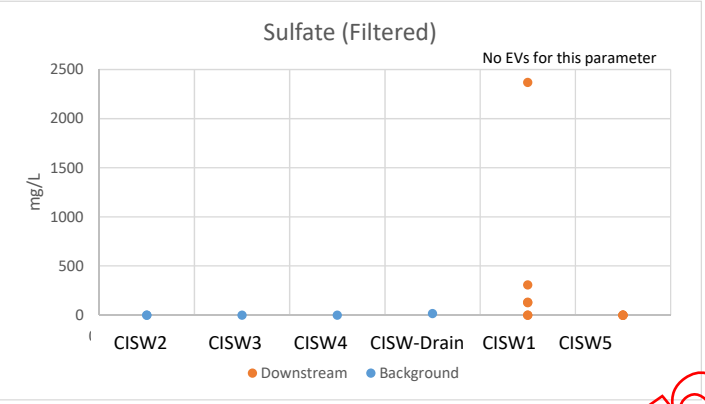

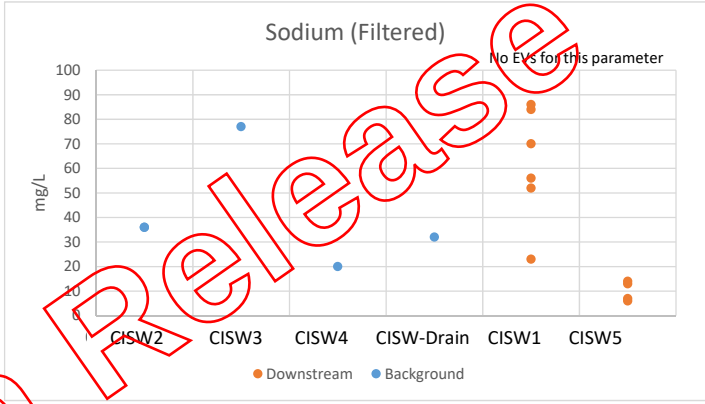

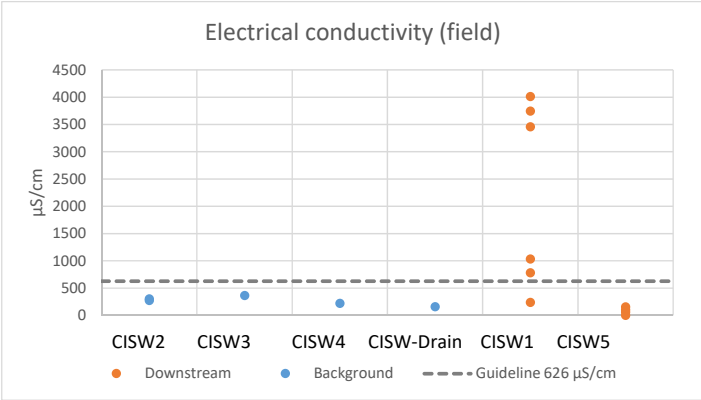

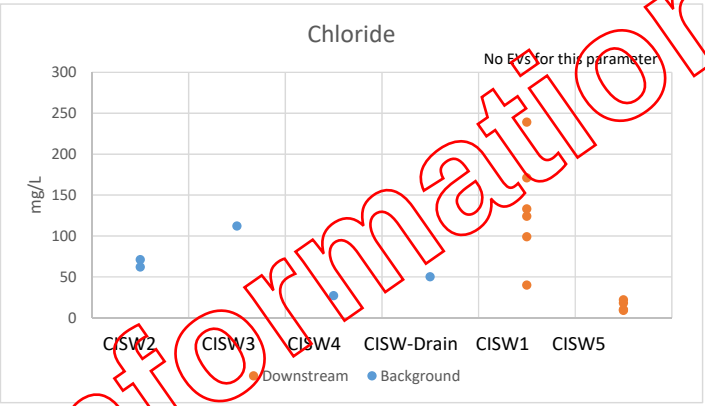

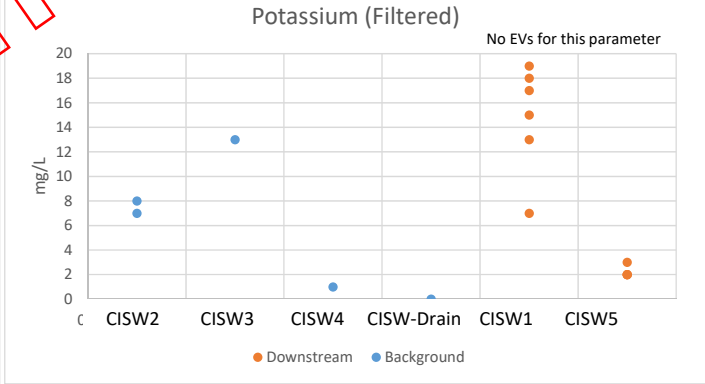

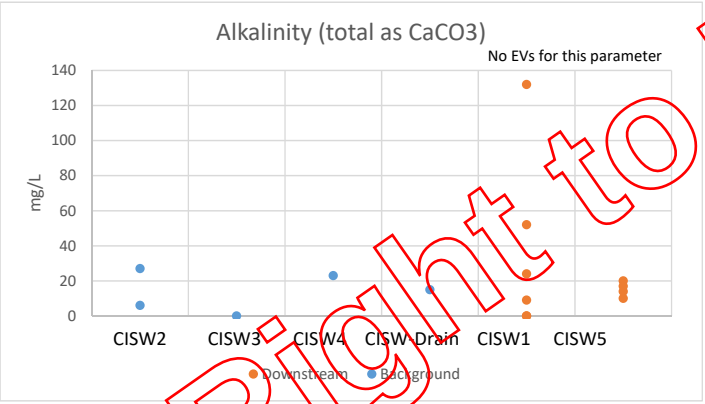

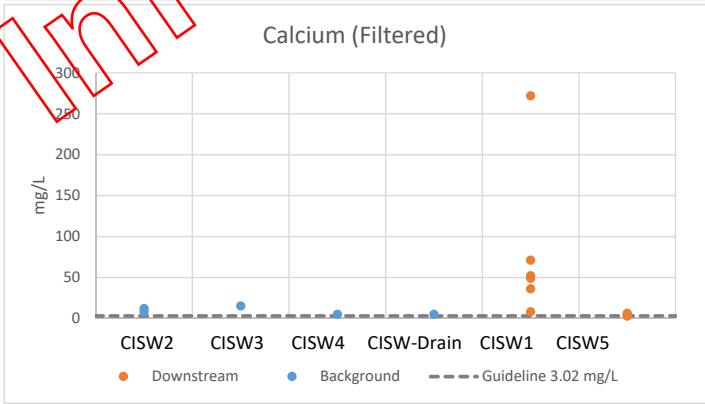

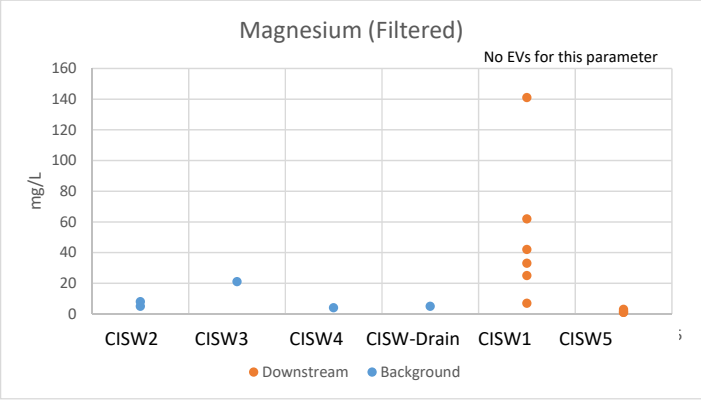

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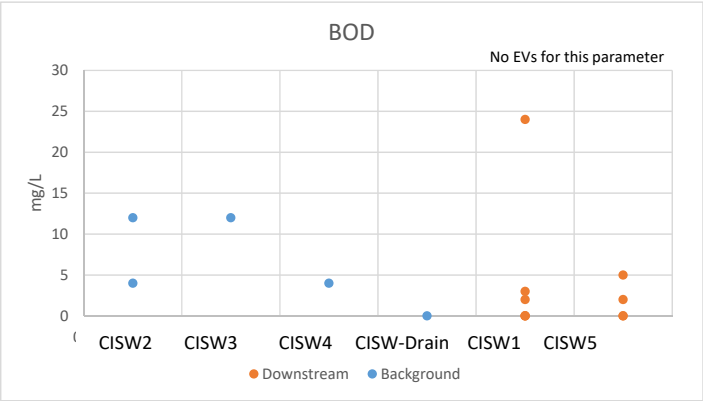

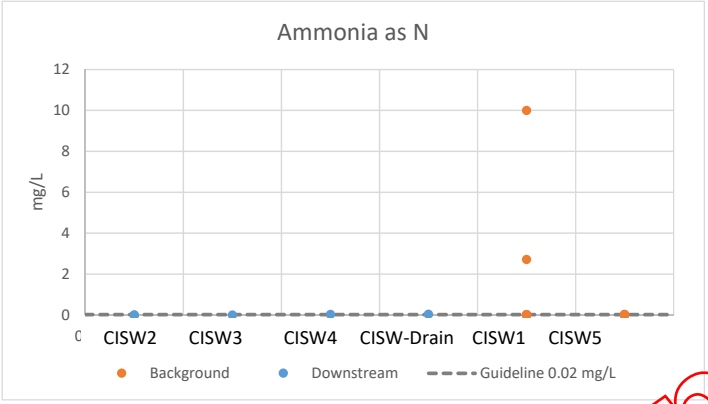

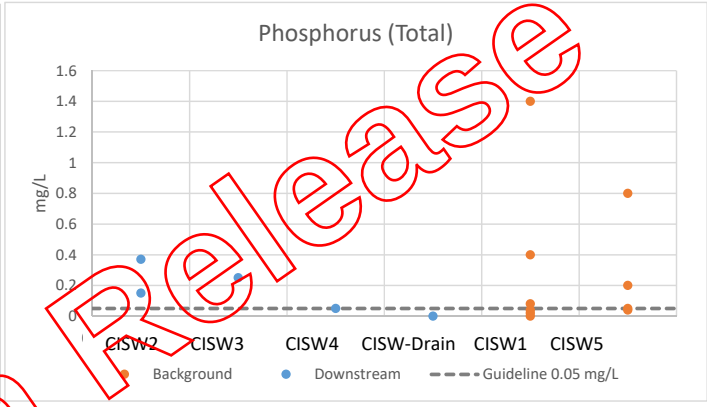

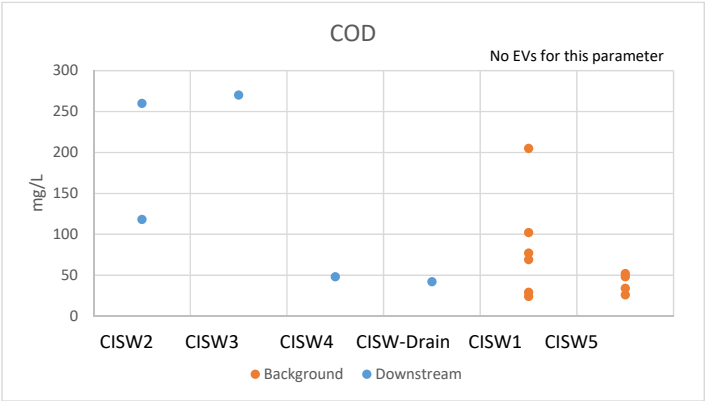

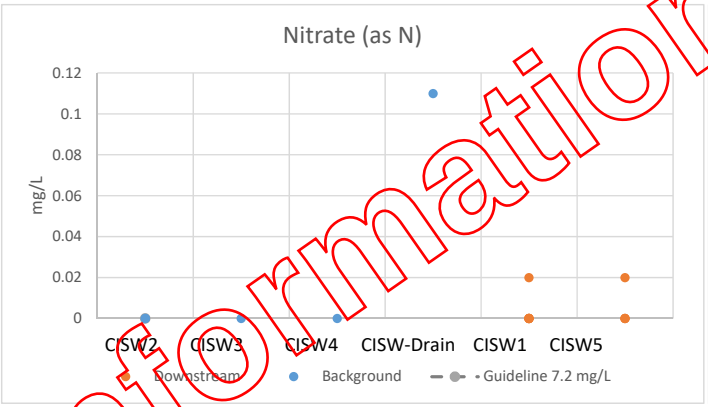

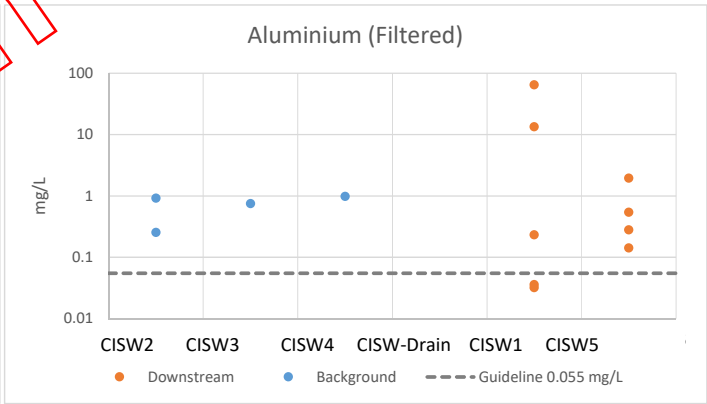

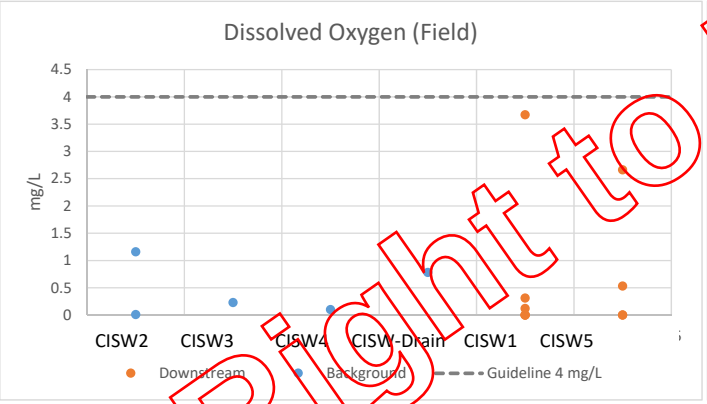

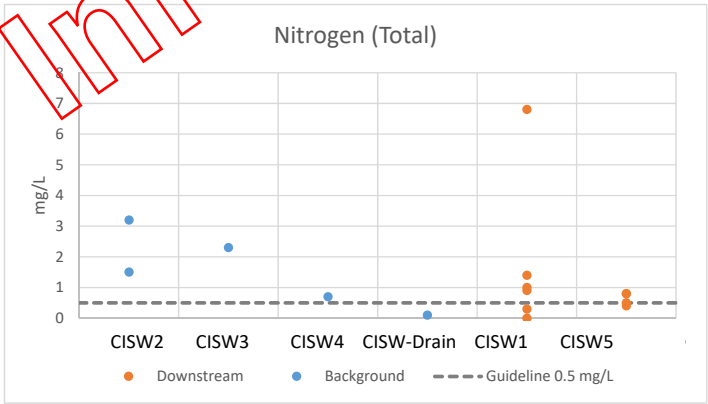

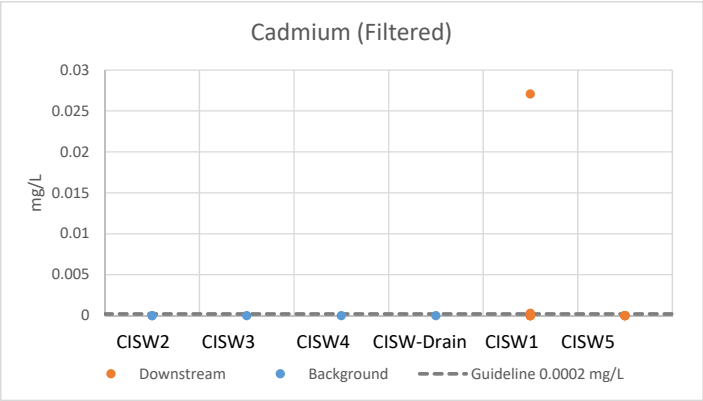

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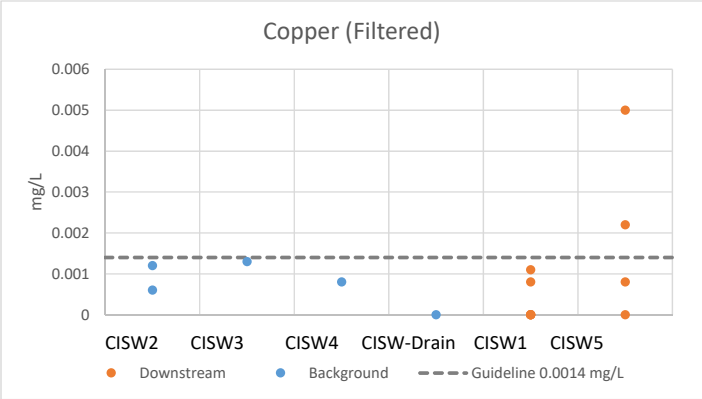

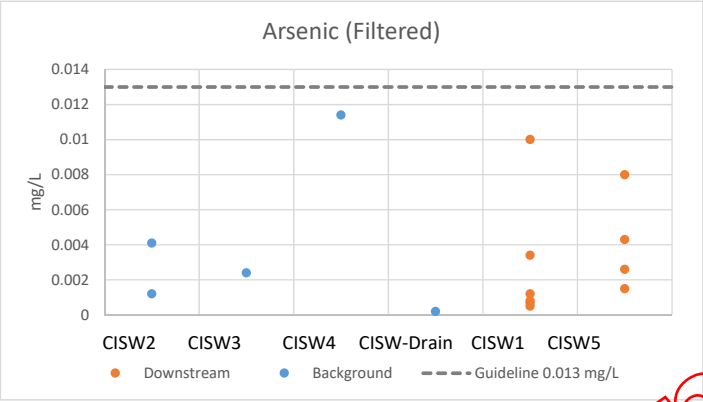

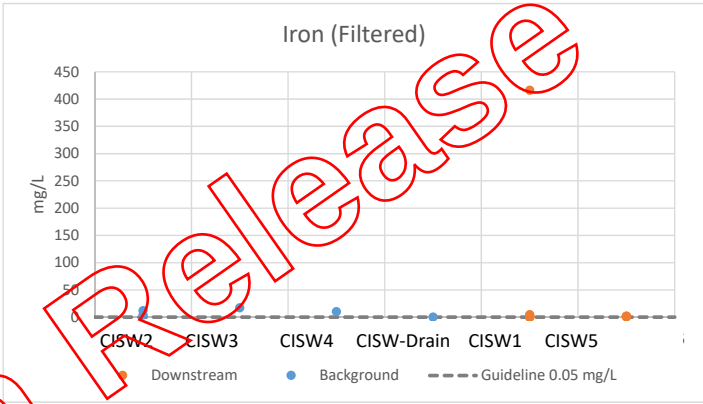

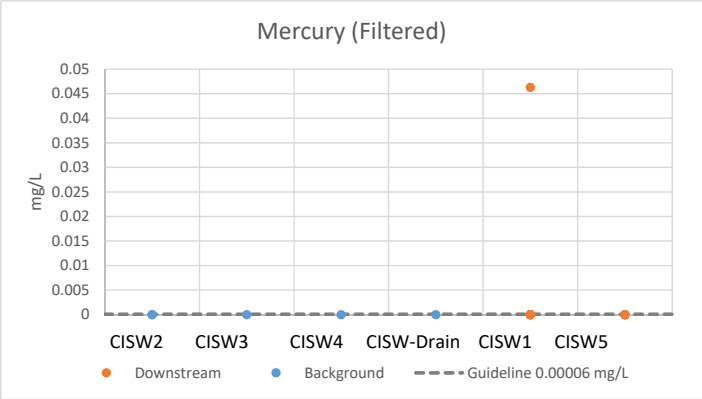

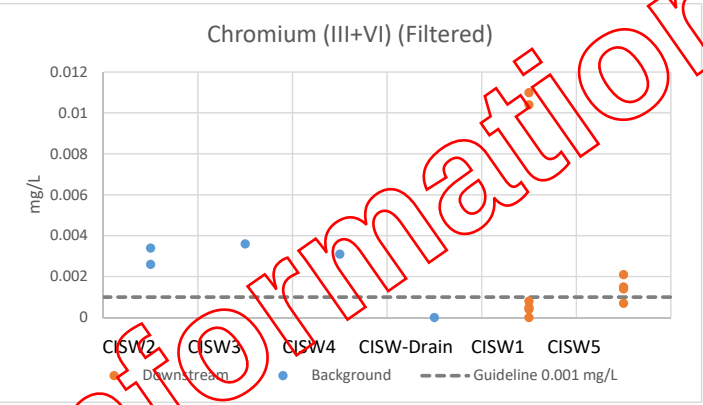

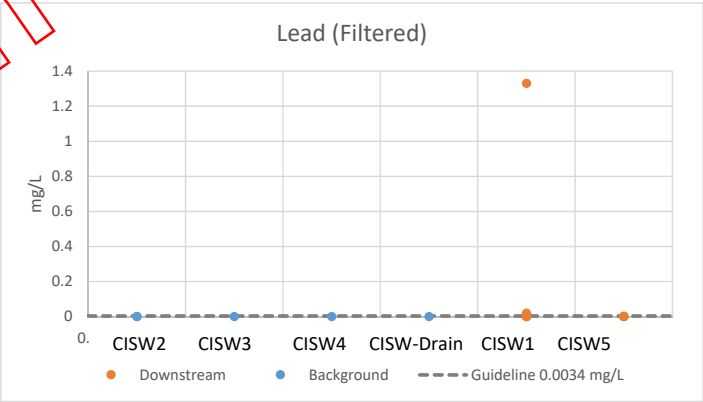

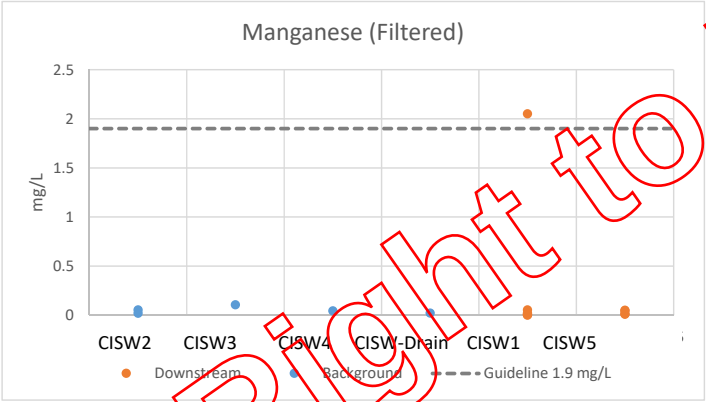

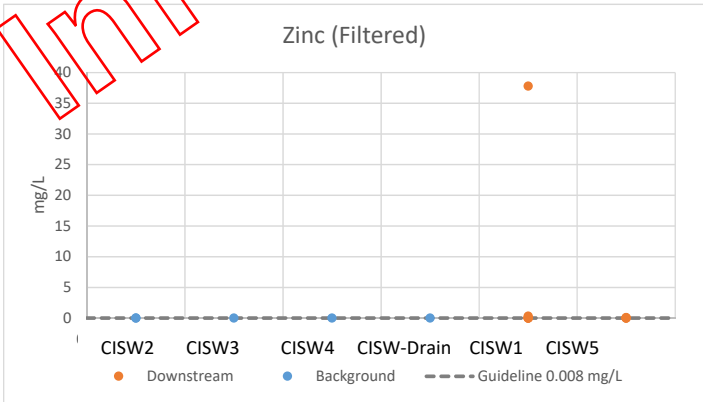

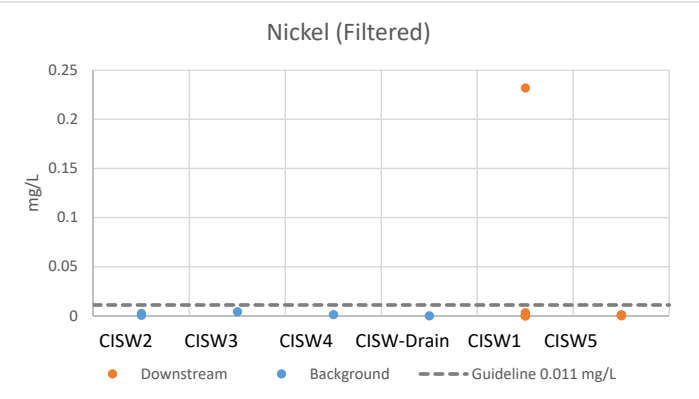

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Appendix D – Official laboratory documentation

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5/9

ALS Environmental

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 4971 6600 E: gladstone@alsglobal.com
MACKAY 79 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Cleary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE:		☐ Non Standard or urgent TAT (List due date): 5 Day TAT	Custody Seal Intact? Yes No N/A
Location: Coochiemudlo Island	ALS QUOTE NO.: EN / 567 / 13 V4		Free ice / frozen ice bricks present upon receipt? Yes No N/A
JOB NUMBER: 4127018			Random Sample Temperature on Receipt: °C
PROJECT MANAGER: James Dowdeswell	CONTACT PH: 3316 3458		Other comment:
SAMPLER: Pascale Lin	SAMPLER MOBILE:		
	EDD FORMAT: EXCEL ESDAT & PDF		
Email Reports to:			
Email Invoice to: AP-FSS@ghd.com			
Reference to ALS Quote No with Table / Suite No's...			

RELINQUISHED BY:	RELINQUISHED BY:	RECEIVED BY:
Pascale Lin		D. Tree
DATE/TIME: 29/08/2019 - 4:30pm	DATE/TIME:	DATE/TIME: 16:55 29/8/19

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Note Limited holding times on: Ammonia, Nitrate and Nitrite

ANALYSIS REQUIRED Including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).

ALS USE	SAMPLE DETAILS		CONTAINER INFORMATION			Major Cations (Calcium, Magnesium, Sodium, Potassium)	Major Anions (Chloride, Sulfate, Alkalinity)	Ammonia as N, Nitrite, Nitrate, Total Nitrogen as N inc NOX & TKN, Total Phosphorus	Dissolved Metals: (Mn, Al, Fe, As, Cu, Pb, Zn, Ni, Cd, Cr, Hg) ULTRA TRACE	Total Organic Carbon (TOC)	Boron	COD	OC / OP								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	NT-1	NT-2	NT-8	W-2 EG064F	EP005	EP030	EP026SF	W-12								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	CISW1-0819-1	29/08/2019	WATER	ANZECC		X	X	X	X	X	X	X	X								
	~~CISW2-0819-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
	~~CISW3-0819-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
	~~CISW4-0819-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
	~~CISW5-0819-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
	~~CISW-Drain-0819-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
2	GW1-0819-1	29/08/2019	WATER	ANZECC		X	X	X	X	X	X	X	X								
3	GW2-0819-1	29/08/2019	WATER	ANZECC		X	X	X	X	X	X	X	X								
4	GW3-0819-1	29/08/2019	WATER	ANZECC		X	X	X	X	X	X	X	X								
5	GW5-0819-1	29/08/2019	WATER	ANZECC		X	X	X	X	X	X	X	X								
6	GW6-0819-1	29/08/2019	WATER	ANZECC		X	X	X	X	X	X	X	X								
	~~DUP1-0819-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~		~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~	~~X~~								
	~~QA1-0819-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~				~~X~~		~~X~~			~~X~~								
	~~QA4-0819-1~~	~~Not sampled~~	~~WATER~~	~~ANZECC~~				~~X~~		~~X~~			~~X~~								
					TOTAL																

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

Environmental Division
Brisbane
Work Order Reference
EB1922725

Telephone : + 61-7-3243 7222

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Contrary to Public Interest

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1922725**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	:	E-mail	:
Telephone	: ----	Telephone	: +61 7 3552 8639
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: 4127018	Page	: 1 of 3
Order number	:	Quote number	: EB2019GHDSER0017 (BN/587/13 V5)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: COOCHIEMUDLO ISLAND		
Sampler	: PASCALE LIN		

Dates

Date Samples Received	: 29-Aug-2019 16:55	Issue Date	: 30-Aug-2019
Client Requested Due Date	: 05-Sep-2019	Scheduled Reporting Date	: **05-Sep-2019**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 4.2°C; 2.0°C - Ice present
Receipt Detail	: MEDIUM ESKY	No. of samples received / analysed	: 6 / 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- ***30/08/2019*: SRN has been resent to acknowledge addition of TOC analysis to sample 'GW5-0819-1' with analysis assigned to the unpreserved container as per Pascale Lin, received by e-mail 30/08/2019. For any further information regarding these adjustments please contact client services at ALSEnviro.Brisbane@alsglobal.com.**
- **Please be advised, sample ID 'GW5' TOC vial was received empty. To continue TOC analysis from a non-compliant container/ process, please contact Client Services at ALSEnviro.Brisbane@ALSGlobal.com**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Right to Information Release

Sample Container(s)/Preservation Non-Compliances

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

Method / Client sample ID	Sample Container Received	Preferred Sample Container for Analysis
Total Organic Carbon : EP005		
GW5-0819-1	- Clear Plastic Bottle - Natural	- Amber TOC Vial - Sulfuric Acid

Summary of Sample(s) and Requested Analysis

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

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG094-F Dissolved Metals by ORC - Ultra Trace in Fresh	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP030 BOD	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-08 Total Nitrogen + NO2 + NO3 + NH3 + Total P	WATER - W-12 OC/OP Pesticides
EB1922725-001	29-Aug-2019 00:00	CISW1-08-19-1	✓	✓	✓	✓	✓	✓	✓
EB1922725-002	29-Aug-2019 00:00	GW1-0819-1	✓	✓	✓	✓	✓	✓	✓
EB1922725-003	29-Aug-2019 00:00	GW2-0819-1	✓	✓	✓	✓	✓	✓	✓
EB1922725-004	29-Aug-2019 00:00	GW3-0819-1	✓	✓	✓	✓	✓	✓	✓
EB1922725-005	29-Aug-2019 00:00	GW5-0819-1	✓	✓	✓	✓	✓	✓	✓
EB1922725-006	29-Aug-2019 00:00	GW6-0819-1	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG035F-LL Dissolved Mercury - Low Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP026SP Chemical Oxygen Demand (COD)
EB1922725-001	29-Aug-2019 00:00	CISW1-08-19-1	✓	✓	✓
EB1922725-002	29-Aug-2019 00:00	GW1-0819-1	✓	✓	✓
EB1922725-003	29-Aug-2019 00:00	GW2-0819-1	✓	✓	✓
EB1922725-004	29-Aug-2019 00:00	GW3-0819-1	✓	✓	✓
EB1922725-005	29-Aug-2019 00:00	GW5-0819-1	✓	✓	✓
EB1922725-006	29-Aug-2019 00:00	GW6-0819-1	✓	✓	✓

Proactive Holding Time Report

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

Right to Information Release

Requested Deliverables

ACCOUNTS PAYABLE (NQ)		
- A4 - AU Tax Invoice (INV)	Email	ap-fss@ghd.com
Accounts Payable Australia		
- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com
GHD LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	GHDLabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	GHDLabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	GHDLabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	GHDLabreports@ghd.com
- Chain of Custody (CoC) (COC)	Email	GHDLabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	GHDLabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	GHDLabreports@ghd.com
JAMES DOWDESWELL		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- A4 - AU Tax Invoice (INV)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
JEMILA DARR		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
JEREMY CANARD		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
LEMUEL CABAHUG		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
PASCALE LIN		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	

Right to Information Release

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1922725**	Page	: 1 of 9
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 29-Aug-2019 16:55
Order number	:	Date Analysis Commenced	: 29-Aug-2019
C-O-C number	: ----	Issue Date	: 06-Sep-2019 13:04
Sampler	: PASCALE LIN		
Site	: COOCHIEMUDLO ISLAND		
Quote number	: BN/587/13 V5		
No. of samples received	: 6		
No. of samples analysed	: 6		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD

Right to Information Release

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-08-19-1	GW1-0819-1	GW2-0819-1	GW3-0819-1	GW5-0819-1
			Client sampling date / time	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EB1922725-001	EB1922725-002	EB1922725-003	EB1922725-004	EB1922725-005
				Result	Result	Result	Result	Result
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	9	137	61	9	4
Total Alkalinity as CaCO3	----	1	mg/L	9	137	61	9	4
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	308	88	21	18	16
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	239	41	408	43	73
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	71	55	32	2	<1
Magnesium	7439-95-4	1	mg/L	62	20	37	2	5
Sodium	7440-23-5	1	mg/L	84	28	149	32	48
Potassium	7440-09-7	1	mg/L	19	11	7	<1	<1
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	10	<5	7	24	22
Arsenic	7440-38-2	0.2	µg/L	0.3	<0.2	3.5	<0.2	<0.2
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	<0.5	0.9	<0.5
Iron	7439-89-6	2	µg/L	1330	<2	10000	324	<2
Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Manganese	7439-96-5	0.5	µg/L	46.3	12.3	4.1	7.6	1.9
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.6	0.6	<0.5
Zinc	7440-66-6	1	µg/L	15	2	147	59	<1
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.05	<0.01	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	1.54	<0.01	0.06	2.62
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	1.54	<0.01	0.06	2.62

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-08-19-1	GW1-0819-1	GW2-0819-1	GW3-0819-1	GW5-0819-1
			Client sampling date / time	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EB1922725-001	EB1922725-002	EB1922725-003	EB1922725-004	EB1922725-005
				Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.4	0.3	1.3	0.2	0.3
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.4	1.8	1.3	0.3	2.9
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	0.01	0.19	0.03	<0.01
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	13.3	5.73	13.2	1.77	2.47
ø Total Cations	----	0.01	meq/L	12.8	5.89	11.3	1.66	2.50
ø Ionic Balance	----	0.01	%	2.10	1.41	7.61	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	10	3	9	3	<1
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	24	<10	41	<10	<10
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	4	<2	<2
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	CISW1-08-19-1	GW1-0819-1	GW2-0819-1	GW3-0819-1	GW5-0819-1
			Client sampling date / time	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00	29-Aug-2019 00:00
Compound	CAS Number	LOR	Unit	EB1922725-001	EB1922725-002	EB1922725-003	EB1922725-004	EB1922725-005
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**87.3**	**91.9**	**85.3**	**94.3**	**90.8**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**93.0**	**92.2**	**84.8**	**93.0**	**93.1**

Right to Information Release

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW6-0819-1	----	----	----	----
			Client sampling date / time	29-Aug-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1922725-006	--------	--------	--------	--------
				Result	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**16**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**793**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**3**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**62**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**321**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**2**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	----	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	**6870**	----	----	----	----
Arsenic	7440-38-2	0.2	µg/L	<0.2	----	----	----	----
Cadmium	7440-43-9	0.05	µg/L	<0.05	----	----	----	----
Chromium	7440-47-3	0.2	µg/L	**0.2**	----	----	----	----
Copper	7440-50-8	0.5	µg/L	**0.7**	----	----	----	----
Iron	7439-89-6	2	µg/L	**745**	----	----	----	----
Lead	7439-92-1	0.1	µg/L	**0.7**	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	**128**	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	**3.0**	----	----	----	----
Zinc	7440-66-6	1	µg/L	**50**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	----	----	----

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW6-0819-1	----	----	----	----
			Client sampling date / time	29-Aug-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1922725-006	--------	--------	--------	--------
				Result	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.1**	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.1**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**22.7**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**19.3**	----	----	----	----
ø Ionic Balance	----	0.01	%	**8.19**	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**2**	----	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	<10	----	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	----	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	----	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	----	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	----	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	----	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	----	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	----	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	----	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	----	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	----	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	----	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	----	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	----	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	----	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	----	----	----	----

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW6-0819-1	----	----	----	----
			Client sampling date / time	29-Aug-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1922725-006	--------	--------	--------	--------
				Result	----	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	----	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	----	----	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	----	----	----	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	----	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	----	----	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	----	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	----	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	----	----	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	----	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	----	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	----	----	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	----	----	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	----	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	----	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	----	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	----	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	----	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	----	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**87.2**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**85.2**	----	----	----	----

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Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	45	139
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	45	139

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ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1922725**	Page	: 1 of 9
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 29-Aug-2019
Order number	:	Date Analysis Commenced	: 29-Aug-2019
C-O-C number	: ----	Issue Date	: 05-Sep-2019
Sampler	: PASCALE LIN		
Site	: COOCHIEMUDLO ISLAND		
Quote number	: BN/587/13 V5		
No. of samples received	: 6		
No. of samples analysed	: 6		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Sarah Ashworth	Laboratory Manager - Brisbane	Brisbane Organics, Stafford, QLD

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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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 2554856)									
EB1922709-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.00	No Limit
EB1922725-003	GW2-0819-1	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	61	60	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	61	60	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2554947)									
EB1922718-048	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	108	108	0.00	0% - 20%
EB1922718-038	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	305	305	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 2554946)									
EB1922718-048	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	535	533	0.337	0% - 20%
EB1922718-038	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	1410	1420	0.943	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 2554937)									
EB1922720-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	6	6	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	5	5	0.00	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
EB1922725-005	GW5-0819-1	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	5	5	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	48	47	2.23	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2554860)									

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG035F: Dissolved Mercury by FIMS (QC Lot: 2554860) - continued									
EB1922725-001	CISW1-08-19-1	EG035F-LL: Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	0.00	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2554891)									
EB1922725-001	CISW1-08-19-1	EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	0.3	0.3	0.00	No Limit
		EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Manganese	7439-96-5	0.5	µg/L	46.3	46.8	0.988	0% - 20%
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	15	14	0.00	0% - 50%
		EG094A-F: Aluminium	7429-90-5	5	µg/L	10	10	0.00	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2554892)									
EB1922725-001	CISW1-08-19-1	EG094B-F: Iron	7439-89-6	2	µg/L	1330	1360	2.00	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2560332)									
EB1922725-002	GW1-0819-1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2554945)									
EB1922718-048	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1922718-038	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2560331)									
EB1922222-006	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1922725-002	GW1-0819-1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	1.54	1.54	0.00	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2556373)									
EB1922221-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.8	0.8	0.00	No Limit
EB1922222-006	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.2	0.00	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2556374)									
EB1922221-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.28	0.27	4.31	0% - 20%
EB1922222-006	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.06	0.06	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 2557364)									
EB1921911-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.00	No Limit
EB1922493-004	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 2560221)									
EB1922573-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	6	9	30.6	No Limit
ET1902630-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	1	0.00	No Limit
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 2560295)									
EB1922168-001	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	<10	0.00	No Limit
EB1922725-006	GW6-0819-1	EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	<10	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2554672)									
EB1922649-005	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2554672) - continued									
EB1922649-008	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	<2	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2560125)									
EB1922675-001	Anonymous	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.00	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2560125)									
EB1922675-001	Anonymous	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2560125) - continued									
EB1922675-001	Anonymous	EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.00	No Limit

Right to Information Release

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 2554856)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	97.2	80	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2554947)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	95.3	85	118
				<1	100 mg/L	86.1	85	118
ED045G: Chloride by Discrete Analyser (QCLot: 2554946)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	101	90	115
				<1	1000 mg/L	102	90	115
ED093F: Dissolved Major Cations (QCLot: 2554937)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG035F: Dissolved Mercury by FIMS (QCLot: 2554860)								
EG035F-LL: Mercury	7439-97-6	0.00004	mg/L	<0.00004	0.002 mg/L	110	85	118
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2554891)								
EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	50 µg/L	90.7	80	120
EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	10 µg/L	99.9	80	120
EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	10 µg/L	103	80	120
EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	10 µg/L	100	80	120
EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	20 µg/L	109	80	120
EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	10 µg/L	99.0	80	120
EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	98.9	80	120
EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	102	80	120
EG094A-F: Zinc	7440-66-6	1	µg/L	<1	20 µg/L	106	80	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2554892)								
EG094B-F: Iron	7439-89-6	2	µg/L	<2	50 µg/L	99.9	80	120
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2560332)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	95.8	84	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2554945)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	103	90	110
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2560331)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	90.8	86	111
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2556373)								

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2556373) - continued								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	82.9	70	108
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2556374)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	93.3	79	105
EP005: Total Organic Carbon (TOC) (QCLot: 2557364)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	88.6	79	113
				<1	100 mg/L	97.9	79	113
EP005: Total Organic Carbon (TOC) (QCLot: 2560221)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	88.5	79	113
				<1	100 mg/L	100	79	113
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2560295)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	50 mg/L	98.5	86	112
				<10	500 mg/L	100	86	112
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2554672)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	97.6	77	115
EP068A: Organochlorine Pesticides (OC) (QCLot: 2560125)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	81.4	60	131
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	77.2	45	126
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	82.4	63	128
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	81.3	60	130
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	80.2	59	120
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	80.1	48	132
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	81.2	54	120
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	83.3	57	122
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	82.3	56	121
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	81.6	57	123
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	83.2	56	122
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	81.4	55	124
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	81.2	53	122
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	82.9	49	131
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	78.2	50	121
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	81.3	47	123
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	75.0	42	122
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	84.2	50	130
EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	5 µg/L	85.0	39	134
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	82.8	51	129
EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	5 µg/L	81.3	46	139
EP068: Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2560125) - continued								
EP068: Sum of DDD + DDE + DDT	72-54-8/72-5 5-9/50-2	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2560125)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	79.6	53	133
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	81.0	44	158
EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	5 µg/L	7.89	5	33
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	72.6	28	153
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	77.8	56	141
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	77.4	58	130
EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	5 µg/L	88.3	45	139
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	82.0	48	135
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	79.4	53	133
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	78.3	56	125
EP068: Parathion	56-38-2	2	µg/L	<2.0	5 µg/L	83.0	37	144
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	82.3	50	131
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	78.0	37	131
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	75.8	47	127
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	78.8	16	150
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	74.4	46	128
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	82.7	39	129
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	78.7	38	134
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	92.2	28	146

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2554947)							
EB1922718-039	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	# Not Determined	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 2554946)							
EB1922718-039	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	75.3	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2554860)							

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG035F: Dissolved Mercury by FIMS (QCLot: 2554860) - continued							
EB1922725-002	GW1-0819-1	EG035F-LL: Mercury	7439-97-6	0.002 mg/L	114	70	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2554891)							
EB1922497-002	Anonymous	EG094A-F: Arsenic	7440-38-2	50 µg/L	96.1	70	130
		EG094A-F: Cadmium	7440-43-9	50 µg/L	105	70	130
		EG094A-F: Chromium	7440-47-3	50 µg/L	97.0	70	130
		EG094A-F: Copper	7440-50-8	100 µg/L	100	70	130
		EG094A-F: Lead	7439-92-1	50 µg/L	92.9	70	130
		EG094A-F: Manganese	7439-96-5	50 µg/L	94.9	70	130
		EG094A-F: Nickel	7440-02-0	50 µg/L	98.0	70	130
		EG094A-F: Zinc	7440-66-6	100 µg/L	100	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2560332)							
EB1922725-001	CISW1-08-19-1	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	96.2	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2554945)							
EB1922718-039	Anonymous	EK057G: Nitrite as N	14797-65-0	0.4 mg/L	96.9	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2560331)							
EB1922725-001	CISW1-08-19-1	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	89.8	70	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2556373)							
EB1922221-003	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	83.4	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2556374)							
EB1922221-003	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	99.6	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 2557364)							
EB1921911-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	104	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 2560221)							
EB1922642-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	104	70	130
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2560295)							
EB1922168-002	Anonymous	EP026SP: Chemical Oxygen Demand	----	50 mg/L	93.5	70	130

Right to Information Release

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1922725**	Page	: 1 of 9
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES DOWDESWELL	Telephone	: +61 7 3552 8639
Project	: 4127018	Date Samples Received	: 29-Aug-2019
Site	: COOCHIEMUDLO ISLAND	Issue Date	: 05-Sep-2019
Sampler	: PASCALE LIN	No. of samples received	: 6
Order number	:	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Right to Information Release

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EB1922718--039	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EP005: Total Organic Carbon (TOC)						
Clear Plastic Bottle - Natural						
GW5-0819-1	----	----	----	31-Aug-2019	30-Aug-2019	**1**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Matrix Spikes (MS)					
Pesticides by GCMS	0	7	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
CISW1-08-19-1, GW1-0819-1, GW2-0819-1, GW3-0819-1, GW5-0819-1, GW6-0819-1	**29-Aug-2019**	**----**	----	----	**30-Aug-2019**	12-Sep-2019	✓

Right to Information Release

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
CISW1-08-19-1,	GW1-0819-1,	**29-Aug-2019**	----	----	----	**30-Aug-2019**	26-Sep-2019	✓
GW2-0819-1,	GW3-0819-1,							
GW5-0819-1,	GW6-0819-1							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
CISW1-08-19-1,	GW1-0819-1,	**29-Aug-2019**	----	----	----	**30-Aug-2019**	26-Sep-2019	✓
GW2-0819-1,	GW3-0819-1,							
GW5-0819-1,	GW6-0819-1							
ED093F: Dissolved Major Cations								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (ED093F)								
CISW1-08-19-1,	GW1-0819-1,	**29-Aug-2019**	----	----	----	**02-Sep-2019**	26-Sep-2019	✓
GW2-0819-1,	GW3-0819-1,							
GW5-0819-1,	GW6-0819-1							
EG035F: Dissolved Mercury by FIMS								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F-LL)								
CISW1-08-19-1,	GW1-0819-1,	**29-Aug-2019**	----	----	----	**30-Aug-2019**	26-Sep-2019	✓
GW2-0819-1,	GW3-0819-1,							
GW5-0819-1,	GW6-0819-1							
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG094B-F)								
CISW1-08-19-1,	GW1-0819-1,	**29-Aug-2019**	----	----	----	**02-Sep-2019**	25-Feb-2020	✓
GW2-0819-1,	GW3-0819-1,							
GW5-0819-1,	GW6-0819-1							
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G)								
CISW1-08-19-1,	GW1-0819-1,	**29-Aug-2019**	----	----	----	**03-Sep-2019**	26-Sep-2019	✓
GW2-0819-1,	GW3-0819-1,							
GW5-0819-1,	GW6-0819-1							
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G)								
CISW1-08-19-1,	GW1-0819-1,	**29-Aug-2019**	----	----	----	**30-Aug-2019**	31-Aug-2019	✓
GW2-0819-1,	GW3-0819-1,							
GW5-0819-1,	GW6-0819-1							
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G)								
CISW1-08-19-1,	GW1-0819-1,	**29-Aug-2019**	----	----	----	**03-Sep-2019**	26-Sep-2019	✓
GW2-0819-1,	GW3-0819-1,							
GW5-0819-1,	GW6-0819-1							

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Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) CISW1-08-19-1, GW1-0819-1, GW2-0819-1, GW3-0819-1, GW5-0819-1, GW6-0819-1	**29-Aug-2019**	**02-Sep-2019**	26-Sep-2019	✓	**02-Sep-2019**	26-Sep-2019	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) CISW1-08-19-1, GW1-0819-1, GW2-0819-1, GW3-0819-1, GW5-0819-1, GW6-0819-1	**29-Aug-2019**	**02-Sep-2019**	26-Sep-2019	✓	**02-Sep-2019**	26-Sep-2019	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005) CISW1-08-19-1, GW1-0819-1, GW2-0819-1, GW3-0819-1, GW6-0819-1	**29-Aug-2019**	**----**	----	----	**03-Sep-2019**	26-Sep-2019	✓
Clear Plastic Bottle - Natural (EP005) GW5-0819-1	**29-Aug-2019**	**----**	----	----	**31-Aug-2019**	30-Aug-2019	×
EP026SP: Chemical Oxygen Demand (Spectrophotometric)							
Clear Plastic Bottle - Sulfuric Acid (EP026SP) CISW1-08-19-1, GW1-0819-1, GW2-0819-1, GW3-0819-1, GW5-0819-1, GW6-0819-1	**29-Aug-2019**	**----**	----	----	**03-Sep-2019**	26-Sep-2019	✓
EP030: Biochemical Oxygen Demand (BOD)							
Clear Plastic Bottle - Natural (EP030) CISW1-08-19-1, GW1-0819-1, GW2-0819-1, GW3-0819-1, GW5-0819-1, GW6-0819-1	**29-Aug-2019**	**----**	----	----	**29-Aug-2019**	31-Aug-2019	✓
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068) CISW1-08-19-1, GW1-0819-1, GW2-0819-1, GW3-0819-1, GW5-0819-1, GW6-0819-1	**29-Aug-2019**	**03-Sep-2019**	05-Sep-2019	✓	**03-Sep-2019**	13-Oct-2019	✓
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068) CISW1-08-19-1, GW1-0819-1, GW2-0819-1, GW3-0819-1, GW5-0819-1, GW6-0819-1	**29-Aug-2019**	**03-Sep-2019**	05-Sep-2019	✓	**03-Sep-2019**	13-Oct-2019	✓

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Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS - Low Level	EG035F-LL	1	6	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	6	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	6	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	4	33	12.12	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS - Low Level	EG035F-LL	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	6	16.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	4	33	12.12	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS - Low Level	EG035F-LL	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS - Low Level	EG035F-LL	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	0	7	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	33	**6.06**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Mercury by FIMS - Low Level	EG035F-LL	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

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Analytical Methods	Method	Matrix	Method Descriptions
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloued and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)

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Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

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Appendix E – Calibration certificates

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Calibration Record

YSI Water Quality Meter

This water quality meter has been performance checked/calibrated as follows

Parameter	Units	Standards value	Pre calibration	Post calibration
Conductivity	µs/cm	2496	2359	2497
pH		4.0	4.0	4.0
		7.0	6.89	7.0
ORP	mV	238.1	167	—
Dissolved Oxygen	mg/L	0	0	—
	%	100	—	—

Serial Number: 17K104481

Equipment checklist

[ ] YSI hand held control unit

Sensor probes

- ☐ pH
- ☐ Conductivity
- ☐ Salinity
- ☐ TDS(Total Dissolved Solid)
- ☐ Seawater specific gravity
- ☐ Temperature
- ☐ Turbidity (LED)
- ☐ Water depth
- ☐ ORP (Oxidation Reduction Potential)
- ☐ Dissolved Oxygen
- ☐ pH (mV)

Date: 27/8/19 Checked By: PL JC

Signed: [redacted]

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Appendix F – Field notes

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 10:08
Site Name:	Coochiemudlo Island	Monitoring Location: CISW1	Sampled by: PL RH
Sample ID:	CISW1-0819-1	QAQC sample collected:	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	10:06
Dissolved Oxygen (%sat):	1.3
Dissolved Oxygen (mg/L):	0.12
Conductivity (microS/cm):	3456
pH:	5.75
Redox (mV):	14:24
Temp (deg C):	17.5

Notes: No flow, pond, 5m x 5m wide .5m deep, vegetation around edges, slight sheen at edges, no odour, clear, no SS, no staining on edges of pond

Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 13:29
Site Name:	Coochiemudlo Island	Monitoring Location: CISW2	Sampled by: PL RH
Sample ID:	CISW2 not sampled	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.567963,153.335817
GPS accuracy:	5 metres

Final Stabilised WQ Parameters	**Results**
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:	Location dry. Unable to sample.
Additional Comments:	

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Surface Water Monitoring Sheet

Job Number:	4127018			Date and Time:	
Site Name:	Coochiemudlo Island	Monitoring Location:	CISW3	Sampled by:	PL RH
Sample ID:	CISW3 not sampled	QAQC sample collected:	No	QAQC sample ID:	

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	**Results**
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes: Location dry. Unable to sample.
Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 13:52
Site Name:	Coochiemudlo Island	Monitoring Location: CISW4	Sampled by: PL RH
Sample ID:	CISW4 not sampled	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	**Results**
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes: Location dry. Unable to be sampled.
Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 11:09
Site Name:	Coochiemudlo Island	Monitoring Location: CISW5	Sampled by: PL RH
Sample ID:	CISW5 not sampled	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.569490,153.334839
GPS accuracy:	5 metres

Final Stabilised WQ Parameters	**Results**
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:	Location dry. Unable to sample.
Additional Comments:	

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 12:57
Site Name:	Coochiemudlo Island	Monitoring Location: CISW-Drain	Sampled by: PL RH
Sample ID:	CISW-Drain not sampled	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.568304,153.333428
GPS accuracy:	5 metres

Final Stabilised WQ Parameters	**Results**
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:	Location dry. Unable to sample.
Additional Comments:	

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 9:39
Site Name:	Coochiemudlo Island	Monitoring Location: GW1	Sampled by: RC PL
Sample ID:	GW1-0819-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.569075,153.334854
GPS accuracy:	5 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	3
Standing Water Level Depth (m BTOC):	1.92
Purge Method:	Bailer

Final Stabilised WQ Parameters	**Results**
Time:	9:39
Volume Purged L:	7
Dissolved Oxygen (%sat):	26.9
Dissolved Oxygen (mg/L):	2.42
Conductivity (microS/cm):	559
pH:	6.11
Redox (mV):	251.7
Temp (deg C):	19.2

Notes:

Observations during purging: Not dry. Clear, no SS, organic odour, no sheen

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 14:07
Site Name:	Coochiemudlo Island	Monitoring Location: GW2	Sampled by: RC PL
Sample ID:	GW2-0819-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.569651,153.334686
GPS accuracy:	5 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	3.34
Standing Water Level Depth (m BTOC):	2.66
Purge Method:	Bailer

Final Stabilised WQ Parameters	**Results**
Time:	14:04
Volume Purged L:	5
Dissolved Oxygen (%sat):	16.7
Dissolved Oxygen (mg/L):	1.49
Conductivity (microS/cm):	1219
pH:	5.73
Redox (mV):	150.7
Temp (deg C):	20.6

Notes:

Observations during purging: Purged dry. Cloudy. Silty at bottom. Organic odour. No sheen. Low to moderate turbidity.

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 10:18
Site Name:	Coochiemudlo Island	Monitoring Location: GW3	Sampled by: RC PL
Sample ID:	GW3-0819-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.569727,153.334679
GPS accuracy:	10 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	11.42
Standing Water Level Depth (m BTOC):	5.16
Purge Method:	Peristaltic Pump

Final Stabilised WQ Parameters	Results
Time:	10:18
Volume Purged L:	17
Dissolved Oxygen (%sat):	16.9
Dissolved Oxygen (mg/L):	1.4
Conductivity (microS/cm):	224.3
pH:	4.95
Redox (mV):	259.3
Temp (deg C):	23

Notes:

Observations during purging: Pale brown, no odour, no sheen, moderate to high turbidity, no SS

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 11:45
Site Name:	Coochiemudlo Island	Monitoring Location: GW5	Sampled by: RC PL
Sample ID:	GW5-0819-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.568828,153.333669
GPS accuracy:	5 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	12.06
Standing Water Level Depth (m BTOC):	4.5
Purge Method:	Peristaltic Pump

Final Stabilised WQ Parameters	Results
Time:	11:54
Volume Purged L:	17
Dissolved Oxygen (%sat):	31
Dissolved Oxygen (mg/L):	2.34
Conductivity (microS/cm):	321
pH:	4.74
Redox (mV):	331.5
Temp (deg C):	22.6

Notes:

Observations during purging: Clear. No SS. No odour or sheen.

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 29/08/2019 9:00
Site Name:	Coochiemudlo Island	Monitoring Location: GW6	Sampled by: RC PL
Sample ID:	GW6-0819-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	-27.569115,153.334837
GPS accuracy:	5 metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	16.53
Standing Water Level Depth (m BTOC):	8.28
Purge Method:	Bailer

Final Stabilised WQ Parameters	**Results**
Time:	14:24
Volume Purged L:	15
Dissolved Oxygen (%sat):	13.9
Dissolved Oxygen (mg/L):	1.21
Conductivity (microS/cm):	2368
pH:	3.83
Redox (mV):	315.5
Temp (deg C):	21.9

Notes:

Observations during purging: Purged dry at 15L. Clear. White SS. Faint organic odour. No sheen.

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		Name	Signature	Name	Signature	Date
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Redland City Council

Coochiemudlo Island Former Landfill

November 2019 - Surface Water and Groundwater Monitoring Annual Report

December 2019

Executive Summary

GHD Pty Ltd (GHD) was commissioned by Redland City Council (RCC) to carry out an environmental assessment at the former Coochiemudlo Island landfill to characterise environmental risk associated with surface water and groundwater originating from the site. The risk review (GHD, 2018c) characterised risk to down gradient receptors including adjacent Melaleuca Wetland as low, however it recommended additional monitoring works to confirm the findings of the assessment. This report presents the results of the quarterly surface water and groundwater monitoring works completed in November 2019, as recommended in the Risk Review report (GHD, 2018c).

During the November 2019 monitoring event, three groundwater wells were sampled (GW3, GW5 and GW6), with two downgradient wells (GW1 and GW2) dry. All surface water locations were dry and unable to be sampled.

In the November 2019 monitoring round, new maximum concentrations were reported at upgradient monitoring location GW5 for DO (92.6 % S) and GW6 for nitrate (0.04 mg/L) and nitrogen (total) (0.04 mg/L) and a new minimum for pH (3.77 pH units) and at downgradient location GW3 for sodium (37 mg/L) and a new minimum for DO (10.9 % S).

Most results in down gradient well locations were consistent with the historical dataset or were less than those reported in background locations.

The concentrations of ammonia, a key landfill leachate indicator, were consistent between up and downgradient wells. Concentrations of iron (also a key landfill leachate indicator) were above the adopted guideline in both up and down-gradient locations (GW6 and GW3). Iron is naturally occurring in groundwater and displayed a high degree of variation in both the upgradient and down gradient wells. On this basis, the results from the November 2019 monitoring event continue to indicate that the landfill represents a low risk to the identified receptors (human and ecological, including the Melaleuca Wetland and the potential Wallum frog habitat).

Quarterly surface water monitoring has been completed since March 2018 in the Melaleuca Wetland. During the November 2019 monitoring round, all surface water locations were dry and unable to be sampled. Historically, several parameters were identified at concentrations in excess of the adopted assessment criteria, including pH, ammonia and dissolved metals.

Potential acid sulfate soils (ASS) impacts (GHD, 2019c), observed during the March 2019 monitoring round were not observed in the subsequent monitoring events in May, July or August 2019.

Based on the findings of this assessment, the former landfill is considered to present a low risk to down gradient receptors and remedial works at the landfill are not considered to be required.

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1. Introduction

GHD Pty Ltd (GHD) was commissioned by Redland City Council (RCC) to undertake an environmental assessment at the Coochiemudlo Island former landfill (herein referred to as 'the site') to characterise environmental risk associated with surface water and groundwater originating from the site. The assessment (*Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report*, GHD, 2018c) characterised risk to down gradient receptors as low, however it recommended additional surface and groundwater monitoring works to confirm the findings of the assessment.

Two rounds of surface and groundwater monitoring conducted in September and November 2018 formed part of the Risk Review report. This report presents the results of the quarterly groundwater and surface water monitoring conducted in November 2019.

This report is part of an ongoing monitoring program for the site. The November 2019 monitoring rounds comprises the eighth monitoring events for the Site.

1.1 Purpose

The purpose of this ongoing environmental monitoring works is to gain an updated understanding of the environmental risk to the Melaleuca Wetland and potential Wallum frog habitat posed by the former landfill and to build on the existing knowledge regarding the quality of the surface water and groundwater on and offsite by:

- Collection of data to characterise surface water and groundwater quality. The program incorporated the assessment of background water quality as well as water quality down gradient of the site.
- Completion of a review of current and past surface water and groundwater quality to characterise the potential risk posed by the former landfill on the receiving environment (i.e. the Melaleuca Wetlands and potential Wallum frog habitat)

1.2 Scope of Works

The following tasks were included in the scope:

- Completion of a surface water and groundwater monitoring event.
- Laboratory analysis of samples for specified analytes.
- Reporting and assessment of the monitoring results.

Laboratory analyses have been conducted by Australian Laboratory Services (ALS), a National Association of Testing Authorities (NATA) accredited laboratory for the analysis undertaken as part of the scope of works.

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1.3 Limitations

This report:

1. Has been prepared by GHD Pty Ltd ("GHD") for Redland City Council (RCC).
2. Redland City Council may use, reproduce, communicate to the public and adapt the report for its own use, however GHD has no liability for changes in the report, or if the Report is relied on by a third party or used for a different purpose to that described in the Report.

GHD otherwise disclaims responsibility to any person other than Redland City Council arising in connection with this Report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in the Report and are subject to the scope limitations set out in the Report.

The opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the date of preparation of the Report. GHD has no responsibility or obligation to update this Report to account for rounds or changes' occurring subsequent to the date the Report was prepared.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD described in this report GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this Report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points. Investigations undertaken in respect of this Report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this Report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this Report if the site conditions change.

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2. Site setting

2.1 Site overview

The Coochiemudlo Island former landfill operated between 1972 and 1994 and was used for the disposal of municipal waste, including inert/hardfill and green waste, servicing a population of approximately 500 on the island.

Site locality is presented in Appendix A Figure 1.

The site is currently used as a waste transfer station and recreational purposes with a park, sports field and tennis courts.

Site name:	Coochiemudlo Island Waste Transfer Facility and the Laurie Burns Recreational Reserve
Address:	Elizabeth Street, Coochiemudlo Island, QLD 4184
Lot on plans	Lot 3 on SP115493, Lot 4 on SP115493 and Lot 83 on SL9191
Waste type:	Municipal solid waste, including domestic, putrescible, and inert waste, as well as green waste.
Operating period:	1972 - 1994[1]
Waste volume:	1,000 – 5,000 m^3 [1]
Filling depth:	Filling occurred in trenches approximately 2 m deep[1]
Surface capping:	Soil cap (~0.4 – 1.0 m thick) over the site[1]
Basal liner and leachate collection	No basal liner or leachate collection system[1]
Current site use:	Recreational reserve (park, sports field, tennis court) and waste transfer station
Surrounding land use:	Residential, Melaleuca Wetlands, waste transfer station

2.2 Surrounding land use

The Coochiemudlo Island former landfill is located within an area of mixed land use, which includes nearby sensitive receptors (residential lots, wetland). The site and surrounds are presented in Appendix A Figure 2. The surrounding land use includes:

- North: Current waste transfer facility (Lot 3 SP115493), beyond this is the northern end of the wetland
- East: Melaleuca Wetland
- South: Residential lots
- West: Elizabeth Street, beyond this residential lots

[1] Egis, 2002

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2.3 Topographical setting

The former landfill is located centrally in the eastern half of Coochiemudlo Island. In general, the site slopes towards the Melaleuca Wetlands, which is located immediately adjacent to the former landfill to the east.

Topographical considerations at Coochiemudlo Island (Appendix A Figure 4) suggest a groundwater flow to the south-east.

The site is located in a low-lying coastal area, below 5 metres Australian Height Datum (m AHD).

2.4 Geological and hydrogeological setting

2.4.1 Geology

Geological mapping of the region (1:100,000 scale) indicates that the geology of the former landfill is Triassic to Jurassic aged Woogaroo subgroup with quartzose sandstone, siltstone, shale conglomerate and coal. The Melaleuca Wetlands to the east are largely characterised as Holocene aged coastal swamp with quartz sand and peaty quartz sand. Refer to Appendix A Figure 1 for geological mapping.

Recent drilling works were completed by GHD in March 2018 for the installation of two additional groundwater monitoring bores on-site and up gradient to the former landfill. In general, the upper material was identified as clayey sand to sandy clay to a depth of 6.5 m bgl. Underlying this, in GW5, sands were identified to a termination depth of 11.5 m bgl, with a water strike at 8 m bgl. Material in GW6, located further south, was identified as clayey silt, likely siltstone with sandy bands to a termination depth of 16 m bgl, with groundwater encountered at 15 m bgl. Refer to Appendix A Figure 2 for monitoring locations.

2.4.2 Acid sulfate soils

Queensland Government Queensland Globe (DNRME, 2003) acid sulfate soils mapping indicate that land at Coochiemudlo Island has not been assessed for acid sulfate soils.

In the absence of assessment for acid sulfate soils, acid sulfate soils are potentially present owing to the low elevation of the site and the adjacent Melaleuca Wetland.

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2.4.3 Hydrogeology

Regional hydrogeological setting

A search of the Queensland Groundwater Database (GWDB) (DNRME, 2018) was completed on 1 May 2018 to identify potential groundwater users in the area. Another search of the DNRME database was completed on 20 November 2019, with the same registered bores identified on the island.

Appendix A Figure 1 displays registered groundwater bores located on Coochiemudlo Island, with details summarised in Table 2-1 below. Five bores were identified on the island, with all bores denoted as 'water supply'. Four of the bores are classified as existing, with one abandoned and destroyed. Available water quality records indicates electrical conductivity ranging from 220 to 270 µS/cm with low yields ranging from 0.1 to 0.75 L/s.

Table 2-1 Summary groundwater use – Coochiemudlo Island

Bore Registered Number	Total Depth (m)	Screened Strata	SWL (m bgl)	Quality	Yield (L/s)	Installation date	Use	Status
124247	17.35	Sand	2.5	potable	0.3	30/10/2004	Water Supply	Existing
124251	36	Weathered basalt	NA	270	1	14/12/2004	Water Supply	Existing
124254	36.6	Sandstone	11	220	0.1	17/01/2005	Water Supply	Abandoned & destroyed
124255	43	Sandstone	NA	230	0.18	19/01/2005	Water Supply	Existing
138454	14	Sand & clayey sand	NA	potable	0.75	26/02/2009	Water Supply	Existing

Notes: data based upon the Queensland GWDB (DNRME, 2018).

NA – Not available

Quality – recorded in µS/cm or a qualitative description based upon salinity

Based on the inferred groundwater flow direction to the south-east as discussed in the following section, none of the five groundwater bores identified on the island are considered to be hydraulically down gradient of the former landfill. Further discussion of *current or realistic future* groundwater users is provided in Section 3.4.

Local hydrogeological setting

The local hydrogeological setting has been interpreted from the monitoring network on the site, which is summarised in section 2.5. The water-bearing profile underlying the site is interpreted to consist of sands and siltstone with sandy bands. Groundwater monitoring wells GW1 and GW2 were dry during the current monitoring event. Water levels were measured from groundwater wells (GW3, GW5 and GW6) during the November 2019 round. The depth to groundwater varied across the site with the November 2019 SWL as follows:

- GW5, located to the west of the site, at the northern end had SWL measured at 2.307 m AHD with GW3, located in the south of the site measured at 1.493 m AHD.
- Groundwater to the south east of the site (GW6) had SWL measured at 2.161 m AHD.

The November 2019 groundwater contour map (Appendix A, Figure 4) infer groundwater flows to an easterly direction. Previous groundwater monitoring events have inferred a south-easterly groundwater flow direction, it is considered that the two dry downgradient wells (GW1 and GW2) may be affecting the groundwater contour for this monitoring event. Section 2.3 notes that the

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topographical considerations at Coochiemudlo Island (Appendix A Figure 4) suggest a groundwater flow to the south-east.

2.5 Site monitoring network

The site monitoring network consists of five on-site groundwater wells and six surface water monitoring locations (CISW5 on-site, with remainder off-site) as described below.

2.5.1 Groundwater monitoring network

Groundwater sampling locations include historical wells GW1 through to GW3 installed by Egis in 2001, as well as new monitoring wells GW5 and GW6, installed by GHD in 2018. GW4, installed by Egis in 2001, was formally decommissioned by GHD in 2018.

Groundwater locations are displayed on Appendix A Figure 2. Details of groundwater wells are provided in Table 2-2.

Table 2-2 Coochiemudlo Island - groundwater monitoring network

Groundwater well	Purpose	Well status	Monument status
GW1	Down gradient	Partial blockage at 3.15 m bgl, however sampling still possible	Hinges rusted, unable to be locked. New well plug installed March 2018.
GW2	Down gradient	Partial blockage at 3.35 m bgl, however sampling still possible	In good condition - new lock and new well plug installed March 2018.
GW3	Down gradient	Re-developed in March 2018 - in good condition	In good condition - new lock and new well plug installed March 2018.
GW5	Up gradient	New well - installed 22 March 2018	In good condition. Installed 22 March 2018.
GW6	Up gradient	New well - installed 22 March 2018	In good condition. Installed 22 March 2018.

For more information regarding the groundwater monitoring network including installation and decommissioning works, refer to the report GHD, 2018b.

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2.5.2 Surface water monitoring network

Surface water sampling locations are presented in Appendix A Figure 2 with details presented in Table 2-3.

Background location CISW-Drain was sampled for the first time during the May 2019 monitoring event following a request from Department of Environment and Science (DES) for additional surface water data.

Table 2-3 Coochiemudlo Island - surface water monitoring locations

Surface water locations	Location	Location description
CISW1	Downstream of former landfill	Located down gradient of GW1 and GW2.
CISW2	Background, potential Wallum frog habitat	Located on the northern boundary of the Melaleuca Wetland. Non-permanent water.
CISW2b	Temporary location	CISW2b was sampled during July 2019 monitoring event as the Melaleuca swamp was flooded and it was unsafe to access CISW2 and CISW3. CISW2b is assumed to be located within the potential Wallum frog habitat for the purpose of this report.
CISW3	Background, potential Wallum frog habitat	Located on the north-east boundary of the Melaleuca Wetland. Non-permanent water.
CISW4	Background	Located on the south-east boundary of the Melaleuca Wetland, adjacent to residential properties on James St.
CISW5	Downstream of former landfill	Located east of the tennis court and west of the BMX track.
CISW-Drain	Background	Located upgradient of GW5 and on the north-western boundary of Lot 3.

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3. Receptors

This section considers *potential* receptors of landfill derived impact based on groundwater / surface water beneficial uses, to evaluate whether actual or potential *source-pathway-receptor* linkages associated with the site exist.

The following section is taken from the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report*, GHD, 2018 (GHD, 2018c)

3.1 NEPM schedule B(6)

Assessment of potential impact at the site is considered based on Schedule B(6) of the *National Environment Protection Measure (NEPM) Guideline on Risk-Based Assessment of Groundwater Contamination* (NEPC, 2013). While Schedule B(6) is designed for groundwater risk assessment, the general approach is also applicable for the assessment of surface water in the context of this assessment. The purpose of Schedule B(6) is to provide a framework for the risk-based assessment of water that may have been affected by site contamination.

The basis for risk assessment under the NEPM is founded on *current* and *realistic future* uses of groundwater, and five environmental values to be assessed and protected are presented in Schedule B(6):

- Aquatic ecosystems
- Aquaculture and human consumers of food
- Agricultural water (irrigation and stock water)
- Recreation and aesthetics
- Drinking water
- Industrial water

3.2 *Potential water use* – State Environmental Protection Policy (Water)

The *Environmental Protection (Water and Wetland Biodiversity) Policy 2019 - Moreton Bay environmental values and water quality objectives* (Department of Environment and Resource Management (DERM)[2], September 2019), [referred to henceforth as EPP (Water)] defines the environmental values (EVs) for surface and groundwater quality within the region. This document also identifies the water quality objectives (WQOs) associated with each EV.

As the Coochiemudlo former landfill and the Melaleuca Wetland are situated within the coastal freshwater[3] area within Coochiemudlo Island, the site is classified as "Coochiemudlo Island" for the purpose of establishing EVs and associated WQOs (DERM, 2019). The EVs identified in Table 3-1 apply.

[2] Currently Department of Environment and Science (DES)
[3] The water type of the site is based on the *South-east Queensland Map Series Plan WQ1441 (Basin 144), Environmental Protection (Water) Policy 2009, July 2010*

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Table 3-1 Environmental Values – Coochiemudlo surface and groundwater potential receptors

Water	Environmental Values											
	Aquatic Ecosystems	Seagrass	Irrigation	Farm supply/use	Stock water	Drinking water	Human consumer	Oystering	Primary recreation	Secondary recreation	Visual recreation	Cultural and spiritual values
Groundwater	✓		✓	✓	✓	✓						
Surface water	✓	✓					✓	✓	✓	✓	✓	✓

Table modified from *Table 1* in *Environmental Protection (Water and Wetland Biodiversity) Policy 2019 – Moreton Bay environmental values and water quality objectives Basin No. 144 (part) and adjacent basins, 141, 142, 143, 145 and 146, including Moreton Bay, North Stradbroke, South Stradbroke, Moreton and Moreton Bay Islands, Coochiemudlo Island Environmental Values and Water quality objectives (Department of Environment and Resource Management (DERM), 2019)*

3.3 Assessment of *actual* water use

The EVs listed in Table 3-1 represent *potential* receptors. Further characterisation is required to establish *current* and *realistic future* receptors. To assist with characterising actual water use in the area, additional data sources have been utilised:

- A search of the groundwater database
- A search of the water entitlements database
- Water use considerations based upon the local setting

3.3.1 Groundwater use

A search of the GWDB was completed (refer to section 2.4), with summary results presented in Table 2-1. The search results identified five bores on the island. None of these bores are within the down gradient flow path of the former landfill and hence are unlikely to experience adverse effects attributable to the landfill.

3.3.2 Water entitlements database

A search of the water entitlements database for active water licences (accessed 1 May 2018, dated 13 February 2018) was completed for Coochiemudlo Island. No licensed groundwater use was identified on the island.

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3.4 Derivation of *actual* or *likely* water use

The *potential* receptors listed in Table 3-1 are discussed below in Table 3-2 to characterise *actual* or *realistically likely* receptors.

Table 3-2 Derivation of *actual* or *likely* water use

Water	Environmental value[1]	Consideration	Current or likely receptor
Groundwater	Aquatic ecosystems	Potential exposure pathway Likelihood of groundwater discharge into the Melaleuca Wetland	✓
	Farm/Supply use	Excluded based on the local land uses	×
	Stock water		×
	Irrigation	Excluded based on water licencing information location of groundwater bores on the island	×
	Drinking water	Excluded based on the local land uses: Reticulated water supply No groundwater licences for water supply on Coochiemudlo Island	×
Surface water	Aquatic ecosystems	Potential exposure pathway Wetland adjacent to former landfill – additional consideration of potential Wallum frog habitat	✓
	Human consumer	Excluded based on the limited surface area of the water bodies, limited access, lack of evidence of recreational use	×
	Primary recreation		x
	Secondary recreation		×
	Seagrass	Incomplete exposure pathway in vicinity of site	×
	Oystering		×
	Visual Recreation	Incomplete exposure pathway in vicinity of site	×
	Cultural and Spiritual Values	Potential exposure pathway	✓

Notes:

1. As defined under the EPP (Water) (refer to Table 3-1)

The assessment of *potential* receptors identified the following receptors as *actual* or *likely* receptors for further assessment:

- Surface water: aquatic ecosystems (including Wallum frog habitat (GHD, 2018a)), cultural and spiritual values
- Groundwater: aquatic ecosystems

3.5 Screening criteria

As recommended in the EPP (Water), the adopted WQOs were determined from a combination of documents, including the following:

- Environmental Protection (Water) Policy (Department of Natural Resource Management, 2010) corresponding to the following:

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  - Physico-chemical WQOs for aquatic ecosystem lowland freshwater (comprising lowland streams, Wallum/tannin-stained streams and coastal streams)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council [ANZECC] / Agriculture and Resource Management Council of Australia and New Zealand [ARMCANZ], 2000 and 2018 revision), corresponding to the following:
  - Protection of slightly to moderately disturbed ecosystems
    - Utilised as the site is in an urbanised environment
  - Protection of 99% species for surface water for metals only
    - Utilised as an indicator of metal concentrations elevated in relation to optimal concentrations for Wallum frogs habitat

Criteria are not explicitly provided for the assessment of spiritual and cultural values, so this EV has been considered implicitly included in the assessment of the aquatic ecosystems EV.

The results from the groundwater and surface water monitoring have been compared against the WQOs. Results that are less than the adopted WQO are considered to represent a low and acceptable risk.

As detailed earlier in this report, this assessment focusses upon the monitoring completed on 07 November 2019.

3.5.1 Site specific WQOs - Wallum frog species optimum habitat

The GHD 2018a report presented site-specific guidelines to improve the assessment of potential Wallum frog habitats.

The *GHD 2018 Coochiemudlo Island wetland* guideline was developed for the following parameters, as summarised in GHD (2018a):

- pH between 3.53 and 4.61 pH units
- EC < 90 µS/cm
- Tannin acid staining > 9.5 mg/L
- Calcium < 3.02 mg/L
- Low levels of monomeric aluminium consistent with siliceous sand and Wallum waters (refer to Aluminium guideline value from ANZECC FW 99%)

The *Myer et al 2006 Wallum-dependent frog species* was developed for the acidic conditions of Wallum frog habitats were specimens tolerate of pH less than 6.

3.6 Background water quality considerations

Groundwater and surface water monitoring results have also been compared to background results to establish if observed water conditions are typical of background conditions. This assessment has been developed to identify if the former landfill represents a potential risk for identified receptors. If groundwater quality is similar between background and down gradient locations, then it indicates that the landfill represents a negligible risk.

Comparison between background and down gradient results has been completed graphically for the chemical and physicochemical parameters included in the site monitoring program (pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, chemical oxygen demand (COD), ammonia as N, nitrate as (N), nitrogen (total) phosphorus (total) and dissolved metals).

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4. Conceptual site model

The conceptual site model (CSM) provides a summary of pertinent features relating to the assessment of risk at the site and supports the *source-pathway-receptor* model for environmental risk assessment.

The following section is taken from the Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report, GHD, 2018c.

4.1 Hazard (contamination source)

Leachate is the liquid that drains or "leaches" from a landfill. Leachate may form via percolation of liquid (such as rainfall) through permeable waste profiles contained in the landfill. Leachate is also generated through the decomposition of organic wastes within the landfill. As leachate percolates through the waste, solutes dissolve and become mobilised.

In this risk assessment, leachate represents the hazard or potential contamination source.

4.2 Pathway

Migration of groundwater, which has been potentially impacted by leachate, is toward the east (inferred groundwater flow direction). Groundwater levels are anticipated to mirror a subdued representation of the surface elevation, as supported by site monitoring data. Groundwater flow is interpreted to be through weathered sandstone and siltstone.

Surface water flow onsite is generally directed to low-lying areas (east) into the Melaleuca Wetland. In addition, relatively shallow groundwater indicates potential surface water / groundwater interaction. Based on this, localised groundwater discharge is likely to occur to the Melaleuca Wetland.

4.3 Receptors

Potential off-site receptors include human and ecological receptors that may be exposed to impacted groundwater and surface water via ingestion (drinking), dermal contact (adsorption via skin) and inhalation (e.g. if water was to become a mist or vapour). This may include human or ecological receptors exposed to impacted:

- Surface water in down gradient Melaleuca Wetland
- Groundwater from groundwater bores or natural discharge to surface water features

4.4 Summary

A schematic conceptual site model (CSM) is presented in Appendix A Figure 3.

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5. Field Monitoring Methodology

5.1 Sampling and field methodology

5.1.1 Groundwater sampling methodology

Groundwater samples were collected from three groundwater monitoring wells in November 2019 monitoring round. Two downgradient monitoring wells, GW1 and GW2 were dry and unable to be sampled during the current monitoring event.

Monitoring locations are presented in Appendix A Figure 2 and details provided in Table 2-2.

GW3 and GW5 were sampled using dedicated sampling equipment (low-flow peristaltic pump) with purging completed until field parameters stabilised. Sampling was completed directly after purging. GW6 was sampled using a disposable bailer (bailed dry and then sampled with a bailer). GW6 has a very low water recharge which prevents the use of the low flow sampling method for these locations. Due to the slow recovery of GW6, this well was bailed dry and allowed to recover for a few hours prior to sampling.

5.1.2 Surface water sampling methodology

During November 2019 monitoring round, all six surface water monitoring locations were dry and unable to be sampled.

Monitoring locations are presented in Appendix A Figure 2 and details provided in Table 2-3.

5.2 Analytical program

5.2.1 Laboratory analytical program

Samples were collected in laboratory supplied bottles dosed with preservative and stored on ice in a cooler. Samples were dispatched to the analytical laboratory under chain of custody documentation following collection. Laboratory analysis was completed by Australian Laboratory Services (ALS), which is a NATA accredited laboratory for the required analysis.

The analytical program for surface water and groundwater included the following:

- Major ions (alkalinity, sulphate, chloride, calcium, sodium, magnesium, potassium)
- Chemical oxygen demand (COD) and biochemical oxygen demand (BOD)
- Nutrients (ammonia, nitrate, nitrite, nitrogen (total), total phosphorous)
- Dissolved metals (aluminium, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc). Metals analysis adopted a lower LOR than the standard laboratory analytical procedure. This approach was utilised to provide greater resolution and additional detail to assist with the assessment of results
- Organochlorine and organophosphate pesticides

5.2.2 Physicochemical parameters

Field physicochemical parameters were recorded in the field using a calibrated YSI water quality meter:

- pH (pH units)
- EC (µS/cm)

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- DO (mg/L)
- DO saturated (%S)
- Redox potential (mV)
- Temperature (°C).

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6. Monitoring Results

The groundwater monitoring was conducted on 07 November 2019. The previous monitoring event was completed on 29 August 2019.

Monitoring locations are presented in Appendix A Figure 2. Groundwater and surface water monitoring results inclusive of field and laboratory data are provided in Table B1 and Table B2 of Appendix B respectively, up gradient and down gradient comparison charts are provided in Appendix C and laboratory documentation is provided in Appendix D.

For the March 2019 monitoring round, SWL and field parameters were recorded on the field electronic device at GW6, which was stolen the following day. Therefore this data is not available for the March 2019 quarter.

A summary of the groundwater conditions is detailed below in Sections 6.1 to 6.4. Surface water findings are provided in Sections 6.5 to 6.8.

6.1 Field observations - Groundwater

Table 6-1 Groundwater monitoring location - samples description

Location ID	Location description	Sample description
GW1 (DG)	Located 10 m west of the waste transfer station.	Dry.
GW2 (DG)	Located 10 m west of the closed landfill.	Dry.
GW3 (DG)	Located 50 m south-west of the former landfill, adjacent to the tennis court.	Yellow. Low to moderate turbidity. Low suspended solids. No odour or sheen.
GW5 (UG)	Located 5 m east of the waste transfer station.	Clear. No suspended solids. No odour or sheen.
GW6 (UG)	Located 60 m south of the waste transfer station.	Clear. No suspended solids. No odour.

Notes: UG – up gradient; DG – down gradient;

6.2 Groundwater standing water levels

The inferred groundwater flow direction is towards the east from the landfill to the Melaleuca Wetland. In previous monitoring events, inferred groundwater flow direction is towards the south-east. The variation in inferred groundwater flow direction It is considered to be associated with the absence of standing water level data from the two dry downgradient wells (GW1 and GW2). Groundwater contour map from the November 2019 gauging is presented in Appendix A (Figure 4). Topographical considerations suggest a north-easterly flow (refer to Figure 5 in Appendix A).

Groundwater standing water levels (SWL), converted to metres above the Australian Height Datum (m AHD) are graphically presented in Figure 6-1.

Groundwater SWLs measured at Coochiemudlo fluctuate between monitoring events since monitoring began in June 2017. A sharp increase in SWL was recorded at GW3 in November 2018, likely correlated to higher rainfall recorded during the weeks preceding sampling. Incremental changes in SWL were recorded across two locations (GW3 and GW5) during the March 2019 monitoring event, which is likely to be concurrent with the prolonged dry period observed during the months preceding sampling, following by heavy rainfall experienced during

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the week prior to the March 2019 sampling. The SWLs recorded during the August and November 2019 rounds generally show a slight decrease compared to the May 2019 SWLs, likely to be associated with dry conditions experienced during the month preceding the monitoring event.

As shown in Figure 6-1, groundwater wells GW3 and GW5 appear to be more responsive to rainfall experienced in the area than other wells in the monitoring network. Plotted cumulative rainfall departure (CRD) shows a prolonged dry period in March 2019 with a subsequent wetter period in May 2019 and July 2019, followed by dry conditions in August and November 2019.

Standing water levels are presented in Figure 6-1 along with the CRD derived from the Brisbane Aero Weather Station (WS) No. 040842. This was utilised for comparison given that rainfall records were complete for the previous months.

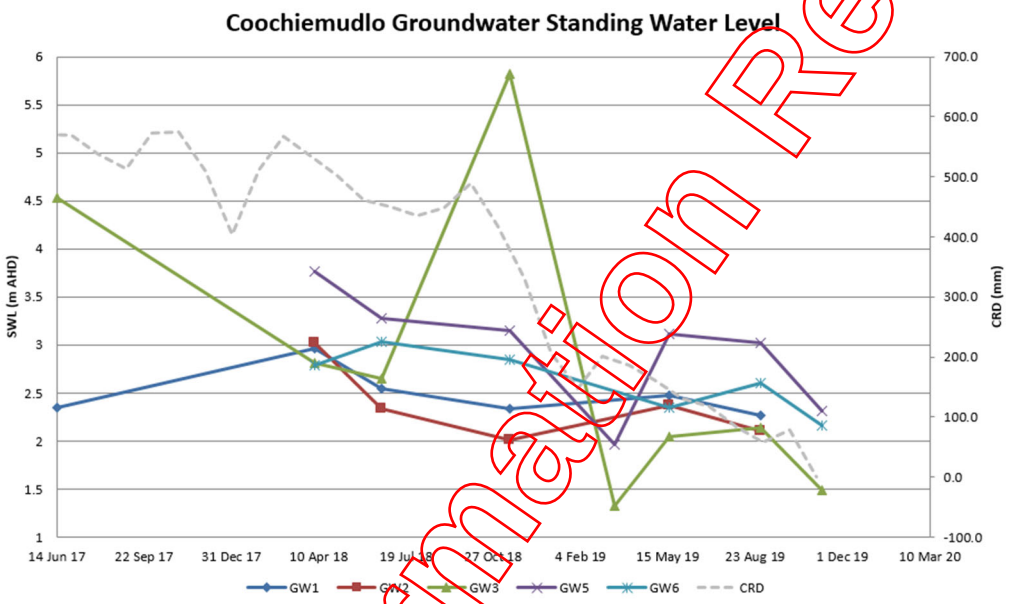

Figure 6-1 Coochiemudlo Standing Water Levels

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6.3 Rainfall

Rainfall data gathered from the Brisbane Airport Weather Station No. 040842 recorded a total of 9.4 mm of rainfall seven days prior to the surface water and groundwater monitoring on 07 November 2019.

The total rainfall recorded during the period preceding the November monitoring event was 107.4 mm (29 August – 07 November 2019) less than the long term average of 133.2 mm. Rainfall recorded three months preceding the August monitoring program was 77 mm (16 May – 29 August 2019), which was less than the long-term average (168 mm).

6.4 Groundwater results

6.4.1 Groundwater monitoring network characterisation

As displayed in Appendix A Figure 4, groundwater monitoring wells GW5 and GW6 are located hydraulically up gradient of the former landfill and are considered to be representative of background groundwater quality. Monitoring wells GW1 and GW2 are directly down gradient of the former landfill.

Topographic considerations and November 2018 groundwater flow suggest GW3 is not located down gradient of the former landfill, however, the May, August and November 2019 groundwater flow conditions indicated GW3 is potentially located down gradient of the landfill. For the purpose of this assessment, GW3 continues to be classified as a down gradient well.

6.4.2 Monitoring results

Three groundwater monitoring wells (two upgradient and one downgradient) were sampled during the November 2019 monitoring event. Two down gradient wells, GW1 and GW2 were dry and unable to be sampled. Groundwater results are provided in Table B1, Appendix B.

Upstream location GW5

Well GW5 is located hydraulically up gradient of the former landfill, and is considered to be representative of background conditions. Reported exceedances of adopted WQOs are summarised in Table 6-2.

Table 6-2 Summary of WQO exceedances at GW5

Parameter	Current results	Exceeded EVs	WQO
pH	4.63 pH units	Aquatic ecosystems[2] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	306.3 µS/cm	Aquatic ecosystems[2]	90 µS/cm
DO (mg/L)	7.63 mg/L	Aquatic ecosystems[3]	> 4 mg/L
Nitrogen (total oxidised)	2.47 mg/L	Aquatic ecosystems[1]	0.06 mg/L
Nitrogen (total)	3.0 mg/L	Aquatic ecosystems[1]	0.5 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] – GHD 2018 Coochiemudlo Island wetland
- [3] – Moreton Bay – Drinking Water

Based on its up gradient location, exceedances of WQOs reported and summarised in Table 6-2 are likely due to other environmental factors, and are not considered to be influenced by landfill impacts.

The remaining parameters were less than the adopted criteria.

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All OC and OP pesticides concentrations were less than the laboratory LOR.

Upstream location GW6

Monitoring well GW6 is located hydraulically up gradient of the former landfill, and is considered to be representative of background conditions.

New minimum was recorded for pH (3.77 pH units) with the current result the most acidic condition reported across all the groundwater monitoring locations. Location GW6 has been historically more acidic and with higher EC concentrations than GW5 and all other downgradient locations.

New maximums for nitrate (as N) (0.04 mg/L) and nitrogen (total) (0.04 mg/L) were reported at GW6 for the current monitoring round.

Reported exceedances of adopted WQOs are summarised in Table 6-3.

Table 6-3 Summary of WQO exceedances at GW6

Parameter	Current results	Exceeded EVs	WQO
pH	3.77 pH units	Aquatic ecosystems[1]	6.5-8 pH units
EC	2077 µS/cm	Aquatic ecosystems[3] Aquatic ecosystems[2] Aquatic ecosystems[3]	90 µS/cm 626 µS/cm 1000 µS/cm
DO (saturated)	15.8 %sat	Aquatic ecosystems[1]	85-100 %sat
Aluminium	4.34 mg/L	Aquatic ecosystems[2]	0.055 mg/L
Iron	0.241 mg/L	Aquatic ecosystems[4]	0.05 mg/L
Zinc	0.025 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- [4] – Moreton Bay – Drinking Water

Based on its up gradient location, exceedances of WQOs reported and summarised in Table 6-3 are likely due to other environmental factors, and are not considered to be influenced by landfill impacts.

The remaining parameters were less than the adopted criteria.

All OC and OP pesticide concentrations were less than the laboratory LOR.

Downstream location GW1

Down gradient monitoring well GW1 was dry during the November 2019 monitoring event and was unable to be sampled.

Historically, results at GW1 are mostly consistent with background concentrations. Iron and ammonia, key parameters for potential landfill impacts, decreased significantly since June 2018 and concentrations were less than LOR in August 2019. Sulfate, potassium, total alkalinity and calcium concentrations have been observed to be elevated compared to background and other downgradient locations.

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Downstream location GW2

Down gradient monitoring well GW2 was dry during the November 2019 monitoring event and was unable to be sampled.

Historically, results at GW2 are mostly consistent with background concentrations. During August 2019 monitoring event, iron concentration (10 mg/L) at GW2 was two orders of magnitude greater than background locations GW5 and GW6, whilst ammonia concentration at GW2 (0.05 mg/L) was slightly greater than concentrations reported at GW6 (0.02 mg/L).

Downstream location GW3

Topographic considerations and November 2018 groundwater flow suggest GW3 is not located down gradient of the former landfill, however, the May, August and November 2019 groundwater flow conditions indicated GW3 is potentially located down gradient of the landfill. For the purpose of this assessment, GW3 continues to be classified as a down gradient well.

Although there were exceedances of the adopted WQOs at GW3, most concentrations were generally consistent with those from up gradient locations.

A new maximum since monitoring began at GW3 in June 2017 was reported at GW3 for sodium (37 mg/L) during the November 2019 monitoring round.

Exceedances of the adopted WQOs are summarised in Table 6-4.

Table 6-4 Summary of WQO exceedances at GW3

Parameter	Current results	Exceeded EVs	WQO
pH	4.6 pH units	Aquatic ecosystems[3] Aquatic ecosystems[1]	3.53-4.61 pH units 6.5-8 pH units
EC	222 µS/cm	Aquatic ecosystems[3]	90 µS/cm
DO (saturated)	10.9 %sat	Aquatic ecosystems[1]	85-100 %sat
Nitrogen (total oxidised)	0.11 mg/L	Aquatic ecosystems[1]	0.06 mg/L
Phosphorous	0.08 mg/L	Aquatic ecosystems[1]	0.05 mg/L
Aluminium	0.195 mg/L	Aquatic ecosystems[2]	0.055 mg/L
Copper	0.0018 mg/L	Aquatic ecosystems[2]	0.0014 mg/L
Iron	0.252 mg/L	Aquatic ecosystems[4]	0.05 mg/L
Zinc	0.147 mg/L	Aquatic ecosystems[2]	0.008 mg/L

- [1] – Moreton Bay – Wallum / Tannin Freshwater
- [2] - ANZECC 2000 FW Slight-Mod Disturbed
- [3] – GHD 2018 Coochiemudlo Island wetland
- [4] – Moreton Bay – Drinking Water

The remaining parameters were less than the adopted criteria.

All OC and OP pesticides concentrations were less than the laboratory LOR.

6.4.3 Background and down gradient comparison

Groundwater monitoring results for the November 2019 monitoring events have been compared to background results to establish if groundwater conditions are typical of background conditions.

Downgradient monitoring wells GW1 and GW2 were dry and unable to be sampled during the November 2019 monitoring event.

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Comparison between background and down gradient results for all monitoring rounds has been completed graphically for pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, COD, ammonia, nitrate, total nitrogen, total phosphorus and dissolved metals. Charts are provided in Appendix C. This approach enables results from down gradient locations to be compared with background locations, with each dot representing a discrete sample.

Examination of the charts in Appendix C identifies that background concentrations are consistent with or greater than down gradient concentrations for EC, DO, sodium, chloride, nitrate, nitrogen (total), BOD, ammonia, magnesium, aluminium, cadmium, iron, arsenic, mercury, lead, manganese and nickel. On the basis that down gradient concentrations are mostly consistent with background, the former landfill does not appear to be adversely affecting the down gradient groundwater quality in terms of impact by these parameters. Consequently, site impacts on these parameters are considered to present a low risk to down gradient receptors.

New maximums were reported during the November 2019 monitoring event at downgradient monitoring location GW3 for sodium (37 mg/L). Upgradient locations reported at GW6 for nitrate (0.04 mg/L) and nitrogen (total oxidisable) (0.04 mg/L), and a new minimum for pH (3.77 pH units).

Slight variations between background and down gradient concentrations were identified in the November 2019 monitoring rounds for:

- pH. Background measurements were more acidic than down gradient measurements (pH ranged between 3.77 pH units (GW6) and 4.6 pH units (GW3).
- Alkalinity (total as $CaCO_3$). Down gradient location GW3 (4 mg/L) concentrations were elevated in comparison to background (<1 mg/L)
- Copper concentrations at downgradient GW3 (0.0018 mg/L) were greater in comparison to background (0.0005 mg/L).
- Zinc concentrations at down gradient GW3 were elevated (0.147 mg/L) in comparison to background (0.025 mg/L).

The groundwater analysis results are consistent with those from historical monitoring events and support the low risk characterisation reported in the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c).

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6.5 Surface water monitoring network characterisation

Surface water monitoring locations are presented in Appendix A Figure 2. CISW1 and CISW5 are located hydraulically downstream of the site and are potentially impacted by site groundwater discharge. Locations CISW2, CISW3 and CISW4 are not hydraulically down gradient of the site and have been characterised as background / reference sites. CISW2 and CISW3 are within an area that has been characterised as potential habitat for Wallum frogs based upon a habitat survey completed by GHD in 2018 (GHD, 2018a).

Since the May 2019 monitoring round, an additional location CISW-Drain has been sampled on the request of DES for additional surface water data. The location was selected by RCC. CISW-Drain has been classified as background data as it is considered hydraulically upstream of the former landfill.

During the additional July 2019 monitoring round, following heavy rainfall event, attempt to conduct surface water sampling and swamp survey was unsuccessful due to water levels preventing access to the usual monitoring locations. CISW2b was sampled 100 m west of CISW2 and CISW3 which were not accessible as the overall area was flooded.

6.6 Field observations – Surface water

Table 6-5 Groundwater monitoring location - samples description

Location ID	Location description	Sample description
CISW1	Downstream of former landfill	Dry
CISW2	Background, potential Wallum frog habitat	Dry
CISW2b	Temporary location	Temporary location in place of CISW2, sampled during July 2019 monitoring event only
CISW3	Background, potential Wallum frog habitat	Dry
CISW4	Background	Dry
CISW5	Downstream of former landfill	Dry
CISW-Drain	Background	Dry

6.7 Surface water monitoring results

During the 07 November 2019 monitoring round, all surface water monitoring locations were found to be dry and no samples were collected.

Surface water results related to the last five monitoring rounds are provided in Table B2, Appendix B.

More stringent guidelines (ANZECC 2000 FW 99% and the GHD 2018 Coochiemudlo Island wetland) have been adopted for potential Wallum frog habitat locations CISW2, CISW2b and CISW3 only. Other locations CISW1, CISW4, CISW5 and CISW-Drain were considered too disturbed for Wallum frog species and are assessed against the ANZECC 2000 slightly to moderately disturbed criteria and EPP guidelines for drinking water and Wallum/Tannin Freshwater criteria.

Upstream location CISW4

Up gradient location CISW4 was dry during the November 2019 monitoring events and was therefore not sampled. Previous results at CISW4 were consistent with background concentrations.

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Upstream location CISW2 (potential Wallum frog habitat)

Up gradient location CISW2 was dry during the November 2019 monitoring events and was therefore not sampled. CISW2 was last sampled during the July 2018 monitoring event and has been dry and unable to be sampled since. Previous results at CISW2 were consistent with background concentrations.

Upstream location CISW3 (potential Wallum frog habitat)

Up gradient location CISW3 was dry during the November 2019 monitoring events and was therefore not sampled. CISW3 was last sampled during the March 2018 monitoring event and has been dry and unable to be sampled since. Previous results at CISW3 were consistent with background concentrations.

Upstream location CISW-Drain

Background location CISW-Drain was dry during November 2019 monitoring round.

Downstream location CISW5

Down gradient location CISW5 was dry during the November 2019 monitoring round.

Downstream location CISW1

Down gradient location CISW1 was dry during the November 2019 monitoring round.

6.8 Discussion of surface water results

6.8.1 Background and downstream comparison

Surface water monitoring has been completed since March 2018 in the Melaleuca Wetland. During the November 2019 monitoring round, all surface water locations were dry and unable to be sampled.

Comparison between background and down gradient results has been completed graphically for pH, electrical conductivity (EC), dissolved oxygen (DO), major ions and total alkalinity, BOD, COD, ammonia as N, nitrate as (N), nitrogen (total), phosphorus (total) and dissolved metals. The charts are provided in Appendix C. This approach enables results from downstream locations to be compared with background locations.

6.8.2 Assessment of potential ASS impacts at CISW1 – March 2019

The March 2019 results showed a greater number of exceedances at CISW1 compared to CISW5 and historical results. At CISW1 during March 2019 concentrations increased by one or more orders of magnitude for pH (4.03 pH units), EC (4009 µS/cm), sulfate (2370 mg/L), ammonia (2.71 mg/L), aluminium (64.8 mg/L), iron (416 mg/L), manganese (2.05 mg/L) and zinc (37.8 mg/L) amongst other elevated dissolved metals.

On 15 March 2019, only surface water location CISW5 was sampled, with remaining locations dry. Due to notable rainfall (121 mm of rainfall in three days, Redland (Alexandra Hills) Station 140007) reported on the weekend following the first monitoring attempt, a second monitoring round was completed on 26 March 2019 to better assess surface water conditions at the Melaleuca Wetland. CISW1 was sampled, however CISW2, CISW3 and CISW4 remained dry.

CISW1 is coastally located, has an elevation of less than 5 m AHD, and is located in a low lying wetland area, indicating that the area may potentially host acid sulfate soils (ASS). Queensland Globe ASS mapping indicates that land at Coochiemudlo Island has not been assessed for ASS. The Melaleuca Wetland is characterised as Holocene aged coastal swampland (GHD,

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2018c), characteristics that classify it as a high probability area for acid sulfate soils[4]. When ASS are exposed to oxygen, the iron sulfides break down, releasing sulfuric acid, soluble iron and additional metals mobilised by the released acid, including aluminium and manganese[5]. ASS can be found or can form in any anoxic, aqueous environment where sulfate-reducing bacteria are provided with organic matter and available sulfate ions[6].

Water quality indicators of CISW1 also suggest the presence of ASS[4]:

- Soluble chloride: soluble sulfate (Cl^- : SO_4^{2-}) ratio (by mass) of less than 2 is a strong indication of an extra source of sulfate from previous sulfide oxidation. The March 2019 results reported chloride (99 mg/L) and sulfate (2370 mg/L) concentration ratios of 0.04.
- Water pH of less than 4.5 pH units may also be an indicator for the presence of ASS. CISW1 reported a pH of 4.03 pH units during March 2019, however, low pH is not a definitive indicator of ASS as environments such as Melaleuca wetlands are generally slightly acidic from other contributing non-sulfidic acids including organic acids[7].

The March 2019 sampling occurred after heavy rainfall following a prolonged dry period. Nearby groundwater concentrations (during March 2019) were inconsistent with (less than) historical results at CISW1, specifically in regards to key parameters aluminium, iron, manganese and sulfate / chloride ratio. Furthermore, the concentrations of these parameters are inconsistent with groundwater or leachate in a municipal landfill setting.

The March 2019 results in CISW1 were inconsistent with historical results, and it is considered that the elevated results may be associated with the presence and oxidation of ASS. Prior to the March 2019 monitoring round a prolonged dry period was followed by heavy rainfall. It is considered that during the prevailing dry conditions, areas of the Melaleuca Wetland containing potential ASS were exposed, allowing oxygen ingress, triggering the oxidation of sulfidic materials. Heavy rainfall experienced at Coochiemudlo Island subsequently resulted in the mobilisation of elevated concentrations of metals including iron, aluminium and manganese, which was likely flushed into CISW1.

Excluding the March 2019 findings, the results for CISW1 in the subsequent monitoring events in May, July and August 2019 reported results that were generally consistent with historical results (prior to March 2019). Water quality parameters indicating potential ASS impacts were not observed with less acidic pH, increase chloride concentration and significant decrease in sulfate and dissolved metals (especially aluminium, nickel and iron) concentrations.

The concentrations of most parameters were less than the relevant WQOs with the exception for pH, EC, DO (saturated and in situ), iron and zinc.

On 11 July 2019, further rainfall was observed prior to the monitoring round, with 91.6 mm recorded in the preceding two weeks. This impacted the site conditions at the Melaleuca swamp with large portions of the swamp between CISW-Drain and CISW2 being flooded (>0.3 m deep). As per May 2019, flushing may have occurred during this period. However, drier conditions reported during late July through to November have had a direct effect on the surface water conditions with all monitoring locations reported as dry, (with the exception of CISW1 in August 2019). Further monitoring of CISW1 is recommended as dry conditions are expected to continue.

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[4] State Planning Policy 1/00, Planning and management of coastal development involving acid sulfate soils (1997)
[5] Queensland Government, Acid sulfate soils and estuarine water quality of the Mackay district (2005)
[6] Queensland Government, Department of Science, Information Technology, Innovation and the Arts. Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines v4.0
[7] Draft State Planning Policy, Planning and Managing Development Involving Acid Sulfate Soils (1997)

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Based on the above, the March 2019 monitoring results are more likely to be the result of oxidation of ASS under prevailing dry conditions than associated with landfill impacts. This is further supported by the findings of the (May 2019) groundwater event, in that groundwater and surface water results had returned to the historical concentration ranges. On this basis, it is considered that the monitoring results continue to support the low risk characterisation reported in the *Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c). This risk characterisation is based upon the environmental risk posed by the landfill, and does not consider risk associated with ASS. Further investigation is recommended to characterise ASS in the area, confirm the potential causal link between CISW1 results and ASS, and identify if ASS need to be managed in the area.

DES have been notified of the March 2019 monitoring results.

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7. Quality Assurance / Quality Control

7.1 Field QA/QC

As part of the RCC LEMP field QA/QC procedures, field equipment is calibrated for each monitoring event, field QA/QC analysis is conducted at one of the closed landfills sites per quarter with three samples collected (field duplicate, rinsate and field blank). QA/QC was undertaken at Birkdale (CLR Site 29 at monitoring well BB1B) in November 2019. Refer to the Birkdale Quarterly Report for the field QA/QC results (GHD, 2019b).

Calibration certificates are provided in Appendix E.

7.2 Laboratory QA/QC

Surrogate spikes, laboratory blanks and laboratory control samples were used by ALS for the water analytical program. Validation of the analytical and laboratory QA / QC results are summarised below and are detailed within official laboratory documentation.

7.2.1 November 2019

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- All water samples were submitted to a NATA accredited laboratory in appropriately pre-treated and preserved containers.
- All water samples were extracted within holding times as recommended by analytical laboratories for all analytes (based on holding times set out in Schedule B(3) of the *NEPM* (2013)).
- Matrix spike (MS) recovery outlier exist for one anonymous sample for ammonia as N with the background level greater than or equal to 4 times the spike level.
- No analysis holding time outlier(s) occurred
- No outliers occurred for the method blanks, laboratory duplicate, surrogates recovery or quality control sample frequency outliers in the QA / QC program.

7.3 Summary of Quality Control Results

In summary, GHD considers that the field, laboratory and analytical QA / QC water results for samples collected and analysed as part of laboratory documentation EB1929731 are generally within the specified requirements. The data is considered to be valid and of sufficient quality to meet the data quality objectives for this assessment.

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8. Annual review

The following sections summarise the groundwater and surface water monitoring results for the past 12 months, collected during separate monitoring events in March, May, July, August and November 2019 at the Coochiemudlo Island former landfill.

8.1 Groundwater

Downgradient monitoring wells GW1 and GW2 were dry in March and November 2019, with all other wells successfully sampled over the five separate monitoring events.

Groundwater monitoring results for all monitoring events have been compared to background results to establish if groundwater conditions are typical of background conditions. Examination of the charts in Appendix C identifies that background concentrations are consistent with or greater than down gradient concentrations for all parameters with exception for slight variations between background and down gradient concentrations were identified at:

- Potassium, calcium and alkalinity (total as $CaCO_3$), which are generally elevated at GW1 and GW2 in comparison to background
- Sulfate and nitrate at GW1, which are generally elevated in comparison to background
- BOD, ammonia, iron and zinc, which are generally elevated at GW2 in comparison to background
- Phosphorous, COD, nitrogen (total), chromium and zinc, which are generally elevated at GW3 in comparison to background

Groundwater results over the last 12 months were generally consistent with historical data, with the exception of the following results:

- GW5 (upgradient)
  - The March 2019 monitoring event reported a new minimum for pH (4.62 pH units) and new maximums for chloride (80 mg/L), sulfate (17 mg/L), KNT (0.5 mg/L) and chromium (0.0004 mg/L)
  - The May 2019 monitoring event reported a new minimum for DO (1.4 mg/L)
- GW6 (upgradient)
  - The March 2019 monitoring event reported new maximums for magnesium (68 mg/L), sodium (385 mg/L), chloride (872 mg/L), sulfate (18 mg/L) and aluminium (7.58 mg/L)
  - The May 2019 monitoring event reported a new minimum for DO (9.6 %S) and a new maximum for zinc (0.129 mg/L)
  - The August 2019 monitoring event reported a new maximum for iron (0.745 mg/L)
  - The November 2019 monitoring event reported new maximums for nitrate (0.04 mg/L) and nitrogen (total oxidisable) (0.04 mg/L)
- GW1 (downgradient)
  - The May 2019 monitoring event reported new minimum for DO (9.7 %S) and a new maximum for sulfate (93 mg/L)
- GW2 (downgradient)
  - The May 2019 monitoring event reported sulfate (41 mg/L), ammonia (0.08 mg/L), BOD (6 mg/L), chromium (0.0003 mg/L),

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- The August 2019 monitoring event reported new minimum for DO (16.7 %S) and pH (5.73 pH units) and new maximums for EC (1219 µS/cm), COD (41 mg/L), TOC (9 mg/L), nitrogen (total) (1.3 mg/L), TKN (1.3 mg/L), phosphorous (0.19 mg/L), arsenic (0.0035 mg/L), manganese (0.0041 mg/L), nickel (0.0006 mg/L) and zinc (0.147 mg/L)

- GW3 (downgradient)
  - The March 2019 monitoring event reported new minimum for pH (4.58 pH units) and new maximums for copper (0.0024 mg/L) and zinc (0.163 mg/L)
  - The July 2019 monitoring event reported new maximum for alkalinity (bicarbonate as $CaCO_3$) (14 mg/L), alkalinity (total as $CaCO_3$) (14 mg/L),
  - The August 2019 monitoring event reported new maximum for EC (259.3 µS/cm) and new maximums for chloride (43 mg/L), sulfate (18 mg/L), manganese (0.0076 mg/L),
  - The November 2019 monitoring event reported new minimum for DO (10.9 %S) and new maximum for sodium (37 mg/L)

8.2 Surface water

Surface water at Coochiemudlo Island has been monitored for the past 12 months at six monitoring locations (two background, two background potential Wallum frog habitat and two downstream).

Potential Wallum frog habitat locations, CISW2 and CISW3 have been dry and unable to be sampled since July 2018 and March 2018, respectively. CISW2b (temporary location) was sampled during July 2019 monitoring event as the Melaleuca swamp was flooded and it was unsafe to access CISW2 and CISW3. A new background surface water location, CISW-Drain, was added to the monitoring program on the request of DES in May 2019 for additional surface water data.

During the March 2019 monitoring event, significantly elevated concentrations of parameters at CISW1 were identified including low pH and elevated EC, sulfate, ammonia, aluminium, iron, manganese and zinc amongst other dissolved metals. During the following May, July and August 2019 monitoring events, concentrations returned to historical surface water quality conditions. The March 2019 monitoring results are likely to be the result of oxidation of ASS under prevailing dry conditions than associated with landfill impacts, as previously discussed in Section 6.8.2.

Surface water monitoring results for all monitoring events have been compared to background results to establish if surface water conditions are typical of background conditions. Examination of the charts in Appendix C identifies that background concentrations are consistent with or greater than downstream concentrations for all parameters with exception for slight variations between background and downstream concentrations were identified at:

- pH at downstream CISW1 is typically more acidic than background and other downstream locations
- EC, sulfate, sodium, chloride, potassium, alkalinity (total as $CaCO_3$), calcium, magnesium, BOD, ammonia, aluminium, nitrogen (total), cadmium, iron, mercury, chromium, lead, manganese, nickel and zinc at CISW1
- Phosphorous at CISW1 and CISW5
- Copper at CISW5

Surface water results over the last 12 months were generally consistent with historical data, with the exception of the aforementioned elevated parameters at downstream locations and the

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following new maximum results (it should be noted that the maximums reported at downgradient location CISW1 are likely due to ASS impacts and are not associated with landfill leachate):

- CISW1 (downstream)
    - The March 2019 monitoring event reported new minimum for pH (4.03 pH units) and new maximums for EC (4003 µS/cm), COD (205 mg/L), calcium (272 mg/L), magnesium (141 mg/L), sodium (86 mg/L), sulfate (2370 mg/L), TOC (44 mg/L), ammonia (2.71 mg/L), nitrogen (total oxidised) (0.04 mg/L), nitrogen (total) (6.8 mg/L), phosphorous (0.08 mg/L), aluminium (64.8 mg/L), arsenic (0.0034 mg/L), cadmium (0.0271 mg/L), chromium (0.011 mg/L), copper (0.0072 mg/L), iron (416 mg/L), lead (0.0195 mg/L), manganese (2.05 mg/L), nickel (0.232 mg/L) and zinc (37.8 mg/L)
    - The August 2019 monitoring event reported a new minimum for DO (1.3% S)
- CISW5 (downstream)
    - The March 2019 monitoring event reported new maximums for nitrogen (total) (0.8 mg/L), TKN (0.8 mg/L), phosphorous (0.2 mg/L), BOD (5 mg/L), arsenic (0.0077 mg/L), copper (0.0039 mg/L), lead (0.0011 mg/L) and zinc (0.009 mg/L)
    - The May 2019 monitoring event reported a new minimum for pH (5.47 pH units) and new maximums for calcium (6 mg/L), potassium (3 mg/L), sodium (14 mg/L), chloride (22 mg/L), TOC (19 mg/L), nitrate (0.02 mg/L), nitrogen (total oxidisable) (0.02 mg/L) and manganese (0.0496 mg/L)
    - The July 2019 monitoring event reported a new maximum for iron (2.61 mg/L)
- Sampling at CISW4 (background) has only been completed for two monitoring rounds. Concentrations have remained relatively similar between the events at this location, with exception for iron in March 2019 (10.4 mg/L) and July 2019 (4.15 mg/L) and aluminium (0.981 mg/L and 0.057 mg/L, respectively)
- Sampling at CISW-Drain (background) has only been completed for two monitoring events, with concentrations similar between the two events have been completed)

Although exceedances of the adopted WQOs and new maximums were identified during the monitoring events, comparisons between upstream and downstream results over the last 12 months indicated that the parameter concentrations are generally consistent between upgradient and downgradient locations, with exception of the March 2019 elevated concentrations (as discussed previously).

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9. Conclusions

An assessment was completed by GHD in September 2018 at the former Coochiemudlo Island landfill to characterise the environmental risk posed by this facility [*Coochiemudlo Island Former Landfill – Monitoring and Environmental Risk Review Report* (GHD, 2018c)]. The review characterised risk to down gradient receptors including adjacent Melaleuca Wetland as low, however it recommended additional monitoring works to confirm the findings of the assessment.

The November 2019 monitoring event forms part of the quarterly monitoring programme for this site as recommended in the risk review report (GHD, 2018c). The Melaleuca Wetland is located adjacent to and downstream of the former landfill. The purpose of the quarterly monitoring programme is to gain an updated understanding of the environmental risk to the Melaleuca Wetland posed by the former landfill and to build on the existing knowledge regarding the quality of the surface water and groundwater on and offsite.

During the November 2019 monitoring round, all groundwater wells except for GW1 and GW2 were sampled, however, all six surface water monitoring locations were dry.

Groundwater

Topographical considerations suggest the groundwater flows towards to north-east, whilst groundwater contour mapping from SWL data in May and November 2019 suggest the groundwater flows in an east to south-easterly direction.

In the November 2019 monitoring round, and GW6 for nitrate (0.04 mg/L) and nitrogen (total) (0.04 mg/L) and a new minimum for pH (3.77 pH units) and at downgradient location GW3 for sodium (37 mg/L) and a new minimum for DO (10.9 % S).

Most results in down gradient locations were consistent with the historical dataset or were less than those reported in background locations.

The concentrations of ammonia, a key landfill leachate indicator, is consistent between up and downgradient wells. Concentrations of iron (also a key landfill leachate indicator) were reported above the adopted guideline in both up and down-gradient locations (GW6 and GW3). Iron is naturally occurring in groundwater and displays a high degree of variation in both the upgradient and down gradient wells. On this basis, the results from the November 2019 monitoring event continue to indicate that the landfill represents a low risk to the identified receptors (human and ecological, including the Melaleuca Wetland and the potential Wallum frog habitat).

Surface water

Surface water monitoring has been completed since March 2018 in the Melaleuca Wetland. During the November 2019 monitoring round, all surface water locations were dry and unable to be sampled.

Historically, the concentrations of most parameters were less than the relevant WQOs with the exception for pH, EC, DO (saturated and in situ), iron and zinc. Of these parameters, only EC was elevated compared to background locations. The groundwater monitoring program has identified EC in down-gradient locations to be consistent with background groundwater quality. These results indicate that the landfill represents a low risk to the identified receptors.

Risk-based conclusion

Based on the findings of this assessment the former landfill is considered to present a low risk to down gradient receptors and remedial works at the landfill are not considered to be required.

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10. Recommendations

The following recommendations are provided in support of this assessment:

- Further surface water and groundwater quarterly monitoring is recommended. While this assessment has characterised the risk posed by the landfill to identified receptors to be low, it is noted that limited monitoring (eight complete events) has been completed over a short period of time (approximately two and a half years). Further surface water and groundwater monitoring is recommended for trend analysis, and to support characterisation of potential risks over differing climatic and seasonal conditions.
- Regular inspections are recommended to identify if site conditions change. It is understood that Council currently implements a program of routine inspections and it is recommended that this program continue.
- The former landfill is effectively capped and maintained. Vegetative cover helps stabilise the landfill cap. It is recommended that maintenance of the site be continued.
- Any earthworks on site should be appropriately managed to prevent leachate or soil release into the adjacent Melaleuca Wetlands.
- An acid sulfate soils investigation is recommended to characterise ASS in the area, confirm the potential causal link between CISW1 results and ASS, and identify if ASS need to be managed in the area.

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Appendices

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Appendix A - Figures

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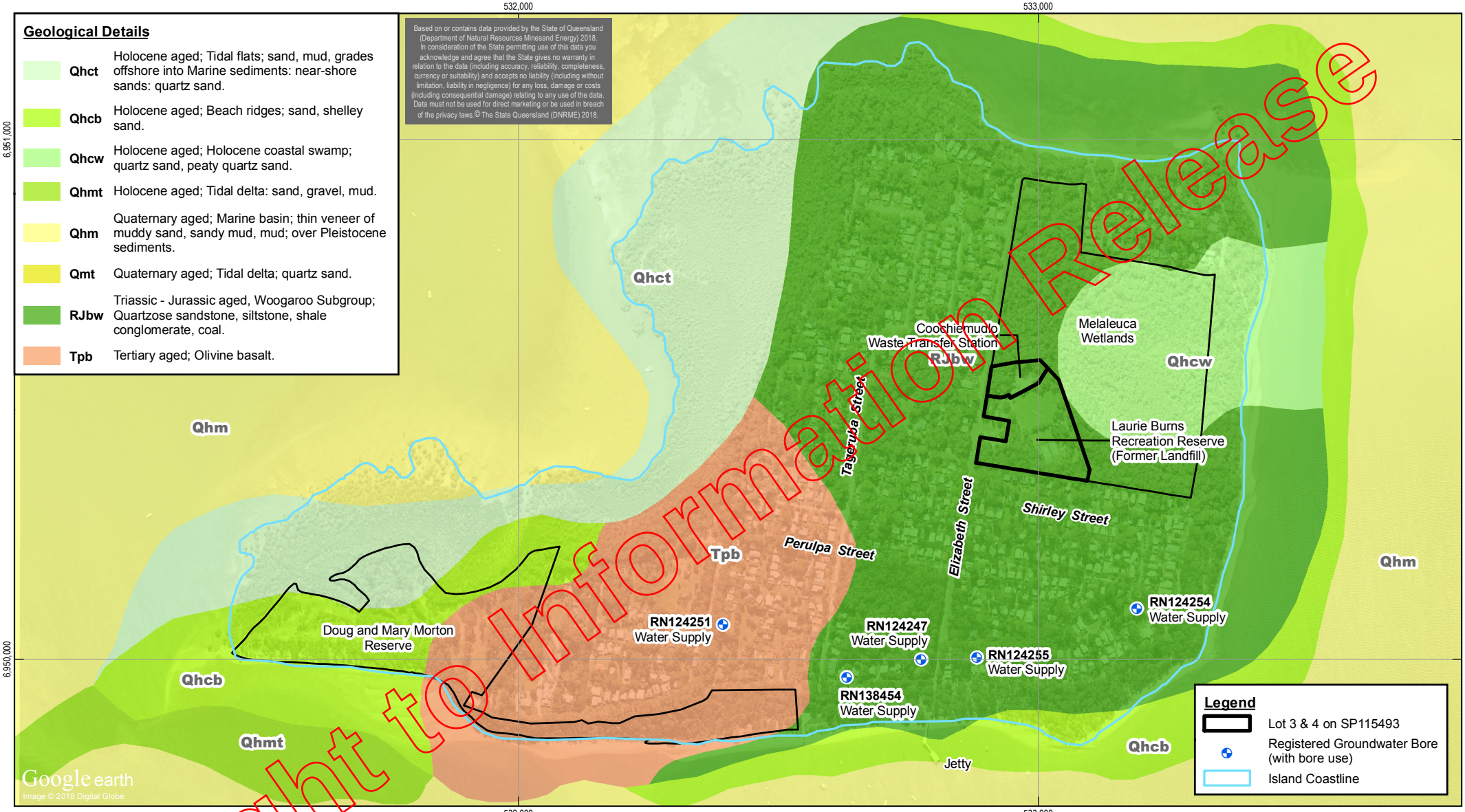

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Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
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REDLAND CITY COUNCIL

Coochiemudlo Island Former Landfill

Job Number	41-27018
Revision	A
Date	09 Aug 2018

Geology and Registered Groundwater Bores

Figure 1

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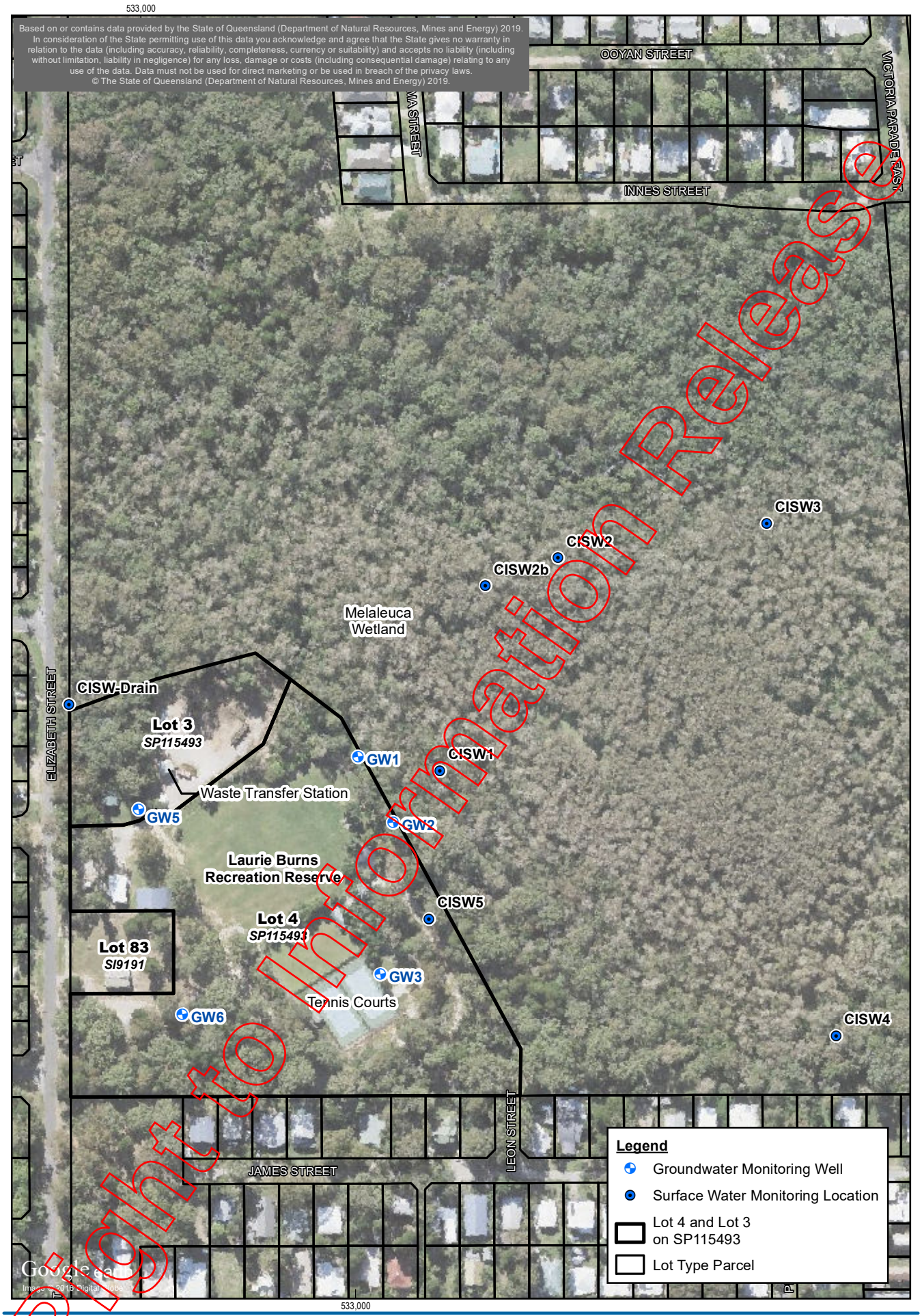

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Metres

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Redland City Council
Coochiemudlo Island

Groundwater Monitoring Well and Surface Water Monitoring Locations

Job Number	41-27018
Revision	B
Date	21 Nov 2019

Figure 2

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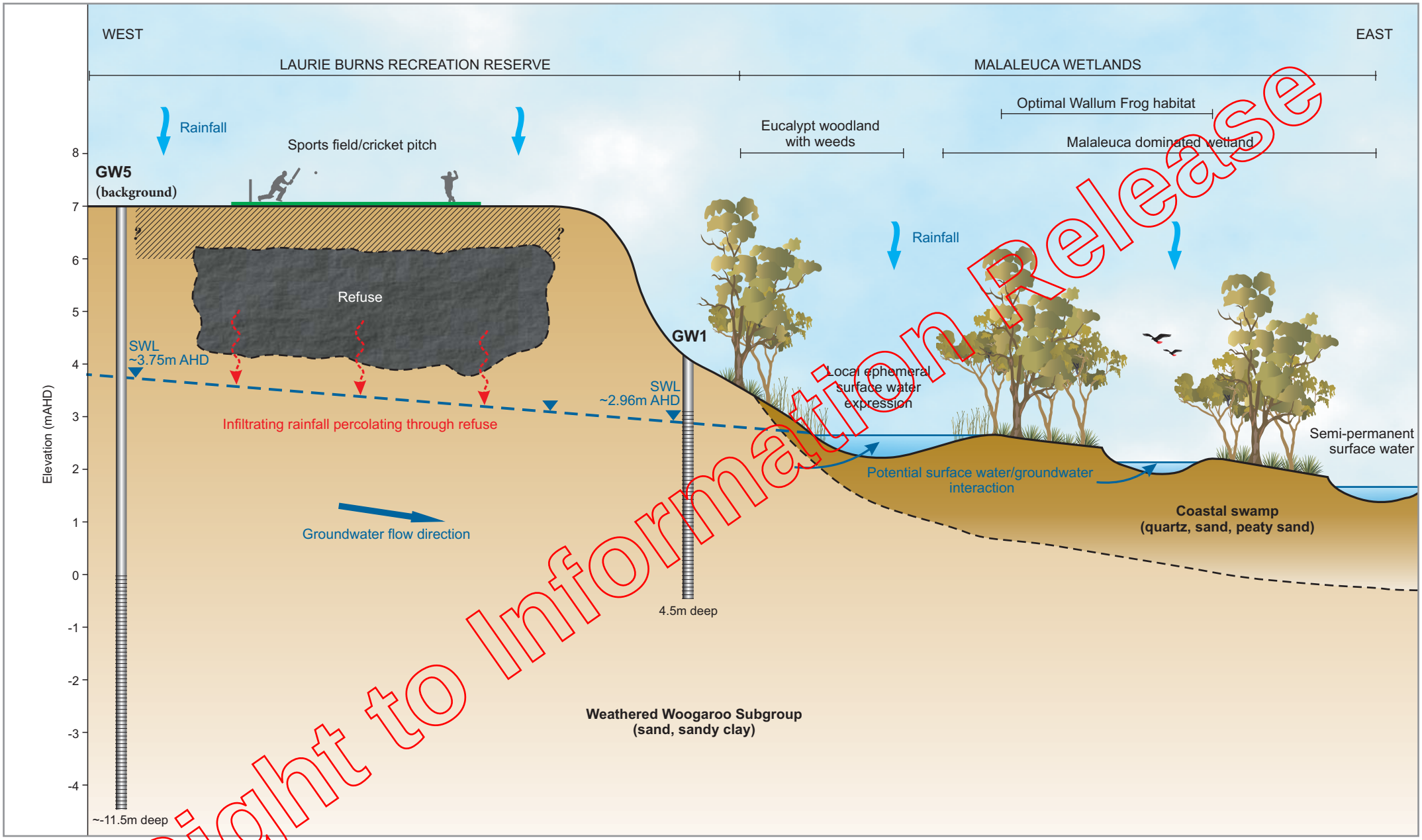

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LEGEND

Soil cover

Refuse

Groundwater level

Conceptual diagram only - not to scale.
Vertical exaggeration x10

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Coochiemudlo Island

Conceptual Site Model

Job Number	41-27018
Revision	A
Date	10 Sep 2018

Figure 3

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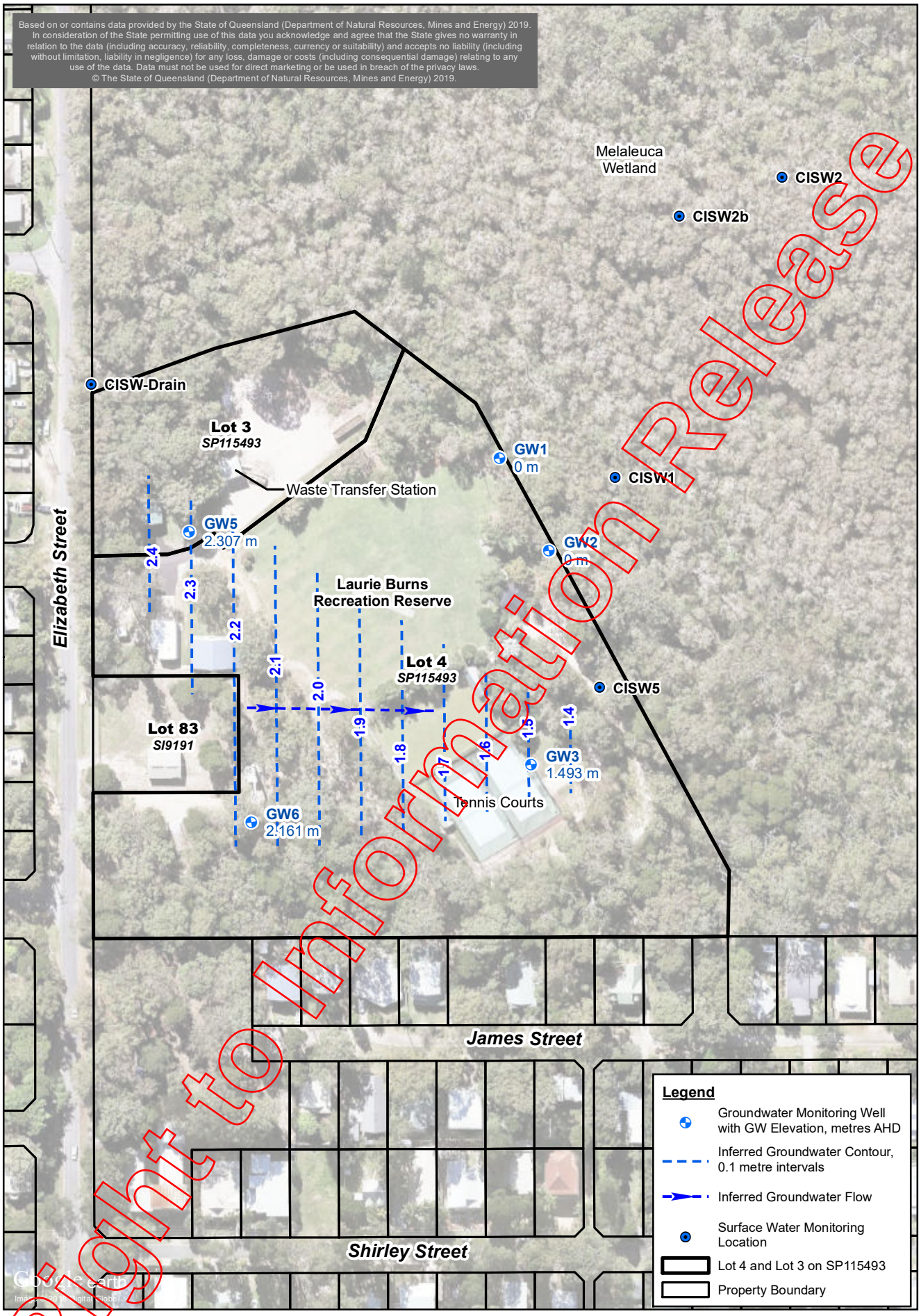

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Metres

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Redland City Council
Coochiemudlo Island

Job Number	41-27018
Revision	A
Date	21 Nov 2019

Groundwater Monitoring Contouring November 2019

Figure 4

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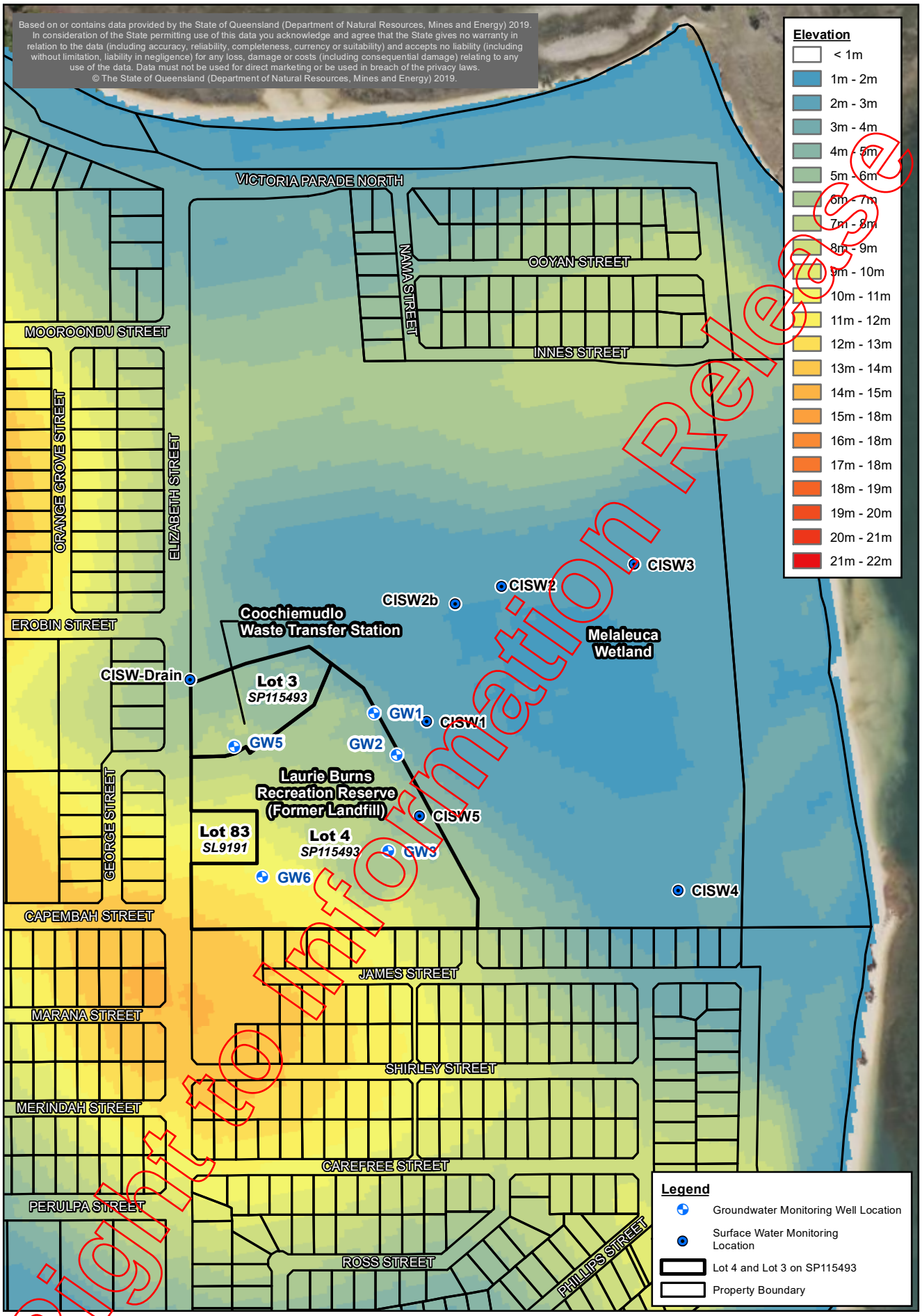

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Metres

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Redland City Council
Coochiemudlo Island

Job Number 41-27018
Revision A
Date 21 Nov 2019

Redland CITY COUNCIL

Topographical Setting

Figure 5

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Appendix B – Results

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Appendix B
Table B1
Groundwater monitoring results

Purpose	Location_Code	Sampled_Date_Time	Field_ID	Field Parameters							Inorganics		Acidity & Alkalinity				Major Ions								
				pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field)	Dissolved Oxygen (Field) (Filtered)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total	Anions Total	Ionic Balance
				pH Units	µS/cm	mg/L	mg/L	%S	mV	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%
EQL											1	10	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01
ANZECC 2000 - Stock Watering																	**1000**					**1000**			
ANZECC 2000 FW Slight-Mod. Disturbed																									
GHD 2018 Coochiemudlo Island wetland				3.53-4.61[#8]	90[#9]												3.02[#9]								
Morton Bay - Schedule 1 EPP (water) - Drinking Water					*1000*	*4*[#10]	*4*[#10]																		
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater				6.5-8[#11]	626[#12]			85-110[#11]																	
Down gradient	GW1	15/03/2019		Dry - Not sampled																					
		16/05/2019	GW1-0519-1	6	598	0.84	-	9.7	90	22.6	-	<10	<1	132	<1	132	60	19	12	37	59	93	6.47	6.24	1.86
		9/07/2019	GW1-0719-1	6.16	604	1.91	-	-	53.6	20.7	119	<10	<1	138	<1	138	65	21	13	28	38	-	6.52	6.31	1.68
		29/08/2019	GW1-0819-1	6.11	559	2.42	-	26.9	251.7	19.2	-	<10	<1	137	<1	137	55	20	11	28	41	88	5.89	5.73	1.41
		7/11/2019		Dry - Not sampled																					
	GW2	15/03/2019		Dry - Not sampled																					
		16/05/2019	GW2-0519-1	5.99	*1059*	1.48	-	17.2	-37	22.7	-	16	<1	116	<1	116	47	23	10	72	169	41	7.62	7.94	2.01
		9/07/2019	GW2-0719-1	6.46	738	2.05	-	-	7.2	21	42	13	<1	134	<1	134	48	20	10	54	100	-	6.64	6.37	2.1
		29/08/2019	GW2-0819-1	5.73	*1219*	1.49	-	16.7	150.7	20.6	-	41	<1	61	<1	61	32	37	7	149	408	21	11.3	13.2	7.61
		7/11/2019		Dry - Not sampled																					
	GW3	15/03/2019	GW3-0319-1	4.58	117	1.42	-	-	296.3	25.7	-	12	<1	10	<1	10	1	2	<1	20	25	9	1.08	1.09	-
		16/05/2019	GW3-0519-1	4.89	117.9	1.5	-	-	218.2	25.3	-	<10	<1	11	<1	11	2	2	<1	19	22	9	1.09	1.03	-
		9/07/2019	GW3-0719-1	5.44	125.5	2.79	-	-	158.3	23.9	8	<10	<1	14	<1	14	2	2	<1	14	15	-	0.87	0.87	-
		29/08/2019	GW3-0819-1	4.95	259.3	1.4	-	16.9	259.3	23	-	<10	<1	9	<1	9	2	2	<1	32	43	18	1.66	1.77	-
		7/11/2019	GW3-1119-1	4.6	222	-	0.89	10.9	225.6	25.2	-	<10	<1	4	<1	4	2	2	<1	37	41	17	-	-	-
Up gradient	GW5	15/03/2019	GW5-0319-1	4.62	332.8	2.97	-	-	329.8	23.9	-	<10	<1	3	<1	3	1	5	<1	55	80	17	2.85	2.67	-
		16/05/2019	GW5-0519-1	4.63	290.7	1.4	-	-	265.1	23.7	-	<10	<1	3	<1	3	1	4	<1	50	74	16	2.55	2.48	-
		9/07/2019	GW5-0719-1	4.77	391.7	2.17	-	-	269	23	17	<10	<1	4	<1	4	<1	5	<1	51	72	-	2.63	2.46	-
		29/08/2019	GW5-0819-1	4.74	321	2.34	-	31	331.5	22.6	-	<10	<1	4	<1	4	<1	5	<1	48	73	16	2.5	2.47	-
		7/11/2019	GW5-1119-1	4.63	306.3	-	*7.63*	92.6	202	25.2	-	<10	<1	4	<1	4	<1	4	<1	48	63	18	-	-	-
	GW6	15/03/2019	GW6-0319-1	Field parameters not available								<50[#1]	<1	<1	<1	<1	4	68	2	385	872	18	22.6	25	5
		16/05/2019	GW6-0519-1	3.95	*1806*	0.83	-	9.6	278.9	22.6	-	<10	<1	<1	<1	<1	3	50	3	292	669	13	17	19.1	5.8
		9/07/2019	GW6-0719-1	3.99	*2225*	2.09	-	-	249	22.2	17	13	<1	<1	<1	<1	3	60	2	338	760	-	19.8	21.8	4.69
		29/08/2019	GW6-0819-1	3.83	*2368*	1.21	-	13.9	315.5	21.9	-	<10	<1	<1	<1	<1	3	62	2	321	793	16	19.3	22.7	8.19
		7/11/2019	GW6-1119-1	3.77	*2077*	-	1.3	15.8	301.4	24.9	-	<10	<1	<1	<1	<1	2	49	3	299	720	14	-	-	-

Env Stds Comments

#1:400 mg/L divided by molecular weight, stock may tolerate higher nitrate concentrations if nitrate in feed are not high, water containing >1500 mg/L (as NO3) is likely to be toxic.
#2:30 mg/L divided by molecular weight
#3:>0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poulty
#4:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anzecc-nitrate-correction-sep02.pdf
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trigger value of 0.8 ug/L (0.0008 mg/L) has been derived
#6:As (V) used as conservative value
#7:Cr(VI) guideline has been adopted
#8:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmental limits of threatened species: the example of the wallum sedgefrog Litoria olongburensis. Ecosphere 7(6):e01384. 10.1002/ecs2.1384
#9:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog assessment
#10:At water surface
#11:Moreton Bay - Wallum/Tannin Freshwater
#12:QWQG 2009 - Sandy Coastal

Data Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

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Appendix B
Table B1
Groundwater monitoring results

				TOC	Nutrients								Organic Indicators	Metals										
				Total Organic Carbon	Nitrite + Nitrate as N	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)	BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL				1	0.01	0.01	0.01	0.01	0.01	0.1	0.1	0.01	2	0.005	0.0002	0.00005	0.0002	0.0005	0.002	0.0001	0.0005	0.00004	0.0005	0.001
ANZECC 2000 - Stock Watering							**90[#1]**	**9.1[#2]**						**5**	**0.5**	**0.01**	**1**	**1[#3]**		**0.1**		**0.002**	**1**	**20**
ANZECC 2000 FW Slight-Mod. Disturbed						0.9	7.2[#4]							0.055[#5]	0.013[#6]	0.0002	0.001[#7]	0.0014	0.3	0.0034	1.9	0.00006	0.011	0.008
GHD 2018 Coochiemudlo Island wetland																								
Morton Bay - Schedule 1 EPP (water) - Drinking Water																			*0.05*		*0.05*			
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater						0.02[#11]			0.06[#11]	0.5[#11]		0.05[#11]												
Purpose	**Location_Code**	**Sampled_Date_Time**	**Field_ID**																					
Down gradient	GW1	15/03/2019																						
		16/05/2019	GW1-0519-1	<1	-	0.04	1.74	<0.01	1.74	2.2	0.5	0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	0.006	<0.0001	0.0034	<0.0001	<0.0005	0.002
		9/07/2019	GW1-0719-1	6	2.74	<0.01	2.74	<0.01	-	3.2	0.5	0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	0.005	<0.0001	0.0087	<0.0001	<0.0005	0.002
		29/08/2019	GW1-0819-1	3	-	<0.01	1.54	<0.01	1.54	1.8	0.3	0.01	<2	<0.005	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0123	<0.00004	<0.0005	0.002
		7/11/2019																						
	GW2	15/03/2019																						
		16/05/2019	GW2-0519-1	7	-	0.08	0.01	<0.01	0.01	0.5	0.5	0.05	6	0.01	0.0025	<0.00005	0.0003	<0.0005	*7.32*	<0.0001	0.0036	<0.0001	<0.0005	0.074
		9/07/2019	GW2-0719-1	7	0.09	0.01	0.09	<0.01	-	0.3	0.2	0.03	3	<0.005	0.0003	<0.00005	<0.0002	<0.0005	*1.25*	<0.0001	0.0008	<0.0001	<0.0005	0.003
		29/08/2019	GW2-0819-1	9	-	0.05	<0.01	<0.01	<0.01	1.3	1.3	0.19	4	0.007	0.0035	<0.00005	<0.0002	<0.0005	*10*	<0.0001	0.0041	<0.00004	0.0006	0.147
		7/11/2019																						
	GW3	15/03/2019	GW3-0319-1	4	-	<0.01	0.11	<0.01	0.11	0.5	0.4	0.08	<2	0.163	<0.0002	<0.00005	0.0007	0.0024	*0.231*	0.0003	0.0045	<0.0001	<0.0005	0.011
		16/05/2019	GW3-0519-1	3	-	0.04	0.05	<0.01	0.05	0.4	0.3	0.1	<2	0.108	<0.0002	<0.00005	0.0004	0.0015	*0.148*	0.0001	0.0048	<0.0001	<0.0005	0.163
		9/07/2019	GW3-0719-1	3	0.06	<0.01	0.06	<0.01	-	0.3	0.2	0.05	<2	0.033	<0.0002	<0.00005	<0.0002	0.0007	0.046	0.0001	0.004	<0.0001	<0.0005	0.008
		29/08/2019	GW3-0819-1	3	-	<0.01	0.06	<0.01	0.06	0.3	0.2	0.03	<2	0.024	<0.0002	<0.00005	<0.0002	0.0009	*0.324*	<0.0001	0.0076	<0.00004	0.0006	0.059
		7/11/2019	GW3-1119-1	3	-	<0.01	0.11	<0.01	0.11	0.4	0.3	0.08	<2	0.195	<0.0002	<0.00005	0.0006	0.0018	*0.252*	0.0002	0.0066	<0.0001	0.0006	0.147
Up gradient	GW5	15/03/2019	GW5-0319-1	<1	-	<0.01	3.02	<0.01	3.02	3.5	0.5	<0.01	<2	0.01	<0.0002	<0.00005	0.0004	<0.0005	0.004	<0.0001	0.0022	<0.0001	<0.0005	<0.001
		16/05/2019	GW5-0519-1	<1	-	0.03	2.91	<0.01	2.91	3.2	0.3	<0.01	<2	0.009	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0026	<0.0001	<0.0005	0.001
		9/07/2019	GW5-0719-1	1	2.93	0.01	2.93	<0.01	-	3.2	0.3	<0.01	<2	0.018	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0019	<0.0001	<0.0005	<0.001
		29/08/2019	GW5-0819-1	<1	-	<0.01	2.62	<0.01	2.62	2.9	0.3	<0.01	<2	0.022	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	<0.0001	0.0019	<0.00004	<0.0005	<0.001
		7/11/2019	GW5-1119-1	1	-	<0.01	2.47	<0.01	2.47	3	0.5	<0.01	<2	0.014	<0.0002	<0.00005	<0.0002	<0.0005	<0.002	0.0001	0.0019	<0.0001	<0.0005	0.001
	GW6	15/03/2019	GW6-0319-1	2	-	<0.01	0.02	<0.01	0.02	<0.1	<0.1	<0.01	<2	**7.58**	<0.0002	<0.00005	0.0002	0.0009	*0.479*	0.0007	*0.12*	<0.0001	0.0032	0.022
		16/05/2019	GW6-0519-1	<1	-	0.04	0.03	<0.01	0.03	0.2	0.2	0.08	<2	4.12	<0.0002	<0.00005	<0.0002	0.0008	*0.172*	0.001	*0.16*	<0.0001	0.002	0.129
		9/07/2019	GW6-0719-1	2	0.02	<0.01	0.02	<0.01	-	<0.1	<0.1	0.01	<2	**6.97**	<0.0002	<0.00005	0.0002	0.0009	*0.153*	0.001	*0.13*	<0.0001	0.0027	0.018
		29/08/2019	GW6-0819-1	2	-	0.02	<0.01	<0.01	<0.01	0.1	0.1	<0.01	<2	**6.87**	<0.0002	<0.00005	0.0002	0.0007	*0.745*	0.0007	*0.128*	<0.00004	0.003	0.05
		7/11/2019	GW6-1119-1	1	-	<0.01	0.04	<0.01	0.04	<0.1	<0.1	0.01	<2	4.34	<0.0002	<0.00005	0.0002	0.0005	*0.241*	0.001	*0.149*	<0.0001	0.0022	0.025

Env Stds Comments
#1:400 mg/L divided by molecular weight, stock may tolerate higher nitrate
#2:30 mg/L divided by molecular weight
#3:>0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poult
#4:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability
#6:As (V) used as conservative value
#7:Cr(VI) guideline has been adopted
#8:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environm
#9:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog a
#10:At water surface
#11:Moreton Bay - Wallum/Tannin Freshwater
#12:QWQG 2009 - Sandy Coastal

Data Comments
#1 Reported Analyte LOR is higher than Requested Analyte LOR

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Appendix B
Table B1
Groundwater monitoring results

Purpose	Location_Code	Sampled_Date_Time	Field_ID	4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
				OC Pesticides																								OP Pesticides																			
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	0.5	0.5
ANZECC 2000 - Stock Watering																																															
ANZECC 2000 FW Slight-Mod. Disturbed									0.03					0.006						0.01			0.2	0.01				0.1				0.01			0.01		0.15				0.05			0.004		
GHD 2018 Coochiemudlo Island wetland																																															
Morton Bay - Schedule 1 EPP (water) - Drinking Water																																															
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																																															
Down gradient	GW1	15/03/2019																																													
		16/05/2019	GW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW1-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		7/11/2019																																													
	GW2	15/03/2019																																													
		16/05/2019	GW2-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW2-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW2-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		7/11/2019																																													
	GW3	15/03/2019	GW3-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW3-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW3-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW3-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		7/11/2019	GW3-1119-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
Up gradient	GW5	15/03/2019	GW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW5-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		7/11/2019	GW5-1119-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
	GW6	15/03/2019	GW6-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	GW6-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	GW6-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	GW6-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		7/11/2019	GW6-1119-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5

Env Stds Comments
#1:400 mg/L divided by molecular weight, stock may tolerate higher nitrate
#2:30 mg/L divided by molecular weight
#3:>0.5 mg/L hazardous to sheep, >1 mg/L for cattle, >5 mg/L pigs and poul
#4:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability
#6:As (V) used as conservative value
#7:Cr(VI) guideline has been adopted
#8:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environm
#9:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog a
#10:At water surface
#11:Moreton Bay - Wallum/Tannin Freshwater
#12:QWQG 2009 - Sandy Coastal

Data Comments
#1 Reported Analyte LOR is higher than Requested Analyte LOR

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Appendix B
Table B2
Surface water monitoring results

					Field Parameters						Inorganics		Acidity & Alkalinity				Major Ions								
					pH (Field)	Electrical conductivity (Field)	Dissolved Oxygen (Field)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	Sulfate as SO4 - Turbidimetric (Filtered)	COD	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total	Anions Total	Ionic Balance
					pH Units	µS/cm	mg/L	%S	mV	°C	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%
EQL											1	10	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01
ANZECC 2000 FW 99% - applicable to CISW2, CISW2b and CISW3 only																									
ANZECC 2000 FW Slight-Mod. Disturbed																									
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2, CISW2b and CISW3 only					3.53-4.61 [#7]	90 [#8]											3.02 [#8]								
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater					*6.5-8* [#9]	*626* [#10]		*85-110* [#9]																	
Myer et al 2006 Wallum-dependent frog species					**0-6** [#11]																				
Site_ID	**Purpose**	**Location_Code**	**Sampled_Date_Time**	**Field_ID**																					
Coochiemudlo Island	Background	CISW2b	9/07/2019	CISW2b-0719-1	*5.74*	315.4	1.06	*10.7*	-88.9	16.4	3	114	<1	8	<1	8	3	4	4	34	59	-	2.06	1.89	-
			29/08/2019		Dry - not sampled (temporary location)																				
		CISW-Drain	16/05/2019	CISW-Drain-0519-1	*5.55*	156.6	0.78	*9.2*	48.5	22.9	-	42	<1	15	<1	15	5	5	<1	32	50	15	2.05	2.02	-
			9/07/2019	CISW-Drain-0719-1	*5.77*	210.8	2.98	*33.5*	243.7	20.6	14	<10	<1	16	<1	16	3	4	<1	26	40	-	1.61	1.74	-
			29/08/2019		Dry - not sampled																				
			7/11/2019		Dry - not sampled																				
		CISW4	26/03/2019		Dry - not sampled																				
			16/05/2019		Dry - not sampled																				
			9/07/2019	CISW4-0719-1	*5.71*	264.4	2.51	*26.7*	100.9	18.4	22	346	<1	7	<1	7	4	5	<1	35	53	-	2.13	2.09	-
			29/08/2019		Dry - not sampled																				
			7/11/2019		Dry - not sampled																				
	Downstream	CISW1	26/03/2019	CISW1-0319-1	*4.03*	*4009*	0	-	141.4	26.5	-	205	<1	<1	<1	<1	272	141	15	86	99	2370	60.1	52.1	7.13
			16/05/2019	CISW1-0519-1	*5.03*	*3743*	0.23	*2.6*	0.4	-0.9	-	102	<1	<1	<1	<1	36	25	13	52	124	131	6.45	6.22	1.76
			9/07/2019	CISW1-0719-1	***6.45***	*800*	3.64	*37.9*	148.7	17.1	170	40	<1	49	<1	49	50	40	17	66	169	-	9.09	9.28	1.05
			29/08/2019	CISW1-0819-1	*5.75*	*3456*	0.12	*1.3*	-5.6	17.5	-	24	<1	9	<1	9	71	62	19	84	239	308	12.8	13.3	2.1
			7/11/2019		Dry - not sampled																				
		CISW5	15/03/2019	CISW5-0319-1	Field parameters not available						-	48	<1	14	<1	14	3	1	2	6	9	<5 [#1]	0.54	0.53	-
			16/05/2019	CISW5-0519-1	*5.47*	101.5	0.85	*9.7*	138.2	19.2	-	52	<1	17	<1	17	6	2	3	14	22	<1	1.15	0.96	-
			9/07/2019	CISW5-0719-1	***6***	105.6	2.46	*26*	154.3	17.9	2	56	<1	12	<1	12	4	2	3	11	18	-	0.92	0.79	-
			29/08/2019		Dry - not sampled																				
			7/11/2019	CISW5-0719-1	Dry - not sampled																				

Env Stds Comments

#1:Guideline value calculated by dividing Ammonia (as Ammonia) value by 1.216
#2:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anzecc-nitrate-correction-sep02.pdf
#3:As (V) used as conservative value
#4:In absence of Total Cr guideline Cr(VI) guideline has been adopted
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trigger value of 0.8 ug/L (0.0008 mg/L) has been derived
#6:Cr(VI) guideline has been adopted
#7:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmental limits of threatened species: the example of the wallum sedgefrog Litoria olongburensis. Ecosphere 7(6):e01384. 10.1002/ecs2.1384
#8:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog assessment
#9:Moreton Bay - Wallum/Tannin Freshwater
#10:QWQG 2009 - Sandy Coastal
#11:Meyer E, Hero JM, Shoo L and Lewis B 2006. National recovery plan for the wallum sedgefrog and other wallum-dependent frog species. Report to Department of the Environment and Water Resources, Canberra. Queensland Parks and Wildlife Service, Brisbane.

Data Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

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Appendix B
Table B2
Surface water monitoring results

					TOC	Nutrients								Organic Indicators	Metals										
					Total Organic Carbon	Nitrite + Nitrate as N	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Kjeldahl Nitrogen Total	Phosphorus (Total)	BOD	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL					1	0.01	0.01	0.01	0.01	0.01	0.1	0.1	0.01	2	0.005	0.0002	0.00005	0.0002	0.0005	0.002	0.0001	0.0005	0.00004	0.0005	0.001
ANZECC 2000 FW 99% - applicable to CISW2, CISW2b and CISW3 only							0.32	4.9 #2							0.027	0.0008 #3	0.00006	0.00001	0.001		0.001	1.2	0.00006	0.008	0.0024
ANZECC 2000 FW Slight-Mod. Disturbed							0.9	7.2 #2							0.055 #5	0.013 #3	0.0002	0.001 #6	0.0014		0.0034	1.9	0.00006	0.011	0.008
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2, CISW2b and CISW3 only																									
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater							*0.02 #9*			*0.06 #9*	*0.5 #9*		*0.05 #9*												
Myer et al 2006 Wallum-dependent frog species																									
Site_ID	**Purpose**	**Location_Code**	**Sampled_Date_Time**	**Field_ID**																					
Coochiemudlo Island	Background	CISW2b	9/07/2019	CISW2b-0719-1	35	<0.01	<0.01	<0.01	<0.01	-	*1.5*	1.5	*0.08*	3	0.686	0.0018	<0.00005	0.0033	<0.0005	4.51	0.0002	0.0103	<0.0001	0.001	0.002
			29/08/2019																						
		CISW-Drain	16/05/2019	CISW-Drain-0519-1	2	-	*0.04*	0.11	<0.01	*0.11*	0.1	<0.1	<0.01	<2	<0.005	0.0002	<0.00005	<0.0002	<0.0005	0.27	<0.0001	0.0201	<0.0001	<0.0005	0.003
			9/07/2019	CISW-Drain-0719-1	3	0.08	<0.01	0.08	<0.01	-	<0.1	<0.1	<0.01	<2	0.039	0.0002	<0.00005	0.0003	0.0005	0.134	<0.0001	0.0182	<0.0001	<0.0005	0.004
			29/08/2019																						
			7/11/2019																						
		CISW4	26/03/2019																						
			16/05/2019																						
			9/07/2019	CISW4-0719-1	84	0.02	*<0.05 #1*	0.02	<0.01	-	*4.3*	4.3	*0.29*	8	0.057	0.0036	<0.00005	0.0012	<0.0005	4.15	<0.0001	0.0325	<0.0001	0.001	0.121
			29/08/2019																						
			7/11/2019																						
	Downstream	CISW1	26/03/2019	CISW1-0319-1	44	-	*2.71*	<0.1 #1	<0.1 #1	0.04	*6.8*	6.8	*0.08*	24	64.8	0.0034	0.0271	0.011	0.0072	416	0.0195	2.05	<0.00004	0.232	37.8
			16/05/2019	CISW1-0519-1	23	-	0.01	<0.01	<0.01	<0.01	*1.4*	1.4	*0.06*	3	0.032	0.0007	<0.00005	0.0008	0.0008	0.723	<0.0001	0.0532	<0.0001	0.0006	0.32
			9/07/2019	CISW1-0719-1	16	<0.01	<0.01	<0.01	<0.01	-	*0.5*	0.5	0.01	<2	0.042	0.0004	<0.00005	0.0008	<0.0005	0.645	0.0001	0.0109	<0.0001	<0.0005	0.005
			29/08/2019	CISW1-0819-1	10	-	<0.01	<0.01	<0.01	<0.01	0.4	0.4	<0.01	<2	0.01	0.0003	<0.00005	<0.0002	<0.0005	1.33	<0.0001	0.0463	<0.00004	<0.0005	0.015
			7/11/2019																						
		CISW5	15/03/2019	CISW5-0319-1	17	-	<0.01	0.02	<0.01	0.02	*0.8*	0.8	*0.2*	5	0.221	0.0077	<0.00005	0.0015	0.0039	1.26	0.0011	0.04	<0.0001	0.0006	0.009
			16/05/2019	CISW5-0519-1	19	-	*0.02*	<0.01	<0.01	<0.01	*0.8*	0.8	*0.05*	2	0.142	0.0043	<0.00005	0.0014	<0.0005	1.93	0.0001	0.0496	<0.0001	0.0009	0.09
			9/07/2019	CISW5-0719-1	15	<0.01	<0.01	<0.01	<0.01	-	*0.8*	0.8	*0.08*	2	0.322	0.0037	<0.00005	0.0012	0.0006	2.61	0.0002	0.0471	<0.0001	0.0009	0.004
			29/08/2019																						
			7/11/2019	CISW5-0719-1																					

Env Stds Comments
#1:Guideline value calculated by dividing Ammonia (as Ammonia) value by 1.216
#2:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anzecc-nitrate-correctic
#3:As (V) used as conservative value
#4:In absence of Total Cr guideline Cr(VI) guideline has been adopted
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trigger value of 0.8 ug/
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#7:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmental limits of threatene
#8:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog assessment
#9:Moreton Bay - Wallum/Tannin Freshwater
#10:QWQG 2009 - Sandy Coastal
#11:Meyer E, Hero JM, Shoo L and Lewis B 2006. National recovery plan for the wallum sedgefrog a

Data Comments
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Appendix B
Table B2
Surface water monitoring results

Site_ID	Purpose	Location_Code	Sampled_Date_Time	Field_ID	4,4'-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	4,4 DDD	4,4 DDT	DDT+DDE+DDD - Lab Calc	Dieldrin	Endosulfan I (alpha)	Endosulfan II (beta)	Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
					OC Pesticides																							
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2
ANZECC 2000 FW 99% - applicable to CISW2, CISW2b and CISW3 only										0.03					0.006						0.01			0.07	0.01			
ANZECC 2000 FW Slight-Mod. Disturbed										0.03					0.006						0.01			0.2	0.01			
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2, CISW2b and CISW3 only																												
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																												
Myer et al 2006 Wallum-dependent frog species																												
Coochiemudlo Island	Background	CISW2b	9/07/2019	CISW2b-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			29/08/2019																									
		CISW-Drain	16/05/2019	CISW-Drain-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			9/07/2019	CISW-Drain-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			29/08/2019																									
			7/11/2019																									
		CISW4	26/03/2019																									
			16/05/2019																									
			9/07/2019	CISW4-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			29/08/2019																									
			7/11/2019																									
	Downstream	CISW1	26/03/2019	CISW1-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			16/05/2019	CISW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			9/07/2019	CISW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			29/08/2019	CISW1-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			7/11/2019																									
		CISW5	15/03/2019	CISW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			16/05/2019	CISW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			9/07/2019	CISW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2
			29/08/2019																									
			7/11/2019	CISW5-0719-1																								

Site_ID	Location_Code	Sampled_Date_Time	Field_ID	Azinphos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos
				OP Pesticides																		
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	2	2	0.5	0.5
ANZECC 2000 FW 99% - applicable to CISW2, CISW2b and CISW3 only				0.01				0.00004			0.00083		0.1				0.002			0.0007		
ANZECC 2000 FW Slight-Mod. Disturbed				0.1				0.01			0.01		0.15				0.05			0.004		
GHD 2018 Coochiemudlo Island wetland - applicable to CISW2, CISW2b and CISW3 only																						
Morton Bay - Schedule 1 EPP (water) - Wallum/Tannin Freshwater																						
Myer et al 2006 Wallum-dependent frog species																						
Coochiemudlo Island	CISW2b	9/07/2019	CISW2b-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019																				
	CISW-Drain	16/05/2019	CISW-Drain-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	CISW-Drain-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019																				
		7/11/2019																				
	CISW4	26/03/2019																				
		16/05/2019																				
		9/07/2019	CISW4-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019																				
		7/11/2019																				
	CISW1	26/03/2019	CISW1-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	CISW1-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	CISW1-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019	CISW1-0819-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		7/11/2019																				
	CISW5	15/03/2019	CISW5-0319-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		16/05/2019	CISW5-0519-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		9/07/2019	CISW5-0719-1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<0.5	<0.5
		29/08/2019																				
		7/11/2019	CISW5-0719-1																			

Env Stds Comments
#1:Guideline value calculated by dividing Ammonia (as Ammonia) value by 1.216
#2:Trigger corrected Sep 2002 - https://www.mfe.govt.nz/sites/default/files/anzecc-nitrate-correctic
#3:As (V) used as conservative value
#4:In absence of Total Cr guideline Cr(VI) guideline has been adopted
#5:Moderate reliability trigger value for pH >6.5, for pH <6.5 a low reliability trigger value of 0.8 ug/
#6:Cr(VI) guideline has been adopted
#7:Shuker, J. D., C. A. Simpkins, and J.-M. Hero. 2016. Determining environmental limits of threatene
#8:Values derived by GHD 2018 Coochiemudlo Island wetland Wallum frog assessment
#9:Moreton Bay - Wallum/Tannin Freshwater
#10:QWQG 2009 - Sandy Coastal
#11:Meyer E, Hero JM, Shoo L and Lewis B 2006. National recovery plan for the wallum sedgefrog a

Data Comments
#1 Reported Analyte LOR is higher than Requested Analyte LOR

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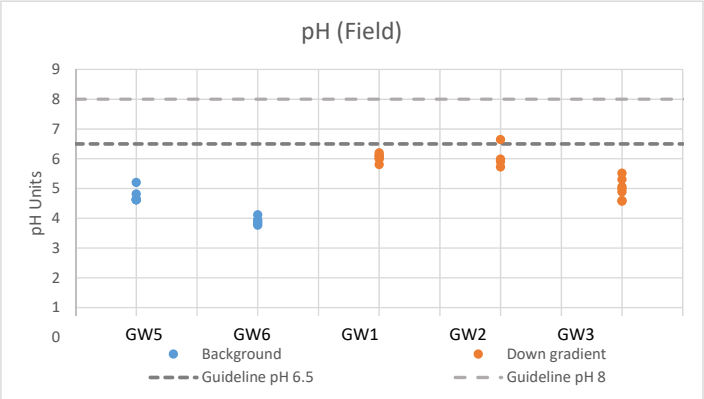
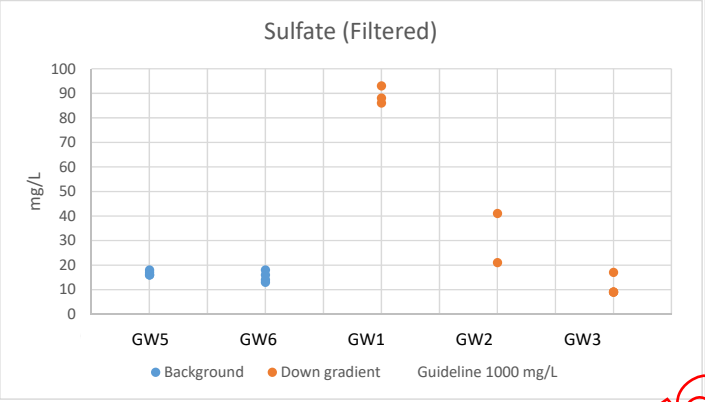
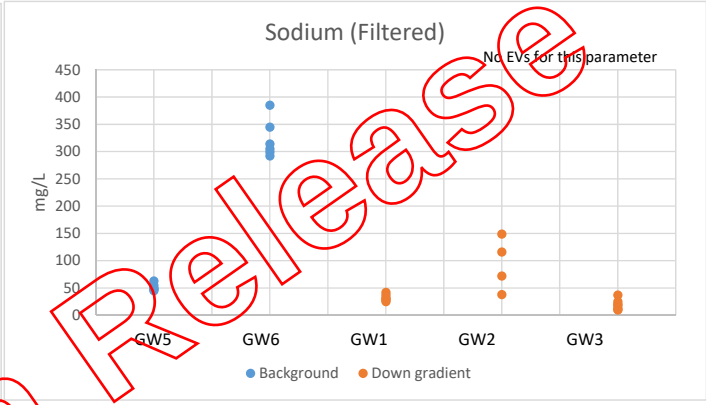
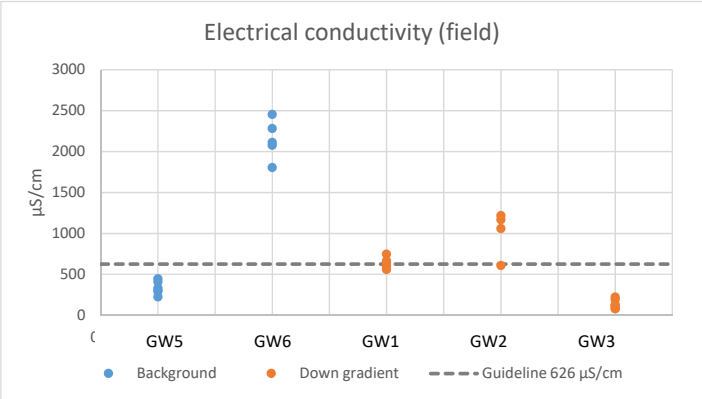
Appendix C – Background – down gradient charts

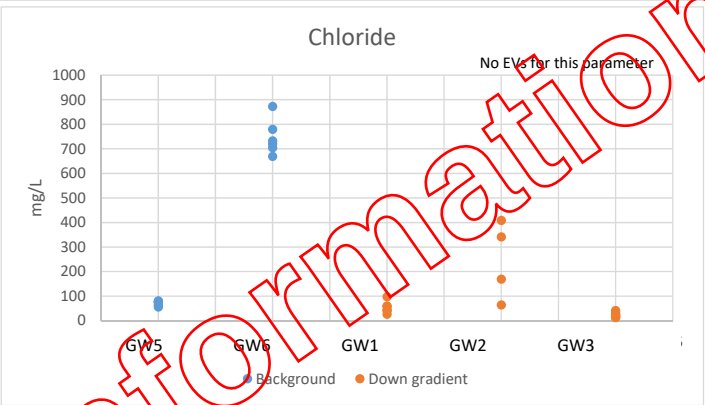
Right to Information Release

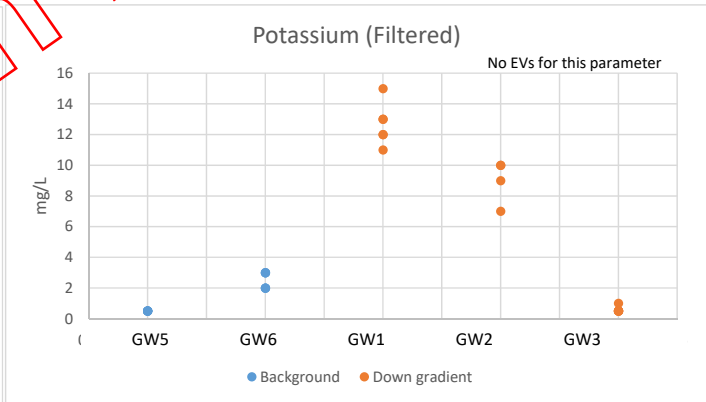


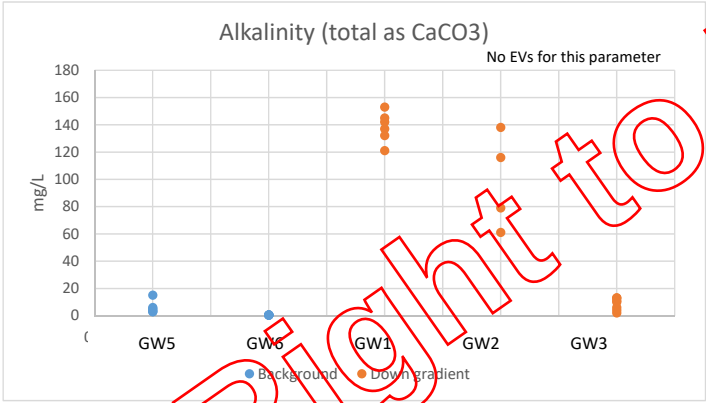


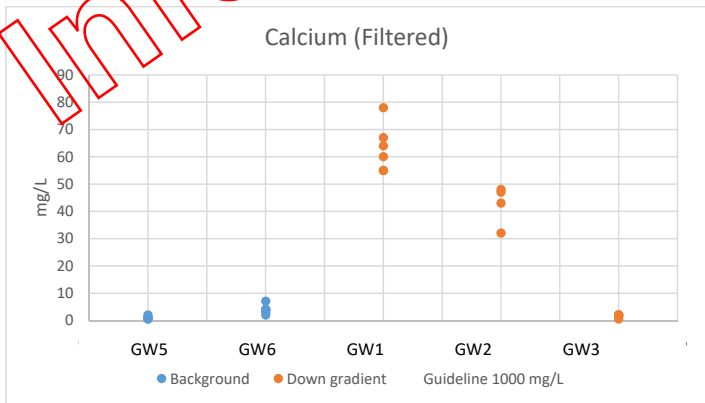


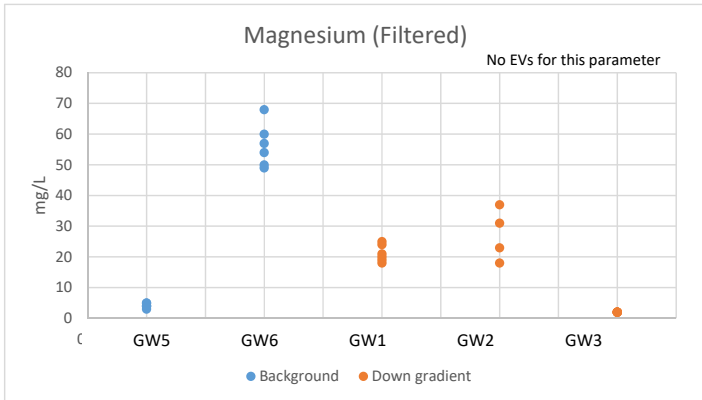












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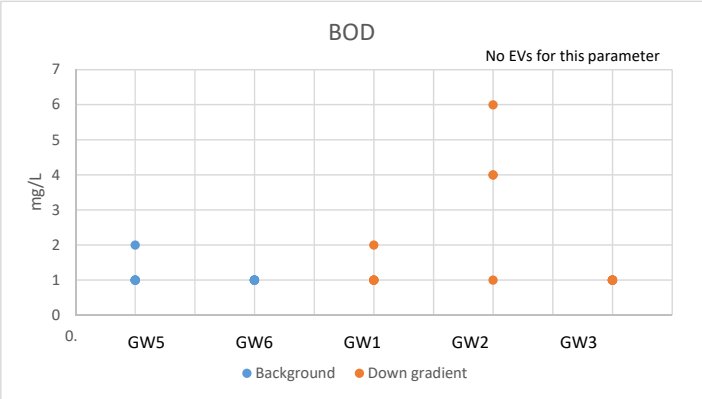

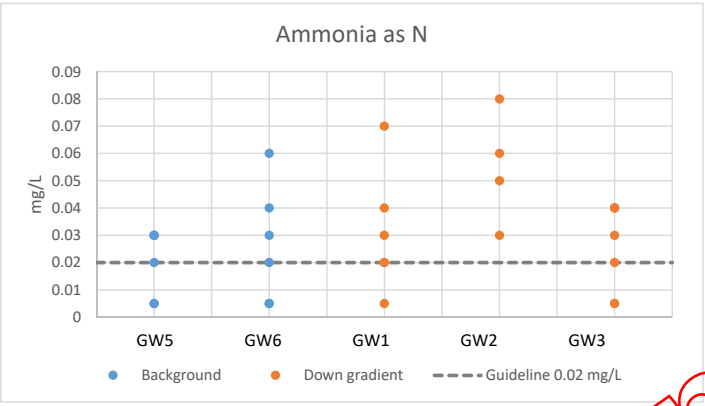

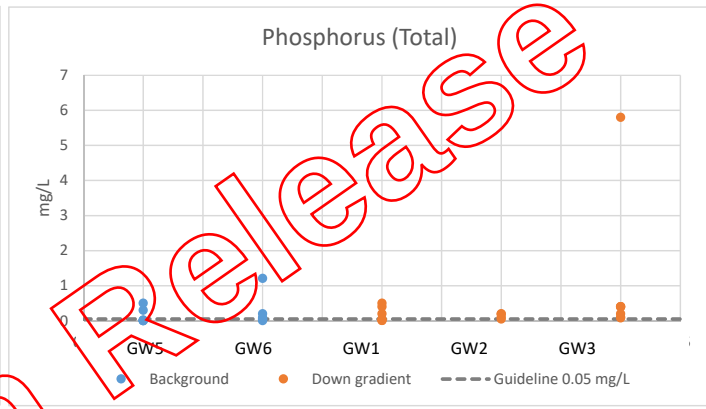

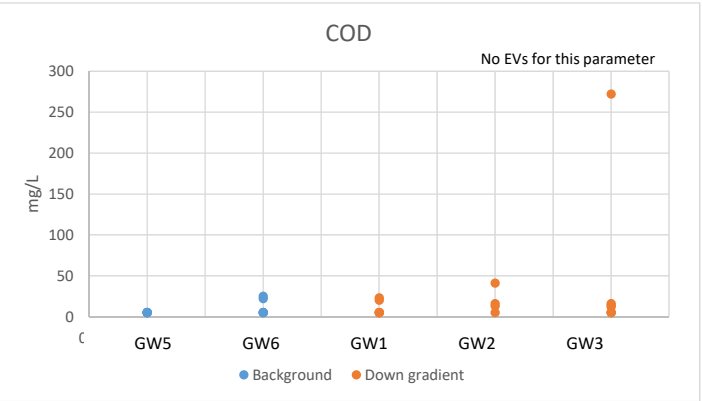

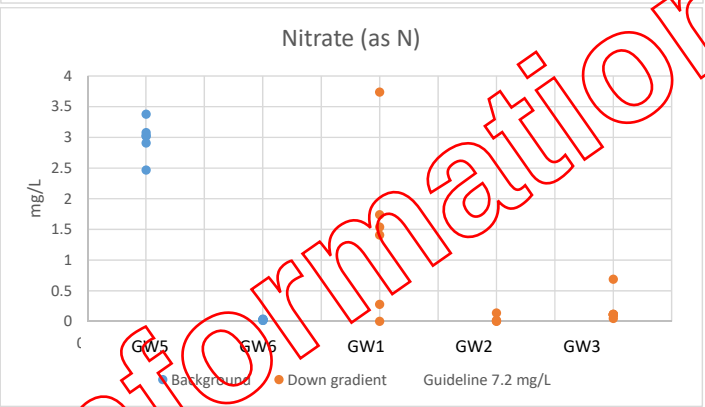

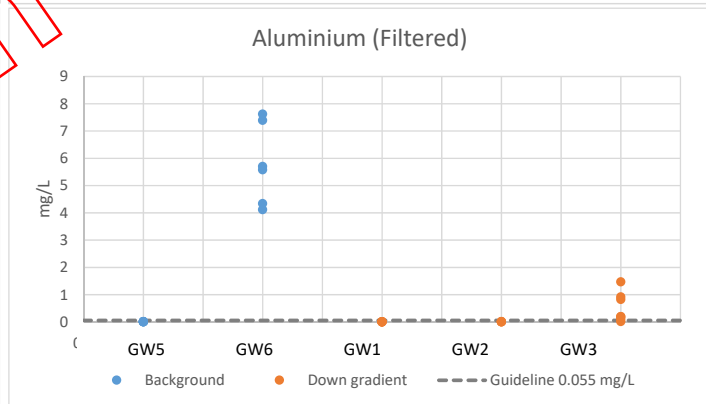

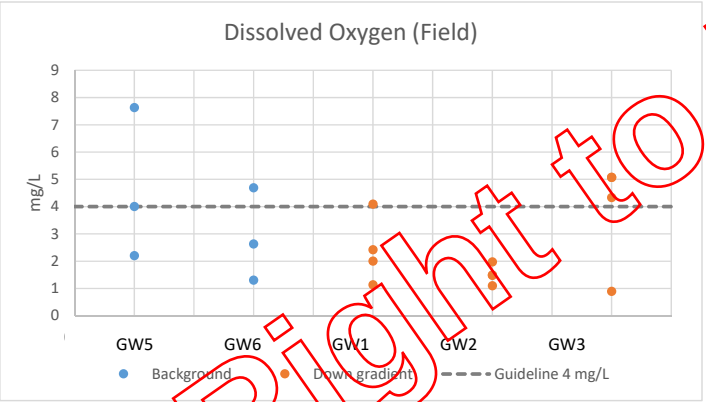

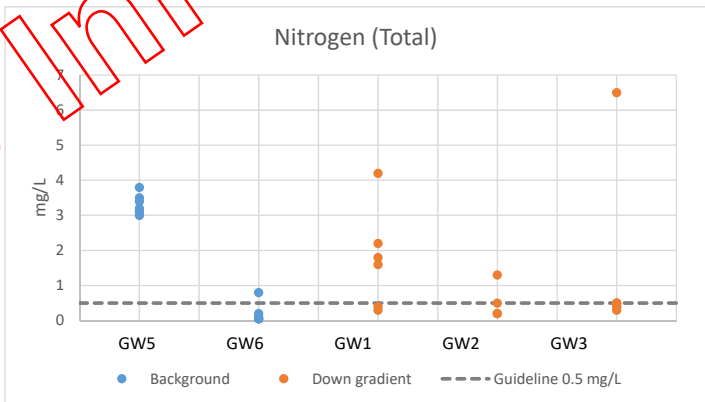

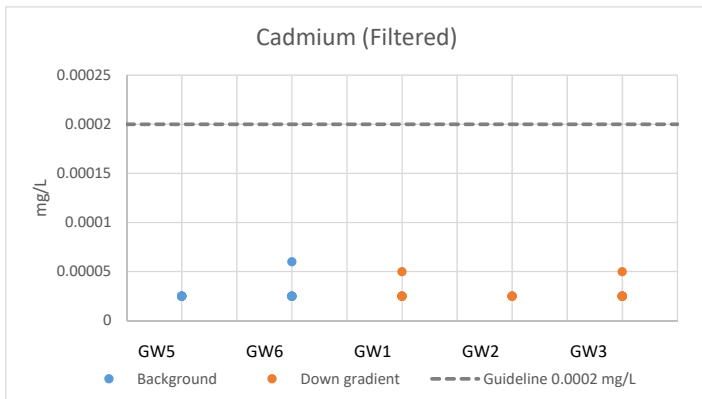

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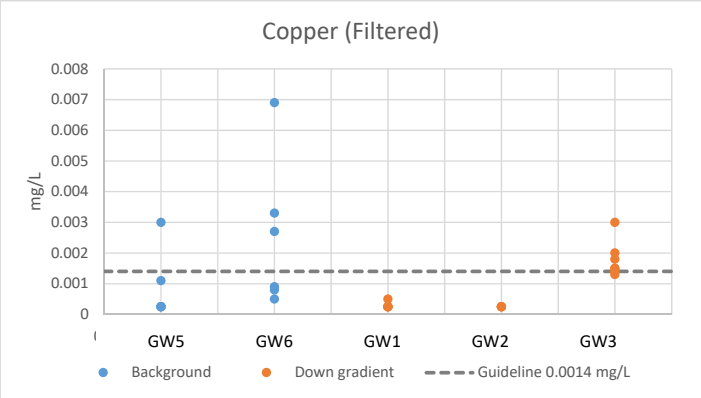

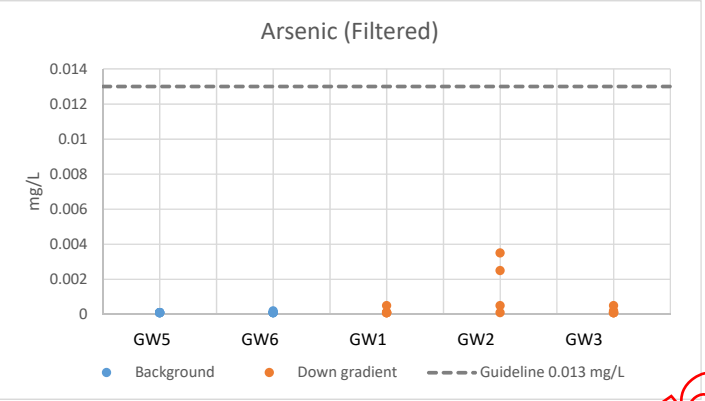

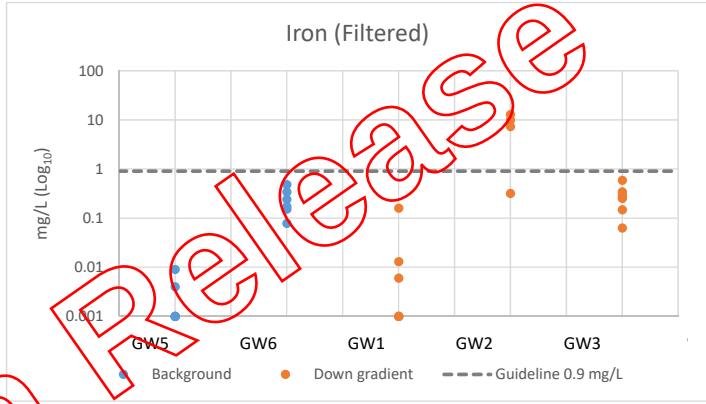

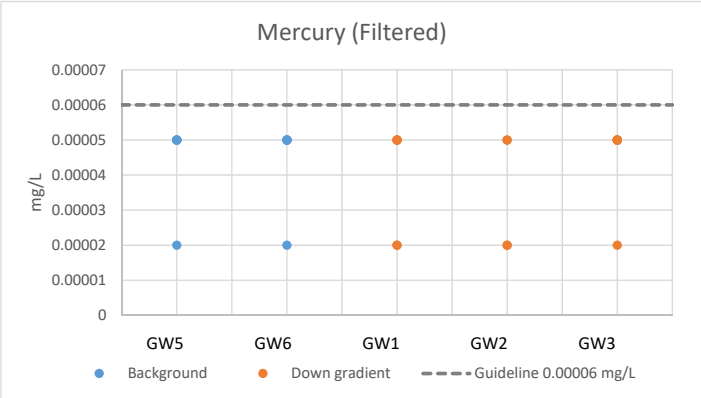

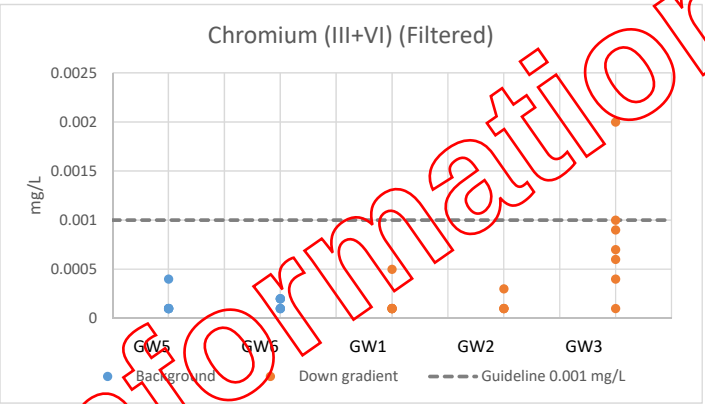

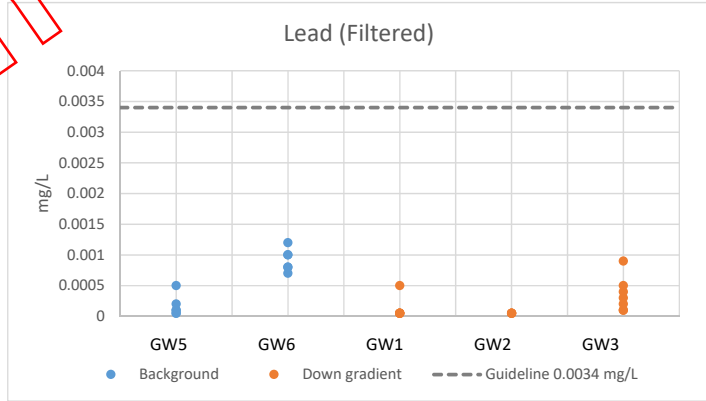

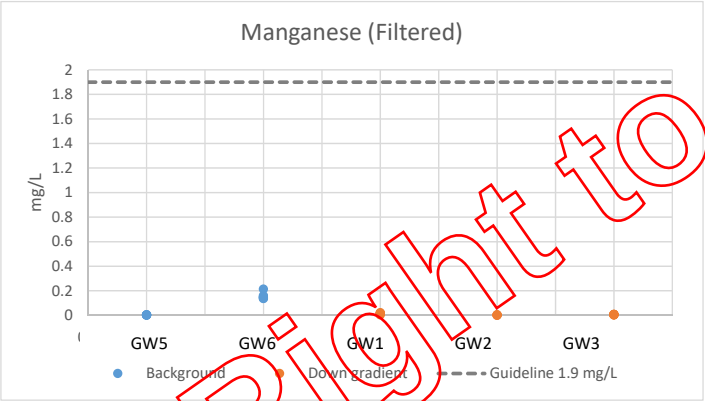

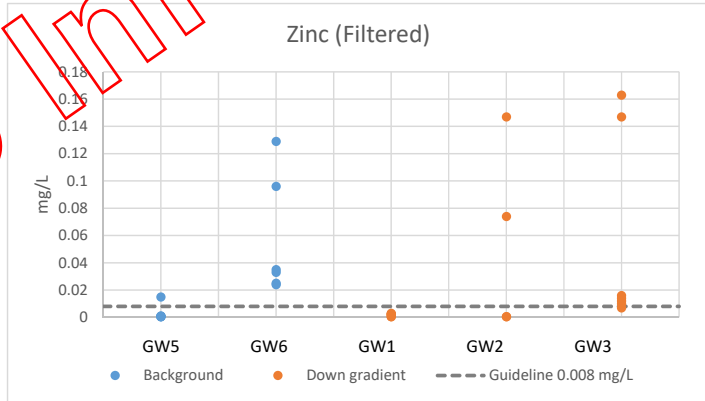

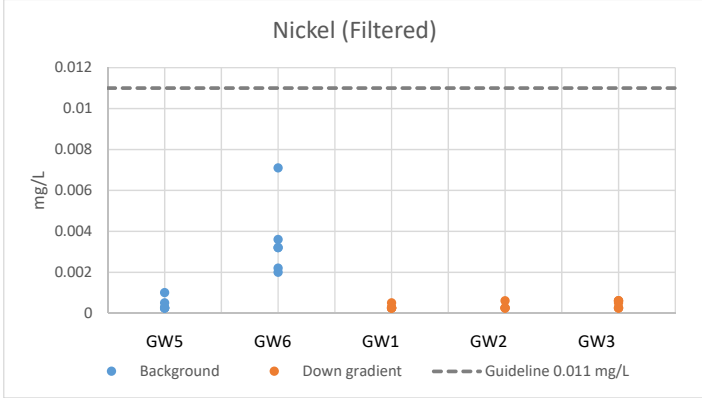

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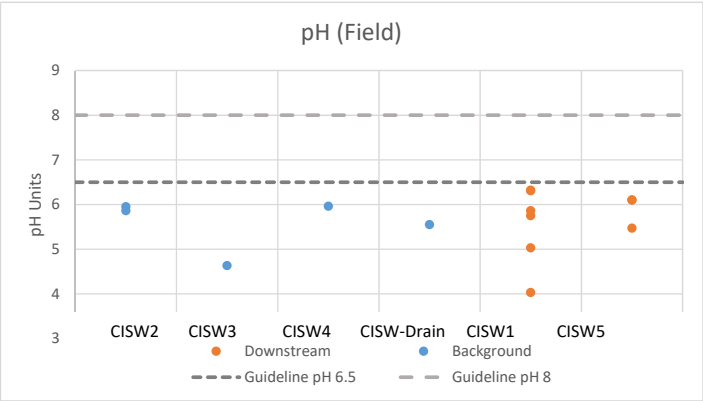
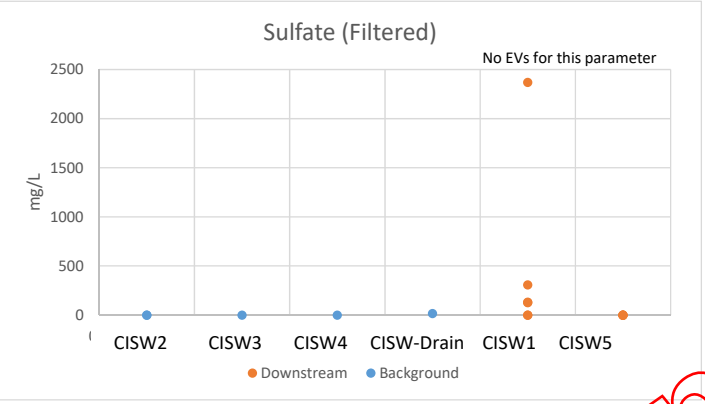
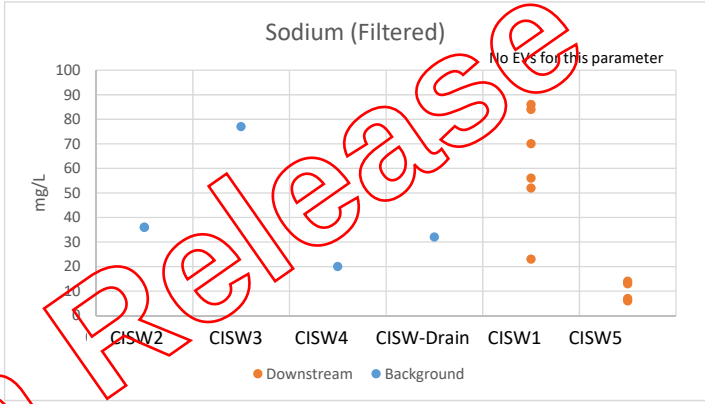
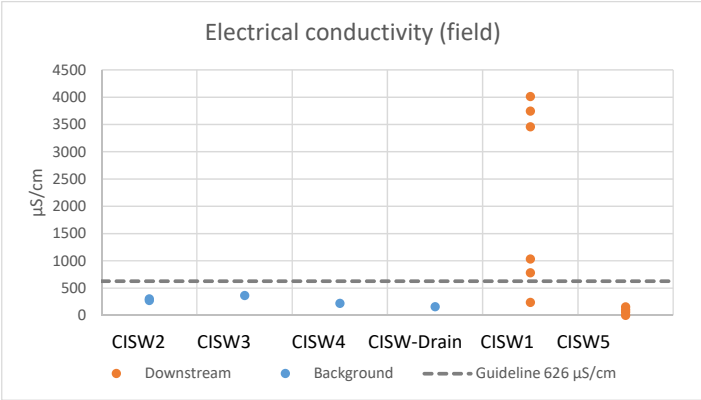
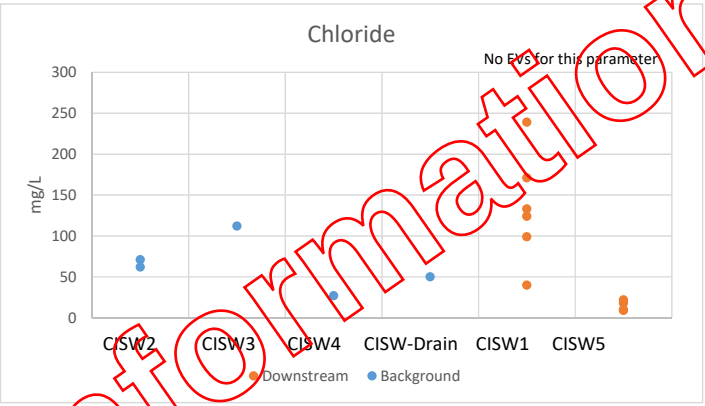
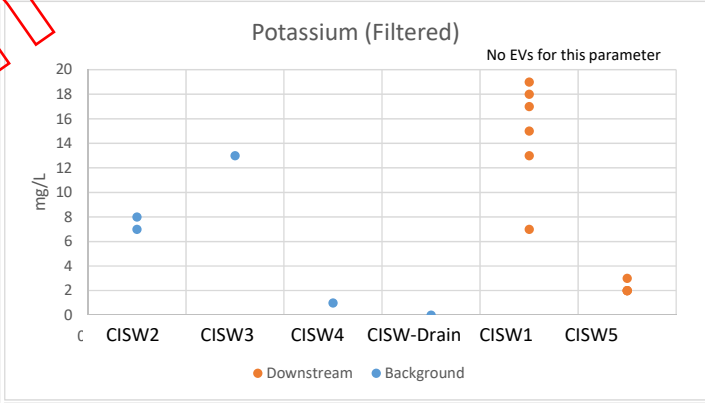


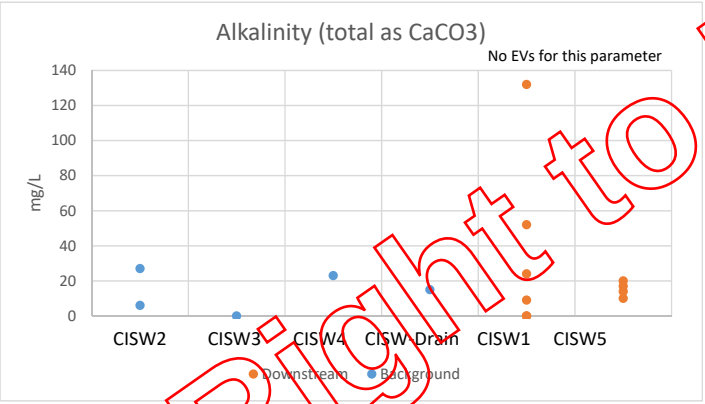


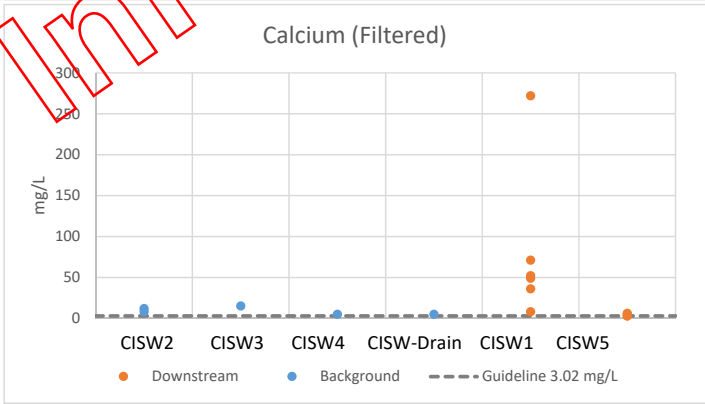


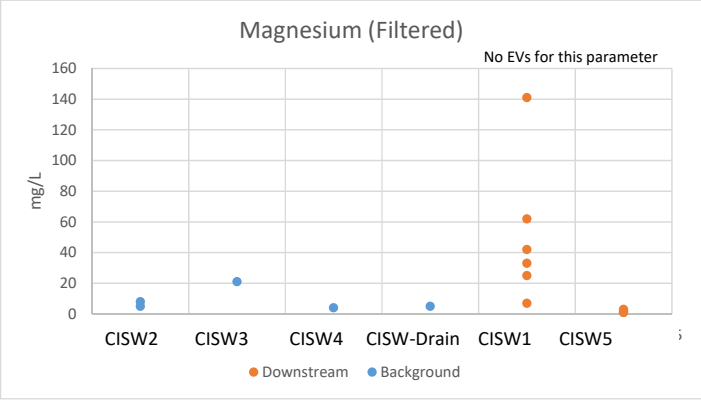




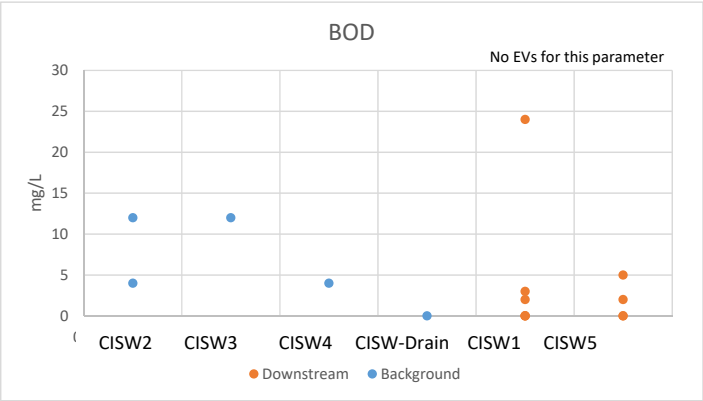


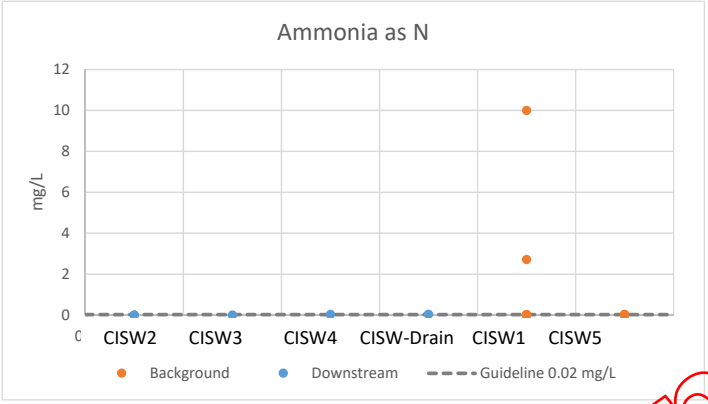


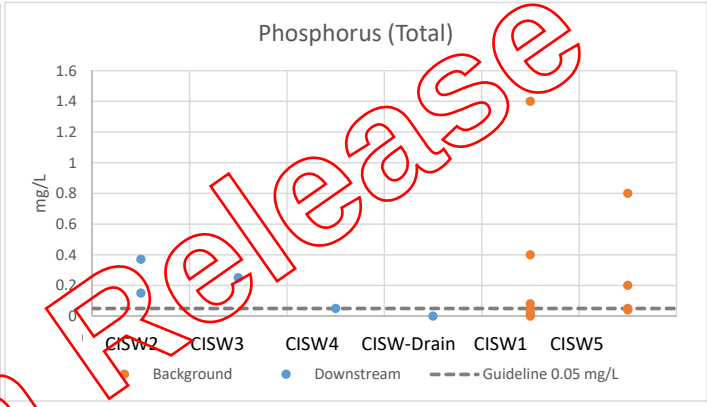


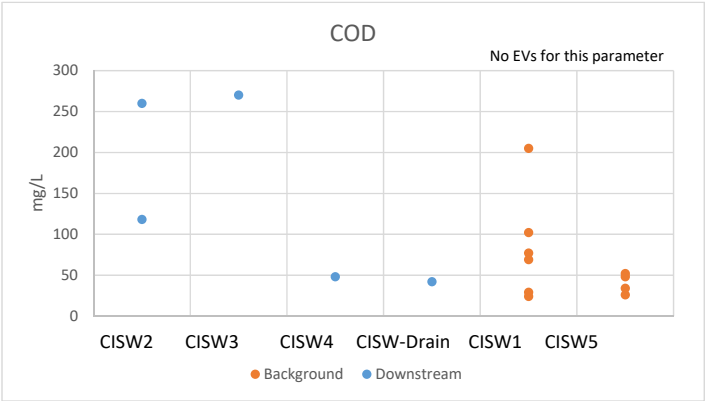


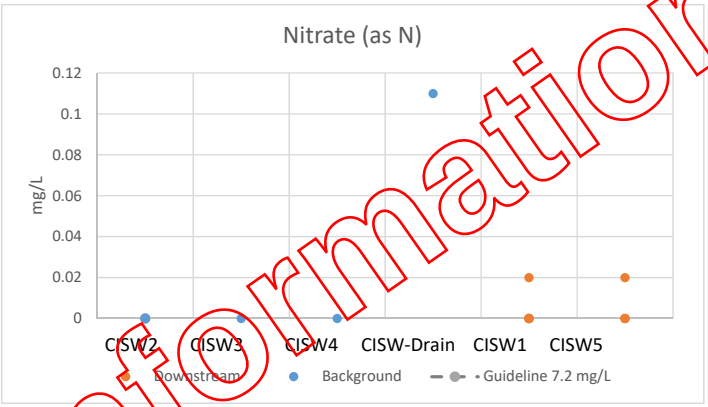
Right to Information Release

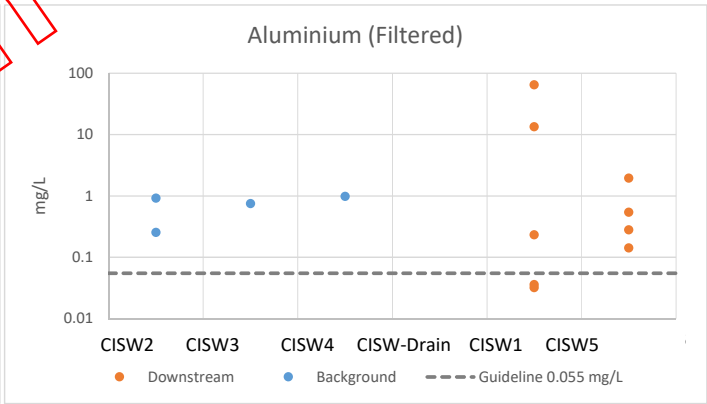


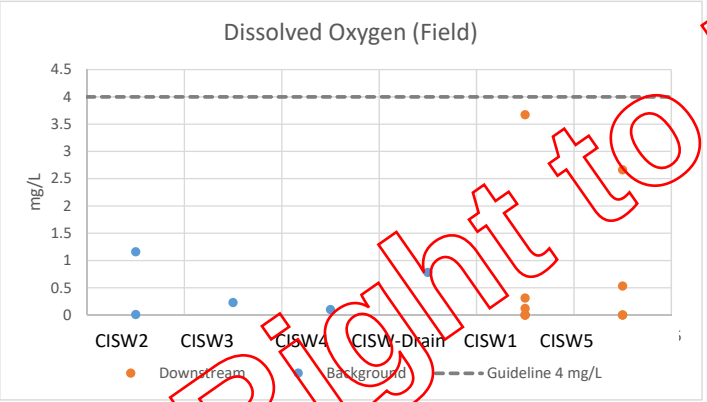


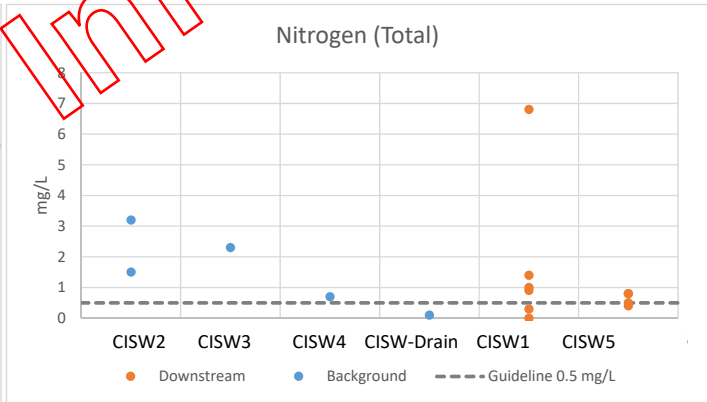


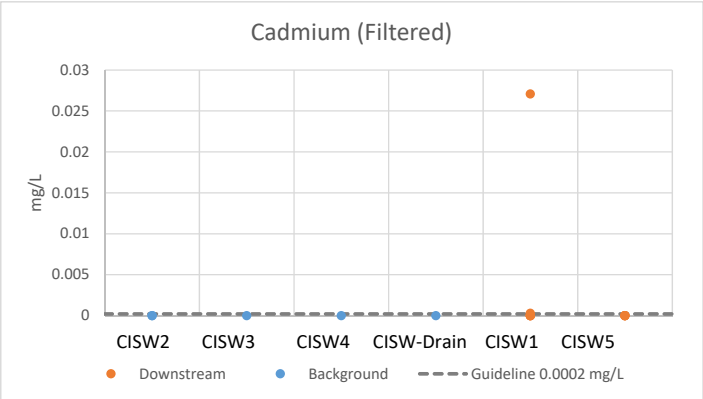












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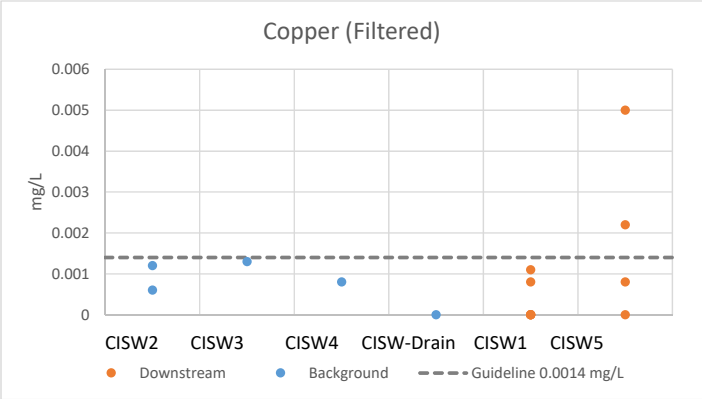

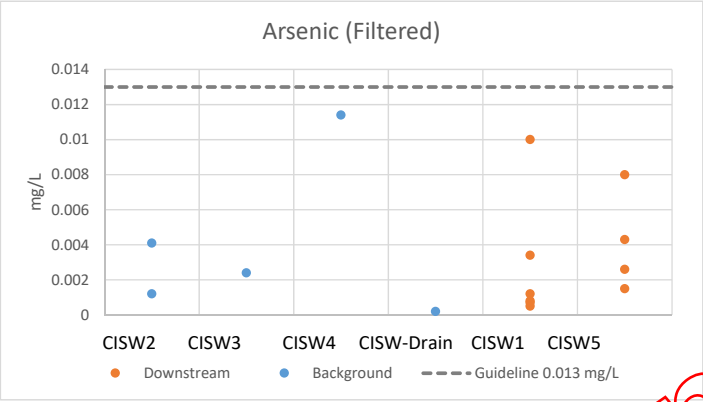

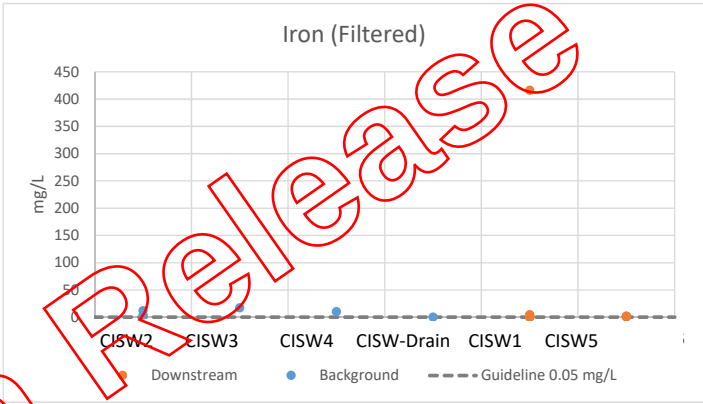

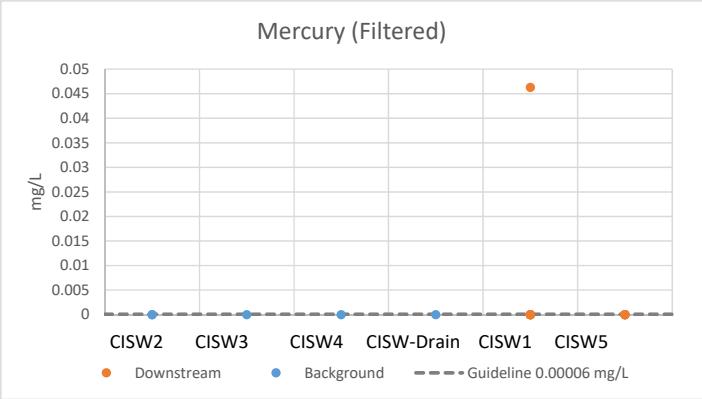

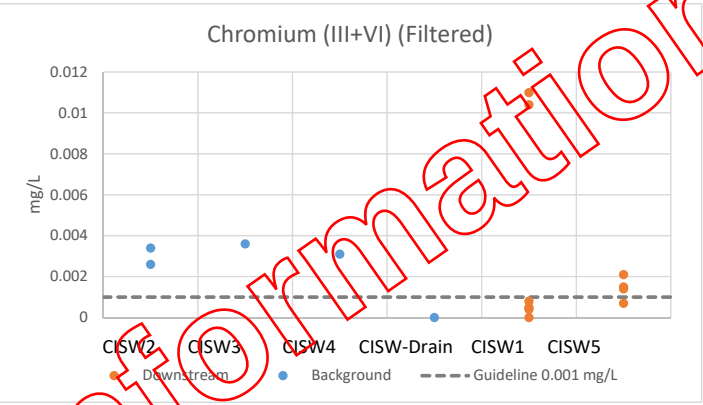

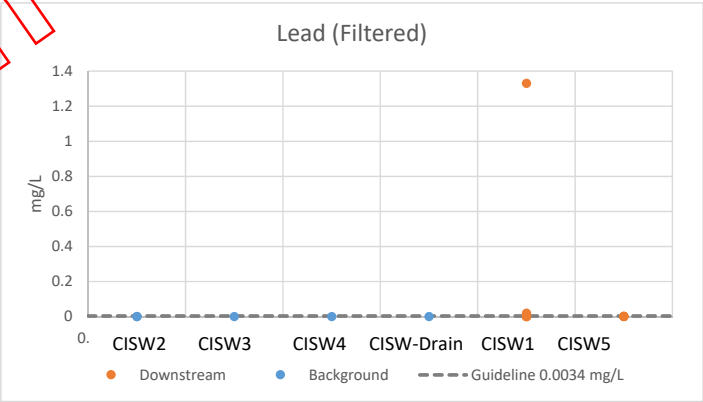

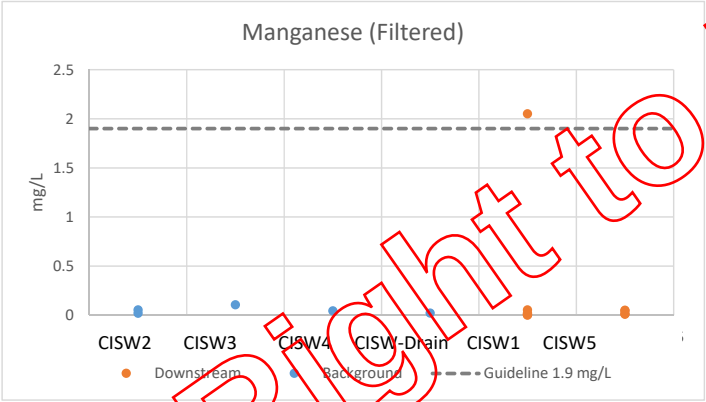

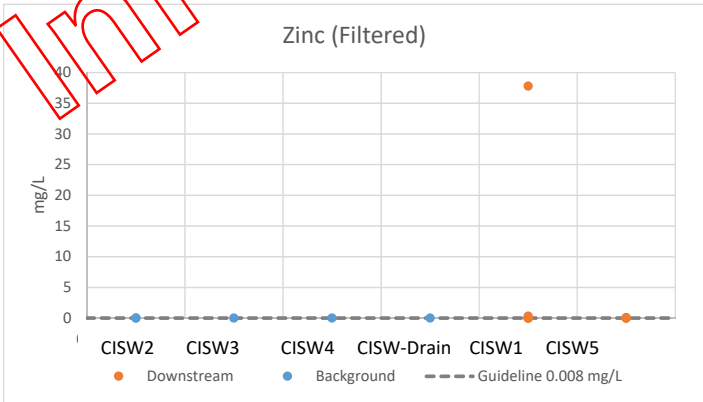

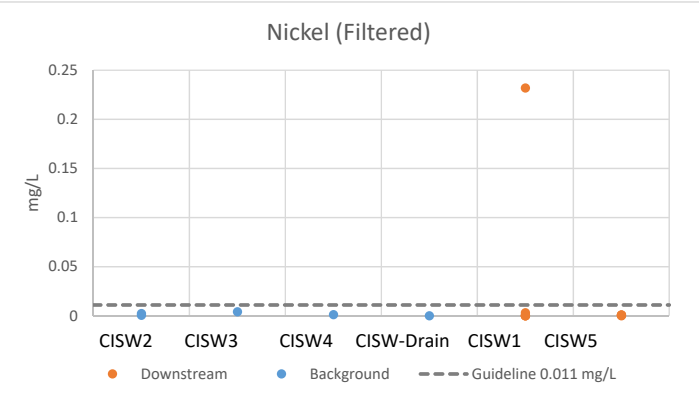

Right to Information Release

Appendix D – Official laboratory documentation

Right to Information Release

ALSCompass
SAMPLING Intelligence

ALS

15/11

Environmental Division
Brisbane
Work Order Reference
EB1929731

Telephone : +61-7-3243 7222

Custody Document

ALS USE ONLY (Circle)

Custody Seal Intact?	YES	NO	N/A
Free ice / frozen ice bricks present upon receipt?	YES	NO	N/A
Random Sample Temperature on receipt		°C	

Project: _____ **Client:** _____ **Project Manager:** _____
Phone: (

ALS Compass COC Ref: _____ **# Samples:** _____ **Sampler:** _____
Phone: (

Turnaround Requiremei Standard _____ Urgent _____

H

Special Instructions: 5691, 5664

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
	Daren		
Date / Time:	Date / Time: 1651 7/11/19	Date / Time:	Date / Time:

Right to Information Release

CHAIN OF CUSTODY

ALS COC#: 5691 ALS Laboratory: EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: GHDSER - GHD PTY LTD

PROJECT: 4127018 - Coochiemudlo Island

SITE: Coochiemudlo Island

ORDER NO: 4127018

PROJECT MANAGER: James Dowdeswell CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Jeremy Canard QUOTE NO: BN/587/13 V5 - RCC Landfill / EB2019GHDSER0017

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Table 16: Suite 6c Coochiemudlo Island Ground & Surface Waters WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	GW5-1119-1		07/11/2019 10:45 AM	Water	ALS: 8 Non ALS: 0	No	X		
002	GW3-1119-1		07/11/2019 11:34 AM	Water	ALS: 7 Non ALS: 0	No	X		
003	GW6-1119-1		07/11/2019 12:43 PM	Water	ALS: 8 Non ALS: 0	No	X		

Right to Information Release

Contrary to Public Interest

CHAIN OF CUSTODY

(ALS) COC#: 5691 *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: GHDSER - GHD PTY LTD

PROJECT: 4127018 - Coochiemudlo Island

SITE: Coochiemudlo Island

ORDER NO: 4127018

PROJECT MANAGER: James Dowdeswell CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Jeremy Canard QUOTE NO: BN/587/13 V5 - RCC Landfill / EB2019GHDSER0017

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	GW5-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062032	Orange	No	
001	GW5-1119-1	Clear HDPE (U-T ORC) - Filtered; Lab-acidified	125 mL	00380199057817	Red/Green	Yes	
001	GW5-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062396	Orange	No	
001	GW5-1119-1	Amber TOC Vial - Sulfuric Acid	40 mL	00181018066988	Purple	No	
001	GW5-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062329	Orange	No	
001	GW5-1119-1	Clear Plastic Bottle - Natural	250 mL	00071018022486	Green	No	
001	GW5-1119-1	BOD Bottle Unpreserved	250 mL	00071018022484	Green	No	
001	GW5-1119-1	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100519030623	Purple	No	
002	GW3-1119-1	Amber TOC Vial - Sulfuric Acid	40 mL	00181018067118	Purple	No	
002	GW3-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062470	Orange	No	
002	GW3-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062471	Orange	No	
002	GW3-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062372	Orange	No	
002	GW3-1119-1	Clear HDPE (U-T ORC) - Filtered; Lab-acidified	125 mL	00380199057599	Red/Green	Yes	
002	GW3-1119-1	BOD Bottle Unpreserved	250 mL	00071018022499	Green	No	
002	GW3-1119-1	Clear Plastic Bottle - Natural	250 mL	00071018022446	Green	No	
003	GW6-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062405	Orange	No	
003	GW6-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062108	Orange	No	
003	GW6-1119-1	BOD Bottle Unpreserved	250 mL	00071018022459	Green	No	
003	GW6-1119-1	Clear Plastic Bottle - Natural	250 mL	00071018022477	Green	No	
003	GW6-1119-1	Amber Glass Bottle - Unpreserved	100 mL	00400719062459	Orange	No	
003	GW6-1119-1	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100519030548	Purple	No	
003	GW6-1119-1	Clear HDPE (U-T ORC) - Filtered; Lab-acidified	125 mL	00380199057676	Red/Green	Yes	
003	GW6-1119-1	Amber TOC Vial - Sulfuric Acid	40 mL	00181018067196	Purple	No	

Total Bottle Count: ALS: 23, Non ALS: 0

Thursday, November 7, 2019 6:47:17 AM

Right to Information Release

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1929731**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	:	E-mail	:
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8639
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 4127018 - Coochiemudlo Island	Page	: 1 of 3
Order number	: 4127018	Quote number	: EB2019GHDSER0017 (BN/587/13 V6 - RCC Landfill)
C-O-C number	: 5691	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Coochiemudlo Island		
Sampler	: JEREMY CANARD, RACHEL HUGHES		

Dates

Date Samples Received	: 07-Nov-2019 04:51	Issue Date	: 07-Nov-2019
Client Requested Due Date	: 15-Nov-2019	Scheduled Reporting Date	: **15-Nov-2019**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not intact.
No. of coolers/boxes	: 1	Temperature	: 3.3 - Ice present
Receipt Detail	: MEDIUM ESKY	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Right to Information Release

Sample Container(s)/Preservation Non-Compliances

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

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

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

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG094-F Dissolved Metals by ORC - Ultra Trace in Fresh	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP030 BOD	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)	WATER - NT-03 Total Nitrogen + NO2 + NO3 + NH3 + Total P	WATER - W-12 OC/OP Pesticides
EB1929731-001	07-Nov-2019 10:45	GW5-1119-1	✓	✓	✓	✓	✓	✓	✓
EB1929731-002	07-Nov-2019 11:34	GW3-1119-1	✓	✓	✓	✓	✓	✓	✓
EB1929731-003	07-Nov-2019 12:43	GW6-1119-1	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EG035F Dissolved Mercury	WATER - EP026SP Chemical Oxygen Demand (COD)
EB1929731-001	07-Nov-2019 10:45	GW5-1119-1	✓	✓
EB1929731-002	07-Nov-2019 11:34	GW3-1119-1	✓	✓
EB1929731-003	07-Nov-2019 12:43	GW6-1119-1	✓	✓

Proactive Holding Time Report

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

Right to Information Release

Requested Deliverables

Accounts Payable Australia		
- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com
GHD LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	GHDLabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	GHDLabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	GHDLabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	GHDLabreports@ghd.com
- Chain of Custody (CoC) (COC)	Email	GHDLabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	GHDLabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	GHDLabreports@ghd.com
JAMES DOWDESWELL		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- A4 - AU Tax Invoice (INV)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	
JEREMY CANARD		
- *AU Certificate of Analysis - NATA (COA)	Email	
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	
- Chain of Custody (CoC) (COC)	Email	
- EDI Format - ENMRG (ENMRG)	Email	
- EDI Format - ESDAT (ESDAT)	Email	
- EDI Format - XTab (XTAB)	Email	

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ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1929731**	Page	: 1 of 9
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8639
Project	: 4127018 - Coochiemudlo Island	Date Samples Received	: 07-Nov-2019 04:51
Order number	: 4127018	Date Analysis Commenced	: 08-Nov-2019
C-O-C number	: 5691	Issue Date	: 15-Nov-2019 12:42
Sampler	: JEREMY CANARD, RACHEL HUGHES		
Site	: Coochiemudlo Island		
Quote number	: BN/587/13 V6 - RCC Landfill		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Assistant Laboratory Manager	Brisbane Organics, Stafford, QLD
Santusha Pandra	Senior Chemist	Brisbane Inorganics, Stafford, QLD

Right to Information Release

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Right to Information Release

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Client sample ID	GW5-1119-1	GW3-1119-1	----	----	----
			Client sampling date / time	07-Nov-2019 10:45	07-Nov-2019 11:34	----	----	----
Compound	CAS Number	LOR	Unit	EB1929731-001	EB1929731-002	--------	--------	--------
				Result	Result	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	4	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	4	4	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	18	17	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	63	41	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	2	----	----	----
Magnesium	7439-95-4	1	mg/L	4	2	----	----	----
Sodium	7440-23-5	1	mg/L	48	37	----	----	----
Potassium	7440-09-7	1	mg/L	<1	<1	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	14	195	----	----	----
Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	----	----	----
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	----	----	----
Chromium	7440-47-3	0.2	µg/L	<0.2	0.6	----	----	----
Copper	7440-50-8	0.5	µg/L	<0.5	1.8	----	----	----
Iron	7439-89-6	2	µg/L	<2	252	----	----	----
Lead	7439-92-1	0.1	µg/L	0.1	0.2	----	----	----
Manganese	7439-96-5	0.5	µg/L	1.9	6.6	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	0.6	----	----	----
Zinc	7440-66-6	1	µg/L	1	147	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	2.47	0.11	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	2.47	0.11	----	----	----

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Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Client sample ID	GW5-1119-1	GW3-1119-1	----	----	----
			Client sampling date / time	07-Nov-2019 10:45	07-Nov-2019 11:34	----	----	----
Compound	CAS Number	LOR	Unit	EB1929731-001	EB1929731-002	--------	--------	--------
				Result	Result	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.5**	**0.3**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**3.0**	**0.4**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.08**	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**1**	**3**	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	<10	<10	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	----	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	----	----	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	<0.5	----	----	----

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Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Client sample ID	GW5-1119-1	GW3-1119-1	----	----	----
			Client sampling date / time	07-Nov-2019 10:45	07-Nov-2019 11:34	----	----	----
Compound	CAS Number	LOR	Unit	EB1929731-001	EB1929731-002	--------	--------	--------
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**64.9**	**61.2**	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**59.6**	**57.4**	----	----	----

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW6-1119-1	----	----	----	----
			Client sampling date / time	07-Nov-2019 12:43	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1929731-003	--------	--------	--------	--------
				Result	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**14**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**720**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**2**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**49**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**299**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**3**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Aluminium	7429-90-5	5	µg/L	**4340**	----	----	----	----
Arsenic	7440-38-2	0.2	µg/L	<0.2	----	----	----	----
Cadmium	7440-43-9	0.05	µg/L	<0.05	----	----	----	----
Chromium	7440-47-3	0.2	µg/L	**0.2**	----	----	----	----
Copper	7440-50-8	0.5	µg/L	**0.5**	----	----	----	----
Iron	7439-89-6	2	µg/L	**241**	----	----	----	----
Lead	7439-92-1	0.1	µg/L	**1.0**	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	**149**	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	**2.2**	----	----	----	----
Zinc	7440-66-6	1	µg/L	**25**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.04**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.04**	----	----	----	----

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW6-1119-1	----	----	----	----
			Client sampling date / time	07-Nov-2019 12:43	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1929731-003	--------	--------	--------	--------
				Result	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.01	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	1	----	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	<10	----	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	----	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	----	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	----	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	----	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	----	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	----	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	----	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	----	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	----	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	----	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	----	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	----	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	----	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	----	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	----	----	----	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	----	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	----	----	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	----	----	----	----
^ Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----

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Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GW6-1119-1	----	----	----	----
			Client sampling date / time	07-Nov-2019 12:43	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1929731-003	--------	--------	--------	--------
				Result	----	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	----	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	----	----	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	----	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	----	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	----	----	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	----	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	----	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	----	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	----	----	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	----	----	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	----	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	----	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	----	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	----	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	----	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	----	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**66.9**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**61.4**	----	----	----	----

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Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	45	139
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	45	139

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	45	139
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	45	139

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ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1929731**	Page	: 1 of 10
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Contact	: Andrew Epps
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 3316 3458	Telephone	: +61 7 3552 8639
Project	: 4127018 - Coochiemudlo Island	Date Samples Received	: 07-Nov-2019
Order number	: 4127018	Date Analysis Commenced	: 08-Nov-2019
C-O-C number	: 5691	Issue Date	: 15-Nov-2019
Sampler	: JEREMY CANARD, RACHEL HUGHES		
Site	: Coochiemudlo Island		
Quote number	: BN/587/13 V6 - RCC Landfill		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Matt Frost	Assistant Laboratory Manager	Brisbane Organics, Stafford, QLD
Santusha Pandra	Senior Chemist	Brisbane Inorganics, Stafford, QLD

Right to Information Release

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 2691766)									
EB1929586-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2	7	121	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	2	7	121	No Limit
EB1929705-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	60	59	1.75	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	60	59	1.75	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2690860)									
EB1929750-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2270	2240	1.13	0% - 20%
EB1929753-010	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	17	17	0.00	0% - 50%
ED045G: Chloride by Discrete Analyser (QC Lot: 2690862)									
EB1929750-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	18200	18300	0.571	0% - 20%
EB1929753-010	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	105	104	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 2690198)									
EB1929648-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	72	70	1.99	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	66	65	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	167	164	1.53	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EB1929753-008	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	28	28	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	9	9	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	59	59	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.00	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 2690196)									

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EG035F: Dissolved Mercury by FIMS (QC Lot: 2690196) - continued									
EB1928983-018	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.1 µg/L	<0.0001	0.00	No Limit
EB1928983-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.1 µg/L	<0.0001	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 2690199)									
EB1929731-002	GW3-1119-1	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2690017)									
EB1929731-001	GW5-1119-1	EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EG094A-F: Lead	7439-92-1	0.1	µg/L	0.1	<0.1	0.00	No Limit
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	<0.2	0.00	No Limit
		EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Manganese	7439-96-5	0.5	µg/L	1.9	1.8	6.49	No Limit
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	1	1	0.00	No Limit
		EG094A-F: Aluminium	7429-90-5	5	µg/L	14	15	0.00	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 2690018)									
EB1929731-001	GW5-1119-1	EG094B-F: Iron	7439-89-6	2	µg/L	<2	<2	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 2695274)									
EB1929430-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.10	0.10	0.00	0% - 50%
EB1929586-008	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 2690861)									
EB1929750-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EB1929753-010	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 2695275)									
EB1929430-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.08	0.08	0.00	No Limit
EB1929586-008	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 2697421)									
EB1926751-003	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	4.6	4.3	6.68	No Limit
EB1929836-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.5	0.5	0.00	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 2697420)									
EB1926751-003	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	33.9	34.7	2.18	0% - 20%
EB1929836-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 2690693)									
EB1929586-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EB1929648-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	3	1	102	No Limit
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QC Lot: 2690485)									
EB1929586-007	Anonymous	EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	<10	0.00	No Limit
EB1929731-002	GW3-1119-1	EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	<10	0.00	No Limit
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2691091)									

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP030: Biochemical Oxygen Demand (BOD) (QC Lot: 2691091) - continued									
EB1929543-001	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	52	51	2.34	0% - 20%
EB1929743-002	Anonymous	EP030: Biochemical Oxygen Demand	----	2	mg/L	5	5	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 2696840)									
EB1929731-001	GW5-1119-1	EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	<2.0	0.00	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2696840)									
EB1929731-001	GW5-1119-1	EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	0.00	No Limit

Right to Information Release

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 2696840) - continued									
EB1929731-001	GW5-1119-1	EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	<2.0	0.00	No Limit
		EP068: Parathion	56-38-2	2	µg/L	<2.0	<2.0	0.00	No Limit

Right to Information Release

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 2691766)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	96.2	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2690860)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	103	85.0	118
				<1	100 mg/L	107	85.0	118
ED045G: Chloride by Discrete Analyser (QCLot: 2690862)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	90.0	115
				<1	1000 mg/L	106	90.0	115
ED093F: Dissolved Major Cations (QCLot: 2690198)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	92.1	70.0	130
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	70.0	130
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	101	70.0	130
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	101	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2690196)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	97.1	84.0	118
EG035F: Dissolved Mercury by FIMS (QCLot: 2690199)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.9	84.0	118
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2690017)								
EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	50 µg/L	91.3	80.0	120
EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	10 µg/L	100.0	80.0	120
EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	10 µg/L	92.2	80.0	120
EG094A-F: Chromium	7440-47-3	0.2	µg/L	<0.2	10 µg/L	98.8	80.0	120
EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	10 µg/L	103	80.0	120
EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	10 µg/L	98.8	80.0	120
EG094A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	99.0	80.0	120
EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	101	80.0	120
EG094A-F: Zinc	7440-66-6	1	µg/L	<1	10 µg/L	107	80.0	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2690018)								
EG094B-F: Iron	7439-89-6	2	µg/L	<2	50 µg/L	98.3	80.0	120
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2695274)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	96.9	83.5	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2690861)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	90.0	110
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2695275)								

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2695275) - continued								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	98.1	85.7	111
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2697421)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	1 mg/L	87.7	70.1	108
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2697420)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.442 mg/L	89.7	79.2	105
EP005: Total Organic Carbon (TOC) (QCLot: 2690693)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	87.3	79.0	113
				<1	100 mg/L	98.0	79.0	113
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2690485)								
EP026SP: Chemical Oxygen Demand	----	10	mg/L	<10	50 mg/L	95.5	86.0	112
				<10	500 mg/L	98.4	86.0	112
EP030: Biochemical Oxygen Demand (BOD) (QCLot: 2691091)								
EP030: Biochemical Oxygen Demand	----	2	mg/L	<2	198 mg/L	78.0	77.0	115
EP068A: Organochlorine Pesticides (OC) (QCLot: 2696840)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	69.5	60.3	131
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	64.1	45.1	126
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	72.6	63.1	128
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	69.5	60.2	130
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	71.0	58.6	120
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	69.7	48.1	132
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	66.9	53.7	120
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	66.6	57.0	122
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	69.4	56.3	121
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	68.5	56.5	123
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	69.9	55.8	122
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	69.1	55.3	124
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	71.9	52.8	122
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	74.3	48.9	131
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	73.8	50.0	121
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	71.2	46.5	123
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	69.0	42.0	122
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	73.2	49.8	130
EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	5 µg/L	81.3	39.4	134
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	71.7	51.4	129
EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	5 µg/L	79.1	45.7	139
EP068: Total Chlordane (sum)	----	0.5	µg/L	<0.5	----	----	----	----
EP068: Sum of DDD + DDE + DDT	72-54-8/72-5	0.5	µg/L	<0.5	----	----	----	----
	5-9/50-2							

Right to Information Release

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068A: Organochlorine Pesticides (OC) (QCLot: 2696840) - continued								
EP068: Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	----	----	----	----
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2696840)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	73.8	53.2	133
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	76.2	44.2	158
EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	5 µg/L	10.9	5.00	32.6
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	69.0	27.6	153
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	72.0	55.6	141
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	66.6	58.4	130
EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	5 µg/L	65.8	45.2	139
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	73.2	47.5	135
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	68.1	53.4	133
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	67.5	56.3	125
EP068: Parathion	56-38-2	2	µg/L	<2.0	5 µg/L	55.6	37.1	144
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	75.2	49.8	131
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	59.4	37.0	131
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	66.4	47.3	127
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	54.0	16.0	150
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	67.9	45.5	128
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	60.9	39.1	129
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	70.4	38.4	134
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	62.2	27.5	146

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2690860)							
EB1929753-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	104	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 2690862)							
EB1929753-001	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	108	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2690196)							
EB1928983-002	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	94.2	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 2690199)							

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%) MS	Recovery Limits (%) Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 2690199) - continued							
EB1929731-003	GW6-1119-1	EG035F: Mercury	7439-97-6	0.01 mg/L	92.1	70.0	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 2690017)							
EB1929512-002	Anonymous	EG094A-F: Arsenic	7440-38-2	500 µg/L	100.0	70.0	130
		EG094A-F: Cadmium	7440-43-9	125 µg/L	95.7	70.0	130
		EG094A-F: Chromium	7440-47-3	500 µg/L	94.2	70.0	130
		EG094A-F: Copper	7440-50-8	500 µg/L	97.2	70.0	130
		EG094A-F: Lead	7439-92-1	500 µg/L	102	70.0	130
		EG094A-F: Manganese	7439-96-5	500 µg/L	93.8	70.0	130
		EG094A-F: Nickel	7440-02-0	500 µg/L	96.5	70.0	130
		EG094A-F: Zinc	7440-66-6	500 µg/L	100	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 2695274)							
EB1929434-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	# Not Determined	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 2690861)							
EB1929753-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.4 mg/L	103	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 2695275)							
EB1929434-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	93.1	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 2697421)							
EB1927416-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	25 mg/L	84.3	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 2697420)							
EB1927416-001	Anonymous	EK067G: Total Phosphorus as P	----	5 mg/L	85.3	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 2690693)							
EB1929586-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	95.9	70.0	130
EP026SP: Chemical Oxygen Demand (Spectrophotometric) (QCLot: 2690485)							
EB1929586-008	Anonymous	EP026SP: Chemical Oxygen Demand	----	50 mg/L	97.5	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 2696840)							
EB1929731-002	GW3-1119-1	EP068: gamma-BHC	58-89-9	20 µg/L	78.0	60.2	130
		EP068: Heptachlor	76-44-8	20 µg/L	79.5	48.1	132
		EP068: Aldrin	309-00-2	20 µg/L	76.5	53.7	120
		EP068: Dieldrin	60-57-1	20 µg/L	82.4	55.3	124
		EP068: Endrin	72-20-8	20 µg/L	83.7	48.9	131
		EP068: 4.4`-DDT	50-29-3	20 µg/L	85.8	39.4	134
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2696840)							
EB1929731-002	GW3-1119-1	EP068: Diazinon	333-41-5	10 µg/L	85.2	55.6	141
		EP068: Chlorpyrifos-methyl	5598-13-0	10 µg/L	77.4	58.4	130
		EP068: Pirimphos-ethyl	23505-41-1	10 µg/L	100	49.8	131

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Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 2696840) - continued							
EB1929731-002	GW3-1119-1	EP068: Bromophos-ethyl	4824-78-6	10 µg/L	75.6	47.3	127
		EP068: Prothiofos	34643-46-4	10 µg/L	73.4	45.5	128

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ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1929731**	Page	: 1 of 7
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES DOWDESWELL	Telephone	: +61 7 3552 8639
Project	: 4127018 - Coochiemudlo Island	Date Samples Received	: 07-Nov-2019
Site	: Coochiemudlo Island	Issue Date	: 15-Nov-2019
Sampler	: JEREMY CANARD, RACHEL HUGHES	No. of samples received	: 3
Order number	: 4127018	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Right to Information Release

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK055G: Ammonia as N by Discrete Analyser	EB1929434--001	Anonymous	**Ammonia as N**	7664-41-7	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*		*Sample Date*	*Extraction / Preparation*			*Analysis*		
			Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
GW5-1119-1, GW6-1119-1	GW3-1119-1,	**07-Nov-2019**	**----**	----	----	**08-Nov-2019**	21-Nov-2019	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
GW5-1119-1, GW6-1119-1	GW3-1119-1,	**07-Nov-2019**	**----**	----	----	**08-Nov-2019**	05-Dec-2019	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
GW5-1119-1, GW6-1119-1	GW3-1119-1,	**07-Nov-2019**	**----**	----	----	**08-Nov-2019**	05-Dec-2019	✓
ED093F: Dissolved Major Cations								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (ED093F)								
GW5-1119-1, GW6-1119-1	GW3-1119-1,	**07-Nov-2019**	**----**	----	----	**11-Nov-2019**	05-Dec-2019	✓
EG035F: Dissolved Mercury by FIMS								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F)								
GW5-1119-1, GW6-1119-1	GW3-1119-1,	**07-Nov-2019**	**----**	----	----	**11-Nov-2019**	05-Dec-2019	✓
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG094B-F)								
GW5-1119-1, GW6-1119-1	GW3-1119-1,	**07-Nov-2019**	**----**	----	----	**11-Nov-2019**	05-May-2020	✓

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Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**----**	----	----	**11-Nov-2019**	05-Dec-2019	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**----**	----	----	**08-Nov-2019**	09-Nov-2019	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**----**	----	----	**11-Nov-2019**	05-Dec-2019	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**13-Nov-2019**	05-Dec-2019	✓	**13-Nov-2019**	05-Dec-2019	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**13-Nov-2019**	05-Dec-2019	✓	**13-Nov-2019**	05-Dec-2019	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**----**	----	----	**08-Nov-2019**	05-Dec-2019	✓
EP026SP: Chemical Oxygen Demand (Spectrophotometric)							
Clear Plastic Bottle - Sulfuric Acid (EP026SP) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**----**	----	----	**08-Nov-2019**	05-Dec-2019	✓
EP030: Biochemical Oxygen Demand (BOD)							
BOD Bottle Unpreserved (EP030) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**----**	----	----	**08-Nov-2019**	09-Nov-2019	✓
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**12-Nov-2019**	14-Nov-2019	✓	**12-Nov-2019**	22-Dec-2019	✓
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068) GW5-1119-1, GW3-1119-1, GW6-1119-1	**07-Nov-2019**	**12-Nov-2019**	14-Nov-2019	✓	**12-Nov-2019**	22-Dec-2019	✓

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Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	3	22	13.64	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	3	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	3	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	22	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Biochemical Oxygen Demand (BOD)	EP030	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Right to Information Release

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

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Analytical Methods	Method	Matrix	Method Descriptions
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloued and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Biochemical Oxygen Demand (BOD)	EP030	WATER	In house: Referenced to APHA 5210 B. The 5-Day BOD test provides an empirical measure of the oxygen consumption capacity of a given water. A portion of the sample is diluted into oxygenated, nutrient rich water, and a seed added to begin biological decay. The initial dissolved oxygen content is measured, then the bottle is sealed and incubated for five days. The remaining dissolved oxygen is measured, and from the difference, the demand for oxygen, by biological decay, is determined. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

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Appendix E – Calibration certificates

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Calibration Record

YSI Water Quality Meter

This water quality meter has been performance checked/calibrated as follows

Parameter	Units	Standards value	Pre calibration	Post calibration
Conductivity	µs/cm	2549	2549	✓
pH		4.0	4.12	4.00
		7.0	7	✓
ORP	mV ✓	240 @ 20	231.2@22	✓
Dissolved Oxygen	mg/L	0	0	✓
	%	100	86.5	✓

Serial Number: 17K104481

Equipment checklist

[ ] YSI hand held control unit

Sensor probes

- ☑ pH
- ☑ Conductivity
- ☐ Salinity
- ☐ TDS(Total Dissolved Solid)
- ☐ Seawater specific gravity
- ☑ Temperature
- ☐ Turbidity (LED)
- ☐ Water depth
- ☑ ORP (Oxidation Reduction Potential)
- ☑ Dissolved Oxygen
- ☐ pH (mV)

Date: 7/11/19 Checked By: J. CANAND

Signed: [redacted]

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Appendix F – Field notes

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:24
Site Name:	Coochiemudlo Island	Monitoring Location: CISW1	Sampled by: JC RH
Sample ID:	CISW1- DRY	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Less than 2cm of water in CISW1. Very dry

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:
Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:35
Site Name:	Coochiemudlo Island	Monitoring Location: CISW2	Sampled by: JC
Sample ID:	CISW2 dry	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:
Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:35
Site Name:	Coochiemudlo Island	Monitoring Location: CISW3	Sampled by: JC
Sample ID:	CISW3 dry	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:
Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:35
Site Name:	Coochiemudlo Island	Monitoring Location: CISW4	Sampled by: JC
Sample ID:	CISW4 dry	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:
Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 11:12
Site Name:	Coochiemudlo Island	Monitoring Location: CISW5	Sampled by: JC
Sample ID:	CISW5 DRY	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Final Stabilised WQ Parameters	Results
Time:	
Dissolved Oxygen (%sat):	9.9
Dissolved Oxygen (mg/L):	0.89
Conductivity (microS/cm):	89.5
pH:	5.18
Redox (mV):	50.7
Temp (deg C):	20.8

Notes:
Additional Comments:

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Surface Water Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:30
Site Name:	Coochiemudlo Island	Monitoring Location: CISW-Drain	Sampled by: JC RH
Sample ID:	CISW-drain dry	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Dry

Dry

Final Stabilised WQ Parameters	**Results**
Time:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:
Additional Comments:

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:20
Site Name:	Coochiemudlo Island	Monitoring Location: GW1	Sampled by: JC RH
Sample ID:	GW1- DRY	QAQC sample collected:	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Groundwater Location Type: Monitoring Well

Total Depth of Well (m BTOC): 3.057

Standing Water Level Depth (m BTOC):

Purge Method: Peristaltic Pump

Final Stabilised WQ Parameters	**Results**
Time:	
Volume Purged L:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes:

Observations during purging:

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:17
Site Name:	Coochiemudlo Island	Monitoring Location: GW2	Sampled by: JC RH
Sample ID:	GW2- DRY	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Groundwater Location Type: Monitoring Well

Total Depth of Well (m BTOC): 3.350

Standing Water Level Depth (m BTOC):

Purge Method: Peristaltic Pump

Final Stabilised WQ Parameters	**Results**
Time:	12:19
Volume Purged L:	
Dissolved Oxygen (%sat):	
Dissolved Oxygen (mg/L):	
Conductivity (microS/cm):	
pH:	
Redox (mV):	
Temp (deg C):	

Notes: Sunny hot.

Observations during purging:

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:17
Site Name:	Coochiemudlo Island	Monitoring Location: GW3	Sampled by: JC RH
Sample ID:	GW3-1119-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:	
GPS accuracy:	metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	11.425
Standing Water Level Depth (m BTOC):	5.800
Purge Method:	Peristaltic Pump

Monitoring well GW3.

Yellow during purging and sampling.

Final Stabilised WQ Parameters	**Results**
Time:	11:43
Volume Purged L:	5
Dissolved Oxygen (%sat):	10.9
Dissolved Oxygen (mg/L):	0.89
Conductivity (microS/cm):	222
pH:	4.6
Redox (mV):	225.6
Temp (deg C):	25.2

Notes:	Hot no breeze.
Observations during purging:	Yellow. No odour, turbidity 2/5. Low suspended solids, no sheen.

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 11:11
Site Name:	Coochiemudlo Island	Monitoring Location: GW5	Sampled by: JC RH
Sample ID:	GW5-1119-1	QAQC sample collected: No	QAQC sample ID:

GPS co-ordinates:
GPS accuracy: metres

Groundwater Location Type:

Total Depth of Well (m BTOC): 12.061

Standing Water Level Depth (m BTOC): 5.218

Purge Method: Peristaltic Pump

Monitoring location.

Purging set up at GW5.

Final Stabilised WQ Parameters	**Results**
Time:	10:44
Volume Purged L:	5
Dissolved Oxygen (%sat):	92.6
Dissolved Oxygen (mg/L):	7.63
Conductivity (microS/cm):	306.3
pH:	4.63
Redox (mV):	202.0
Temp (deg C):	25.2

Notes: Hot and no breeze.

Observations during purging: Clear. No odour. No suspended solids. No sheen.

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Groundwater Monitoring Sheet

Job Number:	4127018		Date and Time: 07-11-2019 12:53
Site Name:	Coochiemudlo Island	Monitoring Location: GW6	Sampled by: JC RH
Sample ID:	GW6-1119-1	QAQC sample collected:	QAQC sample ID:

GPS co-ordinates:	
GPS accuracy:	metres
Groundwater Location Type:	Monitoring Well
Total Depth of Well (m BTOC):	16.533
Standing Water Level Depth (m BTOC):	8.721
Purge Method:	Bailer

Monio

Bailer during sampling.

Final Stabilised WQ Parameters	Results
Time:	12:54
Volume Purged L:	30
Dissolved Oxygen (%sat):	15.8
Dissolved Oxygen (mg/L):	1.3
Conductivity (microS/cm):	2077
pH:	3.77
Redox (mV):	301.4
Temp (deg C):	24.9

Notes:	Hot
Observations during purging:	Clear. No SS. No odour. Purged dry at 9.30am. Sampled at 12.55pm.

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	P Lin	V Lam			J Dowdeswell	

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