CLIENTS | PEOPLE | PERFORMANCE

Gladstone Ports Corporation

Report for Western Basin Dredging and Disposal Project

Groundwater Resources

October 2009

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Figure Index

Appendices

1. Introduction

1.1 Background

This hydrogeological study has been prepared as part of the Environmental Impact Statement for the Western Basin Dredging and Disposal Project. This study uses published information and field investigation data, collected as part of this study, to characterise existing groundwater conditions in the vicinity of the proposed Reclamation Area, assess the potential impacts of the proposed development and identify mitigation strategies. The groundwater study area is shown in Figure 2-1.

1.2 Purpose and Scope

Purpose

The purpose of the hydrogeological study is to:

- Characterise existing groundwater conditions to establish a pre-development baseline;
- Assess the potential impacts of the proposed development on groundwater resources; and
- Identify mitigation options and ongoing groundwater monitoring requirements.

Scope

The following scope of works was undertaken, the results of which are summarised in this report:

- Desktop study, site visit and bore census;
- Installation of 6 additional groundwater monitoring bores;
- Groundwater monitoring at existing and new bores;
- Description of existing hydrogeological conditions; and
- Identification of potential impacts and mitigation measures.

2. Methodology

2.1 Overview

The following activities have been carried out as part of the groundwater resources investigation:

» Review of existing reports, maps and data (see Section 2.2);

» Completion of a bore census (see Section 2.3);

» Installation of 6 additional groundwater monitoring bores (see Section 2.4);

» Monitoring and testing of new and selected existing groundwater bores (Sections 2.4, 2.5 and 2.6); and

» Construction and calibration of a groundwater flow model in order to quantify the potential impacts of the proposed development on groundwater levels (Sections.

2.2 Review of Existing Information

The following published reports, maps and data have been used in the preparation of this study in order to determine likely hydrogeological conditions in the vicinity of the proposed Reclamation Area:

» Wiggins Island Coal Terminal Environmental Impact Statement, Revision 3 (Connell Hatch, 2006);

» Gladstone Nickel Project Environmental Impact Statement (URS, 2007);

» Comalco Alumina Project Gladstone, Impact Assessment Study, Environmental Impact Statement, Volume 1 (Dames and Moore, 1998);

» 1:100 000 Geological Series map, Gladstone Special, Sheet 9150 (Department of Natural Resources and Mines, 2001);

» Gladstone, Sheet 9150, 1:100 000 Geological Map Commentary (Department of Resource Industries, 1991);

» Selected information from the Queensland Groundwater Database (Department of Environment and Resource Management (DERM) April 2009); and

» Historic groundwater monitoring data, provided by Cement Australia and RTAY (Rio Tinto Aluminium Yarwun).

2.3 Groundwater Bore Census

A search of the Queensland Groundwater Bore Database (DERM April 2009) was conducted and identified 18 registered groundwater bores within a 5 km search radius of the proposed Reclamation Area. In addition, contact with the coordinator general and property owners identified 30 un-registered groundwater bores within the same search radius. Thirty four out of the 48 groundwater bores identified (see Figure 2-1) were inspected. The remaining 14 bores were not visited either because access could not be obtained or the bore could not be located in the field.

Selected information relating to each of the 34 groundwater bores located and inspected during the bore census are summarised in Appendix A. This information was used to assess the need for further

borehole installations (see Section 2.4) and to provide data on baseline hydrogeological conditions in the vicinity of the proposed Reclamation Area.

2.4 Groundwater Monitoring Network

A review of the location of existing groundwater bores (see Figure 2-1) indicated an absence of boreholes in the coastal strip to the north and west of the proposed Reclamation Area. However, five existing groundwater monitoring bores with monitoring potential and/or with available historic data, were identified to the south and south west. Permission was obtained from Cement Australia and RTAY to access these boreholes as part of the EIS investigations.

2.4.1 Locations

Selected bore details for each of the monitoring network bores developed for this hydrogeological study are summarised in Table 1 and are shown along with the published geology in Figure 2-2. Table 3 summarises the key to the geology in Figure 2-2.

In addition to the 8 existing Cement Australia bores and the 1 RTAY bore to the south and south-west of the site, 6 new 'shallow' (c5-7 mbgl) and 'deep' (c20 mbgl) bores (prefixed by WB) were drilled at 4 locations to the west and north west of the proposed Reclamation Area. This network of 15 bores is considered to provide good spatial coverage around the Project Area and monitoring of shallow and deeper groundwater flow horizons. No monitoring bores are located to the north as there is from 0.75 to 2 km of ocean between the reclamation footprint and the tidally inundated mudflats and mangroves. All 15 bores in the network have been monitored for groundwater levels and 9 for groundwater quality as part of this study.

Each of the 6 additional bores and two of the pre-existing monitoring bores (FL01-1A and FL01-1B) have been surveyed by *North Surveys* to Australian Height Datum (AHD) and Mapping Grid Australia (MGA). Historical survey data for FL98-1A, FL98-1B, FL98-2A, FL98-2B, FL98-3, FL98-4 and CSGW-2 was provided to GHD.

Table 1 Borehole Summary Data

Bore ID	Easting (MGA 56, GDA94)	Northing (MGA 56, GDA94)	Elevation (top of casing) mAHD	Screened Interval (m AHD)	Bore Depth (m bToC)	Monitored Lithology
WB01-A	310693	7370071	3.31	-13.7 to -16.7 mAHD	20.79	silty clay/ extremely weathered siltstone
WB01-B	310694	7370067	3.29	-0.7 to -3.7 mAHD	7.75	sandy clay
WB02-A	310175	7370112	7.07	-9.9 to -12.9 mAHD	20.82	clay with trace sand
WB03-A	311319	7368957	4.54	-11.5 to -14.5 mAHD	19.75	clay
WB03-B	311323	7368959	4.41	1.9 to -1.1 mAHD	6.20	clay, lenses of sandy clay
WB04-A	310783	7368616	17.02	0.2 to -2.8 mAHD	20.73	sandy clay
FL01-1A	311773	7367698	13.17	Unknown (assumed 3 m screen, -1.2 to -4.2 mAHD based on bore depth)	17.44 (bore census)	Log not available, assumed to be Quaternary-aged colluvium given location and depth
FL01-1B	311771	7367697	13.18	Unknown (assumed 3 m screen, 11.3 to 8.3 mAHD based on bore depth)	4.88 (bore census)	Log not available, assumed to be Quaternary-aged colluvium given location and depth
FL98-1A	311900	7367343	14.79	3 to 0 mAHD (borehole information sheet)	14.54 (bore census)	Log not available, assumed to be Quaternary-aged colluvium given location and depth
FL98-1B	311897	7367345	14.86	12.8 to 9.5 mAHD (borehole information sheet, not consistent with measured depth)	8.25 (bore census)	Log not available, assumed to be Quaternary-aged colluvium given location and depth

Bore ID	Easting (MGA 56, GDA94)	Northing (MGA 56, GDA94)	Elevation (top of casing) mAHD	Screened Interval (m AHD)	Bore Depth (m bToC)	Monitored Lithology
FL98-2A	312139	7367618	5.93	-3.0 to -9.5 mAHD (borehole information sheet)	13.50 (bore census)	Log not available, assumed to be Quaternary-aged colluvium given location and depth
FL98-2B	312142	7367615	6.09	4.05 to 0.70 mAHD (borehole information sheet)	4.15 (bore census)	Log not available, assumed to be Quaternary-aged colluvium given location and depth
FL98-3	312116	7367000	9.19	5.2 to 1.9 mAHD (borehole information sheet)	10.3 (bore census)	Log not available, assumed to be Quaternary-aged colluvium given location and depth
FL98-4	311716	7367127	16.25	11.7 to 5.4 mAHD (borehole information sheet)	16.3 (bore census)	Log not available, assumed to be Quaternary-aged colluvium given location and depth
CSGW-2	312913	7367456	3.81	Unknown (assumed 3 m screen, 2.3 to -0.7 mAHD based on depth)	4.5 (bore census)	Log not available, assumed to be fill

2.4.2 Drilling and Monitoring Bore Installation

The 6 additional boreholes were drilled and installed between June 15 and June 30 2009 by Pioneer Drilling. A truck mounted Hydra Powered Scout rig (wash bore method of drilling) was used to advance the bores.

Four boreholes (WB01-A, WB02-A, WB03-A and WB04-A) were drilled to target deeper groundwater flow horizons and were advanced to 20 m below ground level (BGL), with the exception of WB03-A which could only be advanced to 19 mBGL due to difficult drilling conditions. Two bores (WB01-B and WB03-B) were drilled to target shallow groundwater. Borehole WB01-B was advanced to 7 mBGL and WB03-B was advanced to 5.5 mBGL. Both bores were drilled within 2 to 3 m of a deep monitoring bore (WB01-A and WB03-A) to enable comparison of groundwater heads and water quality from different depths.

Each bore was installed with 50 mm diameter PVC casing and screen and fitted with a lockable monument cover. The bore annulus of the screened interval was filled with washed 1 to 3 mm filter pack, sealed with a bentonite plug and grouted to surface with a cement-bentonite grout. The annulus between the monument and PVC casing was backfilled with filter pack material to minimise the risk of fire damage to the casing. The bores were drilled, logged and developed under the supervision of a qualified GHD geologist and all fieldwork was carried out in accordance with the Australian Standards Site Investigation Code AS1726.

Following a stabilisation period of >48 hours after installation each bore was developed by airlifting for approximately 1 hour until the returning water was void of any fines. Water quality field parameters (dissolved oxygen (DO), pH, temperature, total dissolved solids (TDS), electrical conductivity (EC) and redox potential) were measured and recorded during and at the end of development.

Geological logs and bore construction details are included in Appendix B.

2.5 Groundwater Monitoring and Sampling

Groundwater levels in each bore were measured using a dip meter prior to the start of sampling. Bores were purged dry or until three to five casing volumes had been removed and pH, EC, temperature, DO and redox potential had stabilised prior to obtaining groundwater samples. Field instruments were calibrated prior to use, washed with clean water before use and cleaned between monitoring bores.

Samples were collected using a bailer or waterra tubing fitted with a footvalve, filtered to <0.45 µm (dissolved metals sample only), placed in laboratory-supplied containers with preservatives appropriate for the required analyses and stored on ice for transport to the laboratory. Laboratory analysis was submitted under chain of custody (CoC) documentation to NATA accredited Australian Laboratory Services (ALS), Brisbane.

2.5.1 Monitoring Events

Three groundwater monitoring events were completed in July, August and September 2009.

2.5.2 Analytical Schedule

In order to obtain an understanding of the existing groundwater quality in the vicinity of the proposed Reclamation Area, groundwater samples were tested for the range of parameters summarised in Table

2. Analysis for Phenols, PAHs (polycyclic aromatic hydrocarbons), BTEX (benzene, toluene, xylene, ethylbenzene) and TPH (total petroleum hydrocarbons) were only conducted in the first round of sampling because analysis results confirmed that concentrations were at, or below, the laboratory level of reporting for these analytes.

2.6 Hydraulic Conductivity Testing

Falling head permeability tests (slug tests) were carried out in WB01-A, WB01-B, WB02-A, WB03-B and CSGW-2, and a rising head permeability tests was carried out in WB03-A to estimate the hydraulic conductivity (permeability) of the strata screened by the bores. The falling head tests were conducted by introducing slugs of potable water of varying volumes to the bores and recording groundwater level recovery using a level transducer until the SWL had recovered to within 80% of the pre-test level. The rising head tests were conducted by removing a volume of water from the bores using a bailer and monitoring groundwater level recovery as per the falling head tests.

Test results are presented in Section 2.6 and analysis graphs presented in Appendix C.

Table 2 Summary of Analytes for Groundwater Monitoring

	Parameters Analysed/Measured
Field Parameters (measured prior to sampling)	Total dissolved solids (TDS), dissolved oxygen (DO), electrical conductivity (EC), pH, temperature, redox potential
Laboratory Analysis	TDS, pH
	Dissolved metals: Aluminium, arsenic, beryllium, barium, cadmium, chromium, cobalt, copper, lead, iron, manganese, mercury, molybdenum, nickel, selenium, vanadium, zinc
	Nutrients: Ammonia as N, total phosphorous as P, nitrite as N, nitrate as N, total oxidised nitrogen
	Major and minor ions: Calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity (carbonate and bi-carbonate), fluoride and silica
	Phenols, PAHs (polycyclic aromatic hydrocarbons), BTEX (benzene, toluene, xylene, ethylbenzene), TPH (total petroleum hydrocarbons)

2.7 Groundwater Model Development

2.7.1 Model Design

A groundwater flow model of the Project Area was developed in order to quantify the impacts of the proposed development on groundwater levels. Given the relatively limited hydrogeological data currently available for the area a relatively simple numerical model of the area was developed based on published geological and other mapping and using the few geological logs available for boreholes in the area. A four layer model was developed including the main hydrogeological units present in the area i.e.:

» Layer 1 – Fill (existing Fishermans Landing and proposed Western Basin Reclamation Areas);

» Layer 2 – Marine Clay / Alluvium

» Layer 3 – Colluvial deposits

» Layer 4 – Bedrock.

The model grid layout and boundary conditions are shown in Figure 2-3.

Model development was carried out using the MODFLOW suite of modelling code and modules. MODFLOW is a finite difference saturated groundwater flow model that has been comprehensively tested, is widely utilised and accepted, is freely available and well documented. All model runs have currently been carried out using MODFLOW 2000.

Surface water and groundwater interactions in the offshore areas were simulated through the use of MODFLOW general head boundary cells set at sea level. On shore, MODFLOW drain cells have been defined to simulate discharge to the various creeks in the area where groundwater levels rise above ground surface.

The boundaries of the modelled area are defined by major creek lines to the north and south and the centre line of The Narrows to the north east. Little or no groundwater flow is anticipated across these boundaries and hence all cells outside of these boundary lines have been modelled as no flow or inactive cells.

2.7.2 Recharge and Evaporation

Recharge to the upper surface of the groundwater flow model has been calculated using PERFECT (Littleboy et al., 1989), a one-dimensional cropping and soil moisture balance model. In this investigation, PERFECT's simple water use (crop factor) model was used. The crop factor model calculates actual evapotranspiration via a user-defined annual distribution of green cover and a crop factor (Littleboy et al., 1989). Using daily climate input data, including potential evapotranspiration (ETp) and rainfall, PERFECT partitions daily rainfall into runoff, evaporation, transpiration, soil storage changes and deep drainage. The relative proportion of each component of the daily water balance is primarily dependent upon soil type, land use, and antecedent soil moisture conditions. A detailed description of PERFECT's algorithms is provided in Littleboy et al (1989).

For the purposes of the current study, deep drainage as calculated by PERFECT was then apportioned between "interflow" and groundwater recharge using the algorithm of Rassam and Littleboy (2003), which utilises the vertical saturated hydraulic conductivity contrast within the soil profile, and the topographic slope.

Input data used to implement the approach outlined above included:

» Daily rainfall and potential evaporation from the Bureau of Meteorology SILO website;

» Published soil, land use and ground elevation mapping.

Calculated long term average (January 2000 to May 2009) recharge values used for modelling therefore vary with land use and soil type from around 14 mm/yr in upland tree covered areas to around 49 mm/year in lower lying grassland areas.

In areas where groundwater levels are present close to the surface then actual evapotranspiration is likely to exceed the rates estimated by the recharge calculation described above since these calculations assume that rainfall provides the only input to the soil moisture balance. Hence the MODFLOW evaporation package has also been used to estimate additional evapotranspiration losses from areas where modelled groundwater levels approach the surface. In order to ensure consistency with the recharge model described above and prevent double counting of evaporative losses the maximum evaporation rate for use in MODFLOW is taken as the balance of potential evapotranspiration minus actual evapotranspiration, as calculated by the recharge model. This effectively ensures that the sum of actual evapotranspiration (as calculated by the recharge model) and groundwater evaporation (as calculated by MODFLOW) cannot exceed the potential evapotranspiration rate (based on SILO data).

A maximum evaporation extinction depth of 1m has been assumed and hence MODFLOW reduces evaporation linearly from the potential rate at the evaporative surface (ground level in this case) to zero at 1m.

2.7.3 Modelling Approach

A groundwater model of the existing pre-development hydrogeological system was developed initially and calibrated to available groundwater level data for the period January 2000 to May 2009. This model was run in transient mode using monthly stress periods. Given that this model was intended to represent existing conditions, the Western Basin reclamation area was simulated using general head boundary cells to represent water levels in the offshore area. Levels in the Reclamation Area and the other offshore model cells were calculated based on monthly average tide level data.

This calibrated model was then used to provide initial groundwater levels for a second transient simulation of the area which was identical to the historic model except that model cells within the Western Basin Reclamation Area were converted to active cells, in order to simulate groundwater levels in the proposed development area.

Model calibration and predictive results are presented and discussed in Sections 3.7 and 3.8.

LEGEND

Borehole - Type of Monitoring

- Groundwater level
- Groundwater level & quality
- Not monitored for EIS

- 5km Buffer
- Fisherman's Landing Northern Expansion
- Western Basin Reclamation Footprint

1:75,000

0 0.5 1 1.5 2 2.5

Kilometres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

Gladstone Ports Corporation
Western Basin Reclamation EIS

Registered and Unregistered Groundwater Bores

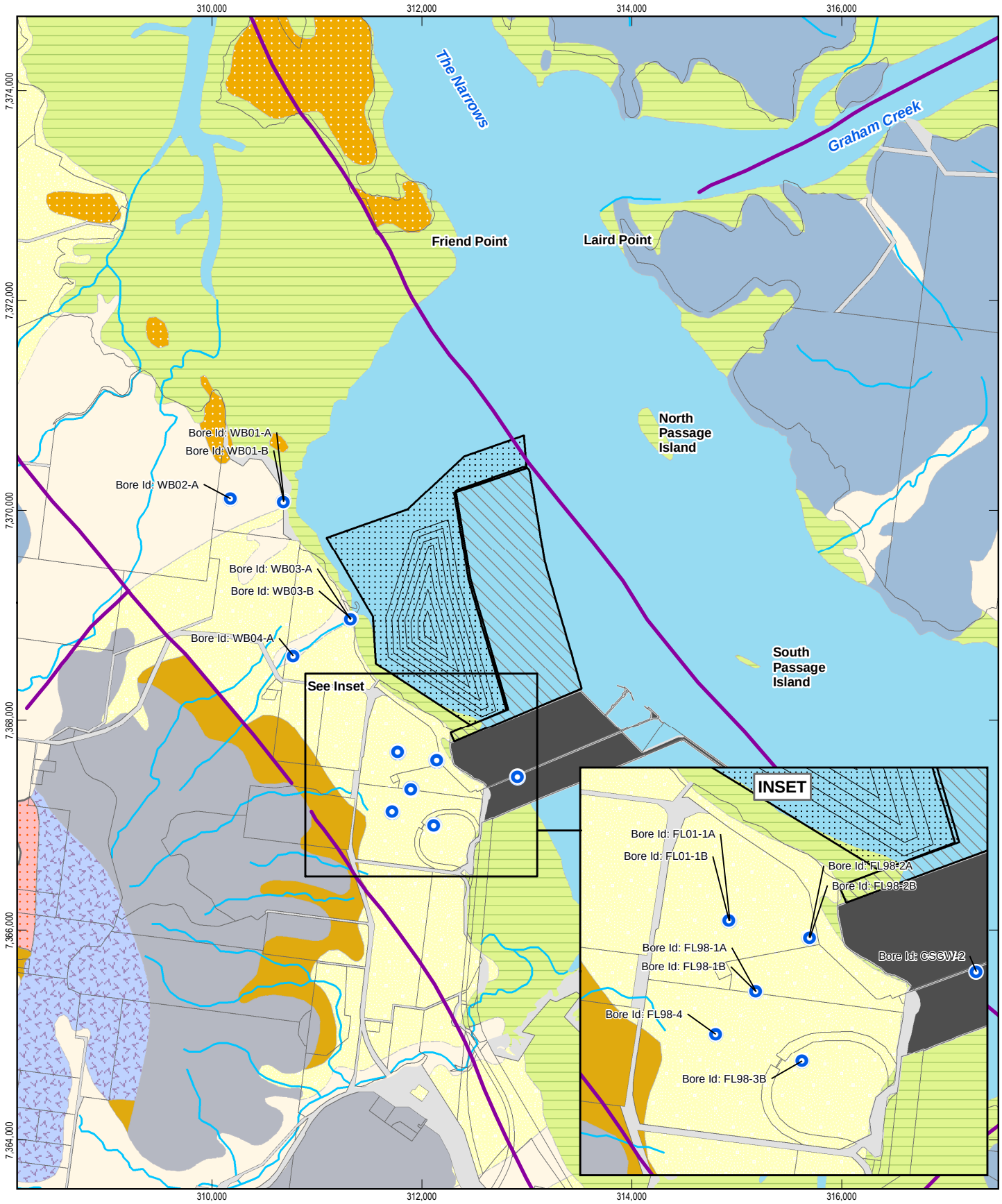
Job Number	42-15386
Revision	A
Date	31 July 2009

Figure 2-1

G:\42\15386\GIS\WesternBasinProjects\MXDs\42-15386_WB_505_rev_a.mxd

Level 4 201 Charlotte Street Brisbane QLD 4000 Australia T +61 7 3316 4496 F +61 7 3316 333 E bnemail@ghd.com.au W www.ghd.com.au

Data source: Reclamation Area - ©The State of QLD (Gladstone Ports Corporation) 2009; DCDB, Aerial (flown 2007) - ©The State of QLD (Department of Environment and Resource Management) 2009. Created by: KD



LEGEND

- Groundwater Bore
- Fault Lines
- Watercourse
- Western Basin Reclamation Footprint
- Fisherman's Landing Northern Expansion
- Cadastre
- Road
- Qhe/m
- Qa
- Qr\s
- Qr\s>Tr
- TQr
- Ts
- PRgta
- DCcw
- DCcd
- DCcd/b
- W

1:50,000 (at A4)

0 0.5 1 1.5 2

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

Port of Gladstone
Western Basin Dredging and Disposal Project

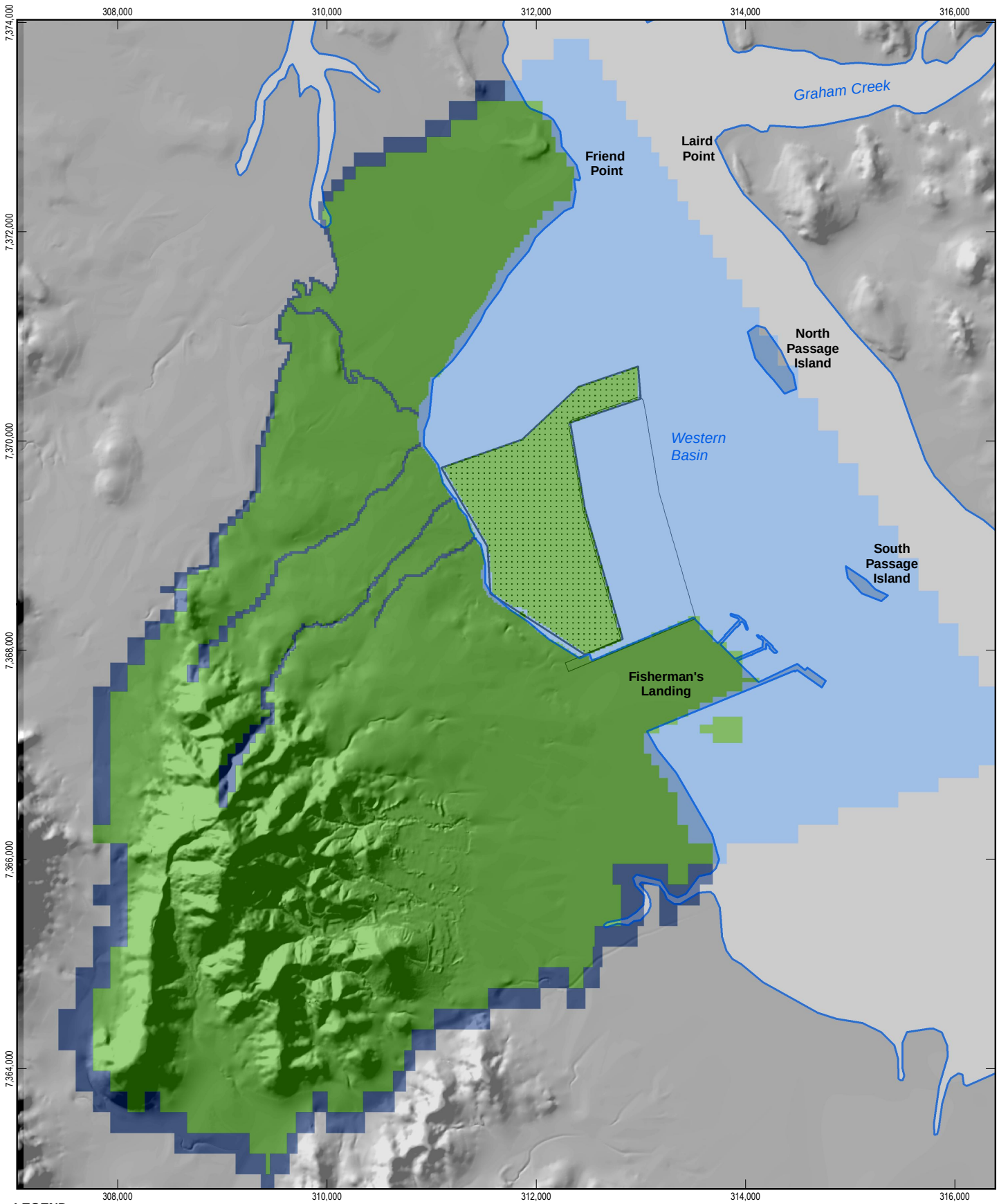
Groundwater Monitoring Bores and Published Geology

Job Number 42-15386
Revision A
Date 01 Sept 2009

Figure 2-2

G:\42\15386\GIS\WesternBasinProjects\MXDs\WB_504_rev_a.mxd

Level 4 201 Charlotte Street Brisbane QLD 4000 Australia T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



LEGEND

Groundwater Model
- No Flow (Inactive Cells)
- General Head Boundary (Sea) Cells
- Drain Cells
- Active Cells

- Western Basin Reclamation Area
- Fisherman's Landing Northern Expansion

1:50,000 (at A4)

0 0.5 1 1.5 2

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

Port of Gladstone
Western Basin Dredging and Disposal Project

Groundwater Model Grid Layout and Boundary Conditions

Job Number	42-15386
Revision	A
Date	14 Oct 2009

Figure 2-3

G:\42\15386\GIS\WesternBasinProjects\MXDs\WB_512_rev_a.mxd

Level 4 201 Charlotte Street Brisbane QLD 4000 Australia T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

3. Results

Sections 3.1 to 3.7 describe the existing hydrogeological conditions and environmental values, based on the data reviewed and collected as part of this study.

3.1 Topography and Drainage

The land immediately surrounding the proposed Reclamation Area is low lying (<20 mAHD) and slopes gently towards the north east (i.e. towards the coastline). It includes tidally inundated mudflats to the north, alluvial plains and forested land to the west and reclaimed land (Fisherman's Landing) to the south. Three surface water channels drain from south west to north east and discharge to the coast along the western boundary of the proposed development area.

3.2 Hydrogeological Units

Digital mapped geology for the area surrounding the proposed Reclamation Area is summarised in Figure 2-2 and Table 3.

Table 3 Key to 1:100 000 Published Geology Presented in Figure 2-2

	Symbol	Description
Quaternary	Qhe/m	Estuarine channels and banks, supratidal flats and coastal grassland; mud, muddy sand, sandy mud, minor gravel
	Qa	Floodplain alluvium; clay, silt, sand, gravel
	Qr\s	Residual soil; sand, silt, mud, gravel
	Qr\s>Tr	residual soil overlying Tertiary residual deposits
Tertiary-Quaternary	TQr	Colluvial and residual deposits; clay, silt, sand, gravel and soil
Tertiary	Ts	Conglomerate, sandstone
Later Permian - Early Triassic	PRgta	Targinie Quartz Monzonite; pink, medium-grained hornblende-biotite quartz monzonite
Late Devonian – Early Carboniferous	DCcw	Wandilla Formation; mudstone, lithic sandstone, siltstone, jasper, chert, slate, schist
	DCcd	Doonside Formation; chert, jasper, mudstone, siltstone, lithic sandstone, tuff, limestone, altered basalt
	DCcd/b	Balnagowan Volcanic Member; basaltic to andesitic lava and volcaniclastic rocks, chert, mudstone, limestone

In summary, the geological/hydrogeological units identified in the vicinity of the proposed Reclamation Area through the desktop review and field investigations are:

» Fill, including marine dredge and quarried material (not mapped);

» Coastal/estuarine sediments (Qhe/m, Holocene –age);

» Alluvium (Qa and TQa, Quaternary-age) and colluvium (TQr, Quaternary-age); and

» Bedrock of varying age, including:

  – The Narrows Group (Tertiary-age);
  – Targinie Quartz Monzonite (Late Permian to Early Triassic-age);
  – Wandilla Formation (Late Devonian to Carboniferous-age); and
  – Doonside Formation (Devonian to Carboniferous-age).

Fill

Fill material, including dredged marine deposits and quarry spoil, has been used to reclaim Fisherman's Landing and is located just beyond the southern boundary of the proposed Reclamation Area. The lithology of the fill is not known however it is likely to be variable and may range from low permeability material such as silt and clay to higher permeability materials such as sand and gravel.

Estuarine Sediments

Low lying, Holocene-age estuarine sediments including mud, sandy mud, and minor gravel are mapped at outcrop adjacent to the proposed Reclamation Area (to the north-west and west) and are likely to be of low permeability. These deposits include organic and shell material, as indicated by the geological log for WB01-A (see Appendix B).

Alluvium and Colluvium

The published mapping indicates Quaternary-age alluvium and colluvium (both units described as clay, silt, sand and gravel) overlying the bedrock in lower lying areas (<20 mAHD) towards the west of the proposed Reclamation Area. Boreholes drilled as part of this technical study (see Appendix B) suggest that these deposits are dominated by clay and sandy clay deposits, with minor clayey gravel and gravelly clay layers, encountered up to 20 m bgl (below ground level). The permeability of the alluvium/colluvium is likely to be vary spatially within this area, depending on the presence or absence of significant sand and gravel horizons.

Bedrock

Published geological mapping and cross sections suggest that the bedrock strata underlying the Quaternary-age sediments include:

» The Narrows Group (Curlew Formation, Rundle Formation and Worthington Formation) which is a sequence of units including claystone, shales, limestone and sandstone;

» Targinie Quartz Monzonite (pink, medium-grained hornblende-biotite quartz monzonite).

» The Wandilla Formation (including mudstone, sandstone, siltstone, chert, slate and schist);

» The Doonside Formation (including chert, mudstone, siltstone, sandstone, limestone and basalt); and

The youngest of these bedrock formations, the Narrows Group, is not present at outcrop in the area but is indicated to be present at subcrop beneath the site in cross section (Department of Natural Resources

and Mines, 2001) due to the influence of faults to south west and north east of the site (see Figure 2-2). The downthrown area between these two faults forms the Narrows Graben. Given the regional deformation and faulting which is known to have occurred in the area zones of relatively high bedrock permeabilities are likely. This is backed up to some extent by information for existing groundwater bores in the area which confirm that the bedrock is water bearing with typical yields of 0.07 to 3L/s, as indicated by records from the groundwater bore database (DERM 2009).

3.3 Groundwater Levels and Flows

Historic groundwater level data provided by Cement Australia (for 2001 to 2009) suggest typical seasonal level fluctuations of 0.4 to 1 m in shallow groundwater (<15 m bgl) within natural strata. Data for 2005 to 2009 provided by RTAY for Fisherman's Landing, which is predominantly fill material, also indicate seasonal fluctuations of up to 1 m in near coastal areas. Groundwater levels close to the coastline are also likely to fluctuate on a sub-daily and monthly basis in response to tidal movements. Tide information for Gladstone (Australian Government Bureau of Meteorology website) indicates that the tidal range for the Gladstone area is typically in the order of 1.5 to 4.5 m.

Groundwater levels for August 2009 are shown in Figure 3-1 and time series data for boreholes of the monitoring network are shown in

Figure 3-2 and

Figure 3-3.

Measured groundwater levels for the coastal strip (WB01-A, WB01-B, WB03-A, WB03-B) immediately west of the Project Area (July to September) ranged between 0.7 mBGL (below ground level) (WB01-A) and 2.8 mBGL (WB03-A). Groundwater levels for WB02-A and WB04-A, approximately 500 m further inland, ranged from 4.5 mBGL (WB02-A) to 7.4 mBGL (WB04A). Groundwater elevations were in the range of 1.3 (WB02-A) to 2.6 mAHD (WB03-B) except at WB04-A where water levels stabilised at around 8.8 mAHD. Automatically recorded groundwater level data for WB03-A and WB03-B, corrected for barometric pressure, confirm small sub-daily and monthly groundwater level fluctuations in response to tidal movements of between 0.02 and 0.075 m (see

Figure 3-3).

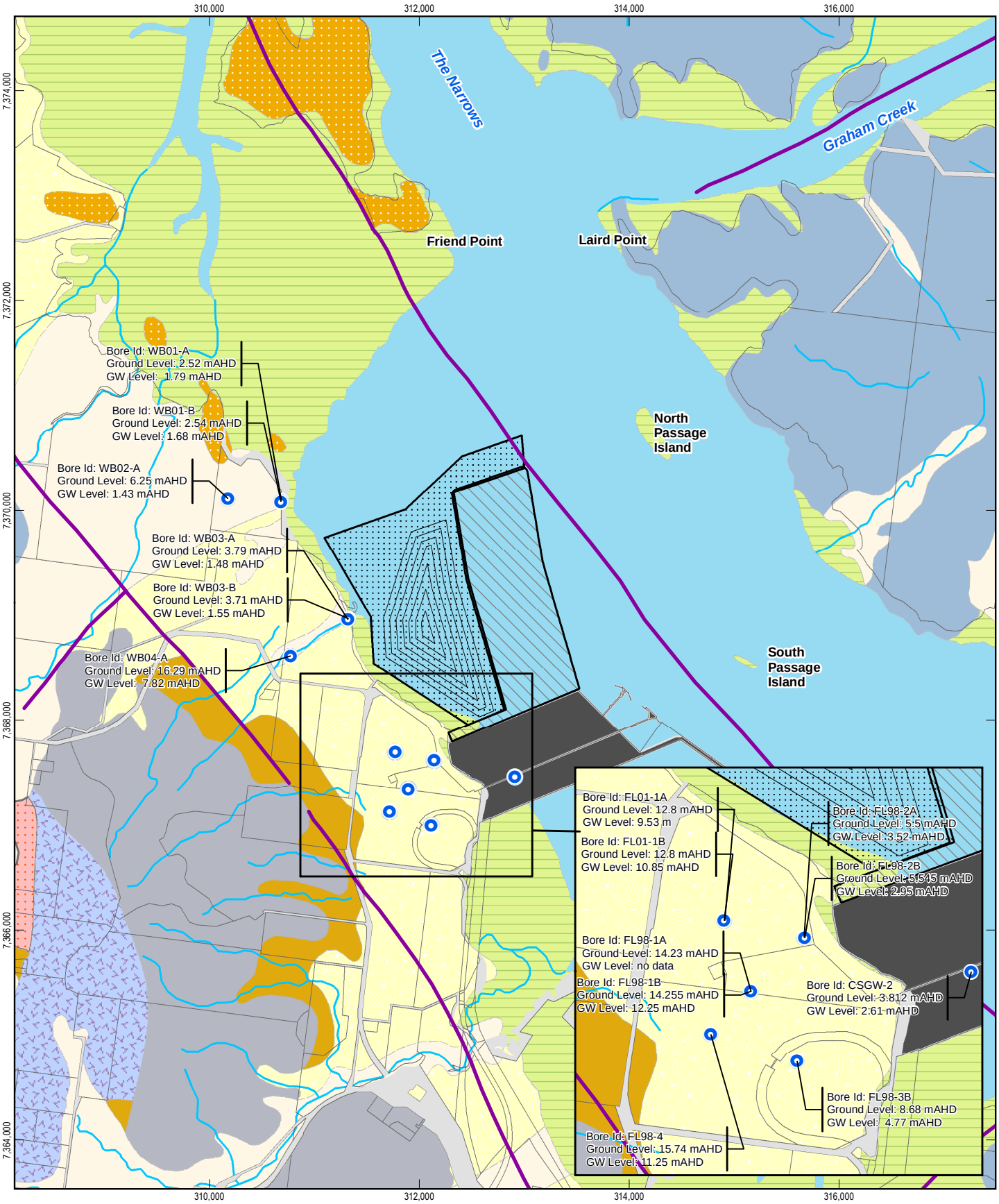
Groundwater elevations for the 15 monitored bores indicate groundwater flow in the alluvial/colluvial deposits is from south west to north east, towards the coast and the proposed development area. Comparison of groundwater levels in the nested piezometers WB03-A and WB03-B suggest that the vertical component of groundwater flow is probably downward at and in the vicinity of these boreholes.

Groundwater within the alluvial/colluvial strata which are predominantly characterised by low permeabilities will tend to move through primary porosity pathways and preferentially through higher permeability material, i.e. material with a high sand or gravel component. A proportion of the groundwater flow within the alluvial strata will discharge direct to the sea with the remainder discharging to the low lying drainage channels close to the coast before ultimately discharging to the sea at low tide.

Groundwater in bedrock was not monitored in the study however, groundwater flow in the underlying bedrock is expected to be predominantly be via fractures and joints and is likely to be driven by the fall in topography and recharge to bedrock outcrop, from south west to north east towards the coast. The distribution and connectivity of the secondary permeability is not well defined, although reported borehole yields for the area are typically 0.07 to 3 L/s (DERM 2009) suggesting relatively low permeabilities and

hence limited groundwater movement through the bedrock. Geotechnical investigations conducted by GHD (2008) suggest the presence of Quaternary and Holocene clays at outcrop offshore which suggests that any flow within the bedrock strata is likely to discharge indirectly into the tidal zone via the overlying unconsolidated deposits.

No information is available on the location or volume of submarine discharges of groundwater although the possibility of direct freshwater discharges to the sea beneath the proposed development area cannot be discounted.



LEGEND

- Groundwater Bore
- Fault Lines
- Watercourse
- Western Basin Reclamation Footprint
- Fisherman's Landing Northern Expansion
- Cadastre
- Road
- Qhe/m
- Qa
- Qr\s
- Qr\s>Tr
- TQr
- Ts
- PRgta
- DCcw
- DCcd
- DCcd/b
- W

1:50,000 (at A4)

0 0.5 1 1.5 2

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

Port of Gladstone
Western Basin Dredging and Disposal Project

Measured Groundwater Elevations, August 2009

Job Number	42-15386
Revision	A
Date	01 Sept 2009

Figure 3-1

G:\42\15386\GIS\WesternBasinProjects\MXDs\WB_510_rev_a.mxd

Level 4 201 Charlotte Street Brisbane QLD 4000 Australia T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Figure 3-2 Groundwater Levels WB04-A, July to September 2009

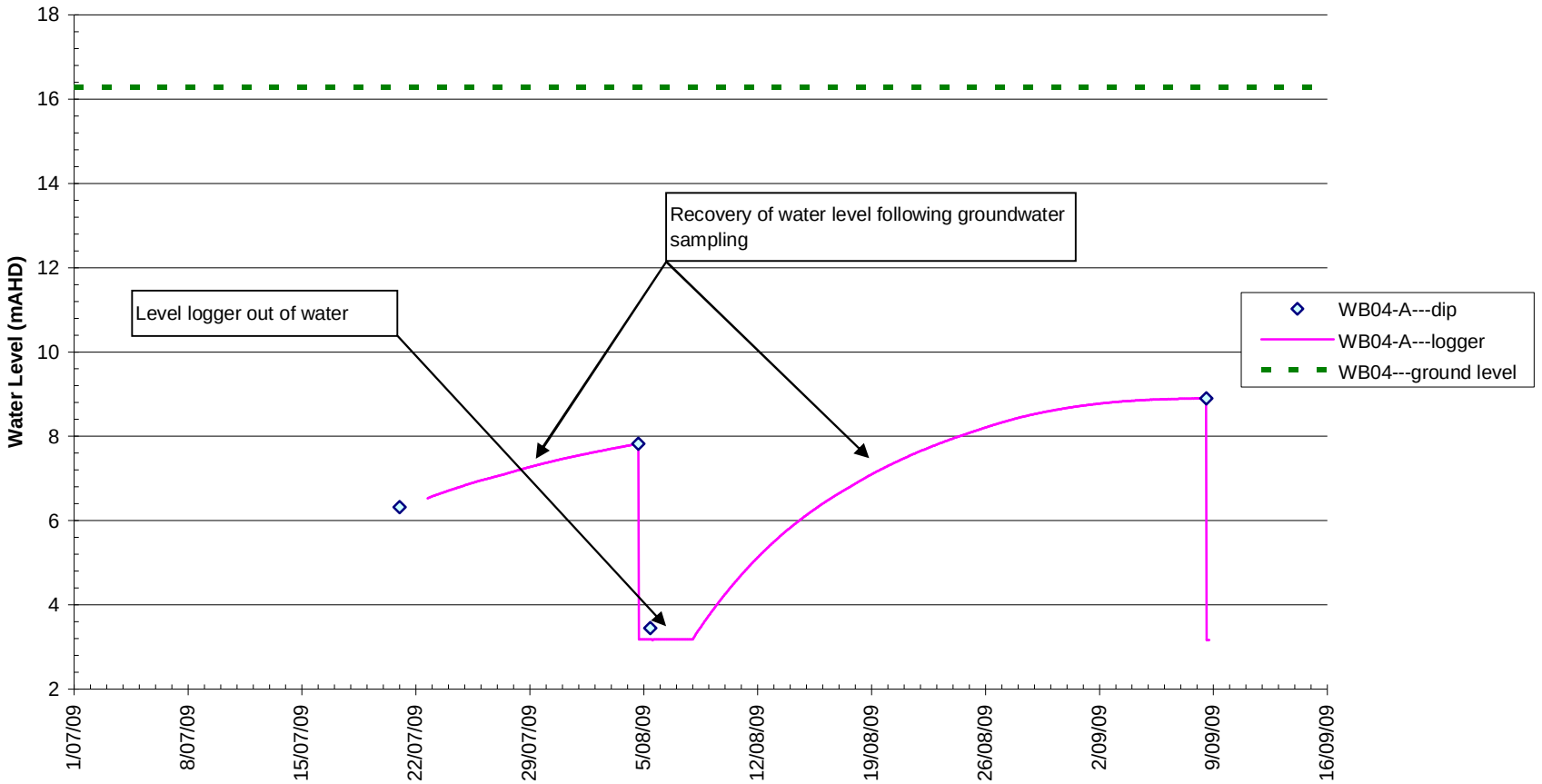
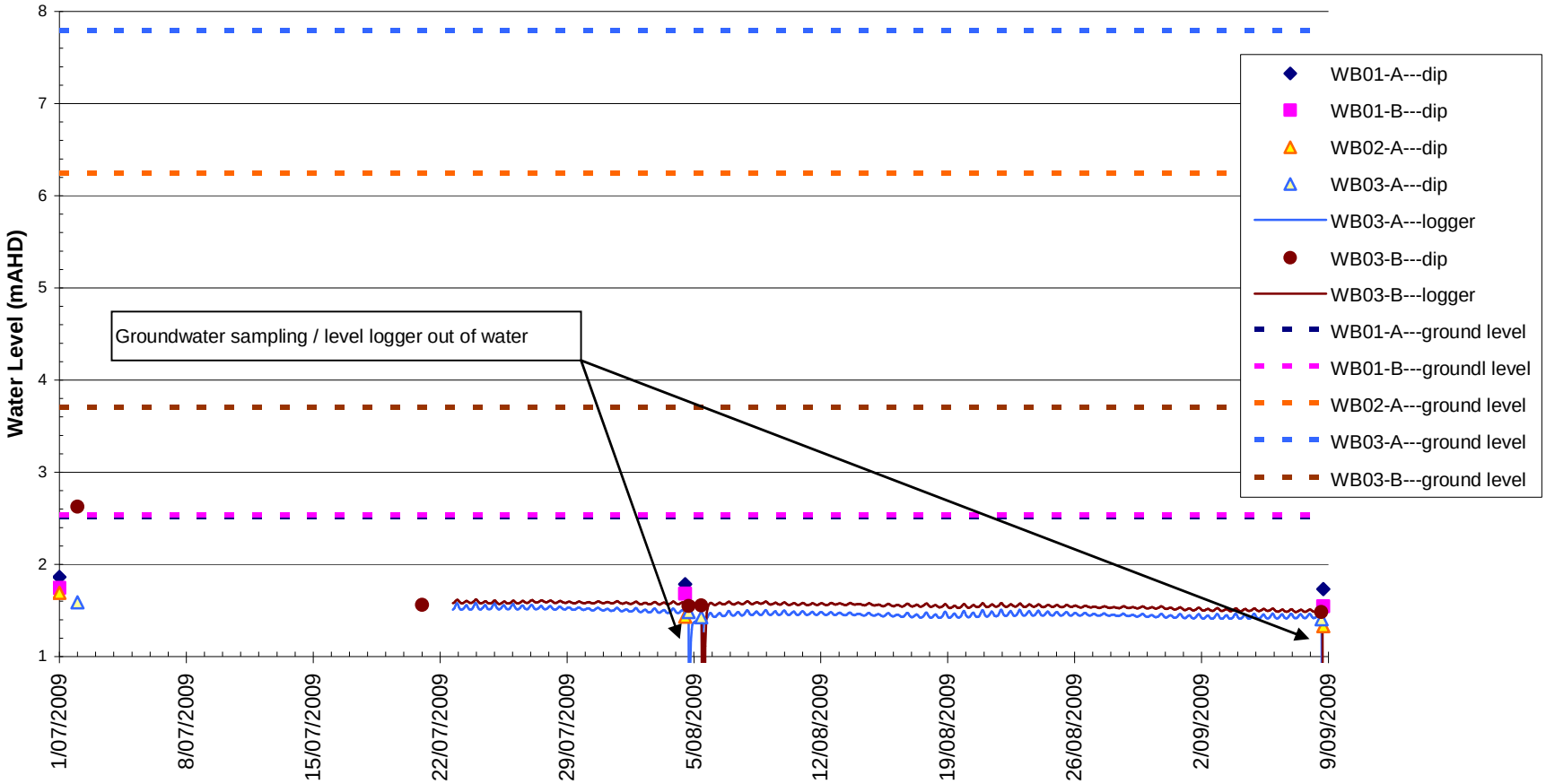


Figure 3-3 Groundwater Levels WB01-A&B, WB02-A, WB03-A&B, July to September 2009



3.4 Groundwater Quality

3.4.1 Alluvial/Colluvial Deposits and Fill

Baseline groundwater monitoring quality sampling results for bores monitoring alluvial deposits (WB series of bores and FL98-2A and FL98-2B) and fill material placed at Fisherman's Landing (CSGW-2) are included in Appendix D and discussed below. Laboratory certificates are included in Appendix E.

Analysis of the major ion groundwater chemistry data indicates that the groundwater is of sodium-chloride type, which is not unexpected given the proximity of the monitoring bores to the coast. The results of this analysis are shown on a piper plot in Figure 3-4.

Field pH and laboratory TDS concentrations are shown in Figure 3-5 and Figure 3-6 respectively. Field monitoring results tend to confirm that groundwater immediately west (alluvial/colluvial deposits) and south (Fisherman's Landing) of the proposed development area is brackish to saline (measured field EC values ranged from 6,900 (WB04-A) to 61,900 µS/cm (WB02-A) with a neutral to slightly acidic pH (7.6 (FL98-2B) to 5.7 pH (WB01-A), July 2009) except at WB03-B where groundwater is more acidic with a measured field pH range of 3.9 to 5.01 pH units. Laboratory TDS concentrations ranges from 4,200 mg/L (WB04-A) to 60,100 mg/L (WB02-A) confirming brackish and saline groundwater (see Figure 3-6). These physico-chemical results are consistent with unpublished historic data in the vicinity of the site and with RN 97444 (4,700 µS/cm EC) located on mapped Quaternary-age alluvial outcrop. The reported TDS concentrations and measured EC indicates that the groundwater in the alluvial/colluvial material in the coastal strip of land immediately adjacent to the proposed development site and in the deposits of Fisherman's Landing is unsuitable for drinking, stock watering and irrigation.

Laboratory testing results also indicate that the groundwater contains concentrations of dissolved metals (chromium, copper, cobalt, lead nickel and zinc) and nutrients (ammonia as N) above the ANZECC & ARMCANZ[1] (2000) guideline values for marine aquatic ecosystems (at the 95% level of protection) at one or more monitoring locations. The ANZECC & ARMCANZ (2000) guideline values for marine aquatic ecosystems have been used for comparison given the marine receiving environment.

Concentrations of dissolved metals above the adopted guideline values, for concentrations above the laboratory detection limit, are summarised as follows:

- Dissolved chromium (III + VI). Concentrations exceeded the ANZECC & ARMCANZ (2000) guideline value (95%) of 0.0044 mg/L on one or more occasions in all of the WB series of monitoring bores, and ranged from 0.005 to 0.023 mg/L;
- Dissolved cobalt. Concentrations in all monitored bores on all but one occasion exceeded the ANZECC & ARMCANZ (2000) guideline value (95%) of 0.001 mg/L and ranged from 0.004 to 0.53 mg/L (WB03-B);
- Dissolved copper. Exceedence of the ANZECC & ARMCANZ (2000) guideline value (95%) of 0.0013 mg/L was reported for all monitored locations with the exception of WB02-A;
- Dissolved lead. The ANZECC & ARMCANZ (2000) guideline value (95%) for lead (0.0044 mg/L) was exceeded on one occasion at WB03-B;

[1] Australia and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand

» Dissolved nickel. Concentrations exceeded the ANZECC & ARMCANZ (2000) guideline value (95%) of 0.07 mg/L at WB03-B (up to 0.194 mg/L);

» Dissolved zinc. Concentrations exceeded the ANZECC & ARMCANZ (2000) guideline value (95%) of 0.015 mg/L in all monitoring bores with the exception of CSGW-2 and WB04-A.

Concentrations of nutrients above the adopted guideline values, for concentrations above the laboratory detection limit, are summarised as follows:

» Ammonia. The ANZECC & ARMCANZ (2000) guideline value (95%) of 0.91 mg/L was exceeded at all monitored locations except for FL98-2A and FL98-2B. Exceedences ranged from 0.97 (WB01-B) to 14.1 mg/L (WB01-A).

Concentrations of phenols, PAHs (polycyclic aromatic hydrocarbons), BTEX (benzene, toluene, xylene, ethylbenzene) and TPH (total petroleum hydrocarbons) were reported equal to or less than the laboratory limit of reporting for these analytes in all of the bores except for FL98-2B where concentrations for 2 fractions of TPH (C15-C28 at 200 µg/L and C29-C36 at 100 µg/L) were reported to just above the laboratory reporting limits of 100 and 50 µg/L respectively.

3.4.2 Bedrock

Queensland Groundwater Database records (see Table 4, DERM 2009) indicate that groundwater in bedrock (Targinie Granite (or Targinie Monzonite), Wandilla Formation and Doonside Formation) within the 5 km search radius of the proposed Reclamation Area is typically slightly brackish (reported up to 1,900 µS/cm EC (RN 97989) for bores indicated to penetrate bedrock) and slightly acidic pH (based on one data record of 5 pH).

Based on these limited data, the groundwater in bedrock is considered not to be good drinking water, but could potentially be used for irrigation and stock watering.

Figure 3-4 Piper Plot

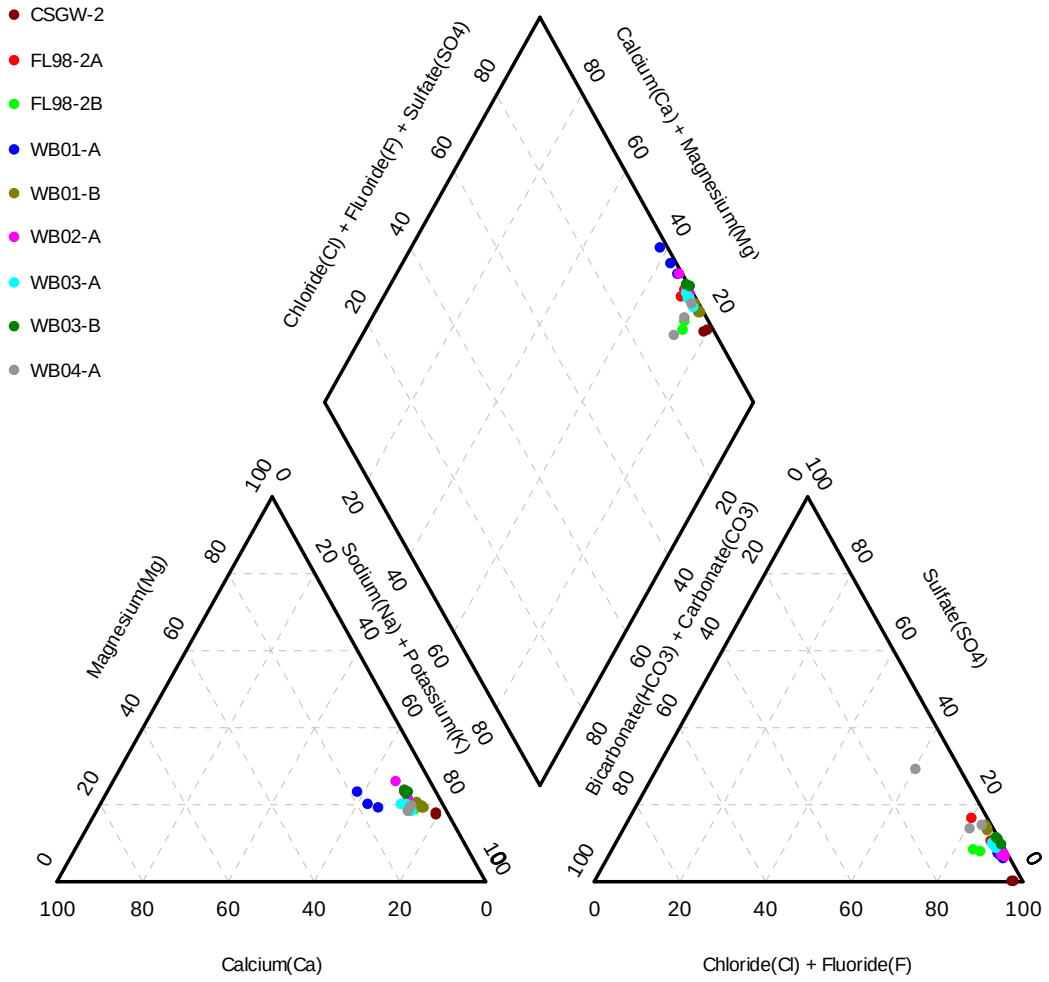


Figure 3-5 Field pH, July to September 2009

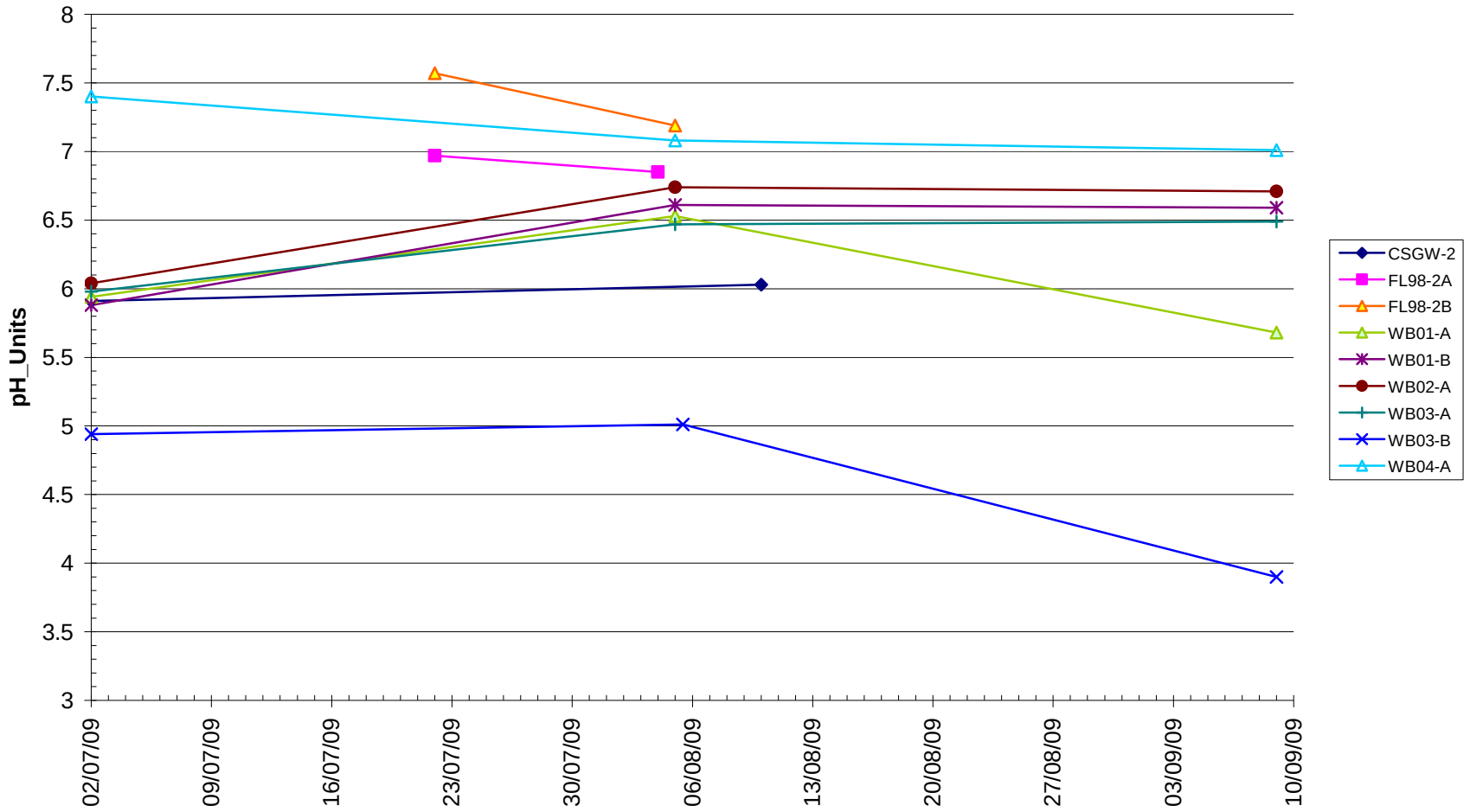
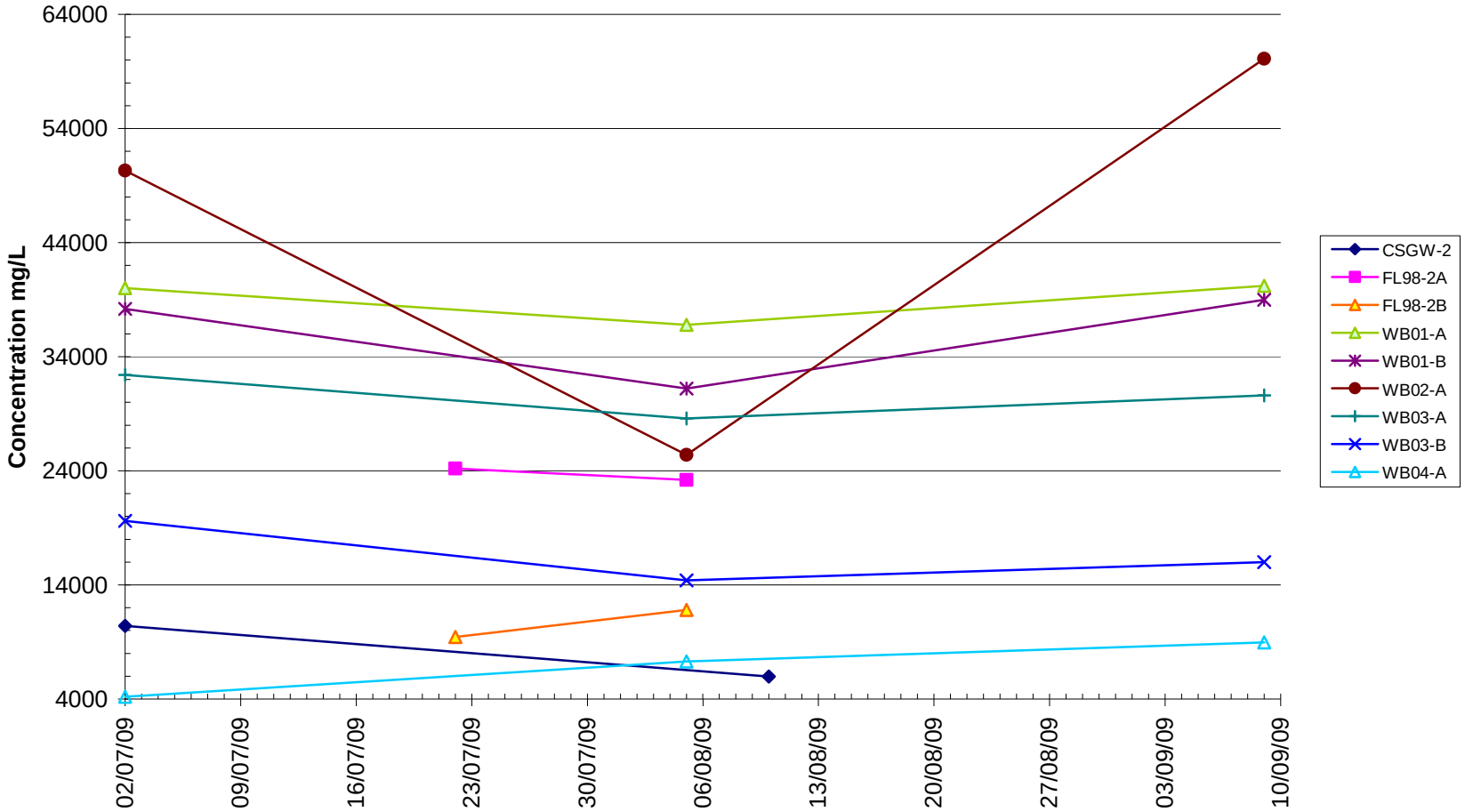


Figure 3-6 Laboratory TDS, July to September 2009



3.5 Groundwater Use

Selected information for registered groundwater bores within 5 km of the proposed Reclamation Area is included in Table 4. Forty-eight groundwater bores were identified within the 5 km radius in the desktop review. This included 18 registered bores which are all recorded as being for water supply in the bore database (DERM 2009) and 30 un-registered bores indicated to be for fire fighting (1 bore), domestic use (1 bore) and monitoring (22 bores). The primary purpose is not detailed for 6 of the un-registered bores.

Of the registered bores at the time of the site visit, 2 did not appear to be in use, 1 had been filled, 6 could not be located and 5 have been confirmed as no longer present. One registered bore was confirmed as being in use and 3 other bores identified in the data review might be in use, however this has not been confirmed as it was not possible to visit these bores.

Of the 8 un-registered bores not identified as monitoring bores, lack of infrastructure and poor condition of the bores indicated that 6 are unlikely to be in use. However, 2 of the bores are indicated to be in use.

Based on the desktop searches and field investigations, groundwater in the alluvium/colluvium within a 5 km radius of the proposed Reclamation Area does not appear to be used for water supply. A review of the available data suggests that groundwater in bedrock is used locally for water supply, however based on the results of the bore census, the nearest groundwater abstraction to the proposed Reclamation Area appears to be registered bore RN 91788, which is approximately 4.4 km to the west. Consultation with the land occupier indicated that water from this bore is used for plant watering and database records indicate that the bore penetrates the Targinie Granite. Two other bores (identified as ‘BH 5’ and ‘BH 8’ in the summary table, Appendix A) were identified as being in use; ‘BH 5’ is used for fire fighting and is located approximately 5.6 km west of the proposed Reclamation Area and ‘BH 8’ for domestic use and is located approximately 4.6 km from the site (see Figure 2-1 for borehole locations). Three registered bores could not be inspected (RN 97960, RN 97989 and RN 122949) but are reported to be for water supply in the groundwater database (DERM 2009). They may also be currently active and are located between 4.7 km and 4.9 km from the proposed Reclamation Area.

All of the bores identified are located up hydraulic gradient of the proposed Reclamation Area.

Table 4 Summary of Selected Information for Registered Groundwater Bores Within 5 km

RN	Facility Role	Facility Status	Groundwater Level (m AHD) (& Year)	Groundwater Quality	Top of Aquifer (mbgl)	Bottom of Aquifer (mbgl)	Yield (l/s)	Water Bearing Horizon	Comments
84982	WS	Existing	-	-	21	22	0.07	Targinie Granite	-
88338	WS	Existing	-	EC 1,880 µS/cm	22	23.8	1	Doonside Formation	-
88456	WS	Existing	-15	EC 1,250 µS/cm	14	22.6	0.35	Targinie Granite	-
88459	WS	Existing	-	-	-	Base of borehole indicated to be 15 m depth	-	-	Lined well, assumed Targinie Granite based on depth
88464	WS	Existing	-	TDS 17,000 mg/L	62.5	65.6	0.65	Rundle Formation	-
91788	WS	Existing	-10	Potable	11	19	0.26	Targinie Granite	-
97440	WS	Existing	-6.1 (2002), -10 (1997)	EC 900 µS/cm, 1,170 µS/cm, 1,200 µS/cm 5 pH	17	23	3	Wandilla Formation	-
97444	WS	Existing	-	EC 4,430 µS/cm	-	-	-	-	Located on mapped outcrop of Quaternary-age alluvium

RN	Facility Role	Facility Status	Groundwater Level (m AHD) (& Year)	Groundwater Quality	Top of Aquifer (mbgl)	Bottom of Aquifer (mbgl)	Yield (l/s)	Water Bearing Horizon	Comments
97960	WS	Existing	-	EC 1,800 µS/cm	13.7	Base of borehole indicated to be 18 m depth	1.26	Targinie Granite	-
97989	WS	Existing	-11 (1997)	EC 1,900 µS/cm	13	Base of borehole indicated to be 23 m depth	0.76	Targinie Granite	-
111120	WS	Existing	-15.24 (1993)	EC 1,485 µS/cm, 1,600 µS/cm	18.9	Base of borehole indicated to be 36.5 m depth	0.08	Targinie Granite	-
111423	WS	Existing	-15.24 (1999)	EC 1,100 µS/cm	19.51	22.56	0.45	Granite	Assumed to be Targinie Granite
111928	WS	Abandoned & Destroyed	-	-	-	-	-	-	Log indicates shale 12 to 72 m depth (Rundle Formation)
111929	WS	Abandoned & Destroyed	-	-	-	-	-	-	Log indicates shale 29 to 72 m depth (Rundle Formation)
111930	WS	Abandoned & Destroyed	-	-	-	-	-	-	Log indicates shale 6 to 24 m depth (Rundle Formation)

RN	Facility Role	Facility Status	Groundwater Level (m AHD) (& Year)	Groundwater Quality	Top of Aquifer (mbgl)	Bottom of Aquifer (mbgl)	Yield (l/s)	Water Bearing Horizon	Comments
111931	WS	Abandoned & Destroyed	-	-	-	-	-	-	Log indicates shale 18 to 48 m depth (Rundle Formation)
111932	WS	Abandoned & Destroyed	-9	TDS 2,700 mg/L	24	36 m (base of borehole on log)	1.7	Rundle Formation	Log indicates shale (Rundle Formation)
122949	WS	Existing	-6.7	EC 1,250 µS/cm	18	24	2.5	Doonside Formation	-

Note: Information taken from the Queensland Bore Database (DERM 2009)

3.6 Hydraulic Parameters

Estimated hydraulic conductivity (K) values for the bores tested are summarised in Table 5. Graphs showing the results of the analysis are included in Appendix C.

The K value presented for each bore is an average of the two analytical solutions used (Hvorslev 1951 and Bouwer-Rice 1976). The data suggest hydraulic conductivity of the alluvium/colluvium immediately to the west of the Project Area varies over at least three orders of magnitude, from 7.3×10^{-4} to 5.0×10^{-1} m/d. The results are consistent with the recorded lithology, and hence the higher conductivity values (5.0×10^{-1}, 3.4×10^{-2} and 4.0×10^{-2} m/d) correspond to tested lithologies of sandy clay and clay with lenses of sandy clay, respectively, whilst the lower conductivity values correspond to more clay dominated lithologies. In addition, the recovery of the groundwater level to the pre-groundwater sampling level at WB04-A (August sampling round) took approximately 19 days indicates very low permeability (see

Figure 3-2). These data support the assumption that the permeability of the alluvium/colluvium varies depending on the composition of the strata.

These values are comparable to a reported hydraulic conductivity value for colluvium of 8.64×10^{-3} m/d (URS 2007). The location of the test was not reported, however it is assumed that it was in the Gladstone/Fisherman's Landing area.

Analysis of data collected for CSGW-2 indicates an hydraulic conductivity of around 0.1 m/d suggesting higher permeability materials such as silts and fine sands for this location on Fisherman's Landing.

The hydraulic conductivity of the bedrock is also likely to be highly variable and dependent on the degree of fracturing. URS (2007) reported a hydraulic conductivity for bedrock (mudstone/oil shale) of 8.64×10^{-2} m/d. Again the location of the test was not reported.

Table 5 Permeability Test Results of Selected New Groundwater Bores

Bore ID	Estimated K Value (m/day)	Screened Interval	Lithology
WB01-A	3.0×10^{-3}	-13.7 to -16.7 m AHD (17-20 m bgl)	silty clay/ extremely weathered siltstone
WB01-B	5.0×10^{-1}	-0.7 to -3.7 m AHD (4-7 m bgl)	sandy clay
WB02-A	7.3×10^{-4}	-9.9 to -12.9 m AHD (17-20 m bgl)	clay with trace sand
WB03-A	4.0×10^{-2}	-11.5 to -14.5 m AHD (16-19 m bgl)	Clay
WB03-B	3.4×10^{-2}	1.9 to -1.1 m AHD (2.5-5.5 m bgl)	clay, lenses of sandy clay
CSGW-2	1.0×10^{-1}	2.3 to -0.7 mAHD (assumed) (1.5-4.5 mbgl)	Unconfirmed (potentially fill)

3.7 Groundwater Model Calibration

Calibrated hydraulic conductivity, specific yield and specific storage values for each model layer are summarised in Table 6 and are broadly consistent with the permeability results summarised in Table 5.

Given the limited amount of information available on hydraulic parameters from which to assess any spatial patterns, single parameter values have been used as far as possible in each layer.

Table 6 Calibrated Values

Dominant Geological Unit; Model Layer	Horizontal Kh (m/d)	Vertical, Kv (m/d)	Specific Yield	Specific Storage (m^{-1})
Fill (Layer 1)	0.5	0.05	0.1	$2.5x10^{-6}$
Alluvium (Layer 2)	1.4	0.14	0.1	$2.5x10^{-6}$
Marine Clay (Layer 2)	0.5	0.05	0.1	$2.5x10^{-6}$
Colluvium (Layer 3)	0.02	0.003	0.1	$2.5x10^{-6}$
Bedrock (Layer 4)	0.25	0.025	0.025	$2.5x10^{-6}$

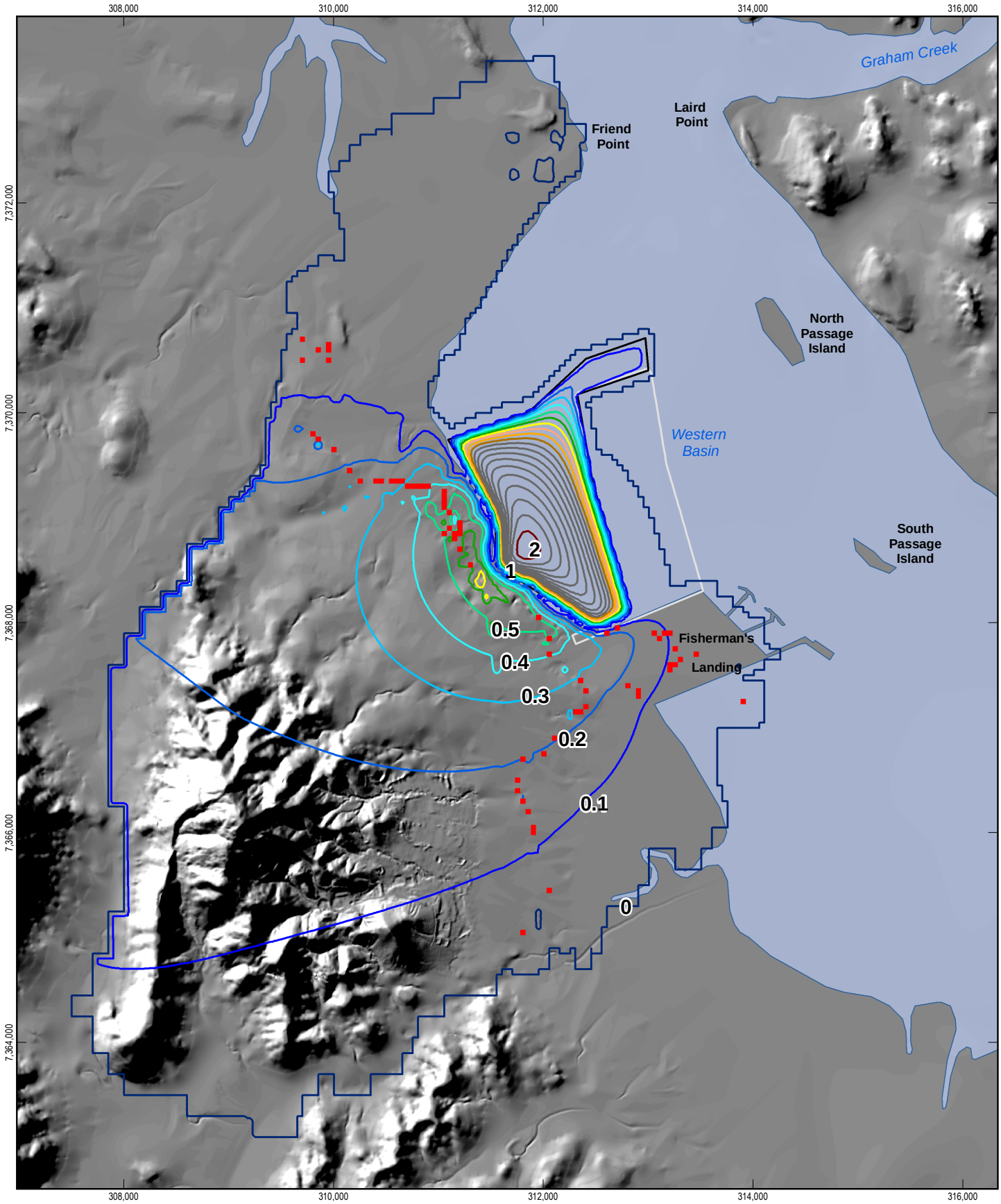
Calibration results indicate a scaled RMS error of 10.7% overall which is close to the 10% target suggested in the Murray Darling Basin Guidelines as being appropriate for an 'Impact Assessment Model' of medium complexity (Middlemiss, Merrick and Ross, 2001). Further effort to improve the calibration is not considered worthwhile in this case since the hydrogeological unit monitored in many of the pre-existing boreholes in the area is not known. For boreholes where geological logs and/or construction details are not available it was necessary to 'guesstimate' which unit was being monitored and hence the reliability of many of the observed data values is uncertain. Similarly geological data for the study area is limited to published geological mapping and a small number of reliable borehole logs predominantly from the current study. The current geological model on which the groundwater flow model is based is therefore very simple and assumes constant thicknesses of the units thought to be present at each location. Notwithstanding these limitations the calibrated groundwater flow model is considered to be the most appropriate tool for quantifying the potential impacts of the development on groundwater levels.

3.8 Groundwater Model Predictions

Following calibration of the historic model a second transient predictive simulation was developed in order to assess the potential impacts of the proposed reclamation. Essentially this predictive model is identical to the historic model except that model cells within the Western Basin reclamation area were converted to active cells, with an upper elevation of 7 mAHD, in order to simulate groundwater levels in the proposed development area. The hydraulic properties of the reclamation area were assumed to be as per the calibrated values for fill material in the existing Fishermans Landing area (see Table 6).

As would be expected predictive model results suggest a tendency towards increased groundwater levels on the landward side of the reclamation area as groundwater levels in the reclamation area itself rise in response to groundwater recharge to the reclaimed surface. Groundwater levels will increase gradually and hence model results suggest onshore groundwater levels may increase by up to 0.5 m after 10 years and by up to 0.8 m after running the model through to equilibrium or steady state conditions. Predicted steady state groundwater level impacts are shown in Figure 3-7 and indicate onshore groundwater level impacts of greater than 0.1 m over a relatively wide area. Further analysis of the groundwater model predictions, however, suggests that the modelled water table will remain more than 1 m below ground surface over the majority of this area and hence the predicted increase in

groundwater levels will not in most cases lead to substantially increased risks of waterlogging. Through comparison of modelled depth to water table from the calibration and predictive models it is possible to identify additional areas where the modelled post development water table is less than 1m below the ground surface. These additional areas are shown in red shading in Figure 3-7 and cover a total area of around 0.175 km^2.



LEGEND

Predicted Groundwater Level Increase (m)

- 0
- 0.1
- 0.2
- 0.3
- 0.4
- 0.5
- 0.6
- 0.7
- 0.8
- 0.9
- 1
- 2

- Additional Shallow (<1m) Water Table Areas
- Western Basin Reclamation Area
- Fisherman's Landing Northern Expansion

1:50,000 (at A4)

0 0.5 1 1.5 2

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

Port of Gladstone
Western Basin Dredging and Disposal Project

Predicted Groundwater Level Impacts

Job Number	42-15386
Revision	A
Date	14 Oct 2009

Figure 3-7

G:\42\15386\GIS\WesternBasinProjects\MXDs\WB_513_rev_a.mxd

Level 4 201 Charlotte Street Brisbane QLD 4000 Australia T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

3.9 Summary of Environmental Values

The review of available data, field investigations and current understanding of existing groundwater conditions has identified the following environmental values of relevance to the groundwater regime in the vicinity of the proposed Reclamation Area:

» Groundwater abstraction (up hydraulic gradient of the proposed Reclamation Area); and

» Biological integrity (maintaining groundwater quality and levels for existing flora and fauna adjacent to the proposed Reclamation Area).

It is recognised that groundwater abstraction has been identified at a distance of more than 2 km from the proposed Reclamation Area, located up-hydraulic gradient (to the west). The registered groundwater bores within 2 km of the proposed Reclamation Area are either no longer present (RN 88464, RN 111928, RN 111929, RN 111930, RN 111931, RN 111932) or do not appear to exist (RN 97440) and the un-registered bores identified within 2 km appear to be for groundwater monitoring purposes.

4. Potential Impacts

Based on the current design of the proposed Reclamation Area, which includes the maintenance of a sea water channel between the existing coastline and the reclaim area, no significant impacts on groundwater resources and/or groundwater quality are anticipated. Nevertheless, potential sources of groundwater impacts during construction and/or post construction are outlined in Sections 4.1.1 and 4.1.2 below. Mitigation options and monitoring requirements are summarised in Section 5.

4.1.1 Potential Impacts - Construction Phase

The following potential impacts on groundwater adjacent to the proposed Reclamation Area have been identified for the construction phase:

- Groundwater modelling results indicate that groundwater levels in the coastal strip adjacent to the reclaim area may increase by up to 0.8 m due to revised groundwater flow patterns post development. However, model predictions also suggest that for the most part groundwater levels will remain more than 1m below surface and hence risks of water logging and/or soil salinisation will only be increased in isolated areas totalling around 0.175 km^2;
- Potential for degradation of groundwater quality adjacent to the proposed Reclamation Area as a result of any leaks and spills originating from construction activities on the landward side of the proposed reclamation; and
- Potential for the acidification and degradation in quality of the surrounding sea water if any acid sulfate soil material used in the proposed reclamation is not managed appropriately. This could lead to the mobilisation of metals in the fill material, such as aluminium and iron, and subsequent discharge to the sea.

4.1.2 Potential Impacts – Post Construction

Two of the identified potential impacts during the construction phase (see above) are also potentially relevant during the post construction phase, specifically:

- Groundwater modelling results indicate that groundwater levels in the coastal strip adjacent to the reclaim area may increase by up to 0.8 m due to revised groundwater flow patterns post development. However, model predictions also suggest that for the most part groundwater levels will remain more than 1m below surface and hence risks of water logging and/or soil salinisation will only be increased in isolated areas totalling around 0.175 km^2; and
- Potential for the acidification and degradation in quality of the surrounding sea water if any acid sulfate soil material used in the reclamation is not managed appropriately. This could lead to the mobilisation of metals in the fill material, such as aluminium and iron, and subsequent discharge to the sea.

5. Cumulative Impacts and Mitigation Strategies

5.1 Cumulative Impacts

Potential cumulative impacts on groundwater, from current and proposed projects are summarised in Table 7.

Table 7 Summary of Potential Cumulative Impacts

Project	Location	Groundwater Impact Potential	Justification
Proposed LNG pipeline (Santos)	Traversing the landward side of the coastline to the west of the Western Basin Project Area	Possible	Possible additional groundwater contaminant source: Proposed pipeline route (URS 2009) shown to be within a few 10's of m's of the coastline and the proposed Western Basin Reclamation Area. Potential for the existing groundwater quality on the landward side of the coastline to be compromised during/as a result of the pipeline construction. Disturbance to shallow groundwater during construction of the pipeline.
Stuart Energy (existing facility)	Approximately 0.5 to 0.75 km south west of the Western Basin Project Area	Unlikely	Potential contaminant source, however the reclaimed land of the Western Basin Project Area will be separated from the mainland by a channel.
Cement Australia (existing facility)	Approximately 0.5 to 0.75 km south of the Western Basin Project Area	Unlikely	Potential contaminant source, however the reclaimed land of the Western Basin Project Area will be separated from the mainland by a channel.
Existing facilities on Fisherman's Landing	Immediately south of the Western Basin Project Area	Unlikely	Potential contaminant source, however groundwater flow from Fisherman's Landing is likely to be towards open water, i.e. to the east and south.

5.2 Mitigation and Monitoring Strategies

Whilst no significant impacts on groundwater resources and/or groundwater quality are anticipated, this assessment is based on adoption of the mitigation strategies outlined below. Pre and post construction monitoring of groundwater levels and groundwater quality is also required to provide a more extensive baseline data set than is currently available and to confirm the impacts of the proposed Reclamation Area.

5.2.1 During Construction

The following measures are proposed to monitor and mitigate the potential impacts identified in Section 4 for the construction phase:

» Maintenance of regular groundwater monitoring (levels and quality), for a minimum 12 month period, prior to the start of construction to establish baseline groundwater conditions adjacent to the Reclamation Area and hence confirm key groundwater quality and level action criteria against which to monitor conditions during construction. This program should be agreed with the relevant authorities prior to commencement;

» Develop and implement a groundwater monitoring program to monitor groundwater levels and quality in the alluvial/colluvial deposits and fill material adjacent to the proposed Reclamation Area to confirm any groundwater impacts during the construction phase;

» Regular assessment of groundwater monitoring results against baseline groundwater conditions during construction;

» The installation of inlets and/or drainage channels at sea level within the proposed reclamation area thereby minimising groundwater level mounding within the area itself and hence reducing the potential for increased groundwater levels in onshore areas;

» If impacts on groundwater levels are identified an assessment of potential mitigation measures will be conducted, which will include the use of the groundwater flow model to help assess the effectiveness of proposed mitigation measures;

» Storage areas for vehicles, machinery, equipment, chemicals etc. whether on land or within the reclaim area during construction should have appropriate facilities to contain spills, leaks and surface water runoff to reduce the potential for contamination of groundwater through infiltration; and

» Groundwater monitoring should be conducted by a suitably qualified and experienced professional in accordance with the AS/NZS 5667.11:1998 *Australian/New Zealand Standard for water quality – sampling Part 11; guidance on sampling of groundwater's.*

5.2.2 Post Construction

The following measure is proposed to monitor and mitigate the potential impacts identified in Section 4 - post-construction:

» Develop and implement a groundwater monitoring program to monitor groundwater levels and quality in the alluvial/colluvial deposits adjacent to the proposed Reclamation Area and fill material within and adjacent to the proposed Reclamation Area to confirm any groundwater impacts.

6. Conclusion

- The hydrogeological units identified beneath and in the near vicinity of the proposed Reclamation Area are:
  - Fill of unknown composition, with potentially variable permeability;
  - Low permeability estuarine mud;
  - Variable permeability water bearing alluvium/colluvium; underlain by; and
  - Water bearing fractured bedrock.
- Groundwater level monitoring data indicates groundwater flow within the alluvium/colluvium from south west to north east, towards the coast and the proposed Reclamation Area and is likely to discharge either directly to the sea or via existing drainage channels;
- Groundwater within bedrock is also likely to flow to the north-east and could potentially discharge to the sea bed via the overlying deposits within the proposed Reclamation Area;
- Groundwater in the alluvium/colluvium on the landward side of the Project Area is poor quality (brackish to saline) and has a sodium-chloride type chemistry. Investigations indicate that it is not likely to be used for water supply within a 5 km radius of the site;
- Groundwater in bedrock on the landward side of the Project Area is also typically brackish but is used for local water supply. Database records and field investigations indicate that the nearest groundwater abstraction from bedrock is registered bore RN 91788, which is approximately 4.4 km west (up hydraulic gradient) of the proposed Reclamation Area;
- All of the groundwater bores identified in the investigations are located up hydraulic gradient of the proposed Reclamation Area;
- Potential impacts on groundwater resources/quality have been identified for the proposed Project however they are not anticipated to be significant. In summary, the potential impacts identified are:
  - Construction Phase – Potential for degradation of groundwater quality on the landward side of the proposed Reclamation Area from any leaks and spills during construction;
  - Construction and Post Construction Phases – Potential increase in groundwater levels and hence potential for water logging and/or soil salinisation on the landward site of the proposed Reclamation Area as a result of reclamation;
  - Construction and Post Construction Phases – Potential for acidification and degradation of the quality of the sea water surrounding the proposed Reclamation Area if any acid sulfate soil material placed in the reclaim fill is not managed appropriately.
- Proposed activities to monitor and mitigate the potential impacts for groundwater identified for the Project have been outlined for construction and post-construction phases.

7. References

ANZECC/ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ANZECC/ARMCANZ, Canberra

AS/NZS 5667.11:1998 *Australian/New Zealand Standard for water quality – sampling Part 11; guidance on sampling of groundwater's*

Bouwer, H. and R.C. Rice 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428

Connell Hatch 2006. Wiggins Island Coal Terminal Environmental Impact Statement, Revision 3

Dames and Moore 1998. Comalco Alumina Project Gladstone, Impact Assessment Study, Environmental Impact Statement, Volume 1

Department of Environment and Resource Management (DERM) April 2009. Queensland Groundwater Bore Database

Department of Natural Resources and Mines 2001. 1:100 000 Geological Series map for Gladstone, Sheet 9150

Department of Resource Industries 1991. Gladstone, Sheet 9150, 1:100 000 Geological Map Commentary

GHD 2008. Draft Environmental Impact Assessment and Preliminary Engineering, Fisherman's Landing: Acid Sulfate Soils Investigation (report ref. 380907)

Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, Bull. No. 36, Waterways Exper. Sta. Corps of Engrs, U.S. Army, Vicksburg, Mississippi, pp. 1-50.

Littleboy, M., Silburn, D.M., Freebairn, D.M., Woodruff, D.R. and Hammer, G.L. (1989). *PERFECT, A computer simulation model of Productivity, Erosion, Runoff Functions to Evaluate Conservation Techniques*. Queensland Department of Primary Industries, Bulletin QB89005, 119 pp.

Middlemis H., Merrick N., Ross, J. (2001) Murray Darling Basin Commission Groundwater Flow Modelling Guideline. Final Guideline Issue I.

Rassam, D. and Littleboy, M. (2003) *Identifying vertical and lateral components of drainage flux in hillslopes.* MODSIM 2003 Proceedings, vol1.

URS 2007. Gladstone Nickel Project Environmental Impact Statement

URS 2009. Terrain Soils and Land Capability, Gladstone LNG Facility, prepared for Santos Ltd

Appendix A

Summary of Bore Census Results

Summary Table

Table 4 Summary of Bore Census Results

RN or Bore Identifier (where known)	Estimated Distance from Mid Point of Project Site (m)	Bore Status	Bore Currently In Use?	Primary Purpose	Perceived Bore Condition Based on Census	Assessment of Monitoring Potential	Visited during Census
84982	4518.6	Existing (DERM)	Does not appear to be in use	Water Supply (DERM)	Good, frogs in bore	Good potential	Yes
88338	5797.4	Existing (DERM)	-	Water Supply (DERM)	-	-	No - No date in DERM database, bore not known to RTAY
88456	4753.4	Existing (DERM)	-	Water Supply (DERM)	-	-	Yes - but could not locate bore
88459	4907.1	Existing (DERM)	Not in use - infilled	Water Supply (DERM)	Filled in	-	Yes
88464	1153.1	Existing (DERM)	No longer present	Water Supply (DERM)	-	-	Yes - appears to have been destroyed
91788	4430.4	Existing (DERM)	In use	Water Supply (DERM) - Plant watering (land owner/occupier)			No - insufficient time to visit
97440	2266.9	Existing (DERM)	Does not appear to exist	Water Supply (DERM)	-	-	Yes - but could not locate bore
97444	5247.0	Existing (DERM)	-	Water Supply (DERM)	-	-	No - Outside model area
97960	4733.6	Existing (DERM)	Uncertain	Water Supply (DERM)	-	-	No - could not contact owner to arrange access
97989	4876.3	Existing (DERM)	Uncertain	Water Supply (DERM)	-	-	No - Could not find access to property
111120	4409.5	Existing (DERM)	Does not appear to be in use	Water Supply (DERM)	Good. No cap.	Good potential	Yes
111423	4845.8	Existing (DERM)	Uncertain	Water Supply (DERM)	-	-	Yes - but could not locate bore
111928	1987.3	Abandoned and Destroyed (DERM)	No longer present	Water Supply (DERM)	-	-	No - owner confirmed bore no longer exists
111929	1743.8	Abandoned and Destroyed (DERM)	No longer present	Water Supply (DERM)	-	-	No - owner confirmed bore no longer exists
111930	1862.7	Abandoned and Destroyed (DERM)	No longer present	Water Supply (DERM)	-	-	No - owner confirmed bore no longer exists
111931	1856.4	Abandoned and Destroyed (DERM)	No longer present	Water Supply (DERM)	-	-	No - owner confirmed bore no longer exists
111932	2534.0	Abandoned and Destroyed (DERM)	No longer present	Water Supply (DERM)	-	-	No - owner confirmed bore no longer exists
122949	4767.7	Existing (DERM)	Uncertain - could not be confirmed	Water Supply (DERM)			No - could not arrange access
No Identifier (Bore 1)	4888.2	Existing	Does not appear to be in use	-	Very bad	Do not use	Yes
No Identifier (Bore 2)	5021.2	Existing	Does not appear to be in use	-	Good, frogs in bore	Good	Yes
No Identifier (Bore 3)	4742.2	Existing	Does not appear to be in use	-	Poor	Not recommended	Yes
No Identifier (Bore 4)	4749.2	Existing	Does not appear to be in use	-	Poor	Not recommended	Yes
No Identifier (Bore 5)	5892.5	Existing	In use	Fire fighting and during training	Good	Bore closed off and capped. Good monitoring potential	Yes
No Identifier (Bore 6)	6334.2	Existing	Does not appear to be in use	-	Poor	Not recommended	Yes
No Identifier (Bore 7)	4700.7	Existing	Does not appear to be in use	-	Poor	Bore sealed with wooden block. Not recommended.	Yes
No Identifier (Bore 8)	4612.4	Existing	In use	Domestic	-	-	No - no permission to access
FL98-1A	1704.4	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL98-1B	1702.3	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL98-2B	1526.3	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL98-2A	1522.4	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL98-4	1885.4	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL98-3B	2092.6	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL01-1A	1330.7	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL01-1B	1331.2	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL01-2A	-	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL01-2B	-	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL01-3A	-	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL01-3B	-	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL01-4A	-	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
FL01-4B	-	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes

Table 4 Summary of Bore Census Results

RN or Bore Identifier (where known)	Estimated Distance from Mid Point of Project Site (m)	Bore Status	Bore Currently In Use?	Primary Purpose	Perceived Bore Condition Based on Census	Assessment of Monitoring Potential	Visited during Census
CSGW-1	2045.1	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
CSGW-2	2092.6	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
CSGW-3	2286.2	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
CSGW-4	2235.5	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
TS4/1	1173.6	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
TS4/2	1179.4	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
SRH-302	1228.8	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes
No Identifier	-	Existing	In use	Monitoring	Good	Good potential. Some historic data available	Yes

Bore monitored in this hydrogeological study
In use/ potentially in use
DERM - Department of Envronment and Resource Management April 2009

Appendix B

Borehole Logs

For monitoring bores installed as part of this hydrogeological study

HYDROGEOLOGICAL LOG

CLIENTS | PEOPLE | PERFORMANCE

Logged By: MP **Checked By:** AM

Site Identification: WB01-A

Project: Western Basin - EIS - Hydrogeology	**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:** Pioneer Drilling	**Datum:** GDA94
Site: Fisherman's Landing	**Easting:** 310693.448	**Equipment:** Hydra Power Scout	**Depth:** 20.0m	**Vertical Datum:** AHD
Job #: 42-15386-51	**Northing:** 7370071.253	**Inclination:** 90° **Bearing:** -	**Width:**	**Commenced:** 15-06-09
Client: Gladstone Ports Corporation Ltd	**Elevation:** 2.52	**North Reference:**	**Length:**	**Completed:** 15-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Graphic Log	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
				2.52		Surface Level					0.765m stickup Completed with lockable steel monument	
0.00				0.00		**CLAY (CH)** High plasticity Fine-to medium-grained sand Trace coarse-grained subangular to rounded sand Trace organic matter (rootlets) Light brown/grey, trace orange mottling	S		H			Bentonite/cement grout to surface
1.00			1.38m: Measured after installation	1.02								
				1.50		**Estuarine CLAY (CL)** Low plasticity Trace silt Trace fine-to coarse-grained sand Trace shell material Trace organic matter (rootlets) Dark grey			L			
2.00				-0.48								
3.00				3.00		**Sandy CLAY (CL)** Low plasticity Medium-to coarse-grained sand Trace fine-grained angular-to subangular gravel Trace organic matter (rootlets) Pale grey			L-M			
						Sandy CLAY (CI) Low to medium plasticity Fine-grained sand Trace medium-grained subangular-to subrounded gravel Pale grey, orange/brown mottling						
4.00				-2.15								
				4.67		**Sandy CLAY (CH)** High plasticity Fine-grained sand Coarse-grained subangular-to rounded gravel Gravel (highly to exteremly weathered) may be broken up to green silt Pale grey, orange mottling			H			
5.00				-3.48								
	Wash boring			6.00		**Clayey SAND (SC)** Medium plasticity fines Medium-to coarse-grained sand Brown			M			
6.00				-4.48								
				7.00		**CLAY (CH)** High plasticity Trace fine-grained and coarse-grained sand Grey, heavily stained orange (mottling)			H			
7.00				-5.48								
				8.00		**CLAY (CH)** High plasticity Firm Pale grey, trace orange mottling			H			
8.00				-6.28								
				8.80		**CLAY (CI)** Medium plasticity Fine-to medium-grained sand Trace organic matter Dark brown			M			
9.00				-7.48								
				10.00		**Clayey SILT (CI)**			M			
10.00												

HYDROGEOLOGICAL LOG

Logged By: MP **Checked By:** AM

Site Identification: WB01-A

Project: Western Basin - EIS - Hydrogeology	**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:** Pioneer Drilling	**Datum:** GDA94
Site: Fisherman's Landing	**Easting:** 310693.448	**Equipment:** Hydra Power Scout	**Depth:** 20.0m	**Vertical Datum:** AHD
Job #: 42-15386-51	**Northing:** 7370071.253	**Inclination:** 90° **Bearing:** -	**Width:**	**Commenced:** 15-06-09
Client: Gladstone Ports Corporation Ltd	**Elevation:** 2.52	**North Reference:**	**Length:**	**Completed:** 15-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
11.00	Wash boring			-8.48 11.00	**Clayey SILT (ML)** Medium plasticity Trace fine-to medium-grained sand Dark brown						
				-8.98 11.50	**CLAY (CH)** High plasticity Extremely weathered siltstone Trace fine-grained sand Dark grey, dark green/grey mottling			H M	EW		
12.00					**SILT (ML)** Medium plasticity Extremely weathered siltstone Trace fine-to medium-grained sand Pale grey, heavily stained orange/brown mottling						
13.00				-10.48 13.00	**Silty CLAY (CI)** Trace fine-grained sand Dark brown/grey, pale orange mottling			M			
14.00				-11.48 14.00	**Silty CLAY (CH)** **Residual** Extremely weathered siltstone High plasticity Firm Trace organic matter (rootlet) Pale grey, orange/brown and pink/brown mottling	F		H			
15.00											
16.00											Bentonite 15.5m to 16.3m
17.00											Screen interval 17.0m to 20.0m
18.00				-15.48 18.00	@ 18.00m: Trace fine-grained sand. Drillers comment; strength increasing with depth						
19.00											
20.00				-17.48 20.00	Borehole terminated at 20.0m Groundwater monitoring bore installed with 50mm ID uPVC casing and fitted with machine-slotted 0.5mm aperture screen (plus sediment sock)						
21.00											

HYDROGEOLOGICAL LOG

CLIENTS | PEOPLE | PERFORMANCE

Logged By: MP **Checked By:** AM

Site Identification: WB01-B

Project: Western Basin - EIS - Hydrogeology	**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:** Pioneer Drilling	**Datum:** GDA94
Site: Fisherman's Landing	**Easting:** 310694.415	**Equipment:** Hydra Power Scout	**Depth:** 7.0m	**Vertical Datum:** mAHD
Job #: 42-15386-51	**Northing:** 7370067.092	**Inclination:** 90° **Bearing:** -	**Width:**	**Commenced:** 15-06-09
Client: Gladstone Ports Corporation Ltd	**Elevation:** 2.54	**North Reference:**	**Length:**	**Completed:** 15-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Graphic Log	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
				2.54		Surface Level					0.765m stickup Completed with lockable steel monument	
0.00	Wash boring		0.868m: GW measured after installation	0.00		**CLAY (CH)** High plasticity Fine-to medium-grained sand Trace coarse-grained subangular to rounded sand Trace organic matter (rootlets) Pale brown/grey, trace orange mottling	S		H		Bentonite/cement grout to surface	
1.00				1.04								
				1.50		**CLAY (CL)** **Estuarine** Low plasticity Trace silt Trace fine-to coarse-grained sand Trace shell material Trace organic matter (rootlets) Dark grey			L			
2.00											Bentonite 2.0m to 3.0m	
				-0.49								
3.00				3.03		**Sandy CLAY (CL)** Low plasticity Medium-to coarse-grained sand Trace fine-grained angular-to subangular gravel Trace organic matter (rootlets) Pale grey			L-M			
						Sandy CLAY (CI) Low to medium plasticity Fine-grained sand Trace medium-grained subangular-to subrounded gravel Pale grey, orange/brown mottling					Screen interval 4.0m to 7.0m	
4.00				-2.06								
				4.60		**Sandy CLAY (CH)** **Residual** High plasticity Fine-grained sand Coarse-grained subangular-to rounded gravel Gravel (highly to extremely weathered) may be broken up to green silt Pale grey, orange mottling			H			
5.00												
				-3.46								
6.00				6.00		**Clayey SAND (SC)** Medium plasticity fines Medium-to coarse-grained sand Brown			M			
				-4.46								
7.00				7.00		Borehole terminated at 7.0m Groundwater monitoring bore installed with 50mm ID uPVC casing and fitted with machine-slotted 0.5mm aperture screen (plus sediment sock) Geological information from WB01-A						
8.00												
9.00												
10.00												

HYDROGEOLOGICAL LOG

CLIENTS | PEOPLE | PERFORMANCE

Logged By: MP **Checked By:**

Site Identification: WB02-A

Project: Western Basin - EIS - Hydrogeology	**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:** Pioneer Drilling	**Datum:** mAHD
Site: Fisherman's Landing	**Easting:** 310175.498	**Equipment:** Hydra Power Scout	**Depth:** 20.0m	**Vertical Datum:** GDA94
Job #: 42-15386-51	**Northing:** 7370111.614	**Inclination:** 90° **Bearing:** -	**Width:**	**Commenced:** 15-06-09
Client: Gladstone Ports Corporation Ltd	**Elevation:** 6.25	**North Reference:**	**Length:**	**Completed:** 15-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Graphic Log	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
				6.25		Surface Level					0.786m stickup Completed with lockable steel monument	
0.00	Wash boring		6.298m: GW measured after installation	0.00		**SILT (ML)** **Topsoil** Low plasticity Fine-to medium-grained sand Trace coarse-grained sand Organic matter (roots/grass) Dark brown			L		Bentonite/cement grout to surface	
				5.50								
				0.75					M			
1.00				5.05		**Clayey SAND (SC)** Medium plasticity Medium-to coarse-grained sand Fine-grained subrounded-to subangular gravel Trace fine-to medium-grained sand Brown			M			
				1.20								
				4.75					M-H			
				1.50								
2.00						**Sandy Gravelly CLAY (CI)** Medium plasticity Medium-to coarse-grained sand Fine-grained angular-to subangular gravel Trace organic matter (rootlets) Pale brown/grey						
3.00						**Sandy CLAY (CH)** Medium to high plasticity Medium-to coarse-grained sand Trace fine-grained sand Trace fine-grained subangular-to subangular gravel Pale brown/grey						
4.00				1.95								
				4.30		**CLAY (CH)** High plasticity Trace fine-to medium-grained sand Brown, trace dark red/brown mottling	F-St		H			
				1.35								
5.00				4.90		@4.90m: Colour change: Dark grey/brown, increase in dark red/brown mottling						
6.00				-0.25								
				6.50		**CLAY (CH)** High plasticity Fine-to medium-grained sand Trace coarse-grained sand Trace fine-grained subangular gravel Trace organic matter (rootlets) Brown/grey, dark red/brown mottling and trace pale orange mottling			H			
7.00				-0.85								
				7.10					M-H			
						CLAY (CI) Medium to high plasticity Trace fine-to medium-grained sand Pale grey/brown, red/brown mottling						
8.00												
				-2.75								
9.00				9.00		@ 9.0m: Dark grey/brown clay and yellow colouring/staining						
				-3.75								
10.00				10.00		@10.0m: Change in colour to pale grey, trace orange mottling and trace dark red/brown staining Occassional bands of hardened sediments (1cm to 5cm) encountered - siltstone/shale Dark grey/dark brown (very hard) - drill bit grinding						

HYDROGEOLOGICAL LOG

Logged By: MP **Checked By:**

Site Identification: WB02-A

Project: Western Basin - EIS - Hydrogeology	**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:** Pioneer Drilling	**Datum:** mAHD
Site: Fisherman's Landing	**Easting:** 310175.498	**Equipment:** Hydra Power Scout	**Depth:** 20.0m	**Vertical Datum:** GDA94
Job #: 42-15386-51	**Northing:** 7370111.614	**Inclination:** 90° **Bearing:** -	**Width:**	**Commenced:** 15-06-09
Client: Gladstone Ports Corporation Ltd	**Elevation:** 6.25	**North Reference:**	**Length:**	**Completed:** 15-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Graphic Log	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
11.00												
12.00												
13.00												
14.00												
15.00	Wash boring											Bentonite 15.0m to 16.0m
16.00				-9.65 15.90		@15.9m: Colour change to grey, trace yellow and red mottling in places						
17.00												Screen interval 17.0m to 20.0m
18.00				-11.75 18.00		@18.0m: Increase in fine-grained sand content to approximately 10%						
19.00												
20.00				-13.75 20.00		Borehole terminated at 20.0m Groundwater monitoring bore installed with 50mm ID uPVC casing and fitted with machine-slotted 0.5mm aperture screen (plus sediment sock)						
21.00												

HYDROGEOLOGICAL LOG

CLIENTS | PEOPLE | PERFORMANCE

Logged By: MP **Checked By:** AM

Site Identification: WB03-A

Project: Western Basin	**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:**		**Datum:** GDA94
Site: Fisherman's Landing	**Easting:** 311319.379	**Equipment:** Hydra Power Scout	**Depth:** 19.0m		**Vertical Datum:** mAHD
Job #: 42-15386-51	**Northing:** 7368956.625	**Inclination:** 90° **Bearing:** -	**Width:**		**Commenced:** 29-06-09
Client: Gladstone Ports Authority	**Elevation:** 3.79	**North Reference:**	**Length:**		**Completed:** 29-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Graphic Log	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
				3.79		Surface Level						0.858m stickup Completed with lockable steel monument
0.00	Wash boring		2.208m: GW measured after installation	0.00		**SILT (ML)** **Topsoil** Low to medium plasticity Fine-to medium-grained sand Trace fine-grained angular-to subangular gravel Organic matter (roots) Brown, trace orange mottling			L-M			Bentonite/cement grout to surface
				0.50					M			
1.00						**Clayey GRAVEL (GC)** Medium plasticity Fine-to medium-grained angular-to subangular gravel Trace fine-to medium-grained sand Trace organic matter (rootlets)						
				1.79		Increase in gravel content and decrease in clay content with depth. Trace coarse-grained gravel (drill bit grinding in places)						
2.00				2.00		**Gravelly CLAY (CI)** Medium to high plasticity Fine-grained subangular-to angular gravel Trace fine-to coarse-grained sand Trace organic matter (rootlets) Brown/yellow			M-H			
3.00				0.49		2.50m to 2.70m: Drill bit grinding; fine-to medium-grained subangular-to angular gravel 2.90m to 3.30m: Drill bit grinding on gravel						
				3.30		**Sandy CLAY (CH)** Medium to high plasticity Fine-to medium-grained sand Trace coarse-grained angular-to subangular sand Trace fine-grained angular gravel Pale grey			M-H			
4.00												
5.00												
6.00				-2.61								
				6.40		**CLAY (CH)** Medium to high plasticity Trace fine-grained sand Pale grey, red, red/brown and orange mottling			M-H			
7.00				-3.41								
				7.20		**Sandy CLAY/CLAY (CL)** Low to medium plasticity Very fine-grained to fine-grained sand Trace medium-grained sand Pale grey, orange mottling Decrease in sand content with depth; trace medium-to coarse-grained angular to subangular sand Trace fine-grained angular to subangular gravel (rounded quartz grains) Mostly sandy CLAY with occassional CLAY lenses; trace sand, trace organic matter (rootlets).			L-M			
8.00												
9.00												
10.00												

HYDROGEOLOGICAL LOG

Logged By: MP **Checked By:** AM

Site Identification: WB03-A

Project: Western Basin		**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:**	**Datum:** GDA94
Site: Fisherman's Landing	**Easting:** 311319.379	**Equipment:** Hydra Power Scout		**Depth:** 19.0m	**Vertical Datum:** mAHD
Job #: 42-15386-51	**Northing:** 7368956.625	**Inclination:** 90°	**Bearing:** -	**Width:**	**Commenced:** 29-06-09
Client: Gladstone Ports Authority	**Elevation:** 3.79	**North Reference:**		**Length:**	**Completed:** 29-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Graphic Log	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
11.00				-7.21 11.00		@11.00m: Increase in sand content, very fine-grained to fine-grained sand Trace medium-grained sand						
12.00												
13.00				-9.71 13.50		**CLAY (CH)** High plasticity Trace fine-grained to medium-grained sand Pale grey, trace orange mottling			H			
14.00												Bentonite 14.0m to 15.0m
15.00	Wash boring											
16.00												Screen interval 16.0m to 19.0m
17.00												
18.00				-14.71 18.50		@18.50-19.00m: Hard, drill bit grinding (siltstone) No cuttings large enough to confirm, trace carbonaceous material	H					
19.00				-15.21 19.00		Borehole terminated at 20.0m Groundwater monitoring bore installedwith 50mm ID uPVC casing and fitted with machine-slotted 0.5mm aperture screen (plus sediment sock)						
20.00												
21.00												

HYDROGEOLOGICAL LOG

CLIENTS | PEOPLE | PERFORMANCE

Logged By: MP **Checked By:** AM

Site Identification: WB03-B

Project: Western Basin EIS		**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:** Pioneer Drilling	**Datum:** GDA94
Site: Fisherman's Landing	**Easting:** 311323.052	**Equipment:** Hydra Power Scout		**Depth:** 5.5	**Vertical Datum:** mAHD
Job #: 42-15386-51	**Northing:** 7368958.946	**Inclination:** 90°	**Bearing:** -	**Width:**	**Commenced:** 29-06-09
Client: Gladstone Ports Corporation	**Elevation:** 3.71	**North Reference:**		**Length:**	**Completed:** 29-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Graphic Log	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
				3.71		Surface Level					0.697m stickup Completed with lockable steel monument	
0.00	Wash boring		SWL 1.78mTOC	0.00		**Clayey Sandy GRAVEL (GC)** Medium-to coarse-grained sand Fine-to medium-grained angular to subangular gravel Trace organic matter (rootlets) Brown, red mottling Drill bit grinding on gravel					Bentonite/cement grout to surface	
1.00				1.71							Bentonite 1.0m to 2.0m	
2.00				2.00		**Sandy Gravelly CLAY (CI)** Medium to high plasticity Fine-to coarse-grained angular to subangular sand Fine-grained angular-to subrounded gravel Trace organic matter Brown			M-H			
3.00				0.31							Screen interval 2.5m to 5.5m	
4.00				3.40		**CLAY (CH)** High plasticity Trace fine-to medium-grained sand Pale grey, trace orange mottling Decrease in sand content with depth Lenses of sandy CLAY, very fine-to fine-grained sand, trace medium-grained sand			H			
5.00				-1.79								
				5.50		Borehole terminated at 5.5m Groundwater monitoring bore installed with 50mm ID uPVC casing and fitted with machine-slotted 0.5mm aperture screen (plus sediment sock)						
6.00												
7.00												
8.00												
9.00												

HYDROGEOLOGICAL LOG

CLIENTS | PEOPLE | PERFORMANCE

Logged By: MP **Checked By:** AM

Site Identification: WB04-A

Project: Western Basin - EIS - Hydrogeology	**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:** Pioneer Drilling	**Datum:** GDA94
Site: Fisherman's Landing	**Easting:** 310783.045	**Equipment:** Hydra Power Scout	**Depth:** 20.0m	**Vertical Datum:** mAHD
Job #: 42-15386-51	**Northing:** 7368615.555	**Inclination:** 90° **Bearing:** -	**Width:**	**Commenced:** 30-06-09
Client: Gladstone Ports Authority	**Elevation:** 16.29	**North Reference:**	**Length:**	**Completed:** 30-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
0.00				16.29	Surface Level					0.733m stickup Completed with lockable steel monument	
				0.00 15.89	**Sandy SILT (ML)** **Topsoil** Low plasticity Fine-to coarse-grained sand Fine-to medium-grained subangular to subrounded gravel Trace cobble Organic matter (rootles/roots) Dark Brown			L			Bentonite/cement grout to surface
				0.40 15.19				M			
1.00				1.10	**Sandy CLAY (CI)** Medium plasticity Fine-to medium-grained sand Trace coarse-grained angular to subangular sand Trace organic matter (rootlets) Red/orange/brown			M			
2.00					**Gravelly CLAY (CI)** Medium plasticity Fine-to coarse-grained sand Fine-grained angular-to subangular gravel (lithic) Pale grey, stained orange/red (pink colouring)						
				13.29 3.00	@3.00m: Red/brown mottling						
3.00				12.29							
4.00				4.00	**Sandy CLAY (CI)** Medium plasticity Fine-to coarse-grained sand Trace fine-grained angular gravel Pale grey, dark red/brown mottling Decrease in red/brown mottling with depth			M			
5.00	Wash boring			10.79 5.50	**CLAY (CH)** High plasticity Trace fine-to medium-grained sand Pale grey, dark red/brown mottling Decrease in dark red/brown mottling with depth			H			
6.00											
7.00											
				8.29 8.00	@ 8.0m: Orange/yellow mottling beginning						
8.00											
				7.29 9.00	@9.0m: Colour change to pale grey/green, orange/yellow mottling and trace red/orange and red mottling						
9.00											
10.00											

HYDROGEOLOGICAL LOG

CLIENTS | PEOPLE | PERFORMANCE

Logged By: MP **Checked By:** AM

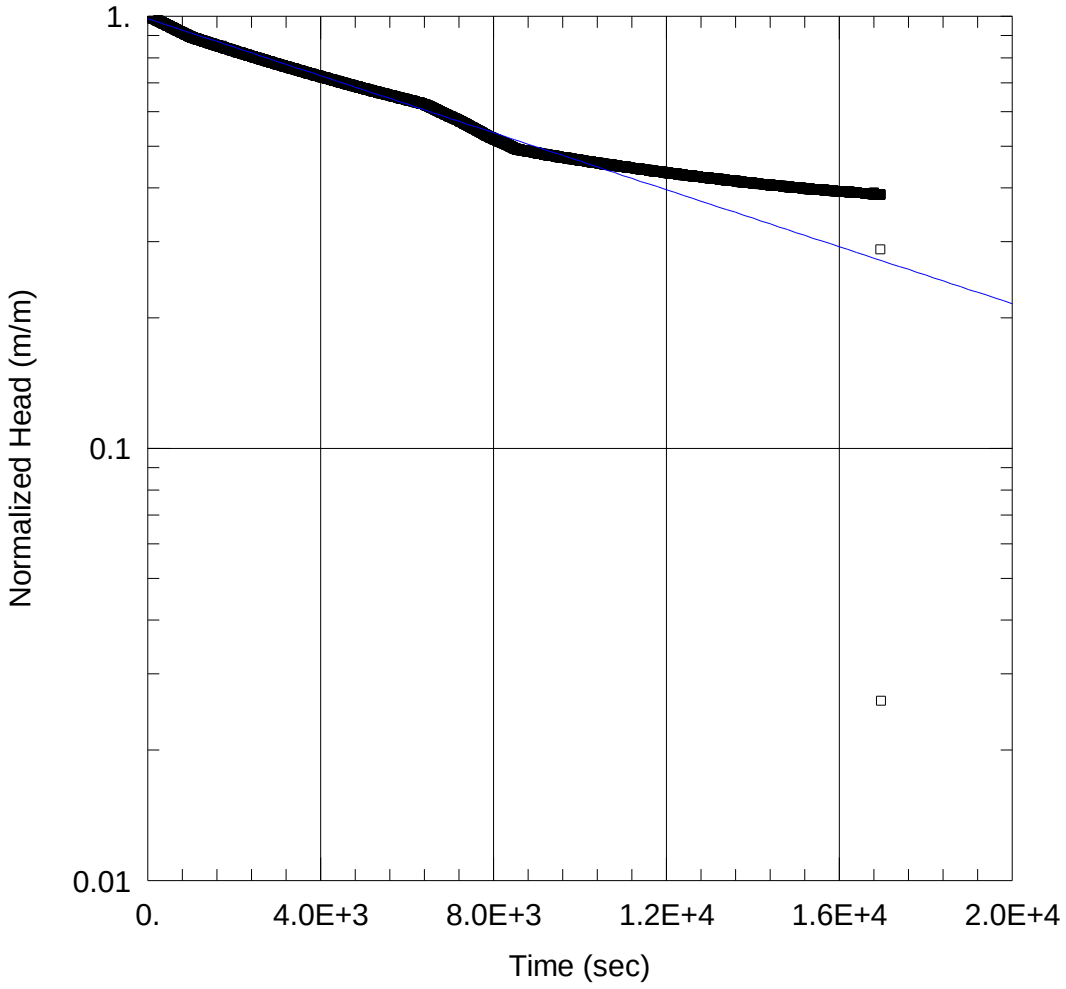
Site Identification: WB04-A

Project: Western Basin - EIS - Hydrogeology	**Test Pit:** ☐ **Drill Hole:** ☑	**Diameter:** 100mm	**Contractor:** Pioneer Drilling	**Datum:** GDA94
Site: Fisherman's Landing	**Easting:** 310783.045	**Equipment:** Hydra Power Scout	**Depth:** 20.0m	**Vertical Datum:** mAHD
Job #: 42-15386-51	**Northing:** 7368615.555	**Inclination:** 90° **Bearing:** -	**Width:**	**Commenced:** 30-06-09
Client: Gladstone Ports Authority	**Elevation:** 16.29	**North Reference:**	**Length:**	**Completed:** 30-06-09

Depth (m)	Method	Support	Water	Elevation/RL (m)	Graphic Log	Material Description	Consistency	Moisture	Plasticity	Weathering	Piezometer Construction	Tests And Samples
11.00												
12.00												
13.00				3.29 13.00		**Sandy CLAY (CH)** High plasticity Fine- to medium-grained sand Dark grey with trace orange and red mottling			H			
14.00												
15.00	Wash boring			1.29 15.00		**SILTSTONE** Highly weathered Medium strength Grey Auger bit grinding, little cuttings returning	VH					Bentonite 15.0m to 16.0m
16.00				-0.21 16.50		**Sandy CLAY (CH)** Medium to high plasticity Fine-to medium-grained sand Trace coarse-grained angular-to subangular sand Grey, trace orange mottling Increase in sand content with depth			M-H			
17.00												Screen interval 17.0m to 20.0m
18.00												
19.00			19.42m TOC: GW measured after slug test									
20.00				-3.71 20.00		Borehold terminated at 20.0m Groundwater monitoring bore installed with 50mm ID uPVC casing and fitted with machine-slotted 0.5mm aperture screen (plus sediment sock)						
21.00												

Appendix C

Hydraulic Conductivity Test Analysis Graphs



WELL TEST ANALYSIS

Data Set: G:\...\WB01-A_BouwerRice_v2.aqt
Date: 09/25/09 Time: 08:30:50

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB01-A
Test Date: 19-06-09

AQUIFER DATA

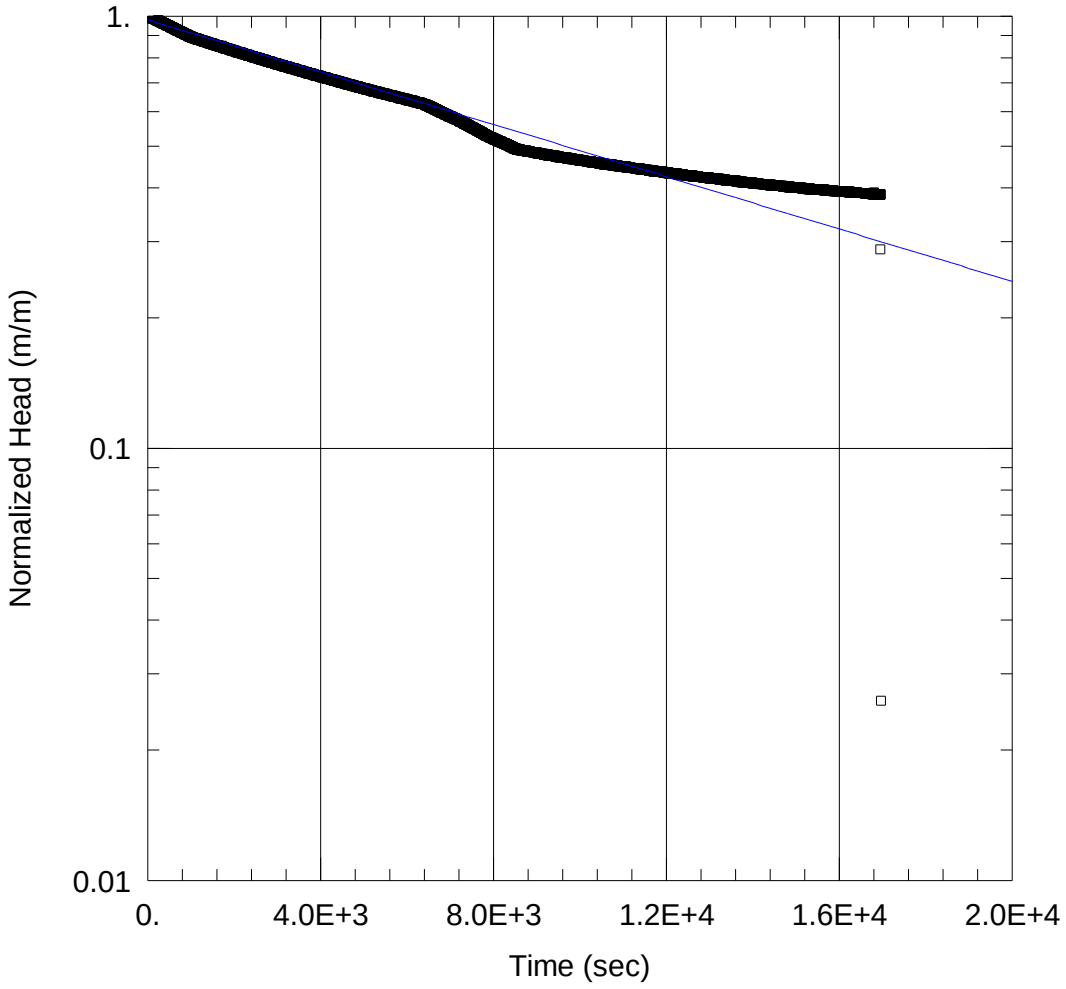
Saturated Thickness: 18.62 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB01-A)

Initial Displacement: 1.733 m
Total Well Penetration Depth: 18.5 m
Casing Radius: 0.025 m
Static Water Column Height: 18.62 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003141 m/day
y0 = 1.707 m



WELL TEST ANALYSIS

Data Set: G:\...\WB01-A_Hvorslev_v2.aqt
Date: 09/25/09 Time: 08:31:04

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB01-A
Test Date: 19-06-09

AQUIFER DATA

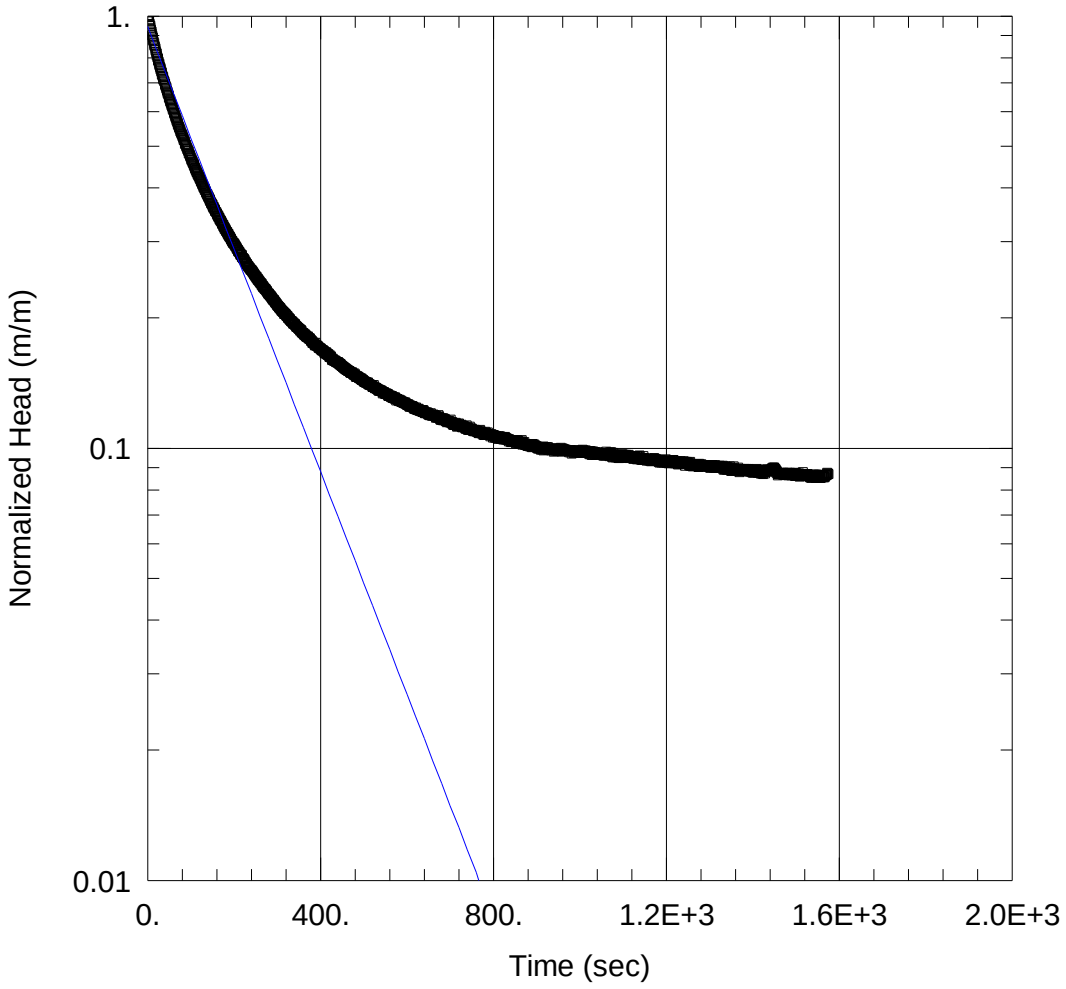
Saturated Thickness: 18.62 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB01-A)

Initial Displacement: 1.733 m
Total Well Penetration Depth: 18.5 m
Casing Radius: 0.025 m
Static Water Column Height: 18.62 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.003003 m/day
y0 = 1.698 m



WELL TEST ANALYSIS

Data Set: G:\...\WB01-B_BouwerRice.aqt
Date: 09/25/09 Time: 08:30:22

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB01-B
Test Date: 19-06-09

AQUIFER DATA

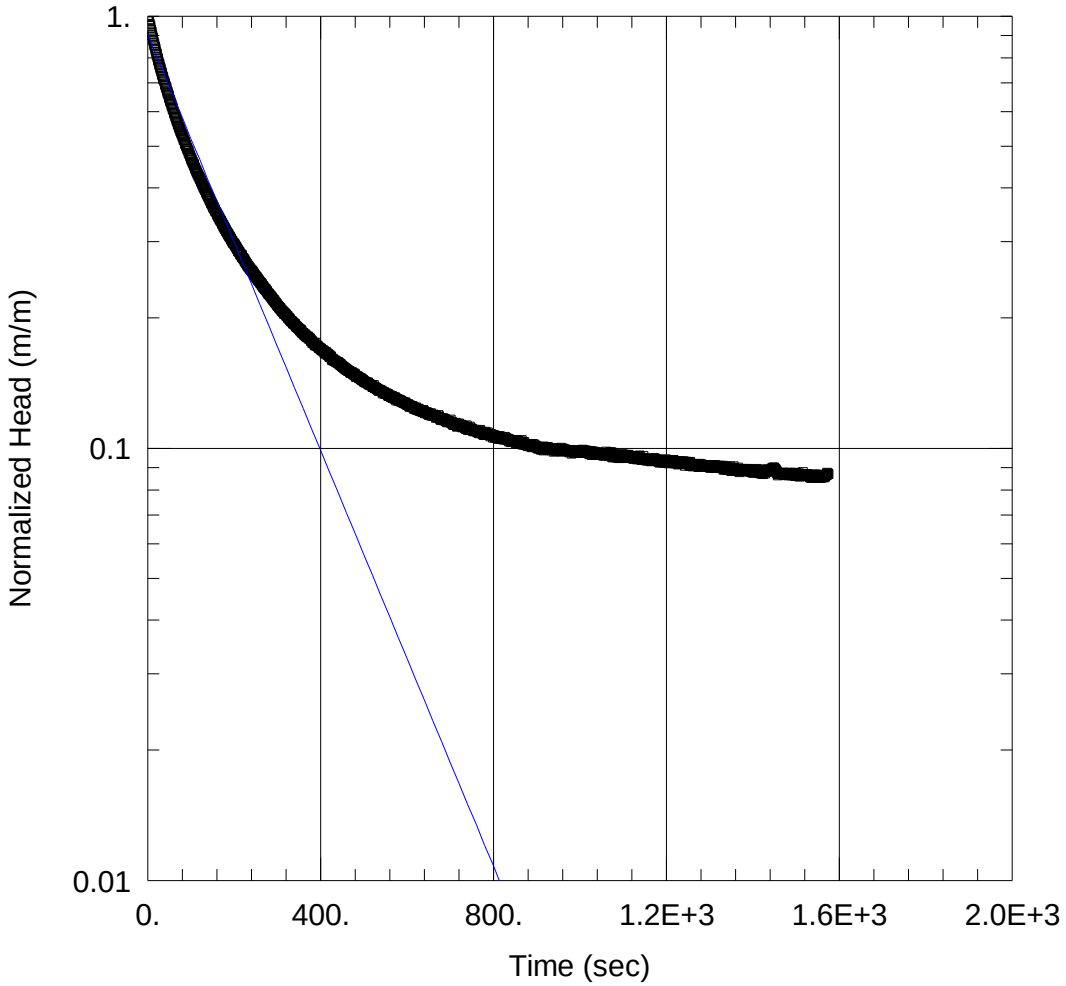
Saturated Thickness: 6.132 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB01-B)

Initial Displacement: 1.398 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.025 m
Static Water Column Height: 6.132 m
Screen Length: 1. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.4536 m/day
y0 = 1.322 m



WELL TEST ANALYSIS

Data Set: G:\...\WB01-B_Hvorslev.aqt
Date: 09/25/09 Time: 08:30:04

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB01-B
Test Date: 19-06-09

AQUIFER DATA

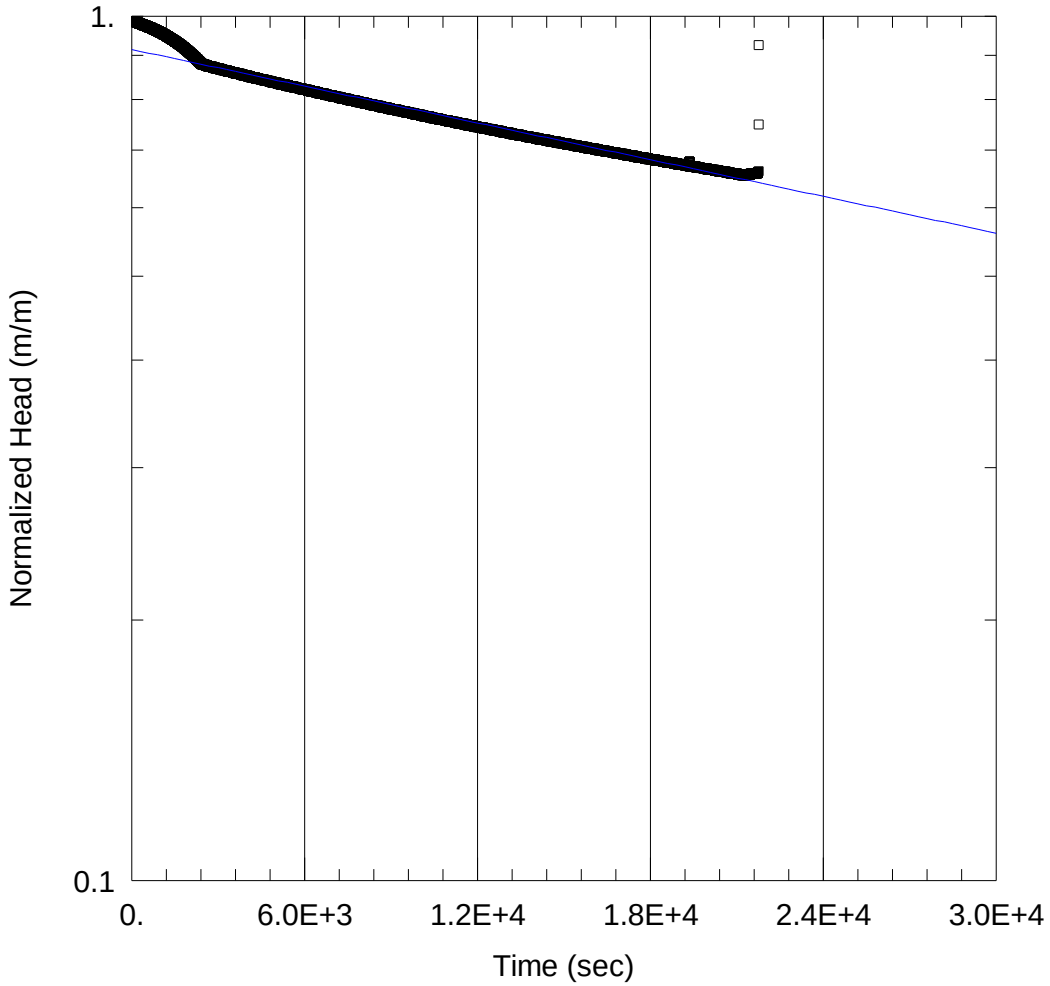
Saturated Thickness: 6.132 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB01-B)

Initial Displacement: 1.398 m
Static Water Column Height: 6.132 m
Total Well Penetration Depth: 3. m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.5519 m/day
y0 = 1.268 m



WELL TEST ANALYSIS

Data Set: G:\...\WB02-A_BouwerRice_v2.aqt
Date: 09/25/09 Time: 08:29:49

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB02-A
Test Date: 19-06-09

AQUIFER DATA

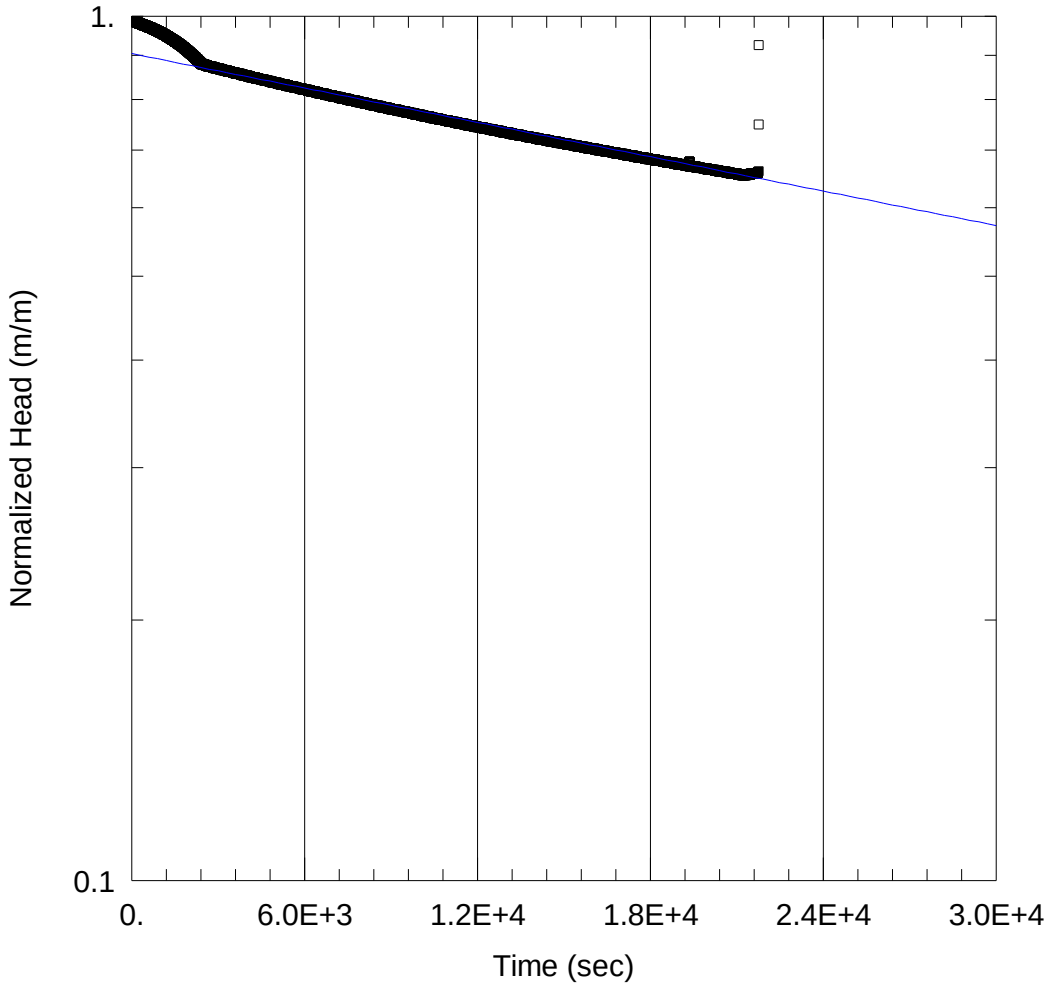
Saturated Thickness: 13.7 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB02-A)

Initial Displacement: 5.016 m
Total Well Penetration Depth: 20. m
Casing Radius: 0.025 m
Static Water Column Height: 13.7 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0007136 m/day
y0 = 4.588 m



WELL TEST ANALYSIS

Data Set: G:\...\WB02-A_Hvorslev_v2.aqt
Date: 09/25/09 Time: 08:29:33

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB02-A
Test Date: 19-06-09

AQUIFER DATA

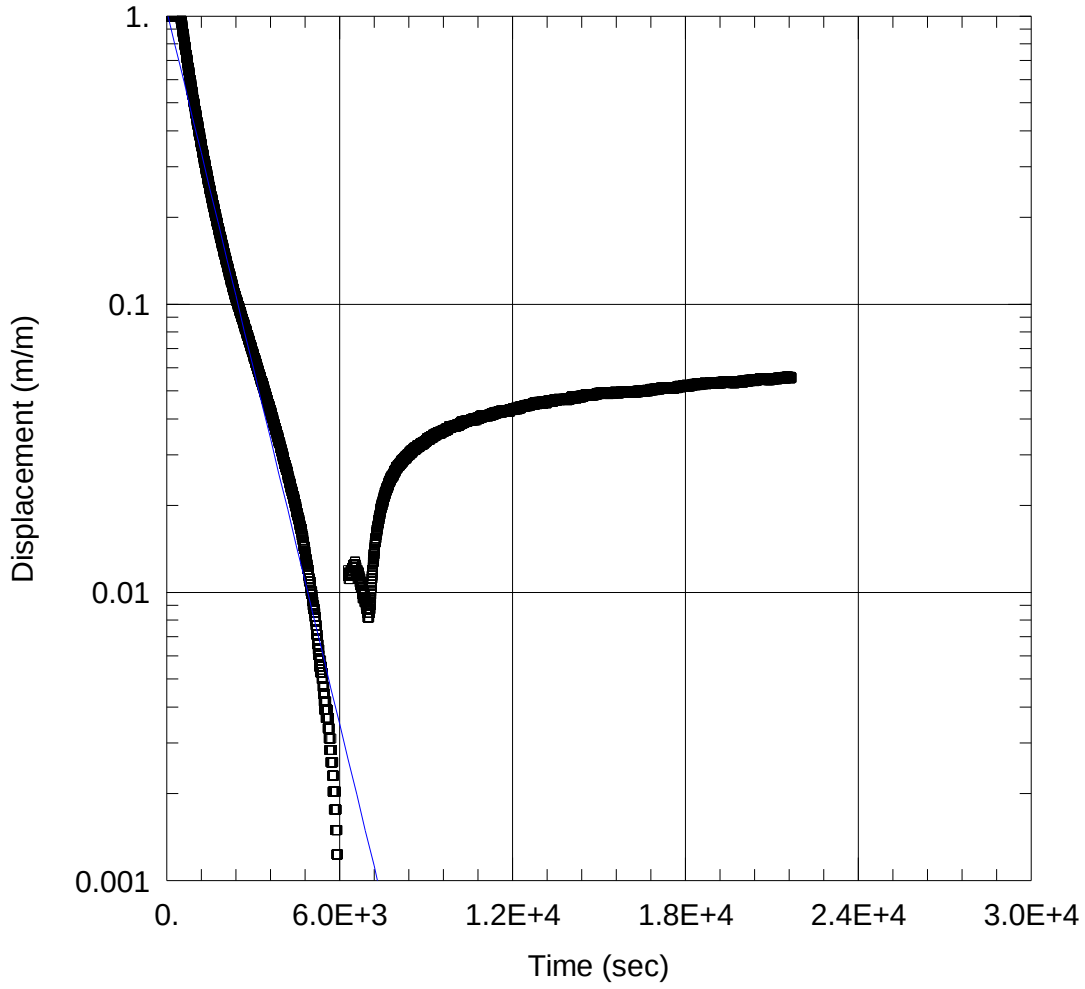
Saturated Thickness: 13.7 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB02-A)

Initial Displacement: 5.016 m
Total Well Penetration Depth: 20. m
Casing Radius: 0.025 m
Static Water Column Height: 13.7 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.0007523 m/day
y0 = 4.537 m



WELL TEST ANALYSIS

Data Set: G:\...\WB03-A_BouwerRice.aqt
Date: 09/25/09 Time: 08:28:21

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB03-A
Test Date: 19-06-09

AQUIFER DATA

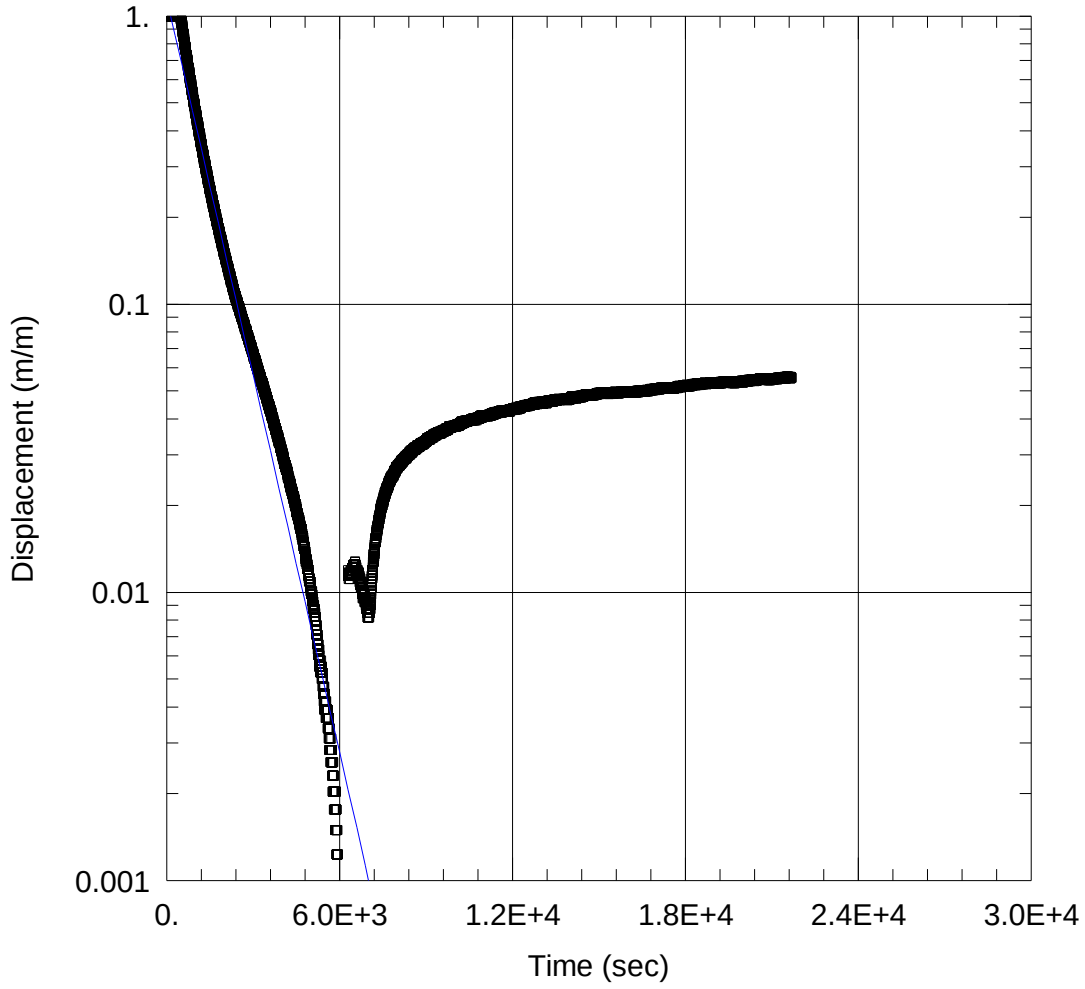
Saturated Thickness: 17.79 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB03-A)

Initial Displacement: -64.1 m
Total Well Penetration Depth: 17. m
Casing Radius: 0.025 m
Static Water Column Height: 17.79 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.03681 m/day
y0 = -67.14 m



WELL TEST ANALYSIS

Data Set: G:\...\WB03-A_Hvorslev.aqt
Date: 09/25/09 Time: 08:28:45

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB03-A
Test Date: 19-06-09

AQUIFER DATA

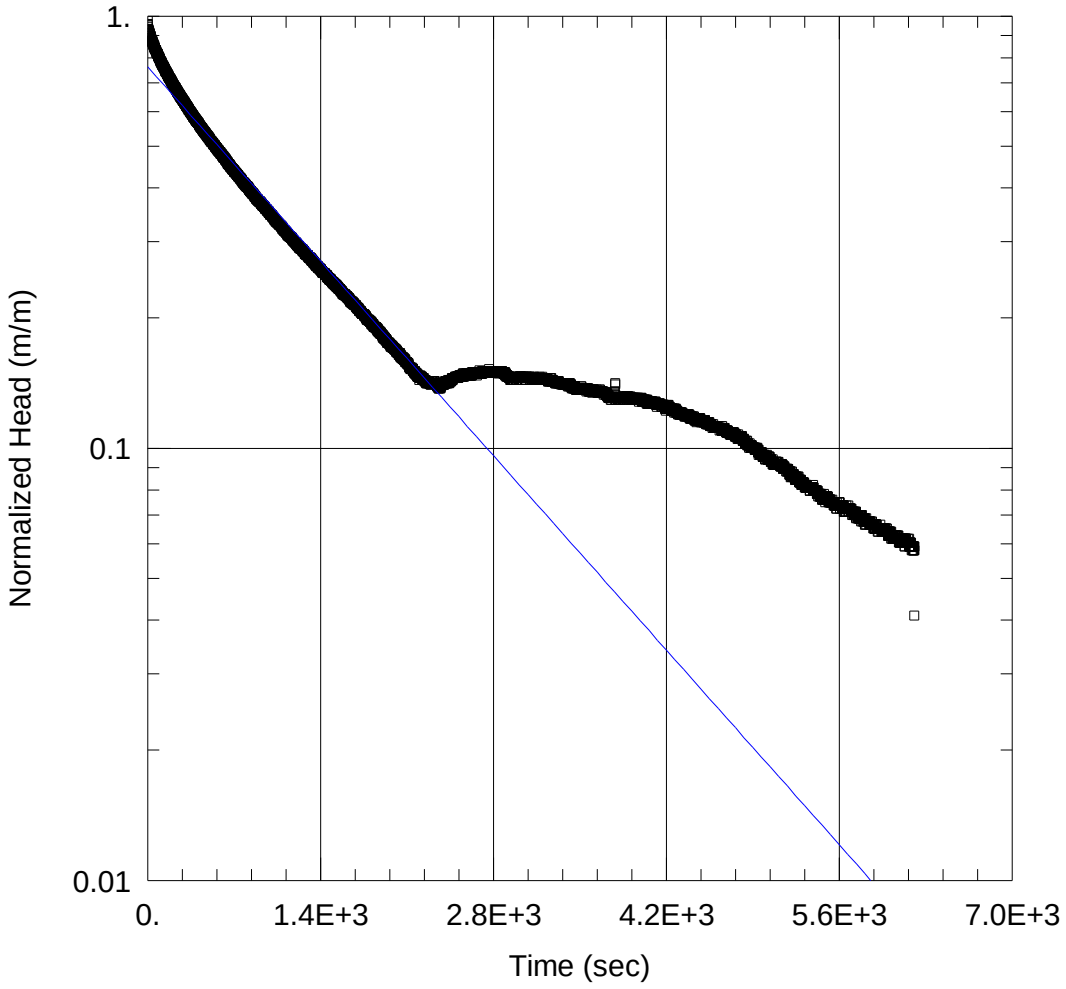
Saturated Thickness: 17.79 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB03-A)

Initial Displacement: -64.1 m
Total Well Penetration Depth: 17. m
Casing Radius: 0.025 m
Static Water Column Height: 17.79 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.04331 m/day
y0 = -74.27 m



WELL TEST ANALYSIS

Data Set: G:\...\WB03-B_BouwerRice.aqt
Date: 09/25/09 Time: 08:29:02

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB03-B
Test Date: 19-06-09

AQUIFER DATA

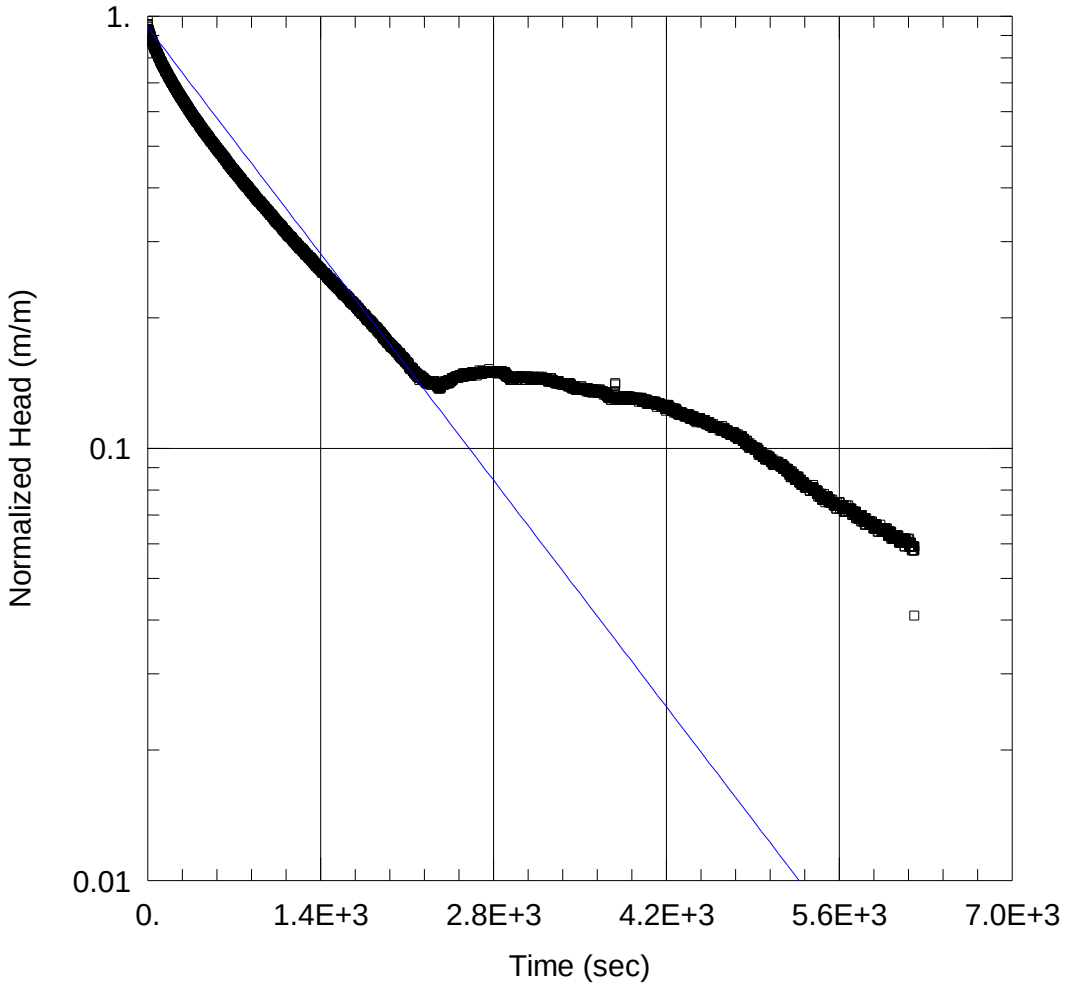
Saturated Thickness: 3.287 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB03-B)

Initial Displacement: 2.064 m
Total Well Penetration Depth: 3.287 m
Casing Radius: 0.025 m
Static Water Column Height: 3.287 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02499 m/day
y0 = 1.576 m



WELL TEST ANALYSIS

Data Set: G:\...\WB03-B_Hvorslev.aqt
Date: 09/25/09 Time: 08:29:20

PROJECT INFORMATION

Company: GHD
Client: Gladstone Pots Corporation Ltd
Project: 42-15386-51
Location: Gladstone - Cement Australia
Test Well: WB03-B
Test Date: 19-06-09

AQUIFER DATA

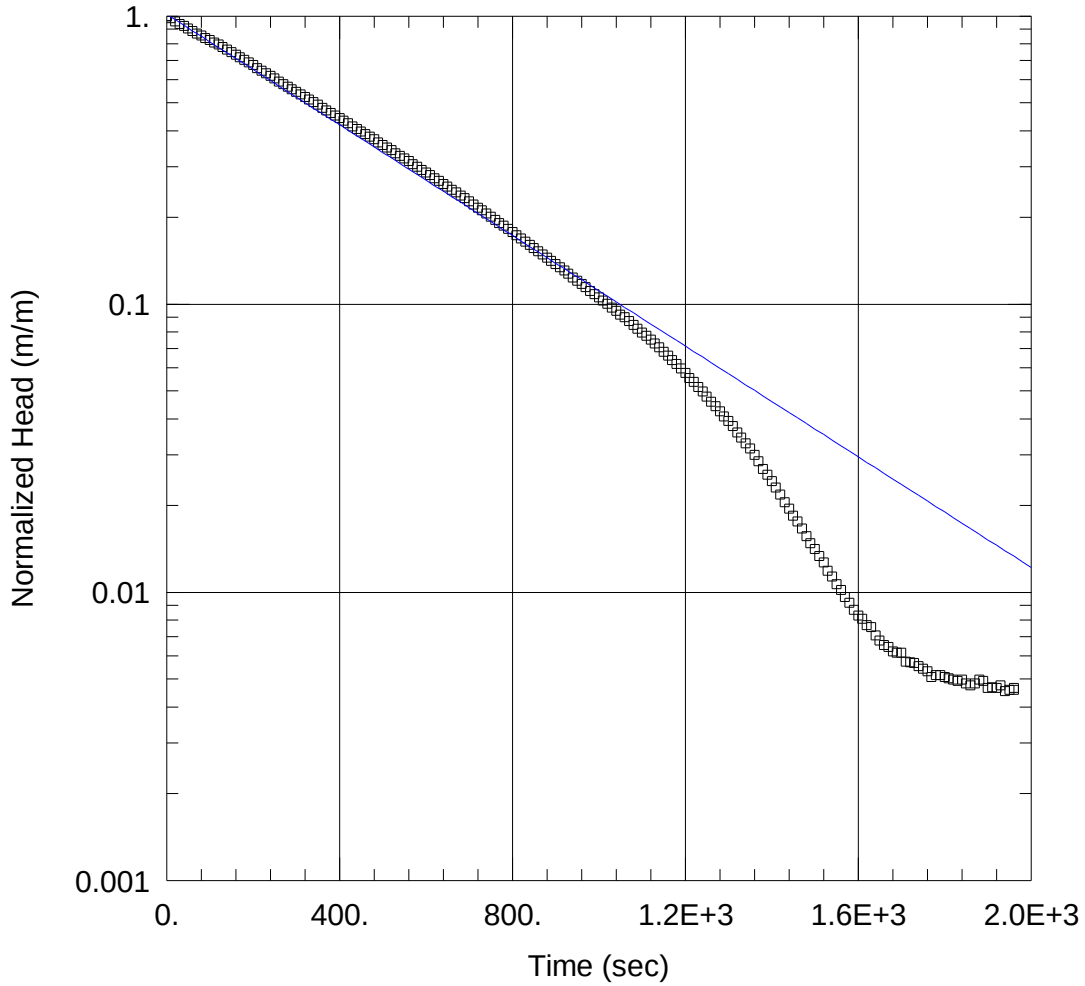
Saturated Thickness: 3.287 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (WB03-B)

Initial Displacement: 2.064 m
Total Well Penetration Depth: 3.287 m
Casing Radius: 0.025 m
Static Water Column Height: 3.287 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.04251 m/day
y0 = 1.944 m



WELL TEST ANALYSIS

Data Set: G:\...\CSGW-2 BouwerRice.aqt
Date: 09/24/09 Time: 17:06:28

PROJECT INFORMATION

Company: GHD
Client: GPC
Project: 42/15386/51
Location: Caustic Bladder
Test Well: CSGW2
Test Date: 10/08/09

AQUIFER DATA

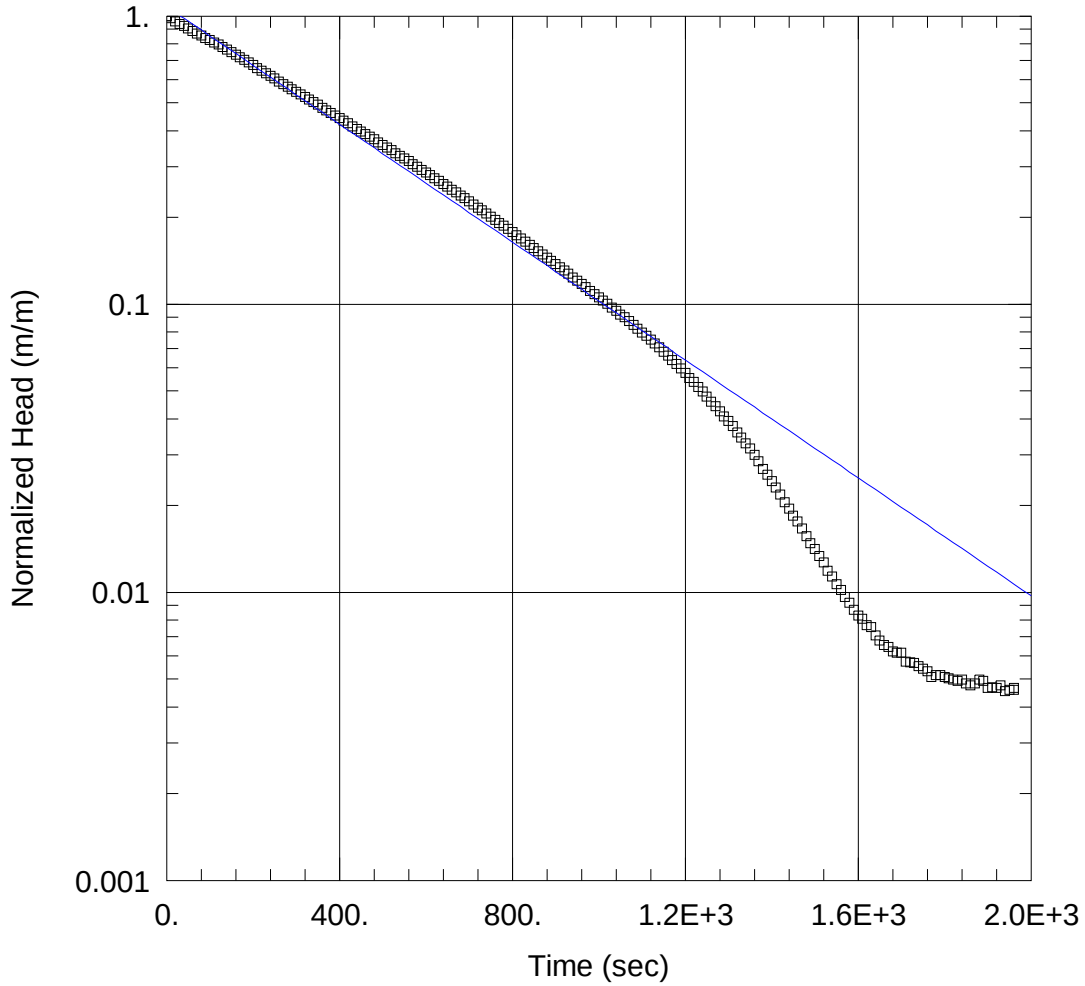
Saturated Thickness: 3.395 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CSGW2)

Initial Displacement: 2.8 m
Static Water Column Height: 3.395 m
Total Well Penetration Depth: 3.395 m
Screen Length: 3. m
Casing Radius: 0.025 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.07505 m/day
y0 = 2.841 m



WELL TEST ANALYSIS

Data Set: G:\...\CSGW-2_Hvorslev.aqt
Date: 09/25/09 Time: 09:44:52

PROJECT INFORMATION

Company: GHD
Client: GPC
Project: 42/15386/51
Location: Caustic Bladder
Test Well: CSGW-2
Test Date: 10/08/09

AQUIFER DATA

Saturated Thickness: 3.395 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CSGW2)

Initial Displacement: 2.8 m
Static Water Column Height: 3.395 m
Total Well Penetration Depth: 3.395 m
Screen Length: 3. m
Casing Radius: 0.025 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.1162 m/day
y0 = 3.023 m

Appendix D

Groundwater Quality Results

Summary Table

Groundwater Analysis Results Summary

									Alkalinity				BTEX						Field Physico-Chemical									Laboratory Physico-Chemical	
			PAH Total (NSW, 1999)	Polycylic aromatic hydrocarbons	Scheduled Chemicals (NSW, 1999)	Silica	Silicon	Silicon (Filtered)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Bicarbonate	Carbonate	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total	Dissolved Oxygen	Dissolved Oxygen (% saturated)	In-situ Electrical Conductivity	pH	Redox	Temp	Field TDS	Hardness Calculated	Hardness Calculated (Filtered)	pH (Lab)	TDS
			mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	%S	uS/cm	pH_Units	mV	oC	mg/L	mg/L	mg/L	pH_Units	mg/L
EQL				1		100	50	50	1	1	1	1	1	2	2	2	2											0.01	1
ANZECC (2000) Ecosystems Marine Water (95%)													**700**																
Field_ID	**LocCode**	**Sampled_Date-Time**																											
CSGW-2	CSGW-2	2/07/2009	<0.0145	<1	<0.003	10400	4840	-	<1	168	168	<1	<1	<2	<2	<2	<2	<4	-	32.8	12710	5.91	-19	23.9	-	1605.612	-	6.46	10400
CSGW-2	CSGW-2	10/08/2009	-	-	-	7200	-	3360	<1	141	141	<1	-	-	-	-	-	-	-	53.7	12200	6.03	-45	22.4	-	-	908.318	6.39	5960
FL98-2A	FL98-2A	22/07/2009	<0.0145	<1	<0.003	20300	-	3300	<1	450	450	<1	<1	<2	<2	<2	<2	<4	-	-	33700	6.97	79	24.4	-	-	5021.115	7.01	24200
FL98-2A	FL98-2A	4/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.35	-	17260	6.85	9.7	24.5	-	-	-	-	-
FL98-2A	FL98-2A	5/08/2009	-	-	-	33800	-	15800	<1	403	403	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6018.306	6.87	23200
FL98-2B	FL98-2B	22/07/2009	<0.0145	<1	<0.003	26200	-	12200	<1	659	659	<1	<1	<2	<2	<2	<2	<4	-	-	9570	7.57	175	22.5	-	-	1981.36	7.3	9430
FL98-2B	FL98-2B	5/08/2009	-	-	-	20900	-	9760	<1	670	670	<1	-	-	-	-	-	-	5.05	-	476	7.19	105	22.2	-	-	2473.923	7.93	11800
WB01-A	WB01-A	2/07/2009	<0.0145	<1	<0.003	21000	9790	-	<1	477	477	<1	<1	<2	<2	<2	<2	<4	1.75	24.3	43100	5.94	18	27.3	29100	9056.65	-	6.42	40000
WB01-A	WB01-A	5/08/2009	-	-	-	19400	-	9050	<1	434	434	<1	-	-	-	-	-	-	2.8	-	26200	6.53	30	24.8	-	-	8974.35	6.6	36800
WB01-A	WB01-A	9/09/2009	-	-	-	20100	-	9400	<1	449	449	<1	-	-	-	-	-	-	4.08	-	12800	5.68	11	25.6	-	-	8695.09	-	40200
WB01-B	WB01-B	2/07/2009	<0.0145	<1	<0.003	60900	28400	-	<1	391	391	<1	<1	<2	<2	<2	<2	<4	2.22	26.5	51700	5.88	48	26.3	35700	6906.228	-	6.36	38200
DUP1	WB01-B	2/07/2009	<0.0145	<1	<0.003	63000	29400	-	<1	397	397	<1	<1	<2	<2	<2	<2	<4	-	-	-	-	-	-	-	7151.93	-	6.38	37400
WB01-B	WB01-B	5/08/2009	-	-	-	60600	-	28200	<1	380	380	<1	-	-	-	-	-	-	3.2	-	32000	6.61	320	24.2	-	-	6503.316	6.64	31200
WB01-B	WB01-B	9/09/2009	-	-	-	63000	-	29400	<1	382	382	<1	-	-	-	-	-	-	3.54	-	28400	6.59	-87	23.7	-	-	6653.136	-	37800
DUP1	WB01-B	9/09/2009	-	-	-	63800	-	29700	<1	403	403	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6782.778	-	39000
WB02-A	WB02-A	2/07/2009	<0.0145	<1	<0.003	20200	9430	-	<1	419	419	<1	<1	<2	<2	<2	<2	<4	1.3	14.5	61900	6.04	44	27.4	43600	10819.49	-	6.68	50300
WB02-A	WB02-A	5/08/2009	-	-	-	18900	-	8830	<1	362	362	<1	-	-	-	-	-	-	3.4	-	30100	6.74	51	25.6	-	-	7647.433	6.91	25400
WB02-A	WB02-A	9/09/2009	-	-	-	17600	-	8220	<1	435	435	<1	-	-	-	-	-	-	3.18	-	39800	6.71	23	26.6	-	-	12931.13	-	60100
WB03-A	WB03-A	2/07/2009	<0.0145	<1	<0.003	51900	24200	-	<1	478	478	<1	<1	<2	2	<2	<2	<4	3.27	37.6	38200	5.98	199	25	25700	6144.859	-	6.49	32400
WB03-A	WB03-A	5/08/2009	-	-	-	51500	-	24000	<1	453	453	<1	-	-	-	-	-	-	2.42	-	22600	6.47	201	23.9	-	-	6461.675	6.62	28600
DUP 1	WB03-A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DUP1	WB03-A	5/08/2009	-	-	-	51400	-	24000	<1	448	448	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6398.052	6.56	25000
WB03-A	WB03-A	9/09/2009	-	-	-	52400	-	24400	<1	471	471	<1	-	-	-	-	-	-	3.17	-	37700	6.49	192	25.4	-	-	6236.05	-	30600
WB03-B	WB03-B	2/07/2009	<0.0145	<1	<0.003	79700	37200	-	<1	84	84	<1	<1	<2	<2	<2	<2	<4	6.1	67.1	17100	4.94	124	25.5	11030	4167.669	-	5.97	19600
WB03-B	WB03-B	5/08/2009	-	-	-	92200	-	43000	<1	4	4	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3631.778	4.96	14400
WB03-B	WB03-B	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.34	-	13100	5.01	175	24.6	-	-	-	-	-
WB03-B	WB03-B	9/09/2009	-	-	-	102000	-	47600	<1	<1	<1	<1	-	-	-	-	-	-	4.72	-	12960	3.9	233	24.1	-	-	3520.214	-	16000
WB04-A	WB04-A	2/07/2009	<0.0145	<1	<0.003	22600	10600	-	<1	390	390	<1	<1	<2	<2	<2	<2	<4	5.75	73	7450	7.4	165	27.3	4570	904.405	-	7.61	4200
WB04-A	WB04-A	5/08/2009	-	-	-	35000	-	16300	<1	131	131	<1	-	-	-	-	-	-	2.76	-	6900	7.08	120	26.5	-	-	1688.215	7.05	7290
WB04-A	WB04-A	9/09/2009	-	-	-	35700	-	16700	<1	524	524	<1	-	-	-	-	-	-	3.79	-	9620	7.01	98	27.1	-	-	2027.924	-	8970

Statistical Summary

Number of Results	10	10	10	27	8	19	27	27	27	27	10	10	10	10	10	10	20	8	24	24	24	24	6	8	19	20	27
Number of Detects	0	0	0	27	8	19	0	26	26	0	0	0	1	0	0	0	20	8	24	24	24	24	6	8	19	20	27
Minimum Concentration	<0.0145	<1	<0.003	7200	4840	3300	<1	<1	<1	<1	<1	<2	<2	<2	<2	<4	1.3	14.5	476	3.9	-87	22.2	4570	904.405	908.318	4.96	4200
Minimum Detect	ND	ND	ND	7200	4840	3300	ND	4	4	ND	ND	ND	2	ND	ND	ND	1.3	14.5	476	3.9	ND	22.2	4570	904.405	908.318	4.96	4200
Maximum Concentration	<0.0145	<1	<0.003	102000	37200	47600	<1	670	670	<1	<1	<2	2	<2	<2	<4	6.1	73	61900	7.57	320	27.4	43600	10819.49	12931.13	7.93	60100
Maximum Detect	ND	ND	ND	102000	37200	47600	ND	670	670	ND	ND	ND	2	ND	ND	ND	6.1	73	61900	7.57	320	27.4	43600	10819.49	12931.13	7.93	60100
Average Concentration	0.0073	0.5	0.0015	41544	19233	19117	0.5	371	371	0.5	0.5	1	1.1	1	1	2	3.5	41	24064	6.3	95	25	24950	5845	5503	6.7	26239
Median Concentration	0.00725	0.5	0.0015	35000	17400	16300	0.5	403	403	0.5	0.5	1	1	1	1	2	3.235	35.2	19930	6.51	88.5	24.9	27400	6525.5435	6236.05	6.61	25400
Standard Deviation	0	0	0	25513	11963	12553	0	172	172	0	0	0	0.32	0	0	0	1.3	21	15728	0.85	98	1.6	14767	3447	3032	0.61	14509
Number of Guideline Exceedances	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(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

Groundwater Analysis Results Summary

			Major Ions														Metals																Non-Metallic Inorganics	Nutrients					
			Anions Total	Calcium	Calcium (Filtered)	Cations Total	Chloride	Ionic Balance	Magnesium	Magnesium (Filtered)	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulphate	Sulphate (Filtered)	Aluminium (Filtered)	Arsenic (Filtered)	Barium (Filtered)	Beryllium (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Cobalt (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Molybdenum (Filtered)	Nickel (Filtered)	Selenium (Filtered)	Vanadium (Filtered)	Zinc (Filtered)	Fluoride	Ammonia	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total Oxidised)	Phosphorus
			meq/L	mg/L	mg/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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			0.01	1	1	0.01	1	0.01	1	1	1	1	1	1	1	1	0.01	0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.001	0.01	0.01	0.005	0.1	0.01	0.01	0.01	0.01	0.01
ANZECC (2000) Ecosystems Marine Water (95%																					**0.0055**	**0.0044**	**0.001**	**0.0013**		**0.0044**		**0.0004**		**0.07**		**0.1**	**0.015**		**0.91**				
Field_ID	**LocCode**	**Sampled_Date-Time**																																					
CSGW-2	CSGW-2	2/07/2009	159	86	-	159	5510	0.02	338	-	101	-	2850	-	8	-	<0.01	0.002	0.68	<0.001	<0.0001	0.002	**0.011**	**0.003**	21.7	<0.001	3.31	<0.0001	<0.001	0.005	0.01	<0.01	0.012	0.4	**5.5**	0.08	<0.01	0.08	0.28
CSGW-2	CSGW-2	10/08/2009	97.5	-	49	88.8	3360	4.71	-	191	-	33	-	1600	-	2	<0.01	<0.001	0.508	<0.001	<0.0001	<0.001	**0.012**	<0.001	38.1	<0.001	2.58	<0.0001	<0.001	0.003	<0.01	<0.01	0.005	0.4	**4.9**	<0.01	<0.01	<0.01	0.11
FL98-2A	FL98-2A	22/07/2009	221	-	470	331	6240	19.9	-	935	-	-	-	5280	-	1740	<0.01	0.003	0.06	<0.001	0.0003	0.003	**0.021**	**0.004**	0.12	<0.001	1.5	<0.0001	0.01	0.009	<0.01	<0.01	**0.28**	0.3	0.68	<0.01	<0.01	<0.01	0.83
FL98-2A	FL98-2A	4/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	0.02	1
FL98-2A	FL98-2A	5/08/2009	372	-	548	395	11500	3.08	-	1130	-	31	-	6290	-	1880	-	<0.001	0.057	<0.001	0.0002	0.003	**0.02**	**0.006**	-	<0.001	1.68	<0.0001	-	0.006	-	<0.01	**0.254**	0.4	-	-	-	-	-
FL98-2B	FL98-2B	22/07/2009	149	-	220	154	4390	1.55	-	348	-	-	-	2610	-	572	<0.01	0.007	0.182	<0.001	<0.0001	0.002	**0.036**	**0.003**	0.08	<0.001	2.28	<0.0001	0.011	0.009	<0.01	<0.01	**0.443**	0.5	0.65	<0.01	0.02	<0.01	0.21
FL98-2B	FL98-2B	5/08/2009	196	-	264	188	5950	2.35	-	441	-	13	-	3170	-	734	-	0.01	0.244	<0.001	0.0002	0.002	**0.045**	**0.005**	-	<0.001	2.9	<0.0001	-	0.016	-	<0.01	**1.61**	0.5	0.61	-	-	0.05	<0.01
WB01-A	WB01-A	2/07/2009	460	1600	-	436	14800	2.76	1230	-	134	-	5770	-	1660	-	0.07	<0.005	0.113	<0.005	<0.0005	<0.005	**0.005**	**0.005**	7.67	<0.005	9.37	<0.0001	<0.005	<0.005	<0.02	<0.05	**0.072**	0.2	**12.8**	0.08	<0.01	0.08	0.43
WB01-A	WB01-A	5/08/2009	492	-	1600	522	16100	3	-	1210	-	96	-	7830	-	1390	-	<0.05	0.169	<0.005	<0.0005	**0.005**	**0.006**	<0.05	-	<0.005	9.31	<0.0001	-	<0.05	-	<0.05	**0.113**	0.2	**12.3**	-	-	0.16	0.31
WB01-A	WB01-A	9/09/2009	496	-	1620	464	16000	3.27	-	1130	-	86	-	6620	-	1700	<0.05	<0.05	0.09	<0.005	<0.005	**0.016**	<0.005	<0.05	10.5	<0.005	10.2	<0.0001	<0.005	<0.05	0.1	<0.05	<0.05	0.2	**14.1**	<0.01	<0.01	<0.01	0.1
WB01-B	WB01-B	2/07/2009	550	574	-	569	16600	1.62	1330	-	376	-	9680	-	3580	-	0.07	<0.005	0.065	<0.005	<0.0005	**0.006**	**0.006**	**0.009**	2.26	<0.005	2.03	<0.0001	<0.005	<0.005	<0.02	<0.05	**0.054**	0.4	**0.98**	0.34	<0.01	0.34	0.6
DUP1	WB01-B	2/07/2009	568	590	-	596	17100	2.45	1380	-	387	-	10200	-	3720	-	0.07	<0.005	0.063	<0.005	<0.0005	**0.005**	**0.007**	**0.005**	2.47	<0.005	2.08	<0.0001	<0.005	0.006	<0.02	<0.05	**0.051**	0.4	**0.97**	0.04	<0.01	0.04	0.32
WB01-B	WB01-B	5/08/2009	486	-	528	525	14700	3.84	-	1260	-	306	-	8900	-	3060	-	<0.05	0.054	<0.005	<0.0005	<0.005	**0.005**	<0.05	-	<0.005	1.82	<0.0001	-	<0.05	-	<0.05	<0.05	0.4	**1.2**	-	-	0.14	0.58
WB01-B	WB01-B	9/09/2009	543	-	588	507	16200	3.45	-	1260	-	345	-	8390	-	3780	<0.05	<0.05	0.039	<0.005	<0.005	**0.02**	**0.006**	<0.05	5.27	<0.005	2.17	<0.0001	<0.005	<0.05	0.12	<0.05	<0.05	0.4	**1.22**	<0.01	0.01	0.01	0.16
DUP1	WB01-B	9/09/2009	565	-	574	516	16900	4.57	-	1300	-	348	-	8540	-	3870	<0.05	<0.05	0.039	<0.005	<0.005	**0.018**	**0.006**	<0.05	4.78	<0.005	2.03	<0.0001	<0.005	<0.05	0.09	<0.05	<0.05	0.4	**1.31**	<0.01	<0.01	<0.01	0.17
WB02-A	WB02-A	2/07/2009	772	1070	-	755	25300	1.13	1980	-	109	-	12300	-	2400	-	0.06	0.005	0.096	<0.005	<0.0005	<0.005	**0.013**	<0.005	0.68	<0.005	0.873	<0.0001	0.006	0.01	<0.02	<0.05	**0.059**	<0.1	**3.43**	0.03	<0.01	0.03	0.42
WB02-A	WB02-A	5/08/2009	487	-	739	509	15800	2.22	-	1410	-	49	-	8170	-	1640	-	<0.05	0.108	<0.005	<0.0005	<0.005	**0.013**	<0.05	-	<0.005	0.878	<0.0001	-	<0.05	-	<0.05	<0.05	0.1	**2.76**	-	-	0.04	1.12
WB02-A	WB02-A	9/09/2009	824	-	1240	761	26800	4	-	2390	-	94	-	11500	-	2860	<0.05	<0.05	0.064	<0.005	<0.005	**0.023**	**0.007**	<0.05	3.54	<0.005	0.909	<0.0001	<0.005	<0.05	0.14	<0.05	<0.05	<0.1	**5.86**	<0.01	<0.01	<0.01	0.86
WB03-A	WB03-A	2/07/2009	425	747	-	467	13300	4.74	1040	-	144	-	7850	-	1940	-	0.06	<0.005	0.076	<0.005	0.0016	<0.005	**0.027**	<0.005	<0.25	<0.005	3.5	<0.0001	<0.005	0.024	<0.02	<0.05	**0.081**	0.4	**2.53**	0.08	<0.01	0.08	1.12
WB03-A	WB03-A	5/08/2009	436	-	775	454	13800	2.03	-	1100	-	116	-	7400	-	1800	-	<0.05	0.118	<0.005	0.0008	**0.01**	**0.037**	**0.386**	-	<0.005	4.98	<0.0001	-	<0.05	-	<0.05	**0.176**	0.3	**3.16**	-	-	0.37	0.11
DUP 1	WB03-A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3.36**	-	-	0.43	0.05
DUP1	WB03-A	5/08/2009	435	-	766	453	13800	1.94	-	1090	-	116	-	7390	-	1780	-	<0.05	0.118	<0.005	0.0009	<0.005	**0.036**	**0.375**	-	<0.005	4.83	<0.0001	-	<0.05	-	<0.05	**0.113**	0.3	-	-	-	-	-
WB03-A	WB03-A	9/09/2009	437	-	800	417	13600	2.32	-	1030	-	137	-	6640	-	2120	<0.05	<0.05	0.097	<0.005	<0.005	**0.015**	**0.033**	**0.781**	0.63	<0.005	4.54	<0.0001	<0.005	<0.05	0.07	<0.05	**0.065**	0.4	**3.04**	<0.01	0.01	0.01	0.35
WB03-B	WB03-B	2/07/2009	288	382	-	270	9000	3.24	781	-	153	-	4200	-	1560	-	0.03	0.001	0.106	<0.001	0.0003	0.002	**0.061**	**0.005**	0.39	<0.001	31.9	<0.0001	<0.001	0.022	0.02	<0.01	**0.055**	0.2	0.49	0.06	<0.01	0.06	0.2
WB03-B	WB03-B	5/08/2009	241	-	319	243	7710	0.46	-	689	-	106	-	3860	-	1120	-	<0.001	0.1	0.009	0.0011	0.002	**0.463**	**0.016**	-	0.003	38.9	<0.0001	-	**0.154**	-	<0.01	**0.213**	0.7	-	-	-	-	-
WB03-B	WB03-B	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.53	-	-	0.16	<0.01
WB03-B	WB03-B	9/09/2009	253	-	332	237	7960	3.31	-	654	-	121	-	3750	-	1360	7.02	<0.05	0.069	0.013	<0.005	**0.009**	**0.53**	**0.071**	0.65	**0.008**	39.5	<0.0001	<0.005	**0.194**	0.05	<0.05	**0.269**	0.4	0.46	0.07	0.01	0.08	0.13
WB04-A	WB04-A	2/07/2009	64.6	115	-	66.8	1360	1.64	150	-	12	-	1110	-	885	-	<0.01	0.004	0.041	<0.001	<0.0001	<0.001	**0.004**	**0.002**	<0.05	<0.001	0.45	<0.0001	0.026	0.007	<0.01	<0.01	0.006	0.5	**1.16**	0.03	0.01	0.04	1.61
WB04-A	WB04-A	5/08/2009	118	-	185	124	3480	2.18	-	298	-	15	-	2060	-	840	-	0.01	0.054	<0.001	<0.0001	<0.001	**0.007**	**0.006**	-	<0.001	0.597	<0.0001	-	0.042	-	<0.01	<0.005	0.4	**2.17**	-	-	0.1	0.65
WB04-A	WB04-A	9/09/2009	161	-	237	149	4550	3.71	-	349	-	15	-	2490	-	1050	<0.05	<0.05	0.05	<0.005	<0.005	**0.008**	**0.008**	<0.05	<0.5	<0.005	1.22	<0.0001	0.006	<0.05	<0.05	<0.05	<0.05	0.4	**2.77**	0.03	0.01	0.04	<0.05

Statistical Summary

Number of Results			27	8	19	27	27	27	8	19	8	17	8	19	8	19	18	27	27	27	27	27	27	27	27	18	27	27	27	18	27	18	27	27	27	27	18	18	27	27
Number of Detects			27	8	19	27	27	27	8	19	8	17	8	19	8	19	7	8	27	2	8	18	26	16	15	2	27	0	5	14	8	0	19	25	27	10	6	21	24
Minimum Concentration			64.6	86	49	66.8	1360	0.02	150	191	12	13	1110	1600	8	2	<0.01	<0.001	0.039	<0.001	<0.0001	<0.001	0.004	<0.001	<0.05	<0.001	0.45	<0.0001	<0.001	0.003	<0.01	<0.01	<0.005	<0.1	0.46	<0.01	<0.01	<0.01	<0.01
Minimum Detect			64.6	86	49	66.8	1360	0.02	150	191	12	13	1110	1600	8	2	0.03	0.001	0.039	0.009	0.0002	0.002	0.004	0.002	0.08	0.003	0.45	ND	0.006	0.003	0.01	ND	0.005	0.1	0.46	0.03	0.01	0.01	0.05
Maximum Concentration			824	1600	1620	761	26800	19.9	1980	2390	387	348	12300	11500	3720	3870	7.02	<0.05	0.68	0.013	<0.005	0.023	0.53	0.781	38.1	0.008	39.5	<0.0001	0.026	0.194	0.14	<0.05	1.61	0.7	14.1	0.34	0.02	0.43	1.61
Maximum Detect			824	1600	1620	761	26800	19.9	1980	2390	387	348	12300	11500	3720	3870	7.02	0.01	0.68	0.013	0.0016	0.023	0.53	0.781	38.1	0.008	39.5	ND	0.026	0.194	0.14	ND	1.61	0.7	14.1	0.34	0.02	0.43	1.61
Average Concentration			381	646	624	384	11919	3.3	1029	959	177	119	6745	5921	1969	1753	0.42	0.013	0.13	0.0025	0.00092	0.0062	0.053	0.07	5.5	0.0021	6.9	0.00005	0.0048	0.029	0.039	0.018	0.15	0.34	3.3	0.049	0.0072	0.089	0.44
Median Concentration			435	582	548	436	13600	2.76	1135	1090	139	96	6810	6620	1800	1700	0.025	0.01	0.09	0.0025	0.00025	0.0025	0.012	0.009	1.47	0.0025	2.28	0.00005	0.0025	0.025	0.01	0.025	0.055	0.4	2.17	0.03	0.005	0.04	0.31
Standard Deviation			200	503	447	194	6467	3.5	594	523	134	110	3909	2793	1261	1033	1.6	0.011	0.14	0.0027	0.001	0.0065	0.13	0.17	9.8	0.0015	11	0	0.0061	0.043	0.045	0.0098	0.31	0.15	3.8	0.079	0.0039	0.12	0.42
Number of Guideline Exceedances			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	27	26	0	17	0	0	0	2	0	0	23	0	20	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	11	26	16	0	1	0	0	0	2	0	0	16	0	20	0	0	0	0

Groundwater Analysis Results Summary

	PAH/Phenols																							SVOC							TPH				
	2,4,5-trichlorophenol	2,4-dichlorophenol	2,4-dimethylphenol	2-chlorophenol	2-methylphenol	3-&4-methylphenol	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Phenol	Pyrene	2,3,4,6-tetrachlorophenol	2,4,6-trichlorophenol	2,6-dichlorophenol	2-methylnaphthalene	2-nitrophenol	4-chloro-3-methylphenol	Pentachlorophenol	TPH C 6 - C 9 Fraction	TPH C10 - C14 Fraction	TPH C15 - C28 Fraction	TPH C29-C36 Fraction	TPH+C10 - C36 (Sum of total)
	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	1	1	1	1	1	2	1	1	1	1	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	20	50	100	50	
ANZECC (2000) Ecosystems Marine Water (95%																				**70**		**400**								**22**					

Field_ID	LocCode	Sampled_Date-Time																																		
CSGW-2	CSGW-2	2/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	<50	<200
CSGW-2	CSGW-2	10/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FL98-2A	FL98-2A	22/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	<50	<200
FL98-2A	FL98-2A	4/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FL98-2A	FL98-2A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FL98-2B	FL98-2B	22/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	200	100	325
FL98-2B	FL98-2B	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB01-A	WB01-A	2/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	50	125
WB01-A	WB01-A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB01-A	WB01-A	9/09/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB01-B	WB01-B	2/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	<50	<200
DUP1	WB01-B	2/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	<50	<200
WB01-B	WB01-B	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB01-B	WB01-B	9/09/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DUP1	WB01-B	9/09/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB02-A	WB02-A	2/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	<50	<200
WB02-A	WB02-A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB02-A	WB02-A	9/09/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB03-A	WB03-A	2/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	<50	<200
WB03-A	WB03-A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DUP 1	WB03-A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DUP1	WB03-A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB03-A	WB03-A	9/09/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB03-B	WB03-B	2/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	<50	<200
WB03-B	WB03-B	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB03-B	WB03-B	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB03-B	WB03-B	9/09/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB04-A	WB04-A	2/07/2009	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	100	<50	150
WB04-A	WB04-A	5/08/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB04-A	WB04-A	9/09/2009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistical Summary

Number of Results	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
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	2	2	3	
Minimum Concentration	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	<100	<50	125
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	100	50	125	
Maximum Concentration	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<20	<50	200	100	325
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	200	100	325	
Average Concentration	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.25	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	10	25	70	35	130	
Median Concentration	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.25	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	10	25	50	25	100	
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	48	24	71	
Number of Guideline Exceedances	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(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	

Appendix E

Laboratory Certificates

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0910533**	Page	: 1 of 9
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS MARIA PRSKALO	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: maria.prskalo@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 0-42/15386/51	Date Samples Received	: 03-JUL-2009
Sampler	: ----	Issue Date	: 13-JUL-2009
Site	: WESTERN BASIN		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics
Matthew Goodwin	Senior Organic Chemist	Organics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

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 insuffient 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 date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

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

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB01-A Client sampling date / time: 02-JUL-2009 15:00 EB0910533-001	WB01-B 02-JUL-2009 15:00 EB0910533-002	WB02-A 02-JUL-2009 15:00 EB0910533-003	WB03-A 02-JUL-2009 15:00 EB0910533-004	WB03-B 02-JUL-2009 15:00 EB0910533-005
EA005: pH								
pH Value	----	0.01	pH Unit	**6.42**	**6.36**	**6.68**	**6.49**	**5.97**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**40000**	**38200**	**50300**	**32400**	**19600**
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	**477**	**391**	**419**	**478**	**84**
Total Alkalinity as CaCO3	----	1	mg/L	**477**	**391**	**419**	**478**	**84**
ED040F: Dissolved Major Anions								
Sulfate as SO4 2-	14808-79-8	1	mg/L	**1660**	**3580**	**2400**	**1940**	**1560**
Silicon	7440-21-3	0.05	mg/L	**9.79**	**28.4**	**9.43**	**24.2**	**37.2**
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**14800**	**16600**	**25300**	**13300**	**9000**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**1600**	**574**	**1070**	**747**	**382**
Magnesium	7439-95-4	1	mg/L	**1230**	**1330**	**1980**	**1040**	**781**
Sodium	7440-23-5	1	mg/L	**5770**	**9680**	**12300**	**7850**	**4200**
Potassium	7440-09-7	1	mg/L	**134**	**376**	**109**	**144**	**153**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.07**	**0.07**	**0.06**	**0.06**	**0.03**
Arsenic	7440-38-2	0.001	mg/L	<0.005	<0.005	**0.005**	<0.005	**0.001**
Beryllium	7440-41-7	0.001	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001
Barium	7440-39-3	0.001	mg/L	**0.113**	**0.065**	**0.096**	**0.076**	**0.106**
Cadmium	7440-43-9	0.0001	mg/L	<0.0005	<0.0005	<0.0005	**0.0016**	**0.0003**
Chromium	7440-47-3	0.001	mg/L	<0.005	**0.006**	<0.005	<0.005	**0.002**
Cobalt	7440-48-4	0.001	mg/L	**0.005**	**0.006**	**0.013**	**0.027**	**0.061**
Copper	7440-50-8	0.001	mg/L	**0.005**	**0.009**	<0.005	<0.005	**0.005**
Lead	7439-92-1	0.001	mg/L	<0.005	<0.005	<0.005	<0.005	<0.001
Manganese	7439-96-5	0.001	mg/L	**9.37**	**2.03**	**0.873**	**3.50**	**31.9**
Molybdenum	7439-98-7	0.001	mg/L	<0.005	<0.005	**0.006**	<0.005	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.005	<0.005	**0.010**	**0.024**	**0.022**
Selenium	7782-49-2	0.01	mg/L	<0.02	<0.02	<0.02	<0.02	**0.02**
Vanadium	7440-62-2	0.01	mg/L	<0.05	<0.05	<0.05	<0.05	<0.01
Zinc	7440-66-6	0.005	mg/L	**0.072**	**0.054**	**0.059**	**0.081**	**0.055**
Iron	7439-89-6	0.05	mg/L	**7.67**	**2.26**	**0.68**	<0.25	**0.39**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB01-A Client sampling date / time: 02-JUL-2009 15:00 EB0910533-001	WB01-B 02-JUL-2009 15:00 EB0910533-002	WB02-A 02-JUL-2009 15:00 EB0910533-003	WB03-A 02-JUL-2009 15:00 EB0910533-004	WB03-B 02-JUL-2009 15:00 EB0910533-005
EG052F: Silica by ICPAES								
^ Silica	7631-86-9	0.1	mg/L	**21.0**	**60.9**	**20.2**	**51.9**	**79.7**
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.4**	<0.1	**0.4**	**0.2**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**12.8**	**0.98**	**3.43**	**2.53**	**0.49**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	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	**0.08**	**0.34**	**0.03**	**0.08**	**0.06**
EK059G: NOX as N by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.08**	**0.34**	**0.03**	**0.08**	**0.06**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.43**	**0.60**	**0.42**	**1.12**	**0.20**
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	**460**	**550**	**772**	**425**	**288**
^ Total Cations	----	0.01	meq/L	**436**	**569**	**755**	**467**	**270**
^ Ionic Balance	----	0.01	%	**2.76**	**1.62**	**1.13**	**4.74**	**3.24**
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
2.3.4.6-Tetrachlorophenol	58-90-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylnaphthalene	91-57-6	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB01-A Client sampling date / time: 02-JUL-2009 15:00 EB0910533-001	WB01-B 02-JUL-2009 15:00 EB0910533-002	WB02-A 02-JUL-2009 15:00 EB0910533-003	WB03-A 02-JUL-2009 15:00 EB0910533-004	WB03-B 02-JUL-2009 15:00 EB0910533-005
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
^ Sum of polycyclic aromatic hydrocarbons	----	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	**50**	<50	<50	<50	<50
EP080: BTEX								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	**2**	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**37.4**	**30.5**	**34.1**	**29.8**	**28.6**
2-Chlorophenol-D4	93951-73-6	0.1	%	**76.1**	**68.2**	**76.8**	**71.7**	**69.6**
2.4.6-Tribromophenol	118-79-6	0.1	%	**75.9**	**67.6**	**76.2**	**69.9**	**69.2**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**76.9**	**71.0**	**76.5**	**71.6**	**70.8**
Anthracene-d10	1719-06-8	0.1	%	**74.2**	**66.9**	**72.2**	**69.2**	**69.6**
4-Terphenyl-d14	1718-51-0	0.1	%	**78.9**	**72.1**	**77.4**	**73.6**	**73.8**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**103**	**113**	**108**	**111**	**104**
Toluene-D8	2037-26-5	0.1	%	**91.3**	**98.4**	**95.8**	**98.0**	**97.5**
4-Bromofluorobenzene	460-00-4	0.1	%	**97.0**	**104**	**101**	**103**	**100**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB04-A	DUP1	CSGW-2	----	----
				Client sampling date / time: 02-JUL-2009 15:00	02-JUL-2009 15:00	02-JUL-2009 15:00	----	----
				EB0910533-006	EB0910533-007	EB0910533-008	----	----
EA005: pH								
pH Value	----	0.01	pH Unit	**7.61**	**6.38**	**6.46**	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**4200**	**37400**	**10400**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**390**	**397**	**168**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**390**	**397**	**168**	----	----
ED040F: Dissolved Major Anions								
Sulfate as SO4 2-	14808-79-8	1	mg/L	**885**	**3720**	**8**	----	----
Silicon	7440-21-3	0.05	mg/L	**10.6**	**29.4**	**4.84**	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**1360**	**17100**	**5510**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**115**	**590**	**86**	----	----
Magnesium	7439-95-4	1	mg/L	**150**	**1380**	**338**	----	----
Sodium	7440-23-5	1	mg/L	**1110**	**10200**	**2850**	----	----
Potassium	7440-09-7	1	mg/L	**12**	**387**	**101**	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	**0.07**	<0.01	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.004**	<0.005	**0.002**	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.005	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.041**	**0.063**	**0.680**	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0005	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.005**	**0.002**	----	----
Cobalt	7440-48-4	0.001	mg/L	**0.004**	**0.007**	**0.011**	----	----
Copper	7440-50-8	0.001	mg/L	**0.002**	**0.005**	**0.003**	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.005	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L	**0.450**	**2.08**	**3.31**	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.026**	<0.005	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	**0.007**	**0.006**	**0.005**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.02	**0.01**	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.05	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	**0.006**	**0.051**	**0.012**	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	**2.47**	**21.7**	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB04-A	DUP1	CSGW-2	----	----
				Client sampling date / time: 02-JUL-2009 15:00	02-JUL-2009 15:00	02-JUL-2009 15:00	----	----
				EB0910533-006	EB0910533-007	EB0910533-008	----	----
EG052F: Silica by ICPAES								
^ Silica	7631-86-9	0.1	mg/L	**22.6**	**63.0**	**10.4**	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.5**	**0.4**	**0.4**	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**1.16**	**0.97**	**5.50**	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	**0.01**	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
^ Nitrate as N	14797-55-8	0.01	mg/L	**0.03**	**0.04**	**0.08**	----	----
EK059G: NOX as N by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.04**	**0.04**	**0.08**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**1.61**	**0.32**	**0.28**	----	----
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	**64.6**	**568**	**159**	----	----
^ Total Cations	----	0.01	meq/L	**66.8**	**596**	**159**	----	----
^ Ionic Balance	----	0.01	%	**1.64**	**2.45**	**0.02**	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	----	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	<2.0	----	----
2.3.4.6-Tetrachlorophenol	58-90-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2-Methylnaphthalene	91-57-6	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB04-A	DUP1	CSGW-2	----	----
				Client sampling date / time: 02-JUL-2009 15:00	02-JUL-2009 15:00	02-JUL-2009 15:00	----	----
				EB0910533-006	EB0910533-007	EB0910533-008	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	1.0	µg/L	<1.0	<1.0	<1.0	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	**100**	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
EP080: BTEX								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**31.2**	**31.8**	**30.2**	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**78.1**	**71.2**	**72.9**	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**78.1**	**68.8**	**71.0**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**80.3**	**71.4**	**73.9**	----	----
Anthracene-d10	1719-06-8	0.1	%	**76.0**	**70.2**	**69.9**	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**80.6**	**74.3**	**74.1**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**101**	**110**	**102**	----	----
Toluene-D8	2037-26-5	0.1	%	**96.5**	**97.7**	**97.6**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**99.8**	**104**	**100**	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	94
2-Chlorophenol-D4	93951-73-6	23	134
2.4.6-Tribromophenol	118-79-6	10	123
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	43	116
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	33	141
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0911699**	Page	: 1 of 6
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: P O BOX 930 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.k.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 4771 5645	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4772 6514	Facsimile	: +61-7-3243 7218
Project	: 42 1538651	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 24-JUL-2009
Sampler	: R. BROWN	Issue Date	: 31-JUL-2009
Site	: WESTERN BASIN		
		No. of samples received	: 2
Quote number	: EN/005/09	No. of samples analysed	: 2

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics
Sarah Ashworth	Organic Chemist	Organics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

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 insuffient 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 date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

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

- **Ionic Balance out of acceptable limits for sample 1 (FL982A) due to analytes not quantified in this report.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: FL982A	FL982B	----	----	----
				Client sampling date / time: 23-JUL-2009 08:40	23-JUL-2009 09:05	----	----	----
				EB0911699-001	EB0911699-002	----	----	----
EA005: pH								
pH Value	----	0.01	pH Unit	**7.01**	**7.30**	----	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**24200**	**9430**	----	----	----
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	**450**	**659**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**450**	**659**	----	----	----
ED040F: Dissolved Major Anions								
Sulfate as SO4 2-	14808-79-8	1	mg/L	**1740**	**572**	----	----	----
Silicon	7440-21-3	0.05	mg/L	**3.30**	**12.2**	----	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**6240**	**4390**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**470**	**220**	----	----	----
Magnesium	7439-95-4	1	mg/L	**935**	**348**	----	----	----
Sodium	7440-23-5	1	mg/L	**5280**	**2610**	----	----	----
Potassium	7440-09-7	1	mg/L	**35**	**14**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	----	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.003**	**0.007**	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Barium	7440-39-3	0.001	mg/L	**0.060**	**0.182**	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	**0.0003**	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	**0.003**	**0.002**	----	----	----
Cobalt	7440-48-4	0.001	mg/L	**0.021**	**0.036**	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.004**	**0.003**	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	**1.50**	**2.28**	----	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.010**	**0.011**	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.009**	**0.009**	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.280**	**0.443**	----	----	----
Iron	7439-89-6	0.05	mg/L	**0.12**	**0.08**	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----

Analytical Results

Sub-Matrix: WATER				Client sample ID	FL982A	FL982B	----	----	----
				Client sampling date / time	23-JUL-2009 08:40	23-JUL-2009 09:05	----	----	----
Compound	CAS Number	LOR	Unit		EB0911699-001	EB0911699-002	----	----	----
EG052F: Silica by ICPAES									
^ Silica	7631-86-9	0.1	mg/L		**20.3**	**26.2**	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	**0.5**	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.68**	**0.65**	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	**0.02**	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
^ Nitrate as N	14797-55-8	0.01	mg/L		<0.01	<0.01	----	----	----
EK059G: NOX as N by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.83**	**0.21**	----	----	----
EN055: Ionic Balance									
^ Total Anions	----	0.01	meq/L		**221**	**149**	----	----	----
^ Total Cations	----	0.01	meq/L		**331**	**154**	----	----	----
^ Ionic Balance	----	0.01	%		**19.9**	**1.55**	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<1.0	----	----	----
2-Chlorophenol	95-57-8	1.0	µg/L		<1.0	<1.0	----	----	----
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<1.0	----	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		<2.0	<2.0	----	----	----
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<1.0	----	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L		<1.0	<1.0	----	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<1.0	----	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L		<1.0	<1.0	----	----	----
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L		<1.0	<1.0	----	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L		<1.0	<1.0	----	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	----	----	----
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	----	----	----
2.3.4.6-Tetrachlorophenol	58-90-2	1.0	µg/L		<1.0	<1.0	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	----	----	----
2-Methylnaphthalene	91-57-6	1.0	µg/L		<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	----	----	----

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: FL982A Client sampling date / time: 23-JUL-2009 08:40 EB0911699-001	Client sample ID: FL982B Client sampling date / time: 23-JUL-2009 09:05 EB0911699-002	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	1.0	µg/L	<1.0	<1.0	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	**200**	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	**100**	----	----	----
EP080: BTEX								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**27.8**	**24.0**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**58.0**	**50.9**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**59.2**	**61.0**	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**62.1**	**58.0**	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**63.7**	**62.5**	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**68.3**	**67.8**	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**105**	**106**	----	----	----
Toluene-D8	2037-26-5	0.1	%	**99.3**	**97.5**	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**89.0**	**86.0**	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	94
2-Chlorophenol-D4	93951-73-6	23	134
2.4.6-Tribromophenol	118-79-6	10	123
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	43	116
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	33	141
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0912386**	Page	: 1 of 4
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: P O BOX 930 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.k.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 4771 5645	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4772 6514	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51 Western Basin EIS	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: ----	Issue Date	: 11-AUG-2009
Site	: ----		
		No. of samples received	: 9
Quote number	: EN/005/09	No. of samples analysed	: 9

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics

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 insuffient 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 date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

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

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: FL982A	FL982B	WB03A	WB03B	WB01A
				Client sampling date / time: 05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00
				EB0912386-001	EB0912386-002	EB0912386-003	EB0912386-004	EB0912386-005
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.50**	**0.61**	**3.16**	**0.53**	**12.3**
EK059G: NOX as N by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.05**	**0.37**	**0.16**	**0.16**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**1.00**	<0.01	**0.11**	<0.01	**0.31**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB01B	WB04A	WB02A	DUP 1	----
				Client sampling date / time: 05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	----
				EB0912386-006	EB0912386-007	EB0912386-008	EB0912386-009	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**1.20**	**2.17**	**2.76**	**3.36**	----
EK059G: NOX as N by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.14**	**0.10**	**0.04**	**0.43**	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.58**	**0.65**	**1.12**	**0.05**	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0912501**	Page	: 1 of 6
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS ALITA McPHEE	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alita_mcphee@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3963	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51 Western Basin EIS	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 07-AUG-2009
Sampler	: ----	Issue Date	: 17-AUG-2009
Site	: ----		
		No. of samples received	: 9
Quote number	: EN/005/09	No. of samples analysed	: 9

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics

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 insuffient 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 date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

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

- **EG020A-F (Dissolved Metals) LORs have been raised for samples EB0912501-003, 005,006, 008, 009 due to saline matrix.**
- **EG020A-F (Dissolved Metals) Sample EB0912501-005(WB01A) shows poor matrix spike recovery due to matrix interference. Confirmed by re-extraction and re-analysis.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: FL98 2A Client sampling date / time: 05-AUG-2009 15:00 EB0912501-001	Client sample ID: FL98 2B Client sampling date / time: 05-AUG-2009 15:00 EB0912501-002	Client sample ID: WB03A Client sampling date / time: 05-AUG-2009 15:00 EB0912501-003	Client sample ID: WB03B Client sampling date / time: 05-AUG-2009 15:00 EB0912501-004	Client sample ID: WB01A Client sampling date / time: 05-AUG-2009 15:00 EB0912501-005
EA005: pH								
pH Value	----	0.01	pH Unit	**6.87**	**7.93**	**6.62**	**4.96**	**6.60**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**23200**	**11800**	**28600**	**14400**	**36800**
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	**403**	**670**	**453**	**4**	**434**
Total Alkalinity as CaCO3	----	1	mg/L	**403**	**670**	**453**	**4**	**434**
ED040F: Dissolved Major Anions								
Sulfate as SO4 2-	14808-79-8	1	mg/L	**1880**	**734**	**1800**	**1120**	**1390**
Silicon	7440-21-3	0.05	mg/L	**15.8**	**9.76**	**24.0**	**43.0**	**9.05**
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**11500**	**5950**	**13800**	**7710**	**16100**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**548**	**264**	**775**	**319**	**1600**
Magnesium	7439-95-4	1	mg/L	**1130**	**441**	**1100**	**689**	**1210**
Sodium	7440-23-5	1	mg/L	**6290**	**3170**	**7400**	**3860**	**7830**
Potassium	7440-09-7	1	mg/L	**31**	**13**	**116**	**106**	**96**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.010**	<0.050	<0.001	<0.050
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.005	**0.009**	<0.005
Barium	7440-39-3	0.001	mg/L	**0.057**	**0.244**	**0.118**	**0.100**	**0.169**
Cadmium	7440-43-9	0.0001	mg/L	**0.0002**	**0.0002**	**0.0008**	**0.0011**	<0.0005
Chromium	7440-47-3	0.001	mg/L	**0.003**	**0.002**	**0.010**	**0.002**	**0.005**
Cobalt	7440-48-4	0.001	mg/L	**0.020**	**0.045**	**0.037**	**0.463**	**0.006**
Copper	7440-50-8	0.001	mg/L	**0.006**	**0.005**	**0.386**	**0.016**	<0.050
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.005	**0.003**	<0.005
Manganese	7439-96-5	0.001	mg/L	**1.68**	**2.90**	**4.98**	**38.9**	**9.31**
Nickel	7440-02-0	0.001	mg/L	**0.006**	**0.016**	<0.050	**0.154**	<0.050
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	<0.05
Zinc	7440-66-6	0.005	mg/L	**0.254**	**1.61**	**0.176**	**0.213**	**0.113**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG052F: Silica by ICPAES								
^ Silica	7631-86-9	0.1	mg/L	**33.8**	**20.9**	**51.5**	**92.2**	**19.4**
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.4**	**0.5**	**0.3**	**0.7**	**0.2**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: FL98 2A	FL98 2B	WB03A	WB03B	WB01A
				Client sampling date / time: 05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00
				EB0912501-001	EB0912501-002	EB0912501-003	EB0912501-004	EB0912501-005
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	**372**	**196**	**436**	**241**	**492**
^ Total Cations	----	0.01	meq/L	**395**	**188**	**454**	**243**	**522**
^ Ionic Balance	----	0.01	%	**3.08**	**2.35**	**2.03**	**0.46**	**3.00**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB01B	WB04A	WB02A	DUP1	----
				Client sampling date / time: 05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	----
				EB0912501-006	EB0912501-007	EB0912501-008	EB0912501-009	----
EA005: pH								
pH Value	----	0.01	pH Unit	**6.64**	**7.05**	**6.91**	**6.56**	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**31200**	**7290**	**25400**	**25000**	----
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	**380**	**131**	**362**	**448**	----
Total Alkalinity as CaCO3	----	1	mg/L	**380**	**131**	**362**	**448**	----
ED040F: Dissolved Major Anions								
Sulfate as SO4 2-	14808-79-8	1	mg/L	**3060**	**840**	**1640**	**1780**	----
Silicon	7440-21-3	0.05	mg/L	**28.2**	**16.3**	**8.83**	**24.0**	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**14700**	**3480**	**15800**	**13800**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**528**	**185**	**739**	**766**	----
Magnesium	7439-95-4	1	mg/L	**1260**	**298**	**1410**	**1090**	----
Sodium	7440-23-5	1	mg/L	**8900**	**2060**	**8170**	**7390**	----
Potassium	7440-09-7	1	mg/L	**306**	**15**	**49**	**116**	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.050	**0.010**	<0.050	<0.050	----
Beryllium	7440-41-7	0.001	mg/L	<0.005	<0.001	<0.005	<0.005	----
Barium	7440-39-3	0.001	mg/L	**0.054**	**0.054**	**0.108**	**0.118**	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0005	<0.0001	<0.0005	**0.0009**	----
Chromium	7440-47-3	0.001	mg/L	<0.005	<0.001	<0.005	<0.005	----
Cobalt	7440-48-4	0.001	mg/L	**0.005**	**0.007**	**0.013**	**0.036**	----
Copper	7440-50-8	0.001	mg/L	<0.050	**0.006**	<0.050	**0.375**	----
Lead	7439-92-1	0.001	mg/L	<0.005	<0.001	<0.005	<0.005	----
Manganese	7439-96-5	0.001	mg/L	**1.82**	**0.597**	**0.878**	**4.83**	----
Nickel	7440-02-0	0.001	mg/L	<0.050	**0.042**	<0.050	<0.050	----
Vanadium	7440-62-2	0.01	mg/L	<0.05	<0.01	<0.05	<0.05	----
Zinc	7440-66-6	0.005	mg/L	<0.050	<0.005	<0.050	**0.113**	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG052F: Silica by ICPAES								
^ Silica	7631-86-9	0.1	mg/L	**60.6**	**35.0**	**18.9**	**51.4**	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.4**	**0.4**	**0.1**	**0.3**	----

Analytical Results

Sub-Matrix: WATER			Client sample ID	WB01B	WB04A	WB02A	DUP1	----
			Client sampling date / time	05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	----
Compound	CAS Number	LOR	Unit	EB0912501-006	EB0912501-007	EB0912501-008	EB0912501-009	----
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	**486**	**118**	**487**	**435**	----
^ Total Cations	----	0.01	meq/L	**525**	**124**	**509**	**453**	----
^ Ionic Balance	----	0.01	%	**3.84**	**2.18**	**2.22**	**1.94**	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES0911920**	Page	: 1 of 4
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS RUTH BROWN	Contact	: Charlie Pierce
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ruth.brown@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3316 3333	Facsimile	: +61-2-8784 8500
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 40036-42/15386/51	Date Samples Received	: 12-AUG-2009
Sampler	: ----	Issue Date	: 18-AUG-2009
Site	: RTAY CAUSTIC BLADDER		
		No. of samples received	: 1
Quote number	: EN/005/09	No. of samples analysed	: 1

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

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 insuffient 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 date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

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

- **EG020A-F: LCS recovery for some elements falls outside ALS Dynamic Control Limit. However, they are within the acceptance criteria based on ALS DQO. No further action is required.**
- **Sample had to be re-filtered in the lab prior to ICPMS analysis due to the presence of sediment.**

Analytical Results

Sub-Matrix: WATER				Client sample ID	CSGW-2	----	----	----	----
				Client sampling date / time	10-AUG-2009 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES0911920-001	----	----	----	----
EA005: pH									
pH Value	----	0.01	pH Unit		**6.39**	----	----	----	----
EA015: Total Dissolved Solids									
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L		**5960**	----	----	----	----
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		**141**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**141**	----	----	----	----
ED040F: Dissolved Major Anions									
Sulfate as SO4 2-	14808-79-8	1	mg/L		**2**	----	----	----	----
Silicon	7440-21-3	0.05	mg/L		**3.36**	----	----	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		**3360**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**49**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**191**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**1600**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**33**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L		**0.508**	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L		**0.012**	----	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		**2.58**	----	----	----	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.003**	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.005**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**38.1**	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----

Analytical Results

Sub-Matrix: WATER				Client sample ID	CSGW-2	----	----	----	----
				Client sampling date / time	10-AUG-2009 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES0911920-001	----	----	----	----
EG052F: Silica by ICPAES									
^ Silica	7631-86-9	0.1	mg/L		**7.2**	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**4.90**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	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: NOX as N by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.11**	----	----	----	----
EN055: Ionic Balance									
^ Total Anions	----	0.01	meq/L		**97.5**	----	----	----	----
^ Total Cations	----	0.01	meq/L		**88.8**	----	----	----	----
^ Ionic Balance	----	0.01	%		**4.71**	----	----	----	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0914339**	Page	: 1 of 6
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 0-42/15386/51	Date Samples Received	: 10-SEP-2009
Sampler	: ----	Issue Date	: 18-SEP-2009
Site	: WESTERN BASIN		
		No. of samples received	: 7
Quote number	: EN/005/09	No. of samples analysed	: 7

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

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 insuffient 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 date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

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

- **EG020A-F (Dissolved Metals): LORs have been raised due to saline sample matrix.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB01A Client sampling date / time: 09-SEP-2009 15:00 EB0914339-001	WB01B 09-SEP-2009 15:00 EB0914339-002	WB02A 09-SEP-2009 15:00 EB0914339-003	WB03A 09-SEP-2009 15:00 EB0914339-004	WB03B 09-SEP-2009 15:00 EB0914339-005
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**40200**	**37800**	**60100**	**30600**	**16000**
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	**449**	**382**	**435**	**471**	<1
Total Alkalinity as CaCO3	----	1	mg/L	**449**	**382**	**435**	**471**	<1
ED040F: Dissolved Major Anions								
Sulfate as SO4 2-	14808-79-8	1	mg/L	**1700**	**3780**	**2860**	**2120**	**1360**
Silicon	7440-21-3	0.05	mg/L	**9.40**	**29.4**	**8.22**	**24.4**	**47.6**
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**16000**	**16200**	**26800**	**13600**	**7960**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**1620**	**588**	**1240**	**800**	**332**
Magnesium	7439-95-4	1	mg/L	**1130**	**1260**	**2390**	**1030**	**654**
Sodium	7440-23-5	1	mg/L	**6620**	**8390**	**11500**	**6640**	**3750**
Potassium	7440-09-7	1	mg/L	**86**	**345**	**94**	**137**	**121**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	**7.02**
Arsenic	7440-38-2	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
Beryllium	7440-41-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	**0.013**
Barium	7440-39-3	0.005	mg/L	**0.090**	**0.039**	**0.064**	**0.097**	**0.069**
Cadmium	7440-43-9	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chromium	7440-47-3	0.005	mg/L	**0.016**	**0.020**	**0.023**	**0.015**	**0.009**
Cobalt	7440-48-4	0.005	mg/L	<0.005	**0.006**	**0.007**	**0.033**	**0.530**
Copper	7440-50-8	0.050	mg/L	<0.050	<0.050	<0.050	**0.781**	**0.071**
Lead	7439-92-1	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	**0.008**
Manganese	7439-96-5	0.005	mg/L	**10.2**	**2.17**	**0.909**	**4.54**	**39.5**
Molybdenum	7439-98-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	7440-02-0	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	**0.194**
Selenium	7782-49-2	0.05	mg/L	**0.10**	**0.12**	**0.14**	**0.07**	**0.05**
Vanadium	7440-62-2	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	7440-66-6	0.050	mg/L	<0.050	<0.050	<0.050	**0.065**	**0.269**
Iron	7439-89-6	0.50	mg/L	**10.5**	**5.27**	**3.54**	**0.63**	**0.65**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG052F: Silica by ICPAES								
^ Silica	7631-86-9	0.1	mg/L	**20.1**	**63.0**	**17.6**	**52.4**	**102**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: WB01A	WB01B	WB02A	WB03A	WB03B
				Client sampling date / time: 09-SEP-2009 15:00	09-SEP-2009 15:00	09-SEP-2009 15:00	09-SEP-2009 15:00	09-SEP-2009 15:00
				EB0914339-001	EB0914339-002	EB0914339-003	EB0914339-004	EB0914339-005
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.4**	<0.1	**0.4**	**0.4**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**14.1**	**1.22**	**5.86**	**3.04**	**0.46**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	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	<0.01	<0.01	**0.07**
EK059G: NOX as N by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	**0.01**	<0.01	**0.01**	**0.08**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.10**	**0.16**	**0.86**	**0.35**	**0.13**
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	**496**	**543**	**824**	**437**	**253**
^ Total Cations	----	0.01	meq/L	**464**	**507**	**761**	**417**	**237**
^ Ionic Balance	----	0.01	%	**3.27**	**3.45**	**4.00**	**2.32**	**3.31**

Analytical Results

Sub-Matrix: WATER				Client sample ID	WB04A	DUP1	----	----	----
				Client sampling date / time	09-SEP-2009 15:00	09-SEP-2009 15:00	----	----	----
Compound	CAS Number	LOR	Unit		EB0914339-006	EB0914339-007	----	----	----
EA015: Total Dissolved Solids									
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L		**8970**	**39000**	----	----	----
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		**524**	**403**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**524**	**403**	----	----	----
ED040F: Dissolved Major Anions									
Sulfate as SO4 2-	14808-79-8	1	mg/L		**1050**	**3870**	----	----	----
Silicon	7440-21-3	0.05	mg/L		**16.7**	**29.7**	----	----	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		**4550**	**16900**	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**237**	**574**	----	----	----
Magnesium	7439-95-4	1	mg/L		**349**	**1300**	----	----	----
Sodium	7440-23-5	1	mg/L		**2490**	**8540**	----	----	----
Potassium	7440-09-7	1	mg/L		**15**	**348**	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.05	mg/L		<0.05	<0.05	----	----	----
Arsenic	7440-38-2	0.050	mg/L		<0.050	<0.050	----	----	----
Beryllium	7440-41-7	0.005	mg/L		<0.005	<0.005	----	----	----
Barium	7440-39-3	0.005	mg/L		**0.050**	**0.039**	----	----	----
Cadmium	7440-43-9	0.0050	mg/L		<0.0050	<0.0050	----	----	----
Chromium	7440-47-3	0.005	mg/L		**0.008**	**0.018**	----	----	----
Cobalt	7440-48-4	0.005	mg/L		**0.008**	**0.006**	----	----	----
Copper	7440-50-8	0.050	mg/L		<0.050	<0.050	----	----	----
Lead	7439-92-1	0.005	mg/L		<0.005	<0.005	----	----	----
Manganese	7439-96-5	0.005	mg/L		**1.22**	**2.03**	----	----	----
Molybdenum	7439-98-7	0.005	mg/L		**0.006**	<0.005	----	----	----
Nickel	7440-02-0	0.050	mg/L		<0.050	<0.050	----	----	----
Selenium	7782-49-2	0.05	mg/L		<0.05	**0.09**	----	----	----
Vanadium	7440-62-2	0.05	mg/L		<0.05	<0.05	----	----	----
Zinc	7440-66-6	0.050	mg/L		<0.050	<0.050	----	----	----
Iron	7439-89-6	0.50	mg/L		<0.50	**4.78**	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EG052F: Silica by ICPAES									
^ Silica	7631-86-9	0.1	mg/L		**35.7**	**63.8**	----	----	----

Analytical Results

Sub-Matrix: WATER				Client sample ID	WB04A	DUP1	----	----	----
				Client sampling date / time	09-SEP-2009 15:00	09-SEP-2009 15:00	----	----	----
Compound	CAS Number	LOR	Unit		EB0914339-006	EB0914339-007	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	**0.4**	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**2.77**	**1.31**	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	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		**0.03**	<0.01	----	----	----
EK059G: NOX as N by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.04**	<0.01	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.05	**0.17**	----	----	----
EN055: Ionic Balance									
^ Total Anions	----	0.01	meq/L		**161**	**565**	----	----	----
^ Total Cations	----	0.01	meq/L		**149**	**516**	----	----	----
^ Ionic Balance	----	0.01	%		**3.71**	**4.57**	----	----	----

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0910533**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS MARIA PRSKALO	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: maria.prskalo@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51	Page	: 1 of 3
Order number	: ----		
C-O-C number	: 0-42/15386/51	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: WESTERN BASIN		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 03-JUL-2009	Issue Date	: 03-JUL-2009 15:22
Client Requested Due Date	: 10-JUL-2009	Scheduled Reporting Date	: **10-JUL-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 0.2 C - Ice present
No. of coolers/boxes	: 1 LARGE	No. of samples received	: 8
Sercurity Seal	: Intact.	No. of samples analysed	: 8

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Breaches in recommended extraction / analysis holding times may occur.**
- **pH holding time is six hours after sampling.**
- **Please be advised that sample CGS-2 was labelled as CSGW-2.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA015 Total Dissolved Solids	WATER - EG020A-F Dissolved Metals by ICPMS - Suite A	WATER - EG052 Silica (Total Dissolved) by ICPAES	WATER - EK040-P Fluoride(PC)	WATER - EK055G Ammonia as N By Discrete Analyser	WATER - EK058G Nitrate as N by Discrete Analyser	WATER - EK067G Total Phosphorus as P By Discrete Analyser
EB0910533-001	02-JUL-2009 15:00	WB01-A	✓	✓	✓	✓	✓	✓	✓	✓
EB0910533-002	02-JUL-2009 15:00	WB01-B	✓	✓	✓	✓	✓	✓	✓	✓
EB0910533-003	02-JUL-2009 15:00	WB02-A	✓	✓	✓	✓	✓	✓	✓	✓
EB0910533-004	02-JUL-2009 15:00	WB03-A	✓	✓	✓	✓	✓	✓	✓	✓
EB0910533-005	02-JUL-2009 15:00	WB03-B	✓	✓	✓	✓	✓	✓	✓	✓
EB0910533-006	02-JUL-2009 15:00	WB04-A	✓	✓	✓	✓	✓	✓	✓	✓
EB0910533-007	02-JUL-2009 15:00	DUP1	✓	✓	✓	✓	✓	✓	✓	✓
EB0910533-008	02-JUL-2009 15:00	CGS-2	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EN055 - DA Ionic Balance (DA)	WATER - EP075 SIM Phenols only SIM - Phenols only	WATER - Major Anions Cl, SO4, Alkalinity PCT	WATER - Major Cations Ca, Mg, Na, K	WATER - W-03 13 Metals (NEPM Suite)	WATER - W-07 TPH/BTEX/PAH
EB0910533-001	02-JUL-2009 15:00	WB01-A	✓	✓	✓	✓	✓	✓
EB0910533-002	02-JUL-2009 15:00	WB01-B	✓	✓	✓	✓	✓	✓
EB0910533-003	02-JUL-2009 15:00	WB02-A	✓	✓	✓	✓	✓	✓
EB0910533-004	02-JUL-2009 15:00	WB03-A	✓	✓	✓	✓	✓	✓
EB0910533-005	02-JUL-2009 15:00	WB03-B	✓	✓	✓	✓	✓	✓
EB0910533-006	02-JUL-2009 15:00	WB04-A	✓	✓	✓	✓	✓	✓
EB0910533-007	02-JUL-2009 15:00	DUP1	✓	✓	✓	✓	✓	✓
EB0910533-008	02-JUL-2009 15:00	CGS-2	✓	✓	✓	✓	✓	✓

Requested Deliverables

MS ANDREA BURCHARDT

- A4 - AU Tax Invoice (INV)	Email	andrea_burchardt@ghd.com.au

MS MARIA PRSKALO

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

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0910533**	Page	: 1 of 11
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS MARIA PRSKALO	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: maria.prskalo@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WESTERN BASIN		
C-O-C number	: 0-42/15386/51	Date Samples Received	: 03-JUL-2009
Sampler	: ----	Issue Date	: 13-JUL-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

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

This 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

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics
Matthew Goodwin	Senior Organic Chemist	Organics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

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 insuffient 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.

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 (%)*
EA005: pH (QC Lot: 1029451)									
EB0910514-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	8.28	8.27	0.1	0% - 20%
EB0910522-002	Anonymous	EA005: pH Value	----	0.01	pH Unit	9.07	9.07	0.0	0% - 20%
EA005: pH (QC Lot: 1029452)									
EB0910533-003	WB02-A	EA005: pH Value	----	0.01	pH Unit	6.68	6.70	0.3	0% - 20%
EB0910544-004	Anonymous	EA005: pH Value	----	0.01	pH Unit	8.36	8.36	0.0	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1034045)									
EB0910386-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	8880	8570	3.6	0% - 20%
EB0910533-004	WB03-A	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	32400	31000	4.6	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1030000)									
EB0910471-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	80	86	7.2	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	999	988	1.1	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	1080	1070	0.6	0% - 20%
EB0910480-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	422	424	0.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	422	424	0.5	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1030003)									
EB0910533-002	WB01-B	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	391	395	1.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	391	395	1.0	0% - 20%
ED040F: Dissolved Major Anions (QC Lot: 1029413)									
EB0910441-001	Anonymous	ED040F: Silicon	7440-21-3	0.05	mg/L	1.07	1.08	0.0	0% - 20%
		ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	9	9	0.0	No Limit
EB0910533-005	WB03-B	ED040F: Silicon	7440-21-3	0.05	mg/L	37.2	37.8	1.6	0% - 20%
		ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	1560	1580	1.2	0% - 20%
ED045G: Chloride Discrete analyser (QC Lot: 1029416)									
EB0910441-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	14	14	0.0	0% - 50%
EB0910533-005	WB03-B	ED045G: Chloride	16887-00-6	1	mg/L	9000	8920	0.9	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1029414)									
EB0910441-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	15	16	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	23	22	0.0	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 (%)*
ED093F: Dissolved Major Cations (QC Lot: 1029414) - continued									
EB0910441-001	Anonymous	ED093F: Potassium	7440-09-7	1	mg/L	9	8	0.0	No Limit
EB0910533-005	WB03-B	ED093F: Calcium	7440-70-2	1	mg/L	382	385	0.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	781	794	1.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	4200	4300	2.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	153	156	1.4	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1030514)									
EB0910533-001	WB01-A	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0005	<0.0005	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.113	0.109	3.5	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.005	<0.005	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.005	<0.005	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	9.37	9.22	1.5	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.072	0.073	1.9	0% - 50%
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.07	0.06	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.02	<0.02	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	7.67	7.63	0.5	0% - 20%
EB0910545-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.078	0.077	1.8	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.066	0.064	3.0	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	0.006	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1030513)									

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 (%)*
EG035F: Dissolved Mercury by FIMS (QC Lot: 1030513) - continued									
EB0910533-001	WB01-A	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EB0910589-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 1030002)									
EB0910533-002	WB01-B	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.4	0.4	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1032492)									
EB0910533-001	WB01-A	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	12.8	13.0	1.6	0% - 20%
EB0910569-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.24	0.26	6.3	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1029412)									
EB0910441-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB0910526-002	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1029417)									
EB0910533-005	WB03-B	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB0910573-002	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	0.11	0.15	29.4	0% - 50%
EK059G: NOX as N by Discrete Analyser (QC Lot: 1032491)									
EB0910533-001	WB01-A	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.08	0.07	18.4	No Limit
EB0910569-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.04	0.06	50.5	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1030118)									
EB0910436-008	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.02	0.08	104	No Limit
EB0910515-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	12.1	11.5	5.1	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1030122)									
EB0910533-004	WB03-A	EK067G: Total Phosphorus as P	----	0.01	mg/L	1.12	1.10	1.8	0% - 20%
EB0910567-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.17	0.18	0.0	0% - 50%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1030039)									
EB0910523-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	27900	27800	0.6	0% - 20%
EB0910533-008	CSGW-2	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEX (QC Lot: 1030039)									
EB0910523-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	7530	7560	0.4	0% - 20%
		EP080: Toluene	108-88-3	2	µg/L	4950	4910	0.8	0% - 20%
		EP080: Ethylbenzene	100-41-4	2	µg/L	394	387	1.7	0% - 20%
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	5680	5630	0.8	0% - 20%
		EP080: ortho-Xylene	95-47-6	2	µg/L	2470	2430	1.6	0% - 20%
EB0910533-008	CSGW-2	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit

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 Sample (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
EA005: pH (QCLot: 1029451)								
EA005: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	85	115
EA005: pH (QCLot: 1029452)								
EA005: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	85	115
EA015: Total Dissolved Solids (QCLot: 1034045)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	96.2	85	109
ED037P: Alkalinity by PC Titrator (QCLot: 1030000)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	102	83	111
ED037P: Alkalinity by PC Titrator (QCLot: 1030003)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	103	83	111
ED040F: Dissolved Major Anions (QCLot: 1029413)								
ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	<1	----	----	----	----
ED040F: Silicon	7440-21-3	0.05	mg/L	<0.05	----	----	----	----
ED045G: Chloride Discrete analyser (QCLot: 1029416)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	106	90	130
ED093F: Dissolved Major Cations (QCLot: 1029414)								
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: 1030514)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	118	76	130
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	104	80	124
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	123	84	130
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	108	89	117
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	110	85	127
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	107	87	117
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	106	85	119
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	106	88	116
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	113	83	123
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.100 mg/L	99.7	85	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	106	85	119
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.100 mg/L	109	82	122

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1030514) - continued								
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	102	79	117
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	120	86	130
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	108	79	128
EG020F: Dissolved Metals by ICP-MS (QCLot: 1034366)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	107	76	130
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	100	80	124
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	130	84	130
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	100	89	117
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	116	85	127
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	103	87	117
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	104	85	119
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	101	88	116
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	106	83	123
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.100 mg/L	98.9	85	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	105	85	119
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.100 mg/L	95.6	82	122
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	99.6	79	117
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	108	86	130
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	105	79	128
EG035F: Dissolved Mercury by FIMS (QCLot: 1030513)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	96.5	81	115
EK040P: Fluoride by PC Titrator (QCLot: 1030002)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	10 mg/L	90.3	75	123
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1032492)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	85.2	70	129
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1029412)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	107	74	128
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1029417)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	111	74	128
EK059G: NOX as N by Discrete Analyser (QCLot: 1032491)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	105	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1030118)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	93.6	73	117
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1030122)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	97.8	73	117
EP075(SIM)A: Phenolic Compounds (QCLot: 1032104)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)A: Phenolic Compounds (QCLot: 1032104) - continued								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	26.9	24	70
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	65.2	57	105
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	58.2	51	96
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	52.3	45	94
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	71.9	48	132
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	67.1	44	112
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	66.6	60	114
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	66.2	59	115
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	65.6	60	117
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	69.5	59	123
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	64.2	59	123
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	75.8	22.1	130
EP075(SIM): 2.3.4.6-Tetrachlorophenol	58-90-2	1	µg/L	<1.0	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1032104)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	77.3	46	111
EP075(SIM): 2-Methylnaphthalene	91-57-6	1	µg/L	<1.0	5 µg/L	68.9	50	120
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	73.0	51	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	67.8	50	114
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	70.2	55	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	67.1	54	110
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	69.8	49	117
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	72.1	51	117
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	72.0	51	117
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	72.8	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	70.9	48	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	72.5	48	130
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	73.2	43	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	74.6	44	120
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	75.2	45	129
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	77.2	47	131
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	74.7	42	126
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1030039)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	160 µg/L	102	73	135
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1032103)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	600 µg/L	55.1	49	110
EP071: C15 - C28 Fraction	----	100	µg/L	<100	1020 µg/L	63.2	58	130
EP071: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080: BTEX (QCLot: 1030039)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEX (QCLot: 1030039) - continued								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	102	77.6	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	102	74	122
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	102	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	101	70.4	129
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	100	74.3	126

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**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride Discrete analyser (QCLot: 1029416)							
EB0910441-002	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	99.1	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1030514)							
EB0910533-002	WB01-B	EG020A-F: Aluminium	7429-90-5	1.25 mg/L	103	70	130
		EG020A-F: Arsenic	7440-38-2	.25 mg/L	106	70	130
		EG020A-F: Beryllium	7440-41-7	.25 mg/L	107	70	130
		EG020A-F: Barium	7440-39-3	1.25 mg/L	101	70	130
		EG020A-F: Cadmium	7440-43-9	.25 mg/L	99.1	70	130
		EG020A-F: Chromium	7440-47-3	.25 mg/L	110	70	130
		EG020A-F: Cobalt	7440-48-4	.25 mg/L	100	70	130
		EG020A-F: Copper	7440-50-8	.5 mg/L	93.1	70	130
		EG020A-F: Lead	7439-92-1	.25 mg/L	91.0	70	130
		EG020A-F: Manganese	7439-96-5	.25 mg/L	# Not Determined	70	130
		EG020A-F: Molybdenum	7439-98-7	.25 mg/L	108	70	130
		EG020A-F: Nickel	7440-02-0	.25 mg/L	96.6	70	130
		EG020A-F: Selenium	7782-49-2	.25 mg/L	102	70	130
		EG020A-F: Vanadium	7440-62-2	.25 mg/L	107	70	130
		EG020A-F: Zinc	7440-66-6	.5 mg/L	99.2	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 1030513)							
EB0910533-002	WB01-B	EG035F: Mercury	7439-97-6	0.010 mg/L	# ----	70	130
EK040P: Fluoride by PC Titrator (QCLot: 1030002)							
EB0910533-001	WB01-A	EK040P: Fluoride	16984-48-8	4.9 mg/L	73.5	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1032492)							
EB0910533-002	WB01-B	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	112	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1029412)							
EB0910441-002	Anonymous	EK057G: Nitrite as N	----	0.4 mg/L	127	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1029417)							
EB0910533-006	WB04-A	EK057G: Nitrite as N	----	0.4 mg/L	98.1	70	130
EK059G: NOX as N by Discrete Analyser (QCLot: 1032491)							
EB0910533-002	WB01-B	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	118	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1030118)							
EB0910437-001	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	104	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1030122)							
EB0910589-003	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	102	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1030039)							
EB0910523-002	Anonymous	EP080: C6 - C9 Fraction	----	140 µg/L	86.1	70	130
EP080: BTEX (QCLot: 1030039)							
EB0910523-002	Anonymous	EP080: Benzene	71-43-2	10 µg/L	100	70	130
		EP080: Toluene	108-88-3	10 µg/L	101	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0910533**	Page	: 1 of 9
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MS MARIA PRSKALO	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: maria.prskalo@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WESTERN BASIN		
C-O-C number	: 0-42/15386/51	Date Samples Received	: 03-JUL-2009
Sampler	: ----	Issue Date	: 13-JUL-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

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

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

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
EA005: pH								
Clear Plastic Bottle - Natural								
WB01-A,	WB01-B,	**02-JUL-2009**	**----**	----	----	**03-JUL-2009**	02-JUL-2009	✗
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural								
WB01-A,	WB01-B,	**02-JUL-2009**	**----**	----	----	**09-JUL-2009**	09-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural								
WB01-A,	WB01-B,	**02-JUL-2009**	**---**	---	----	**06-JUL-2009**	16-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
ED040F: Dissolved Major Anions								
Clear Plastic Bottle - Natural								
WB01-A,	WB01-B,	**02-JUL-2009**	**---**	---	----	**03-JUL-2009**	30-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
ED045G: Chloride Discrete analyser								
Clear Plastic Bottle - Natural								
WB01-A,	WB01-B,	**02-JUL-2009**	**---**	---	----	**04-JUL-2009**	30-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							

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 - Natural								
WB01-A,	WB01-B,	**02-JUL-2009**	---	---	----	**03-JUL-2009**	30-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Filtered; Lab-acidified								
WB01-A,	WB01-B,	**02-JUL-2009**	---	---	----	**06-JUL-2009**	29-DEC-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Filtered; Lab-acidified								
WB01-A,	WB01-B,	**02-JUL-2009**	---	---	----	**07-JUL-2009**	30-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EK040P: Fluoride by PC Titrator								
Clear Plastic Bottle - Natural								
WB01-A,	WB01-B,	**02-JUL-2009**	---	---	----	**06-JUL-2009**	30-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid								
WB01-A,	WB01-B,	**02-JUL-2009**	---	---	----	**07-JUL-2009**	30-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural								
WB01-A,	WB01-B,	**02-JUL-2009**	---	---	----	**04-JUL-2009**	04-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							

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
EK059G: NOX as N by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid								
WB01-A,	WB01-B,	**02-JUL-2009**	**---**	---	----	**07-JUL-2009**	30-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid								
WB01-A,	WB01-B,	**02-JUL-2009**	**06-JUL-2009**	30-JUL-2009	✓	**06-JUL-2009**	30-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EP075(SIM)A: Phenolic Compounds								
Amber Glass Bottle - Unpreserved								
WB01-A,	WB01-B,	**02-JUL-2009**	**08-JUL-2009**	09-JUL-2009	✓	**09-JUL-2009**	17-AUG-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved								
WB01-A,	WB01-B,	**02-JUL-2009**	**08-JUL-2009**	09-JUL-2009	✓	**09-JUL-2009**	17-AUG-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved								
WB01-A,	WB01-B,	**02-JUL-2009**	**08-JUL-2009**	09-JUL-2009	✓	**09-JUL-2009**	17-AUG-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
Amber VOC Vial - HCl or NaHSO4								
WB01-A,	WB01-B,	**02-JUL-2009**	**---**	---	----	**06-JUL-2009**	16-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							
EP080: BTEX								
Amber VOC Vial - HCl or NaHSO4								
WB01-A,	WB01-B,	**02-JUL-2009**	**---**	---	----	**06-JUL-2009**	16-JUL-2009	✓
WB02-A,	WB03-A,							
WB03-B,	WB04-A,							
DUP1,	CSGW-2							

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(where) 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	3	23	**13.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Filtered	ED040F	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	4	34	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	4	34	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	23	**8.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	34	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	34	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

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							
Major Anions - Filtered	ED040F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	34	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	34	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	11	**9.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	**6.7**	**5.0**	✓	ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	34	**5.9**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	34	**5.9**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement

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
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 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 (1999) Schedule B(3) (Appdx. 2)
Major Anions - Filtered	ED040F	WATER	APHA 21st ed., 3120 Sulfur and/or Silcon content is determined by ICP/AES and reported as Sulfate and/or Silica after conversion by gravimetric factor.
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 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 - Filtered	ED093F	WATER	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): 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	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) 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 (1999) Schedule B(3) (Appdx. 2)
Silica (Total Dissolved) by ICPAES	EG052	WATER	APHA 21st ed., 4500-SiO2. Silica (Total) determined by calculation from Silicon by ICPAES.
Fluoride by PC Titrator	EK040P	WATER	APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a cadmium reduction column 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 (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample 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 (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by PCT DA and ICPAES	EN055 - DA	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

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							
EG020F: Dissolved Metals by ICP-MS	EB0910533-002	WB01-B	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG035F: Dissolved Mercury by FIMS	EB0910533-002	WB01-B	**Mercury**	7439-97-6	---- %	70-130%	**Recovery less than lower data quality objective**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

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
EA005: pH							
Clear Plastic Bottle - Natural							
WB01-A,	WB01-B,	----	----	----	03-JUL-2009	02-JUL-2009	**1**
WB02-A,	WB03-A,						
WB03-B,	WB04-A,						
DUP1,	CSGW-2						

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0911699**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: P O BOX 930 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.k.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 4771 5645	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4772 6514	Facsimile	: +61-7-3243 7218
Project	: 42 1538651	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: WESTERN BASIN		
Sampler	: R. BROWN	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 24-JUL-2009	Issue Date	: 24-JUL-2009 15:55
Client Requested Due Date	: 30-JUL-2009	Scheduled Reporting Date	: **30-JUL-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 8.0 C - Ice bricks present
No. of coolers/boxes	: 1 MEDIUM	No. of samples received	: 2
Sercurity Seal	: Intact.	No. of samples analysed	: 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur.**
- **pH holding time is six hours after sampling.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA015 Total Dissolved Solids	WATER - EG020A-F Dissolved Metals by ICPMS - Suite A	WATER - EG052 Silica (Total Dissolved) by ICPAES	WATER - EK040-P Fluoride(PC)	WATER - EK055G Ammonia as N By Discrete Analyser	WATER - EK058G Nitrate as N by Discrete Analyser	WATER - EK067G Total Phosphorus as P By Discrete Analyser
EB0911699-001	23-JUL-2009 08:40	FL982A	✓	✓	✓	✓	✓	✓	✓	✓
EB0911699-002	23-JUL-2009 09:05	FL982B	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EN055 - DA Ionic Balance (DA)	WATER - EP075 SIM Phenols only SIM - Phenols only	WATER - Major Anions Cl, SO4, Alkalinity PCT	WATER - Major Cations Ca, Mg, Na, K	WATER - W-03 13 Metals (NEPM Suite)	WATER - W-07 TPH/BTEX/PAH
EB0911699-001	23-JUL-2009 08:40	FL982A	✓	✓	✓	✓	✓	✓
EB0911699-002	23-JUL-2009 09:05	FL982B	✓	✓	✓	✓	✓	✓

Requested Deliverables

MS ALITA McPHEE

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

MS ANDREA BURCHARDT

- A4 - AU Tax Invoice (INV)	Email	andrea_burchardt@ghd.com.au

MS RUTH BROWN

- *AU Certificate of Analysis - NATA	Email	ruth.k.brown@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep)	Email	ruth.k.brown@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA	Email	ruth.k.brown@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental	Email	ruth.k.brown@ghd.com.au
- Default - Chain of Custody	Email	ruth.k.brown@ghd.com.au
- EDI Format - ENMRG	Email	ruth.k.brown@ghd.com.au
- EDI Format - ESDAT	Email	ruth.k.brown@ghd.com.au
- EDI Format - XTab (XTAB)	Email	ruth.k.brown@ghd.com.au

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0911699**	Page	: 1 of 10
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: P O BOX 930 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.k.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 4771 5645	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4772 6514	Facsimile	: +61-7-3243 7218
Project	: 42 1538651	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WESTERN BASIN		
C-O-C number	: ----	Date Samples Received	: 24-JUL-2009
Sampler	: R. BROWN	Issue Date	: 31-JUL-2009
Order number	: ----		
		No. of samples received	: 2
Quote number	: EN/005/09	No. of samples analysed	: 2

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

This 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

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics
Sarah Ashworth	Organic Chemist	Organics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

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 insuffient 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.

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 (%)*
EA005: pH (QC Lot: 1049939)									
EB0911696-003	Anonymous	EA005: pH Value	----	0.01	pH Unit	7.51	7.51	0.0	0% - 20%
EB0911699-002	FL982B	EA005: pH Value	----	0.01	pH Unit	7.30	7.30	0.0	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1054301)									
EB0911699-001	FL982A	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	24200	24200	0.0	0% - 20%
EB0911884-009	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	2240	2000	11.6	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1050392)									
EB0911608-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	36	39	8.0	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	467	464	0.6	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	503	503	0.0	0% - 20%
EB0911679-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	338	344	1.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	338	344	1.7	0% - 20%
ED040F: Dissolved Major Anions (QC Lot: 1051236)									
EB0911654-001	Anonymous	ED040F: Silicon	7440-21-3	0.05	mg/L	8.67	8.33	4.0	0% - 20%
		ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	11	10	0.0	0% - 50%
EB0911678-003	Anonymous	ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	136	113	18.6	0% - 20%
ED045G: Chloride Discrete analyser (QC Lot: 1051239)									
EB0911654-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	73	75	2.4	0% - 20%
EB0911654-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	73	75	3.1	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1051237)									
EB0911654-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	27	26	4.5	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	19	18	0.0	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	49	47	4.1	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
EB0911678-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	121	118	2.7	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	601	584	2.8	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	3420	3320	3.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	387	382	1.3	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1050010)									
EB0911455-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.008	0.009	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit

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 (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1050010) - continued									
EB0911455-001	Anonymous	EG020A-F: Barium	7440-39-3	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.010	0.010	0.0	0% - 50%
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.074	0.075	1.8	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.111	0.112	1.3	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	0.018	0.018	0.0	0% - 50%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.029	0.029	0.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	2.29	2.34	2.3	0% - 20%
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	2.77	2.83	2.2	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.30	0.31	3.9	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1050009)									
EB0911455-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 1050394)									
EB0911608-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.5	0.5	0.0	No Limit
EB0911679-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.6	0.5	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1051748)									
EB0911607-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.10	<0.01	162	No Limit
EB0911662-006	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.09	0.09	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1051238)									
EB0911654-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB0911678-003	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: NOX as N by Discrete Analyser (QC Lot: 1051747)									
EB0911607-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.09	0.15	45.2	0% - 50%
EB0911662-006	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.49	0.43	13.5	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1050610)									
EB0911670-003	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.27	0.28	0.0	0% - 20%
EB0911736-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.10	<0.01	164	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1049784)									
EB0911607-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EB0911666-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEX (QC Lot: 1049784)									
EB0911607-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit

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 (%)*
EP080: BTEX (QC Lot: 1049784) - continued									
EB0911607-001	Anonymous	EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
EB0911666-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit

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 Sample (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
EA005: pH (QCLot: 1049939)								
EA005: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	85	115
EA015: Total Dissolved Solids (QCLot: 1054301)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	99.6	85	109
ED037P: Alkalinity by PC Titrator (QCLot: 1050392)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	89.6	83	111
ED040F: Dissolved Major Anions (QCLot: 1051236)								
ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	<1	----	----	----	----
ED040F: Silicon	7440-21-3	0.05	mg/L	<0.05	----	----	----	----
ED045G: Chloride Discrete analyser (QCLot: 1051239)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	89.9	90	130
ED093F: Dissolved Major Cations (QCLot: 1051237)								
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: 1050010)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	106	76	130
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	98.1	80	124
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	125	84	130
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	102	89	117
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	113	85	127
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	105	87	117
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	107	85	119
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	102	88	116
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	109	83	123
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.100 mg/L	96.7	85	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	104	85	119
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.100 mg/L	103	82	122
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	102	79	117
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	111	86	130
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	108	79	128
EG035F: Dissolved Mercury by FIMS (QCLot: 1050009)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 1050009) - continued								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	107	81	115
EK040P: Fluoride by PC Titrator (QCLot: 1050394)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	10 mg/L	84.5	75	123
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1051748)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	88.2	70	129
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1051238)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	108	74	128
EK059G: NOX as N by Discrete Analyser (QCLot: 1051747)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	80.2	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1050610)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	102	73	117
EP075(SIM)A: Phenolic Compounds (QCLot: 1052001)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	# 80.4	24	70
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	86.7	57	105
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	88.2	51	96
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	79.4	45	94
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	77.8	48	132
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	84.4	44	112
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	97.9	60	114
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	92.0	59	115
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	86.0	60	117
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	84.2	59	123
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	85.1	59	123
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	61.4	22.1	130
EP075(SIM): 2.3.4.6-Tetrachlorophenol	58-90-2	1	µg/L	<1.0	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1052001)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	85.5	46	111
EP075(SIM): 2-Methylnaphthalene	91-57-6	1	µg/L	<1.0	5 µg/L	96.3	50	120
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	85.3	51	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	77.1	50	114
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	78.7	55	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	71.4	54	110
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	77.8	49	117
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	77.1	51	117
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	80.1	51	117
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	79.0	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	87.2	48	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	74.6	48	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1052001) - continued								
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	77.5	43	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	81.7	44	120
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	66.8	45	129
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	66.7	47	131
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	71.4	42	126
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	1	µg/L	<1.0	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1049784)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	160 µg/L	105	73	135
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1051998)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	600 µg/L	68.0	49	110
EP071: C15 - C28 Fraction	----	100	µg/L	<100	1020 µg/L	82.3	58	130
EP071: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080: BTEX (QCLot: 1049784)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	108	77.6	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	100	74	122
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	106	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	97.3	70.4	129
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	102	74.3	126

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**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride Discrete analyser (QCLot: 1051239)							
EB0911654-002	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	89.9	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1050010)							
EB0911455-002	Anonymous	EG020A-F: Aluminium	7429-90-5	.5 mg/L	87.7	70	130
		EG020A-F: Arsenic	7440-38-2	0.100 mg/L	104	70	130
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	113	70	130
		EG020A-F: Barium	7440-39-3	.5 mg/L	96.4	70	130
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	102	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	96.7	70	130
		EG020A-F: Cobalt	7440-48-4	0.100 mg/L	130	70	130
		EG020A-F: Copper	7440-50-8	.2 mg/L	# Not Determined	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	99.5	70	130
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	108	70	130
		EG020A-F: Molybdenum	7439-98-7	0.100 mg/L	93.1	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	102	70	130
		EG020A-F: Selenium	7782-49-2	0.100 mg/L	108	70	130
		EG020A-F: Vanadium	7440-62-2	0.100 mg/L	111	70	130
		EG020A-F: Zinc	7440-66-6	.2 mg/L	# Not Determined	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 1050009)							
EB0911455-002	Anonymous	EG035F: Mercury	7439-97-6	0.010 mg/L	86.3	70	130
EK040P: Fluoride by PC Titrator (QCLot: 1050394)							
EB0911608-001	Anonymous	EK040P: Fluoride	16984-48-8	4.9 mg/L	86.0	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1051748)							
EB0911607-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	106	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1051238)							
EB0911654-002	Anonymous	EK057G: Nitrite as N	----	0.4 mg/L	124	70	130
EK059G: NOX as N by Discrete Analyser (QCLot: 1051747)							
EB0911607-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	71.5	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1050610)							
EB0911670-004	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	97.9	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1049784)							
EB0911607-002	Anonymous	EP080: C6 - C9 Fraction	----	140 µg/L	70.4	70	130
EP080: BTEX (QCLot: 1049784)							
EB0911607-002	Anonymous	EP080: Benzene	71-43-2	10 µg/L	84.4	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEX (QCLot: 1049784) - continued							
EB0911607-002	Anonymous	EP080: Toluene	108-88-3	10 µg/L	81.9	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0911699**	Page	: 1 of 9
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: P O BOX 930 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.k.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 4771 5645	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4772 6514	Facsimile	: +61-7-3243 7218
Project	: 42 1538651	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WESTERN BASIN		
C-O-C number	: ----	Date Samples Received	: 24-JUL-2009
Sampler	: R. BROWN	Issue Date	: 31-JUL-2009
Order number	: ----		
		No. of samples received	: 2
Quote number	: EN/005/09	No. of samples analysed	: 2

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

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

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
EA005: pH								
Clear Plastic Bottle - Natural								
FL982A,	FL982B	**23-JUL-2009**	**----**	----	----	**24-JUL-2009**	23-JUL-2009	✗
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural								
FL982A,	FL982B	**23-JUL-2009**	**----**	----	----	**30-JUL-2009**	30-JUL-2009	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**27-JUL-2009**	06-AUG-2009	✓
ED040F: Dissolved Major Anions								
Clear Plastic Bottle - Natural								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**27-JUL-2009**	20-AUG-2009	✓
ED045G: Chloride Discrete analyser								
Clear Plastic Bottle - Natural								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**27-JUL-2009**	20-AUG-2009	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**27-JUL-2009**	20-AUG-2009	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**28-JUL-2009**	19-JAN-2010	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Filtered								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**28-JUL-2009**	20-AUG-2009	✓
EK040P: Fluoride by PC Titrator								
Clear Plastic Bottle - Natural								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**27-JUL-2009**	20-AUG-2009	✓
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**28-JUL-2009**	20-AUG-2009	✓

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								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**27-JUL-2009**	25-JUL-2009	×
EK059G: NOX as N by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**28-JUL-2009**	20-AUG-2009	✓
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulphuric Acid								
FL982A,	FL982B	**23-JUL-2009**	**27-JUL-2009**	20-AUG-2009	✓	**27-JUL-2009**	20-AUG-2009	✓
EP075(SIM)A: Phenolic Compounds								
Amber Glass Bottle - Unpreserved								
FL982A,	FL982B	**23-JUL-2009**	**28-JUL-2009**	30-JUL-2009	✓	**28-JUL-2009**	06-SEP-2009	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Amber Glass Bottle - Unpreserved								
FL982A,	FL982B	**23-JUL-2009**	**28-JUL-2009**	30-JUL-2009	✓	**28-JUL-2009**	06-SEP-2009	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved								
FL982A,	FL982B	**23-JUL-2009**	**28-JUL-2009**	30-JUL-2009	✓	**28-JUL-2009**	06-SEP-2009	✓
Amber VOC Vial - HCl or NaHSO4								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**27-JUL-2009**	06-AUG-2009	✓
EP080: BTEX								
Amber VOC Vial - HCl or NaHSO4								
FL982A,	FL982B	**23-JUL-2009**	**---**	---	----	**27-JUL-2009**	06-AUG-2009	✓

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(where) 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	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Filtered	ED040F	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	2	10	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

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							
Major Anions - Filtered	ED040F	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	16	**6.3**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	16	**6.3**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	11	**9.1**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement

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
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 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 (1999) Schedule B(3) (Appdx. 2)
Major Anions - Filtered	ED040F	WATER	APHA 21st ed., 3120 Sulfur and/or Silcon content is determined by ICP/AES and reported as Sulfate and/or Silica after conversion by gravimetric factor.
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 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 - Filtered	ED093F	WATER	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): 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	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) 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 (1999) Schedule B(3) (Appdx. 2)
Silica (Total Dissolved) by ICPAES	EG052	WATER	APHA 21st ed., 4500-SiO2. Silica (Total) determined by calculation from Silicon by ICPAES.
Fluoride by PC Titrator	EK040P	WATER	APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a cadmium reduction column 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 (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample 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 (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by PCT DA and ICPAES	EN055 - DA	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

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
Laboratory Control Spike (LCS) Recoveries							
ED045G: Chloride Discrete analyser	1208374-037	----	**Chloride**	16887-00-6	88.2 %	90-110%	**Recovery less than lower control limit**
EP075(SIM)A: Phenolic Compounds	1209370-018	----	**Phenol**	108-95-2	80.4 %	24-70%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
EG020F: Dissolved Metals by ICP-MS	EB0911455-002	Anonymous	**Copper**	7440-50-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG020F: Dissolved Metals by ICP-MS	EB0911455-002	Anonymous	**Zinc**	7440-66-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005: pH						
Clear Plastic Bottle - Natural						
FL982A, FL982B	----	----	----	24-JUL-2009	23-JUL-2009	**1**
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural						
FL982A, FL982B	----	----	----	27-JUL-2009	25-JUL-2009	**2**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0912386**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: P O BOX 930 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.k.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 4771 5645	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4772 6514	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51 Western Basin EIS	Page	: 1 of 2
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 06-AUG-2009	Issue Date	: 06-AUG-2009 16:29
Client Requested Due Date	: 14-AUG-2009	Scheduled Reporting Date	: **13-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 5.4 C - Ice present
No. of coolers/boxes	: 1 SMALL	No. of samples received	: 9
Sercurity Seal	: Intact.	No. of samples analysed	: 9

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EK055G Ammonia as N By Discrete Analyser	WATER - EK059G Nitrite plus Nitrate as N (NOx) by Discrete Analyser	WATER - EK067G Total Phosphorus as P By Discrete Analyser
EB0912386-001	05-AUG-2009 15:00	FL982A	✓	✓	✓
EB0912386-002	05-AUG-2009 15:00	FL982B	✓	✓	✓
EB0912386-003	05-AUG-2009 15:00	WB03A	✓	✓	✓
EB0912386-004	05-AUG-2009 15:00	WB03B	✓	✓	✓
EB0912386-005	05-AUG-2009 15:00	WB01A	✓	✓	✓
EB0912386-006	05-AUG-2009 15:00	WB01B	✓	✓	✓
EB0912386-007	05-AUG-2009 15:00	WB04A	✓	✓	✓
EB0912386-008	05-AUG-2009 15:00	WB02A	✓	✓	✓
EB0912386-009	05-AUG-2009 15:00	DUP 1	✓	✓	✓

Requested Deliverables

MS ALITA MCPHEE

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

MS ANDREA BURCHARDT

- A4 - AU Tax Invoice (INV)	Email	andrea_burchardt@ghd.com.au

MS RUTH BROWN

- *AU Certificate of Analysis - NATA (COA)	Email	ruth.k.brown@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ruth.k.brown@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ruth.k.brown@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	ruth.k.brown@ghd.com.au
- Default - Chain of Custody (COC)	Email	ruth.k.brown@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	ruth.k.brown@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	ruth.k.brown@ghd.com.au
- EDI Format - XTab (XTAB)	Email	ruth.k.brown@ghd.com.au

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0912386**	Page	: 1 of 5
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: P O BOX 930 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.k.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 4771 5645	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4772 6514	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51 Western Basin EIS	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: ----	Issue Date	: 11-AUG-2009
Order number	: ----		
		No. of samples received	: 9
Quote number	: EN/005/09	No. of samples analysed	: 9

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

This 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

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics

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 insuffient 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.

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 (%)*
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1061978)									
EB0912059-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.08	0.09	14.9	No Limit
EB0912302-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.09	0.10	0.0	0% - 50%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1061980)									
EB0912386-005	WB01A	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	12.3	12.9	4.8	0% - 20%
EK059G: NOX as N by Discrete Analyser (QC Lot: 1061977)									
EB0912059-002	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.42	0.47	9.8	0% - 20%
EB0912302-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	2.20	2.34	5.7	0% - 20%
EK059G: NOX as N by Discrete Analyser (QC Lot: 1061979)									
EB0912386-005	WB01A	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.16	0.15	8.9	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1063688)									
EB0912349-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB0912355-006	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1063689)									
EB0912387-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.42	0.51	19.3	0% - 20%
EB0912387-004	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit

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 Sample (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
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1061978)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	96.0	70	129
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1061980)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	95.4	70	129
EK059G: NOX as N by Discrete Analyser (QCLot: 1061977)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	86.2	70	130
EK059G: NOX as N by Discrete Analyser (QCLot: 1061979)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	83.4	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1063688)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	106	73	117
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1063689)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	110	73	117

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**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1061978)							
EB0912269-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	91.5	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1061980)							
EB0912386-006	WB01B	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	100	70	130
EK059G: NOX as N by Discrete Analyser (QCLot: 1061977)							
EB0912269-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	100	70	130
EK059G: NOX as N by Discrete Analyser (QCLot: 1061979)							
EB0912386-006	WB01B	EK059G: Nitrite + Nitrate as N	----	0.4 mg/L	84.5	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1063688)							
EB0912349-002	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	88.4	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1063689)							
EB0912387-002	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	101	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0912386**	Page	: 1 of 5
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: P O BOX 930 TOWNSVILLE QLD, AUSTRALIA 4810	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.k.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 4771 5645	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4772 6514	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51 Western Basin EIS	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: ----	Issue Date	: 11-AUG-2009
Order number	: ----		
		No. of samples received	: 9
Quote number	: EN/005/09	No. of samples analysed	: 9

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

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

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 - Sulphuric Acid							
FL982A, FL982B, WB03A, WB03B, WB01A, WB01B, WB04A, WB02A, DUP 1	**05-AUG-2009**	**---**	---	----	**10-AUG-2009**	02-SEP-2009	✓
EK059G: NOX as N by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid							
FL982A, FL982B, WB03A, WB03B, WB01A, WB01B, WB04A, WB02A, DUP 1	**05-AUG-2009**	**---**	---	----	**10-AUG-2009**	02-SEP-2009	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid							
FL982A, FL982B, WB03A, WB03B, WB01A, WB01B, WB04A, WB02A, DUP 1	**05-AUG-2009**	**10-AUG-2009**	02-SEP-2009	✓	**10-AUG-2009**	02-SEP-2009	✓

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(where) 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)							
Ammonia as N by Discrete analyser	EK055G	3	30	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	3	30	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	4	34	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	2	30	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	30	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	34	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	2	30	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	30	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	34	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	2	30	**6.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	30	**6.7**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	34	**5.9**	**5.0**	✓	ALS QCS3 requirement

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
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample 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 (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

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

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0912501**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51 Western Basin EIS	Page	: 1 of 2
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 07-AUG-2009	Issue Date	: 10-AUG-2009 10:47
Client Requested Due Date	: 17-AUG-2009	Scheduled Reporting Date	: **17-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 6.6,5.9,7.5,6.8C - Ice bricks present
No. of coolers/boxes	: 3 LARGE, 3 MEDIUM	No. of samples received	: 9
Sercurity Seal	: Intact.	No. of samples analysed	: 9

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur.**
- **pH holding time is six hours after sampling.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA015 Total Dissolved Solids	WATER - EG052 Silica (Total Dissolved) by ICPAES	WATER - EK040-P Fluoride(PC)	WATER - EN055 - DA Ionic Balance (DA)	WATER - Major Anions Cl, SO4, Alkalinity PCT	WATER - Major Cations Ca, Mg, Na, K	WATER - W-03 13 Metals (NEPM Suite)
EB0912501-001	05-AUG-2009 15:00	FL98 2A	✓	✓	✓	✓	✓	✓	✓	✓
EB0912501-002	05-AUG-2009 15:00	FL98 2B	✓	✓	✓	✓	✓	✓	✓	✓
EB0912501-003	05-AUG-2009 15:00	WB03A	✓	✓	✓	✓	✓	✓	✓	✓
EB0912501-004	05-AUG-2009 15:00	WB03B	✓	✓	✓	✓	✓	✓	✓	✓
EB0912501-005	05-AUG-2009 15:00	WB01A	✓	✓	✓	✓	✓	✓	✓	✓
EB0912501-006	05-AUG-2009 15:00	WB01B	✓	✓	✓	✓	✓	✓	✓	✓
EB0912501-007	05-AUG-2009 15:00	WB04A	✓	✓	✓	✓	✓	✓	✓	✓
EB0912501-008	05-AUG-2009 15:00	WB02A	✓	✓	✓	✓	✓	✓	✓	✓
EB0912501-009	05-AUG-2009 15:00	DUP1	✓	✓	✓	✓	✓	✓	✓	✓

Requested Deliverables

MS ALITA McPHEE

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

MS ANDREA BURCHARDT

- A4 - AU Tax Invoice (INV)	Email	andrea_burchardt@ghd.com.au

MS RUTH BROWN

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

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0912501**	Page	: 1 of 8
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS ALITA McPHEE	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alita_mcphee@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3963	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51 Western Basin EIS	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 07-AUG-2009
Sampler	: ----	Issue Date	: 17-AUG-2009
Order number	: ----		
		No. of samples received	: 9
Quote number	: EN/005/09	No. of samples analysed	: 9

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

This 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

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics

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 insuffient 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.

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 (%)*
EA005: pH (QC Lot: 1063707)									
EB0912501-001	FL98 2A	EA005: pH Value	----	0.01	pH Unit	6.87	6.97	1.4	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1068003)									
EB0912355-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	665	681	2.4	0% - 20%
EB0912355-010	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	2970	2940	1.1	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1068004)									
EB0912501-007	WB04A	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	7290	6630	9.5	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1063835)									
EB0912501-002	FL98 2B	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	670	670	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	670	670	0.0	0% - 20%
EB0912507-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	258	258	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	258	258	0.0	0% - 20%
ED040F: Dissolved Major Anions (QC Lot: 1064598)									
EB0912462-003	Anonymous	ED040F: Silicon	7440-21-3	0.05	mg/L	5.28	5.34	1.2	0% - 20%
		ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	17	17	0.0	0% - 50%
EB0912463-004	Anonymous	ED040F: Silicon	7440-21-3	0.05	mg/L	7.62	7.72	1.3	0% - 20%
		ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	157	156	0.0	0% - 20%
ED045G: Chloride Discrete analyser (QC Lot: 1064600)									
EB0912463-004	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	95	95	0.0	0% - 20%
EB0912501-006	WB01B	ED045G: Chloride	16887-00-6	1	mg/L	14700	14800	0.7	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1064599)									
EB0912462-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	22	23	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	9	9	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	42	42	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	4	0.0	No Limit
EB0912501-006	WB01B	ED093F: Calcium	7440-70-2	1	mg/L	528	536	1.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1260	1270	1.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	8900	9130	2.5	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	306	300	1.9	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1064520)									
EB0912229-005	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

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 (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1064520) - continued									
EB0912229-005	Anonymous	EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.005	0.006	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.006	0.005	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.013	0.013	0.0	0% - 50%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.021	0.020	0.0	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.895	0.896	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.046	0.045	0.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.123	0.121	1.4	0% - 20%
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB0912441-003	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.025	0.025	0.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1064523)									
EB0912501-004	WB03B	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0011	0.0011	0.0	0% - 50%
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	0.009	0.008	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.100	0.095	5.4	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.463	0.441	4.8	0% - 20%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.016	0.016	0.0	0% - 50%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	38.9	40.7	4.6	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.154	0.153	1.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.213	0.207	3.0	0% - 20%
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EB0912507-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0005	<0.0005	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.005	<0.005	0.0	No Limit

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 (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1064523) - continued									
EB0912507-004	Anonymous	EG020A-F: Barium	7440-39-3	0.001	mg/L	0.035	0.036	3.1	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.012	0.012	0.0	0% - 50%
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.917	0.922	0.5	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.05	<0.05	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1064519)									
EB0912229-005	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EB0912501-004	WB03B	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 1063836)									
EB0912501-002	FL98 2B	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.5	0.5	0.0	No Limit
EB0912505-002	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.3	0.3	0.0	No Limit

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 Sample (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
EA005: pH (QCLot: 1063707)								
EA005: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	85	115
EA015: Total Dissolved Solids (QCLot: 1068003)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	101	85	109
EA015: Total Dissolved Solids (QCLot: 1068004)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	98.6	85	109
ED037P: Alkalinity by PC Titrator (QCLot: 1063835)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	500 mg/L	94.2	83	111
ED040F: Dissolved Major Anions (QCLot: 1064598)								
ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	<1	----	----	----	----
ED040F: Silicon	7440-21-3	0.05	mg/L	<0.05	----	----	----	----
ED045G: Chloride Discrete analyser (QCLot: 1064600)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	96.5	90	130
ED093F: Dissolved Major Cations (QCLot: 1064599)								
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: 1064520)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	109	80	124
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	125	84	130
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	107	89	117
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	118	85	127
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	106	87	117
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	105	85	119
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	103	88	116
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	120	83	123
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	102	85	119
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	110	79	117
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	119	86	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1064523)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	101	80	124
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	116	84	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1064523) - continued								
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	106	89	117
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	108	85	127
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	103	87	117
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	99.5	85	119
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	101	88	116
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	110	83	123
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	96.5	85	119
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	97.3	79	117
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	103	86	130
EG035F: Dissolved Mercury by FIMS (QCLot: 1064519)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	86.8	81	115
EK040P: Fluoride by PC Titrator (QCLot: 1063836)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	10 mg/L	92.4	75	123

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**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride Discrete analyser (QCLot: 1064600)							
EB0912463-007	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	84.5	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1064520)							
EB0912424-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.100 mg/L	112	70	130
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	100	70	130
		EG020A-F: Barium	7440-39-3	.5 mg/L	100	70	130
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	109	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	108	70	130
		EG020A-F: Cobalt	7440-48-4	0.100 mg/L	104	70	130
		EG020A-F: Copper	7440-50-8	.2 mg/L	107	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	106	70	130
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	117	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	101	70	130
		EG020A-F: Vanadium	7440-62-2	0.100 mg/L	116	70	130
		EG020A-F: Zinc	7440-66-6	.2 mg/L	122	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1064523)							
EB0912501-005	WB01A	EG020A-F: Arsenic	7440-38-2	0.100 mg/L	# 295	70	130
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	# 283	70	130
		EG020A-F: Barium	7440-39-3	.5 mg/L	# 311	70	130
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	# 289	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	# 313	70	130
		EG020A-F: Cobalt	7440-48-4	0.100 mg/L	# 296	70	130
		EG020A-F: Copper	7440-50-8	.2 mg/L	# 278	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	# 254	70	130
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	# Not Determined	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	# 283	70	130
		EG020A-F: Vanadium	7440-62-2	0.100 mg/L	# 313	70	130
		EG020A-F: Zinc	7440-66-6	.2 mg/L	# 272	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 1064519)							
EB0912424-001	Anonymous	EG035F: Mercury	7439-97-6	0.010 mg/L	87.4	70	130
EK040P: Fluoride by PC Titrator (QCLot: 1063836)							
EB0912501-001	FL98 2A	EK040P: Fluoride	16984-48-8	4.9 mg/L	74.1	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0912501**	Page	: 1 of 7
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MS ALITA McPHEE	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: alita_mcphee@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3963	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51 Western Basin EIS	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 07-AUG-2009
Sampler	: ----	Issue Date	: 17-AUG-2009
Order number	: ----		
		No. of samples received	: 9
Quote number	: EN/005/09	No. of samples analysed	: 9

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

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

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
EA005: pH								
Clear Plastic Bottle - Natural								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**----**	----	----	**10-AUG-2009**	05-AUG-2009	×
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**----**	----	----	**13-AUG-2009**	12-AUG-2009	×
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**---**	---	----	**10-AUG-2009**	19-AUG-2009	✓
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								
ED040F: Dissolved Major Anions								
Clear Plastic Bottle - Natural								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**---**	---	----	**11-AUG-2009**	02-SEP-2009	✓
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								

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
ED045G: Chloride Discrete analyser								
Clear Plastic Bottle - Natural								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**---**	---	----	**11-AUG-2009**	02-SEP-2009	✓
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**---**	---	----	**11-AUG-2009**	02-SEP-2009	✓
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								
EG020F: Dissolved Metals by ICP-MS								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**---**	---	----	**13-AUG-2009**	01-FEB-2010	✓
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								
EG035F: Dissolved Mercury by FIMS								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**---**	---	----	**11-AUG-2009**	02-SEP-2009	✓
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								
EK040P: Fluoride by PC Titrator								
Clear Plastic Bottle - Natural								
FL98 2A,	FL98 2B,	**05-AUG-2009**	**---**	---	----	**10-AUG-2009**	02-SEP-2009	✓
WB03A,	WB03B,							
WB01A,	WB01B,							
WB04A,	WB02A,							
DUP1								

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(where) 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	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	37	**10.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Filtered	ED040F	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	3	30	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	37	**5.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	9	**22.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	30	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	37	**5.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Filtered	ED040F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	30	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	37	**5.4**	**5.0**	✓	ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	11	**9.1**	**5.0**	✓	ALS QCS3 requirement

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
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 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 (1999) Schedule B(3) (Appdx. 2)
Major Anions - Filtered	ED040F	WATER	APHA 21st ed., 3120 Sulfur and/or Silcon content is determined by ICP/AES and reported as Sulfate and/or Silica after conversion by gravimetric factor.
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 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 - Filtered	ED093F	WATER	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): 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	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) 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 (1999) Schedule B(3) (Appdx. 2)
Silica (Total Dissolved) by ICPAES	EG052	WATER	APHA 21st ed., 4500-SiO2. Silica (Total) determined by calculation from Silicon by ICPAES.
Fluoride by PC Titrator	EK040P	WATER	APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by PCT DA and ICPAES	EN055 - DA	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

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							
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Arsenic**	7440-38-2	295 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Beryllium**	7440-41-7	283 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Barium**	7440-39-3	311 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Cadmium**	7440-43-9	289 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Chromium**	7440-47-3	313 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Cobalt**	7440-48-4	296 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Copper**	7440-50-8	278 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Lead**	7439-92-1	254 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Nickel**	7440-02-0	283 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Vanadium**	7440-62-2	313 %	70-130%	**Recovery greater than upper data quality objective**
EG020F: Dissolved Metals by ICP-MS	EB0912501-005	WB01A	**Zinc**	7440-66-6	272 %	70-130%	**Recovery greater than upper data quality objective**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005: pH						
Clear Plastic Bottle - Natural						
FL98 2A, FL98 2B, WB03A, WB03B, WB01A, WB01B, WB04A, WB02A, DUP1	----	----	----	10-AUG-2009	05-AUG-2009	**5**
EA015: Total Dissolved Solids						
Clear Plastic Bottle - Natural						
FL98 2A, FL98 2B, WB03A, WB03B, WB01A, WB01B, WB04A, WB02A, DUP1	----	----	----	13-AUG-2009	12-AUG-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0914339**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51	Page	: 1 of 2
Order number	: ----		
C-O-C number	: 0-42/15386/51	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: WESTERN BASIN		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 10-SEP-2009	Issue Date	: 11-SEP-2009 11:43
Client Requested Due Date	: 17-SEP-2009	Scheduled Reporting Date	: **17-SEP-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 6.9'C - Ice present
No. of coolers/boxes	: 1 MEDIUM	No. of samples received	: 7
Sercurity Seal	: Intact.	No. of samples analysed	: 7

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA015 Total Dissolved Solids	WATER - EG020A-F (Marine) Dissolved Metals by ICPMS - Suite A (Marine)	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG052 Silica (Total Dissolved) by ICPAES	WATER - EK040-P Fluoride(PC)	WATER - EK055G Ammonia as N By Discrete Analyser	WATER - EK058G Nitrate as N by Discrete Analyser	WATER - EK067G Total Phosphorus as P By Discrete Analyser
EB0914339-001	09-SEP-2009 15:00	WB01A	✓	✓	✓	✓	✓	✓	✓	✓
EB0914339-002	09-SEP-2009 15:00	WB01B	✓	✓	✓	✓	✓	✓	✓	✓
EB0914339-003	09-SEP-2009 15:00	WB02A	✓	✓	✓	✓	✓	✓	✓	✓
EB0914339-004	09-SEP-2009 15:00	WB03A	✓	✓	✓	✓	✓	✓	✓	✓
EB0914339-005	09-SEP-2009 15:00	WB03B	✓	✓	✓	✓	✓	✓	✓	✓
EB0914339-006	09-SEP-2009 15:00	WB04A	✓	✓	✓	✓	✓	✓	✓	✓
EB0914339-007	09-SEP-2009 15:00	DUP1	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EN055 - DA Ionic Balance (DA)	WATER - Major Anions Cl, SO4, Alkalinity PCT	WATER - Major Cations Ca, Mg, Na, K
EB0914339-001	09-SEP-2009 15:00	WB01A	✓	✓	✓
EB0914339-002	09-SEP-2009 15:00	WB01B	✓	✓	✓
EB0914339-003	09-SEP-2009 15:00	WB02A	✓	✓	✓
EB0914339-004	09-SEP-2009 15:00	WB03A	✓	✓	✓
EB0914339-005	09-SEP-2009 15:00	WB03B	✓	✓	✓
EB0914339-006	09-SEP-2009 15:00	WB04A	✓	✓	✓
EB0914339-007	09-SEP-2009 15:00	DUP1	✓	✓	✓

Requested Deliverables

MS RUTH BROWN

- *AU Certificate of Analysis - NATA (COA)	Email	ruth.brown@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ruth.brown@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ruth.brown@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	ruth.brown@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	ruth.brown@ghd.com.au
- Default - Chain of Custody (COC)	Email	ruth.brown@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	ruth.brown@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	ruth.brown@ghd.com.au

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0914339**	Page	: 1 of 8
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WESTERN BASIN		
C-O-C number	: 0-42/15386/51	Date Samples Received	: 10-SEP-2009
Sampler	: ----	Issue Date	: 18-SEP-2009
Order number	: ----		
		No. of samples received	: 7
Quote number	: EN/005/09	No. of samples analysed	: 7

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

This 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

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

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 insuffient 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.

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 (%)*
EA015: Total Dissolved Solids (QC Lot: 1102611)									
EB0914306-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	112	116	3.5	0% - 20%
EB0914339-005	WB03B	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	16000	16700	3.8	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1099394)									
EB0914258-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	207	204	1.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	207	204	1.4	0% - 20%
EB0914306-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	65	63	3.1	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	65	63	3.1	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1099397)									
EB0914339-003	WB02A	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	435	441	1.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	435	441	1.4	0% - 20%
ED040F: Dissolved Major Anions (QC Lot: 1098685)									
EB0914226-012	Anonymous	ED040F: Silicon	7440-21-3	0.05	mg/L	6.12	6.08	0.7	0% - 20%
		ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	124	124	0.0	0% - 20%
EB0914339-002	WB01B	ED040F: Silicon	7440-21-3	0.05	mg/L	29.4	29.9	1.8	0% - 20%
		ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	3780	3880	2.5	0% - 20%
ED045G: Chloride Discrete analyser (QC Lot: 1098684)									
EB0914226-007	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	650	650	0.0	0% - 20%
EB0914339-002	WB01B	ED045G: Chloride	16887-00-6	1	mg/L	16200	17100	5.4	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1098682)									
EB0914226-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	40	43	6.6	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	38	39	2.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	386	390	1.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	35	36	3.1	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1100933)									
EB0914294-003	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.094	0.094	0.0	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 (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1100933) - continued									
EB0914294-003	Anonymous	EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.164	0.165	0.6	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EB0914339-002	WB01B	EG020A-F: Beryllium	7440-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.005	mg/L	0.039	0.040	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.005	mg/L	0.020	0.021	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.005	mg/L	0.006	0.006	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.005	mg/L	2.17	2.14	1.7	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Cadmium	7440-43-9	0.0050	mg/L	<0.0050	<0.0050	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.05	mg/L	0.12	0.11	10.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.050	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.050	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.050	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.050	mg/L	<0.050	<0.050	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.50	mg/L	5.27	5.25	0.3	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1100931)									
EB0914258-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EB0914339-002	WB01B	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 1099396)									
EB0914258-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.8	0.8	0.0	No Limit
EB0914306-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 1099398)									
EB0914339-003	WB02A	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1099977)									
EB0913946-007	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.79	0.80	0.0	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1098683)									

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1098683) - continued									
EB0914226-012	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	0.10	0.10	0.0	0% - 50%
EB0914339-002	WB01B	EK057G: Nitrite as N	----	0.01	mg/L	0.01	0.01	0.0	No Limit
EK059G: NOX as N by Discrete Analyser (QC Lot: 1099976)									
EB0913946-007	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	4.43	4.36	1.6	0% - 20%
EB0914455-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.26	0.27	6.8	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1102192)									
EB0914213-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.07	<0.01	150	No Limit
EB0914294-004	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.06	0.05	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1102193)									
EB0914395-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.22	0.20	12.8	0% - 20%
EB0914490-002	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.88	0.86	2.9	0% - 20%

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 Sample (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
EA015: Total Dissolved Solids (QCLot: 1102611)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	89.4	85	109
ED037P: Alkalinity by PC Titrator (QCLot: 1099394)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	93.5	83	111
ED037P: Alkalinity by PC Titrator (QCLot: 1099397)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	96.5	83	111
ED040F: Dissolved Major Anions (QCLot: 1098685)								
ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	<1	----	----	----	----
ED040F: Silicon	7440-21-3	0.05	mg/L	<0.05	----	----	----	----
ED045G: Chloride Discrete analyser (QCLot: 1098684)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	95.9	90	130
ED093F: Dissolved Major Cations (QCLot: 1098682)								
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: 1100933)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.500 mg/L	98.9	76	130
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.100 mg/L	104	80	124
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.100 mg/L	106	84	130
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.100 mg/L	98.3	89	117
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.100 mg/L	116	85	127
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.100 mg/L	101	87	117
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.200 mg/L	105	85	119
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.100 mg/L	101	88	116
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.100 mg/L	110	83	123
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.100 mg/L	94.4	85	113
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.100 mg/L	103	85	119
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.100 mg/L	99.8	82	122
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.100 mg/L	97.2	79	117
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.200 mg/L	110	86	130
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.50 mg/L	106	79	128
EG035F: Dissolved Mercury by FIMS (QCLot: 1100931)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 1100931) - continued								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	102	81	115
EK040P: Fluoride by PC Titrator (QCLot: 1099396)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	10 mg/L	87.8	75	123
EK040P: Fluoride by PC Titrator (QCLot: 1099398)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	10 mg/L	93.7	75	123
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1099977)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	101	70	129
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1098683)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.5 mg/L	96.0	74	128
EK059G: NOX as N by Discrete Analyser (QCLot: 1099976)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	90.2	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1102192)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	97.8	73	117
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1102193)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.2 mg/L	96.4	73	117

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**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride Discrete analyser (QCLot: 1098684)							
EB0914226-008	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	70.9	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1100933)							
EB0914294-006	Anonymous	EG020A-F: Aluminium	7429-90-5	.5 mg/L	126	70	130
		EG020A-F: Arsenic	7440-38-2	0.100 mg/L	113	70	130
		EG020A-F: Beryllium	7440-41-7	0.100 mg/L	102	70	130
		EG020A-F: Barium	7440-39-3	.5 mg/L	102	70	130
		EG020A-F: Cadmium	7440-43-9	0.100 mg/L	103	70	130
		EG020A-F: Chromium	7440-47-3	0.100 mg/L	111	70	130
		EG020A-F: Cobalt	7440-48-4	0.100 mg/L	107	70	130
		EG020A-F: Copper	7440-50-8	.2 mg/L	112	70	130
		EG020A-F: Lead	7439-92-1	0.100 mg/L	102	70	130
		EG020A-F: Manganese	7439-96-5	0.100 mg/L	112	70	130
		EG020A-F: Molybdenum	7439-98-7	0.100 mg/L	97.1	70	130
		EG020A-F: Nickel	7440-02-0	0.100 mg/L	107	70	130
		EG020A-F: Selenium	7782-49-2	0.100 mg/L	107	70	130
		EG020A-F: Vanadium	7440-62-2	0.100 mg/L	115	70	130
		EG020A-F: Zinc	7440-66-6	.2 mg/L	116	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 1100931)							
EB0914262-008	Anonymous	EG035F: Mercury	7439-97-6	0.010 mg/L	97.9	70	130
EK040P: Fluoride by PC Titrator (QCLot: 1099396)							
EB0914258-001	Anonymous	EK040P: Fluoride	16984-48-8	4.9 mg/L	112	70	130
EK040P: Fluoride by PC Titrator (QCLot: 1099398)							
EB0914339-007	DUP1	EK040P: Fluoride	16984-48-8	4.9 mg/L	97.3	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1099977)							
EB0913946-008	Anonymous	EK055G: Ammonia as N	7664-41-7	0.4 mg/L	113	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1098683)							
EB0914226-008	Anonymous	EK057G: Nitrite as N	----	0.4 mg/L	76.2	70	130
EK059G: NOX as N by Discrete Analyser (QCLot: 1099976)							
EB0913946-008	Anonymous	EK059G: Nitrite + Nitrate as N	----	2.0 mg/L	85.0	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1102192)							
EB0914224-002	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	94.0	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1102193)							
EB0914395-002	Anonymous	EK067G: Total Phosphorus as P	----	1.0 mg/L	111	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0914339**	Page	: 1 of 9
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MS RUTH BROWN	Contact	: Tim Kilmister
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: ruth.brown@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: WESTERN BASIN		
C-O-C number	: 0-42/15386/51	Date Samples Received	: 10-SEP-2009
Sampler	: ----	Issue Date	: 18-SEP-2009
Order number	: ----		
		No. of samples received	: 7
Quote number	: EN/005/09	No. of samples analysed	: 7

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

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

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
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**----**	----	----	**16-SEP-2009**	16-SEP-2009	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**14-SEP-2009**	23-SEP-2009	✓
ED040F: Dissolved Major Anions							
Clear Plastic Bottle - Natural							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**12-SEP-2009**	07-OCT-2009	✓
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**12-SEP-2009**	07-OCT-2009	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**12-SEP-2009**	07-OCT-2009	✓

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
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**16-SEP-2009**	08-MAR-2010	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**16-SEP-2009**	07-OCT-2009	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**14-SEP-2009**	07-OCT-2009	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**14-SEP-2009**	07-OCT-2009	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**12-SEP-2009**	11-SEP-2009	×
EK059G: NOX as N by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**---**	---	----	**14-SEP-2009**	07-OCT-2009	✓

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
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid							
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	**09-SEP-2009**	**16-SEP-2009**	07-OCT-2009	✓	**16-SEP-2009**	07-OCT-2009	✓

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(where) 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	3	25	**12.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	3	27	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Dissolved	ED040F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	20	**5.0**	**10.0**	×	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	4	35	**11.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	25	**8.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	27	**7.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	35	**5.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	27	**7.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Dissolved	ED040F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	35	**5.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

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*	
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	10	**10.0**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	27	**7.4**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.1**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	35	**5.7**	**5.0**	✓	ALS QCS3 requirement

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
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 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 (1999) Schedule B(3) (Appdx. 2)
Major Anions - Dissolved	ED040F	WATER	APHA 21st ed., 3120. The 0.45um filtered samples are determined by ICP/AES for Sulfur and/or Silcon content and reported as Sulfate and/or Silica after conversion by gravimetric factor.
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 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	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises the 0.45um filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um 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	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45 um 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 (1999) Schedule B(3) (Appdx. 2)
Silica (Total Dissolved) by ICPAES	EG052	WATER	APHA 21st ed., 4500-SiO2. Silica (Total) determined by calculation from Silicon by ICPAES.
Fluoride by PC Titrator	EK040P	WATER	APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a cadmium reduction column 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 (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample 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 (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by PCT DA and ICPAES	EN055 - DA	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural						
WB01A, WB01B, WB02A, WB03A, WB03B, WB04A, DUP1	----	----	----	12-SEP-2009	11-SEP-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Major Cations - Dissolved	1	20	5.0	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES0911920**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS RUTH BROWN	Contact	: Charlie Pierce
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ruth.brown@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3316 3333	Facsimile	: +61-2-8784 8500
Project	: 42 15386 51	Page	: 1 of 2
Order number	: ----		
C-O-C number	: 40036-42/15386/51	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: RTAY CAUSTIC BLADDER		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 12-AUG-2009	Issue Date	: 12-AUG-2009 16:42
Client Requested Due Date	: 19-AUG-2009	Scheduled Reporting Date	: **18-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 1.4'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 1
Sercurity Seal	: Intact.	No. of samples analysed	: 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur. Please contact ALS for further information (Nanthini Coilparampil).**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA015 Total Dissolved Solids	WATER - ED093F Dissolved Major Cations	WATER - EG020A-F Dissolved Metals by ICPMS - Suite A	WATER - EG052 Silica (Total Dissolved) by ICPAES	WATER - EK055G Ammonia as N By Discrete Analyser	WATER - EK057G Nitrite as N by Discrete Analyser	WATER - EK058G Nitrate as N by Discrete Analyser
ES0911920-001	10-AUG-2009 15:00	CSGW-2	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EK067G Total Phosphorus as P By Discrete Analyser	WATER - EN055 - IC ED009 Ionic Balance (IC)	WATER - NT-02 (IC) Major Anions (Cl, SO4, Alkalinity)	WATER - W-03 13 Metals (NEPM Suite)
ES0911920-001	10-AUG-2009 15:00	CSGW-2	✓	✓	✓	✓

Requested Deliverables

MS RUTH BROWN

- *AU Certificate of Analysis - NATA (COA)	Email	ruth.brown@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ruth.brown@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ruth.brown@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	ruth.brown@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	ruth.brown@ghd.com.au
- Default - Chain of Custody (COC)	Email	ruth.brown@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	ruth.brown@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	ruth.brown@ghd.com.au
- EDI Format - XTab (XTAB)	Email	ruth.brown@ghd.com.au

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **ES0911920**	Page	: 1 of 8
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS RUTH BROWN	Contact	: Charlie Pierce
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ruth.brown@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3316 3333	Facsimile	: +61-2-8784 8500
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: RTAY CAUSTIC BLADDER		
C-O-C number	: 40036-42/15386/51	Date Samples Received	: 12-AUG-2009
Sampler	: ----	Issue Date	: 18-AUG-2009
Order number	: ----		
		No. of samples received	: 1
Quote number	: EN/005/09	No. of samples analysed	: 1

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

This 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

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

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 insuffient 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.

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 (%)*
EA005: pH (QC Lot: 1066794)									
ES0911920-001	CSGW-2	EA005: pH Value	----	0.01	pH Unit	6.39	6.40	0.2	0% - 20%
ES0911949-007	Anonymous	EA005: pH Value	----	0.01	pH Unit	8.90	8.91	0.1	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1067674)									
ES0911895-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	778	756	2.9	0% - 20%
ES0911905-012	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	734	836	13.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 1068595)									
ES0911920-001	CSGW-2	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	141	144	1.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	141	144	1.5	0% - 20%
ES0911958-011	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	309	314	1.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	309	314	1.8	0% - 20%
ED040F: Dissolved Major Anions (QC Lot: 1066809)									
ES0911918-007	Anonymous	ED040F: Silicon	7440-21-3	0.05	mg/L	5.71	5.74	0.4	0% - 20%
		ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	2	2	0.0	No Limit
ED045G: Chloride Discrete analyser (QC Lot: 1067662)									
ES0911920-001	CSGW-2	ED045G: Chloride	16887-00-6	1	mg/L	3460	3580	3.4	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 1066808)									
ES0911860-006	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	62	62	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	79	78	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	286	283	0.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	9	9	0.0	No Limit
ES0911949-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	125	130	4.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	468	466	0.3	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2770	2730	1.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	39	38	0.0	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1068704)									
ES0911920-001	CSGW-2	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.508	0.494	2.8	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1068704) - continued									
ES0911920-001	CSGW-2	EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.012	0.011	0.0	0% - 50%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	2.58	2.48	4.0	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.003	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	38.1	36.8	3.4	0% - 20%
ES0912009-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.033	0.038	14.7	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.006	0.007	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.722	0.768	6.2	0% - 20%
		EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.010	0.011	9.4	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.042	0.046	9.4	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.08	0.10	24.5	0% - 50%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	13.7	14.8	7.8	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1068703)									
ES0911920-001	CSGW-2	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES0912009-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 1068596)									
ES0911920-001	CSGW-2	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.4	0.5	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1067036)									
ES0911918-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	7.59	8.12	6.7	0% - 20%
ES0911937-002	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.25	0.29	14.6	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1066807)									
ES0911859-010	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES0911860-008	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: NOX as N by Discrete Analyser (QC Lot: 1067035)									

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 (%)*
EK059G: NOX as N by Discrete Analyser (QC Lot: 1067035) - continued									
ES0911890-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	66200	66100	0.2	0% - 20%
ES0911932-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.03	<0.01	91.9	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1067044)									
ES0911774-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.64	0.66	3.1	0% - 20%
ES0911918-007	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit

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 Sample (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
EA015: Total Dissolved Solids (QCLot: 1067674)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	293 mg/L	102	77.9	122
ED037P: Alkalinity by PC Titrator (QCLot: 1068595)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	105	80.2	108
ED040F: Dissolved Major Anions (QCLot: 1066809)								
ED040F: Sulfate as SO4 2-	14808-79-8	1	mg/L	<1	150 mg/L	97.0	82.9	114
ED040F: Silicon	7440-21-3	0.05	mg/L	<0.05	5 mg/L	96.7	85	121
ED045G: Chloride Discrete analyser (QCLot: 1067662)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	96.6	83.7	124
ED093F: Dissolved Major Cations (QCLot: 1066808)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	96.2	88	110
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	90	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	87.4	81	107
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.1	89	109
EG020F: Dissolved Metals by ICP-MS (QCLot: 1068704)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	93.9	92	112
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.8	88	110
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	88.9	80	114
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	99.0	85	109
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	95.9	89	107
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	104	91	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	97.5	89	109
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	108	87	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.7	90	110
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	99.8	87	113
EG020A-F: Molybdenum	7439-98-7	0.001	mg/L	<0.001	0.1 mg/L	99.9	84	114
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	96.5	89	109
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	# 72.7	79	119
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	# 111	91	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.2	85	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	101	84	114
EG035F: Dissolved Mercury by FIMS (QCLot: 1068703)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	97.2	86	116
EK040P: Fluoride by PC Titrator (QCLot: 1068596)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EK040P: Fluoride by PC Titrator (QCLot: 1068596) - continued								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5.0 mg/L	99.0	64.8	115
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1067036)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1.00 mg/L	99.8	79.6	122
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1066807)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.96 mg/L	90.1	65.1	129
EK059G: NOX as N by Discrete Analyser (QCLot: 1067035)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.96 mg/L	98.8	76.9	122
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1067044)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	106	64.3	120

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**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED045G: Chloride Discrete analyser (QCLot: 1067662)							
ES0911920-001	CSGW-2	ED045G: Chloride	16887-00-6	250 mg/L	# Not Determined	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 1068704)							
ES0911961-002	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	90.1	70	130
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	79.7	70	130
		EG020A-F: Barium	7440-39-3	0.2 mg/L	103	70	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	82.6	70	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	89.8	70	130
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	97.6	70	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	83.9	70	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	86.0	70	130
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	88.3	70	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	89.4	70	130
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	103	70	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	78.3	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 1068703)							
ES0911961-002	Anonymous	EG035F: Mercury	7439-97-6	0.0100 mg/L	75.8	70	130
EK040P: Fluoride by PC Titrator (QCLot: 1068596)							
ES0911920-001	CSGW-2	EK040P: Fluoride	16984-48-8	5.0 mg/L	96.4	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1067036)							
ES0911918-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	# Not Determined	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1066807)							
ES0911859-010	Anonymous	EK057G: Nitrite as N	----	0.60 mg/L	81.3	70	130
EK059G: NOX as N by Discrete Analyser (QCLot: 1067035)							
ES0911890-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.60 mg/L	# Not Determined	70	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1067044)							
ES0911774-001	Anonymous	EK067G: Total Phosphorus as P	----	1.00 mg/L	107	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0911920**	Page	: 1 of 9
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS RUTH BROWN	Contact	: Charlie Pierce
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: ruth.brown@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3316 3333	Facsimile	: +61-2-8784 8500
Project	: 42 15386 51	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: RTAY CAUSTIC BLADDER		
C-O-C number	: 40036-42/15386/51	Date Samples Received	: 12-AUG-2009
Sampler	: ----	Issue Date	: 18-AUG-2009
Order number	: ----		
		No. of samples received	: 1
Quote number	: EN/005/09	No. of samples analysed	: 1

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

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

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
EA005: pH							
Clear Plastic Bottle - Natural							
CSGW-2	**10-AUG-2009**	**----**	----	----	**12-AUG-2009**	10-AUG-2009	✗
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural							
CSGW-2	**10-AUG-2009**	**----**	----	----	**13-AUG-2009**	17-AUG-2009	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural							
CSGW-2	**10-AUG-2009**	**---**	---	----	**14-AUG-2009**	24-AUG-2009	✓
ED040F: Dissolved Major Anions							
Clear Plastic Bottle - Natural							
CSGW-2	**10-AUG-2009**	**---**	---	----	**13-AUG-2009**	07-SEP-2009	✓
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural							
CSGW-2	**10-AUG-2009**	**---**	---	----	**13-AUG-2009**	07-SEP-2009	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural							
CSGW-2	**10-AUG-2009**	**---**	---	----	**13-AUG-2009**	07-SEP-2009	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified							
CSGW-2	**10-AUG-2009**	**---**	---	----	**14-AUG-2009**	06-FEB-2010	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified							
CSGW-2	**10-AUG-2009**	**---**	---	----	**14-AUG-2009**	07-SEP-2009	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural							
CSGW-2	**10-AUG-2009**	**---**	---	----	**14-AUG-2009**	07-SEP-2009	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid							
CSGW-2	**10-AUG-2009**	**---**	---	----	**13-AUG-2009**	07-SEP-2009	✓

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							
CSGW-2	**10-AUG-2009**	**---**	---	----	**12-AUG-2009**	12-AUG-2009	✓
EK059G: NOX as N by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid							
CSGW-2	**10-AUG-2009**	**---**	---	----	**13-AUG-2009**	07-SEP-2009	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid							
CSGW-2	**10-AUG-2009**	**13-AUG-2009**	07-SEP-2009	✓	**13-AUG-2009**	07-SEP-2009	✓

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(where) 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	4	39	**10.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	1	**100.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Filtered	ED040F	1	7	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	39	**5.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	3	**66.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Filtered	ED040F	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	1	**100.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Anions - Filtered	ED040F	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

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							
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	1	**100.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement

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
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 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 (1999) Schedule B(3) (Appdx. 2)
Major Anions - Filtered	ED040F	WATER	APHA 21st ed., 3120 Sulfur and/or Silcon content is determined by ICP/AES and reported as Sulfate and/or Silica after conversion by gravimetric factor.
Chloride by Discrete Analyser	ED045G	WATER	APHA 21st ed., 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 - Filtered	ED093F	WATER	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): 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	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) 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 (1999) Schedule B(3) (Appdx. 2)
Silica (Total Dissolved) by ICPAES	EG052	WATER	APHA 21st ed., 4500-SiO2. Silica (Total) determined by calculation from Silicon by ICPAES.
Fluoride by PC Titrator	EK040P	WATER	APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a cadmium reduction column 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 (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample 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 (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by PCT DA and ICPAES	EN055 - DA	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

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
Laboratory Control Spike (LCS) Recoveries							
EG020F: Dissolved Metals by ICP-MS	1229608-009	----	**Selenium**	7782-49-2	72.7 %	79-119%	**Recovery less than lower control limit**
EG020F: Dissolved Metals by ICP-MS	1229608-009	----	**Vanadium**	7440-62-2	111 %	91-109%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
ED045G: Chloride Discrete analyser	ES0911920-001	CSGW-2	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK055G: Ammonia as N by Discrete Analyser	ES0911918-001	Anonymous	**Ammonia as N**	7664-41-7	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK059G: NOX as N by Discrete Analyser	ES0911890-001	Anonymous	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005: pH						
Clear Plastic Bottle - Natural						
CSGW-2	----	----	----	12-AUG-2009	10-AUG-2009	**2**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

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

GHD

201 Charlotte Street Brisbane QLD 4000
GPO Box 668 Brisbane QLD 4001
T: (07) 3316 3000 F: (07) 3316 3333 E: bnemail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	Ruth Brown	Keith Phillipson		Joanna Lee		21/10/09
1	Ruth Brown	Keith Phillipson		Joanna Lee		21/10/09
2	Alita McPhee	Keith Phillipson		Joanna Lee		21/10/09