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AUSTRALIA PACIFIC LNG

Australia Pacific LNG - Dredge Area Option 2A

Sediment Characterisation Study

08-Oct-09

301001-00752-00-EV-REP-0002 - APLN-000-PC-R01-D-00002



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AUSTRALIA PACIFIC LNG - DREDGE AREA OPTION 2A

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Executive Summary

Australia Pacific LNG Limited (APLNG) is proposing to develop a liquefied natural gas (LNG) plant on the western side of Curtis Island as part of its development of coal seam gas (CSG) reserves in Queensland. The establishment of the LNG plant will require the construction of wharf and jetty structures to enable the loading of the LNG vessels. Construction may also involve the establishment of a materials offloading facility (MOF) for the transfer of building materials, heavy equipment and people to the project site.

The construction of the marine infrastructure will involve dredging at the wharf, berth pockets, MOF and the subsequent management of the dredged material, in two Phases: dredging for initial berth location, then dredging for the second berth location. Combined Phase 1 and Phase 2 dredging is contained within an approximate 118 ha footprint referred to as Option 2A and will be to a depth of RL-13.0m LAT in two swing basins and RL-8.5m LAT in other areas, plus another 1m for overdredging throughout, making final depths RL-14.0m and RL-9.5m respectively. A total of approximately 12,930,000m^3 of capital dredging would be required. The proposed dredging area is located adjacent to and continuous with the Gladstone Ports Corporation (GPC) Port of Gladstone Western Basin Dredging and Disposal Project.

The procedures for sediment sampling and analysis for APLNG dredging followed that which was detailed in the draft sediment sampling and analysis plan (SAP) for the Western Basin Dredging and Disposal Project, proposed by GPC in July 2009 and approved by the Department of the Environment, Water, Heritage and the Arts (DEWHA) in September 2009. This SAP was based on a pilot-scale study design, whereby 20% of sample location numbers for a full sample program are surveyed.

Sampling design was based on an initial dredge footprint design of approximately 91ha and volume of approximately 9,651,000m^3. Field sampling for contaminant substances was undertaken from a total of eight randomly located sampling sites and tested for the following listed contaminants. In addition, acid sulphate soil (ASS) testing was undertaken from a total of 34 sampling locations using a combination of field ASS testing and laboratory testing.

- Particle size distribution (PSD)
- Moisture content
- Total Organic Carbon (TOC)
- Metals (Al, Sb, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, V, Zn)
- Organotins (TBT)
- BTEX
- Total Petroleum Hydrocarbons (TPH)
- Organophosphorus Pesticides (OPP)
- Organochlorine Pesticides (OCP)
- Polychlorinated Biphenyls (PCB)
- Polycyclic Aromatic Hydrocarbons (PAH)

Golder Associates Pty Ltd (Golder) was sub-contracted to undertake the in-field sampling and analysis and reporting for acid sulphate soils assessment. Golder engaged GeoCoastal to undertake the overwater vibrocoring and Shine Drilling, Australian Barge Hire and Drillsure to undertake the drilling. Sampling was undertaken between 29 July and 5 August 2009 using a combination of vacuum vibrocoring techniques and 23 August and 27 August 2009 using drilling techniques.

Sediments extracted utilising vacuum-vibrocoring techniques enabled the recovery of a continuous core of all sedimentary media including unconsolidated sediments such as flowing sands. The method prevented cross contamination or vertical mixing of samples and enabled the collection of a high volume of sample for multiple analyses and sub-sampling. Drilling techniques were used beyond the depth of refusal for the

vacuum-vibrocore to the depth of intended dredging plus 1m for overdredging. The vessel and marine coring equipment was relocated around the dredge area using a differential GPS (accurate to ± 3-5m), to locate the borehole sites.

For contaminant testing within each borehole, two sub-samples were collected from the top 1m of the core, at 0.5m intervals. Below 1m, sub-samples were collected and composited at approximately 1m intervals from 1.0-5.0m and from below 5.0m (where present, from the full depth cores). Samples beyond vibrocore refusal (drilling techniques) were taken at 1m intervals down the borehole, until depth of dredging was reached, and were approximately 450mm in length.

ASS samples were initially screened at approximately 0.5m vertical intervals (in accordance with QASSIT methodology) in at least 25% of the locations sampled (ie five locations) and to carry out less intensive analysis on the remaining cores, at a rate of 1 test per 1-2m or core (depending on results of sampling). Screening was undertaken by Golder using the pH_F (field pH) and pH_{FOX} (pH following peroxide oxidation) method of analysis. A representative number of samples selected from the screened samples were sent to the primary laboratory (ALS) and subjected to the full SPOCAS or S_{CR} test suites.

Primary sediment analysis was completed by a NATA accredited laboratory, Australian Laboratory Services (ALS). A secondary laboratory (Advanced Analytical Australia, AAA) was used for quality assurance purposes. Sediment contaminant concentrations were assessed against: the *National Assessment Guidelines for Dredging* (NAGD; Commonwealth of Australia, 2009); and Environmental Investigation Levels (EIL) and Health Investigations Levels for residential land use (HIL-A) in the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* (DEH, 1998).

Chemical analyses of sediments within capital dredging area Option 2A identified that contaminant substances, if present, are generally below NAGD Screening Levels. The exception to this was the presence of arsenic in three samples (one within the surface 1m of sediment and two below 1m), mercury in one sample (below 1m), and zinc in two samples (below 1m). Arsenic has previously been identified as occurring naturally within sediments in the Port of Gladstone (GHD, 2009). Given that the exceedance of mercury occurred in sediments below 1m and have been reported independently in nearby sediment surveys (URS, 2009), it is possible that these results are also an indication of natural levels of mercury within the sediments. Zinc exceedances occurred below 6m sediment depth and hence may be a reflection of natural levels, but are significantly higher than other sample concentrations from similar depths.

In comparison with DEH (1998) guidelines three arsenic, one manganese and two zinc samples exceeded respective EILs. Arsenic and zinc are discussed above. Manganese has been recorded above the EIL in the Port of Gladstone previously and is considered to be at naturally occurring levels (URS, 2009). No HIL-A investigation levels were exceeded.

A summary of the remainder of the contaminant substance results includes:

- Total Petroleum Hydrocarbon fractions C6-C9 and C10-C14 were not detected in any sample.
- Fractions C15-C28 and C29-C36 were detected in the majority of samples from all sediment horizons,
- Generally, the majority of PAHs were not detected in any sample. A total of nine PAHs were recorded above detection limits, the majority of these only occurring in sediments below 1m in one location.
- BTEX, Tributyltin, Organochlorine Pesticides, Organophosphorus Pesticides and Polychlorinated Biphenyls (PCBs) were not detected in any sample.

Following the completion of the sampling and analysis, the Option 2A dredge footprint ‘shifted’ westward by approximately 120m and expanded from 91ha to 118ha due to rectification of discrepancies in the dredge

options data and the displaced design, and layout efficiency modifications. Consequently, several sampled boreholes became located outside the amended dredge footprint but still provide useful information on the sediment characteristics of the immediate dredge area at Laird Point. Remaining within the amended dredge area were six borehole locations tested for contaminants, and 25 borehole locations tested for ASS.

Based on statistical analysis of the six sites remaining within the amended Option 2A dredge footprint, the 95% upper confidence level of the means for all contaminants tested in dredge area Option 2A were below respective NAGD Screening Levels as well as EIL and HIL-A levels. Despite undertaking only a pilot level of sampling, statistical power was sufficiently high to make a valid comparison against NAGD Screening Levels for all contaminants except arsenic. However, while power was marginally low for arsenic comparison against NAGD Screening Level of 20 mg/kg (power = 0.68 versus recommended 0.8), it was sufficient for comparison against the locally derived Port Curtis Integrated Monitoring Program's (PCIMP) trigger value for arsenic of 24.3 mg/kg, which reflects naturally elevated background concentrations.

Holocene sediments within the dredge footprint are ASS bearing. There is a 'zone of infiltration' on the boundary of the Holocene and Pleistocene sediments in which ASS may also occur. These sediments are shallow, occurring at depth between 0.2m and 4.1m sediment depth, with an average depth of 1.8m. The Holocene sediment layer appears to be limited in extent to north eastern portion of the dredge footprint. Holocene sediments within the footprint contain negligible actual acidity (ie no actual ASS). However, the majority of the dredge area has moderate to very high potential acidity (potential acid sulphate soils, PASS). PASS was detected at all depths throughout the Holocene layer and in some instances up to 1.2m into the underlying Pleistocene sediments (zone infiltration). Acid neutralising capacity (ANC) is generally insufficient to neutralise the potential acidity generated. Therefore, treatment of the soils with good quality agricultural lime will be required to mitigate acid generation. Liming rates range from 20kg lime/m^3 in the central portion of the dredge area to 150-200 kg lime/m^3 in areas closest to Curtis Island. Based on the quantity to be dredged and the level of acidity, the treatment category, according to QASSIT guidelines and State Planning Policy 2/02 is considered 'extra high'. Note that by moving the footprint further west (from the location originally proposed), some areas of high PASS have been avoided.

Based on these analyses it is considered that capital dredging material within dredge area Option 2A is suitable for unconfined ocean disposal at an approved spoil ground, and is suitable for placement on land subject to acid sulphate soils management requirements.

1. Introduction

1.1 Background

Australia Pacific LNG Limited (APLNG) is seeking to accelerate the development and production of its coal seam gas (CSG) reserves in Queensland through the development of a CSG to liquefied natural gas (LNG) project. The proposed CSG to LNG Project, which is the largest under consideration in Australia, will encompass the further development of APLNG's CSG fields, the construction of a gas transmission pipeline(s), together with the construction of a LNG plant and associated port infrastructure to export LNG to international markets.

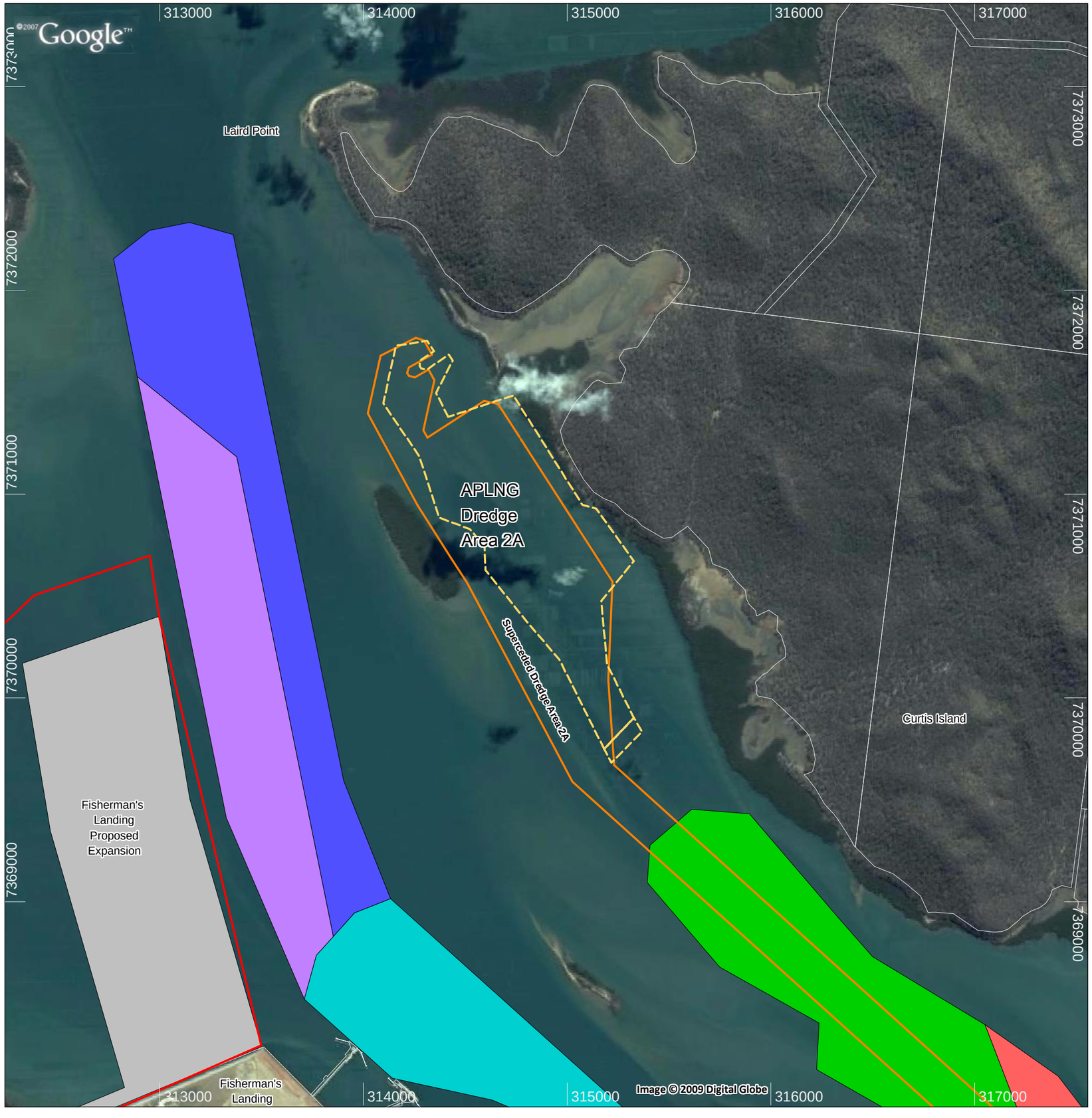
APLNG is proposing to develop the LNG plant on the western side of Curtis Island. The establishment of the LNG plant will require the construction of wharf and jetty structures to enable the loading of the LNG vessels. Construction may also involve the establishment of a materials offloading facility (MOF) for the transfer of building materials, heavy equipment and people to the project site.

The construction of the marine infrastructure will involve dredging at the wharf, berth pockets, MOF and the subsequent management of the dredged material, in two Phases: dredging for initial berth location, then dredging for the second berth location. The dredging is confined within a footprint referred to as dredge Option 2A. Capital dredging requirements, as part of the proposed APLNG project, lie adjacent to and continuous with the Gladstone Ports Corporation (GPC) Port of Gladstone Western Basin Dredging and Disposal project.

APLNG's dredge Option 2A extends north from GPC's Stage 1A dredging works for approximately 2km, to just south of Laird Point where the MOF will be located, refer to Figure 1-1. The Option 2A dredge footprint covers an area of approximately 1.18km^2 and will require a dredge volume of approximately 12,930,000m^3 to obtain a depth of RL-8.5m LAT in the majority of the dredge area, and RL -13.0m LAT in the two swing basins, plus allowance of 1m for overdredging, making final dredge depths RL-9.5m and RL-14.0m respectively.

Dredged material is proposed to be placed in the proposed Western Basin Reclamation area at Fisherman's Landing along with other material dredged from GPC's Western Basin Dredging and Disposal Project.

This report characterises capital dredging sediments within APLNG's dredge area, Option 2A.



LEGEND

- Cadastral boundaries
- APLNG Dredge Area 2A
- Superceded Dredge Area 2A

Dredge Areas - Gladstone Ports Corporation

- Stage 1A - North China Bay LNG Precinct
- Stage 1B - Fisherman's Landing LNG
- Stage 2 - Laird Point LNG
- Stage 3 - Fisherman's Landing
- Stage 4 - Hamilton Point

Proposed dredge area digitised from Bechtel CAD drawing 25509-100-K0-K01-00002.dgn supplied on 11/09/2009.
Dredge areas translated from GPC CAD drawing xFootprint_030909.dxf supplied 10/09/2009

Superceded dredge areas digitised from Halcrow Figure 12 dated 06/07/09 and GHD Figure 42-15386 dated 22/07/09 and should not be considered to be accurate

Google Earth image extracted 28/09/2009

0 500m

SCALE - 1:20,000 (at A3)

N W E S

Map Grid of Australia Zone 56
Geocentric Datum of Australia 1994

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A	22/09/2009	Issued for squad check	MM	DH		

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Figure 1-1 - Location of APLNG's Dredge Area 2A in Relation to the Gladstone Port Corporation's Western Basin Dredge Project

Project No: 301001-00752	Figure: 00752-00-EN-DAL-0063	Rev: A

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1.1.1 Sampling and Analysis Plan

Sediment sampling and analysis undertaken reflects that proposed by GPC in the sediment sampling and analysis plan (SAP) for the Western Basin Dredging and Disposal Project (GHD, 2009) which was submitted to the Department of Environment Water Heritage and the Arts (DEWHA) in July 2009 and approved in September 2009. That SAP was based on a pilot-level sampling collection program, testing for a wide range of contaminant substances. While extensive in its spatial extent, the SAP did not specifically include APLNG dredge area Option 2A within the proposed dredge footprint, however it has subsequently been included, so supplementary sampling and analysis was undertaken in accordance with the approved SAP methodology with the intent of including the results in the environmental impact statement for the Western Basin Dredging and Disposal Project. While meeting the approved SAP requirements, additional sampling was undertaken to that proposed by GPC, including drilling for sample material beyond the depth of vibrocore refusal and additional acid sulphate soil assessment.

1.2 Project Objectives

WorleyParsons was commissioned by APLNG to characterise sediments within the Option 2A dredge area at Laird Point, Curtis Island. The objectives of the study were to:

- Undertake a pilot program for sediment sampling and analysis program consistent with the Western Basins Dredging and Disposal Project draft SAP study methods (GHD, 2009);
- Test and analyse sediments for a range of physical and chemical properties;
- Provide a comparison of contaminant concentrations against the NAGD Screening Levels and the DEH (1998) environment and health investigation levels;
- Undertake a pilot program of acid sulfate soils assessment to provide an indication of the extent of acid sulphate soils presence within the dredge footprint; and
- Determine the suitability of sediments for placement on land or unconfined sea disposal.

2. Methods

2.1 Sampling Locations and Horizons

For contaminant substances, the number of locations sampled within the dredging area was determined using the approach of undertaking a pilot study under the NAGD. Pilot programs sample 20% of the full number of locations required for the volume of potentially contaminated sediments. For capital dredging programs assessed under the NAGD, the volume of potentially contaminated sediment is nominally identified as that which occurs within the top 1m of sediments.

The sampling program undertaken was based on the initial Option 2A dredge area footprint of approximately 91ha, so a volume of approximately 910,000 m^3 was appropriate for determining sample locations numbers. Such a volume exceeds that identified within Table 6 in Appendix D of the NAGD, so the equation to linearly extend Table 6 was applied. Based on that equation, 39 sample locations are required to be tested for a full survey. Consequently, the pilot study program sampled eight locations.

Sample locations were selected by first overlaying a sampling grid over the intended dredging extents, with the grid containing at least five times the full number of sample location numbers (i.e. greater than 5 x 39 = 195). Final selection of eight grid cell locations for sampling was undertaken using random number generation.

Acid sulphate soils testing (ASS) was undertaken at a total of 34 sites. This number was based also on a pilot level approach of 20% of samples that would normally be required under the terms of the QASSIT Sampling Guideline for Acid Sulphate Soils (1997), which is based on disturbance area. The 34 sites included the eight randomly located sites sampled for contaminant status assessment, and another 26 sampling locations evenly distributed across the dredge footprint.

Following completion of the planned sampling and analysis program, the proposed shape and extent of the Option 2A footprint was modified and moved westward away from the coast of Curtis Island. This modification was due to rectification of discrepancies in the dredge options data and the displaced design, and layout efficiency modifications. Consequently, several sampled boreholes became located outside the amended dredge footprint but still provide useful information on the sediment characteristics of the adjacent dredge area at Laird Point. Remaining within the amended dredge area were six borehole locations tested for contaminants, and 25 borehole locations tested for ASS. A map showing all sampling sites is provided in Figure 2-1, and Table 2-1 provides a list of the GPS coordinates and sampling depth for each core. The sites within the amended Option 2A dredge footprint are identifiable in both the table and figure.

Samples were labelled according to the following nomenclature:

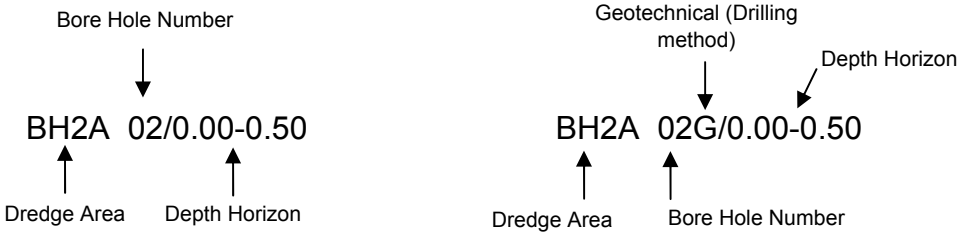


Table 2-1: Sample locations, depth of cores and number of horizons sampled for each bore hole

Sample Site	Within Amended Dredge Area	Latitude (S)	Longitude (E)	Vibrocore Sediment Depth (*Drilled Core Sediment Depth*) m	Analysis Completed	No. Horizons Analysed for Contaminants	No. Horizons Laboratory Analysed for ASS
BH 01	Yes	23°45.303'	151°10.651'		ASS	-	6
BH 02	Yes	23°45.381'	151°10.581'	0.90 *(4.45)*	Contaminant + ASS	5	-
BH 03	No	23°45.332'	151°10.738''	2.90 *(10.45)*	Contaminant + ASS	11	3
BH 04	Yes	23°45.383'	151°10.692'	3.00	ASS	-	2
BH 05	No	23°45.452'	151°10.933'	3.60	ASS	-	3
BH 06	Yes	23°45.473'	151°10.582'	2.40	ASS	-	5
BH 07	Yes	23°45.476'	151°10.782'	2.40	ASS	-	3
BH 08	No	23°45.507'	151°10.692'	1.20	ASS	-	1
BH 09	Yes	23°45.506'	151°10.867'	3.10	ASS	-	6
BH 10	Yes	23°45.574'	151°10.741'	1.20	ASS	-	1
BH 11	Yes	23°45.577'	151°10.842'	1.80	ASS	-	2
BH 12	Yes	23°45.601'	151°10.947'	2.30	ASS	-	2
BH 13	No	23°45.625'	151°11.060'	1.30	ASS	-	2
BH 14	Yes	23°45.654'	151°10.689'	1.00 *(7.95)*	Contaminant + ASS	8	1
BH 15	Yes	23°45.659'	151°10.811'	0.90	ASS	-	2
BH 16	Yes	23°45.700'	151°10.932'	2.20 *(13.45)*	Contaminant + ASS	13	1
BH 17	Yes	23°45.735'	151°11.048'	2.55	ASS	-	3
BH 18	No	23°45.749'	151°11.167'	1.10	ASS	-	2
BH 19	Yes	23°45.761'	151°10.753'	1.30	ASS	-	1
BH 20	Yes	23°45.810'	151°10.899'	1.80 *(8.45)*	Contaminant + ASS	9	1

Sample Site	Within Amended Dredge Area	Latitude (S)	Longitude (E)	Vibrocore Sediment Depth (*Drilled Core Sediment Depth*) m	Analysis Completed	No. Horizons Analysed for Contaminants	No. Horizons Laboratory Analysed for ASS
BH 21	Yes	23°45.825'	151°11.017'	1.40	ASS	-	1
BH 22	Yes	23°45.863'	151°11.143'	4.40 *(14.34)*	Contaminant + ASS	14	3
BH 23	No	23°45.862'	151°11.255'	2.00	ASS	-	4
BH 24	Yes	23°45.907'	151°10.874'	1.20	ASS	-	1
BH 25	Yes	23°45.944'	151°11.001'	1..50	ASS	-	3
BH 26	Yes	23°45.958'	151°11.104'	1.70	ASS	-	2
BH 27	Yes	23°46.035'	151°10.970'	1.30 *(3.95)*	Contaminant + ASS	6	1
BH 28	Yes	23°46.037'	151°11.087'	1.50	ASS	-	2
BH 29	Yes	23°46.057'	151°11.174'	2.00	ASS	-	4
BH 30	Yes	23°46.136'	151°11.066'	1.90	ASS	-	1
BH 31	No	23°46.178'	151°11.200'	0.70	ASS	-	1
BH 32	Yes	23°46.249'	151°11.116'	1.10	ASS	-	3
BH 33	No	23°46.283'	151°11.216'	0.70 *(6.45)*	Contaminant + ASS	6	1
BH 34	No	23°46.364'	151°11.209'	1.00	ASS	-	1



LEGEND

- APLNG Dredge Area 2A
- Superceded Dredge Area 2A

Dredge Areas - Gladstone Ports Corporation

- Stage 1A - North China Bay LNG Precinct
- Stage 1B - Fisherman's Landing LNG
- Stage 2 - Laird Point LNG
- Stage 3 - Fisherman's Landing
- Stage 4 - Hamilton Point

Analysis Points

- Acid Sulfate Soil Only
- Contaminant and Acid Sulfate Soil

Proposed dredge area digitised from Bechtel CAD drawing 25509-100-K0-K01-00002.dgn supplied on 11/09/2009.
Dredge areas translated from GPC CAD drawing xFootprint_030909.dxf supplied 10/09/2009
Superceded dredge areas digitised from Halcrow Figure 12 dated 06/07/09 (and adjusted to MGA Zone 56 GDA94) and GHD Figure 42-15386 dated 22/07/09 and should not be considered to be accurate.

0 500m

SCALE - 1:20,000 (at A3)

N W E S

Map Grid of Australia Zone 56
Geocentric Datum of Australia 1994

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A	22/09/2009	Issued for squad check	MM	DH		

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Figure 2-1 Location of Sample Sites

Project No: 301001-00752	Figure: 00752-00-EN-DAL-0058	Rev: A

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2.2 Sample Collection

Golder Associates Pty Ltd (Golder) was sub-contracted to undertake the sampling and analysis for a wide range of substances from within the Option 2A dredge area. Golder engaged GeoCoastal to undertake the overwater vibrocoring, Shine Drilling Pty Ltd (Shine Drilling) for 'shallow water' drilling, and Australian Barge Hire Pty Ltd (ABH) and Drillsure Pty Ltd (Drillsure) for 'deeper water' drilling. Vibrocore samples were taken between 29 July and 5 August 2009 and drilling samples were taken between 23 August and 27 August 2009.

2.2.1 Vibrocoring

GeoCoastal utilised a vacuum-vibrocoring system that enabled the recovery of a continuous core of all sedimentary media including unconsolidated sediments such as flowing sands. The method prevents cross contamination or vertical mixing of samples and enabled the collection of a high volume of sample for multiple analyses and sub-sampling.

The vacuum-vibrocoring system was mounted on a dumb barge/support vessel combination. The vibrocoring system uses a thin-wall (2mm) stainless steel barrel to collect continuous, undisturbed sediment cores of 70mm diameter, which is extruded into plastic sheathing for transport back to shore for processing in a controlled environment. The core barrel is thoroughly washed by a combination of high pressure water and air combined with vibration between coring runs. On average, a recovery rate of better than 95% (sample contained within core) was achieved throughout the sampling program.

The vessel and marine coring equipment was relocated around the dredging site using a differential GPS (accurate to ± 3-5m), to locate the borehole sites.

2.2.2 Drilling

Shine Drilling used a Rason 300 drilling rig mounted on a jack-up barge. Drillsure used a Hydrapower Scout track rig mounted on a larger jack-up barge. Boreholes were drilled by open-hole rotary wash boring in conjunction with casing advancement and using polymer 'mud' as required for cutting removal and borehole stability. A single U50/U75 undisturbed tube sample was recovered from each borehole.

Actual (as built) locations of the boreholes were surveyed by North Surveys Pty Ltd following barge positioning and commencement of drilling. Sample sites are shown in Figure 2-1.

2.3 Sampling Handling and Processing

2.3.1 Vibrocoring

The sealed cores were kept refrigerated on the barge and returned to land daily and retained in a refrigerated unit until logged and sub-sampled on the following day. Each sheathed vibro-vacuum core was placed onto cleaned PVC half-pipe supports. The top of the sheath was then carefully sliced lengthways to expose sufficient core for photographing, logging and sub-sampling.

Generally, the cores were split in half vertically and ASS screening sub-samples (about 10g) were taken at 0.25m intervals. Then a representative longitudinal sample was recovered for ASS quantitative testing by running a cleaned spatula along the length of the core. For contaminant testing in relevant boreholes, two sub-samples were collected from the top 1m of the remaining core of the material, at 0.5m intervals. Below

1m, sub-samples were collected and composited at approximately 1m intervals from 1.0-5.0m and from below 5.0m (where present, from the full depth cores). Samples from 1m to 5m depth were submitted for analysis and the remaining samples (where the Holocene alluvium extends beyond 5m depth) were submitted to the laboratory for storage until results of analysis were known. If no contaminants were detected in the immediately overlying samples (i.e. the 4-5m sample), then these samples were not analysed.

Sub-samples were recovered from soil cores using a stainless steel spatula that was thoroughly cleaned between samples using a three rinse process of post-wash rinsing, washing in detergent (Decon 90) and rinsing with de-ionised water. Sub-samples were promptly transferred into the laboratory supplied sample jars (to be used for the contaminant analysis) and plastic bags (for PSD and acid sulphate soil laboratory testing).

The material for each contaminant sample was homogenised and sub-sampled into a jar (or jars) if no volatile analysis was required. For volatiles, a number of evenly distributed representative sub-samples were recovered and placed in the jar to fill it leaving no ‘head space’, in order to prevent any loss of volatiles during mixing.

Samples were again homogenised at the laboratory, except when volatiles analyses were required. In this instance, the jar was opened and a small longitudinal ‘core’ was recovered from the full depth of the jar and used for volatiles analysis, with the remainder of the sample then being homogenised.

Logging was conducted in the field by a scientist experienced in logging marine sediment cores. Characteristics of the sediment including texture, consistency, colour, proportional grain size estimations, presence of accessory material (biological matter, organic debris, shells etc.), were recorded against depth. Stratigraphical soil logs were produced for each core.

Chain of custody (COC) forms were completed for all samples collected to track movement from coring, analysis at the laboratory through to reporting.

2.3.2 Drilling

Drilling techniques were used to obtain samples from beyond vibrocore refusal depth to the full depth of dredging, including overdredging.

Standard Penetration Tests (SPT) were carried out at 1m depth intervals within the boreholes (beyond the vobrocore refusal depth) to provide an indication of in situ strength of the soil strata; and for the recovery of disturbed samples. Undisturbed tube samples (U50/U75) were also recovered at selected depths in suitable cohesive strata. A single U50/U75 undisturbed tube sample was recovered from each borehole.

The 38mm diameter samples recovered from the SPT split-spoon were approximately 450mm in length. These and the single 50mm U50 sample from each borehole were used to provide samples for calculation of bulk density, and to undertake, moisture, particle size distribution and settling rate tests. A small sub-sample was also recovered from each sample and submitted for heavy metals analysis.

Logging was conducted in the field by an experienced geotechnical engineer from Golders. Characteristics of the soils including texture, consistency, colour, proportional grain size estimations, and presence of accessory material (biological matter, organic debris, shells etc.) were recorded against depth. Stratigraphical soil logs were produced for each core.

Sample processing was similar to that as for vibrocoring. Chain of custody (COC) forms were completed for all samples collected to track movement from coring, analysis at the laboratory through to reporting.

2.3.3 Physical and Chemical Testing

Primary sediment analyses were conducted by Australian Laboratory Services (ALS). Inter-laboratory quality control testing was undertaken by Advanced Analytical Australia (AAA). Both laboratories are NATA accredited for the analyses performed.

Table 2-2 provides a summary of the analyses performed, which includes the following:

- Particle size distribution (PSD);
- Moisture content;
- Total Organic Carbon (TOC);
- Metals (Al, Sb, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, V, Zn);
- Organotins (TBT);
- Benzene, toluene, ethylbenzene, and xylenes (BTEX);
- Total Petroleum Hydrocarbons (TPH);
- Organophosphorus Pesticides (OPP);
- Organochlorine Pesticides (OCP);
- Polychlorinated Biphenyls (PCB); and
- Polycyclic Aromatic Hydrocarbons (PAH).

For vibrocored boreholes, moisture content, metals, TBT, PAHs and TOC testing was undertaken on each sample within the upper 1m of sediment. TBT was not undertaken on sediments below 1m sediment depth as they are likely present only in the upper sediment layer. Other contaminant substances were screened for half the sampling locations only since they were likely to be below detection levels based on the results of previous nearby sampling surveys.

Drilled sediment samples tested for metals, particle size and moisture content only as anthoropogenic contaminant substances were unlikely to occur in these deeper, undisturbed sediments.

Table 2-2: Sample contaminant analyses undertaken at sampling locations in dredge area Option 2A

Borehole	Horizon	Coring method*	Moisture Content	PSD	TOC	Metals	TBT	BTEX	TPH	OPP	OCP	PCB	PAH
BH 2	0.00 - 0.50	V	X	X	X	X	X	X	X	X	X	X	X
	0.50 – 0.90	V	X	X	X	X	X	X	X	X	X	X	X
	1.00 – 1.45	D	X			X							
	3.00 – 3.45	D	X			X							
	4.00 – 4.45	D	X			X							
BH 3 (outside amended Option 2A footprint)	0.00 – 0.50	V	X	X	X	X	X						X
	0.50 – 1.00	V	X	X	X	X	X						X
	1.00 – 1.60	V	X	X	X	X							X
	1.60 – 2.00	V	X	X	X	X							X
	2.00 – 2.90	V	X	X	X	X							X
	3.00 – 3.45	D	X			X							
	5.00 – 5.45	D	X			X							
	7.00 – 7.45	D	X			X							
	8.00 – 8.45	D	X			X							
	9.00 – 9.45	D	X			X							
	10.00 – 10.45	D	X			X							
BH 14	0.00 – 0.50	V	X	X	X	X	X						X
	0.50 – 1.00	V	X	X	X	X	X						X
	1.50 – 1.95	D	X			X							
	2.50 – 2.95	D	X			X							
	3.50 – 3.95	D	X			X							
	4.50 – 4.95	D	X			X							
	6.50 – 6.95	D	X			X							
	7.50 – 7.95	D	X			X							
BH 16	0.00 – 0.10	V	X	X	X	X	X	X	X	X	X	X	X
	0.10 – 0.60	V	X	X	X	X	X	X	X	X	X	X	X
	0.60 – 1.10	V	X	X	X	X	X	X	X	X	X	X	X
	1.10 – 2.10	V	X	X	X	X	X	X	X	X	X	X	X
	3.00 – 3.45	D	X			X							
	4.00 – 4.45	D	X			X							
	6.00 – 6.23	D	X			X							
	7.00 – 7.40	D	X			X							
	8.00 – 8.36	D	X			X							
	9.00 – 9.38	D	X			X							
	11.00 – 11.45	D	X			X							
	12.00 – 12.45	D	X			X							
	13.00 – 13.45	D	X			X							
BH 20	0.00 – 0.50	V	X	X	X	X	X						X
	0.50 – 1.00	V	X	X	X	X	X						X
	1.00 – 1.80	V	X	X	X	X							X
	2.50 – 2.95	D	X			X							

Borehole	Horizon	Coring method*	Moisture Content	PSD	TOC	Metals	TBT	BTEX	TPH	OPP	OCP	PCB	PAH
	4.00 – 4.42	D	X			X							
	5.00 – 5.45	D	X			X							
	6.00 – 6.45	D	X			X							
	7.00 – 7.45	D	X			X							
	8.00 – 8.45	D	X			X							
BH 22	0.00 – 0.50	V	X	X	X	X	X	X	X	X	X	X	X
	0.50 – 1.00	V	X	X	X	X	X	X	X	X	X	X	X
	1.00 – 2.00	V	X	X	X	X		X	X	X	X	X	X
	2.00 – 3.00	V	X	X	X	X		X	X	X	X	X	X
	3.00 – 4.10	V	X	X	X	X		X	X	X	X	X	X
	4.10 – 4.40	V	X	X	X	X		X	X	X	X	X	X
	5.00 – 5.45	D	X			X							
	6.00 – 6.45	D	X			X							
	8.00 – 8.45	D	X			X							
	9.00 – 9.45	D	X			X							
	10.00 – 10.45	D	X			X							
	12.00 – 12.40	D	X			X							
	13.00 – 13.40	D	X			X							
	10.00 – 14.34	D	X			X							
BH 27	0.00 – 0.6	V	X	X	X	X	X	X	X	X	X	X	X
	0.60 – 1.00	V	X	X	X	X	X	X	X	X	X	X	X
	1.00 – 1.30	V	X	X	X	X		X	X	X	X	X	X
	1.50 – 1.95	D	X			X							
	2.50 – 2.95	D	X			X							
	3.50 – 3.95	D	X			X							
BH 33 (outside amended Option 2A footprint)	0.00 – 0.50	V	X	X	X	X	X						X
	0.50 – 0.70	V	X	X	X	X	X						X
	1.00 – 1.38	D	X			X							
	3.00 – 3.41	D	X			X							
	4.00 – 4.45	D	X			X							
	6.00 – 6.45	D	X			X							

Note: * V = Vacuum vibrocoring; D = drilling.

Material submitted for testing included additional samples for quality control purposes in accordance with NAGD requirements (refer Section 2.4.1 for further details). These QC samples assessed:

- Sediment homogeneity - a ‘replicate triplicate’ sample (ie. three separate samples taken with $1m^3$);
- Laboratory variation – a ‘split triplicate’ sample – two samples sent to the ‘primary laboratory’ and a third sent to a secondary (‘check’) laboratory;
- Analytical variation – a sample ‘split duplicate’ analysed in one batch was submitted in a later batch; and

- Volatile transfer between samples – a 'trip blank' consisting of inert chromatographic sand was shipped in the sealed eskies with samples.

Laboratory limits of reporting (LORs) are identified as the lowest chemical analysis level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Only sediments within the top 1m were analysed for compliance with Practical Quantitation Limits (PQLs) required under Appendix A, Table 1 of the NAGD. This is because capital dredging sediment sampling and analysis programs typically only require testing for contaminants in the upper 1m of sediment. Physical testing only is required for material below 1m under the NAGD, however select chemical analyses have also been undertaken here. The LORs reported in Table 2-3 were applicable to the analyses undertaken for both the top 1m and sediment below 1m.

Table 2-3: Laboratory LOR for analyses undertaken

Analyte	NAGD PQL		LOR for Analysis of Top 1m of Sediment	LOR for Analysis of Sediments Below 1m
Moisture Content	-		1%	1%
Total Organic Carbon	-		0.02%	0.02%
Metals	Al	200mg/kg	50mg/kg	50mg/kg
	Fe	100mg/kg	50mg/kg	50mg/kg
	Mn	10mg/kg	10mg/kg	5mg/kg
	V	2mg/kg	2mg/kg	5mg/kg
	As	1mg/kg	1mg/kg	5mg/kg
	Cr	1mg/kg	1mg/kg	2mg/kg
	Cu	1mg/kg	1mg/kg	5mg/kg
	Pb	1mg/kg	1mg/kg	5mg/kg
	Ni	1mg/kg	1mg/kg	2mg/kg
	Zn	1mg/kg	1mg/kg	5mg/kg
	Sb	0.5mg/kg	0.5mg/kg	5mg/kg
	Co	0.5mg/kg	0.5mg/kg	2mg/kg
	Cd	0.1mg/kg	0.1mg/kg	1mg/kg
	Se	0.1mg/kg	0.1mg/kg	5mg/kg
	Ag	0.1mg/kg	0.1mg/kg	2mg/kg
	Hg	0.01mg/kg	0.01mg/kg	0.01mg/kg

Analyte	NAGD PQL	LOR for Analysis of Top 1m of Sediment	LOR for Analysis of Sediments Below 1m
TBT	1 μgSn/kg	0.5 μgSn/kg	0.5 μgSn/kg
BTEX	0.2mg/kg	0.2mg/kg	0.2mg/kg
TPH	100mg/kg	3mg/kg	3mg/kg
OPP	10-100μg/kg (varies according to toxicity	10μg/kg	10μg/kg
OCP	1μg/kg	0.5μg/kg (HCB and chlordanes 0.25μg/kg)	0.5μg/kg (HCB and chlordanes 0.25μg/kg)
PCB	5μg/kg	5μg/kg	5μg/kg
PAH	5μg/kg	4μg/kg (Naphthalene, 2-Methylnaphthalene, Coronene 5μg/kg)	4μg/kg (Naphthalene, 2-Methylnaphthalene, Coronene 5μg/kg)

2.3.4 Acid Sulphate Soils Testing

Sediments were initially screened for acid sulphate soils presence at approximately 0.5m vertical intervals (in accordance with QASSIT methodology) in at least 25% of the locations sampled (i.e. nine locations). Less intensive screening was undertaken on the remaining cores at a rate of 1 test per 1-2m or core (depending on results of sampling).

Screening was undertaken by Golder using the pH_F (field pH) and pH_{FOX} (pH following peroxide oxidation) method of analysis. The pH_F/pH_{FOX} screening method consists of two steps; initially determining the field pH of a 1:5 soil/water suspension, followed by the addition of 30% Hydrogen Peroxide, allowing the sample time to oxidise, before determining the pH_{FOX} (pH after oxidation) of the reacted sample. A significant drop in pH is indicative of potential acidity, while a low initial pH is indicative of actual acidity.

A representative number of samples (refer Table 2-1) selected from the screened samples were sent to the primary laboratory (ALS) and subjected to the full SPOCAS or S_{CR} test suites. The latter test method was used on some samples that contained significant amounts of organic matter, which could contain sulphur of organic origin that could artificially 'inflate' the Percent Oxidisable Sulphur (S_{POS}) determined by the SPOCAS method.

Representative samples were determined according to the following method. In cores where screening indicated a complete absence of ASS, limited laboratory sampling was undertaken. However, a minimum of one sample of Holocene material was analysed from each borehole location. Some samples from slightly deeper into the Pleistocene layer were included for analysis where the Holocene layer was less than 0.5m thick, to make up the sampling numbers in the profile at those locations. In all, 75 samples (from all boreholes including the nine outside the amended Option 2A dredge footprint) were selected for quantitative analysis. Of these 42 were Holocene in origin and 33 were Pleistocene.

2.4 Procedures for Sample Handling, Preservation, Storage and QA/QC

Prior to use, the vessel to be used for the coring operations and all equipment was inspected and washed down. Any evident sources of contamination such as exposed metal, galvanized or oily surfaces were cleaned, covered in plastic and taped down to avoid accidental contamination of samples.

Core samples collected from the vibro-corer were recovered in a clear plastic sleeve. The vibro-corer method for collecting soil cores prevents cross contamination and vertical mixing of samples. On the vessel, samples were placed in sealed eskies with crushed ice to keep the samples below 4°C. Onshore, the cores were then sub-sampled into appropriate sample containers supplied by the analytical laboratories. Samples were couriered to the laboratory in eskies with crushed ice so that they remained frozen and were delivered to the laboratory within 72 hours of collection.

Soil samples are retained at the laboratory for three months after reporting.

Field sample collection and analyses followed Golder's QA/QC standard work procedures for managing soil samples and laboratory procedures. This included the following documentation:

- Sample inventory logs. Samples were allocated a Job number, borehole number and labelled with a depth of sample and date of collection;
- Sample collections were logged on the vessel. This provided a record of the drilled soil core and where samples were collected;
- Chain of Custody (COC) forms that list all the sample numbers and locations and the analyses required accompanied each batch of samples to the laboratory. At each stage of handling, samples were checked against the COCs;
- A Sample Receipt Notification (SRN) was issued by ALS upon receipt of the samples, detailing the condition of the samples, anticipated turnaround time, internal tracking and work order number; and
- Reporting of results (Certificate of Analysis) were sent via email from ALS to Golder. Final Result Certificates including QC results were issued as a PDF file. Contaminant substance results were then forwarded to WorleyParsons for compilation and data analysis.

Similar COC, SRN and analytical results reporting procedures were undertaken by the secondary laboratory, AAA.

2.4.1 Quality Control – Field and Laboratory Analysis

The laboratories used for sediment sample analysis, ALS (primary) and AAA (secondary) are NATA accredited for the methods used and are experienced in the analysis of marine sediments.

Quality control procedures for contaminant assessment were used from sampling through to completion of laboratory analysis, including:

- COC documentation;
- Field and intra-laboratory QC protocols; and
- Inter-laboratory analyses.

Field quality control samples included one inter-batch duplicate, one field replicate triplicate, and one field split triplicate, which were taken from the following sites:

- Inter-batch duplicate (ie one sample split into two and submitted to the laboratory in two different batches):
    - BH2A 22/0.00-0.50
- Field replicate triplicate (ie. Three separate samples taken at the one site):
    - BH2A 27/0.00-0.60
- Field split triplicate (ie one sample split into three and tested at two laboratories):
    - BH2A 33/0.00-0.50 (Note: this is outside the amended Option 2A dredge footprint, but provides suitable indication of homogeneity of sediment contaminant concentrations)
- Field trip-blank sample.

Laboratory QC procedures were conducted in accordance with the requirements of Appendix F of the NAGD. These requirements included analysis of laboratory blank, certified reference materials, replicate and spiked samples.

Validation of the laboratory analyses was undertaken in accordance with Appendix A of the NAGD to confirm that the data quality was suitable for undertaking an assessment to characterise material proposed for dredging and disposal. Laboratory data validation included assessment of results for laboratory blanks, standards, surrogate and matrix spikes and duplicate samples. Field data validation included calculation of relative standard deviation (RSD) for field split triplicates and replicate triplicate samples, and comparison against laboratory and NAGD criteria.

2.5 Data Analysis

2.5.1 Chemical Analysis

Contaminant levels for sediments are compared against the following guidelines:

- Screening Level concentrations listed in Appendix A Table 2 of the *National Assessment Guidelines for Dredging* (Commonwealth of Australia, 2009): to assess whether the material is suitable for unconfined placement at sea or if further testing is required (e.g. elutriate, bioavailability and/or direct toxicity assessment).
- Environmental Investigation Level (EIL) and Health Investigation Level for residential land use (HIL-A) in *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* (DEH, 1998): to assess the contaminant-related suitability for placement of dredged material on land, using the most stringent of the health investigation categories (residential use).

The comparison against guideline levels involves the comparison of mean contaminant concentrations at the upper 95% confidence level (95% UCL) of the mean. For the purposes of calculation of normalised values and of 95% UCLs, values below detection limits were set to one-half of the LOR in accordance with NAGD recommendations. Results for organic parameters are normalised to 1% TOC where the recorded value is within the range of 0.2 – 10%. If TOC values are outside this range, then the highest or lowest of the 0.2 – 10% range is adopted as appropriate. Organic contaminants below LOR were not normalised to 1% TOC in 95% UCL calculations, but left at half the LOR.

The methods used to calculate the 95% UCLs were based on those required in Appendix A of the NAGD (P58, Comparison of Data to Screening Levels). Normality of datasets was determined using Shapiro-Wilks test and quantile-quantile plots in ProUCL Version 4 (4.00.02) developed by the US EPA. Datasets were determined as being normal, log-normal or neither in their distributions. Normal datasets were analysed using the 1-tailed student's t UCL. Log-normal datasets were analysed using non-parametric jacknife analysis as recommended in the NAGD. Similarly, datasets that were neither normal nor log-normally distributed were analysed using non-parametric jacknife analysis.

Outcomes regarding the tests are presented in Section 3. Under the NAGD, if the 95% UCL values for all substances are below relevant Screening Levels, it is considered unlikely that sediment contaminants will have adverse effects on organisms living in or on that sediment or on water quality during disposal. The sediment is therefore considered non-toxic and there are no chemical obstacles to unconfined placement at sea. 95% UCLs of the mean are also compared against EIL and HIL-A guidelines as a conservative measure when assessing the suitability of the material for disposal on land.

Statistical power analysis was undertaken to determine whether acceptable statistical power was achieved to make a valid comparison against the NAGD Screening Levels given that a pilot program level of sampling was undertaken for contaminant assessment. The NAGD refers to ANZECC/ARAMCANZ (2000: Section A5.1.10) in relation to power analysis, which suggests that a Type I error rate of 5% (i.e. $\alpha = 0.05$) is conventional and Type II error rate of 20% (i.e. $\beta = 0.2$, whereby power = $1-\beta = 0.8$) is acceptable.

Power analysis was undertaken on the metals dataset only, as TBT was not detected and other contaminant groups were either not detected or were well below Screening Levels. Power analysis also identified the required number of samples to achieve a statistically rigorous comparison against NAGD Screening Levels and these are reported against the actual number of samples taken.

Analysis of power and required sample number was undertaken using the one-sample t-test method, which determines whether the population mean μ (at the 95% UCL in this case) equals some specified constant value μ_0 (Screening Level in this case). The t-test analysis assumes a normal distribution of data. Where datasets were log-normally distributed, the Screening Level and data were log-transformed to enable use of the t-test. Where data did not have a discernable distribution, it was assumed that they approximated a normal distribution for the purposes of the analysis.

A one-sided ('one tailed') test was used in the calculation as the study is only concerned with detecting whether a contaminant concentration is above the Screening Level. The null and alternate hypothesis of the t-test state:

$H_0 : \mu - \mu_0 = 0$

$H_1 : \mu - \mu_0 > 0$

The effect size index 'd' used in the calculations is defined as:

$d = (\mu - \mu_0)/\sigma$

where σ denotes the (unknown) standard deviation in the population. Thus, if μ and μ_0 deviate by one standard deviation then d = 1.

2.5.2 Acid Sulphate Soils Analysis

The S_{CR} and SPOCAS analysis suites have been adopted by QASSIT for the analysis of ASS in Queensland. These methods include analysis and quantification of naturally occurring alkaline materials (i.e.

calcite, coral debris, fine shell fragments) and any 'retained acidity' which includes sulphur held in stable oxidation minerals such as 'jarosite' which was previously not included in estimates of total acidity.

Sulphidic derived acidity had been historically determined using the following equation:

- Total Potential Acidity (TPA) = Total Actual Acidity (TAA) + Total Sulphidic Acidity (TSA)

However, experience has proved that TPA can include acidity of organic and/or mineralogical origin as well as sulphidic origin. Thus an overall acid-base accounting method has been derived to calculate a 'net acidity' value which is used to qualify analytical test results and calculation of liming rates. This equation is:

- 'net acidity' = actual acidity (as TAA) + retained acidity (as S_{NAS}) + Potential Acidity (as S_{CR} or S_{POS}) – *in-situ* acid neutralising capacity (ANC)

Results are compared to the 'action criteria' for disturbances of more that 1,000 tonnes of material (ie. 18 moles of acid/tonne) as set out in the QASSIT (1998) guidelines.

3. Results

3.1 Physical Characteristics

Samples were collected from each vibrocoring sampling horizon and analysed for particle size distribution (PSD). Laboratory reports for PSD analysis are included in Appendix 3. Core logs from each bore hole are presented Appendix 1.

Figure 3-1 and Figure 3-2 provide a graphical summary of PSD within the surface 1m of sediments and those below 1m respectively. Figure 3-1 shows that across the sample sites, PSD is relatively consistent in the surface 1m of sediments, with the exception of BH2A 27 and BH2A 33 (outside the amended Option 2A dredge area) which have a much higher sand content compared to the other sites. Figure 3-2 identifies that PSD in sediments below 1m is consistent across all sites.

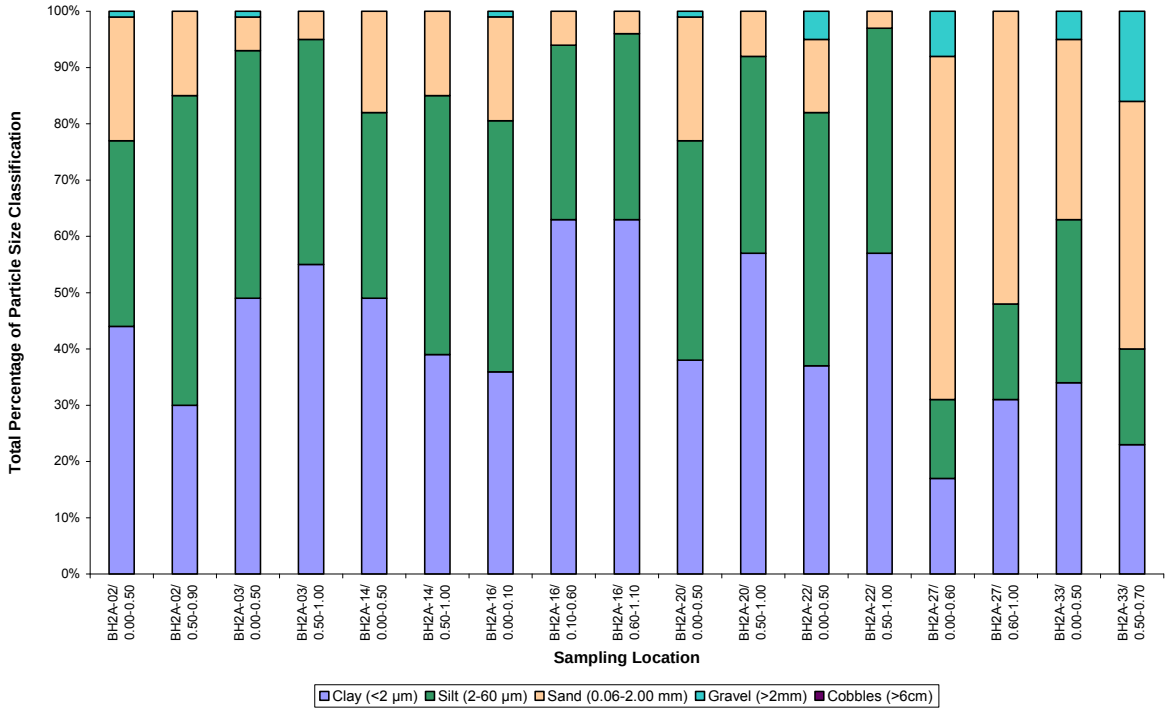


Figure 3-1: Graphical summary of particle size distribution within the surface 1m of sediments of dredge area Option 2A.

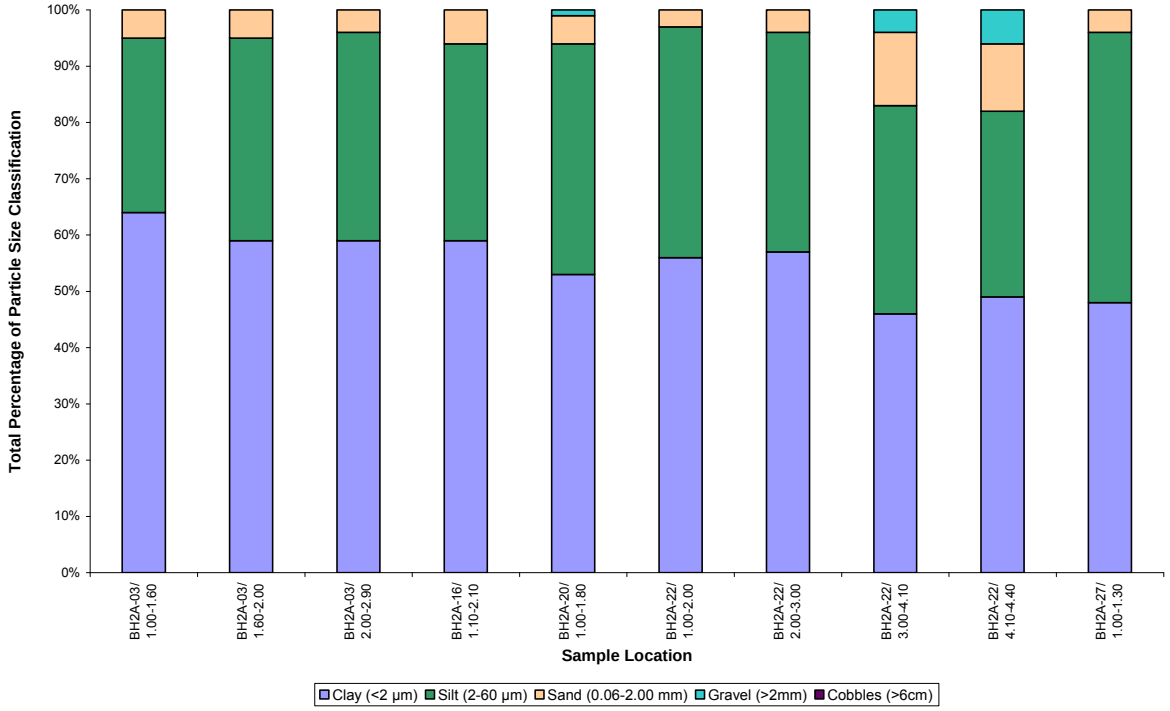


Figure 3-2: Graphical summary of particle size distribution for sediments below 1m within dredge area Option 2A

Table 3-1 provides a comparison of summary statistics between the surface 1m of sediments and those below 1m. The surface 1m of sediments is dominated by clay (43%), silt (35%) and sand (20%). The silt fractions for both the surface 1m and sediments below 1m were relatively similar (35% and 38% respectively). The difference in sediment PSD is that sediments below 1m have a higher clay content (55% compared to 43%) and a lower sand content (6% compared to 20%) than those in the surface 1m (Table 3-1).

Table 3-1: Comparison of summary statistics for sediments within the surface 1 m and below 1m for particle size distribution across all sample sites

	Cobble (+ 6cm)		Gravel (+ 2 mm)		Sand (2 mm - 0.060 mm)		Silt (0.060 mm - 0.002 mm)		Clay (-0.002 mm)	
	Top 1m	Below 1m	Top 1m	Below 1m	Top 1m	Below 1m	Top 1m	Below 1m	Top 1m	Below 1m
Number of Samples	17	10	17	10	17	10	17	10	17	10
Mean	0	0	2	1	20	6	35	38	43	55
Standard Deviation	0.0	0.0	4.3	2.1	17.4	3.5	11.3	4.8	13.7	5.8
Minimum	0	0	0	0	3	3	14	31	17	46
Maximum	0	0	16	6	61	13	55	48	63	64

3.2 Chemical Results

Laboratory results obtained during the study are summarised in Table 3-2 and Table 3-4. Primary laboratory analytical reports are provided in Appendix 4. Results are compared against the Screening Levels listed in

Appendix A Table 2 of the NAGD (Commonwealth of Australia, 2009) and against DEH (1998) EIL and HIL-A concentrations. Exceedances of these Screening Levels by individual sample sites are identified within Figure 3-3. Summary statistics (mean, standard deviation, 95%UCL of the mean, power and minimum sample size) are provided in Table 3-3 and Table 3-5.

3.2.1 Upper 1m of Sediments

Results for the upper 1m of sediments are summarised below. The NAGD recognises this layer as that which may potentially be contaminated by anthopogenically sourced contaminants. Sediments below 1m generally represent undisturbed material. The NAGD requires contaminant analyses be undertaken only on the upper 1m of sediment for capital dredging projects such as this. Salient results for relevant contaminant groups are presented within this section below.

Metals

- Aluminium, cobalt, iron, selenium and vanadium were above LOR in all samples. There are no NAGD Screening Levels for these metals.
- Antimony and cadmium were below LOR in all samples.
- Arsenic was detected in all but three samples. One sample, BH2A 22/0.00-0.5m, exceeded the NAGD Screening Level of 20mg/kg. The 95% UCL of the mean for arsenic was below the NAGD screening criteria.
- Chromium, copper, lead and zinc were above LOR and below respective NAGD Screening Levels in all samples. All 95% UCLs of the means were below respective NAGD Screening Levels.
- Manganese was above detection limits in all but two samples. Both samples with non detections were from BH2A 20. There are no NAGD Screening Levels for Manganese.
- Mercury was detected from each borehole except BH2A 02 and BH2A 33 (outside the amended Option 2A dredge footprint). However, all detections were below the NAGD Screening Levels, as was the 95% UCL of the mean.
- Nickel and silver were detected in all but one sample each (BH2A 20/0.5–1.0m and BH2A 22/0.5-1.0m respectively). All detections were below respective NAGD Screening Levels, as were the 95%UCLs of the means.

BTEX

- All BTEX species were below detection levels across all samples.

Total Petroleum Hydrocarbons

- C6-C9 and C10-C14 fractions were below LOR in all samples.
- C15-C28 and C29-C36 fractions were present in BH2A 16 (both horizons), BH2A 22 (both horizons) and BH2A 27/0.00-0.60m.
- The NAGD Screening Level for the sum of TPHs was not exceeded in any sample or at the 95% UCL of the mean.

Organotins

- Tributyltin was below detection limits in all samples.

Organophosphorus Pesticides

- All organophosphorus pesticides were below LOR in all samples.

Organochlorine Pesticides

- All organochlorine pesticides were below LOR in all samples.

Polychlorinated Biphenyls

- All polychlorinated biphenyls were below LOR in all samples.

Polycyclic Aromatic Hydrocarbons

- Fluoranthene, Pyrene, and Perylene were detected in a maximum of three samples each. There are no NAGD Screening Levels for individual PAH species for comparison.
- All other PAHs were below detection limits are all sites.
- In samples where PAHs were detected, the Sum of PAHs were below NAGD Screening Levels.

3.2.1.1 Contaminant Concentrations Exceeding EIL or HIL-A

The following parameters reported concentrations exceeding EIL guidelines detailed in DEH (1998):

- Arsenic exceeded EIL concentrations at BH2A 22/0.00-0.50.
- Manganese exceeded EIL concentrations at BH2A 27/0.00-0.60.

There were no exceedances of HIL-A guidelines.

3.2.1.2 Power Analysis for Total Trace Metals

Results for statistical power and minimum required sample size required to make a statistically valid comparison against the Screening Level are provided in Table 3-3. Note that this analysis is based on the sample results from within the amended Option 2A dredge area. Metals only were tested, as TBT was below detection levels and other analyte groups were either below detection or were well below LOR. For most metals that have NAGD Screening Levels, the statistical power is very high (1.0) and the number of samples required to make a statistically valid comparison against the Screening Levels is generally two to four, which compares favourably with the 12 samples analysed. Arsenic was the exception, with power being 0.7 (marginally below the recommended 0.8), with the number of samples required to make a statistically valid comparison against the NAGD Screening Level (20mg/kg) being 16. It is noted, however that arsenic is naturally elevated in Port Curtis (GHD, 2009) and that elevations reflected in a locally derived sediment arsenic guideline of 24.3mg/kg within the Port Curtis Integrated Monitoring Program (PCIMP) for environmental health reporting. Comparison of arsenic concentrations to the PCIMP guideline achieves a very high power (0.98) and requires a minimum sample size of only seven, which is less than the 12 samples taken.

Table 3-2: Results for sediments in the upper 1m of dredge area Option 2A

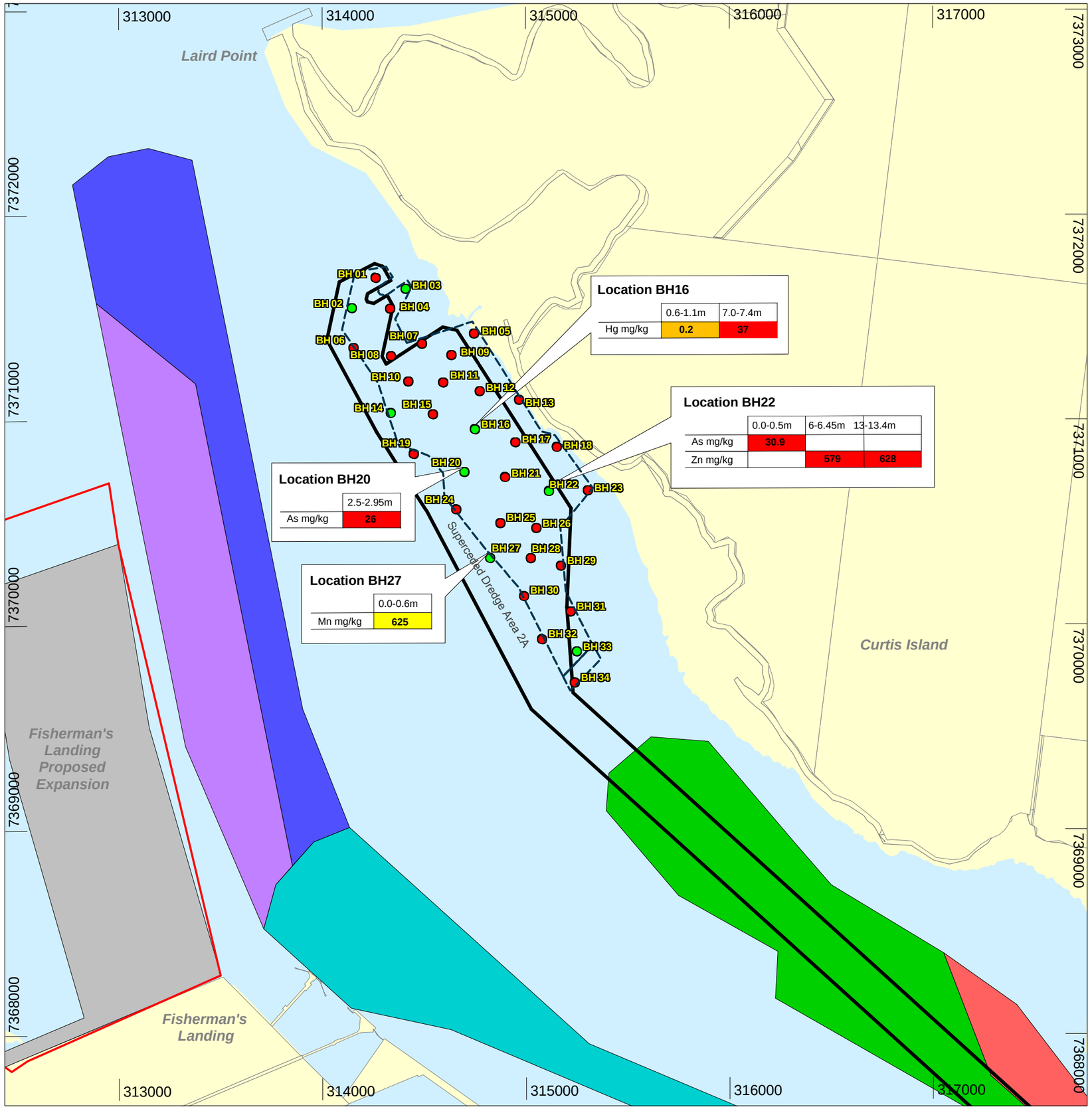
Sample ID	Unit	LOR	NAGD PQL	DEH (1998) EIL	DEH (1998) HIL-A	NAGD Screening Level (PCIMP guideline)	BH2A 02/ 0.00-0.50	BH2A 02/ 0.50-0.90	BH2A 14/ 0.00-0.50	BH2A 14/ 0.50-1.00	BH2A 16/ 0.00-0.10	BH2A 16/ 0.10-0.60	BH2A 20/ 0.00-0.50	BH2A 20/ 0.50-1.00	BH2A 22/ 0.00-0.50	BH2A 22/ 0.50-1.00	BH2A 27/ 0.00-0.60	BH2A 27/ 0.60-1.00	Excluded from updated dredge footprint: BH2A 03/ 0.00-0.50	BH2A 03/ 0.50-1.00	BH2A 33/ 0.00-0.50	BH2A 33/ 0.50-0.70
Sample Date							4/08/09	4/08/09	4/08/09	4/08/09	29/07/09	29/07/09	4/08/09	4/08/09	3/08/09	3/08/09	5/08/09	5/08/09	4/08/09	4/08/09	5/08/09	5/08/09
Moisture Content (dried @ 103°C)	%	1					23.8	23.3	18.9	21.9	60.7	28.5	20.7	19.5	56.4	48.8	33.3	17.1	43.2	43.6	20.1	20.6
Total Organic Carbon	%	0.02					0.24	0.1	0.06	0.04	2.44	0.28	0.12	0.12	2.06	1.12	0.46	0.04	1.64	1.84	0.18	0.13
Metals																						
Aluminium	mg/kg	50	200				8310	5450	5880	5070	16900	10900	6010	5730	14100	15300	9640	5950	13700	15700	9210	6480
Antimony	mg/kg	0.5	0.5	20		2	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Arsenic	mg/kg	1	1	20	100	20 (24.3)	5.98	10.6	3.61	<1.00	17.6	<1.00	<1.00	2.73	**30.9**	12.3	15	11.2	11.6	9.1	11.1	9.2
Cadmium	mg/kg	0.1	0.1	3	20	1.5	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	1	1	50	100	80	9	7.7	9.4	6.8	28.5	8.6	6.1	6.9	27.1	23.2	14.6	10.3	21.3	21	15	10.2
Cobalt	mg/kg	0.5	0.5				2.5	2.2	9.4	5	13.8	3.4	1.3	1	17.7	13.5	13	2.3	16.2	13.6	6	5.5
Copper	mg/kg	1	1	60	1,000	65	14.8	24.2	23.6	8.2	24.6	34	17.4	12.7	24.6	30	10.5	9.8	32.4	36.3	15	10
Iron	mg/kg	50	100				19500	21200	11600	3560	30700	8910	4660	9550	40200	27400	22700	21500	30700	28300	43700	21800
Lead	mg/kg	1	1	300	300	50	6.5	6.4	6.2	5.6	11.4	8	4.6	6	12.5	10.9	5.6	5	9.2	9.8	9.5	5.2
Manganese	mg/kg	10	10	500	1,500		19	11	21	17	192	118	<10	<10	335	380	**625**	29	368	280	40	71
Mercury	mg/kg	0.01	0.01	1	15	0.15	<0.01	<0.01	<0.01	0.03	0.04	0.01	0.01	<0.01	0.05	0.09	0.01	<0.01	0.02	0.02	<0.01	<0.01
Nickel	mg/kg	1	1	60	600	21	3.4	2.3	7.3	3.2	14.9	2.1	1.4	<1.0	14.8	13	9.5	2.3	12.6	12.3	5	3.8
Selenium	mg/kg	0.1	0.1				0.6	0.8	0.8	0.4	1.4	1	0.1	0.1	1	0.8	0.6	0.4	1	0.9	1.2	0.5
Silver	mg/kg	0.1	0.1			1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	mg/kg	2	2				43.6	41.2	39	15.7	59.7	32.6	15.6	25.4	55.1	55	47.1	40.4	85.3	63.6	65.3	39
Zinc	mg/kg	1	1	200	7,000	200	12.4	6.5	14.2	7.8	45.4	10.6	5.6	4.9	47.5	41.4	27.2	8.2	35.6	38.6	16.8	13.6
BTEX																						
Benzene	mg/kg	0.2	0.2	1,000			<0.2	<0.2			<0.2	<0.2			<0.2	<0.2	<0.2	<0.2				
Toluene	mg/kg	0.2	0.2				<0.2	<0.2			<0.2	<0.2			<0.2	<0.2	<0.2	<0.2				
Ethylbenzene	mg/kg	0.2	0.2				<0.2	<0.2			<0.2	<0.2			<0.2	<0.2	<0.2	<0.2				
meta- & para-Xylene	mg/kg	0.2	0.2				<0.2	<0.2			<0.2	<0.2			<0.2	<0.2	<0.2	<0.2				
ortho-Xylene	mg/kg	0.2	0.2				<0.2	<0.2			<0.2	<0.2			<0.2	<0.2	<0.2	<0.2				
Total Petroleum Hydrocarbons																						
C6 - C9 Fraction	mg/kg	3	100				<3	<3			<3	<3			<3	<3	<3	<3				
C10 - C14 Fraction	mg/kg	3	100				<3	<3			<3	<3			<3	<3	<3	<3				
C15 - C28 Fraction	mg/kg	3	100				<3	<3			33	12			10	6	10	<3				
Normalised to 1% TOC											*13.52*	*42.86*			*4.85*	*5.36*	*21.74*					
C29 - C36 Fraction	mg/kg	5	100				<5	<5			52	20			14	13	8	<5				
Normalised to 1% TOC											*21.31*	*71.43*			*6.80*	*11.61*	*17.39*					
Sum of TPH Fractions (calculated)	mg/kg						-	-			85	32			24	19	18	-				
Normalised to 1% TOC						*550*					*34.84*	*114.29*			*11.65*	*16.96*	*39.13*					
Organotins																						
Tributyltin	µgSn/kg	0.5	1			9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Organophosphorus Pesticides																						
Bromophos-ethyl	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Carbophenothion	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Chlorfenvinphos (E)	µg/kg	10					<10.0	<10.0			<10.0	<10.0			<10.0	<10.0	<10.0	<10.0				
Chlorfenvinphos (Z)	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Chlorpyrifos	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Chlorpyrifos-methyl	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Demeton-S-methyl	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Diazinon	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Dichlorvos	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Dimethoate	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Ethion	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Fenamiphos	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Fenthion	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Malathion	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Azinphos Methyl	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Monocrotophos	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Parathion	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Parathion-methyl	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Pirimphos-ethyl	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Prothiofos	µg/kg	10					<10	<10			<10	<10			<10	<10	<10	<10				
Organochlorine Pesticides																						
Aldrin	µg/kg	0.5	1	200	10,000		<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
alpha-BHC	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
beta-BHC	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
delta-BHC	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
4.4`-DDD	µg/kg	0.5	1			2	<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
4.4`-DDE	µg/kg	0.5	1			2.2	<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
4.4`-DDT	µg/kg	0.5	1	200	200,000		<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
DDT (total)	µg/kg	0.5	1			1.6	<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Dieldrin	µg/kg	0.5	1	200	10,000	280	<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
alpha-Endosulfan	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
beta-Endosulfan	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Endosulfan sulfate	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Endosulfan (sum)	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Endrin	µg/kg	0.5	1			10	<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Endrin aldehyde	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Endrin ketone	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Heptachlor	µg/kg	0.5	1		10,000		<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Heptachlor epoxide	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
Hexachlorobenzene (HCB)	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
gamma-BHC	µg/kg	0.25	1				<0.25	<0.25			<0.50	<0.50			<0.25	<0.25	<0.25	<0.25				
Methoxychlor	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				
cis-Chlordane	µg/kg	0.25	1		50,000		<0.25	<0.25			<0.50	<0.50			<0.25	<0.25	<0.25	<0.25				
trans-Chlordane	µg/kg	0.25	1				<0.25	<0.25			<0.50	<0.50			<0.25	<0.25	<0.25	<0.25				
Total Chlordane (sum)	µg/kg	0.25	1			0.5	<0.25	<0.25			<0.50	<0.50			<0.25	<0.25	<0.25	<0.25				
Oxychlordane	µg/kg	0.5	1				<0.50	<0.50			<0.50	<0.50			<0.50	<0.50	<0.50	<0.50				

Table 3-2: Results for sediments in the upper 1m of dredge area Option 2A

Sample ID	Unit	LOR	NAGD PQL	DEH (1998) EIL	DEH (1998) HIL-A	NAGD Screening Level (PCIMP guideline)	BH2A 02/ 0.00-0.50	BH2A 02/ 0.50-0.90	BH2A 14/ 0.00-0.50	BH2A 14/ 0.50-1.00	BH2A 16/ 0.00-0.10	BH2A 16/ 0.10-0.60	BH2A 20/ 0.00-0.50	BH2A 20/ 0.50-1.00	BH2A 22/ 0.00-0.50	BH2A 22/ 0.50-1.00	BH2A 27/ 0.00-0.60	BH2A 27/ 0.60-1.00	Excluded from updated dredge footprint: BH2A 03/ 0.00-0.50	BH2A 03/ 0.50-1.00	BH2A 33/ 0.00-0.50	BH2A 33/ 0.50-0.70
Sample Date							4/08/09	4/08/09	4/08/09	4/08/09	29/07/09	29/07/09	4/08/09	4/08/09	3/08/09	3/08/09	5/08/09	5/08/09	4/08/09	4/08/09	5/08/09	5/08/09
Polychlorinated Biphenyls																						
Total Polychlorinated biphenyls	µg/kg	5	5	1,000	10,000	23	<5.0	<5.0			<5.0	<5.0			<5.0	<5.0	<5.0	<5.0				
Aroclor 1016	µg/kg	5					<5.0	<5.0			<5.0	<5.0			<5.0	<5.0	<5.0	<5.0				
Aroclor 1221	µg/kg	5					<5.0	<5.0			<5.0	<5.0			<5.0	<5.0	<5.0	<5.0				
Aroclor 1232	µg/kg	5					<5.0	<5.0			<5.0	<5.0			<5.0	<5.0	<5.0	<5.0				
Aroclor 1242	µg/kg	5					<5.0	<5.0			<5.0	<5.0			<5.0	<5.0	<5.0	<5.0				
Aroclor 1248	µg/kg	5					<5.0	<5.0			<5.0	<5.0			<5.0	<5.0	<5.0	<5.0				
Aroclor 1254	µg/kg	5					<5.0	<5.0			<5.0	<5.0			<5.0	<5.0	<5.0	<5.0				
Aroclor 1260	µg/kg	5					<5.0	<5.0			<5.0	<5.0			<5.0	<5.0	<5.0	<5.0				
Polycyclic Aromatic Hydrocarbons																						
Naphthalene	µg/kg	5	5				<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
2-Methylnaphthalene	µg/kg	5	5				<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Acenaphthylene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Acenaphthene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Fluorene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Phenanthrene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Anthracene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Fluoranthene	µg/kg	4	5				<4	<4	<4	<4	4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Normalised to 1% TOC											*1.64*											
Pyrene	µg/kg	4	5				<4	<4	<4	<4	4	<4	<4	<4	7	<4	<4	<4	<4	5	<4	<4
Normalised to 1% TOC											*1.64*				*3.40*					*2.72*		
Benz(a)anthracene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Chrysene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Benzo(b)fluoranthene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Benzo(k)fluoranthene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Benzo(e)pyrene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Benzo(a)pyrene	µg/kg	4	5		1,000		<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Perylene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	43	<4	<4	36	74	<4	<4
Normalised to 1% TOC																*38.39*			*21.95*	*40.22*		
Benzo(g.h.i)perylene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Dibenz(a.h)anthracene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Indeno(1.2.3.cd)pyrene	µg/kg	4	5				<4	<4	<4	<4	<4	<4	<4	<4	<5	<4	<4	<4	<4	<4	<4	<4
Coronene	µg/kg	5	5				<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Sum of PAHs	µg/kg	4	100		20,000	10000	<4	<4	<4	<4	9	<4	<4	<4	7	43	<4	<4	36	78	<4	<4
Normalised to 1% TOC											*3.69*				*3.40*	*38.39*			*21.95*	*42.39*		

Legend

Note	When calculating averages and 95% UCLs, values below detection for individual results were set to half the detection levels, consistent with the NAGD
PQL	Practical Quantitation Limit
-	No guideline levels (ie. Screening levels) or no analysis undertaken for a given sample
50	Value exceeds NAGD Screening Level
50	Value exceeds Queensland EPA soil 'environmental investigation level' (as given in DEH (1998)). The DEH (1998) guideline for dieldrin and aldrin is based on the sum of the concentrations reported for the two analytes
Normalised to 1% TOC	Normalised to 1% TOC, over the range of TOC from 0.2 to 10%



LEGEND

- APLNG Dredge Area 2A
- Superceded Dredge Area 2A

Dredge Areas - Gladstone Ports Corporation

- Stage 1A - North China Bay LNG Precinct
- Stage 1B - Fisherman's Landing LNG
- Stage 2 - Laird Point LNG
- Stage 3 - Fisherman's Landing
- Stage 4 - Hamilton Point

Analysis Points

- Acid Sulfate Soil Only
- Contaminant and Acid Sulfate Soil

Contaminant Levels

- Value Exceeds DEH (1998) EIL
- Value Exceeds NAGD Screening Level
- Value Exceeds Both DEH and NAGD Levels

Variables

As - Arsenic | Mn - Manganese | Pb - Lead
Hg - Mercury | Ni - Nickel | Zn - Zinc

Proposed dredge area digitised from Bechtel CAD drawing 25509-100-K0-K01-00002.dgn supplied on 11/09/2009.
Dredge areas translated from GPC CAD drawing xFootprint_030909.dxf supplied 10/09/2009
Superceded dredge area digitised from Halcrow Figure 12 dated 06/07/2009 (and adjusted to MGA Zone 56 GDA94) and GHD Figure 42-15386 dated 22/07/2009 and should not be considered to be accurate.

0 500m

SCALE - 1:20,000 (at A3)

N W E S

Map Grid of Australia Zone 56
Geocentric Datum of Australia 1994

This map incorporates data which is
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Rev	Date	Revision Description	ORIG	CHK	ENG	APPD
A	22/09/2009	Issued for squad check	MM	DH		

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Figure 3-3 Sample Locations and Corresponding Guideline Exceedances

Project No: 301001-00752	Figure: 00752-00-EN-DAL-0060	Rev: A

Compiled by BRISBANE INFRASTRUCTURE GIS SECTION

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Table 3-3: Summary statistics for contaminant substances in the upper 1m of sediments in dredge area Option 2A

							Summary Statistics Excluding BH03 and BH33						
Sample ID	**Unit**	**LOR**	**NAGD PQL**	**DEH (1998) EIL**	**DEH (1998) HIL-A**	**NAGD Screening Level (PCIMP guideline)**	**Mean/ Geomean**	**Standard Deviaiton**	**95% UCL**	**Normal (N) Log-normal (L) Neither (X)**	**Power at alpha = 0.05 (cf PCIMP Guideline)**	**No. samples required for Power of 0.8 (cf PCIMP Guideline)**	**No. samples taken**
Moisture Content (dried @ 103°C)	%	1					28.19	15.46	39.09	L			
Total Organic Carbon	%	0.02					0.232	0.835	1.023	L			
Metals													
Aluminium	mg/kg	50	200				8291.61	4255	11309	L	-	-	12
Antimony	mg/kg	0.5	0.5	20		2	<0.50	-	<0.50	-	1	2	12
Arsenic	mg/kg	1	1	20	100	20 (24.3)	9.285	9.051	13.98	N	0.70 (0.98)	16 (7)	12
Cadmium	mg/kg	0.1	0.1	3	20	1.5	0.0542	0.0144	0.0616	X	1	2	12
Chromium	mg/kg	1	1	50	100	80	13.18	8.269	17.47	X	1	2	12
Cobalt	mg/kg	0.5	0.5				4.688	5.996	10.2	L	-	-	12
Copper	mg/kg	1	1	60	1,000	65	19.53	8.458	23.92	N	1	3	12
Iron	mg/kg	50	100				18457	11153	24239	N	-	-	12
Lead	mg/kg	1	1	300	300	50	7.001	2.695	8.789	L	1	2	12
Manganese	mg/kg	10	10	500	1,500		46.34	200.7	250.4	L	-	-	12
Mercury	mg/kg	0.01	0.01	1	15	0.15	0.0221	0.0264	0.0358	X	1	3	12
Nickel	mg/kg	1	1	60	600	21	4.003	5.457	9.054	L	1	4	12
Selenium	mg/kg	0.1	0.1				0.667	0.382	0.865	N	-	-	12
Silver	mg/kg	0.1	0.1			1	0.0625	0.0433	0.0849	X	1	2	12
Vanadium	mg/kg	2	2				39.2	14.63	46.78	N	-	-	12
Zinc	mg/kg	1	1	200	7,000	200	13.888	16.49	27.86	L	1	2	12
BTEX													
All BTEX elements below detection	mg/kg	0.2	0.2				<0.2	-	<0.2	-	-	-	8
Total Petroleum Hydrocarbons													
C6 - C9 Fraction	mg/kg	3	100				<3	-	<3	-	-	-	8
C10 - C14 Fraction	mg/kg	3	100				<3	-	<3	-	-	-	8
C15 - C28 Fraction	mg/kg	3	100										
Normalised to 1% TOC							*5.697*	*14.51*	*21.32*	*L*	-	-	*8*
C29 - C36 Fraction	mg/kg	5	100										
Normalised to 1% TOC							*8.697*	*23.13*	*32.5*	*L*	-	-	*8*
Sum of TPH Fractions (calculated)	mg/kg										-	-	8
Normalised to 1% TOC						*550*	*43.37*	*41.3*	*82.75*	*N*	-	-	8
Organotins													
Tributyltin	µgSn/kg	0.5	1			9	<0.5	-	<0.5	-	-	-	12
Organophosphorus Pesticides													
All Organophosphorus Pesticides below detection	µg/kg	10					<10	-	<10	-	-	-	8
Organochlorine Pesticides													
All Organochlorine Pesticides below detection	µg/kg	0.5	1				<0.50	-	<0.50	-	-	-	8
Polychlorinated Biphenyls													
All Polychlorinated Biphenyls below detection	µg/kg	5	5				<5.0	-	<5.0	-	-	-	8
Polycyclic Aromatic Hydrocarbons													
Naphthalene	µg/kg	5	5				<5	-	<5	-	-	-	12
2-Methylnaphthalene	µg/kg	5	5				<5	-	<5	-	-	-	12
Acenaphthylene	µg/kg	4	5				<4	-	<4	-	-	-	12
Acenaphthene	µg/kg	4	5				<4	-	<4	-	-	-	12
Fluorene	µg/kg	4	5				<4	-	<4	-	-	-	12
Phenanthrene	µg/kg	4	5				<4	-	<4	-	-	-	12
Anthracene	µg/kg	4	5				<4	-	<4	-	-	-	12
Fluoranthene	µg/kg	4	5										
Normalised to 1% TOC							*2.102*	*0.185*	*2.108*	*X*	-	-	*12*
Pyrene	µg/kg	4	5										
Normalised to 1% TOC							*2.086*	*0.426*	*2.307*	*X*	-	-	*12*
Benz(a)anthracene	µg/kg	4	5				<4	-	<4	-	-	-	12
Chrysene	µg/kg	4	5				<4	-	<4	-	-	-	12
Benzo(b)fluoranthene	µg/kg	4	5				<4	-	<4	-	-	-	12
Benzo(k)fluoranthene	µg/kg	4	5				<4	-	<4	-	-	-	12
Benzo(e)pyrene	µg/kg	4	5				<4	-	<4	-	-	-	12
Benzo(a)pyrene	µg/kg	4	5		1,000		<4	-	<4	-	-	-	12
Perylene	µg/kg	4	5										
Normalised to 1% TOC							*5.074*	*10.49*	*10.51*	*X*	-	-	*12*
Benzo(g.h.i)perylene	µg/kg	4	5				<4	-	<4	-	-	-	12
Dibenz(a.h)anthracene	µg/kg	4	5				<4	-	<4	-	-	-	12
Indeno(1.2.3.cd)pyrene	µg/kg	4	5				<4	-	<4	-	-	-	12
Coronene	µg/kg	5	5				<5	-	<5	-	-	-	12
Sum of PAHs	µg/kg	4	100		20,000	10000							
Normalised to 1% TOC							*5.29*	*10.44*	*10.7*	*X*	-	-	*12*

Legend

Note	When calculating averages and 95% UCLs, values below detection for individual results were set to half the detection levels, consistent with the NAGD
PQL	Practical Quantitation Limit
-	No guideline levels (ie. Screening levels) or no analysis undertaken for a given sample
50	Value exceeds NAGD Screening Level
50	Value exceeds Queensland EPA soil 'environmental investigation level' (as given in DEH (1998)). The DEH (1998) guideline for dieldrin and aldrin is based on the sum of the concentrations reported for the two analytes
Normalised to 1% TOC	Normalised to 1% TOC, over the range of TOC from 0.2 to 10%

3.2.2 Sediments Below 1m

Results for sediments below 1m are summarised below. Under the NAGD, reporting of only physical characteristics is required, however chemical analyses have been undertaken and salient results are presented within this section below.

Metals

- Aluminium, iron, manganese and vanadium were above LOR in all samples analysed. There are no NAGD Screening Levels for these metals and as such, samples collected via drilling techniques were not assessed for these metals.
- Antimony, cadmium, selenium and silver were below LOR in all samples analysed.
- Arsenic was above detection limits in less than half of the samples. Two samples (BH2A 16G/7.0-7.4 and BH2A 20G/2.5-2.95) recorded concentrations above the NAGD Screening Levels.
- Chromium, copper and zinc were above LOR and below respective NAGD Screening Levels in the majority of samples. Generally, any non-detections occurred in samples that were drilled. The exception however is zinc, which exceeded NAGD Screening Levels in two samples (BH2A 22G/6.0-6.45 and BH2A 22G/13-13.4). Cobalt was above LOR in all but two samples. There are no NAGD Screening Levels for comparison.
- Lead and nickel were above detection limits in the majority of samples. All detections were below respective NAGD Screening Levels. Generally, any non-detections occurred in samples that were drilled.
- Mercury was below detection limits in all but one sample. BH2A 16/0.60–1.10m was above LOR and above the NAGD Screening Level of 0.01mg/kg. The 95% UCL of the mean was below the NAGD Screening Level.

All 95% UCLs of the mean (for amended Option 2A dredge footprint samples only) were below respective NAGD Screening Levels.

BTEX

- All BTEX species were below LOR across all sites.

Total Petroleum Hydrocarbons

- C6-C9 and C10-C14 fractions were below LOR in all samples.
- C15-C28 and C29-C36 fractions were present in BH2A 16 and BH2A 22.
- There NAGD Screening Level for the sum of TPHs was not exceeded in any sample.

Organotins

- Tributyltin was below LOR in all samples.

Organophosphorus Pesticides

- All organophosphorus pesticides were below LOR in all samples.

Organochlorine Pesticides

- All organochlorine pesticides were below LOR in all samples.

Polychlorinated Biphenyls

- All polychlorinated biphenyls were below LOR in all samples.

Polycyclic Aromatic Hydrocarbons

- No PAHs were identified in BH2A 16, BH2A 20, or BH2A 27.
- Nine PAH species were detected in BH2A 03. There are no NAGD Screening Levels for individual PAH species for comparison.
- Perylene and Benzo (g.h.i)perylene were the only PAHs identified in BH2A 22. There are no NAGD Screening Levels for comparison.
- In samples where PAHs were detected, the sum of PAHs was below NAGD Screening Levels.

3.2.2.1 Contaminant Concentrations Exceeding EIL or HIL-A

The following parameters reported concentrations exceeding EIL guidelines in DEH (1998). There were no exceedances of HIL-A.

- Arsenic exceeded EIL concentrations at BH2A 16G/7.00-7.40 and BH2A 20G/2.50-2.95.
- Zinc exceeded EIL concentrations at BH2A 22G/6.00-6.45 and BH2A 22G/13.00-13.40.

3.2.2.2 Power Analysis for Total Trace Metals

Results for statistical power and corresponding sample size required to make a statistically valid comparison against NAGD Screening Levels are provided in Table 3-5. For most metals that have NAGD Screening Levels, the power is extremely high (1.0) and the number of samples required to make a statistically valid comparison against the Screening Levels is between two and nine, which compares favourably with the number of samples analysed (between 8 and 43). Therefore, the pilot-level of sampling undertaken is powerful enough to make a statistically valid comparison against Screening Level criteria to assess the suitability of material for unconfined placement at sea.

Table 3-4: Results for sediments below 1m sediment depth in dredge area Option 2A

| Sample ID | Unit | LOR | NAGD PQL | DEH (1998) EIL | DEH (1998) HIL-A | NAGD Screening Level (PCIMP guideline) | BH2A 02G/ 1.0-1.45 | BH2A 02G/ 3.0-3.45 | BH2A 02G/ 4.0-4.45 | BH2A 14G/ 1.5-1.95 | BH2A 14G/ 2.5-2.95 | BH 2A 14G/ 3.5-3.95 | BH2A 14G/ 4.5-4.95 | BH 2A 14G/ 6.5-6.95 | BH 2A 14G/ 7.5-7.95 | BH2A 16/ 0.60-1.10 | BH2A 16/ 1.10-2.10 | BH2A 16G/ 3.0-3.45 | BH2A 16G/ 4.0-4.45 | BH2A 16G/ 6.0-6.23 | BH2A 16G/ 7.0-7.4 | BH2A 16G/ 8.0-8.36 | BH2A 16G/ 9-9.38 | BH2A 16G/ 11-11.45 | BH2A 16G/ 12-12.45 | BH2A 16G/ 13-13.45 | BH2A 20/ 1.00-1.80 | BH2A 20G/ 2.5-2.95 | BH2A 20G/ 4.0-4.42 | BH2A 20G/ 5.0-5.45 | BH2A 20G/ 6.0-6.45 | BH2A 20G/ 7.0-7.45 | BH2A 20G/ 8.0-8.45 | BH2A 22/ 1.00-2.00 | BH2A 22/ 2.00-3.00 | BH2A 22/ 3.00-4.10 | BH2A 22/ 4.10-4.40 | BH2A 22G/ 5.0-5.45 | BH2A 22G/ 6.0-6.45 | BH2A 22G/ 8.0-8.45 | BH2A 22G/ 9.0-9.45 | BH2A 22G/ 10.0-10.45 | BH2A 22G/ 12.0-12.4 | BH2A 22G/ 13-13.4 | BH2A 22G/ 14.0-14.34 | BH2A 27/ 1.00-1.30 | BH2A 27G/ 1.5-1.95 | BH2A 27G/ 2.5-2.95 | BH2A 27G/ 3.5-3.95 | BH2A 03/ 1.00-1.60 | BH2A 03/ 1.60-2.00 | BH2A 03/ 2.00-2.90 | BH2A 03G/ 3.0-3.45 | BH2A 03G/ 5.0-5.45 | BH2A 03G/ 7.0-7.45 | BH2A 03G/ 8.0-8.45 | BH2A 03G/ 9.0-9.45 | BH2A 03G/ 10.0-10.45 | BH2A 33G/ 1.0-1.38 | BH2A 33G/ 3.0-3.41 | BH2A 33G/ 4.0-4.5 | BH2A 033G/ 6.0-6.45 |
|---|---|---

Table 3-4: Results for sediments below 1m sediment depth in dredge area Option 2A

| Sample ID | Unit | LOR | NAGD PQL | DEH (1998) EIL | DEH (1998) HIL-A | NAGD Screening Level (PCIMP guideline) | BH2A 02G/ 1.0-1.45 | BH2A 02G/ 3.0-3.45 | BH2A 02G/ 4.0-4.45 | BH2A 14G/ 1.5-1.95 | BH2A 14G/ 2.5-2.95 | BH 2A 14G/ 3.5-3.95 | BH2A 14G/ 4.5-4.95 | BH 2A 14G/ 6.5-6.95 | BH 2A 14G/ 7.5-7.95 | BH2A 16/ 0.60-1.10 | BH2A 16/ 1.10-2.10 | BH2A 16G/ 3.0-3.45 | BH2A 16G/ 4.0-4.45 | BH2A 16G/ 6.0-6.23 | BH2A 16G/ 7.0-7.4 | BH2A 16G/ 8.0-8.36 | BH2A 16G/ 9-9.38 | BH2A 16G/ 11-11.45 | BH2A 16G/ 12-12.45 | BH2A 16G/ 13-13.45 | BH2A 20/ 1.00-1.80 | BH2A 20G/ 2.5-2.95 | BH2A 20G/ 4.0-4.42 | BH2A 20G/ 5.0-5.45 | BH2A 20G/ 6.0-6.45 | BH2A 20G/ 7.0-7.45 | BH2A 20G/ 8.0-8.45 | BH2A 22/ 1.00-2.00 | BH2A 22/ 2.00-3.00 | BH2A 22/ 3.00-4.10 | BH2A 22/ 4.10-4.40 | BH2A 22G/ 5.0-5.45 | BH2A 22G/ 6.0-6.45 | BH2A 22G/ 8.0-8.45 | BH2A 22G/ 9.0-9.45 | BH2A 22G/ 10.0-10.45 | BH2A 22G/ 12.0-12.4 | BH2A 22G/ 13-13.4 | BH2A 22G/ 14.0-14.34 | BH2A 27/ 1.00-1.30 | BH2A 27G/ 1.5-1.95 | BH2A 27G/ 2.5-2.95 | BH2A 27G/ 3.5-3.95 | BH2A 03/ 1.00-1.60 | BH2A 03/ 1.60-2.00 | BH2A 03/ 2.00-2.90 | BH2A 03G/ 3.0-3.45 | BH2A 03G/ 5.0-5.45 | BH2A 03G/ 7.0-7.45 | BH2A 03G/ 8.0-8.45 | BH2A 03G/ 9.0-9.45 | BH2A 03G/ 10.0-10.45 | BH2A 33G/ 1.0-1.38 | BH2A 33G/ 3.0-3.41 | BH2A 33G/ 4.0-4.5 | BH2A 033G/ 6.0-6.45 |
|---|---|---

Table 3-5: Summary statistics for contaminant substances below 1m sediment depth in dredge area Option 2A

							Summary Statistics Excluding BH03 and BH33						
Sample ID	**Unit**	**LOR**	**NAGD PQL**	**DEH (1998) EIL**	**DEH (1998) HIL-A**	**NAGD Screening Level (PCIMP guideline)**	**Mean/ Geomean**	**Standard Deviation**	**95% UCL**	**Normal (N) Log-normal (L) Neither (X)**	**Power at alpha = 0.05 (cf PCIMP Guideline)**	**No. samples required for Power of 0.8 (cf PCIMP Guideline)**	**No. samples taken**
Moisture Content (dried @ 103°C)	%	1					19.7	7.897	21.73	X			
Total Organic Carbon	%	0.02					0.292	0.453	0.802	L			
Metals													
Aluminium	mg/kg	50	200				11810	5193	15289	N	-	-	8
Antimony	mg/kg	5	0.5	20		2	<5	-	<5	-	1	2	8
Arsenic	mg/kg	5	1	20	100	20 (24.3)	7.151	7.323	9.029	X	1	5 (4)	43
Cadmium	mg/kg	1	0.1	3	20	1.5	<1	-	<1	-	1	2	43
Chromium	mg/kg	2	1	50	100	80	6.586	8.355	11.91	L	1	2	43
Cobalt	mg/kg	2	0.5				7.25	5.751	11.1	N	-	-	8
Copper	mg/kg	5	1	60	1,000	65	12.16	11.13	15.02	X	1	3	43
Iron	mg/kg	50	100				18075	11200	25577	N	-	-	8
Lead	mg/kg	5	1	300	300	50	4.419	3.168	5.21	X	1	2	43
Manganese	mg/kg	5	10	500	1,500		173	173.4	289.1	N	-	-	8
Mercury	mg/kg	0.1	0.01	1	15	0.15	0.0535	0.0229	0.0594	X	1	3	43
Nickel	mg/kg	2	1	60	600	21	3.321	3.478	4.225	X	1	3	43
Selenium	mg/kg	5	0.1				<5	-	<5	-	-	-	8
Silver	mg/kg	2	0.1			1	<2	-	<2	-	1	2	8
Vanadium	mg/kg	5	2				52.63	31.96	74.03	N	-	-	8
Zinc	mg/kg	5	1	200	7,000	200	44.78	127.6	77.52	X	0.99	9	43
BTEX													
All BTEX elements below detection	mg/kg	0.2	0.2				<0.2	-	<0.2	-	-	-	7
Total Petroleum Hydrocarbons													
C6 - C9 Fraction	mg/kg	3	100				<3	-	<3	-	-	-	7
C10 - C14 Fraction	mg/kg	3	100				<4	-	<4	-	-	-	7
C15 - C28 Fraction	mg/kg	3	100										
Normalised to 1% TOC							*6*	*15.28*	*23.51*	*L*	-	-	*7*
C29 - C36 Fraction	mg/kg	5	100										
Normalised to 1% TOC							*23.7*	*24.27*	*41.52*	*N*	-	-	*7*
Sum of TPH Fractions (calculated)	mg/kg										-	-	7
Normalised to 1% TOC						*550*	*41.73*	*41.02*	*75.47*	*X*	-	-	7
Organotins													
Tributyltin	µgSn/kg	0.5	1			9	<0.5	-	<0.5	-	-	-	2
Organophosphorus Pesticides													
All Organophosphorus Pesticides below detection	µg/kg	10					<10	-	<10	-	-	-	7
Organochlorine Pesticides													
All Organochlorine Pesticides below detection	µg/kg	0.5	1				<0.50	-	<0.50	-	-	-	7
Polychlorinated Biphenyls													
All Polychlorinated Biphenyls below detection	µg/kg	5	5				<5.0	-	<5.0	-	-	-	7
Polycyclic Aromatic Hydrocarbons													
Naphthalene	µg/kg	5	5				<5	-	<5	-	-	-	8
2-Methylnaphthalene	µg/kg	5	5				<5	-	<5	-	-	-	8
Acenaphthylene	µg/kg	4	5				<4	-	<4	-	-	-	8
Acenaphthene	µg/kg	4	5				<4	-	<4	-	-	-	8
Fluorene	µg/kg	4	5				<4	-	<4	-	-	-	8
Phenanthrene	µg/kg	4	5				<4	-	<4	-	-	-	8
Anthracene	µg/kg	4	5				<4	-	<4	-	-	-	8
Fluoranthene	µg/kg	4	5				<4	-	<4	-	-	-	8
Pyrene	µg/kg	4	5				<4	-	<4	-	-	-	8
Benz(a)anthracene	µg/kg	4	5				<4	-	<4	-	-	-	8
Chrysene	µg/kg	4	5				<4	-	<4	-	-	-	8
Benzo(b)fluoranthene	µg/kg	4	5				<4	-	<4	-	-	-	8
Benzo(k)fluoranthene	µg/kg	4	5				<4	-	<4	-	-	-	8
Benzo(e)pyrene	µg/kg	4	5				<4	-	<4	-	-	-	8
Benzo(a)pyrene	µg/kg	4	5		1,000		<4	-	<4	-	-	-	8
Perylene	µg/kg	4	5										
Normalised to 1% TOC							*25.85*	*34.25*	*48.79*	*X*	-	-	*8*
Benzo(g.h.i)perylene	µg/kg	4	5										
Normalised to 1% TOC							*3.474*	*4.169*	*6.267*	*X*	-	-	*8*
Dibenz(a.h)anthracene	µg/kg	4	5				<4	-	<4	-	-	-	8
Indeno(1.2.3.cd)pyrene	µg/kg	4	5				<4	-	<4	-	-	-	8
Coronene	µg/kg	5	5				<5	-	<5	-	-	-	8
Sum of PAHs	µg/kg	4	100		20,000	10,000							
Normalised to 1% TOC							*27.33*	*33.31*	*49.64*	*X*	-	-	*8*

Legend

Note	When calculating averages and 95% UCLs, values below detection for individual results were set to half the detection levels, consistent with the NAGD
PQL	Practical Quantitation Limit
-	No guideline levels (ie. Screening levels) or no analysis undertaken for a given sample
50	Value exceeds NAGD Screening Level
50	Value exceeds Queensland EPA soil 'environmental investigation level' (as given in DEH (1998)). The DEH (1998) guideline for dieldrin and aldrin is based on the sum of the concentrations reported for the two analytes
Normalised to 1% TOC	Normalised to 1% TOC, over the range of TOC from 0.2 to 10%

3.3 Acid Sulphate Soils

The results of ASS testing are provided in detail in a separate report prepared by Golders (2009), which is provided in Appendix 2. The following is a summary of key findings of this report.

The seabed of dredge area Option 2A is comprised of Holocene sediments that overlay sediments of Pleistocene origin. Holocene sediments are characterised mainly by silt/clay and are associated with former mangrove areas and the tidal flats of Curtis Island. These sediments are ASS bearing. Pleistocene sediments are residual soils of older age, and therefore do not present inherent ASS forming conditions. There is a 'zone of infiltration' on the boundary of the Holocene and Pleistocene sediments in which ASS may also occur, having infiltrated from the Holocene sediments into the underlying Pleistocene sediments.

The Holocene sediments within the Option 2A footprint are comprised of fine to medium textured soils (mainly light to medium clays). These sediments are shallow, occurring at depth between 0.2m and >3m, with an average depth of 1.8m. In parts of the western half of the Option 2A footprint, Holocene sediments are absent. As such, the Holocene sediment layer appears to be limited in extent to north eastern portion of the dredge footprint.

Results of the ASS testing indicate that the Holocene sediments within the footprint contain negligible actual acidity (ie no actual ASS). However, the majority of the dredge area has moderate to very high potential acidity (PASS). PASS was detected at all depths throughout the Holocene layer and in some instances up to 1.2m into the underlying Pleistocene sediments (zone infiltration).

Acid neutralising capacity (ANC) is present through the majority of the sediments, however is generally insufficient to neutralise all the potential acidity generated. Therefore, treatment of the soils with good quality agricultural lime will be required to mitigate acid generation. Liming rates range from 20kg lime/m^3 in the central portion of the dredge area to 150-200 kg lime/m^3 in areas closest to Curtis Island.

During dredging operations (specifically placement of spoil on land) the excavation of Holocene sediments and immediately underlying Pleistocene clay may result in the oxidation of PASS and the migration of acidic fines into receiving waters.

Based on the quantity to be dredged and the level of acidity, the treatment category, according to QASSIT guidelines and State Planning Policy 2/02 is considered 'extra high'.

3.4 Bulk Density and Settling Rates

Results for bulk density and settling rate test results are provided in Appendix 6.

4. Chemical Data Validation

This section examines the validity of the analytical data obtained in the study. It provides the scientific confidence in the actual results presented.

4.1 Laboratory Accuracy and Precision

The primary laboratory (ALS) and secondary laboratory (AAA) incorporated a range of QA/QC methods to ensure accuracy of data. These are detailed further below. Laboratory QA/QC reports are included in laboratory reports in Appendix 3 (ALS) and Appendix 5 (AAA). Discussion of these is presented below.

4.1.1 Laboratory Blanks

Laboratory blanks are samples submitted by the laboratory during sample analysis to assist in identifying any cross contamination of samples during laboratory preparation, extraction or analysis. Analysis of laboratory blank samples should result in a concentration not exceeding the detection limit for a particular contaminant. An assessment of laboratory blank samples reported by ALS demonstrates concentrations below the detection limit for all parameters, so cross-contamination of samples does not appear to have occurred.

4.1.2 Laboratory Duplicates

The precision of analysis performed by the laboratory is determined by the calculation of the relative percent difference (RPD). The RPD is calculated based on a comparison of an intra-laboratory split of the sample material with results representing the percent difference between the two sample concentrations for a specific contaminant. While NAGD states that the RPD should be within ±35%, ALS prefers to use a sliding scale to account for greater analytical uncertainty for contaminant concentrations nearer to the detection limit. The laboratory RPDs have been assessed using the following protocol:

- Results <10 times LOR: no limits;
- Results between 10 and 20 times LOR: 0% - 50%; and
- Results >20 time LOR: 0% - 20%.

Three metals, zinc, manganese and aluminium, were regularly outside of the above criteria for laboratory duplicates.

4.1.3 Surrogate Spikes

Surrogate spikes are compounds similar in composition to the target analyte but are not likely to be present within the environment. Samples are spiked with the surrogate material and a calculation of the percent recovery of the spiked amount against the returned concentration is performed. The percent recovery result provides an indication of the ability of the laboratory to extract a specified contaminant type from the sample matrix. Typically surrogate spikes are performed only on organic compounds. NAGD states that recovery limits of 75% - 125% are generally acceptable.

For the analysis, two tributyltin surrogates were outside the recovery limits.

The NAGD criteria range is likely based on surrogate recoveries from ‘clean’ matrix free samples. In real samples, the range of recoveries can be much greater and often lower due to matrix interference. Matrix

interference occurs when samples contain certain properties such as high moisture content, high salinity and contain substances such as plant sterols, waxes, lipids or other organic matter content that can inhibit the full extrusion of a contaminant during laboratory surrogate extraction.

4.1.4 Matrix Spikes

Matrix spikes are undertaken by the laboratory to identify the amount of interference from the sediment matrix on contaminant recovery. Samples collected from the field are split from the base sample and spiked with a known contaminant concentration. The percent recovery of the contaminant is then calculated.

The accuracy of the data is determined through analysis of spiked samples. NAGD recommends that "*Recovery Rates [for matrix spiked samples] should be within the limits specified for the analysis method (typically 75-125%)*".

Matrix spike recoveries show that TPH C6-C9 fraction and BTEX were outside ALS specified limits. ALS reported that this was due to matrix interference and confirmed results through re-analysis. Mercury and a number of TPH, BTEX OPP, OCP and PCB substances were outside of the NAGD criteria in each batch.

Matrix interference occurs when samples contain certain properties such as high salinity, moisture content and/or organic matter that inhibit the full extrusion of a contaminant during laboratory analysis. Consequently, reported contaminant concentrations by the laboratory are potentially lower than actual contaminant concentrations found within sediment samples. Given that these analytical groups were typically not detected or were well below Screening Levels, these matrix spike recovery exceedances are not of significant concern.

4.1.5 Field Split Triplicate, Replicate Triplicate and Inter-Batch Duplicate Analysis

Table 4-1 provides a summary of RPDs and RSDs of field split triplicate, field replicate triplicate and inter-batch duplicate analyses. Results for the various analyses are discussed below.

Field Split Triplicate Sample Analyses

Field split triplicates are samples that are split from the original sample with two of the samples submitted to the primary laboratory and the third sample submitted to the secondary laboratory for analysis. This assesses variation associated with sub-sample handling and repeatability of laboratory analysis. Contaminant concentrations are compared between the split samples through calculation of the Relative Standard Deviation (RSD). One field split triplicate was collected from site BH2A 33/0.00-0.50 (ultimately outside the amended Option 2A dredge footprint).

The NAGD states that RSDs for field split samples should be within ±50%. Assessment of field split triplicate samples identified that only one contaminant, arsenic (53%), was marginally outside of the 50% criterion (Table 4-1). Based on RSD data analysis for field split triplicate samples, sub-sample handling was undertaken effectively to a standard that ensured sample contaminant concentrations were representative of sampled sediments.

Field Replicate Triplicate Analyses

One field replicate triplicate sample (i.e. three separate samples collected in the field at a given sampling location) was collected from site BH2A 27/0.00-0.60, to test for sediment homogeneity. Contaminant results were compared through calculation of the Relative Standard Deviation (RSD). According to NAGD:

> *"Field replicates (that is, two separate samples taken at the same location) should agree within an RPD (or for three samples at the one location, the relative standard deviation, RSD) of ±50%, although they may not always do so where the sediments are very inhomogeneous or greatly differing in grain size".*

All contaminants were compliant with the 50% criterion, indicating that sample contaminant concentrations are relatively homogenous across the dredge area.

Inter-batch Duplicate Sample Analyses

Inter-batch duplicates are samples that are split from the original sample and each sample is then submitted to the laboratory in a different sample batch for analysis. This is to identify any analysis variation between sample batches. Contaminant concentrations are compared between the two split samples through calculation of the Relative Percent Difference (RPD). The RPD value provides an indication of the accuracy of laboratory analysis between samples/batches. The NAGD states that RPDs for duplicate split samples should be within ±50%. One inter-batch duplicate sample was taken from location BH2A 22/0.00-0.50.

All contaminants were within the NAGD criteria, except for the Sum of PAHs, which fell outside the criterion at 92%.

Based on RPD data analysis for the inter-batch duplicate, laboratory analysis between batches appears to be consistent.

4.1.6 Trip Blanks

Field trip blank samples provide an indication of cross-contamination from volatile substances during field sampling. One trip blank sample was collected in the field and sent to the primary laboratory for BTEX analysis. BTEX concentrations were below detection limits, so no cross-contamination is likely to have occurred during in-field sample processing.

4.2 Holding Times

Samples were kept chilled whilst in the field, during storage and during delivery, and stored under refrigeration at the laboratories. All sample analyses were undertaken within required holding times by the primary laboratory (ALS) and the secondary laboratory (AAA).

Table 4-1: Field duplicate, triplicate and inter-laboratory precision testing for dredge area Option 2A

Sample Identification	Sample Date	Moisture Content	Total Organic Carbon	Aluminium	Iron	Arsenic	Chromium	Copper	Cobalt	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Mercury	C15 - C28 Fraction	C29 - C36 Fraction	Sum of PAHs
		%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg
Inter-batch Duplicate																			
BH2A 22/0.00-0.50	03/08/2009	56.4	2.06	14100	40200	30.9	27.1	24.6	17.7	12.5	335	14.8	1	55.1	47.5	0.05	10	14	7
QC-1/	03/08/2009	58.5	2.06	14200	36300	25.4	26.1	24.4	17.2	11.5	319	14.7	1	54.5	48.8	0.04	7	12	19
RPD		**3.66%**	**0.00%**	**0.71%**	**10.20%**	**19.54%**	**3.76%**	**0.82%**	**2.87%**	**8.33%**	**4.89%**	**0.68%**	**0.00%**	**1.09%**	**2.70%**	**22.22%**	**35.29%**	**15.38%**	**92.31%**
Field Replicate Triplicate																			
BH2A 27/0.00-0.60	05/08/2009	33.3	0.46	9640	22700	15	14.6	10.5	13	5.6	625	9.5	0.6	47.1	27.2	0.01	10	8	<4
QC-2/	05/08/2009	38	0.62	8980	20400	9.2	15.6	12.6	12.7	5.9	577	10.1	0.5	45.5	32	0.01	8	6	9
QC-3/	06/08/2009	42.1	0.44	7220	22400	15.5	13.7	9.4	14.8	5	1030	8.8	0.5	48.1	30.2	<0.01	13	8	<4
RSD		**11.65%**	**19.47%**	**14.52%**	**5.73%**	**26.46%**	**6.50%**	**15.01%**	**8.41%**	**8.33%**	**33.45%**	**6.87%**	**10.83%**	**2.80%**	**8.14%**	**ND**	**24.35%**	**15.75%**	**ND**
Field Split Triplicate																			
BH2A 33/0.00-0.50	05/08/2009	20.1	0.18	9210	43700	11.1	15	15	6	9.5	40	5	1.2	65.3	16.8	<0.01			<4
QC-4/	05/08/2009	18.1	0.22	7590	46800	15	15.5	16	6.2	10	65	5.2	1.2	77.4	18.1	<0.01			<4
BH2A 33/0.00 - 0.50	5/08/2009	19.3	0.22	10000	26000	4.4	14	20	4.1	4.3	31	4	<0.5	47	13	-			<100
RSD		**5.25%**	**11.17%**	**13.75%**	**28.90%**	**52.73%**	**5.15%**	**15.56%**	**21.33%**	**39.79%**	**38.86%**	**13.58%**	**ND**	**24.20%**	**16.60%**	**ND**			**ND**

Note: Cell shaded yellow represent RPD or RSD percentages outside of the NAGD criteria (only substances with concentrations above detection limits for each sample have been reported)

5. Discussion and Conclusions

Chemical analyses of sediments within capital dredging area Option 2A identifies that contaminant substances, if present, are generally below NAGD Screening Levels. The exception to this is the presence of arsenic in three samples (one within the surface 1m of sediments and two below 1m), mercury in one sample (below 1m), and zinc in two samples (below 1m). Arsenic has previously been identified as occurring naturally within sediments in the Port of Gladstone (GHD, 2009). Given that the exceedance of mercury occurred in sediments below 1m and mercury has been identified in other nearby sediment sampling programs (URS, 2009) it is possible that these results are indicative of natural levels. Likewise, exceedances of the zinc Screening Level occurred below 6m sediment depth and hence may be naturally occurring levels.

In comparison with DEH (1998) guidelines three arsenic, one manganese and two zinc samples exceeded the EILs. As discussed, arsenic and zinc may be considered to occur naturally in sediments within the Port of Gladstone. Similarly, manganese has been recorded above the EIL in the Port of Gladstone previously and was considered to be at naturally occurring levels (URS, 2009). There were no exceedances of the HIL-A guidelines.

The results of this study are comparable with those of URS (2009) which also undertook sediment studies at Curtis Island. URS (2009) identified that arsenic and mercury were present above guideline levels in a number of samples and that these generally occurred in sediments below 1m. Manganese was also identified in concentrations above EIL concentrations, as it was in this APLNG dredge area Option 2A study. A notable difference is that URS (2009) also identified exceedances in antimony, chromium, copper and nickel concentrations. These elements were all below guideline levels in this current study.

For organic contaminant substances in the APLNG dredge area Option 2A survey, results are summarised below:

- Total Petroleum Hydrocarbon fractions C6-C9 and C10-C14 were not detected in any sample.
- Fractions C15-C28 and C29-C36 were detected in the majority of samples from all sediment horizons.
- Generally, the majority of PAHs were not detected in any sample. A total of nine PAHs were recorded above detection limits, the majority of these only occurring in sediments below 1m of BH2-A 03.
- BTEX, Tributyltin, Organochlorine Pesticides, Organophosphorus Pesticides and Polychlorinated Biphenyls were not detected in any sample.

The 95% UCL of the mean for all contaminants tested in dredge area Option 2A were below respective NAGD Screening Levels and EIL and HIL-A. Power analysis and minimum sample size requirements for the sampling conducted within the amended Option 2A dredge area identify that statistically valid comparisons can be made against the NAGD Screening Levels, even at the pilot level of sampling undertaken. The only exception to this was the analysis of arsenic in the upper 1m of sediment, where statistical power (0.68) was marginally below the recommended level of 0.8 for comparison against the NAGD Screening Level, but was sufficient for comparison against locally derived PCIMP guideline that reflect naturally elevated background arsenic concentrations.

With regard to ASS results, the level of treatment required under the terms of the current State Planning Policy 2/02 (SPP) is deemed ‘extra high’. As such, should the dredged material be placed on land, specific

strategies are required to manage ASS. These are required to be documented in a 'stand alone' Environmental Management Plan following the requirements of Appendix 4 of the SPP 2/02. Ultimately the PASS will be required to be treated with good quality agricultural lime according to the determined liming rates of up to 200 kg/m^3. To avoid areas of high PASS modifications to the dredge footprint would be required. Further ASS testing will be required in areas were PASS has been identified.

Based on the analyses undertaken for the APLNG dredge area Option 2A, it is considered that the capital material to be dredged to is suitable for unconfined placement at sea, according to the NAGD contaminant assessment framework. It is also suitable for placement on land, subject to ASS management requirements.

6. References

Commonwealth of Australia (2009) *National Assessment Guidelines for Dredging*. Commonwealth of Australia, Canberra, March 2009.

ANZECC/ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation/Agriculture and Resource Management Council of Australia and New Zealand.

DEH (1998) *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland.* Department of Environment and Heritage, Queensland Government. May 1998.

GHD (2009) *Report for Western Basin Dredging and Disposal Project – Sediment Sampling and Analysis Plan (Draft)*. Prepared by GHD for the Gladstone Ports Corporation, July 2009.

QASSIT (1998) *Guidelines for Sampling and Analysis of Lowland Acid Sulphate Soils (ASS) in Queensland.* Queensland Acid Sulphate Soils Investigation Team (QASSIT), Department of Natural Resources and Mines (now Department of Environment and Resource Management). DNRQ980124.

URS (2009) *Marine Sediment Investigation, Environmental Investigations of Proposed Capital Dredging at China Bay and Pipeline Crossing at the Narrows, Gladstone*. Prepared by URS for Santos Ltd, January 2009.

Appendix 1 Core Logs and Photos

BOREHOLE #BH2A-01

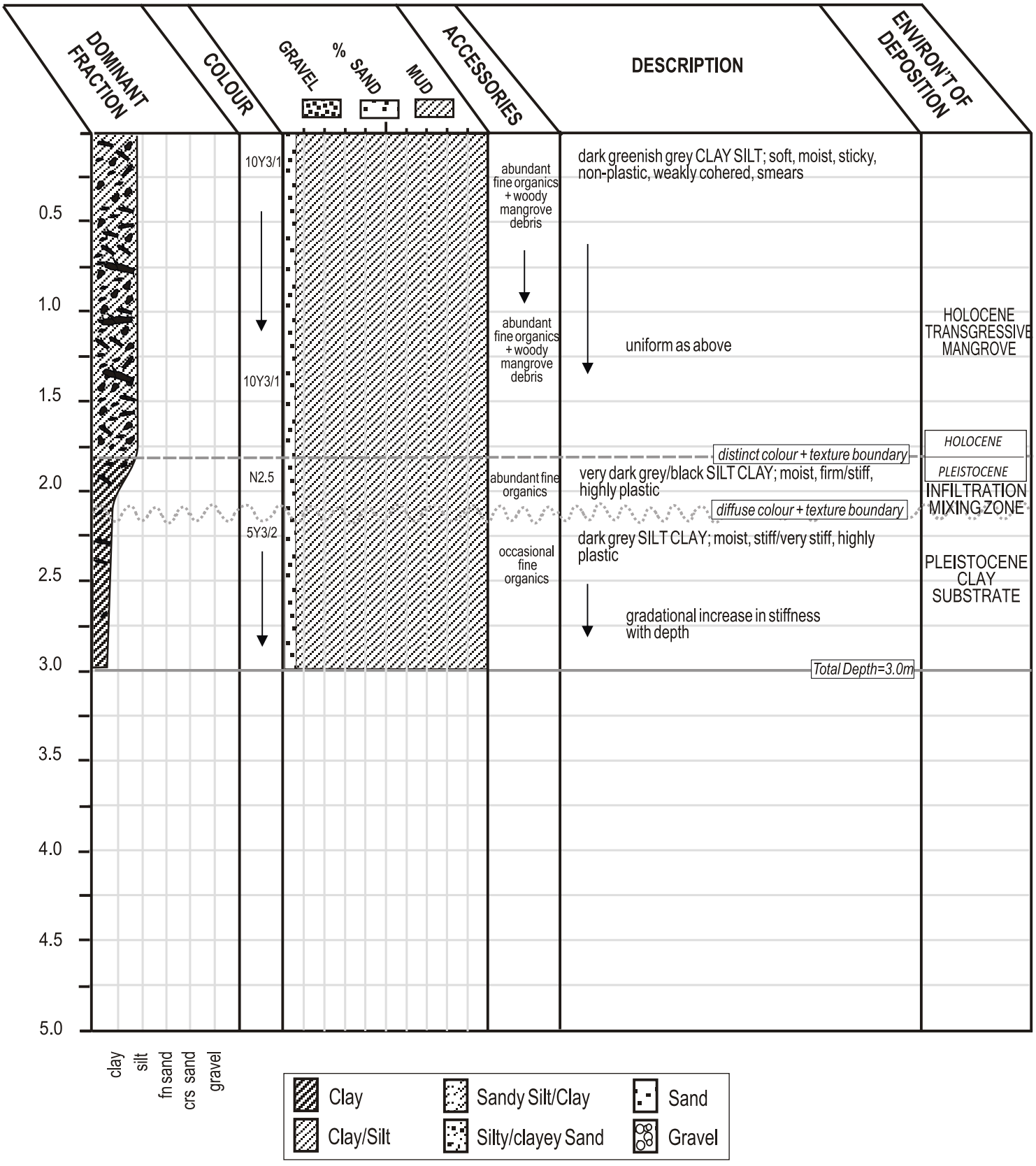
SITE: GC/ BH2A-01

DATE: 6/08/09

LOCATION: Port of Gladstone
23°45.303' **S** 151°10.651 **E**
R.L. -0.7m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-02

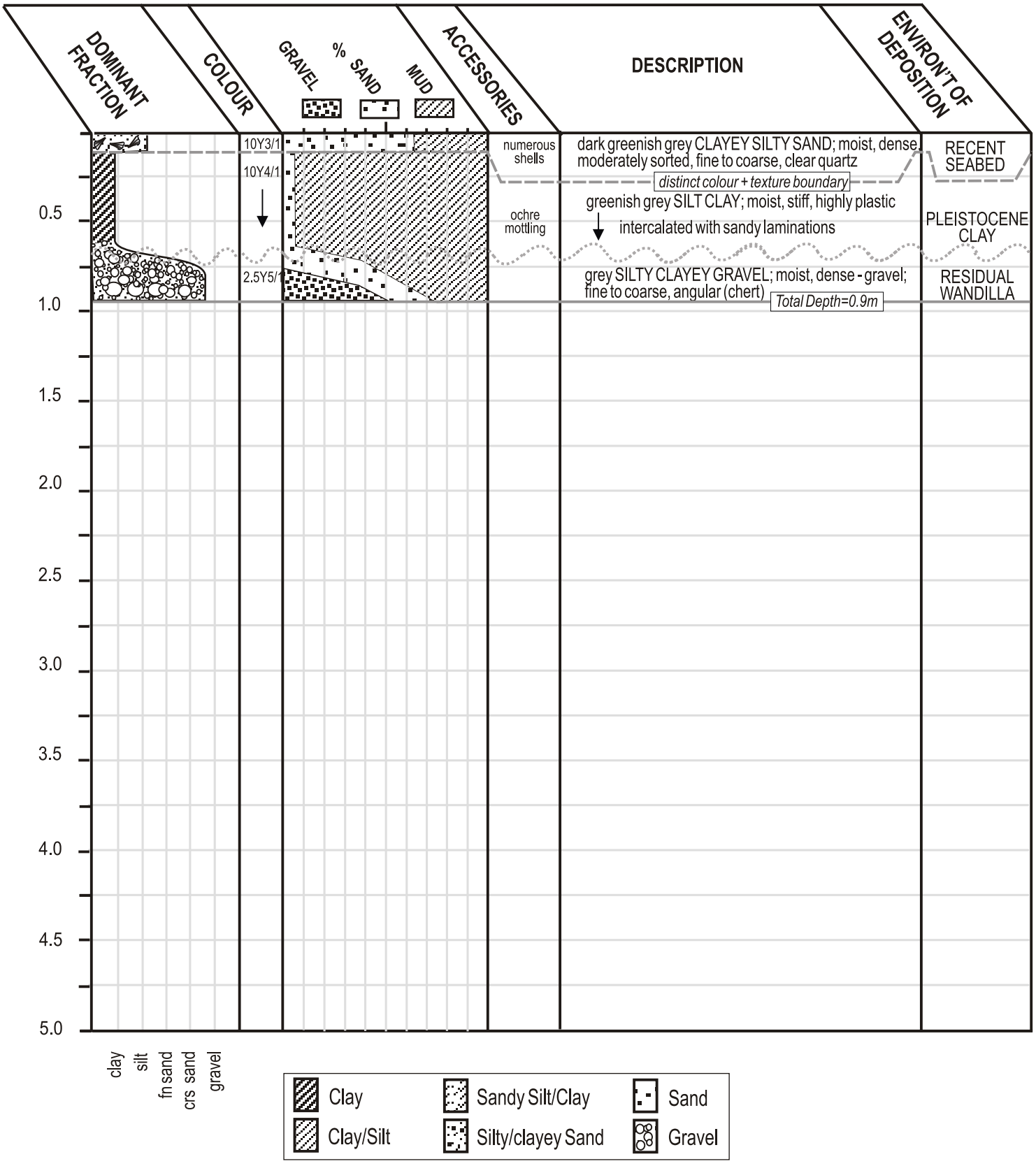
SITE: GC/ BH2A-02

LOCATION: Port of Gladstone
23°45.381' **S** 151°10.581 **E**
R.L. 4.6m L.A.T. (Port Datum)

DATE: 4/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-03

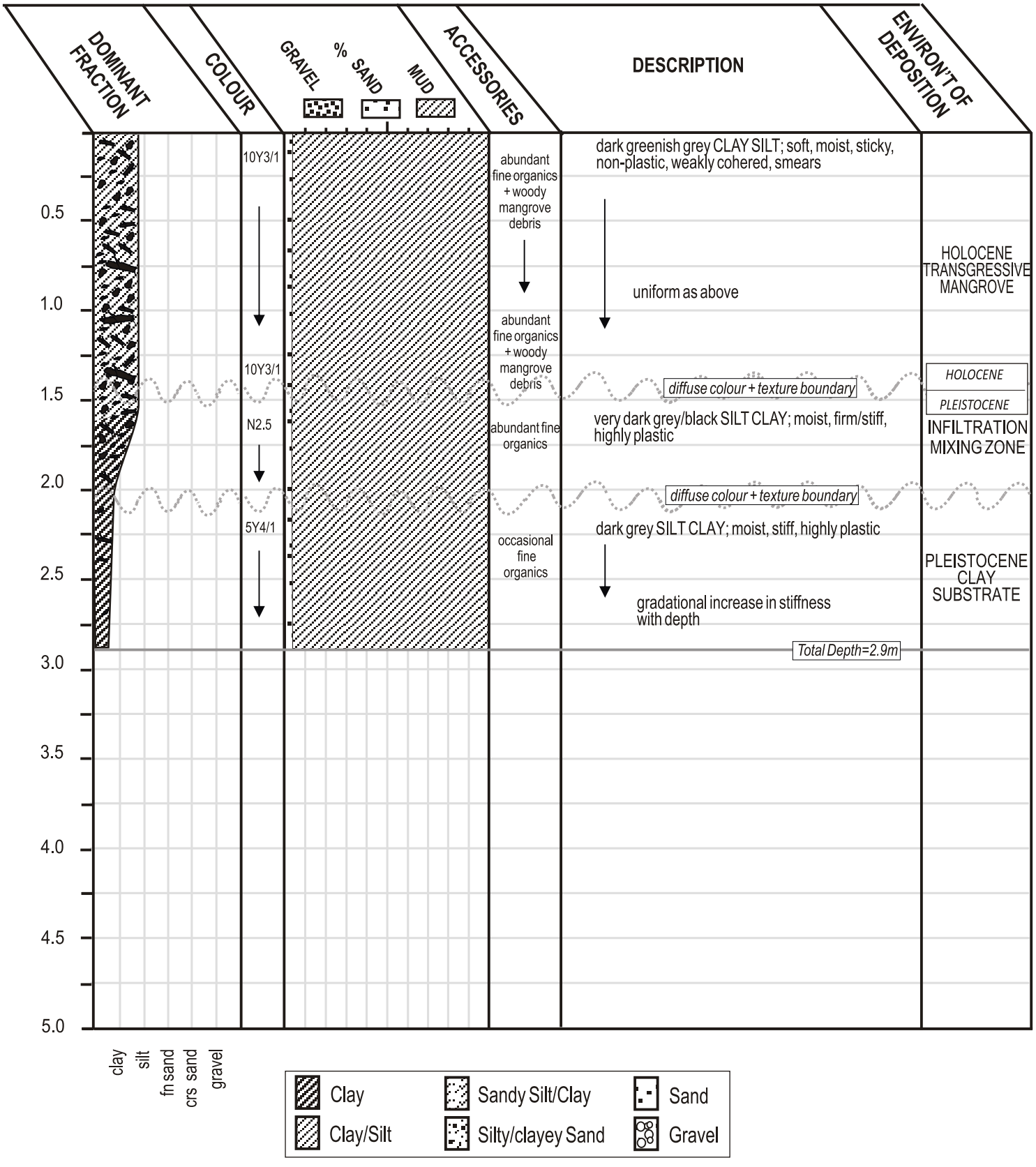
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LOCATION: Port of Gladstone
23°45.332' **S** 151°10.738 **E**
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DATE: 4/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-04

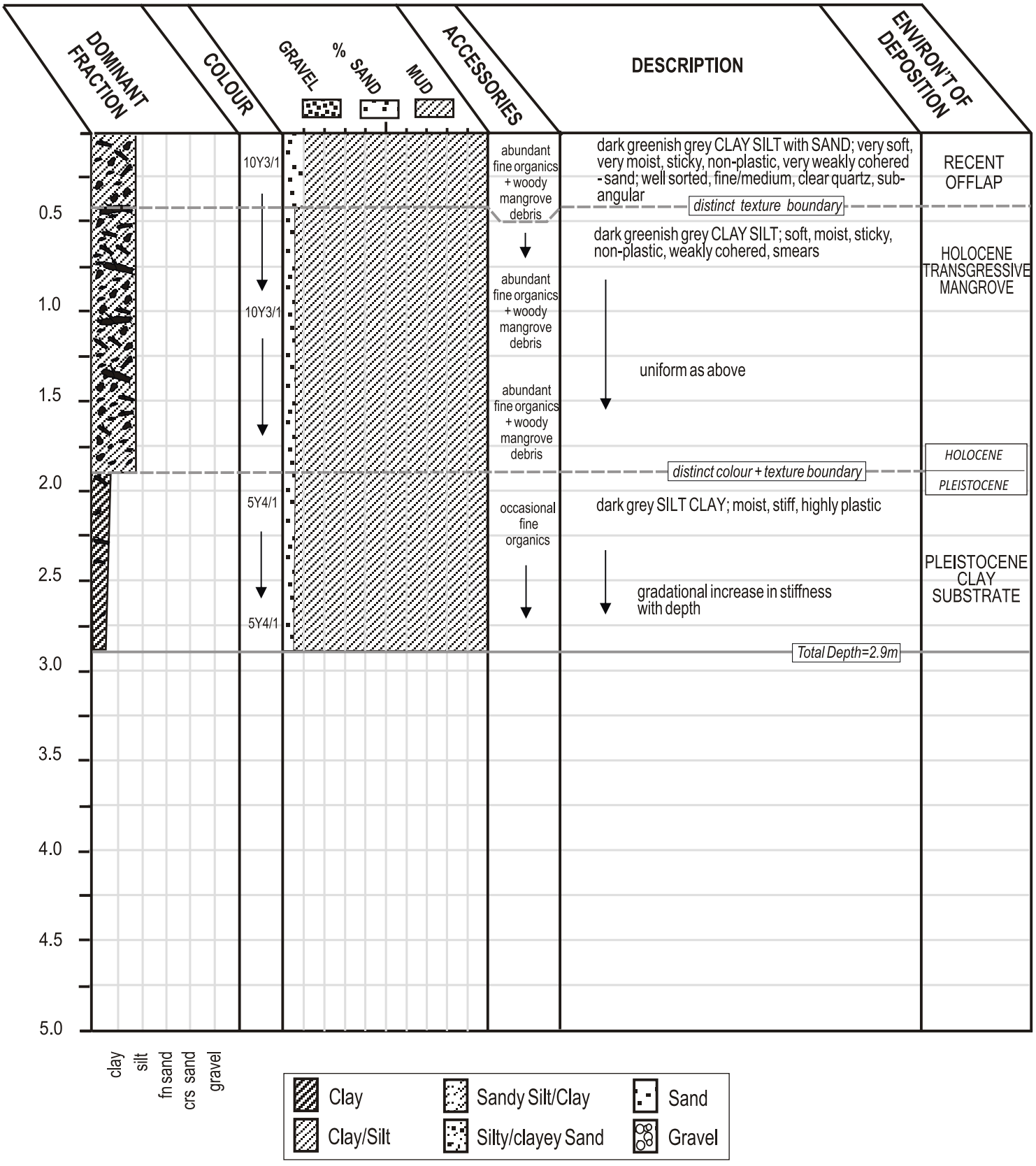
SITE: GC/ BH2A-04

LOCATION: Port of Gladstone
23°45.383' **S** 151°10.692 **E**
R.L. -0.3m L.A.T. (Port Datum)

DATE: 6/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-05

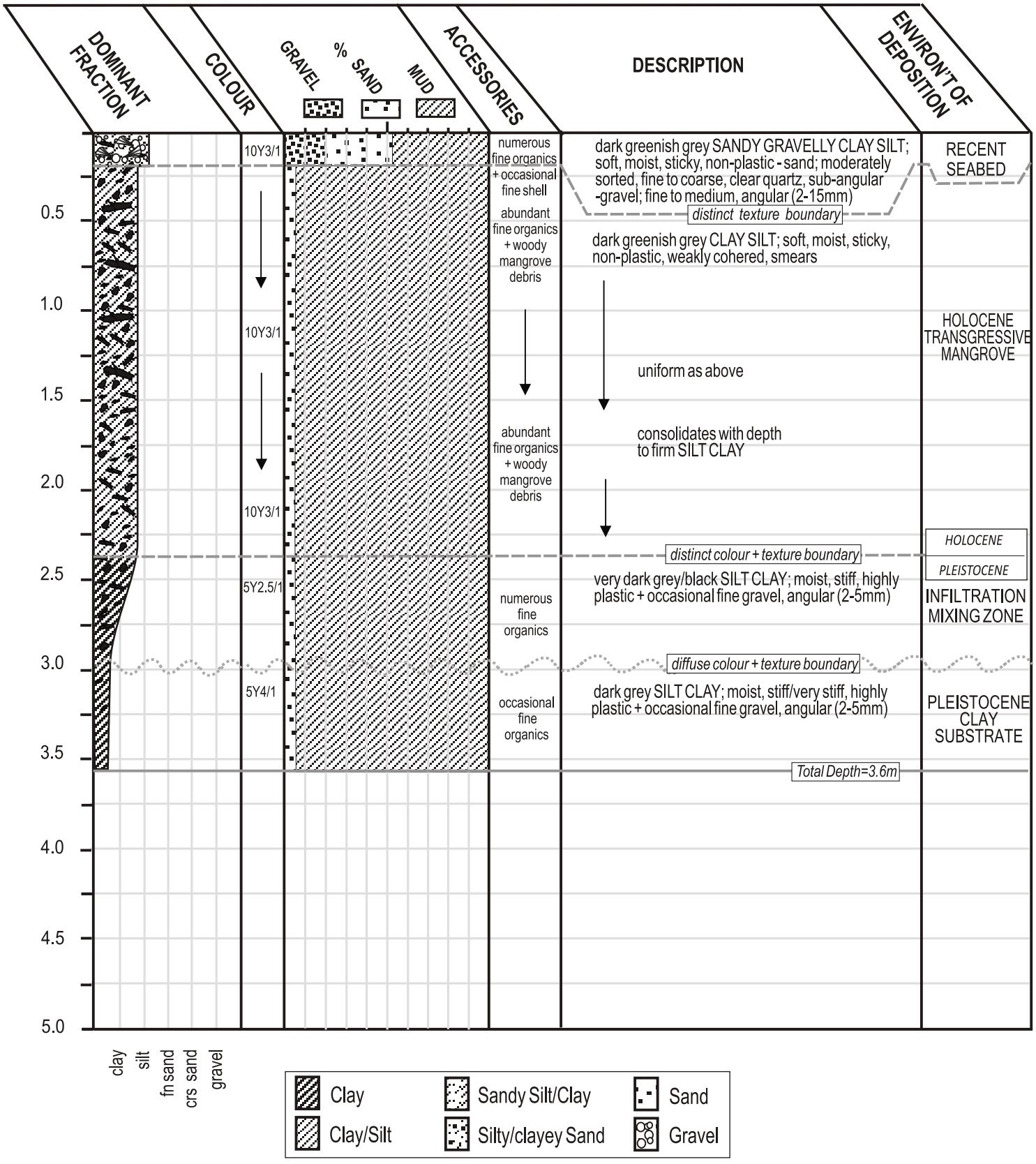
SITE: GC/ BH2A-05

DATE: 6/08/09

LOCATION: Port of Gladstone
23°45.452' **S** 151°10.933 **E**
R.L. -0.7m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-06

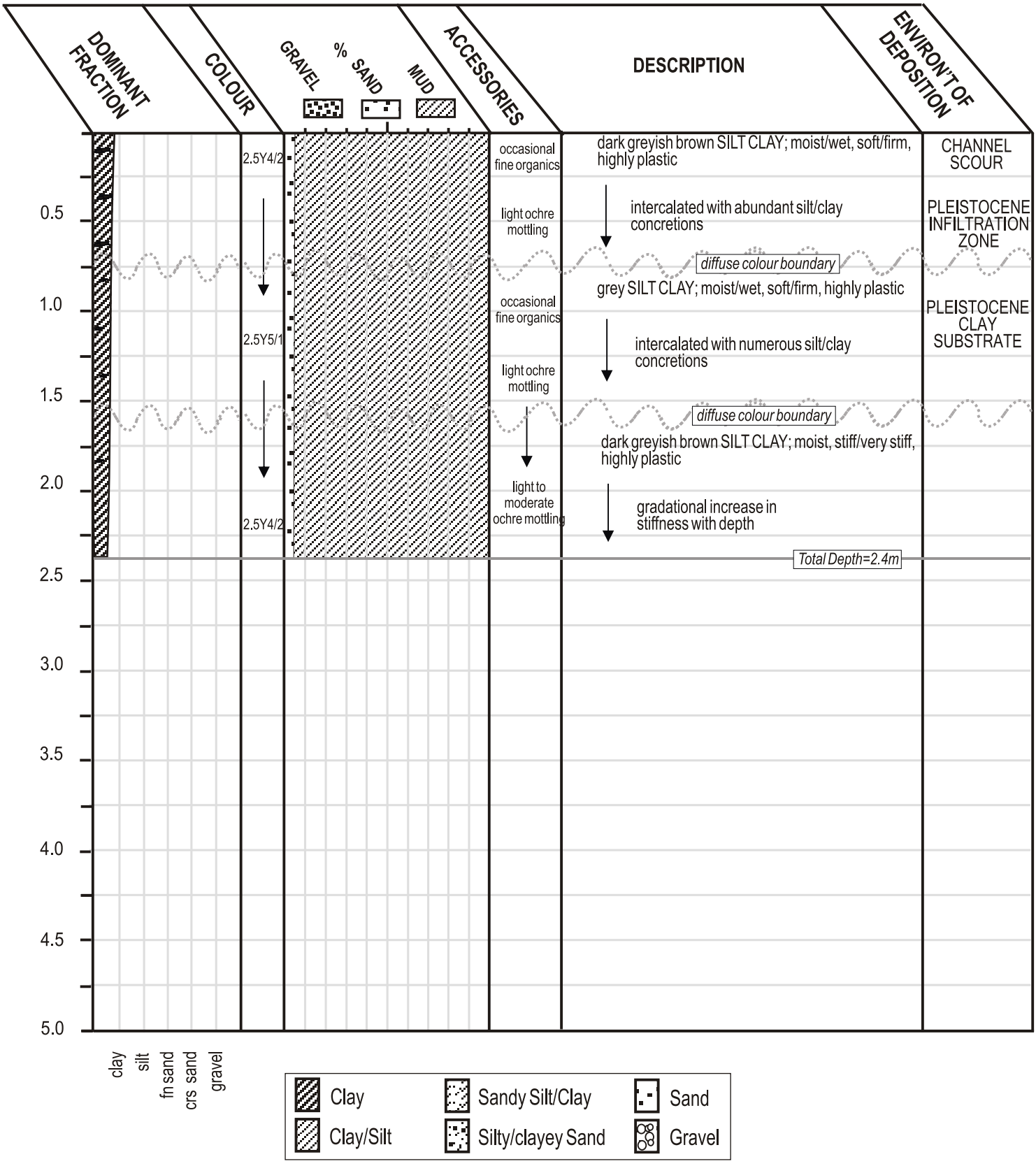
SITE: GC/ BH2A-06

LOCATION: Port of Gladstone
23°45.473' **S** 151°10.582 **E**
R.L. 6.35m L.A.T. (Port Datum)

DATE: 7/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-07

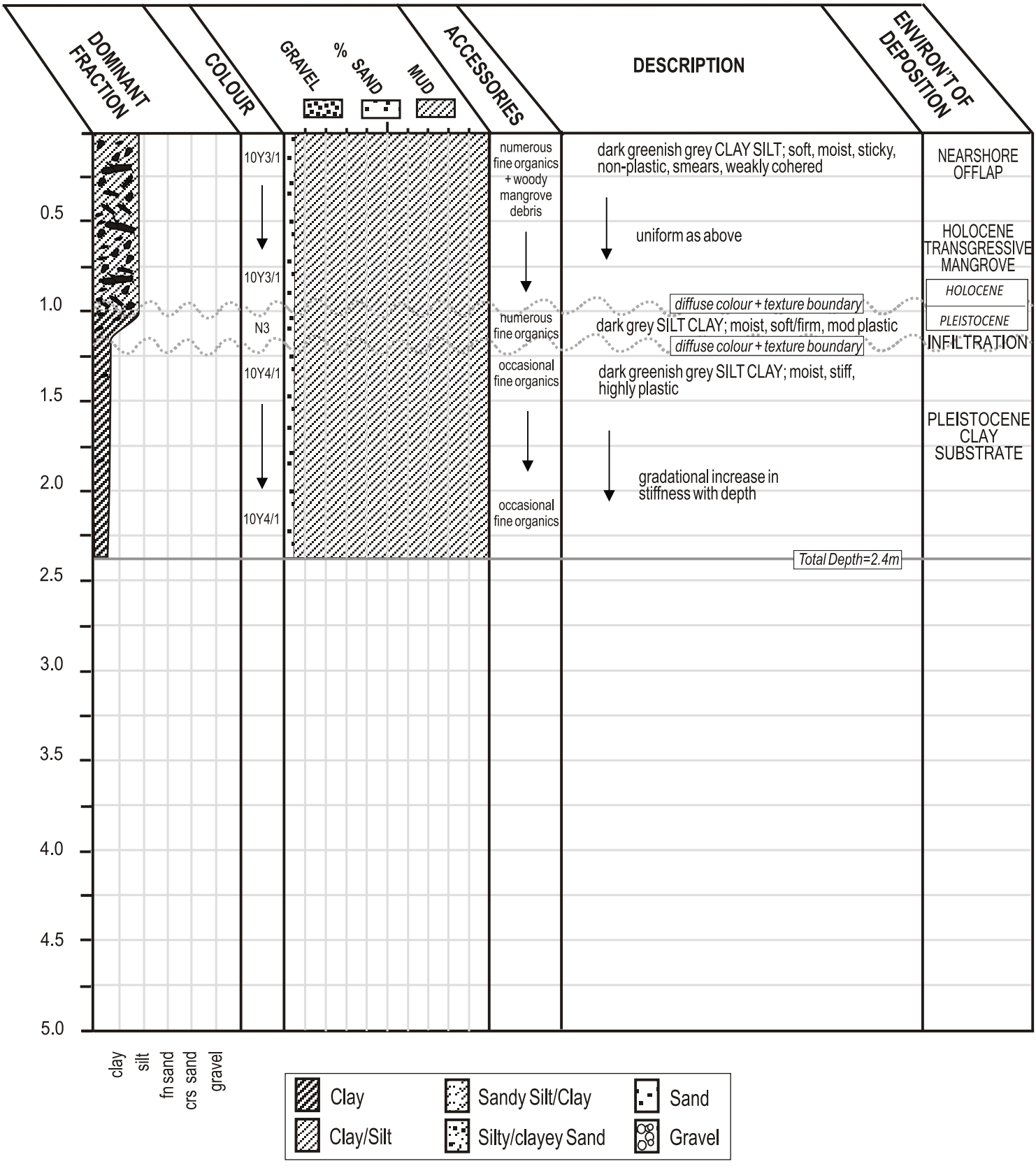
SITE: GC/ BH2A-07

DATE: 6/08/09

LOCATION: Port of Gladstone
$23^0 45.476'$ **S** $151^0 10.782$ **E**
R.L. -0.6 m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-08

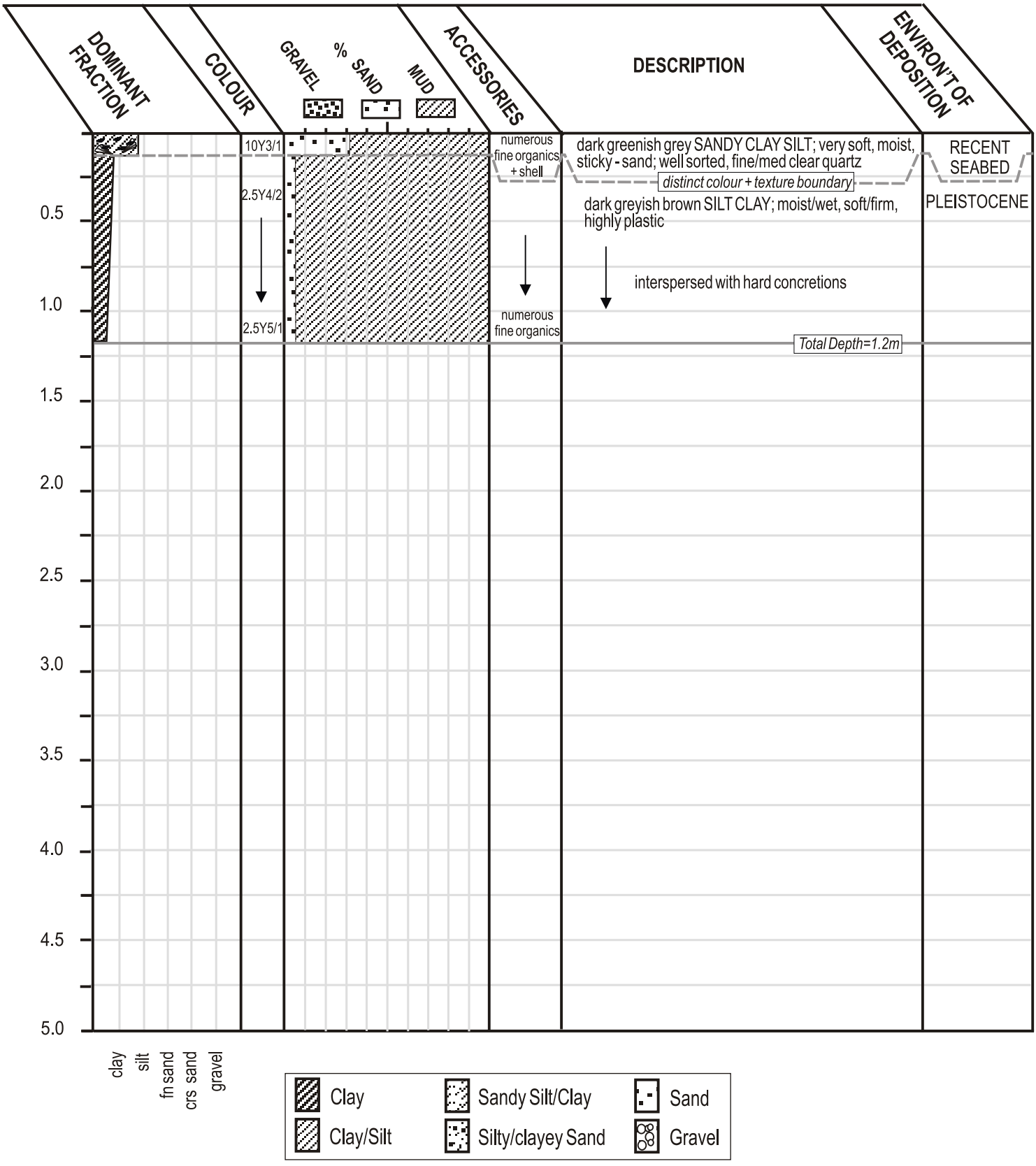
SITE: GC/ BH2A-08

LOCATION: Port of Gladstone
23°45.507' **S** 151°10.689 **E**
R.L. 5.3 m L.A.T. (Port Datum)

DATE: 7/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-09

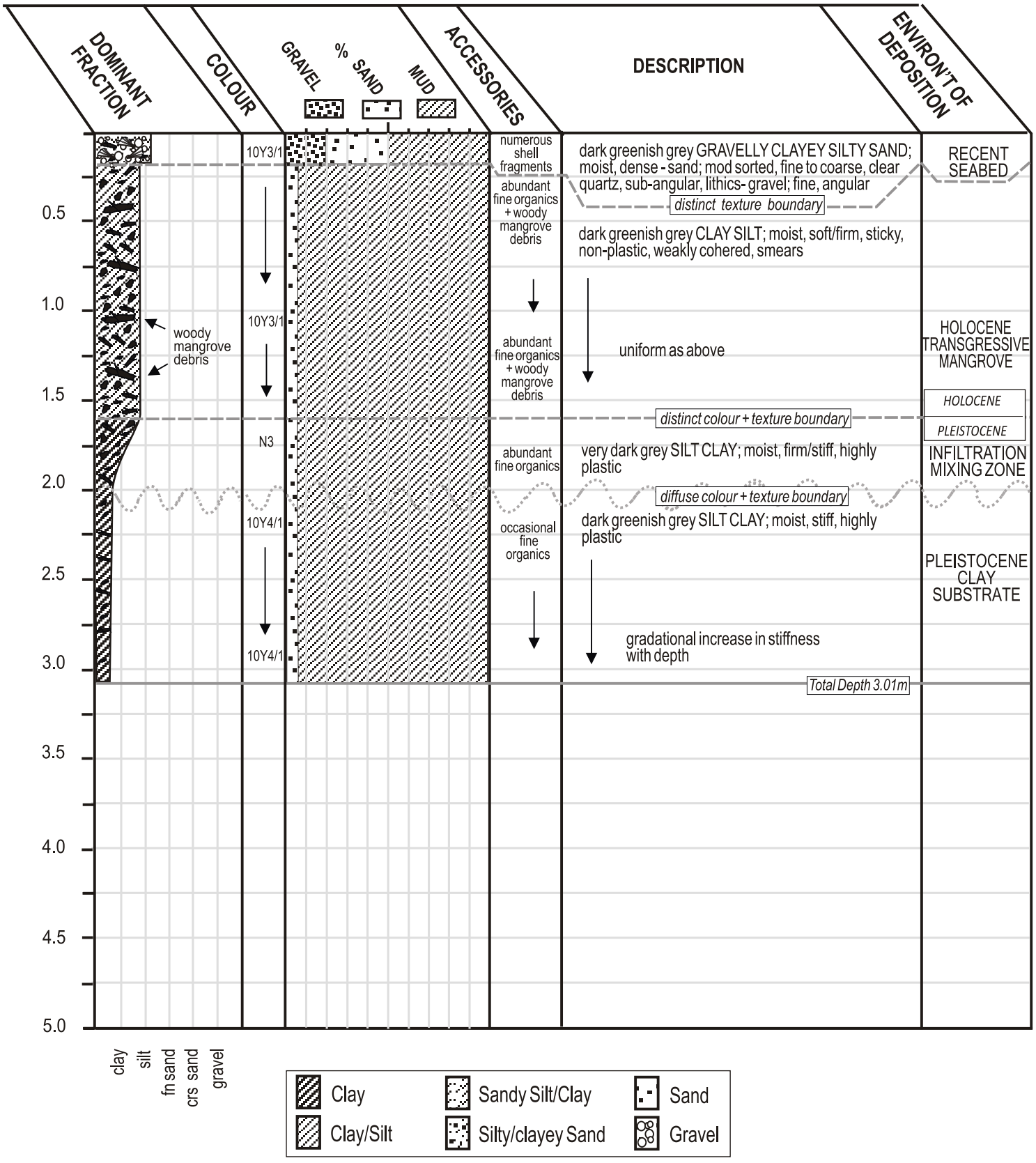
SITE: GC/ BH2A-09

LOCATION: Port of Gladstone
23°45.506' **S** 151°10.867 **E**
R.L. -1.3m L.A.T. (Port Datum)

DATE: 31/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-10

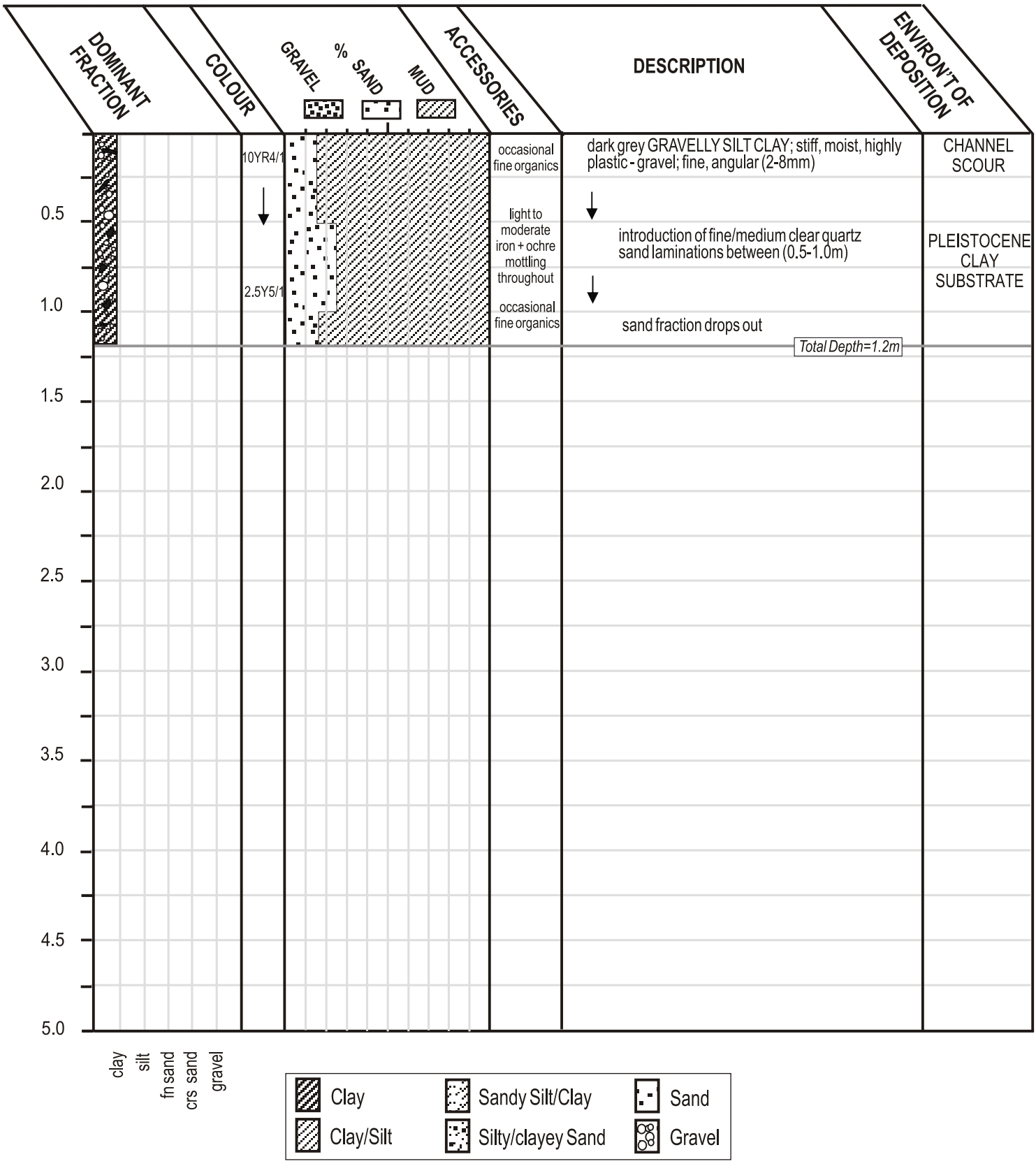
SITE: GC/ BH2A-10

LOCATION: Port of Gladstone
23°45.574' **S** 151°10.741 **E**
R.L. 4.8m L.A.T. (Port Datum)

DATE: 7/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-11

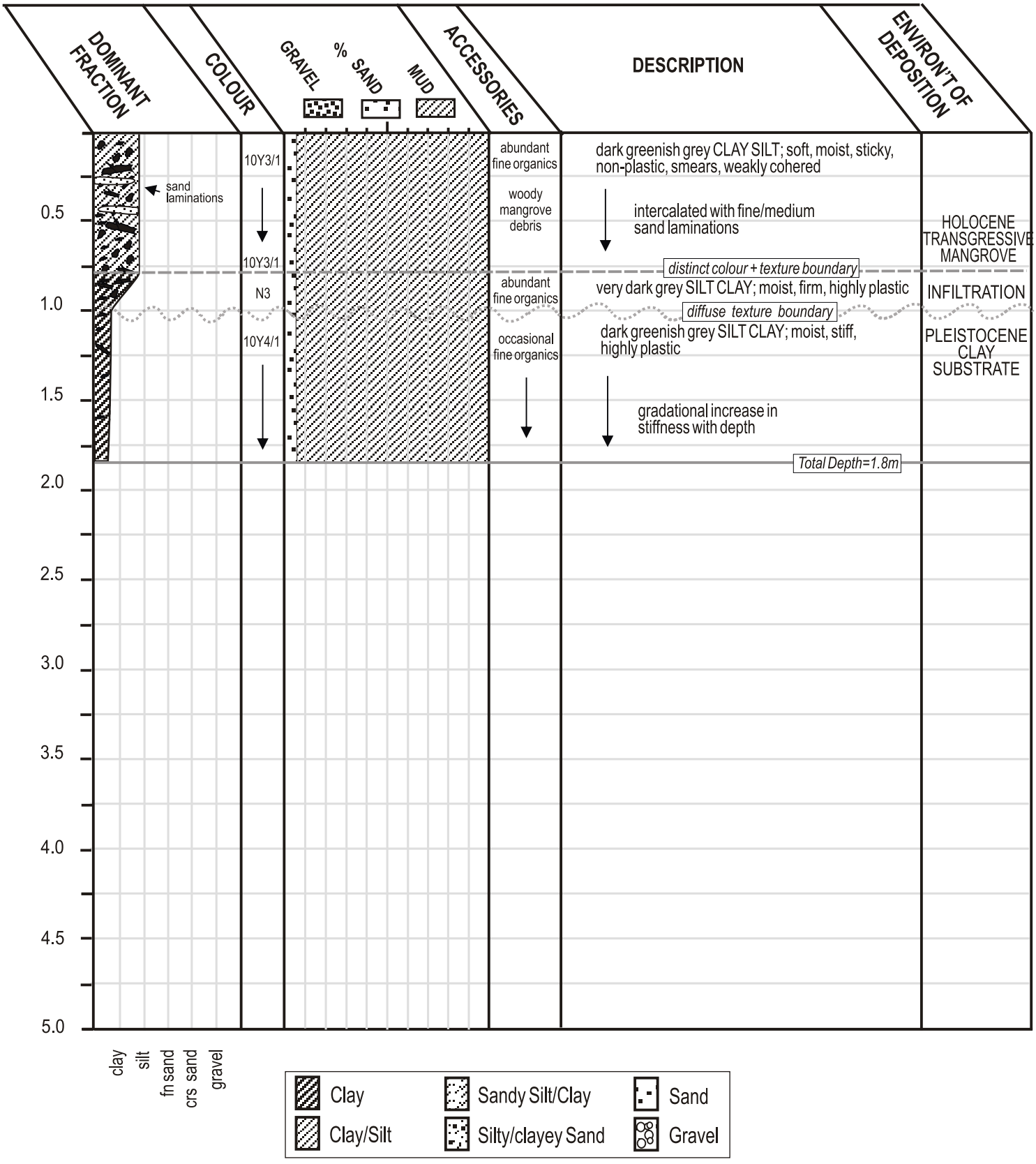
SITE: GC/ BH2A-11

DATE: 30/07/09

LOCATION: Port of Gladstone
23°45.577' **S** 151°10.842 **E**
R.L. -1.68 m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-12

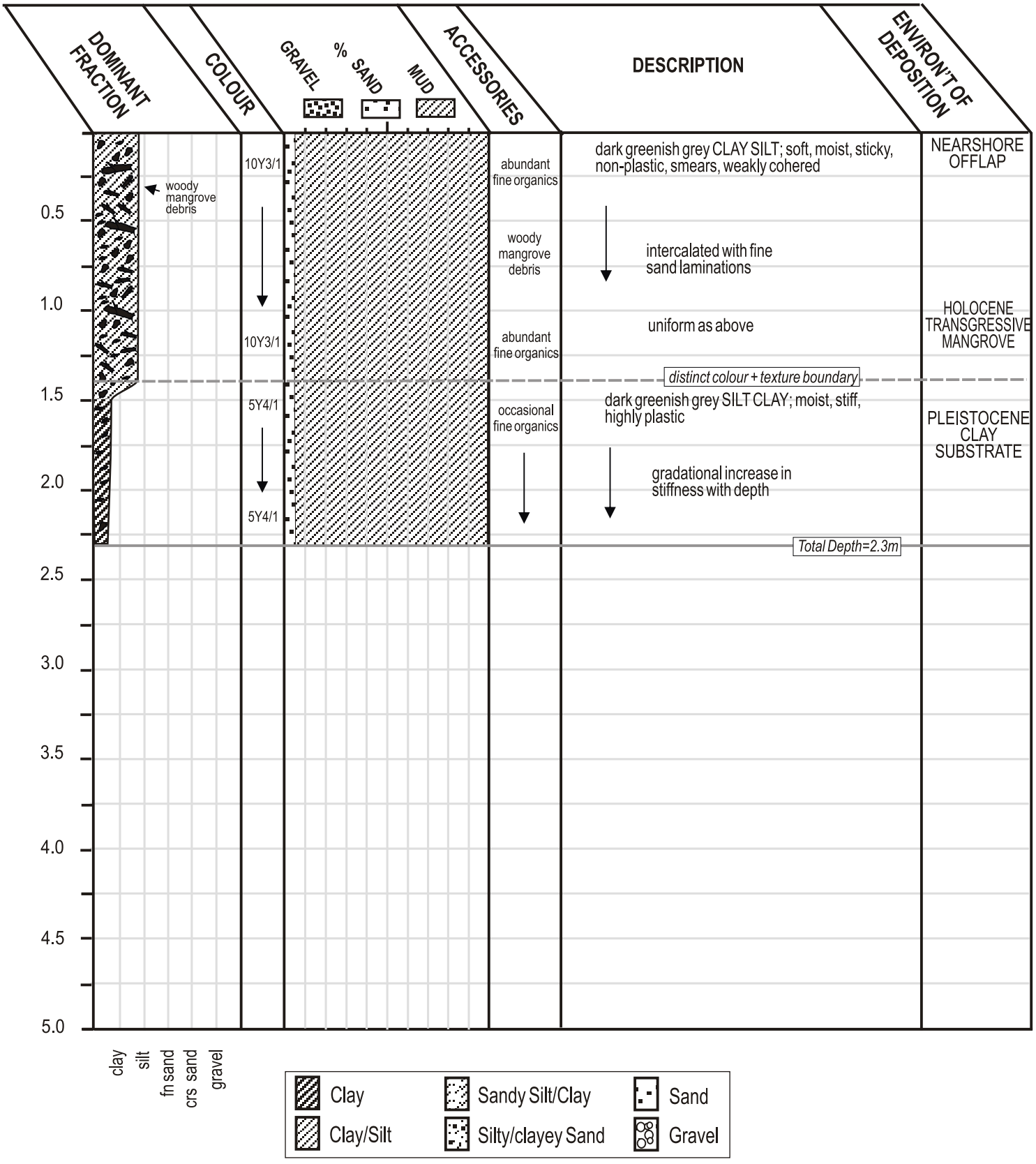
SITE: GC/ BH2A-12

LOCATION: Port of Gladstone
23°45.601' **S** 151°10.947 **E**
R.L. 0 m L.A.T. (Port Datum)

DATE: 30/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-13

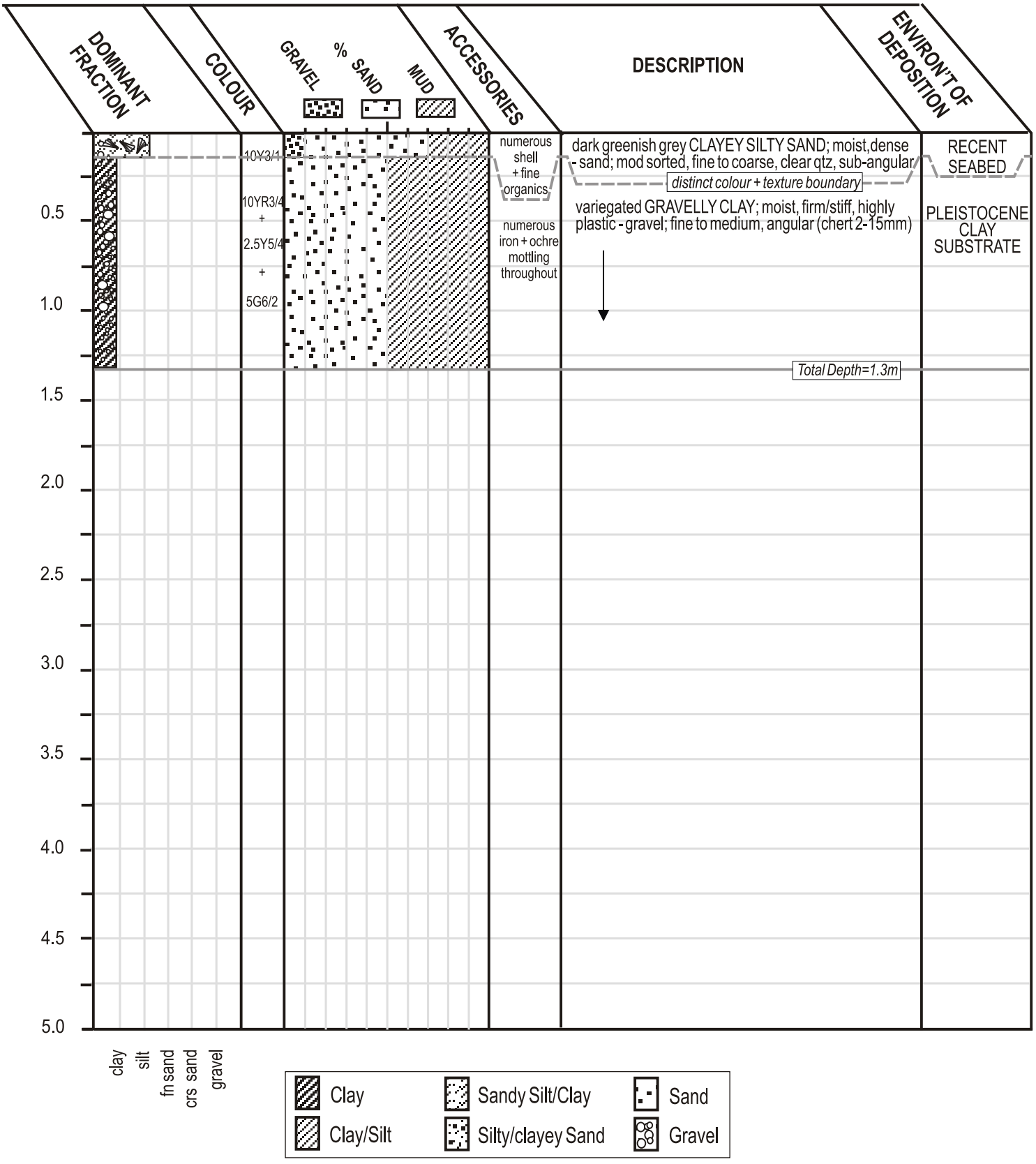
SITE: GC/ BH2A-13

LOCATION: Port of Gladstone
23°45.625' **S** 151°11.060 **E**
R.L. -2.4m L.A.T. (Port Datum)

DATE: 30/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-14

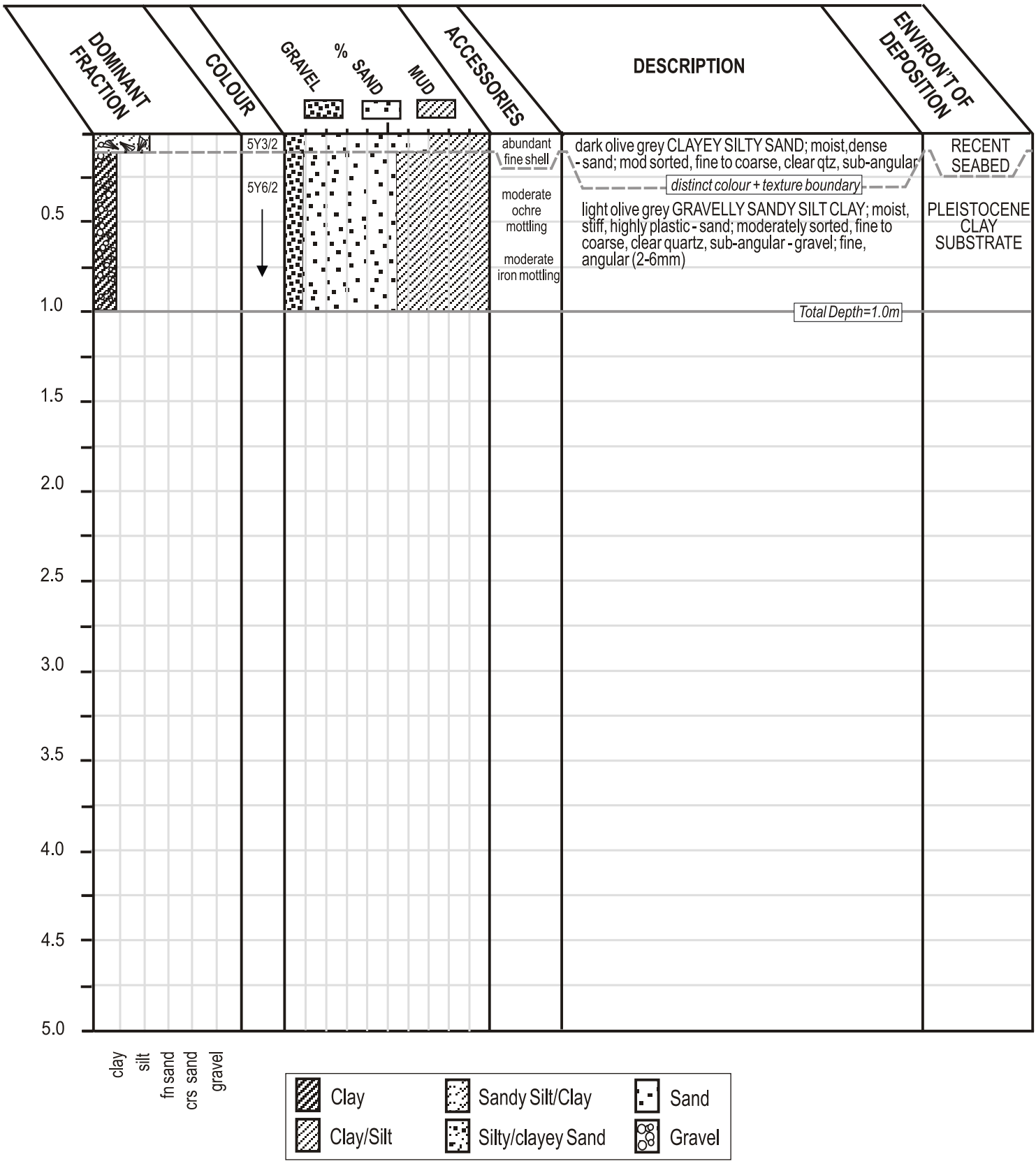
SITE: GC/ BH2A-14

LOCATION: Port of Gladstone
23°45.654' **S** 151°10.689 **E**
R.L. 6.2m L.A.T. (Port Datum)

DATE: 4/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-15

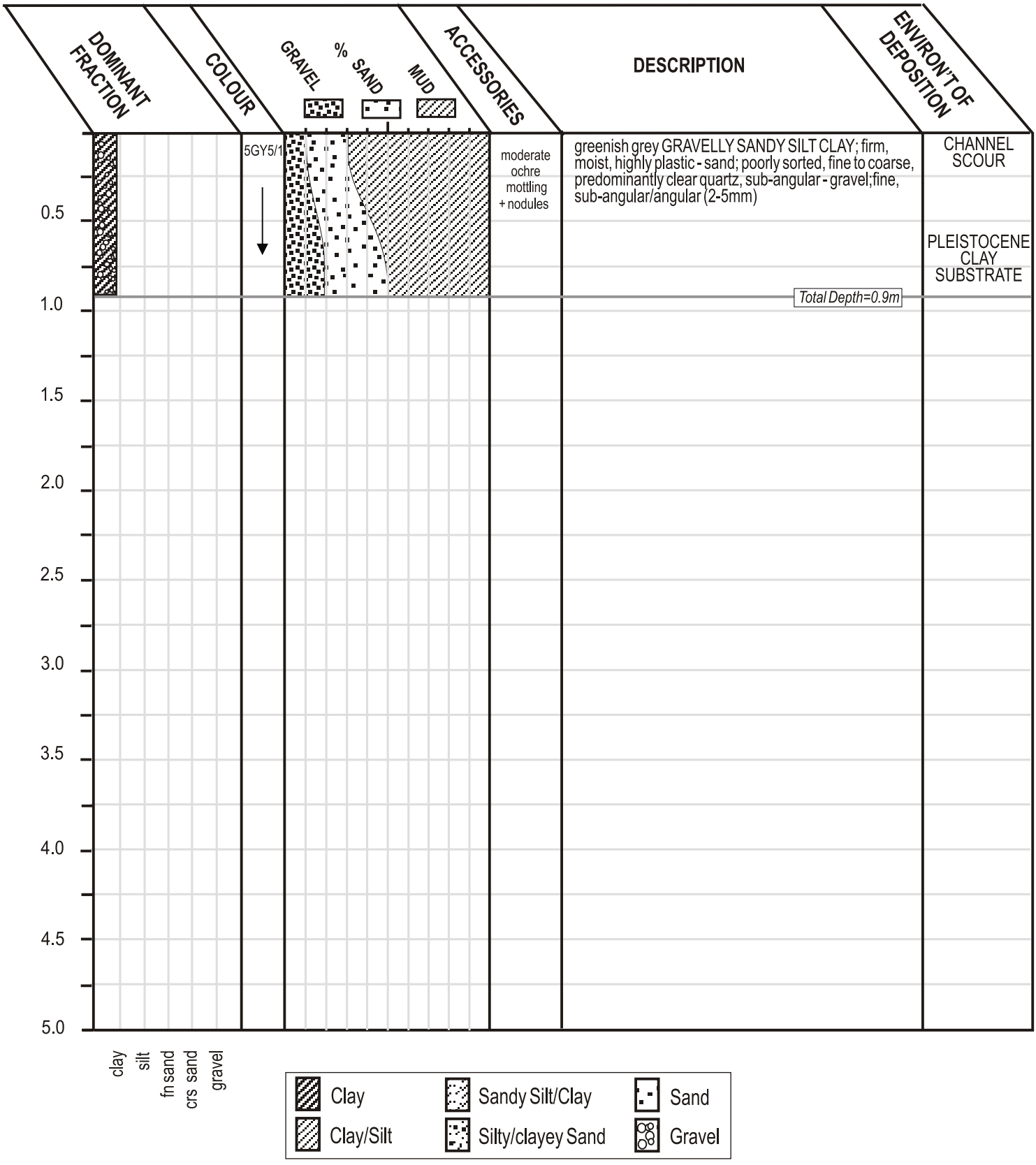
SITE: GC/ BH2A-15

DATE: 29/07/09

LOCATION: Port of Gladstone
23°45.679' **S** 151°10.811 **E**
R.L. 4.7m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-16

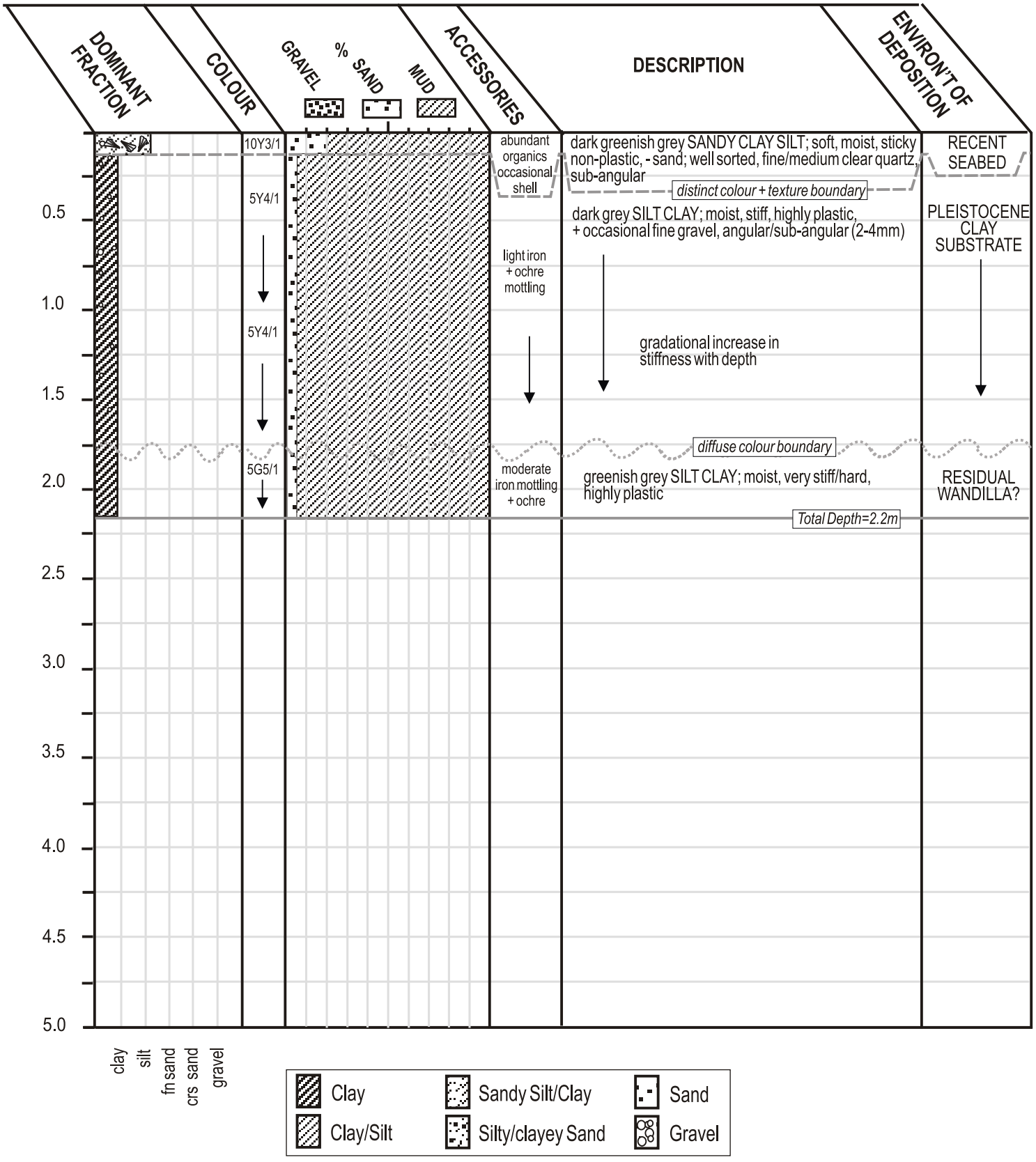
SITE: GC/ BH2A-16

LOCATION: Port of Gladstone
23°45.700' **S** 151°10.932 **E**
R.L. 0.9m L.A.T. (Port Datum)

DATE: 29/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-17

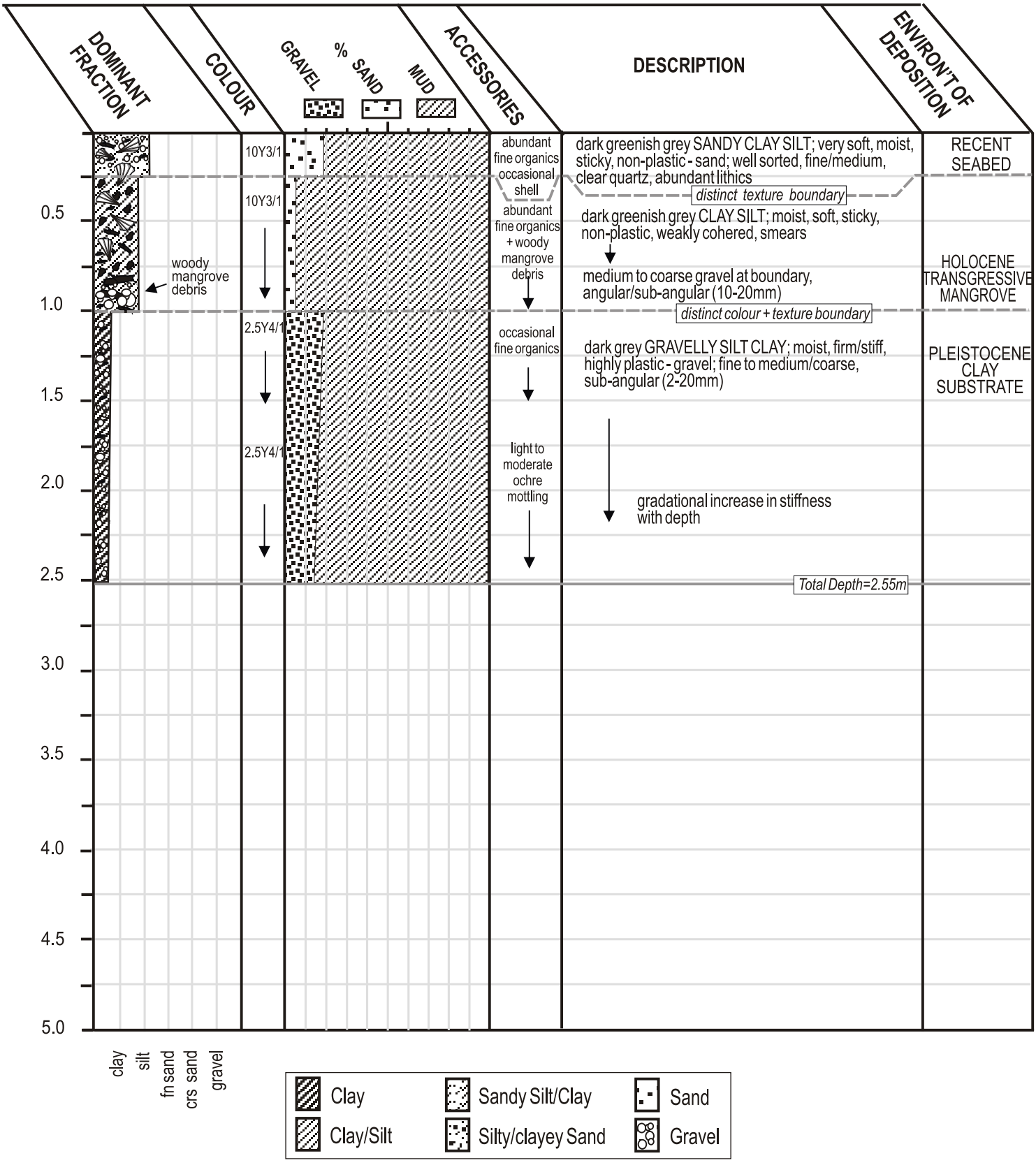
SITE: GC/ BH2A-17

LOCATION: Port of Gladstone
23°45.735' **S** 151°11.046 **E**
R.L. -0.9m L.A.T. (Port Datum)

DATE: 29/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-18

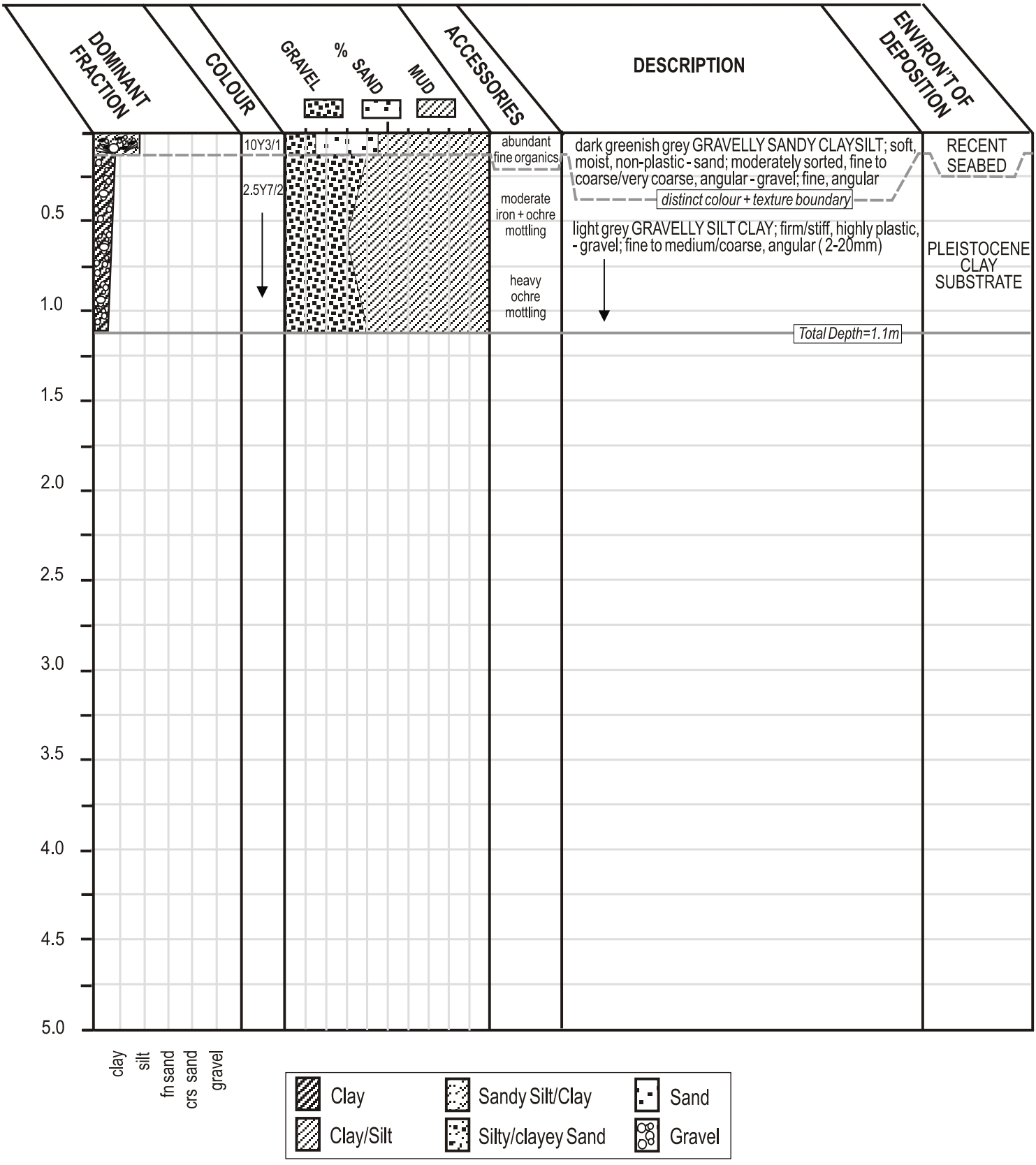
SITE: GC/ BH2A-18

LOCATION: Port of Gladstone
23°45.749' **S** 151°11.167 **E**
R.L. -2.51 m L.A.T. (Port Datum)

DATE: 29/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-19

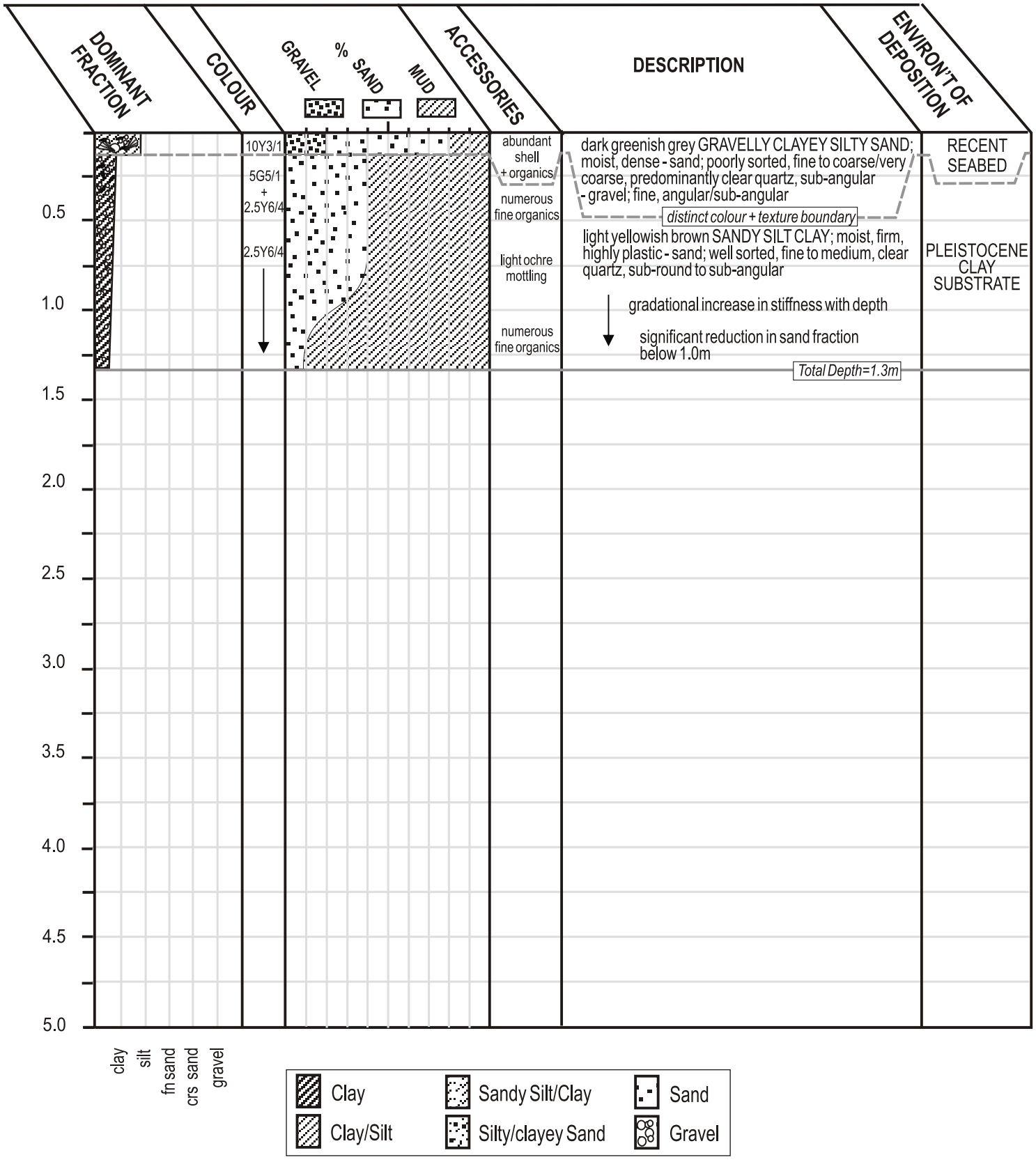
SITE: GC/ BH2A-19

LOCATION: Port of Gladstone
23°45.761' **S** 151°10.753 **E**
R.L. 5.9 m L.A.T. (Port Datum)

DATE: 30/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-20

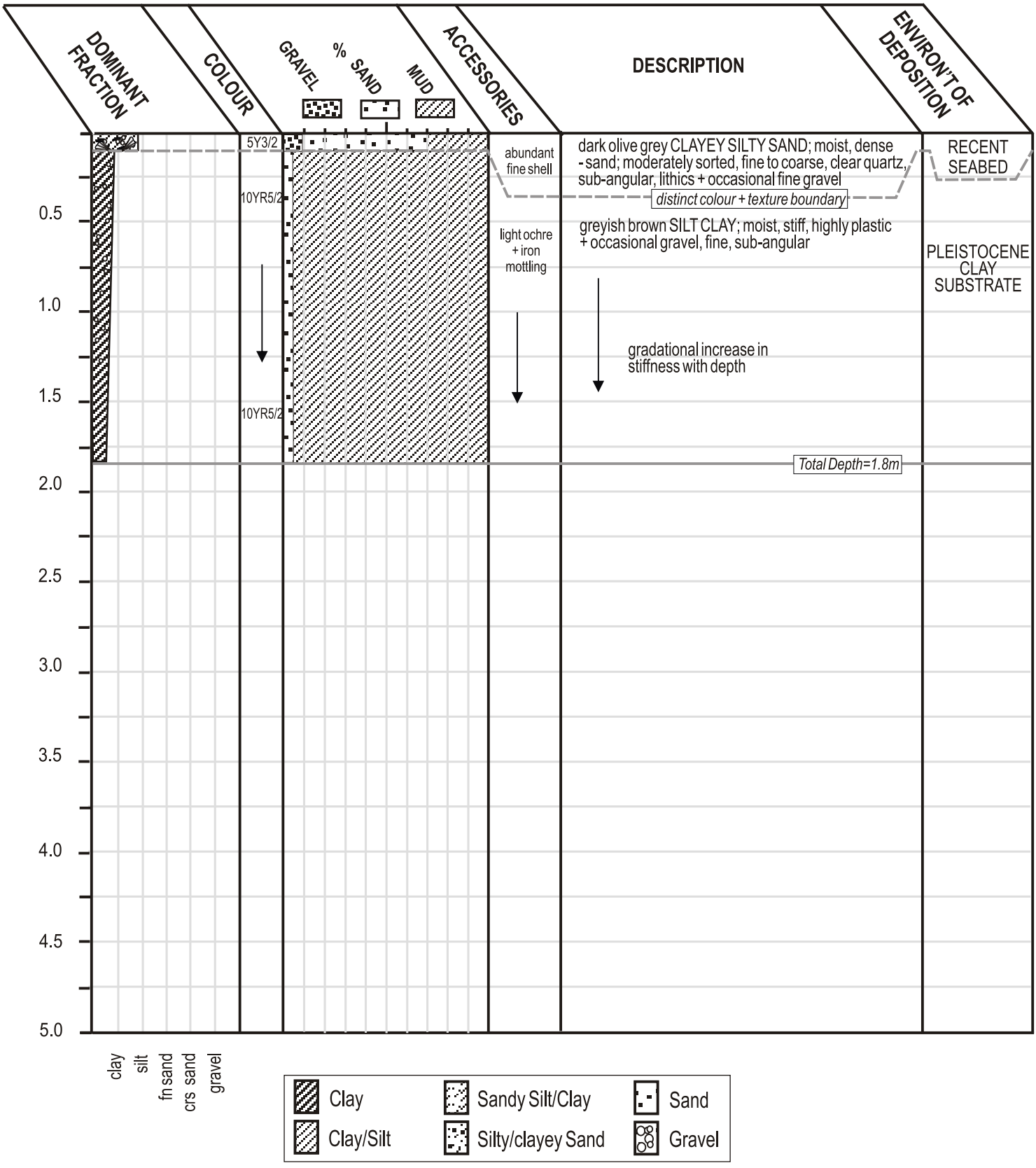
SITE: GC/ BH2A-20

LOCATION: Port of Gladstone
23°45.810' **S** 151°10.899 **E**
R.L. 5.4 m L.A.T. (Port Datum)

DATE: 4/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-21

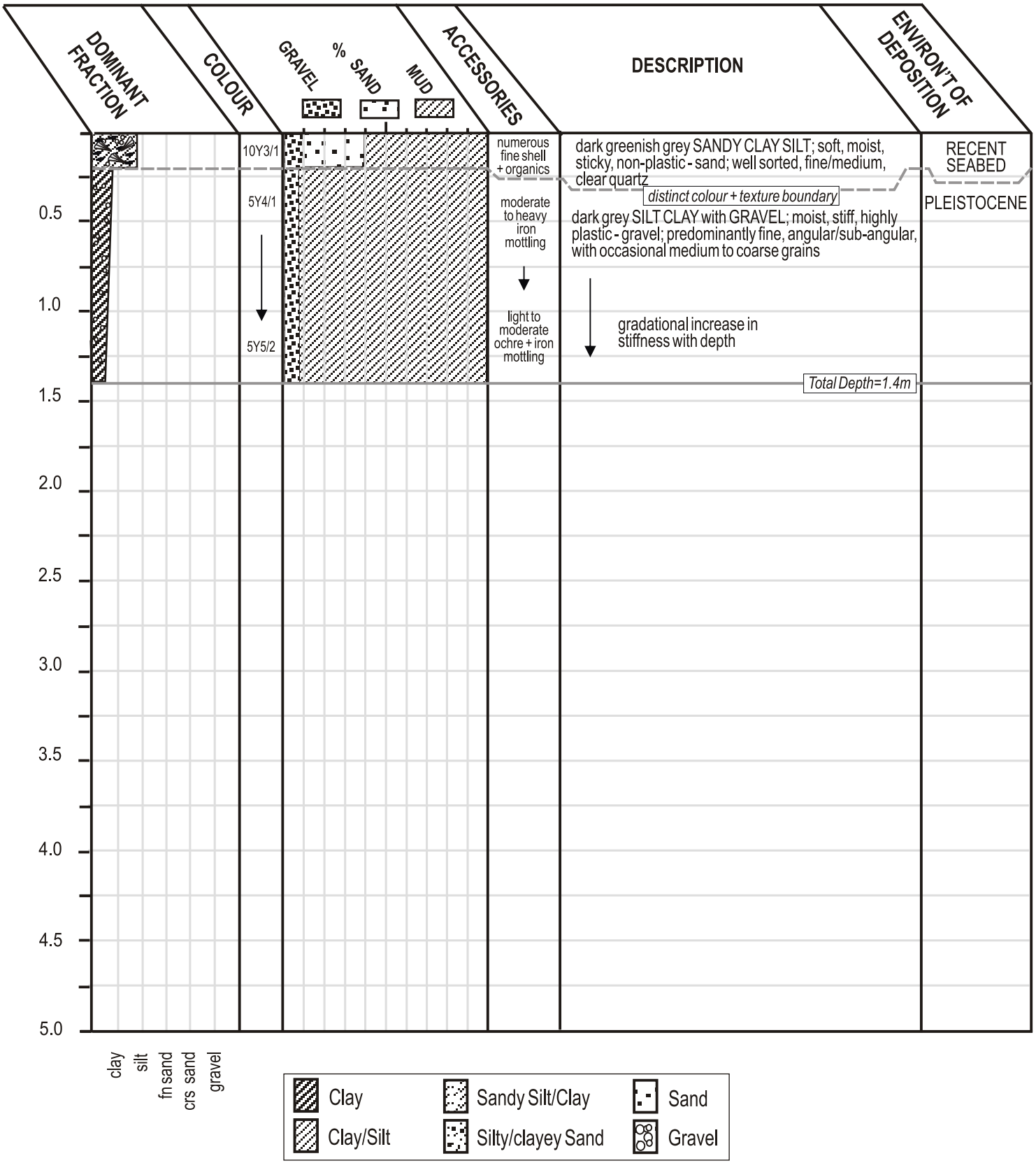
SITE: GC/ BH2A-21

LOCATION: Port of Gladstone
23°45.825' **S** 151°11.017 **E**
R.L. 1.95 m L.A.T. (Port Datum)

DATE: 1/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-22

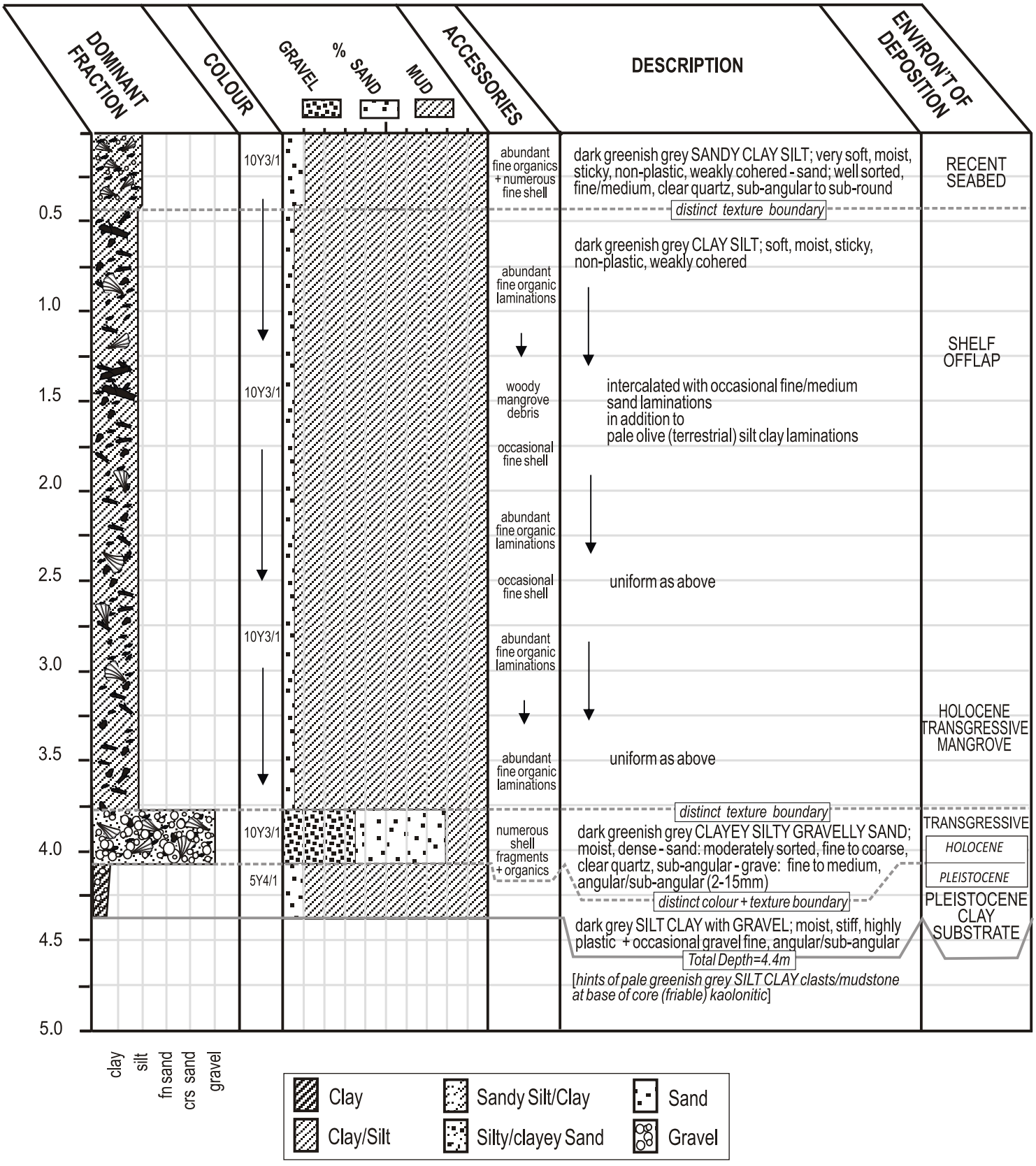
SITE: GC/ BH2A-22

LOCATION: Port of Gladstone
23°45.863' **S** 151°11.143 **E**
R.L. -0.7 m L.A.T. (Port Datum)

DATE: 3/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-23

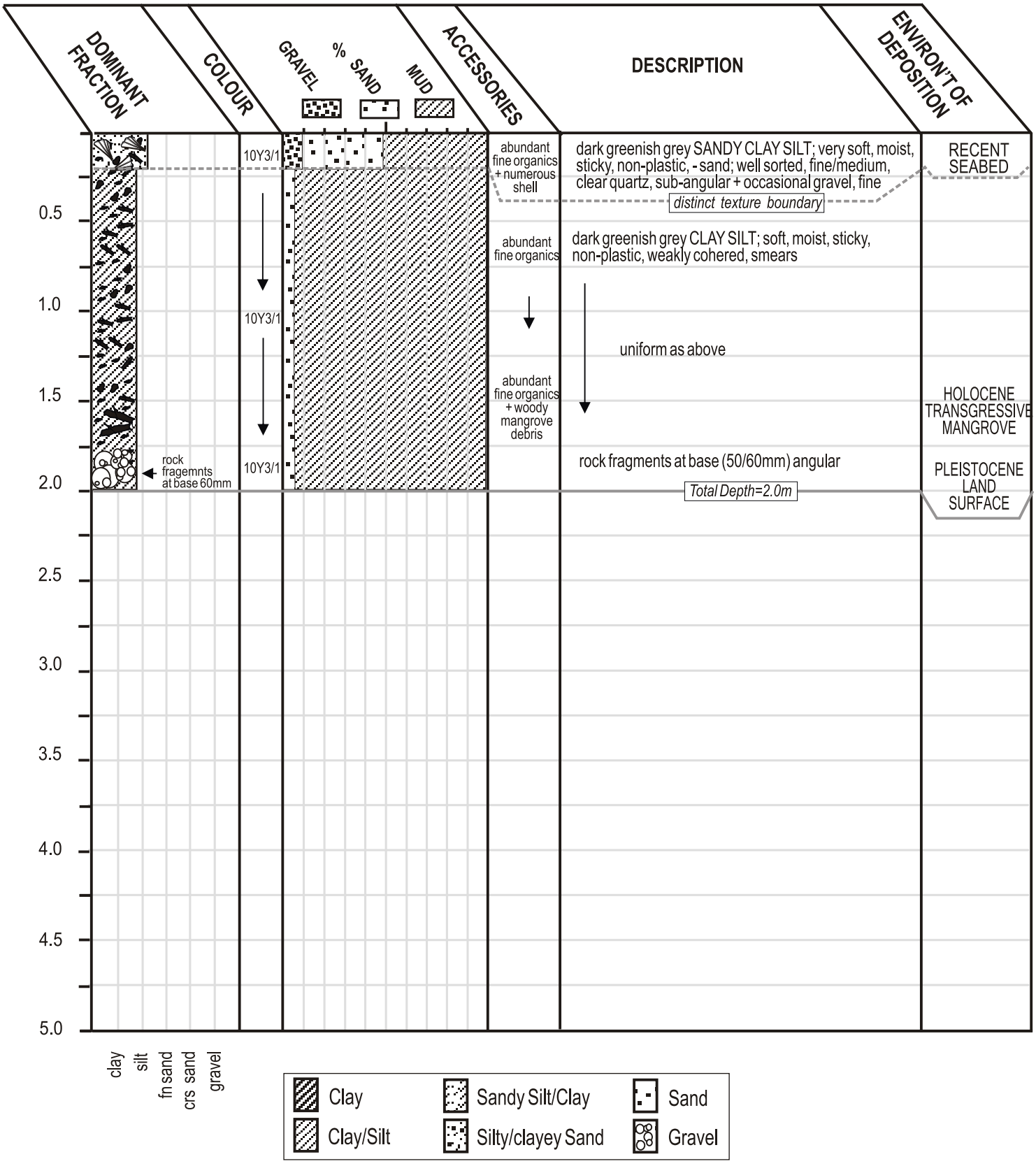
SITE: GC/ BH2A-23

LOCATION: Port of Gladstone
23°45.862' **S** 151°11.255 **E**
R.L. -2.8m L.A.T. (Port Datum)

DATE: 3/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-24

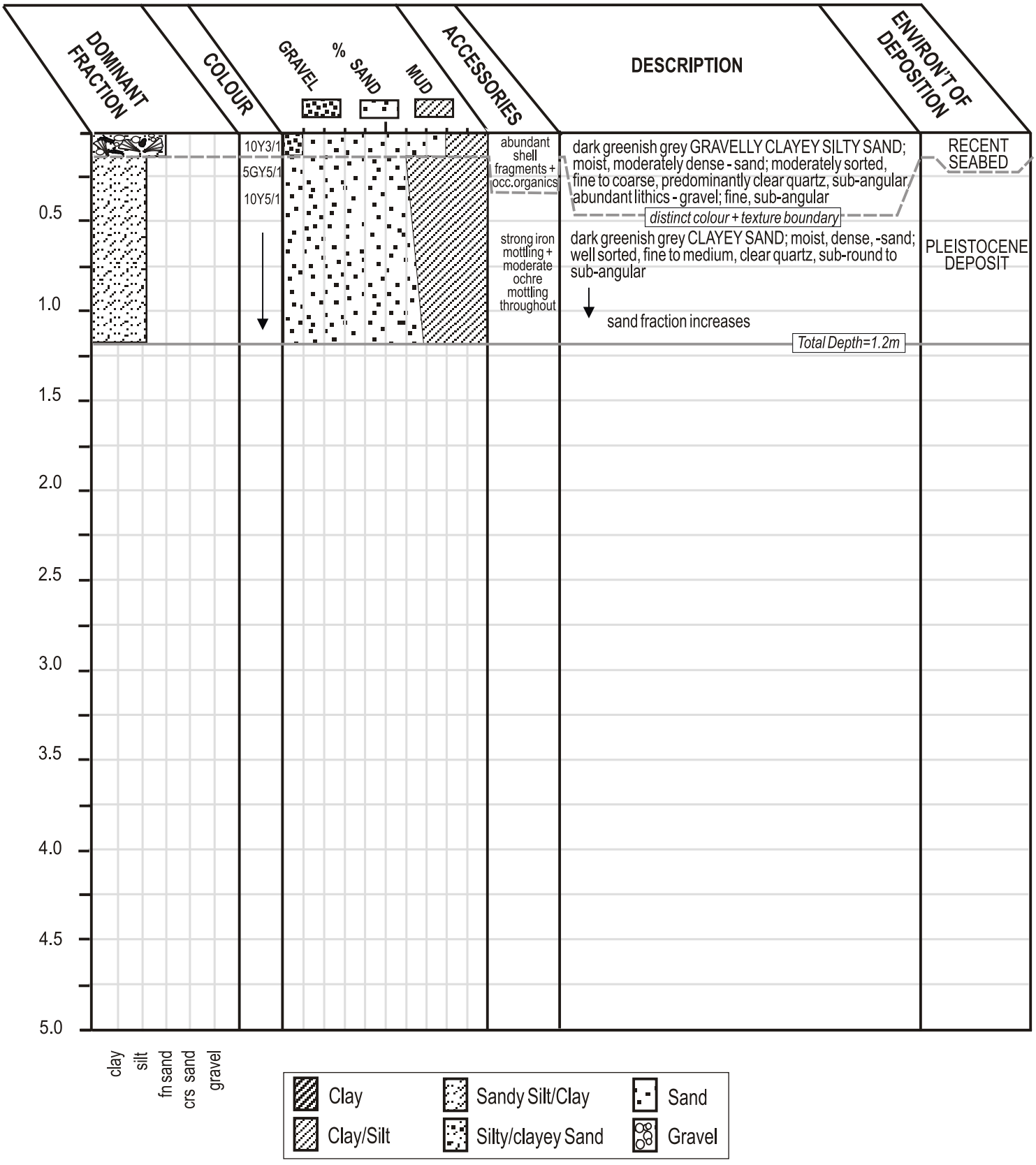
SITE: GC/ BH2A-24

LOCATION: Port of Gladstone
23°45.907' **S** 151°10.874 **E**
R.L. 5.8m L.A.T. (Port Datum)

DATE: 7/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-25

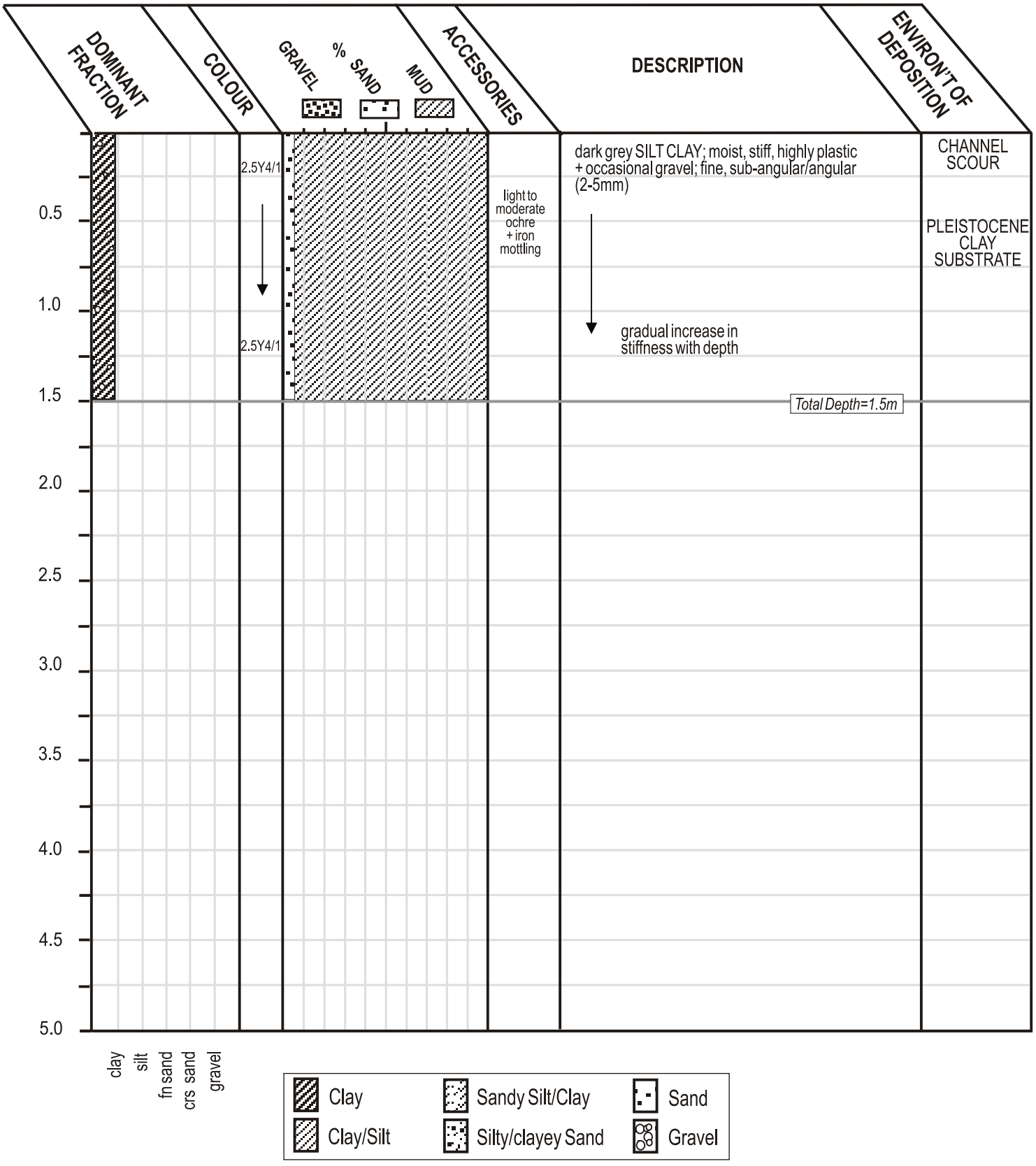
SITE: GC/ BH2A-25

LOCATION: Port of Gladstone
23°45.944' **S** 151°11.001 **E**
R.L. 5.85m L.A.T. (Port Datum)

DATE: 1/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-26

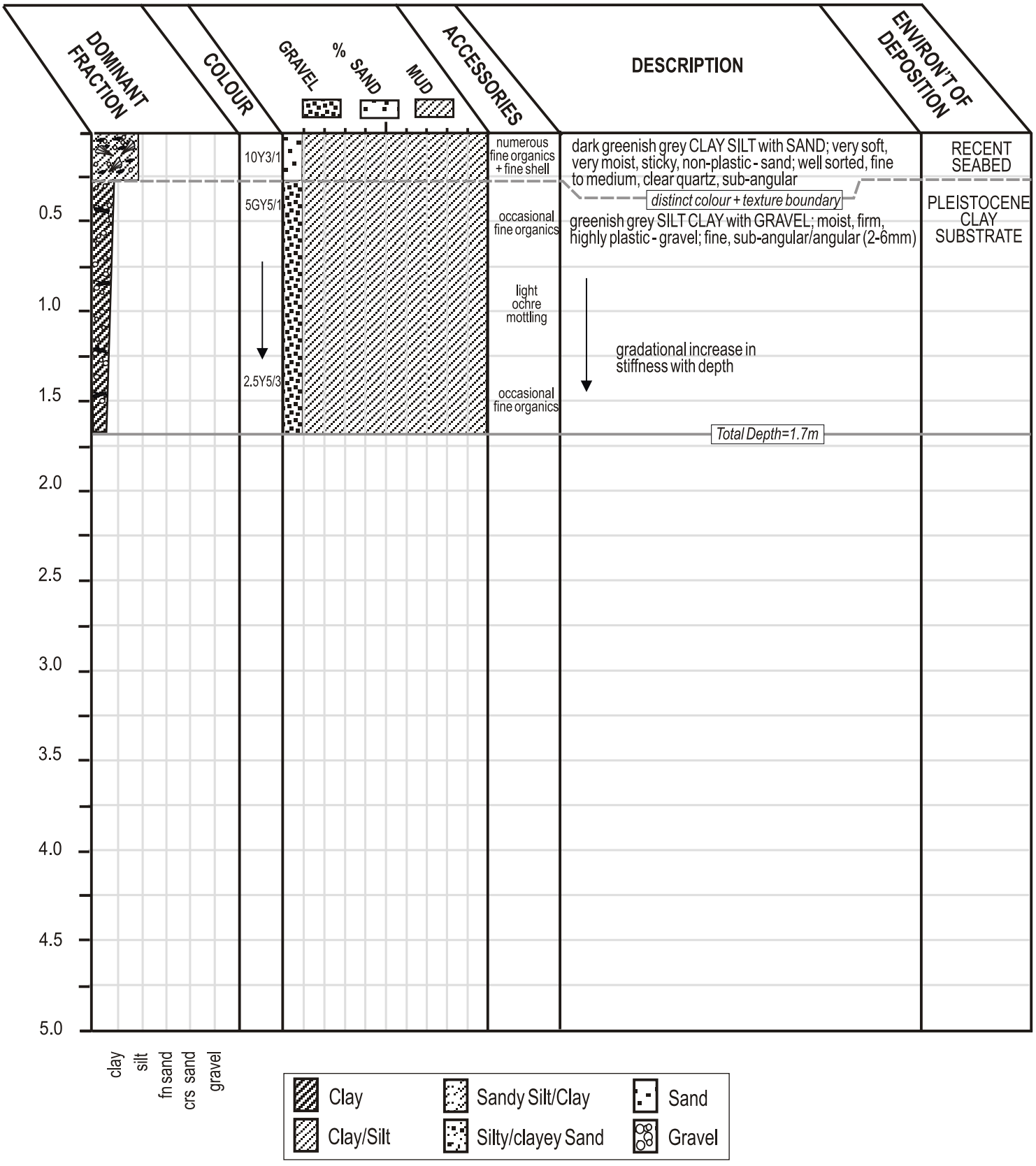
SITE: GC/ BH2A-26

LOCATION: Port of Gladstone
23°45.958 **S** 151°11.104 **E**
R.L. 2.6 m L.A.T. (Port Datum)

DATE: 6/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-27

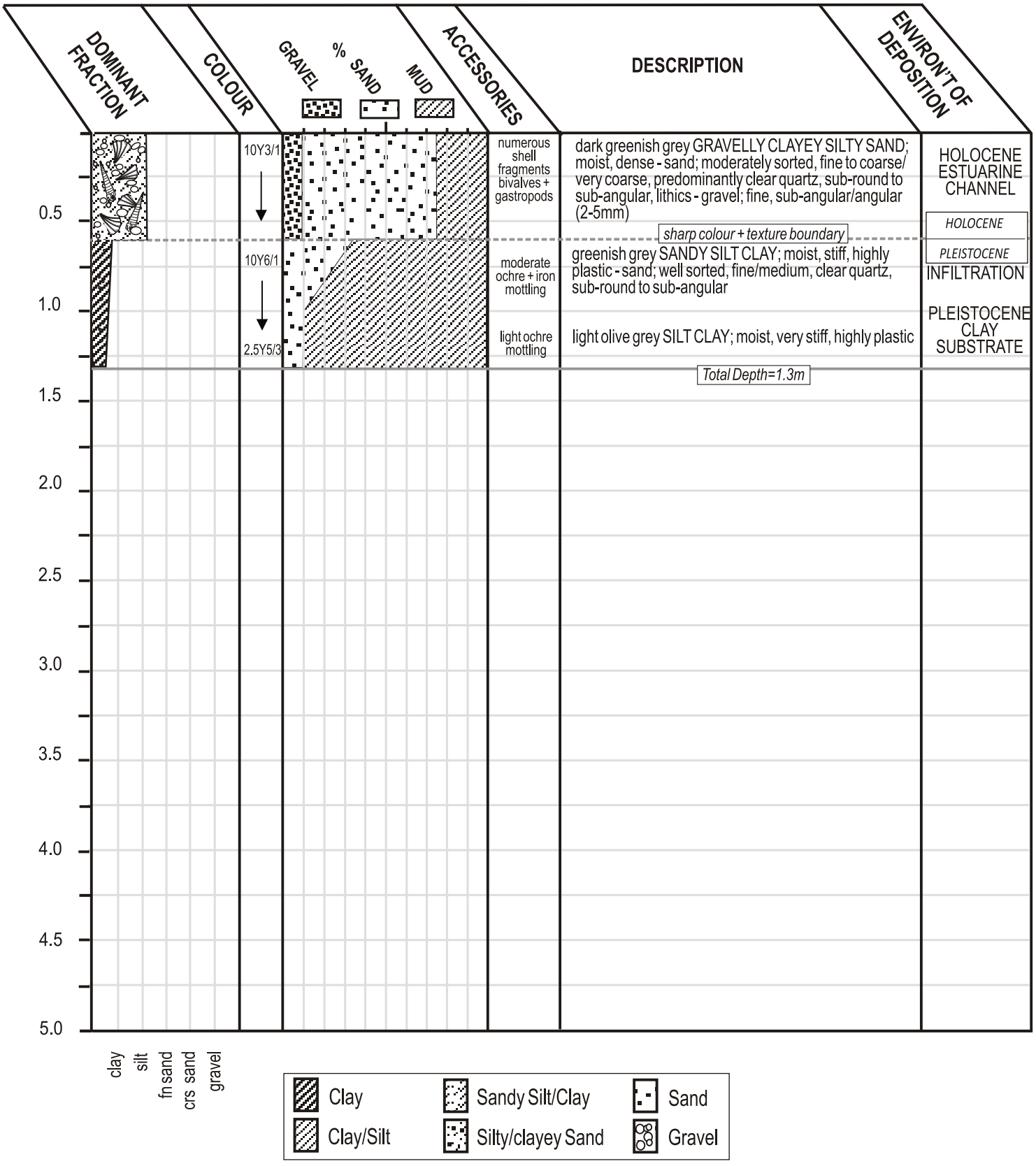
SITE: GC/ BH2A-27

LOCATION: Port of Gladstone
23°46.035 **S** 151°10.970 **E**
R.L. 5.1 m L.A.T. (Port Datum)

DATE: 5/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-28

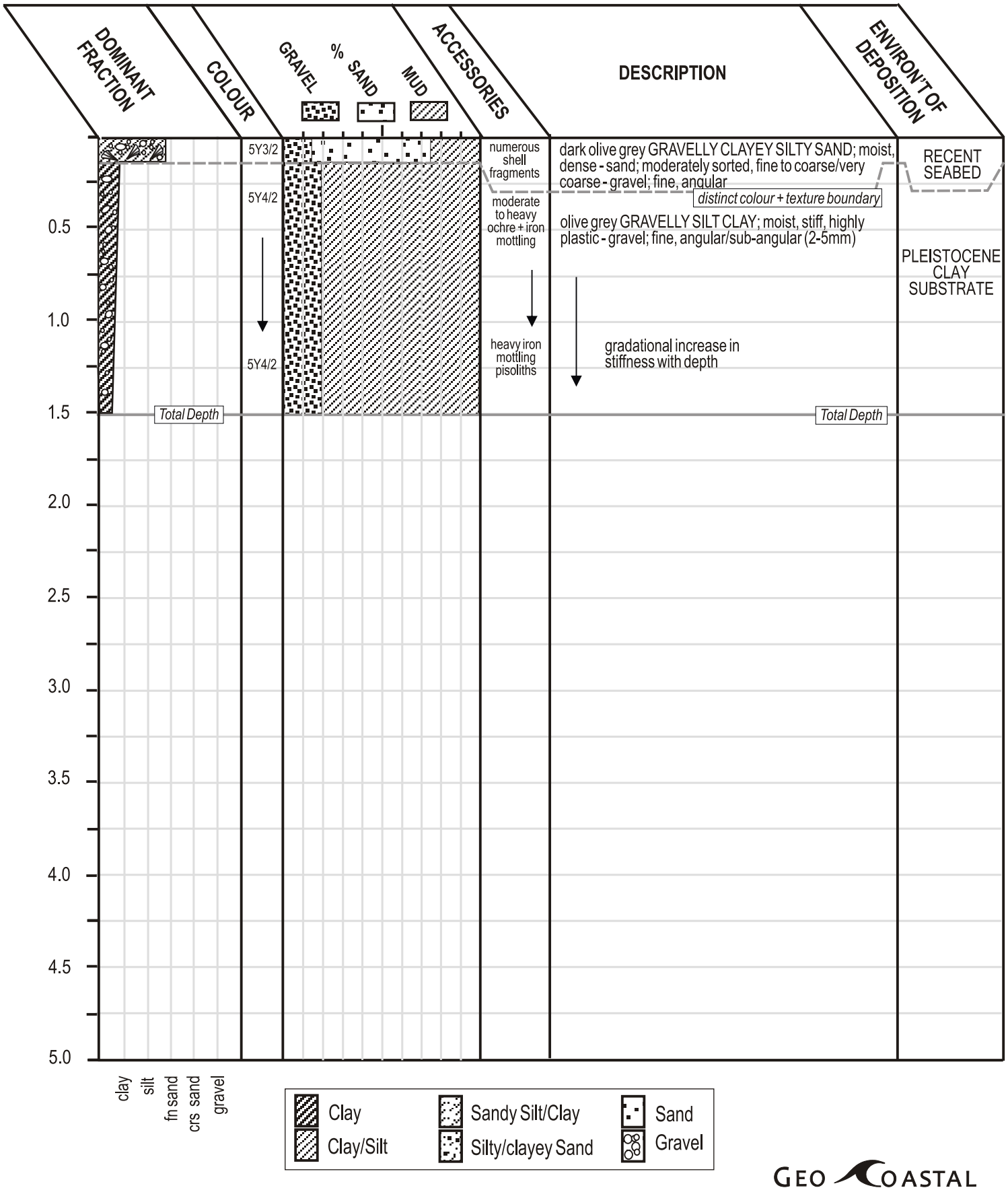
SITE: GC/ BH2A-28

LOCATION: Port of Gladstone
23°46.037 **S** 151°11.087 **E**
R.L. 5.6 m L.A.T. (Port Datum)

DATE: 31/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-29

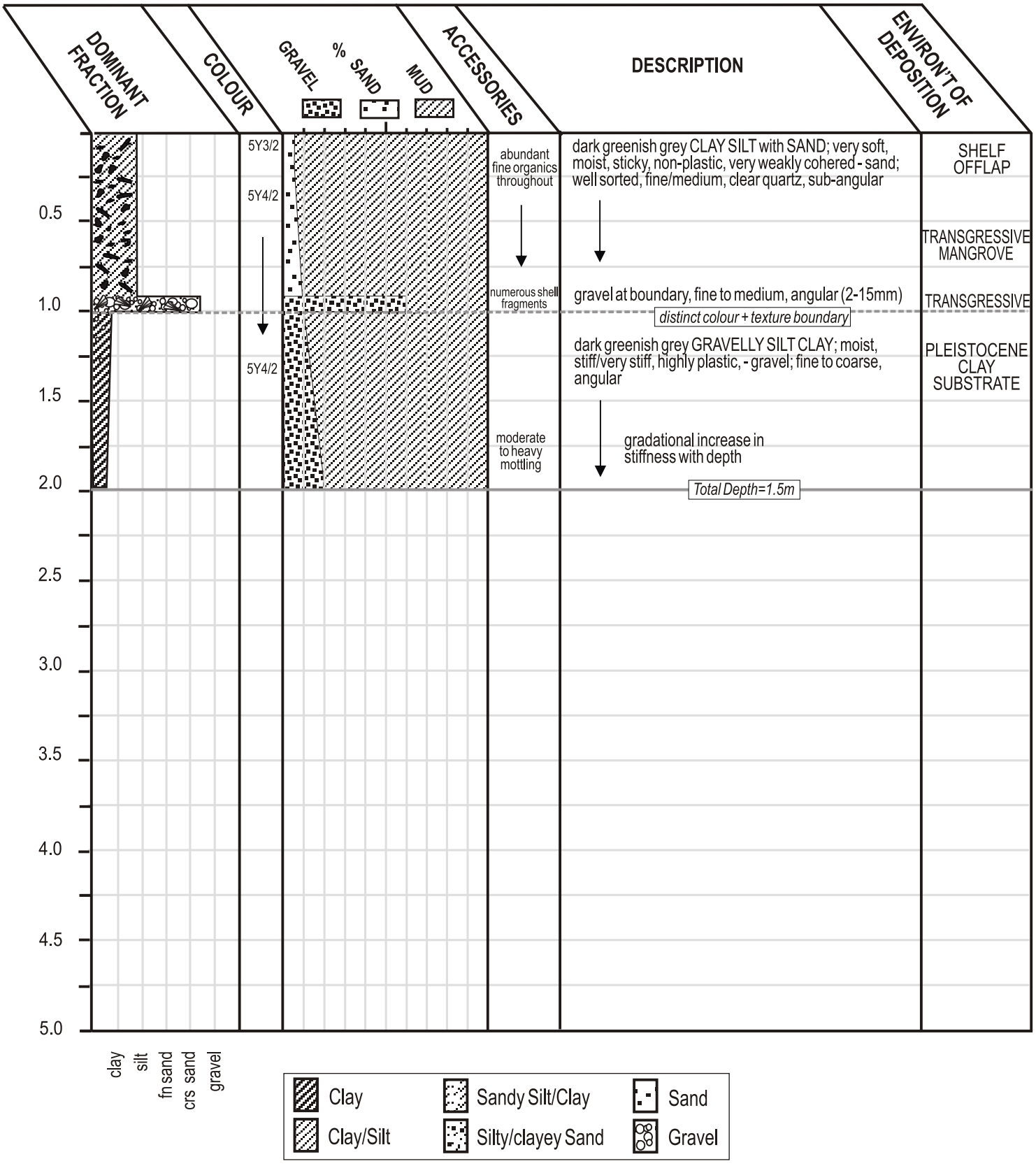
SITE: GC/ BH2A-29

LOCATION: Port of Gladstone
23°46.057 **S** 151°11.174 **E**
R.L. 2.8 m L.A.T. (Port Datum)

DATE: 8/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-30

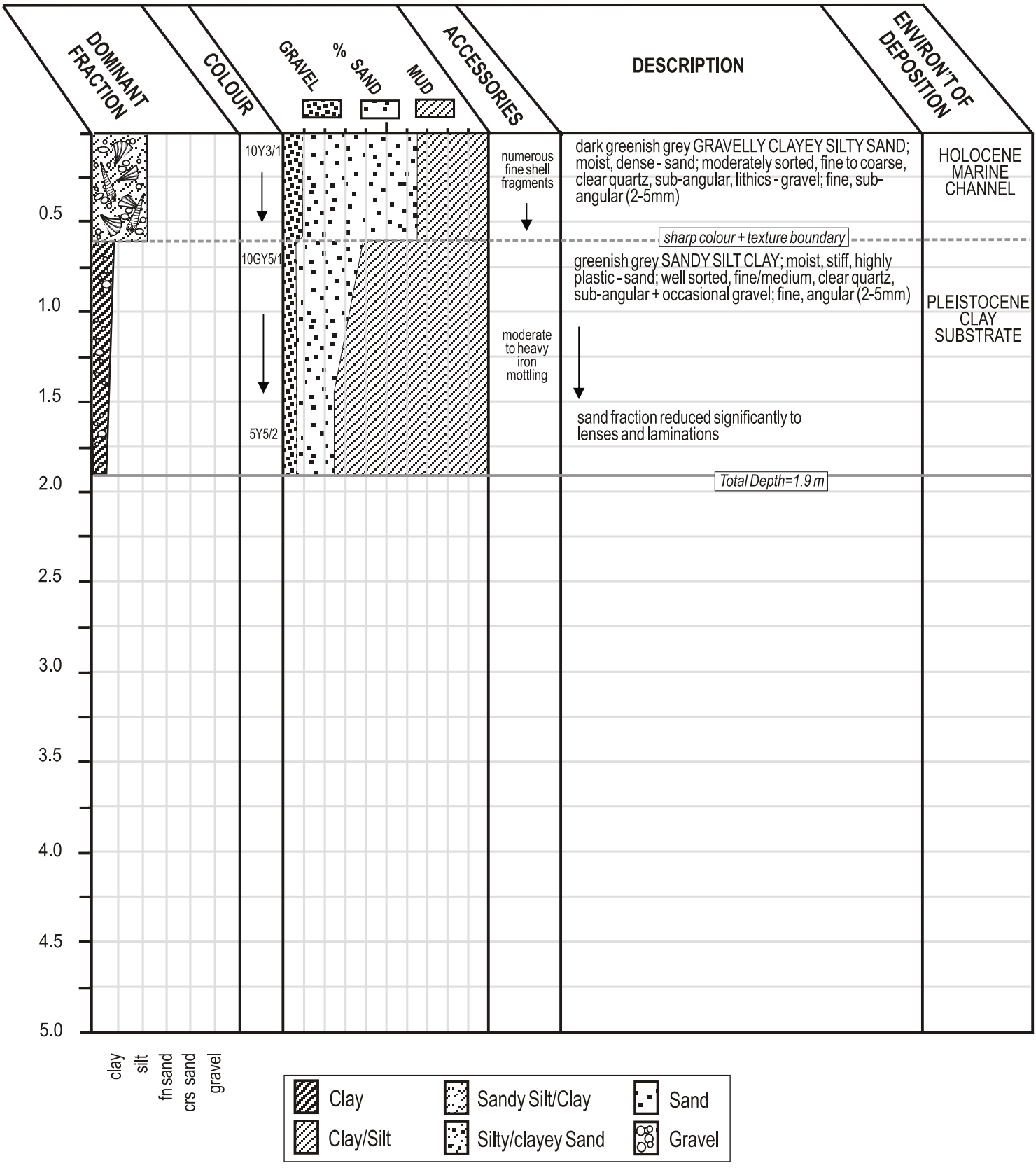
SITE: GC/ BH2A-30

LOCATION: Port of Gladstone
23°46.136 **S** 151°11.066 **E**
R.L. 5.47 m L.A.T. (Port Datum)

DATE: 31/7/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-31

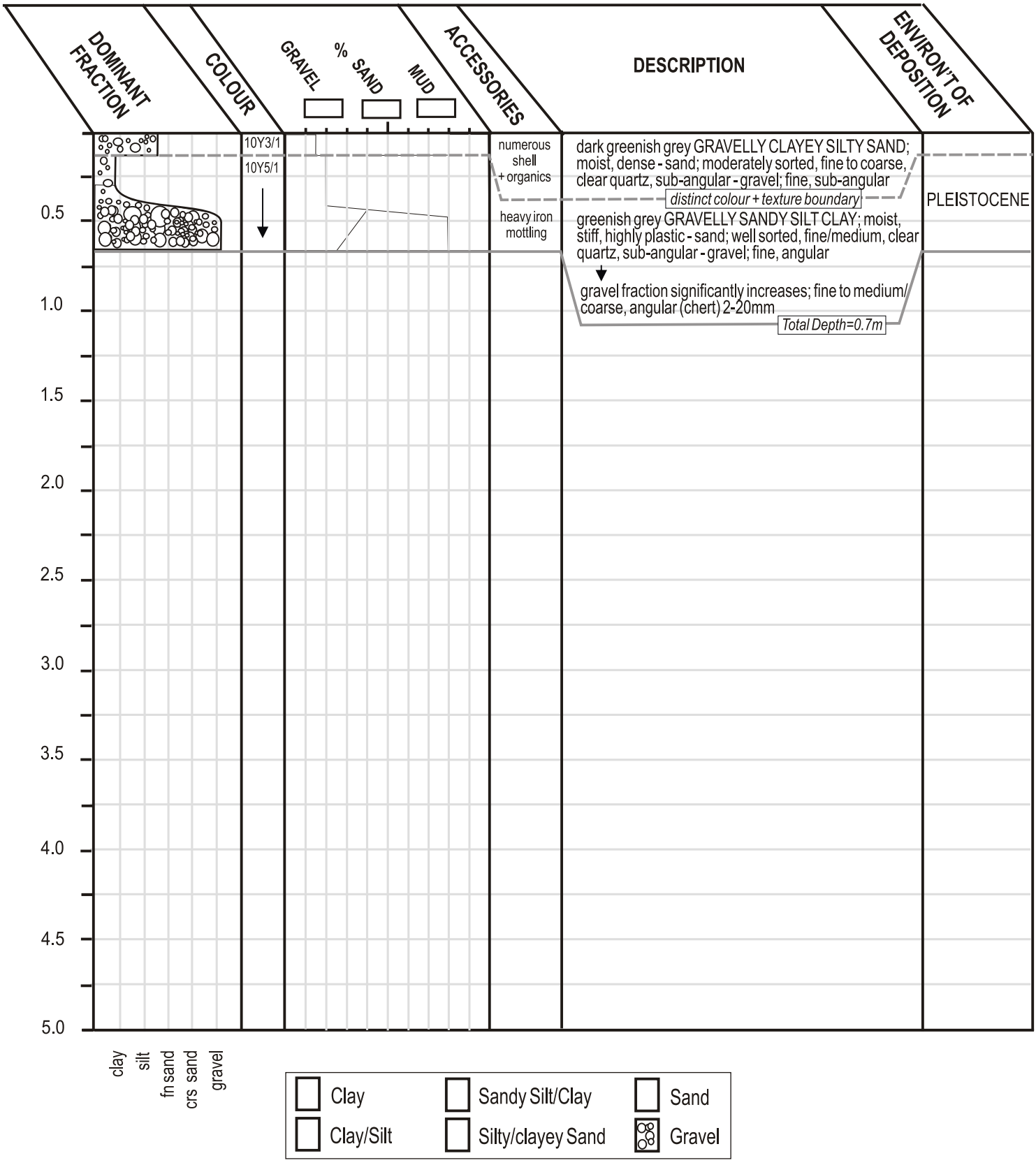
SITE: GC/ BH2A-31

LOCATION: Port of Gladstone
23°46.178 **S** 151°11.200 **E**
R.L. 4.7 m L.A.T. (Port Datum)

DATE: 31/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-32

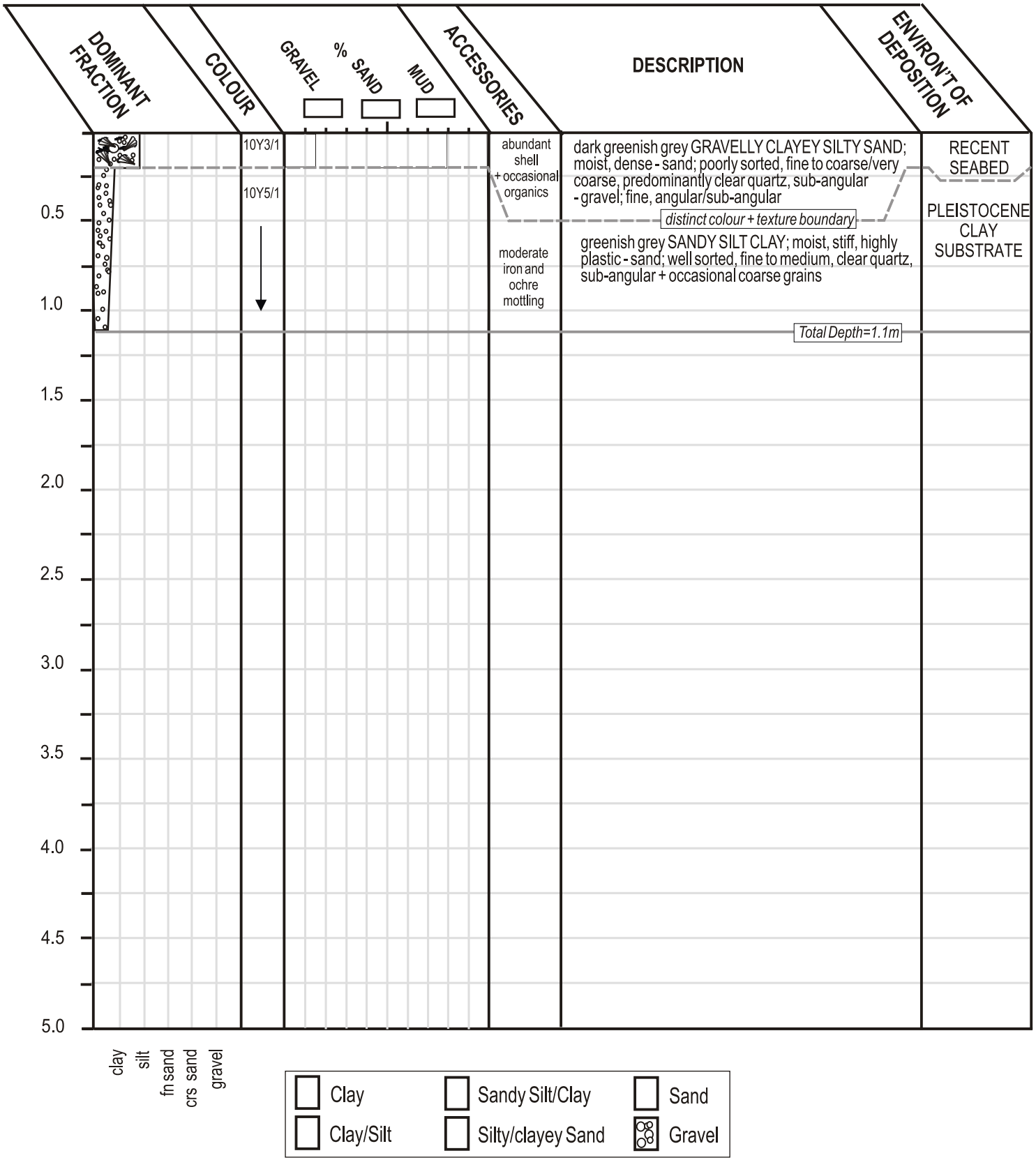
SITE: GC/ BH2A-32

LOCATION: Port of Gladstone
23°46.249' **S** 151°11.116 **E**
R.L. 5.1 m L.A.T. (Port Datum)

DATE: 31/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-33

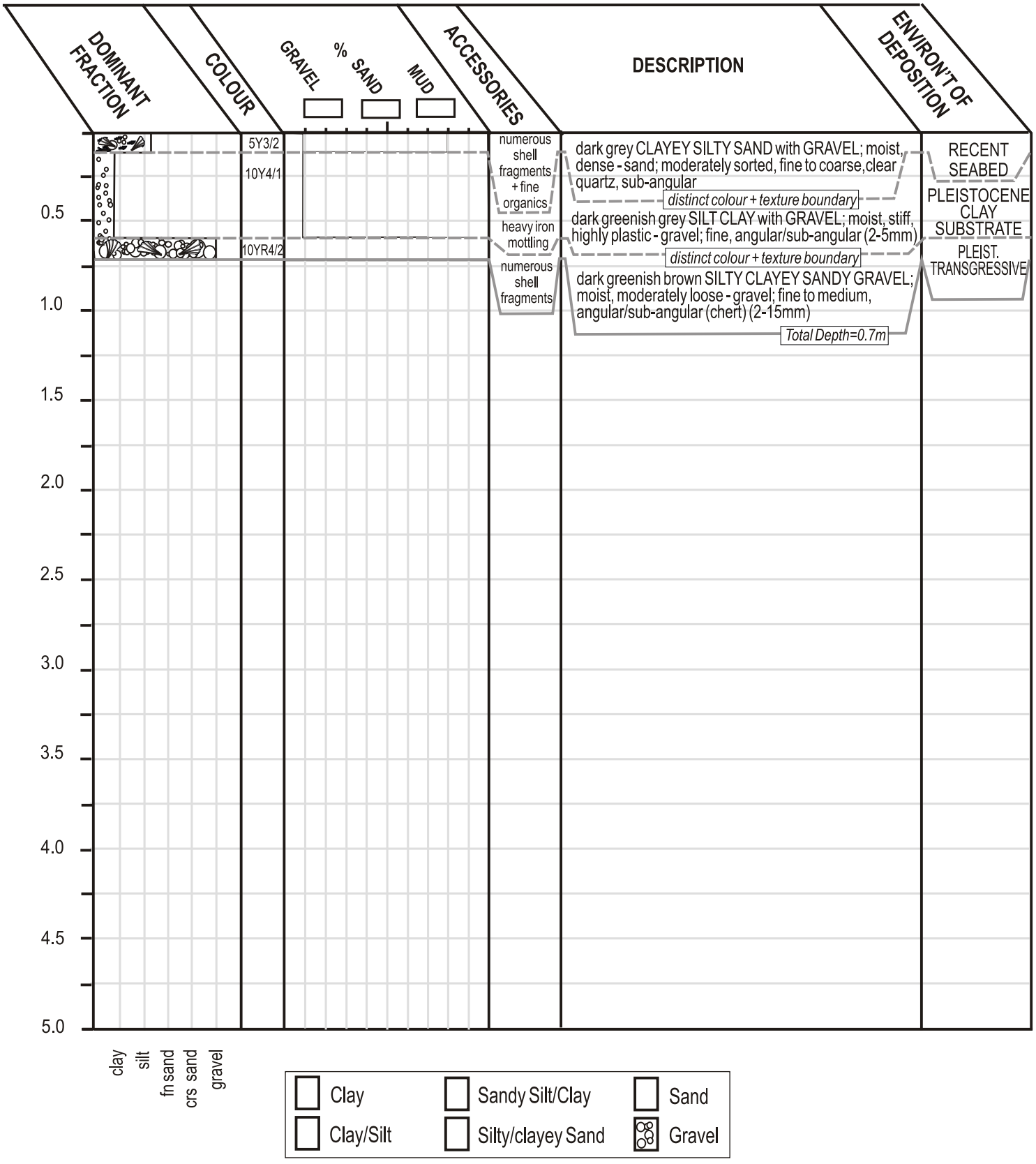
SITE: GC/ BH2A-33

LOCATION: Port of Gladstone
23°46.283' **S** 151°11.216 **E**
R.L. 5.5 m L.A.T. (Port Datum)

DATE: 5/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-34

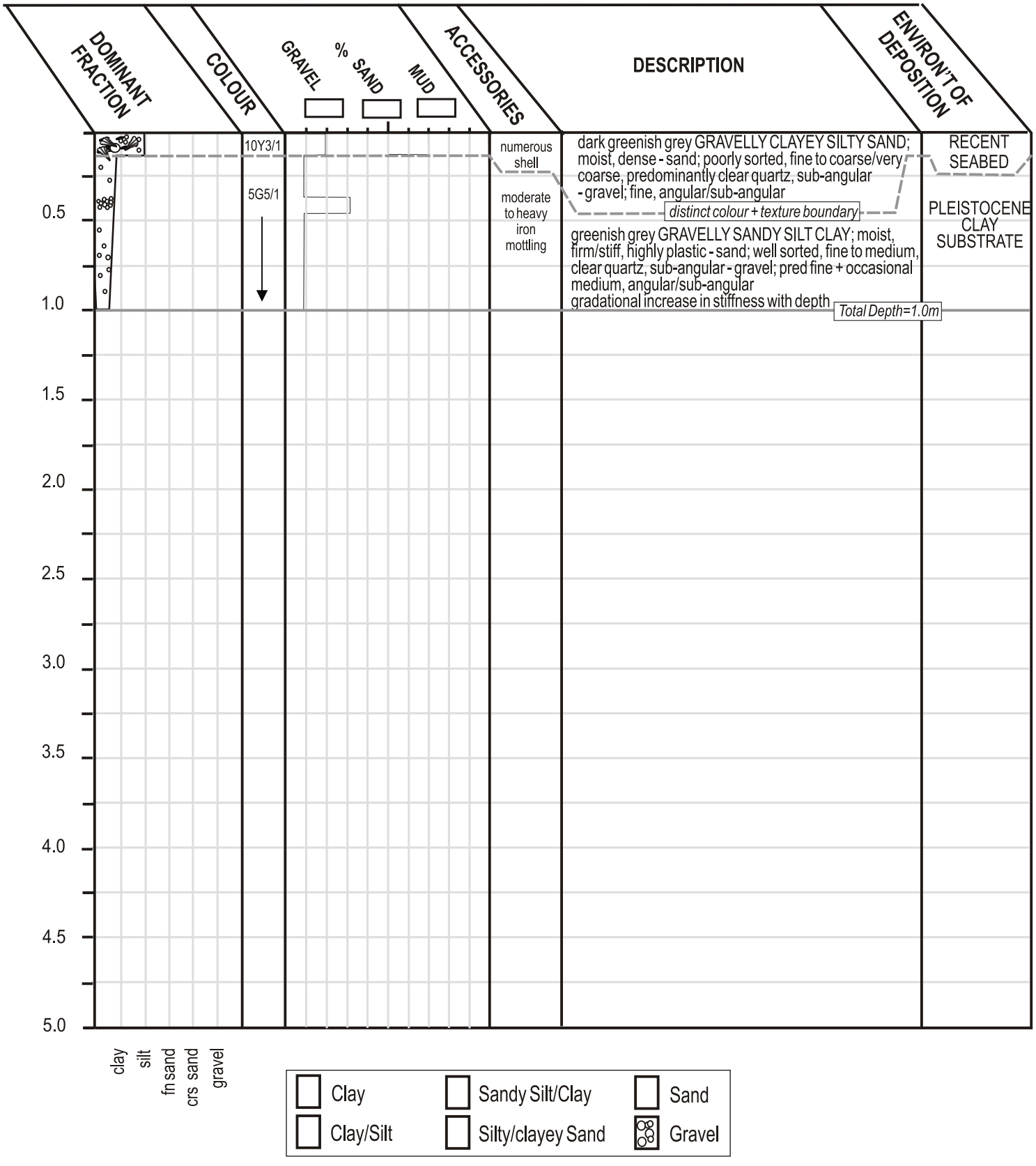
SITE: GC/ BH2A-34

LOCATION: Port of Gladstone
23°46.364' **S** 151°11.209 **E**
R.L. 8.32 m L.A.T. (Port Datum)

DATE: 30/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



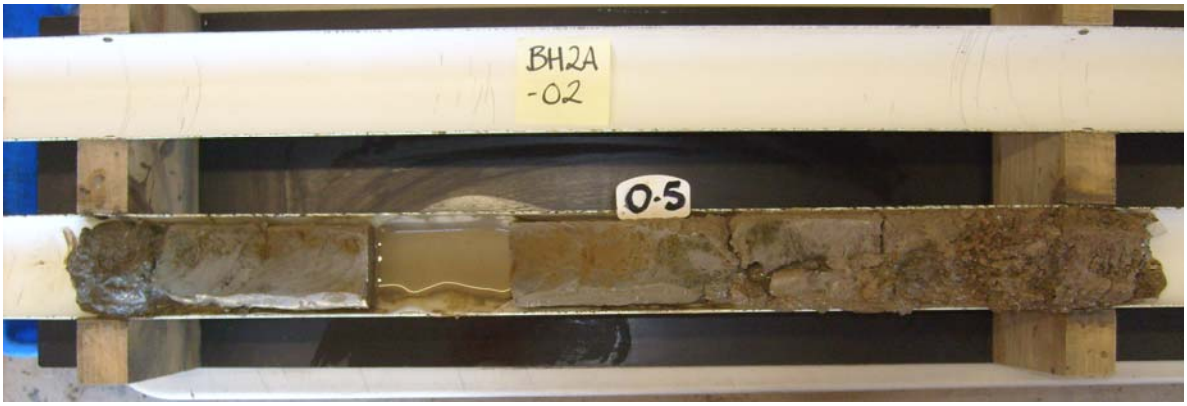
GEO COASTAL Australia

REPORT OF PHOTOGRAPHS: BH2-A 02

CLIENT: Worley Parsons
PROJECT: Laird Point Dredging Study
LOCATION: Dredge Footprint - Option 2A
JOB NO: 097633052

SURFACE RL: 4.6m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 0.90m

DRILL RIG: Small barge ('The Crab')
DRILLER: GeoCoastal
CHECKED: HP DATE: 28/08/2009

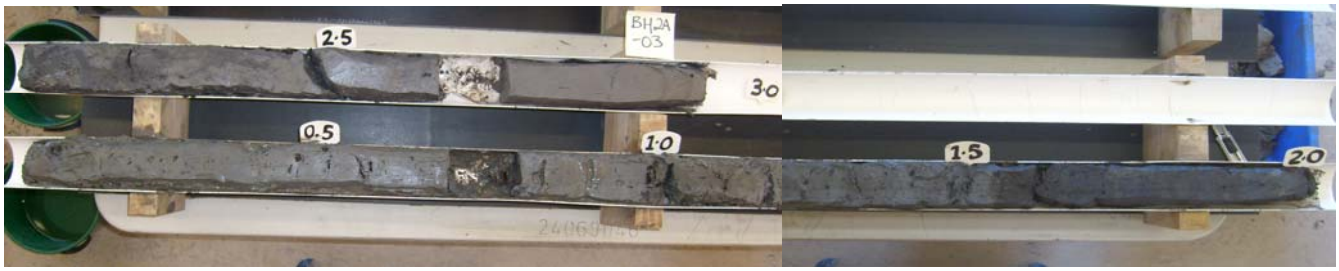


REPORT OF PHOTOGRAPHS: BH2-A 03

CLIENT: Worley Parsons
PROJECT: Laird Point Dredging Study
LOCATION: Dredge Footprint - Option 2A
JOB NO: 097633052

SURFACE RL: 1.1m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 2.90m

DRILL RIG: Small barge ('The Crab')
DRILLER: GeoCoastal
CHECKED: HP DATE:28/08/2009



REPORT OF PHOTOGRAPHS: BH2-A 14

CLIENT: Worley Parsons
PROJECT: Laird Point Dredging Study
LOCATION: Dredge Footprint - Option 2A
JOB NO: 097633052

SURFACE RL: 6.2m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 1.00m

DRILL RIG: Small barge ('The Crab')
DRILLER: GeoCoastal
CHECKED: HP DATE: 28/08/2009



REPORT OF PHOTOGRAPHS: BH2-A 16

CLIENT: Worley Parsons
PROJECT: Laird Point Dredging Study
LOCATION: Dredge Footprint - Option 2A
JOB NO: 097633052

SURFACE RL: 0.9m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 2.20m

DRILL RIG: Small barge ('The Crab')
DRILLER: GeoCoastal
CHECKED: HP DATE:28/08/2009



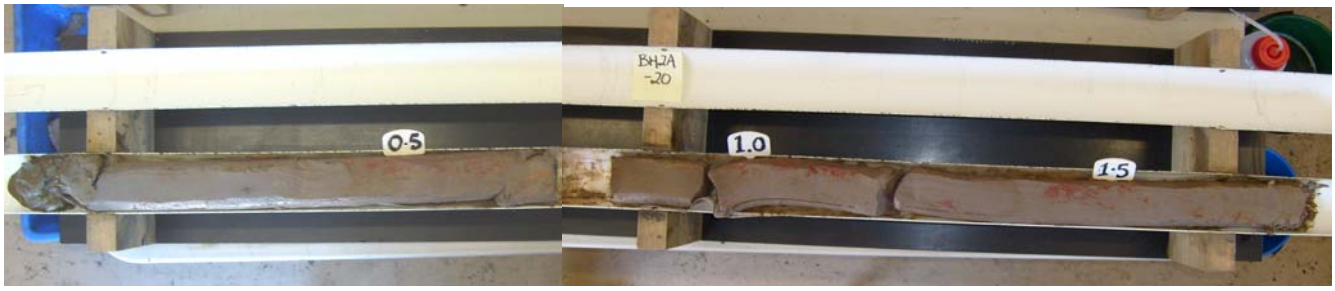


REPORT OF PHOTOGRAPHS: BH2-A 20

CLIENT: Worley Parsons
PROJECT: Laird Point Dredging Study
LOCATION: Dredge Footprint - Option 2A
JOB NO: 097633052

SURFACE RL: 5.4m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 1.80m

DRILL RIG: Small barge ('The Crab')
DRILLER: GeoCoastal
CHECKED: HP DATE: 28/08/2009

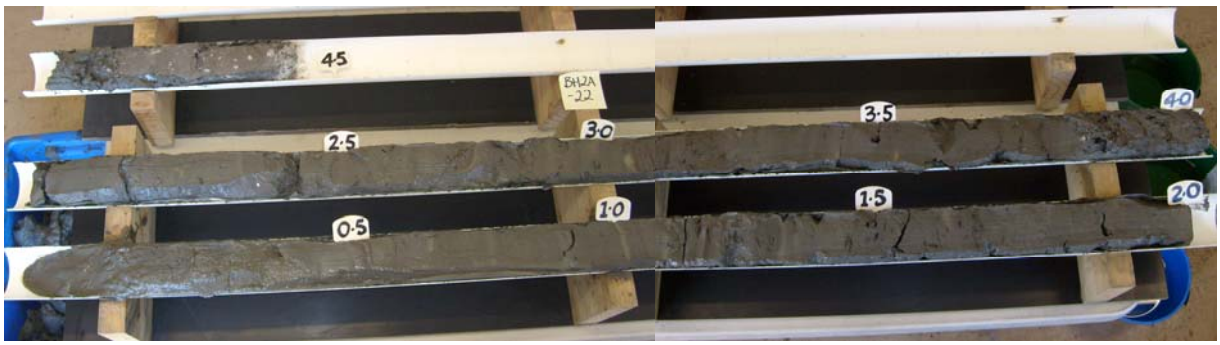


REPORT OF PHOTOGRAPHS: BH2-A 22

CLIENT: Worley Parsons
PROJECT: Laird Point Dredging Study
LOCATION: Dredge Footprint - Option 2A
JOB NO: 097633052

SURFACE RL: -0.7m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 4.40m

DRILL RIG: Small barge ('The Crab')
DRILLER: GeoCoastal
CHECKED: HP DATE:28/08/2009



REPORT OF PHOTOGRAPHS: BH2-A 27

CLIENT: Worley Parsons
PROJECT: Laird Point Dredging Study
LOCATION: Dredge Footprint - Option 2A
JOB NO: 097633052

SURFACE RL: 5.1m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 1.30m

DRILL RIG: Small barge ('The Crab')
DRILLER: GeoCoastal
CHECKED: HP DATE: 28/08/2009



REPORT OF PHOTOGRAPHS: BH2-A 33

CLIENT: Worley Parsons
PROJECT: Laird Point Dredging Study
LOCATION: Dredge Footprint - Option 2A
JOB NO: 097633052

SURFACE RL: 5.5m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 0.7m

DRILL RIG: Small barge ('The Crab')
DRILLER: GeoCoastal
CHECKED: HP DATE:28/08/2009



Appendix 2 Acid Sulfate Soils Investigation Laird Point Dredge Study Option 2A (Prepared by Golder Associates)

October, 2009

REPORT

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REPORT ON

ACID SULFATE SOILS INVESTIGATION LAIRD PT DREDGE STUDY OPTION 2A GLADSTONE, QUEENSLAND

Submitted to:
WorleyParsons (Resources & Energy)
PO Box 15081,
City East, Brisbane,
Queensland, 4002

Report Number: 097633052 003 Rev1

Distribution:

2 Copies (1 Electronic) - WorleyParsons

Golder Associates

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1.0 INTRODUCTION

1.1 Background

Golder Associates Pty Ltd (Golder) were commissioned by WorleyParsons (WP) to undertake sampling for Acid Sulfate Soils (ASS) and potential contaminants in bottom sediments from a proposed dredging footprint 'Option 2A', located off Laird Point in central Queensland. The Option 2A footprint lies adjacent to the west coast of Curtis Island, south of Laird Point.

Golder has undertaken an assessment of ASS, however, assessment of contaminants has been conducted by others.

Following completion of the planned sampling and analysis program, the proposed shape and extent of the Option 2A footprint was modified and moved westward away from the coast of Curtis Island. The extent of the amended footprint (outlined in yellow) and the former footprint (outlined in white dashes) are indicated on Figure 1.

The purpose of the ASS investigation was to assess the extent of any Potential Acid Sulfate Soil (PASS) existing in Holocene sediments proposed for dredging from within the Option 2A footprint.

A separate ASS assessment has been undertaken by Golder for an alternate dredging footprint Option 1B (part), located further to the west of Option 2A, and is reported in Golder Report 097633052-005.

1.2 Limitations

The assessment was originally limited to undertaking sampling at approximately 20% of the locations that would normally be required for ASS investigations under the terms of the State Planning Policy 2/02 Guideline "Planning and Managing Development involving Acid Sulfate Soils" (SPP 2/02). The basis of 20% of 'normal' site coverage under the terms of the National Assessment Guidelines for Dredging NAGD (2009) has been proposed by the final preparer of the Environmental Impact Statement (EIS), as sufficient site coverage for a 'pilot study' for Option 2A. The same basis of approximately 20% of 'normal' site coverage under the terms of the QASSIT Sampling Guideline for ASS (1997), which is based on disturbance area, was adopted by Golder as the minimum site coverage for a preliminary ASS investigation, and is also consistent with the 'pilot study' approach adopted for the contaminant assessment for Option 2A. For the investigation area proposed originally (approximately 90ha) this was thirty four (34) sampling locations. This was the number of sampling locations adopted for the investigation, with an 'overlap' of the Option 2A and Option 1B footprints of approximately 5% of the area, resulting in two ASS sampling locations being common to both footprints and thus included in the ASS assessment report(s) for both footprint options. However, following the recent amendment to the location and extent of Option 2A, the area has increased to approximately 118ha, and the footprint includes an area of approximately 20ha at the southern end, in which sampling has not been undertaken. Also as a result of moving the footprint to the west, 8 of the coring locations now lie outside of the footprint by between 20m and 120m.

2.0 SITE DESCRIPTION

Dredging of the footprint that is eventually chosen will be required to deepen the seabed to allow access by heavy shipping. The ASS assessment is required for the preparation of an EIS for the overall project, to be prepared by others. There are two alternate locations proposed for the dredge footprint, Option 2A (considered in this report), and Option 1B (part). The two footprints overlap where they adjoin the Materials Handling Facility (MOF) to be constructed on Curtis Island.

Option 2A is situated west of and adjacent to Curtis Island and to the east of a small island (North Passage Island) in the channel between Curtis Island and the mainland. The footprint is elongated and runs approximately north – south. The existing seabed dips from both the east (Curtis Island) and the west (North Passage Island).

The amended Option 2A footprint has moved west by up to 120m, and the seabed level varies from approximately 1m Lowest Astronomical Tide (LAT) on the eastern edge, down to -6m LAT, then back up to 1m LAT along the western most edge near North Passage Island.

Prior to undertaking field investigations, two figures were provided by WP, showing the proposed locations and extent of the dredge footprint options and including the locations of two deeper turning basin circles, situated within each dredge footprint. The layout and location of Option 2A was amended following completion of investigations and the amended Option 2A is shown in Figures 1-3 of this report, along with the previous Option 2A footprint.

3.0 EXTENT OF PROPOSED DREDGING

It is understood that the maximum dredging depth within the seabed will be to -13m LAT inside the turning basin circles, and 8.5m LAT in other areas within the Option 2A footprint. This is the basis that was adopted for preparation of the field sampling program. It has not been determined at this time which of the two options will be adopted for the final dredging operation, so both possible footprints required investigation.

If Option 2A is adopted, the dredging depth within the turning basins would be approximately 10.5m to reach -13m LAT, dredging in areas outside of the turning basin circles would be to -8.5m LAT. A total of approximately 12,930,000 m^3 of spoil would be disturbed if the Option 2A is adopted (calculated spoil volume provided by WP.

ASS occur generally within Holocene age sediments (6,500 – 10,000 years old). It was anticipated that the Holocene layer, likely to contain ASS, would be generally shallow (i.e. average 3-4m thick) and deepest along the eastern edge of the footprint, nearest to Curtis Island. Where Holocene sediment was present through the full depth of the sediment profile, the cores were to be extended an additional 1m in depth to conform to SPP 2/02 sampling requirements. Therefore cores were progressed to a minimum depth of approximately -14m LAT within the turning basin circles, and -9.5m LAT in other areas, unless shallower Pleistocene sediments and/or residual soils are encountered. However, investigations indicated that the actual Holocene thickness was considerably less than anticipated, i.e. maximum of 4.1m (at one location only) and on average less than 1m resulting in much shorter cores than expected.

The final fate/use of the dredge spoil cannot be confirmed at this time until the results of the contaminant investigation are known. However, for purposes of developing preliminary ASS management strategies, disposal on land has been assumed.

4.0 REGIONAL GEOLOGY & GEOMORPHOLOGY

4.1 Regional Geology

The onshore geology of the region is presented on published geological maps; however, the offshore geology of the region is not available. The Queensland Department of Mines “Geology of the Rockhampton and Port Clinton 1:250 000 Sheet Areas” indicates that Curtis Island is underlain by the Lower Palaeozoic Wandilla Formation of the Curtis Island Group. Regionally, the formation consists of layered, interbedded mudstone with subordinate arenite and minor chert. The bedding is steeply dipping and is orientated north-west/south-east parallel to the prevailing regional lineament. The parent geology of the Wandilla Formations extends to the seabed underlying the Option 2A footprint.

The Sheet also indicates the presence of Quaternary aged Holocene alluvial deposits comprising gravel, sand, silt and clay in areas of the site immediately adjacent to the island coastline and extending at shallow depth out into the channel within the Option 2A footprint.

Graphical depictions of the stratigraphy are included as Figures 4a and 4b and described in Table 1 below.

Table 1: Description of Typical Geological Units

Formation	Location
Holocene Alluvium - Soft Silts and Clays layered with loose Sands and Gravels	Extending from tidal mudflats into the eastern edge of northern and central footprint.
Wandilla Formation Mudstone, Greywacke, Chert	Underlies the entire footprint and emerges at some locations as areas of chert cobbles.

4.2 Geomorphology Related to Origins of ASS

Pyritic soils or ASS, were deposited in coastal zones throughout the world during the last 6,500 to 10,000 years. When drained for development or otherwise disturbed, the iron pyrite in these sediments oxidises producing sulfuric acid which subsequently lowers the pH in runoff and groundwater, leading to the release of toxic aluminium and iron from the sediments. Acidic water introduced into coastal streams can cause fish kills, alterations to ecosystems and corrosion of civil structures. The source of the acid is naturally occurring pyrite (FeS_2). Environmental degradation occurs when this pyrite oxidises and sulfuric acid is produced and discharged into receiving waters.

The geological sequences most likely to contain ASS relate primarily to deposition that has occurred in the Holocene epoch and in some circumstances deposits from the penultimate interglacial high sea level period in the late Pleistocene period (ca. 125,000 years). On Curtis Island, and extending into the Option 2A footprint, Holocene age deposition is characterised mainly by silt/clay sediments associated with former mangrove areas which fill embayments within the bedrock geological template of the underlying Wandilla Formation. The depth of Holocene sediments has proved to be relatively shallow, and is less than 0.5m deep (or even absent) within the western half of the Option 2A footprint.

Pre-Holocene sequences at most sites are residual soils of older age, and therefore do not present inherent ASS forming conditions. This is supported generally by consistent negligible potential acidity results in residual soils tested. An important exception to this general rule is the phenomenon that has been reported at a number of locations in Queensland, where a shallow zone of discolouration occurs immediately below the surface of these pre-Holocene clays. This phenomenon is interpreted as a zone of infiltration by overlying Holocene-age interstitial water and can include limited physical intermixing where the sediments are soft enough. This phenomenon is observed at a number of sample locations, mostly located along the edge of Curtis Island (some now located just out side of the amended Option 2A footprint). There was evidence of previous mangrove/vegetation growth in the soil structure. The Pleistocene clays which underlie the Holocene layer contains only low levels of ASS derived acidity, except where the ‘mixing zone’ is present at the base of the softer Holocene layer. In this region, intermixing of sediments and possible intrusion of Holocene ASS has occurred via former mangrove root channels into the top 0.5-1m or so of the Pleistocene layer.

These zones have been previously found to have inherited potential acidity from overlying sediments, and generally appear devoid of any carbonate buffering capacity to neutralise this effect. This was observed at six locations, at BH2A 1, BH2A 4, BH2A 7, BH2A 9, BH2A 13 and BH2A 29, where penetration of pre-Holocene clays has produced positive SPOS results of up to 0.90%. Generally this infiltration effect is confined to the upper 0.5-1.0m of the pre-Holocene substrate.

Determination of the local upper Pleistocene and Holocene sedimentary sequences was part of the objective of the investigation program undertaken and reported herein, as this relates directly to the vertical extent of ASS and any required management measures.

5.0 INVESTIGATION METHODOLOGY

5.1 Desk Top Study

A brief desktop study of the site has been undertaken. The work was undertaken to meet part of the requirements of assessment of ASS set down in the SPP 2/02.

The desktop study included review of soil landscapes (geomorphology), site geology and potential ASS conditions in the area. The scope of the study was limited to interpretation of available published maps, aerial photographs and existing soil data from previous studies (where available), with respect to preliminary drawings of the site.

Reference material includes:

- State Planning Policy 2/02 Guideline - "Planning and Managing Development Involving Acid Sulfate Soils";
- QASSIT - "Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland - 1998";
- A Guide to the Influence of Parent Material on Soil Distribution in Eastern Australia "Parent Material and Soils (DLWC Technical Report No. 45)" - 1999;
- Geology of the Rockhampton and Port Clinton 1:250 000 Sheet;
- Figures showing 'original outline' of Dredge Option 2A footprint and bathymetry – "Laird Point, Case B, Option 2A, July 2009, Fig 12 rev0, and the amended outline of Option 1B, "Dredge Area_ Region, Dredge Areas, 29 September, 2009" (supplied by WP).

5.2 Mapped ASS Layers

Reference to the Department of Natural Resources Mines (DNR & M) [now Department of Environment and Resource Management] Map for the "Tannum Sands – Gladstone Area (QNRM04285)" was undertaken; however, islands (including Curtis island and surrounds) are not surveyed as part of that mapping program. As such, the site is mapped as "Not Assessed".

5.3 Previously Identified Areas of ASS

Reference to the DNR & M report "Acid Sulfate Soils, Tannum Sands – Gladstone Area, Central Queensland Coast - 2004" indicates that the majority of land containing ASS in the Gladstone area is generally tidal flats with an elevation of less than 3m AHD. No specific information was included on whether the ASS extended into the adjoining passage. A number of previous studies undertaken in mudflats areas adjoining Curtis Island have also indicated the presence of very high levels of potential acidity (more than 5% oxidisable sulfur) in shallow Holocene sediments.

5.4 Receiving Environment

The aquatic receiving environment comprises the immediate channel and fringe of the Pacific Ocean. This includes aggregated Sea Grass meadows, with regional receiving waters including the Great Barrier Reef Marine Park and a Dugong Protected Area (DPA) which includes the majority of the immediate Gladstone Port area. The Great Barrier Reef Marine Park extends from mainland east and north-east and includes, General Use, Island Cay, and Marine National Park and Habitat Protection Zones near Curtis Island. Declared Fish habitats also exist within about 15km of the project area (to the south).

5.5 Potential Impacts

During dredging, excavations in the shallow Holocene sediment layer and immediately underlying Pleistocene clays could result in oxidation of PASS and the migration of acidic fines into receiving waters. Depending on specific location, this includes the top 1-4m of spoil.

Where any disturbance of confirmed ASS is required, specific management measures will need to be developed and carefully followed, in order to prevent generation of acid run off.

6.0 SAMPLING PROGRAM

The information collected from the desktop study was used in part as the basis of assessment of the likely extent of ASS/PASS materials within the proposed dredge footprint, and the associated risk of disturbance in these areas.

6.1 Equipment

Golder engaged GeoCoastal, an integrated company with scientific expertise and specialised marine coring equipment and vessels, to undertake the overwater coring. GeoCoastal utilised vacuum-vibrocoring techniques which enabled the recovery of a continuous core of all sedimentary media including unconsolidated sediments such as flowing sands. The method prevented cross contamination or vertical mixing of samples and enabled the collection of a high volume of sample for multiple analyses and sub-sampling.

GeoCoastal's vacuum-vibrocoring system is mounted on a dumb barge/support vessel combination. The vibrocoring system uses a thin-wall (2mm) stainless steel barrel to collect continuous, undisturbed sediment cores of 70mm diameter, which is extruded into plastic sheathing for transport back to shore for processing in a controlled environment. The core barrel is thoroughly washed by a combination of high pressure water and air combined with vibration between coring runs. On average, recovery of better than 95% was achieved throughout the sampling program.

The vessel and marine coring equipment was relocated around the dredging site using a differential GPS (accurate to ± 3-5m), to locate the borehole sites.

6.2 Sampling Plan

The dredge footprint proposed originally was approximately 90ha in area, including an area of approximately 6ha common to the Option 1B footprint, which has been assessed separately by Golder. Golder attempted to evenly distribute sampling points, while first allowing for distribution of the 8 common contaminant sampling locations (BH2A-01 to BH2A-08) using the 'random methods' described in the NAGD. Selected sample locations and investigation depths are presented in Table 2 below, and the locations are also indicated, along with the final amended footprint on Figure 1.

Coring revealed that the Holocene layer was generally very shallow, less than 1.0m at 23 locations, and absent all together at four locations. The deepest deposit was 4.1m at BH2A-22. Overall Holocene recovery was 23.66m of the 62.35m recovered, much shallower than anticipated (i.e. we expected an average of 4m or 136m total). In general, deeper deposits were limited to two areas on the eastern side, one around BH2A-01, BH2A-03, BH2A-04, BH2A-05, BH2A-07, BH2A-09 and BH2A-12, and the other around BH2A-22 and BH2A-23.

The whole western side of the area investigated contained less than 0.5m of Holocene sediment and based on stratigraphy and bathymetry available, it is likely that this paucity of Holocene sediments could extend further into the south-western corner of the amended footprint (an area not investigated).

6.3 Sample Selection for Analysis.

A representative number of sub-samples were selected and subjected to quantitative analyses by the Suspension Peroxide Oxidation Combined Acidity and Sulfate (SPOCAS) or 'improved' Chromium Reducible Sulfur (SCR) analytical test methods. The approach adopted was to undertake analysis of sediments at approximately 0.5m vertical intervals (in accordance with QASSIT methodology) in at least 25% of the locations sampled (i.e. in 9 locations) and carry out less intensive analysis on the remaining cores, at a rate of 1 test per 1-2m of core (depending on results of sampling). In this manner, some cores where screening indicates a complete absence of ASS were omitted.

Generally, at least one sample of Holocene material was analysed from each location (only BH2A-02 and BH2A-33 did not have quantitative samples selected). Due to the overall limited depth of Holocene, slightly fewer samples were recovered for analysis. Some samples from the Pleistocene layer were included for analysis where the Holocene layer was less than 0.5m thick, to increase sampling numbers in the profile at those locations. In all, 72 samples were selected for quantitative analysis, 37 Holocene and 35 Pleistocene.

The sealed cores were kept refrigerated and returned to land daily for sub-sampling by a scientist from Golder. Sub-samples were collected from the sealed cores in labelled bags. Additional samples were recovered for contaminant analysis (to be reported by others) from the following locations, BH2A-02, BH2A-03, BH2A-14, BH2A-16, BH2A-20, BH2A-22, BH2A-27 and BH2A-33.

Table 2: Investigation Locations and Depths

Sample Location No.	Latitude	Longitude	Depth of Core (m)	Depth of Holocene (m)
BH2A-01	S 23° 45.303'	E 151° 10.651'	3.00	1.80
BH2A-02	S 23° 45.381'	E 151° 10.581'	0.90	0.05
BH2A-03	S 23° 45.332'	E 151° 10.738'	2.90	1.6
BH2A-04	S 23° 45.383'	E 151° 10.692'	3.00	1.9
BH2A-05	S 23° 45.452'	E 151°10.933'	3.60	2.4
BH2A-06	S 23° 35.473'	E 151° 10.582'	2.40	0.0
BH2A-07	S 23° 345.476	E 151° 10.782'	2.40	1.0
BH2A-08	S 23° 45.507'	E 151° 10.689'	1.20	0.05
BH2A-09	S 23° 45.506'	E 151° 10.867'	3.10	1.6
BH2A-10	S 23° 45.574'	E 151° 10.741'	1.20	0.0
BH2A-11	S 23° 45.577'	E 151° 10.842	1.80	0.8
BH2A-12	S 23° 45.601'	E 151° 10.947'	2.30	1.4
BH2A-13	S 23° 45.625'	E 151° 11.060'	1.30	0.25
BH2A-14	S 23° 45.654'	E 151° 10.689'	1.00	0.05
BH2A-15	S 23° 45.679'	E 151° 10.811'	0.90	0.0
BH2A-16	S 23° 45.700'	E 151° 10.932'	2.20	0.1
BH2A-17	S 23° 45.735'	E 151° 11.046'	2.55	1.00
BH2A-18	S 23° 45.749'	E 151° 11.167'	1.10	0.25
BH2A-19	S 23° 45.761'	E 151° 10.753'	1.30	0.1
BH2A-20	S 23° 45.810'	E 151° 10.899	1.80	0.03
BH2A-21	S 23° 45.825'	E 151° 11.017'	1.40	0.2
BH2A-22	S 23° 45.863'	E 151° 11.143'	4.40	4.1
BH2A-23	S 23° 45.862'	E 151° 11.255	2.00	2.0
BH2A-24	S 23° 45.907'	E 151° 10.874'	1.20	0.1
BH2A-25	S 23° 45.944'	E 151° 11.001'	1.50	0.0
BH2A-26	S 23° 45.958'	E 151° 11.104'	1.70	0.25
BH2A-27	S 23° 46.035'	E 151° 10.970	1.30	0.6
BH2A-28	S 23° 46.037	E 151° 11.087'	1.50	0.1
BH2A-29	S 23° 46.057'	E 151° 11.174'	2.00	1.0
BH2A-30	S 23° 46.136'	E 151° 11.066'	1.90	0.6
BH2A-31	S 23° 46.178'	E 151° 11.200'	0.70	0.1
BH2A-32	S 23° 46.249'	E 151° 11.116'	1.10	0.1
BH2A-33	S 23° 46.283'	E 151° 11.216'	0.70	0.03
BH2A-34	S 23° 46.364'	E 151° 11.209'	1.00	0.1

6.4 Analysis Methods

Sub-samples were screened in the Golder laboratory using the pH_F (Field pH) and pH_{FOX} (pH Following Peroxide Oxidation) methods of analyses.

The pH_F/pH_{FOX} screening method consists of two steps; initially determining the field pH of a 1:5 soil/water suspension, followed by the addition of 30% Hydrogen Peroxide, allowing the sample time to oxidise, before determining the pH_{FOX} (pH after oxidation) of the reacted sample. A significant drop in pH is indicative of potential acidity, while a low initial pH is indicative of actual acidity (not anticipated in a fully marine environment).

A representative number of samples selected from the screened samples were sent to ALS Brisbane and subjected to the full SPOCAS or S_{CR} test suites. The latter test method was used on some samples that contained significant amounts of organic matter, which could contain sulfur of organic origin that could artificially 'inflate' the Percent Oxidisable Sulfur (S_{POS}) determined by the SPOCAS method.

The S_{CR} and SPOCAS analysis suites have been adopted by QASSIT for the analysis of ASS in Queensland. These methods include analysis and quantification of naturally occurring alkaline materials (i.e. calcite, coral debris, fine shell fragments) and any 'retained acidity' which includes sulfur held in stable oxidation minerals such as 'jarosite' which was previously not included in the estimate of total potential acidity.

Sulfidic derived acidity had been historically determined using the following equation:

- Total Potential Acidity (TPA) = Total Actual Acidity (TAA) + Total Sulfidic Acidity (TSA)

However, experience has proved that TPA can include acidity of organic and/or mineralogical origin as well as sulfidic origin. Thus an overall acid-base accounting method has been derived to calculate a 'net acidity' value which is used to qualify analytical test results and calculate of liming rates. This equation is:

- 'net acidity' = actual acidity (as TAA) + retained acidity (as S_{NAS}) + Potential Acidity (as S_{Cr} or S_{POS}) - insitu acid neutralising capacity (ANC).

7.0 FIELDWORK

Overwater sampling commenced on 29th July, 2009 and was completed on 6th August. Due to strong winds developing on most afternoons, sampling runs were cut short on several occasions resulting in a total of 3.6 days of 'standby' time for the small barge / rig.

GeoCoastal's vibrocoring system mounted on a mobile barge was used to drill the holes and sample soils. This method produces undisturbed sediment cores of 65mm diameter. Each sheathed vibro-vacuum core was placed onto cleaned PVC half-pipe supports. The top of the sheath was then carefully sliced lengthways to expose sufficient core for logging and sub-sampling.

Logging was conducted in the field by an experienced scientist from GeoCoastal. Characteristics of the sediment including texture, consistency, colour, proportional grain size estimations, presence of accessory material (biological matter, organic debris, shells etc.), were recorded against depth. Stratigraphical soil logs were produced for each core by GeoCoastal for reporting purposes (Appendix A).

All sub-samples collected on site were placed in labelled plastic bags which were sealed and refrigerated until screened, then frozen within 24 hours of screening until laboratory testing was undertaken. ASS screening was undertaken in accordance with current QASSIT requirements.

Sample locations are shown on the Site Plan (Figure 1).

8.0 STRATIGRAPHY

8.1 Holocene Facies

Field investigations revealed that the Holocene layer was generally very shallow (i.e. average depth 1.8m). The Holocene sediments were encountered at the surface of the deposition sequence at the majority of locations (i.e. only absent in BH2A-06, BH2A-10, BH2A-15 and BH2A-25), and predominated in the eastern half of the northern and central portion of the 2A footprint (Figure 2). The deepest deposit encountered was at BH2A-22, midway down the footprint, on the eastern side.

The ultimate Holocene deposit found commonly along the tidal flats of Curtis Island is a fan of silty clays historically washed down from nearby landforms and it is this that is the source of the Holocene alluvium extending to the adjacent seabed.

Some of the deeper deposits have formed in small embayments extending out below the low tide mark along the west coast of Curtis Island, which are no longer actually within the amended Option 2A footprint. These deposits are characteristic of suspension sediment accretion from estuarine/restricted marine settings such as Curtis Island.

The deposits toward the centre and western side of the footprint are regularly scoured by the mid-channel currents, resulting in a very shallow and somewhat sparse layer. Further to the west, the seabed climbs steeply to form the Passage Islands, which due to their linear form, lack any embayments in which to accumulate and/or protect any Holocene deposits. Small embayments such as these can achieve a similar complexity of depositional evolution to a larger embayment, but compressed into shorter distances.

The alluvial soils comprise mainly very dark greenish grey, moist, soft, low to medium plasticity silt/clay sediments. The sediments are ‘unripe’ and are often incorrectly described as ‘marine clays’ because of their high visible shell content, they generally incorporate a high percentage of silt and non-reactive clays. Shell fragments were in evidence from the surface in the majority of cores taken; the exception being those few from the northern most end of the footprint closest to Laird Point. Shell fragments ranged from trace to significant amounts in most samples.

The taxonomy of the sediments was generally quite consistent. Fine to medium textured soils (mainly light to medium clays) were encountered within the Holocene layer. Coarse textured sediments were generally absent, apart from a shallow layer of clayey sand encountered in BH2A-14 and BH2A-24.

The deposits included highly organic, very soft, light clays indicating the previous establishment of mangroves along the fringe of Curtis Island (communities are still in evidence on Curtis Island adjacent to the site). Accretion of the more recent sediments had raised the seabed to within range of mangrove colonisation (i.e. approaching mean sea level) in this area.

Figure 2 depicts the inferred depth of the Holocene layer, by using contours representing the depth of the Holocene PASS layer (within the original 2A footprint), with shading to indicate thickness of the deposit. Orange represent greater than 3m thickness, brown 2.0-3.0m, yellow 1.0-2.0m, green 0.2-1.0m and blue <0.2m.

8.2 Pre-Holocene Facies

The interface of pre-Holocene/Holocene aged sediments is generally characterised by a seaward declining continuation of the residual landscape (of Curtis Island), not encountered other than possibly in BH2A-02. This substrate is generally overlain by Pleistocene aged sediments characteristically composed of dark grey / grey-brown, (or continuing greenish grey consistent with the colour of overlying Holocene layer), clay which are typically stiff to very stiff, moderate to high plasticity, and slightly gravelly in places.

A shallow zone of discolouration immediately below the surface of these clays was observed in a number of the cores. This phenomenon has been observed commonly in Queensland pre-Holocene clays, and is interpreted as a zone of infiltration by overlying Holocene-age interstitial water and in some instances physical intrusion by intermixing where the underlying clays are soft and/or by Holocene sediments intruding

via old mangrove root canals. This observation has significance in the discussion of the distribution of ASS conditions. Pleistocene sediments contain less shell debris, but none the less, fragments and debris are present at a number of locations, particularly at the southern end of the footprint where there was a general absence of overlying Holocene sediments.

The taxonomy of the Pleistocene sediments encountered were generally quite consistent. Fine textured soils (mainly medium and heavy clays). A layer of cobbles interpreted as being part of the parent Wandilla Formation were encountered at very shallow depth in BH2A-02 at the northern end of the footprint. Otherwise coarse textured sediments were generally absent.

The individual soil taxonomy units encountered are described using methods included in the 'Australian Soil & Land Survey Field Handbook' on laboratory test result summaries in Appendix B and in the summary in Table 3.

Graphical sections displaying the of the dredge footprint annotated with TAA and net acidity values for the samples analysed are included as Figures 4a-4b.

9.0 LABORATORY TESTING

The laboratory testing program outlined below was carried out to assess actual and potential ASS conditions in sediments from the footprint area. It was anticipated that the Holocene layer would be between about 2m to 5m in thickness. This proved to be somewhat of an over estimate, as actual thickness ranged from 0.1m to 4.1m (average thickness 1.8m). Thus the overall number of screening sub-samples was less than half what had been planned. As the sediments were saturated, no actual acidity was expected to be detected.

9.1 Preliminary Screening

The pH_F values for samples from all locations generally indicated an absence of actual acidity, and ranged from 4.6 to 9.3, but were generally higher than 6.5, (as expected given the saturated state of the soils and that some samples contain inherent acid buffering capacity, most likely in the form of shell material). During logging and sub-sampling, shells were observed to be present in the soil matrix within the Holocene stratum and upper 'mixing' zone in the Pleistocene stratum at most locations within the western half of the dredge footprint closest to Curtis Island.

Of the 255 sub-samples analysed, 97 were from material logged as Holocene and 158 as Pleistocene. Results of screening also confirmed the absence of any actual or potential acidity in samples from BH2A-10, BH2A-15 and BH2A-25, which were logged as not containing any Holocene material and are unlikely to contain ASS.

Screening indicated that the majority of the Holocene samples returned possible, probable or positive results, with pH_{FOX} ranging from 1.5 to 7.1, but generally less than 4.5. Only samples from BH2A-22 and BH2A-27 to BH2A-34 did not indicate the likelihood of PASS (the latter eight borehole locations [BH2A-27 to BH2A-34] were all located at the southern end of the dredge footprint, in very shallow Holocene). Screening generally confirmed the distinction between the acid forming Holocene stratum (low pH_{FOX}) and the absence of potential acidity in the underlying Pleistocene. However, low pH_{FOX} results in several cores (BH2A-01, BH2A-05, BH2A-07, BH2A-09 and BH2A-11) from below the top of the Pleistocene were interpreted as representative of an infiltration / inter-mixing zone between the Holocene and the softer top of the Pleistocene strata, containing significant residual potential acidity possibly the result of soluble sulfate migration and/or extrusion down voids created by former mangrove roots. The majority of screening results from within the Pleistocene layer returned pH_{FOX} ranging from 5.5 to 8.5.

Tabulations of pH_F/pH_{FOX} screening tests are attached in Appendix B, the benign Pleistocene layer is shown shaded in pale green, and where present, the 'infiltration / inter-mixing' zone between the Holocene and Pleistocene layers is identified by shading in ochre.

9.2 Quantitative Analysis

Sub-samples from approximately 25% of the cores recovered (9) were taken at 0.5m vertical intervals. Sub-samples were recovered from the majority of the remaining cores (21) at approximately 1.0m vertical intervals, based on screening test results. Four cores in which the Holocene layer was effectively absent and screening results were negative were not analysed.

In all, 75 samples were selected to undergo laboratory analysis by the SPOCAS or S_{Cr} test methods. Of these, 42 were Holocene and 33 Pleistocene, in origin. Eleven (11) of the Pleistocene samples originate from the Holocene/Pleistocene 'infiltration mixing' zone. Results of laboratory testing are included in Appendix B and summarised in Table 3.

The results are compared to the 'Action Criteria' for disturbances of more than 1000 tonnes of material (i.e. 18 moles of acid / tonne). Values shown in **bold** exceed the adopted action criterion.

Table 3: Quantitative Analysis Results

Location	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}
Holocene Layer						
BH2A-01 0.00-0.50m	<2	245	LMC, dk grey, orgs	1.21*	**590**	--*
BH2A-01 0.50-1.00m	<2	266	MC, dk grey, orgs	1.44*	**720**	--*
BH2A-01 1.00-1.50m	<2	--	MC, dk grey, trace orgs	1.18	**680**	2.1
BH2A-01 1.50-1.80m	<2	--	MC, dk grey, trace orgs	1.91	**1180**	1.9
BH2A-03 0.00-0.25m	<2	212	LMC, dk grey, org	1.88*	**1030**	--*
BH2A-03 1.25-1.60m	5	--	LMC, dk grey, org	1.19	**749**	1.9
BH2A-03 2.50-2.75m	<2	--	HC, dk grey	0.69	**335**	2.5
BH2A-04 0.50-0.75m	<2	170	MC, dk grey, org	1.48*	**809**	--*
BH2A-05 0.50-0.75m	4	--	MC, dk grey, orgs	1.50*	**941**	--*
BH2A-05 1.75-2.00m	4	--	MC, dk grey, orgs	1.52*	**951**	--*
BH2A-05 2.40-2.75m	<2	--	MHC, dk grey	0.85	**489**	2.4
BH2A-07 0.25-0.50m	7	--	LMC, dk grey, org	1.70*	**1070**	--*
BH2A09 0.00-0.50m	<2	546	LC, dk grey, orgs, shell	1.39	<10	7.5
BH2A-09 0.50-1.00m	<2	320	LC, dk grey, orgs, shell	1.68*	**832**	--*
BH2A-09 1.00-1.60m	<2	278	LC, dk grey, orgs, shell	1.78*	**924**	--*
BH2A-11 0.25-0.50m	<2	237	LMC, dk grey, orgs, shell	1.76*	**942**	--*
BH2A-11 0.80-1.0m	<2	--	MC, dk grey, trace orgs	1.08	**584**	2.3
BH2A-12 1.00-1.25m	11	--	MC, dk grey, trace orgs	2.70	**1700**	2.0
BH2A-12 1.40-1.75m	<2	--	HC, dk grey	1.47	**828**	2.2
BH2A-13 0.00-0.25m	<2	--	LC, dk grey, orgs, shell	0.72	**301**	2.6
BH2A-16 0.00-0.10m	<2	--	LMC, dk grey, shells	0.48	**100**	6.1
BH2A-17 0.00-0.5m	<2	1040	LMC, dk grey, orgs, shell	1.94*	**515**	--*
BH2A-17 0.50-1.0m	<2	--	MC, dk grey, orgs, shell	2.38	**1280**	2.0
BH2A-18 0.00-0.25m	<2	712	LMC, dk grey, orgs, shell	0.52*	<10	--*
BH2A-19 0.00-0.10m	<2	1450	LMC, dk grey, orgs, shell	0.07*	<10	--*
BH2A-21 0.00-0.20m	<2	413	MC, dk grey, orgs	0.24*	<10	--*
BH2A-22 0.00-0.25m	<2	371	LMC, dk grey, org, shell	1.14*	**462**	--*
BH2A-22 1.75-2.00m	<2	--	LMC, dk grey, trace orgs	1.15	**512**	2.4
BH2A-22 3.00-3.25m	<2	--	LMC, dk grey, trace orgs	1.13	**510**	2.4
BH2A-23 0.00-0.50m	<2	1320	LMC, dk grey, orgs, shell	0.76*	<10	--*
BH2A-23 0.50-1.00m	<2	--	MC, dk grey, trace orgs	0.92	**448**	2.3
BH2A-23 1.00-1.50m	<2	--	MC, dk grey	1.09	**557**	2.3
BH2A-23 1.50-2.00m	20	--	MC, dk grey	1.74	**1110**	1.9
BH2A-24 0.00-0.10m	<2	2910	CS, dk grey, orgs, shell	0.17*	<10	--*
BH2A-26 0.00-0.25m	<2	192	LC, dk grey, org, sand	0.48*	**170**	--*
BH2A-27 0.25-0.60m	<2	952	LC, dk grey, org's, shell	0.34	<10	7.9
BH2A-28 0.00-0.10m	<2	254	LC, grey, shells	0.10	<10	7.9
BH2A-29 0.00-0.50m	<2	309	LC, dk grey, organics	0.58*	**159**	--*
BH2A-30 0.25-0.60m	<2	914	LC, dk grey, sand, shell	0.57	<10	7.9
BH2A-31 0.00-0.10m	<2	470	CS, dark grey, shells	0.90	<10	8
BH2A-32 0.00-0.10m	<2	1560	LC, grey, sand, org's, shell	0.09*	<10	--*
BH2A-33 0.00-0.25m	<2	203	LC, dk grey, sandy	0.02	<10	8.3
Averages	<2	365	Fine to Medium Textured	1.05	**513**	n/a

Table 3 (Cont.): Quantitative Analysis Results

Location	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}
Holocene/Pleistocene Intrusion						
BH2A-01 1.80-2.25m	<2	--	MHC, dk grey	0.74	**390**	2.5
BH2A-01 2.25-3.00m	<2	--	HC, dk grey	0.34	**155**	3.1
BH2A-04 1.90-2.25m	<2	--	HC, dk grey	0.87	**494**	2.1
BH2A-07 1.50-1.75m	<2	-	HC, dk grey	0.76	**391**	2.4
BH2A-07 2.25-2.40m	<2	-	HC, dk grey	0.43	**197**	2.8
BH2A-09 1.60-2.00m	<2	--	LMC, dk grey	0.52	**261**	3.1
BH2A-09 2.00-2.25m	<2	--	MC, grey	0.44	**212**	3.0
BH2A-09 2.50-2.75m	<2	--	MC, grey	0.90	**502**	2.3
BH2A-13 0.25-0.50m	<2	--	MC, grey & red-brown	0.23	**83**	3.6
BH2A-29 0.50-1.00m	<2	127	LC, dk grey	0.85	**92**	6.7
BH2A-29 1.00-1.50m	<2	--	MHC, grey & red-brown	0.27	**80**	4.3
Averages	<2	12	Fine Textured	0.58	**260**	n/a
Pleistocene Layer						
BH2A-06 0.00-0.50m	4	--	LMC, grey & brown	<0.02	11	5.6
BH2A-06 0.50-1.00m	5	--	MHC, grey & brown	<0.02	<10	5.6
BH2A-06 1.00-1.50m	8	--	MHC, grey & brown	<0.02	<10	5.7
BH2A-06 1.50-2.00m	6	--	HC, grey & brown	<0.02	<10	5.9
BH2A-06 2.00-2.40m	7	--	HC, grey & brown	<0.02	<10	5.8
BH2A-08 1.00-1.20m	14	-	MC, grey & red-brown	<0.02	12	5.3
BH2A-10 0.75-1.00m	13	--	LMC, dk grey & red-brown	<0.02	16	5.6
BH2A-14 0.25-0.50m	<2	--	MC, grey & red, some gravel	<0.02	<10	6.2
BH2A-15 0.00-0.50m	<2	<10	MC, grey & red-brown	<0.02	<10	6.8
BH2A-15 0.50-0.90m	5	--	MC, grey & red-brown	<0.02	<10	6.4
BH2A-17 1.00-1.5m	<2	48	MC/HC, dk grey	0.12	<10	6.7
BH2A-18 0.75-1.10m	19	--	HC, lt grey & or'ge-brown	0.02	**34**	4.6
BH2A-20 1.25-1.50m	30	--	HC, grey/red-brown	<0.02	**30**	4.8
BH2A-25 0.00-0.50m	<2	50	HC, dk grey & or'ge brown	<0.02	<10	6.7
BH2A-25 0.50-1.00m	<2	--	MC, grey & or'ge-brown	<0.02	16	5.5
BH2A-25 1.00-1.50m	<2	--	MC, grey & red brown	<0.02	15	5.2
BH2A-26 1.50-1.70m	<2	66	HMC, grey & lt brown	<0.02	<10	7.4
BH2A-28 1.25-1.50m	24	--	MC, grey & red, sand, gravel	<0.02	**32**	4.9
BH2A-29 1.50-2.00m	<2	40	MHC, grey & red, gravel	<0.02	<10	7.2
BH2A-32 0.10-0.50m	<2	169	LMC, grey & red-brown	0.04	<10	7.9
BH2A-32 0.50-1.10m	<2	34	MC, grey & red, sand & gravel	0.02	<10	7.3
BH2A-34 0.1-0.25m	<2	622	LC/CS, dk grey, sandy	0.12	<10	8.3
Averages	<2	51	Fine Textured	<0.03	11	n/a

NOTE: TAA - Total Actual Acidity, ANC_E – Excess Acid Neutralising Capacity, S_{POS} - Peroxide Oxidisable Sulfur, pHox (pH after peroxide oxidation), n/a - not applicable.

* denotes analysis by Chromium Reducible Sulfur (S_{Cr}) - pH_{OX} is not analysed.

Excess ANC is only determined for samples analysed with an initial pH_{KCl} of greater than 6.5 if analysed by the S_{Cr} method, or pH_{OX} greater than 6.5 if analysed by the SPOCAS method.

Values shown Highlighted in 'yellow' appear inconsistent with the remainder of the data set and may be influenced by laboratory handling or analytical error and have been excluded from statistical analysis.

Actual Acidity (TAA)

Test results indicate that the samples tested generally contain negligible total actual acidity with TAA values less than the detection limits (i.e. <2 moles of acid/tonne). This was expected given the fact that the sediments have been submerged and therefore unlikely to have undergone any oxidation. Four of the 75 samples analysed (one Holocene sample and three Pleistocene) returned low concentrations of TAA in excess of the action criteria of 18 moles of acid per tonne (highlighted in yellow). These values have been excluded from the statistical analysis carried out on the data set, but even if included, would not take the average TAA value above the adopted action criteria.

These individual elevated TAA results are considered to be either due to post sampling oxidation, which perhaps occurred during sub-sampling or during slightly delayed preparation of the samples at the laboratory, or, in the case of the Pleistocene samples, to low level acidity inherent to the mineralogy.

For all intents and purposes, all samples should be considered as containing negligible actual acidity.

Oxidisable Sulfur (S_{POS})

Results of Percent Oxidisable Sulfur (S_{POS}) and Chromium Reducible Sulfur (S_{Cr}) tests indicated the presence of moderate to high levels of oxidisable Sulfur (Sulfides) in the 42 Holocene samples analysed from all cores (where present). The tests results for Holocene sediments ranged from 0.10 to 2.70%S, at an average of 1.05%S. No samples of Holocene analysed showed a complete absence of oxidisable sulfur. The highest level of oxidisable Sulfur recorded (2.70%) was from BH2A-12 at a depth of 1.0m.

As significant amounts of organic matter were present in a number of the Holocene samples selected for analysis, 20 samples were analysed by the S_{Cr} test method instead of SPOCAS. Generally samples analysed using the S_{Cr} method did not appear to return significantly lower levels of oxidisable sulfur than samples analysed suing the SPOCAS method, indicating that acidity attributed by the organic matter present in the samples was not likely to be significant.

Results of S_{POS} tests undertaken in samples of Pleistocene sediments indicate the presence of moderate levels of oxidisable Sulfur (Sulfides) in 11 of the 42 Holocene samples analysed. These samples were from close to the top of the Pleistocene layer in what is interpreted as an intermixing zone with the overlying Holocene stratum. These S_{POS} tests results ranged from 0.27 to 0.90%S, at an average of 0.58%S.

The remaining 22 samples of Pleistocene sediments from below the intermixing zone returned generally negligible or low concentrations of $S_{POS.}$ All but five of the samples of Pleistocene from below the Holocene intermixing zone analysed showed a complete absence of oxidisable sulfur. The average level of oxidisable Sulfur in samples analysed was < 0.03%S.

Acid Neutralising Capacity (ANC)

Acid Neutralising Capacity (ANC) test results indicate the presence of excess alkalinity within the majority of the Holocene samples analysed and in a number of Pleistocene samples. There was excess ANC present in 23 of the 42 Holocene samples analysed, at an average value equivalent to 365 moles/tonne, and 8 of the 33 Pleistocene samples (including one sample from the intermixing zone). This correlated with the visual observation of fine shell fragments in many of the samples.

Where excess ANC was detected, values were generally quite high in the Holocene sediments and much lower in the Pleistocene clays. The highest individual value was equivalent to 2,910 moles of acid/tonne, detected in a surface sample from BH2A-24 (the only sand sample analysed).

Net Acidity

Despite high levels of ANC in Holocene samples containing oxidisable Sulfur, higher potential acidity meant that 'net acidity' values exceeded the appropriate QASSIT 'Action Criteria' of 18 moles of acid/tonne in 30 of the 42 samples analysed.

The highest individual net acidity detected was 1,700 moles of acid/tonne, in a sample of medium clay from BH2A-12 at 1.0-1.25m depth. This sample reported no excess ANC and no shells were visible in the sample. The average net acidity in the Holocene materials was 513 moles of acid/tonne.

Moderate to high levels of net acidity exceeding the 'Action Criteria' of 18 moles of acid/tonne were present in the ten samples of Pleistocene sediments interpreted to be in the intermixing zone with the overlying Holocene sediments. Net acidity ranged from 80 to 502 moles of acid/tonne in the ten samples analysed. Excess ANC was absent in all but one sample.

The 22 samples analysed from the underlying Pleistocene clays returned generally negligible levels of net acidity. Only eight samples returned reportable levels of net acidity, and of these, only three had net acidity values exceeding the adopted action criteria of 18 moles of acid/tonne. Average net acidity was only 11 moles/tonne. In general, the Pleistocene layer below the Holocene intermixing / intrusion zone can be considered as free of ASS/PASS materials (refer to Sections A-A, B-B and C-C).

No analysis for retained acidity was undertaken as all 75 samples analysed had initial pH values well above 4.5 (the usual trigger for retained acidity analysis).

10.0 ASSESSMENT

10.1 Soil Acidity Regime

Holocene Sediments

The results of screening and follow-up quantitative analysis of soils undertaken as part of the overwater ASS investigation for Option 2A confirm that Holocene alluvium, present to depths of 0.2 to 4.1m, contains negligible actual acidity, but moderate to very high potential and net acidity within a significant part of the proposed dredge footprint. Some of the higher individual net acidity values are associated with sample locations that now lie outside of (east) of the amended 2A footprint. These include BH2A-03, BH2A-05 and BH2A-23.

PASS was detected in samples collected from all depths throughout the Holocene layer and at some locations, up to 1.5m into the underlying Pleistocene.

Results of the ASS analysis indicate that moderate to very high levels of net acidity (up to 1,700 moles of acid /tonne) are present in samples of Holocene sediments analysed.

The Holocene sediment layer appears limited in extent to the eastern half of the northern and central areas of Option 2A dredge footprint and to an estimated average depth of 0.5-1.0m. The deeper Holocene deposits were limited to two areas on the eastern side, one around BH2A-01, BH2A-03, BH2A-04, BH2A-05, BH2A-07, BH2A-09 (partly outside of the amended footprint) and BH2A-12, and the other around BH2A-22 and BH2A-23. The deepest Holocene deposits encountered ranged from 1.0 to 4.1m in depth (areas shaded yellow, brown and orange on Figure 2). For all intents and purposes Holocene sediments are absent from western and southern areas (shaded blue on Figure 2).

Pleistocene Sediments

Generally moderate levels of net acidity were also indentified in the upper 0.5-1.0m of the underlying Pleistocene layer at some locations. It is understood that similar zones of Holocene influence / intermixing have been previously identified in marine ASS investigations in Queensland. Actionable net acidity was observed at six locations in the Option 2A footprint, at BH2A-01, BH2A-04, BH2A-07, BH2A-09, BH2A-13 and BH2A-29, where penetration of pre-Holocene clays has produced positive net acidity of up to 502 moles of acid/tonne.

Generally this infiltration effect is confined to the upper 0.5-1.0m of the pre-Holocene substrate. However, deeper inter-mixing was identified at BH2A-09, where the zone appears to extend to approximately 2.75m depth, and at BH1B-07 where it extends to 2.40m depth.

The results of the laboratory testing indicate that, in some samples, the acid generating potential is buffered by adequate ANC. In most samples however, the ANC is insufficient to neutralise all of the acidity but does reduce the quantity of lime required to treat the material, if disturbed.

Negligible to low levels of net acidity were detected below this intermixing zone (where present) and generally within the Pleistocene stratum at all other sampling locations.

The acidity regimes of the main soil layers are depicted on Figure 3 and on cross-sections included on Figures 4a to 4b. On Figure 3, the highest actual acidity (TAA) and highest 'net acidity' detected at each location is indicated in moles of acid / tonne. Note that 'discredited' TAA values shaded in yellow in Table 3 have not been shown. The locations where the highest levels of net acidity were detected (i.e. >400 moles of acid/tonne) are indicated with a red halo. Locations with high levels of net acidity (i.e. 120-400 moles of acid/tonne) are shown with an orange halo, moderate levels (62 -120 moles of acid/tonne) with a brown halo, low levels (18 -62 moles of acid/tonne) with a yellow halo, and negligible levels (<18 moles of acid/tonne) with a green halo.

Should it be decided to adopt the Option 2A footprint, disturbance of all Holocene sediments and the underlying Pleistocene sediment for a depth of approximately 1.0m within the proposed dredge footprint will require either treatment with good quality agricultural lime to varying degrees, or replacement of the spoil permanently below the water table (i.e. ocean disposal) which is unlikely to be an acceptable treatment option in the immediate environmentally sensitive local. Preliminary lime application rates are discussed in Section 10.2. Liming rates are based on a bulk density of 1.5 tonne/m^3 and a factor of safety of 1.5.

The area shown hatched in blue on Figure 3, to the west of the line projected north-south through the dredge footprint, is considered essentially benign and does not appear to contain any actionable acidity. Although no investigation has been carried out in the south-western areas of the amended 2A footprint, based on stratigraphy nearby and bathymetry, it is likely that any Holocene in these areas would be relatively shallow. The spoil from this area will not require lime treatment.

10.2 Spoil Volumes and Liming Rates

If Option 2A is adopted, dredging would result in approximately 12,930,000m^3 of spoil. An estimate of the total volume of Holocene PASS sediments that would be disturbed (including allowance for a 0.75m depth of the underlying partially acidified Pleistocene sediments) is 800,000m^3 or about 6% of the total spoil volume. An indication of the relative depth of the PASS layer is shown on Figure 2 and Figures 4a-4c.

However, Holocene sediments are generally limited to the northern part of the dredge footprint near the MOF, around the edges of the two turning basins and as a very shallow layer (less than 0.5m) in southern parts. It is estimated that only about 200,000m^3 of the PASS spoil would result from dredging in these areas, with the remainder of the PASS spoil from areas in the eastern half of the footprint closer to Curtis Island.

Test results indicate that high levels of net acidity are associated with sediments along the eastern side of the footprint (refer to the red 'halos' on Figure 3). Liming of PASS spoil taken from these locations will be required at rates ranging from 40 to 200 kg of lime/m^3, based on a factor of safety of 1.5 and a bulk density of 1.5 tonne/m. If a liming rate of 150 kg of lime/m^3 were adopted, this would provide a factor of safety of 1.5 for all but the highest single test result from BH2A-12 at 1.0-1.25m depth.

Much lower levels of net acidity were detected in sediments from closer to the centre of the dredge footprint, and a liming rate of 20 kg of lime/m^3 will be sufficient for this material.

Sediments from the blue hatched area on Figure 3 are Pleistocene in age and do not appear to contain actionable levels of net acidity.

10.3 Risk Assessment

Holocene sediments present in a significant part of the footprint (approximately 45ha) contain mostly high level PASS to at least 1.0-4.1m depth, and hence, the proposed dredging activities are likely to generate acid runoff. As such, physical disturbance of sediments poses a high risk of adverse impact to the receiving environment if not properly managed.

Management measures that can reduce the risk of impact to the environment include neutralisation of spoil by addition of agricultural lime and first and foremost, avoidance, where possible of the areas of highest PASS.

10.4 Recommendations

Should the Option 2A footprint be adopted, then further ASS sampling and analysis (at a suitably higher testing frequency) will be required in areas were PASS have been identified and areas of the amended footprint not investigated. Note that by moving the footprint further west (from the location originally proposed), some areas of high PASS have been avoided.

Given the potential volume of PASS material to be dredged, up to 800,000m^3 (a conservative estimate) and the level of potential acidity present, the level of treatment required under the terms of the current State Planning Policy 2/02 (SPP) is deemed 'Extra High'. As such, specific strategies are required to be developed to manage ASS during proposed dredging activities. The strategies are required to be documented in a 'stand alone' Environmental Management Plan (EMP), following the requirements of Appendix 4 of the SPP 2/02. The EMP will need to be prepared once the final fate of the material is known.

The management of the proposed dredge material will ultimately be dependant on the final location of the dredge spoil. The final location of the dredge spoil should be assessed following completion of any further assessment(s). The PASS spoil will ultimately need to be treated according to the liming rates outlined in section 9.2, although these could be further refined and included in the project ASS EMP.

Further advice can be given following completion of the ASS assessment report for dredge footprint Option 1B.

We would be pleased to answer any questions about this important information from the reader of this report.

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A.B.N. 64 006 107 857

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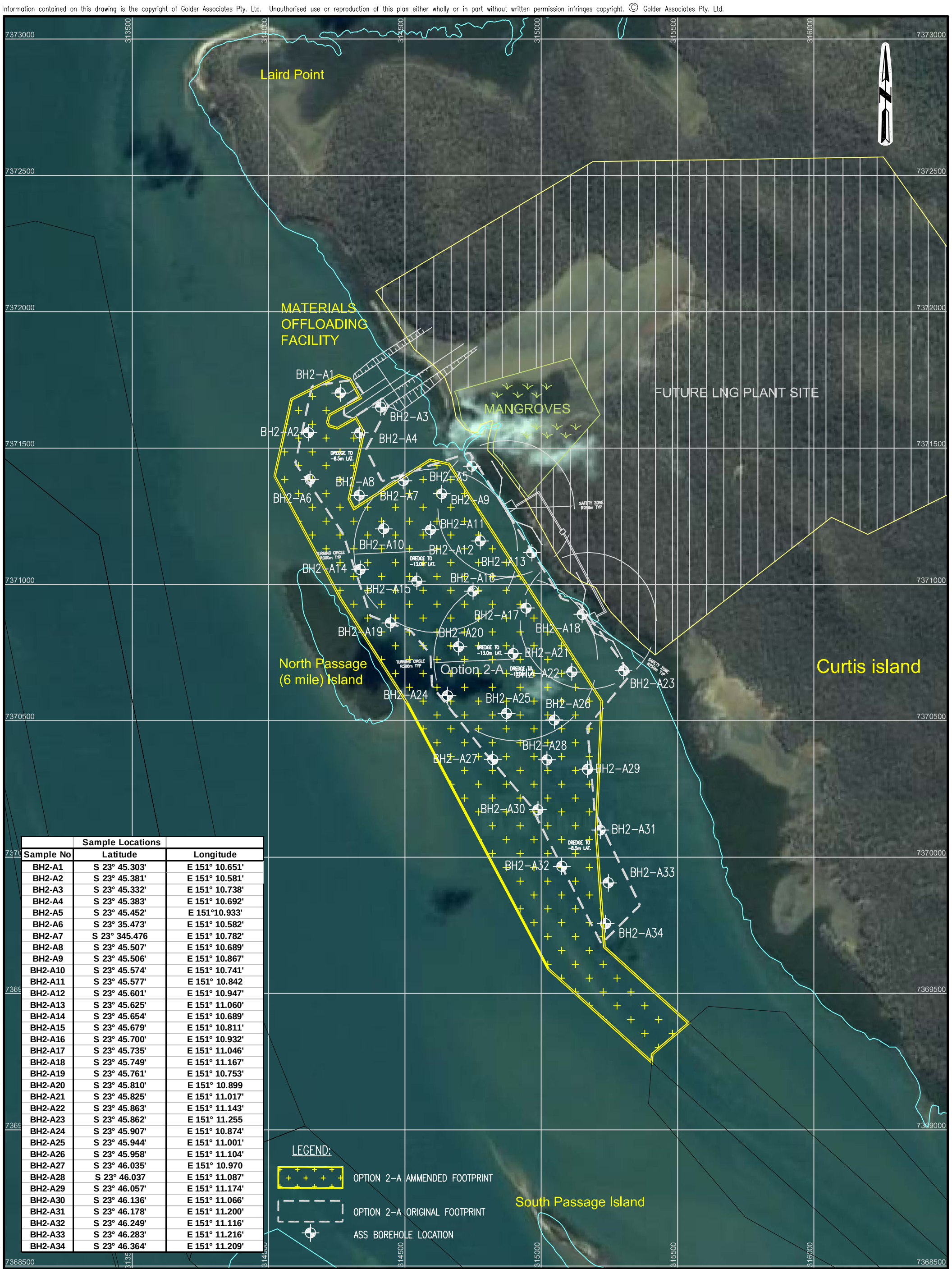
FIGURES

FIGURES

Checked by:……

Date:……25/09/09……

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	Sample Locations	
Sample No	Latitude	Longitude
BH2-A1	S 23° 45.303'	E 151° 10.651'
BH2-A2	S 23° 45.381'	E 151° 10.581'
BH2-A3	S 23° 45.332'	E 151° 10.738'
BH2-A4	S 23° 45.383'	E 151° 10.692'
BH2-A5	S 23° 45.452'	E 151°10.933'
BH2-A6	S 23° 35.473'	E 151° 10.582'
BH2-A7	S 23° 345.476	E 151° 10.782'
BH2-A8	S 23° 45.507'	E 151° 10.689'
BH2-A9	S 23° 45.506'	E 151° 10.867'
BH2-A10	S 23° 45.574'	E 151° 10.741'
BH2-A11	S 23° 45.577'	E 151° 10.842
BH2-A12	S 23° 45.601'	E 151° 10.947'
BH2-A13	S 23° 45.625'	E 151° 11.060'
BH2-A14	S 23° 45.654'	E 151° 10.689'
BH2-A15	S 23° 45.679'	E 151° 10.811'
BH2-A16	S 23° 45.700'	E 151° 10.932'
BH2-A17	S 23° 45.735'	E 151° 11.046'
BH2-A18	S 23° 45.749'	E 151° 11.167'
BH2-A19	S 23° 45.761'	E 151° 10.753'
BH2-A20	S 23° 45.810'	E 151° 10.899
BH2-A21	S 23° 45.825'	E 151° 11.017'
BH2-A22	S 23° 45.863'	E 151° 11.143'
BH2-A23	S 23° 45.862'	E 151° 11.255
BH2-A24	S 23° 45.907'	E 151° 10.874'
BH2-A25	S 23° 45.944'	E 151° 11.001'
BH2-A26	S 23° 45.958'	E 151° 11.104'
BH2-A27	S 23° 46.035'	E 151° 10.970
BH2-A28	S 23° 46.037	E 151° 11.087'
BH2-A29	S 23° 46.057'	E 151° 11.174'
BH2-A30	S 23° 46.136'	E 151° 11.066'
BH2-A31	S 23° 46.178'	E 151° 11.200'
BH2-A32	S 23° 46.249'	E 151° 11.116'
BH2-A33	S 23° 46.283'	E 151° 11.216'
BH2-A34	S 23° 46.364'	E 151° 11.209'

LEGEND:

OPTION 2-A AMMENDED FOOTPRINT

OPTION 2-A ORIGINAL FOOTPRINT

ASS BOREHOLE LOCATION

NOTE
BASE PLAN DERIVED FROM "WORELY PARSONS", DRAWING No. Dredge_Areas_region.DXF Dredge_Area_20090915(1B).DXF, Approach_Channel_20090911(2A).DXF DATE 29/09/09

Golder Associates

CLIENT	Worley Parsons	PROJECT	Laird Point Dredge Option 2-A
DRAWN	GPG	DATE 25/08/09	TITLE LOCALITY PLAN SHOWING EXTENT OF FOOTPRINT OPTION 2-A
CHECKED	*HEP	DATE 25/08/09	
SCALE	1:12,500	PROJECT No 097633052-003	FIGURE No 1 / REV No 1 / A3

NOTE: THE * BESIDE THE TYPED INITIALS DENOTES THE ORIGINAL DRAWING ISSUE WAS SIGNED OR INITIALLED BY THAT RESPECTIVE PERSON.

K:\Env\2009\097633052\Figures\097633052-003-r-fig01_REV1.dwg Oct 08, 2009 - 4:16pm

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MATERIALS OFFLOADING FACILITY

MANGROVES

FUTURE LNG PLANT SITE

BH2-A1
BH2-A2
BH2-A3
BH2-A4
BH2--A6
BH2-A5
BH2-A7
BH2-A8
BH2-A9
BH2-A10
BH2-A11
BH2-A12
BH2-A13
BH2-A14
BH2-A15
BH2-A16
BH2-A17
BH2-A18
BH2-A19
BH2-A20
BH2-A21
BH2-A22
BH2-A23
BH2-A24
BH2-A25
BH2-A26
BH2-A27
BH2-A28
BH2-A29
BH2-A30
BH2-A31
BH2-A32
BH2-A33
BH2-A34

DREDGE TO -8.5m LAT.
DREDGE TO -13.0m LAT.
DREDGE TO -8.5m LAT.

TURNING CIRCLE R300m TYP
TURNING CIRCLE R300m TYP

SAFETY ZONE R250m TYP
SAFETY ZONE R250m TYP

North Passage
(6 mile) Island

Option 2-A

LEGEND:

- OPTION 2-A AMMENDED FOOTPRINT
- OPTION 2-A ORIGINAL FOOTPRINT
- ASS BOREHOLE LOCATION
- >3m THICK HOLOCENE SEDIMENTS
- 2m – 3m THICK HOLOCENE SEDIMENTS
- 1m – 2m THICK HOLOCENE SEDIMENTS
- 0.2m – 1m THICK HOLOCENE SEDIMENTS
- 0m – 0.2m THICK HOLOCENE SEDIMENTS

NOTE
BASE PLAN DERIVED FROM "WORELY PARSONS", DRAWING No. Dredge_Areas_region.DXF Dredge_Area_20090915(1B).DXF, Approach_Channel_20090911(2A).DXF DATE 29/09/09

1:5000

0 100 200 300 400 500 m

100

Golder Associates

CLIENT	Worley Parsons		
DRAWN	GPG	DATE	26/08/09
CHECKED	*HEP	DATE	26/08/09
SCALE	1:5000		

PROJECT: Laird Point Dredge Option 2-A

TITLE: SITE PLAN SHOWING BOREHOLE LOCATIONS AND INFERRED THICKNESS OF HOLOCENE LAYER

PROJECT No	FIGURE No	REV No	
097633052	2	1	A2

K:\Env\2009\097633052\Figures\097633052-003-r-fig02_REV1.dwg Oct 08, 2009 – 4:17pm

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OFFLOADING MATERIALS OFFLOADING FACILITY

FUTURE LNG PLANT SITE

MANGROVES

BH2-A1 <2/1180
BH2-A2 -/-
BH2-A3 5/1030
BH2-A4 <2/809
BH2-A5 4/451
BH2-A6 <2/<10
BH2-A7 7/1070
BH2-A8 12/-
BH2-A9 <2/924
BH2-A10 13/16
BH2-A11 <2/942
BH2-A12 11/1700
BH2-A13 <2/301
BH2-A14 <2/<10
BH2-A15 5/<10
BH2-A16 <2/100
BH2-A17 <2/1280
BH2-A18 19/34
BH2-A19 <2/<10
BH2-A20 -/30
BH2-A21 <2/<10
BH2-A22 <2/512
BH2-A23 <2/1110
BH2-A24 <2/<10
BH2-A25 <2/16
BH2-A26 <2/170
BH2-A27 <2/<10
BH2-A28 <2/32
BH2-A29 <2/59
BH2-A30 <2/<10
BH2-A31 -/-
BH2-A32 <2/<10
BH2-A33 -/-
BH2-A34 -/-

DREDGE TO -8.5m LAT.
DREDGE TO -13.0m LAT.
DREDGE TO -8.5m LAT.
DREDGE TO -13.0m LAT.

TURNING CIRCLE R300m TYP
TURNING CIRCLE R300m TYP

SAFETY ZONE R250m TYP
SAFETY ZONE R250m TYP

NEGLIGABLE ASSNG TREATMENT REQUIRED

Option 2-A

North Passage (6 mile) Island
North Passage (6 mile) Island

A
B
C
C
A

313800 314000 314200 314400 314600 314800 315000 315200 315400 315600
7371800 7371600 7371400 7371200 7371000 7370800 7370600 7370400 7370200 7370000 7369800 7369600 7369400

LEGEND:

- OPTION 2-A AMMENDED FOOTPRINT
- OPTION 2-A ORIGINAL FOOTPRINT
- ASS BOREHOLE LOCATION
- NEGLIGIBLE PASS
- LOW PASS
- MODERATE PASS
- HIGH PASS
- VERY HIGH PASS

NOTE
BASE PLAN DERIVED FROM "WORELY PARSONS", DRAWING No. Dredge_Areas_region.DXF Dredge_Area_20090915(1B).DXF, Approach_Channel_20090911(2A).DXF DATE 29/09/09

1:5000

0 100 200 300 400 500 m
100

Golder Associates

CLIENT	Worley Parsons		
DRAWN	GPG	DATE	26/08/09
CHECKED	*HEP	DATE	26/08/09
SCALE	1:5000		

PROJECT: Laird Point Dredge Option 2-A

TITLE: SITE PLAN - SHOWING BOREHOLE LOCATIONS AND HIGHEST INDIVIDUAL ASS TEST RESULTS

PROJECT No	FIGURE No	REV No	
097633052	3	0	A2

K:\Env\2009\097633052\Figures\097633052-003-r-fig03_REV1.dwg Oct 08, 2009 - 4:17pm

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SECTION A-A

REDUCED LEVEL (m - LAT)

DISTANCE (m)

MHWS 4.14m CD

MLWS 0.71m CD

BH2-A 01

BH2-A 04 (Proj. -20.8)

BH2-A 07 (Proj. 34.5)

BH2-A 11 (Proj. 27.9)

BH2-A 16 (Proj. 46.9)

BH2-A 21 (Proj. 53.2)

BH2-A 25 (Proj. -75.9)

BH2-A 28 (Proj. -35.8)

BH2-A 31

BH2-A 33 (Proj. -71.7)

<2 /590
<2 /720
<2 /680
<2 /1180
<2 /390
INTERMIXED ZONE
<2 /155

<2 /155
<2 /809

7 /1070
HOLOCENE
<2 /391
<2 /197

<2 /942
<2 /584

PLEISTOCENE

<2 /100

<2 /<10

<2 /<10
<2 /16
<2 /15

<2 /<10
24 /32

<2 /<10

<2 /<10

PLEISTOCENE

DREDGE TO -8.5m LAT

DREDGE TO -8.5m LAT

DREDGE TO -13.0m LAT (TURNING BASIN)

OFFSET FROM BASELINE
BH# (5.0)
CONSISTENCY, DENSITY OR ROCK STRENGTH
SPT "N"
16
UNDISTURBED SAMPLE
U63
PP=500 kPa
k=3.5x10-8m/s
REFER TO EXPLANATION SHEET CAP Form No 6
WATER REFER TO EXPLANATION SHEET CAP Form No 6
σv=450 kPa
PID=5 ppm
PM=480 kPa
SOIL (NON CORED)
CORED
RQD %
95
UNIT OR CLASS
PACKER TEST
19 uL

LEGEND

- Clayey SILT
- Gravelly Clayey SILT
- Clayey Silty SAND
- Silty CLAY
- Sandy Silty CLAY
- Gravelly Silty CLAY
- Sandy Clayey GRAVEL
- HOLOCENE LAYER
- INTERMIXED LAYER
- PLEISTOCENE LAYER

TAA (mole H^+/t) / Net Acidity (mole H^+/t)

41 /41

Value 'in red' exceeds the 'Action Criteria

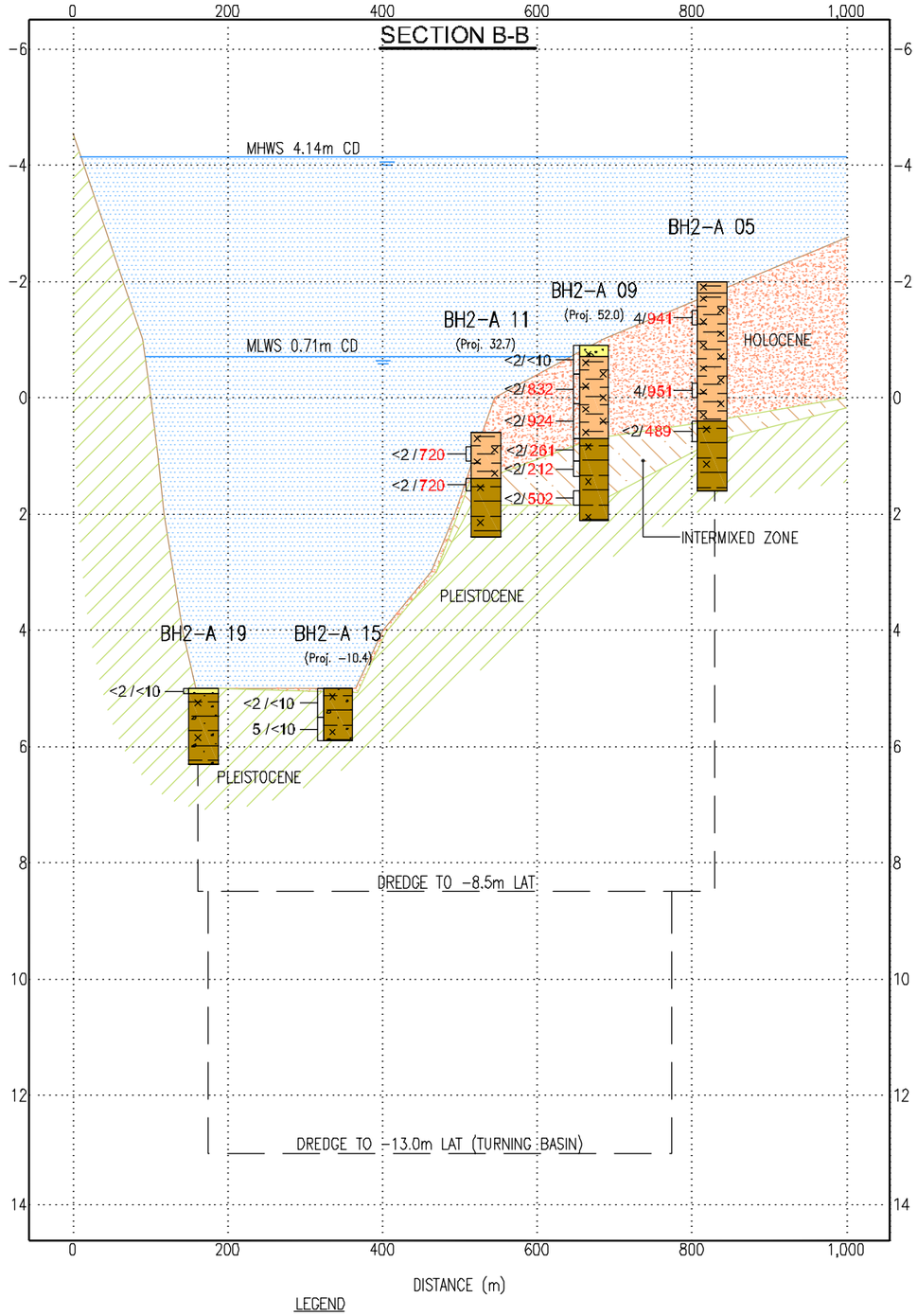
CLIENT	Worley Parsons	PROJECT	Laird Point Dredge Option 2-A
DRAWN GPG	DATE 27/08/09	TITLE	LONGITUDINAL SECTION A-A
CHECKED *HEP	DATE 27/08/09		
SCALE H 1:7500 V 1:100		PROJECT NO 097633052-003	FIGURE NO 4A / REV NO 1 / A3

NOTE: THE * BESIDE THE TYPED INITIALS DENOTES THE ORIGINAL DRAWING ISSUE WAS SIGNED OR INITIALLED BY THAT RESPECTIVE PERSON.

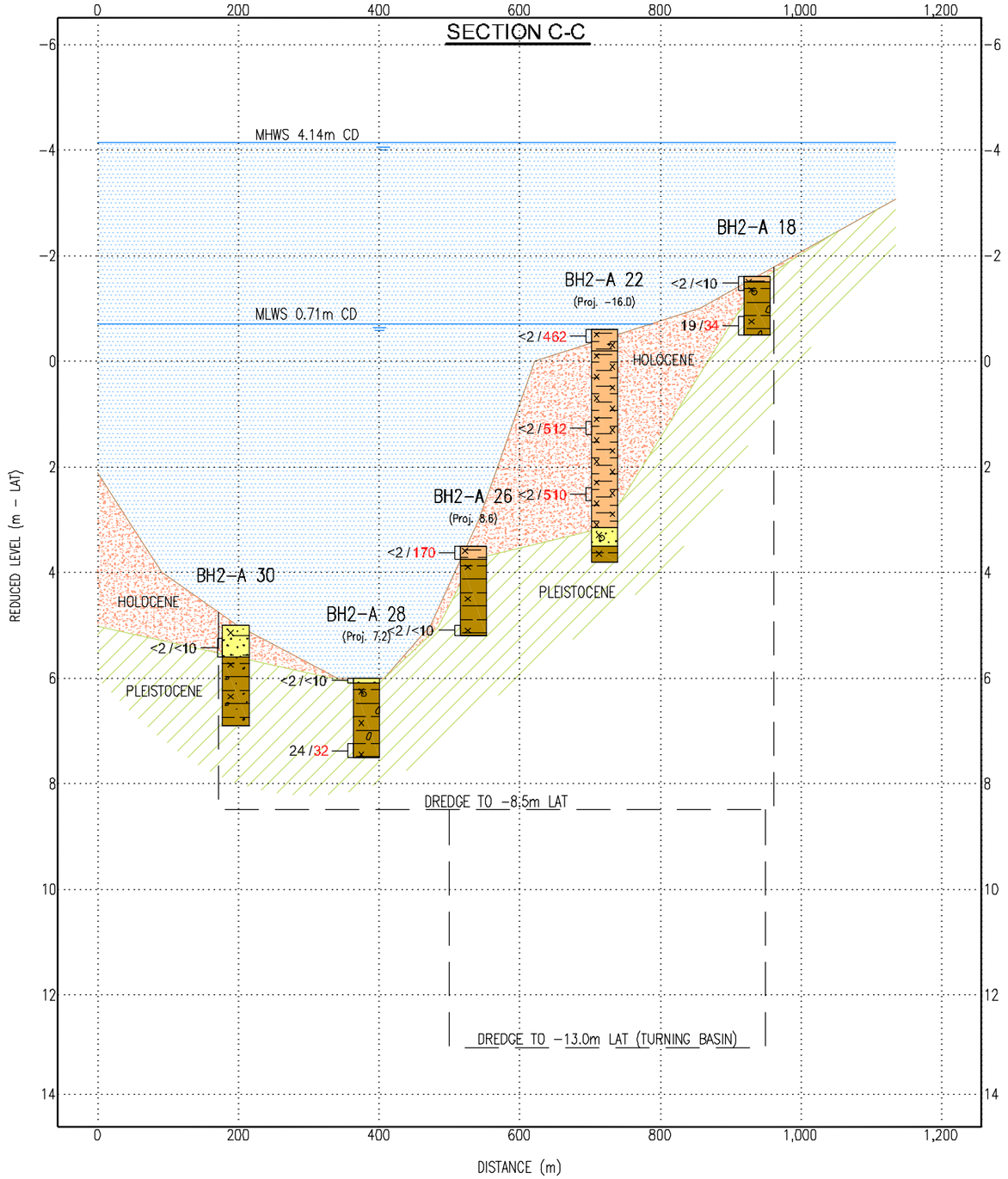
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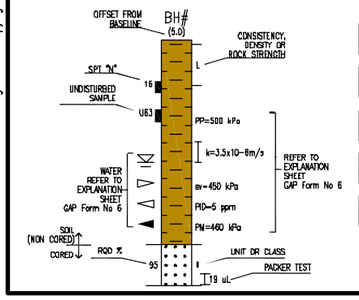
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SECTION B-B



SECTION C-C





LEGEND

- Clayey SILT
- Gravelly Clayey SILT
- Silty CLAY
- Gravelly Silty CLAY
- Sandy Silty CLAY
- Silty SAND
- Silty Gravelly SAND
- Clayey Silty SAND
- HOLOCENE LAYER
- INTERMIXED LAYER
- PLEISTOCENE LAYER

TAA (mole H^+/t) / Net Acidity (mole H^+/t)

41/41

Value 'in red' exceeds the 'Action Criteria

CLIENT: Worley Parsons		PROJECT: Laird Point Dredge Option 2-A	
DRAWN: GPG	DATE: 27/08/09	TITLE: CROSS SECTIONS B-B & C-C	
CHECKED: *HEP	DATE: 27/08/09		
SCALE: H 1:7500 V 1:100		PROJECT NO: 097633052-003	FIGURE NO: 4B / REV NO: 1 / A3

NOTE: THE * BESIDE THE TYPED INITIALS DENOTES THE ORIGINAL DRAWING ISSUE WAS SIGNED OR INITIALLED BY THAT RESPECTIVE PERSON.

K:\Env\2009\097633052\Figures\097633052-003-r-fig04B_REV1.dwg Sep 30, 2009 - 3:34pm

APPENDIX A

Sediment Core Logs

BOREHOLE #BH2A-01

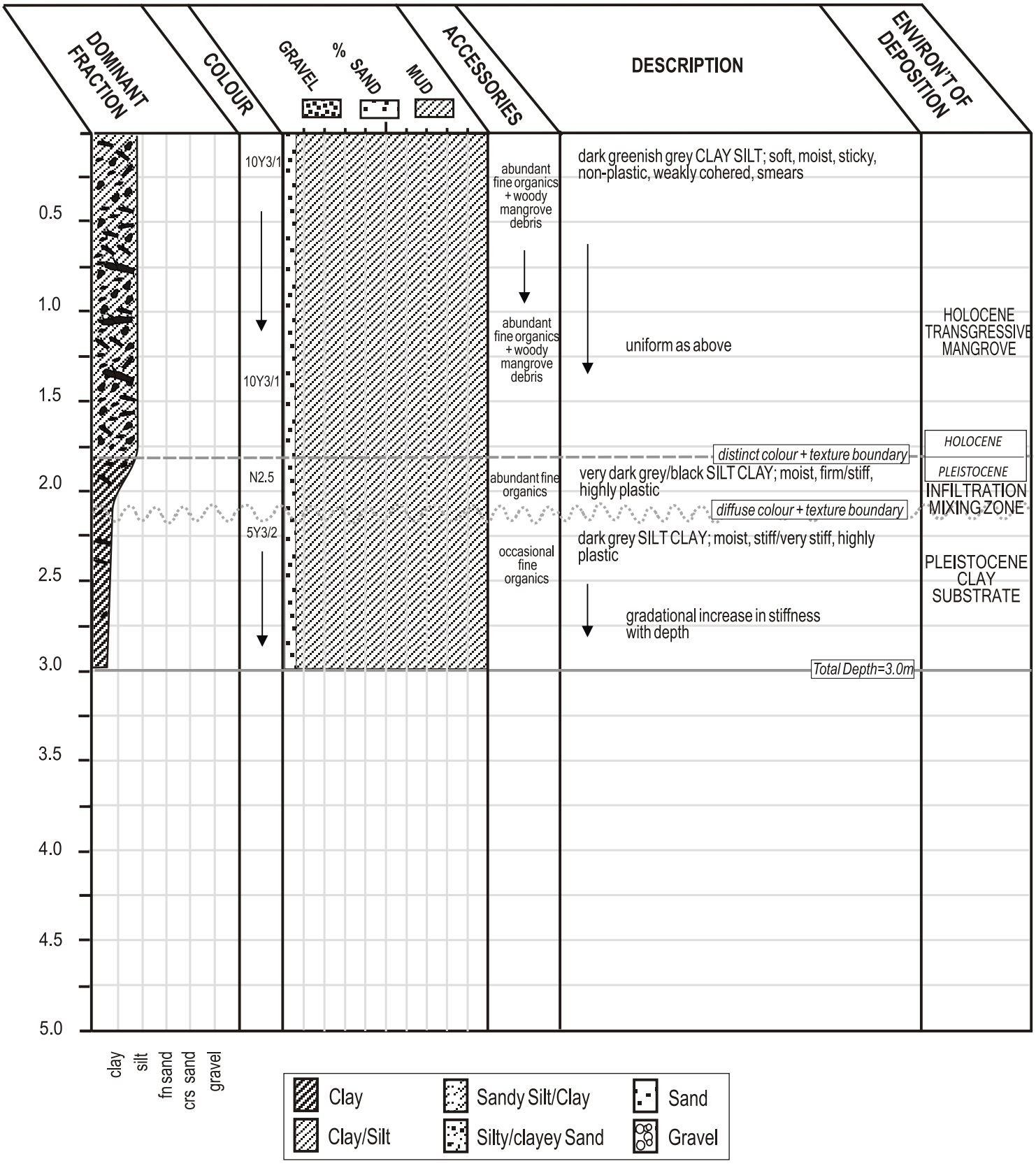
SITE: GC/ BH2A-01

DATE: 6/08/09

LOCATION: Port of Gladstone
23°45.303' **S** 151°10.651 **E**
R.L. -0.7m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-02

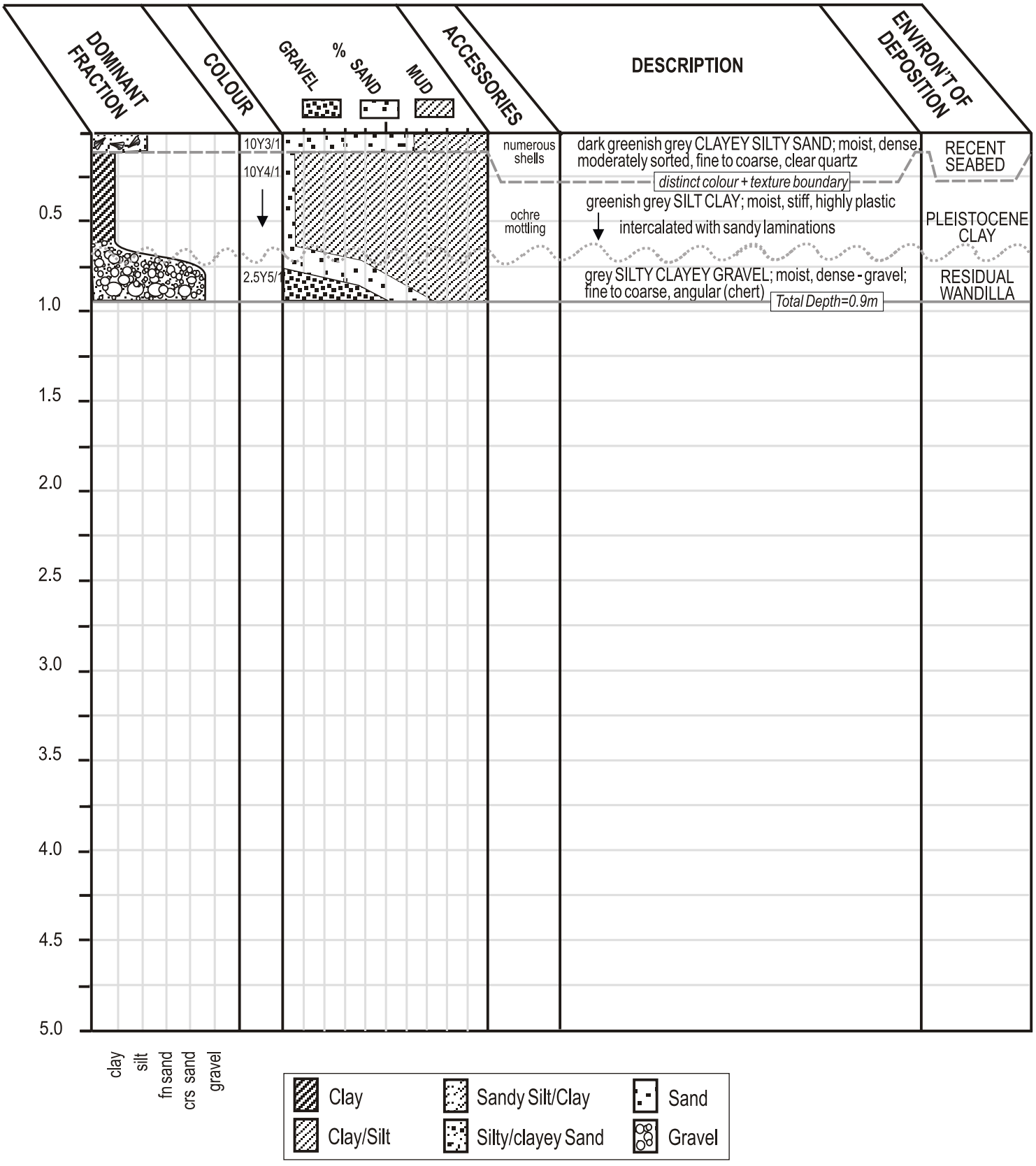
SITE: GC/ BH2A-02

LOCATION: Port of Gladstone
23°45.381' **S** 151°10.581 **E**
R.L. 4.6m L.A.T. (Port Datum)

DATE: 4/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-03

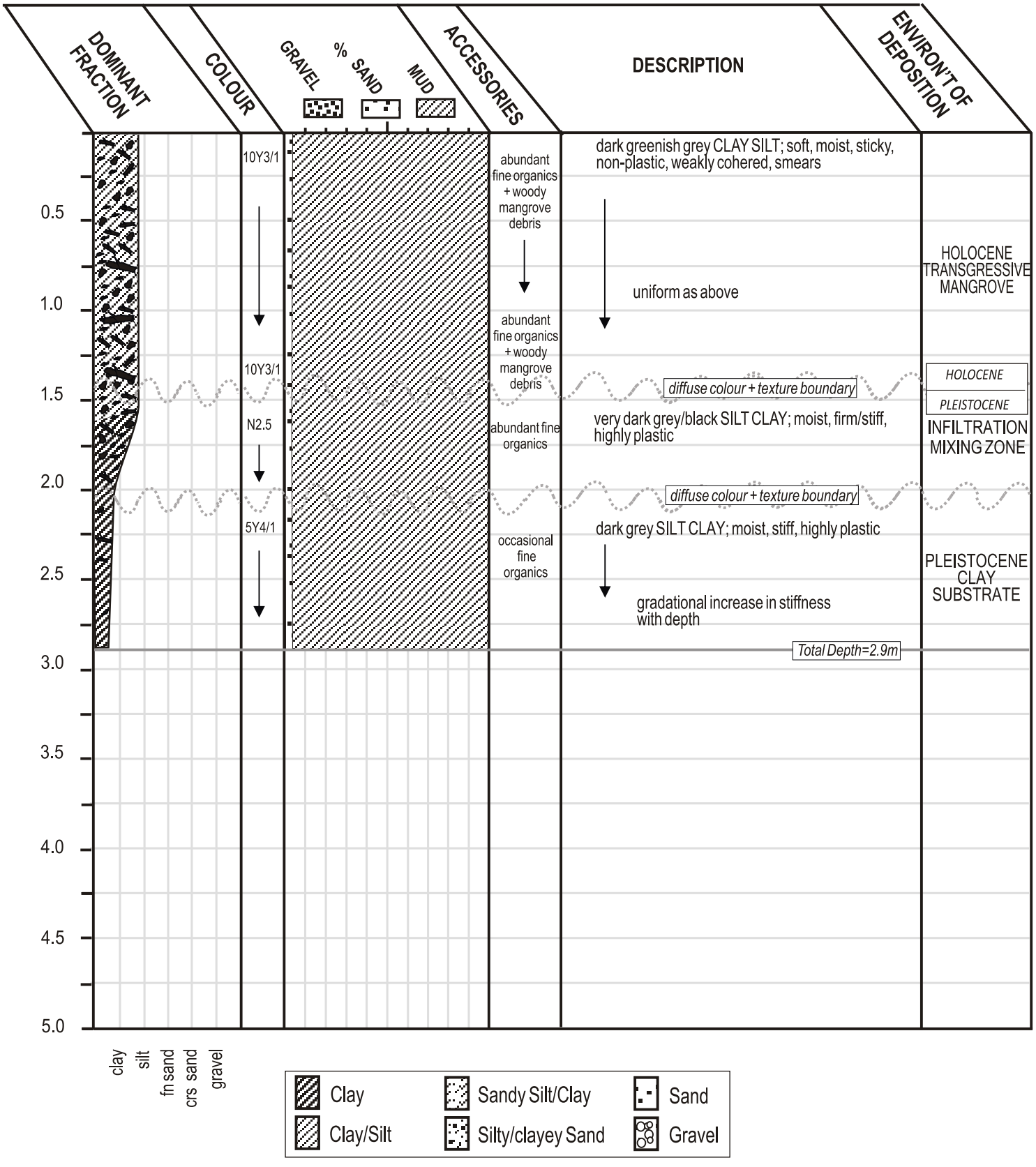
SITE: GC/ BH2A-03

LOCATION: Port of Gladstone
23°45.332' **S** 151°10.738 **E**
R.L. 1.1m L.A.T. (Port Datum)

DATE: 4/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-04

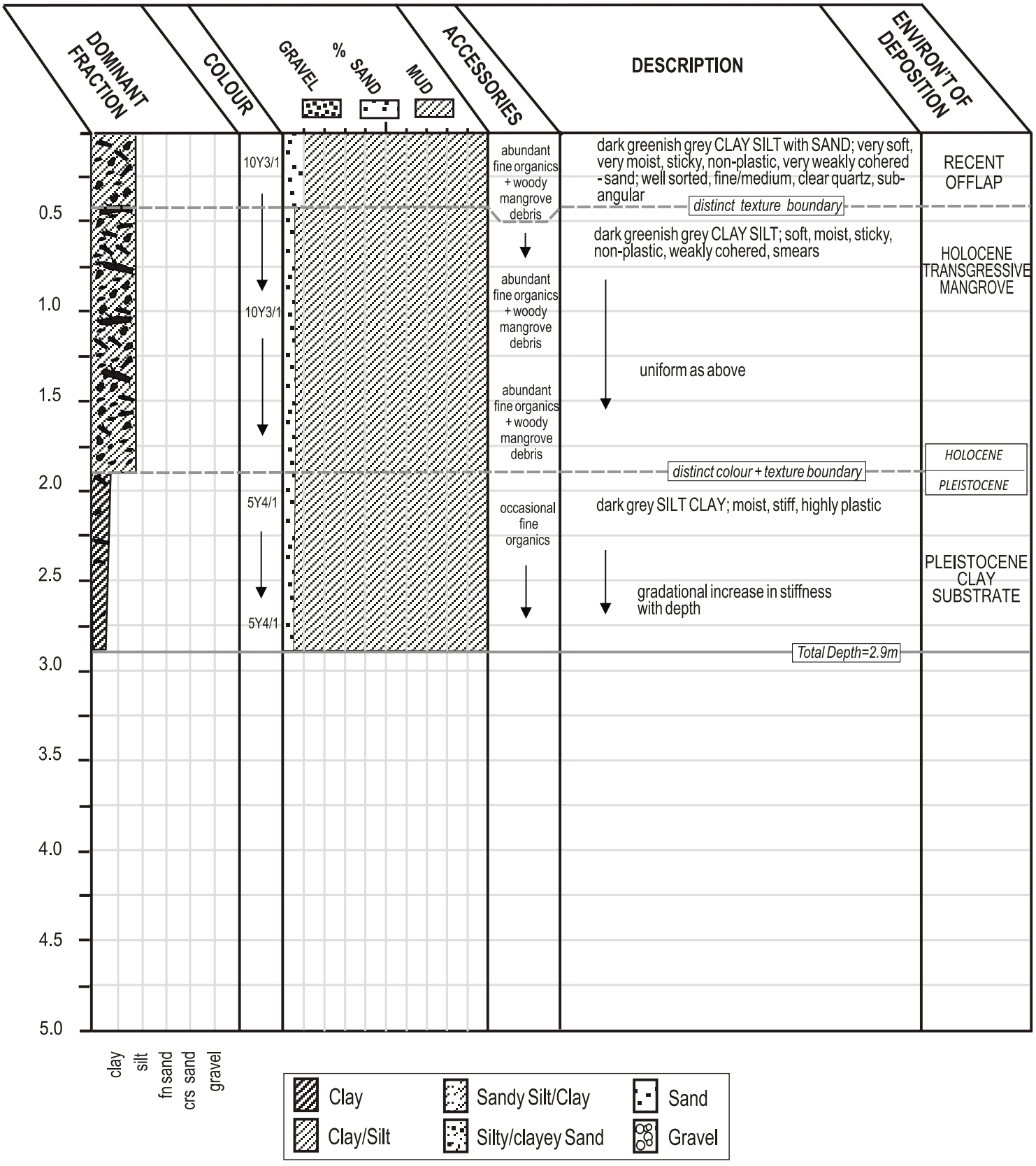
SITE: GC/ BH2A-04

LOCATION: Port of Gladstone
23°45.383' **S** 151°10.692 **E**
R.L. -0.3m L.A.T. (Port Datum)

DATE: 6/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-05

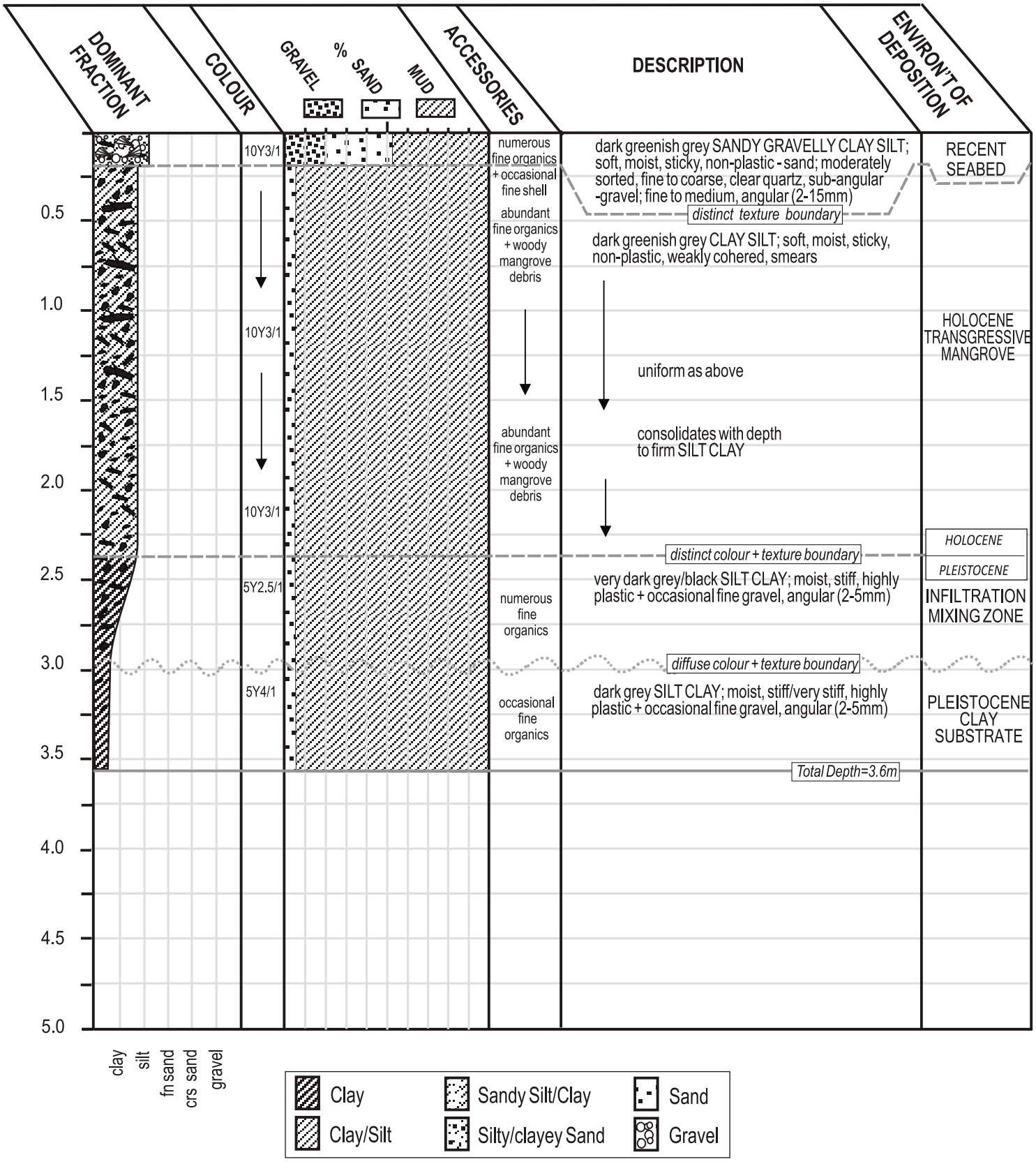
SITE: GC/ BH2A-05

DATE: 6/08/09

LOCATION: Port of Gladstone
23°45.452' **S** 151°10.933 **E**
R.L. -0.7m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-06

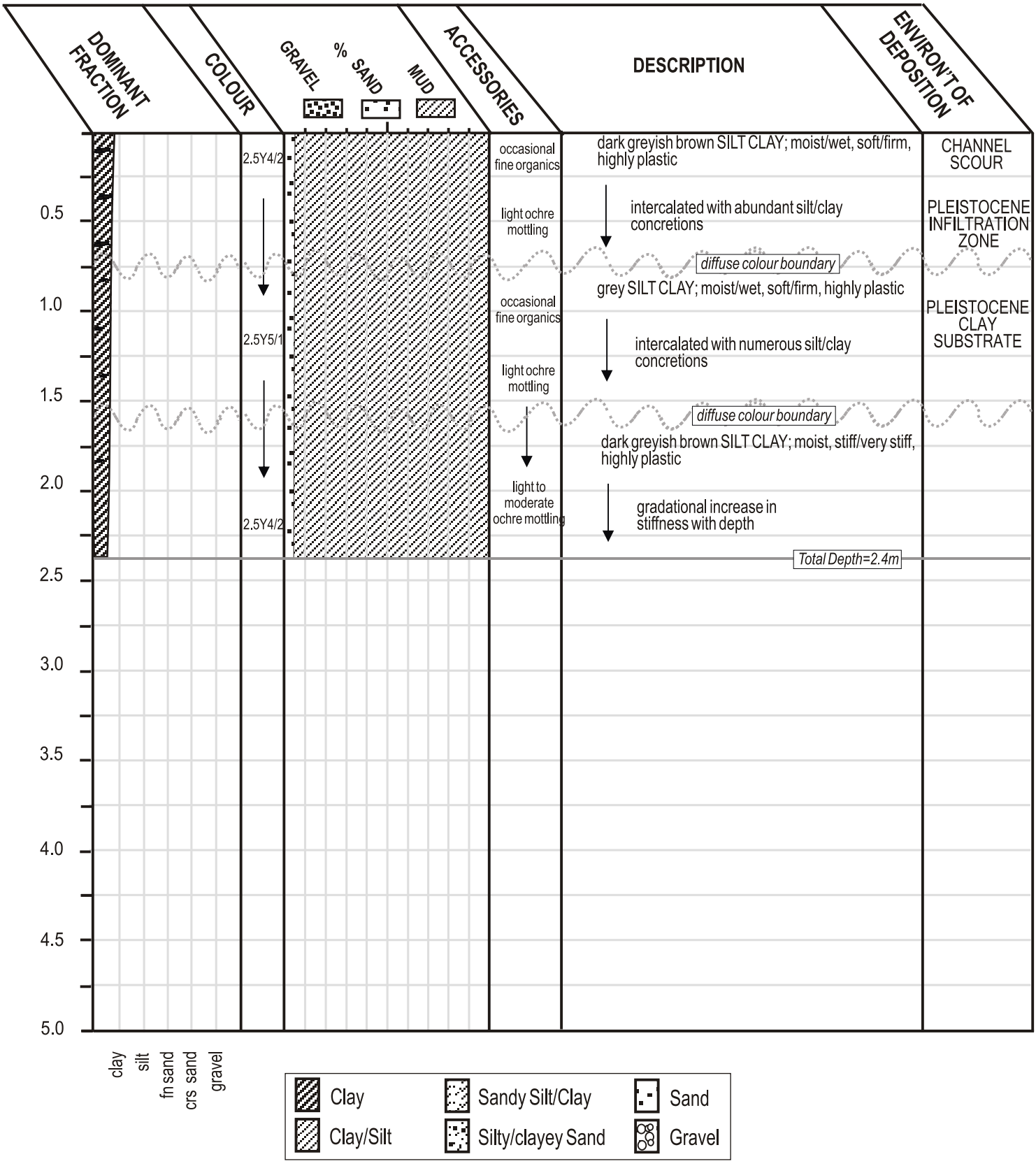
SITE: GC/ BH2A-06

LOCATION: Port of Gladstone
23°45.473' **S** 151°10.582 **E**
R.L. 6.35m L.A.T. (Port Datum)

DATE: 7/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-07

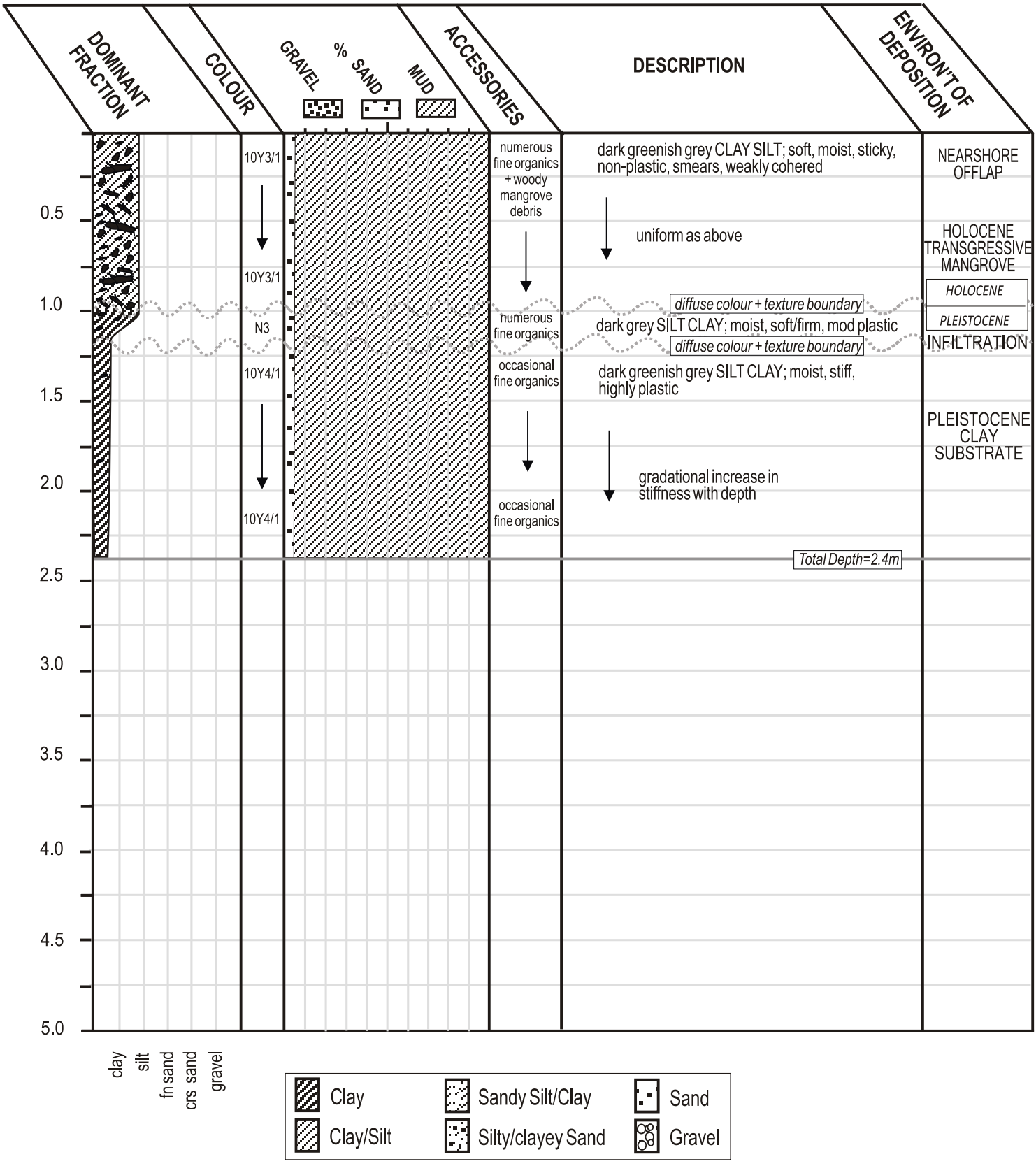
SITE: GC/ BH2A-07

DATE: 6/08/09

LOCATION: Port of Gladstone
$23^0 45.476'$ **S** $151^0 10.782$ **E**
R.L. -0.6 m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-08

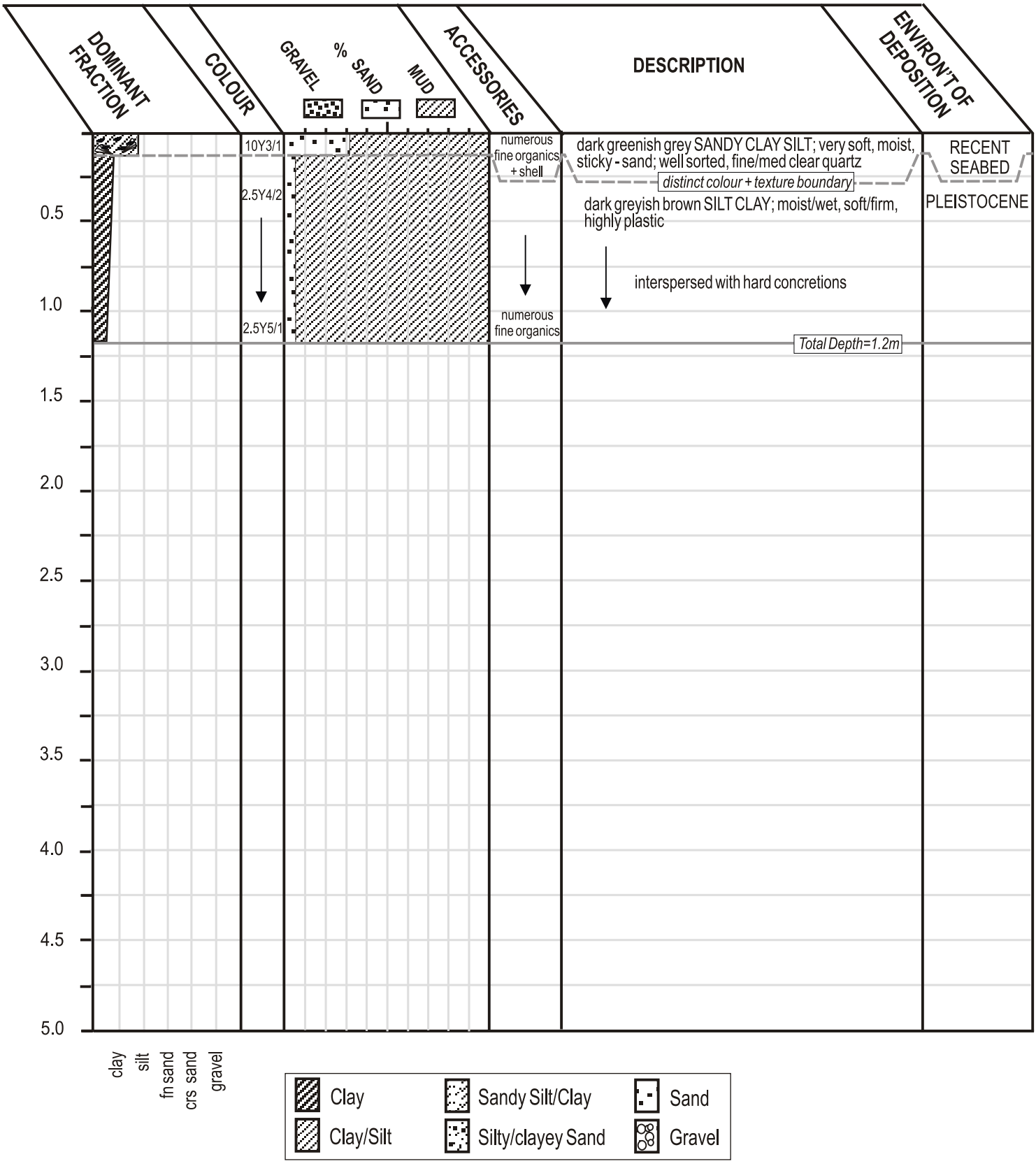
SITE: GC/ BH2A-08

LOCATION: Port of Gladstone
23°45.507' **S** 151°10.689 **E**
R.L. 5.3 m L.A.T. (Port Datum)

DATE: 7/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-09

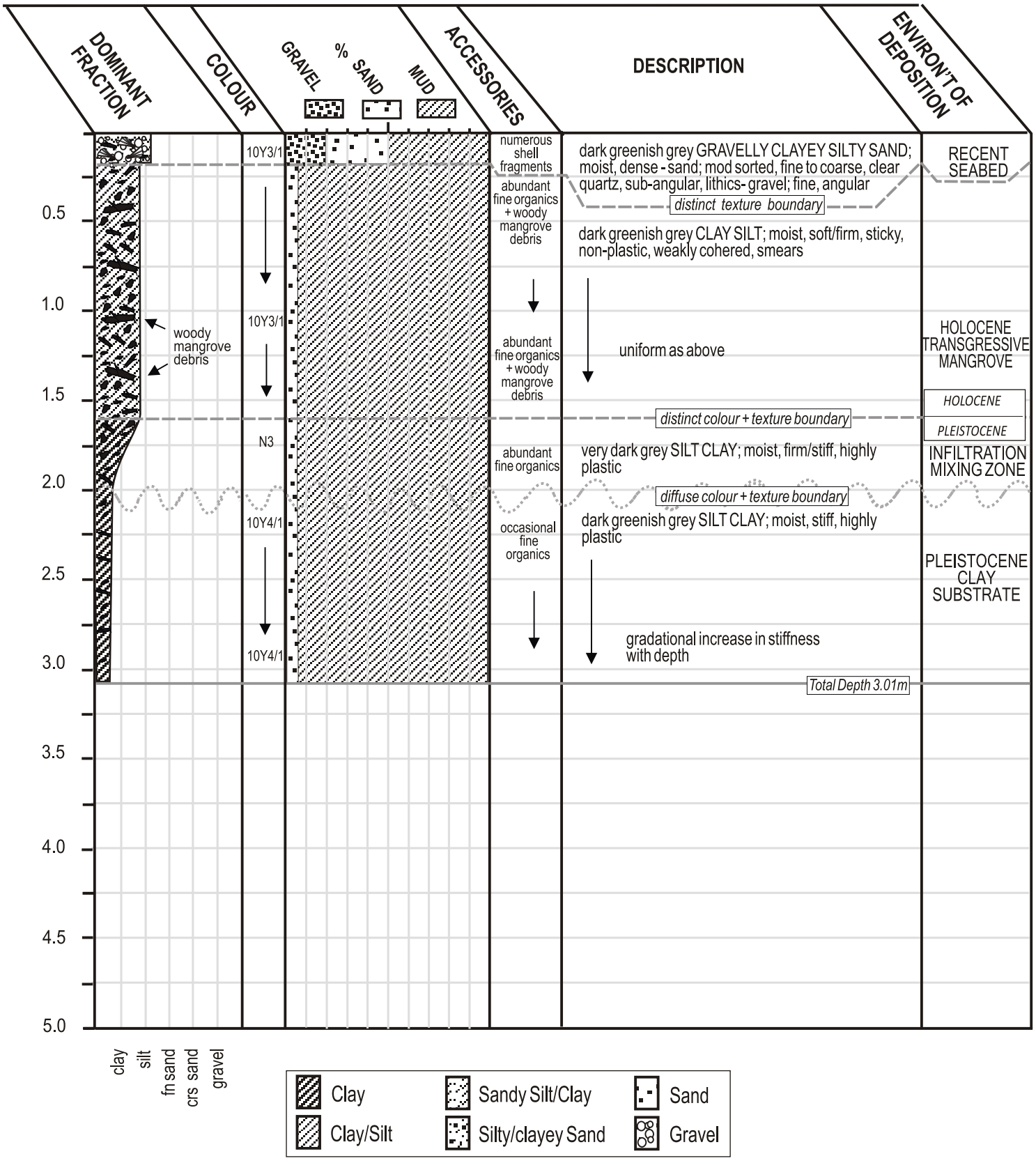
SITE: GC/ BH2A-09

LOCATION: Port of Gladstone
23°45.506' **S** 151°10.867 **E**
R.L. -1.3m L.A.T. (Port Datum)

DATE: 31/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-10

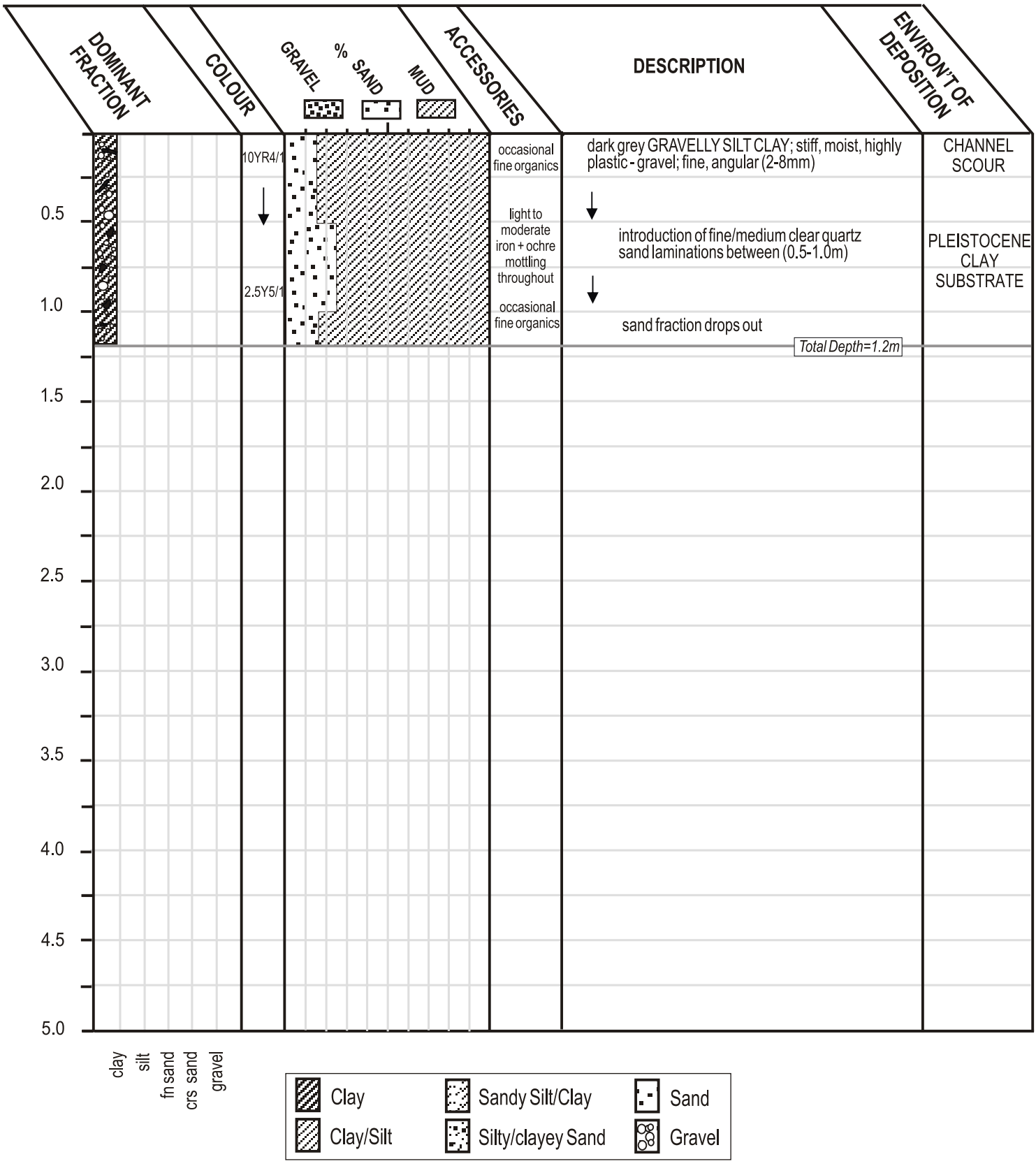
SITE: GC/ BH2A-10

LOCATION: Port of Gladstone
23°45.574' **S** 151°10.741 **E**
R.L. 4.8m L.A.T. (Port Datum)

DATE: 7/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-11

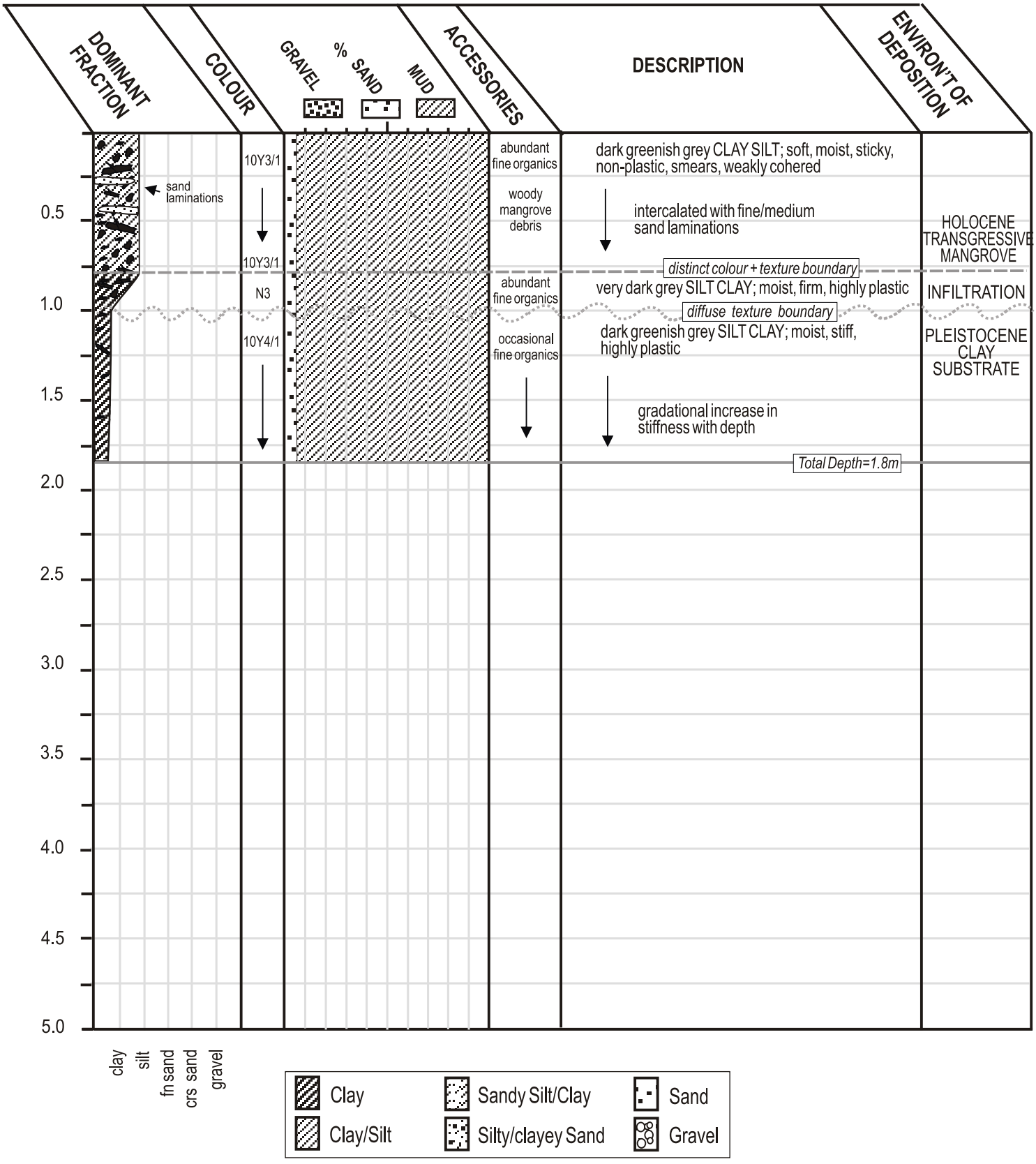
SITE: GC/ BH2A-11

DATE: 30/07/09

LOCATION: Port of Gladstone
23°45.577' **S** 151°10.842 **E**
R.L. -1.68 m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-12

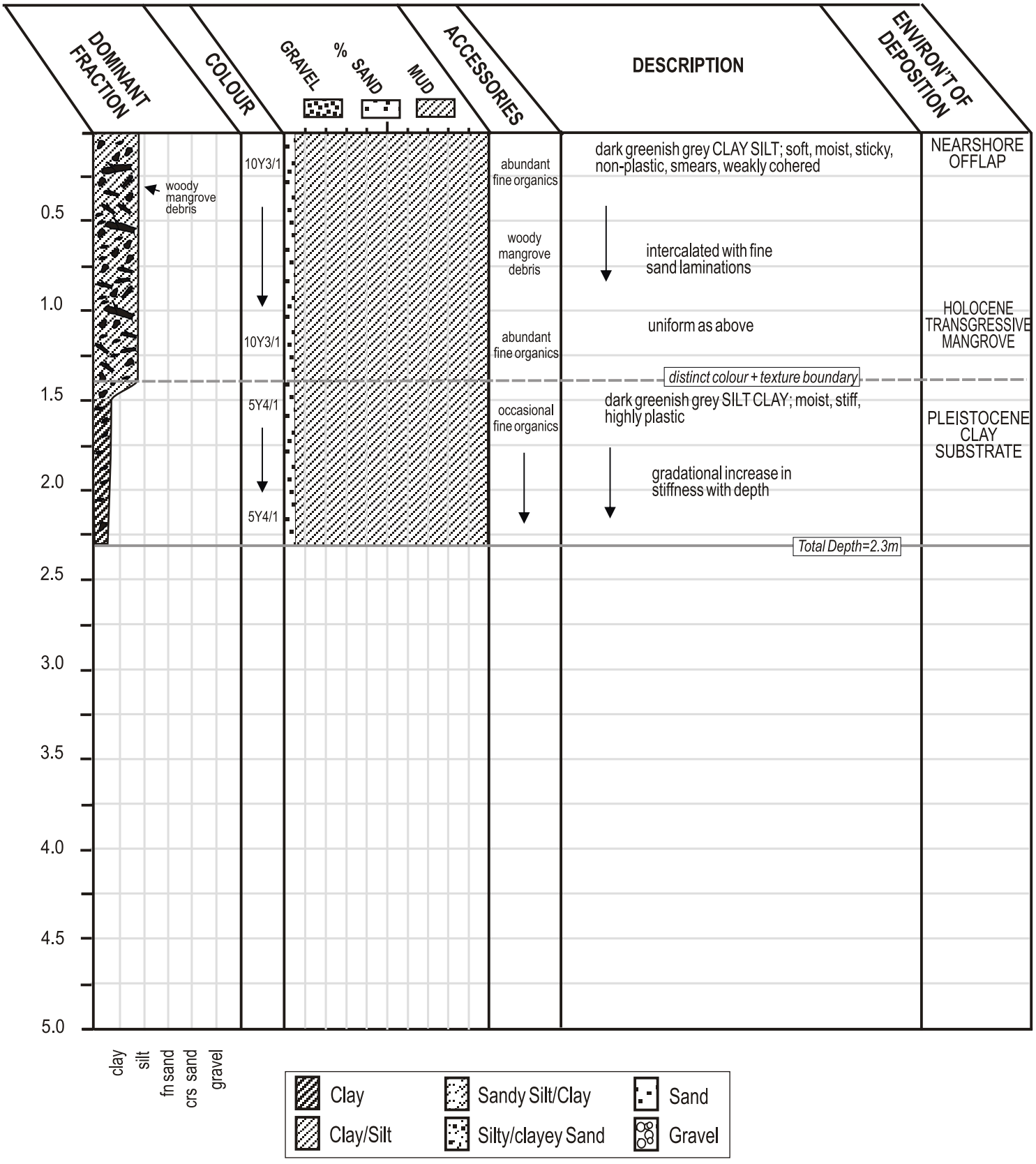
SITE: GC/ BH2A-12

LOCATION: Port of Gladstone
23°45.601' **S** 151°10.947 **E**
R.L. 0 m L.A.T. (Port Datum)

DATE: 30/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-13

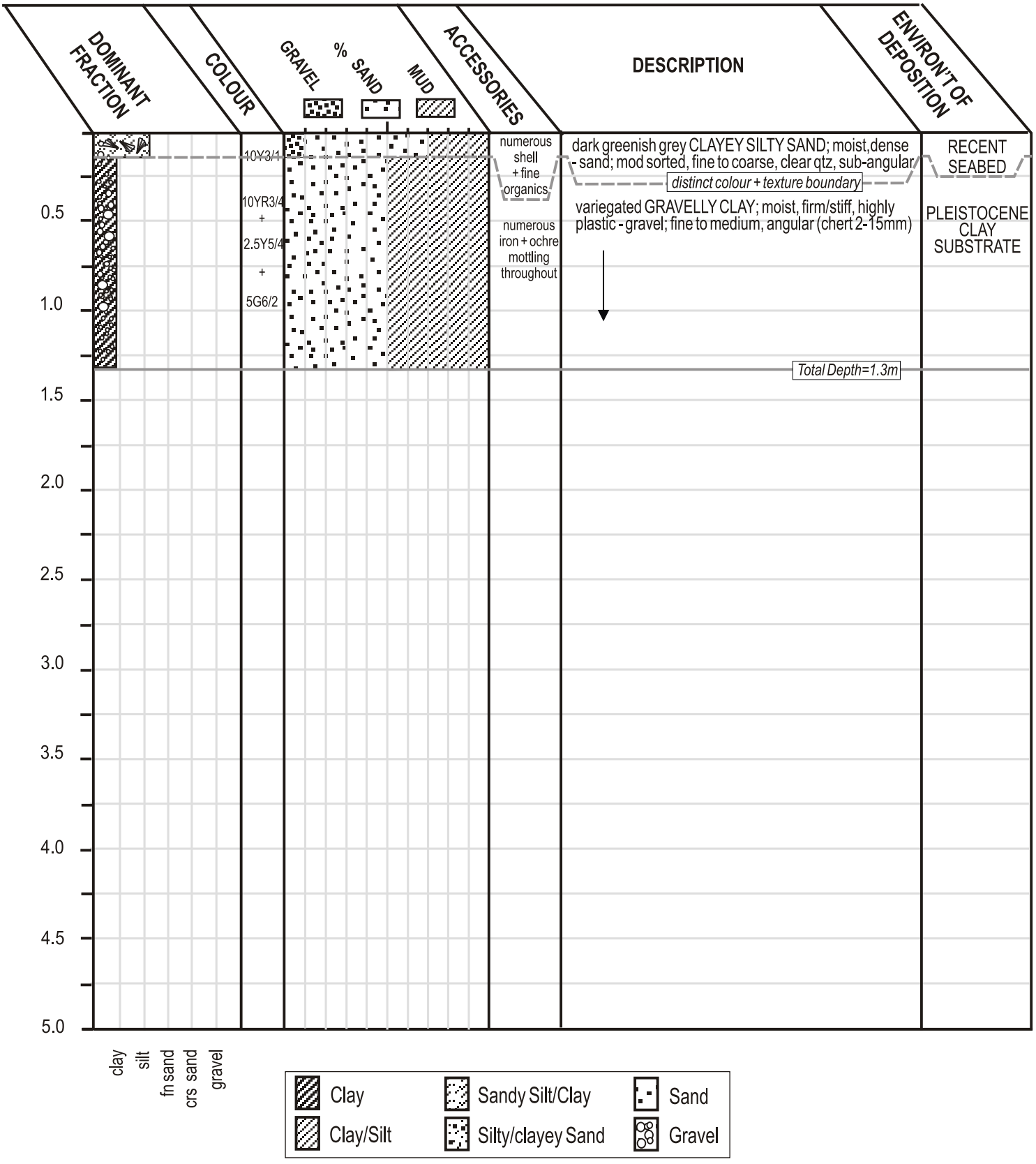
SITE: GC/ BH2A-13

LOCATION: Port of Gladstone
23°45.625' **S** 151°11.060 **E**
R.L. -2.4m L.A.T. (Port Datum)

DATE: 30/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-14

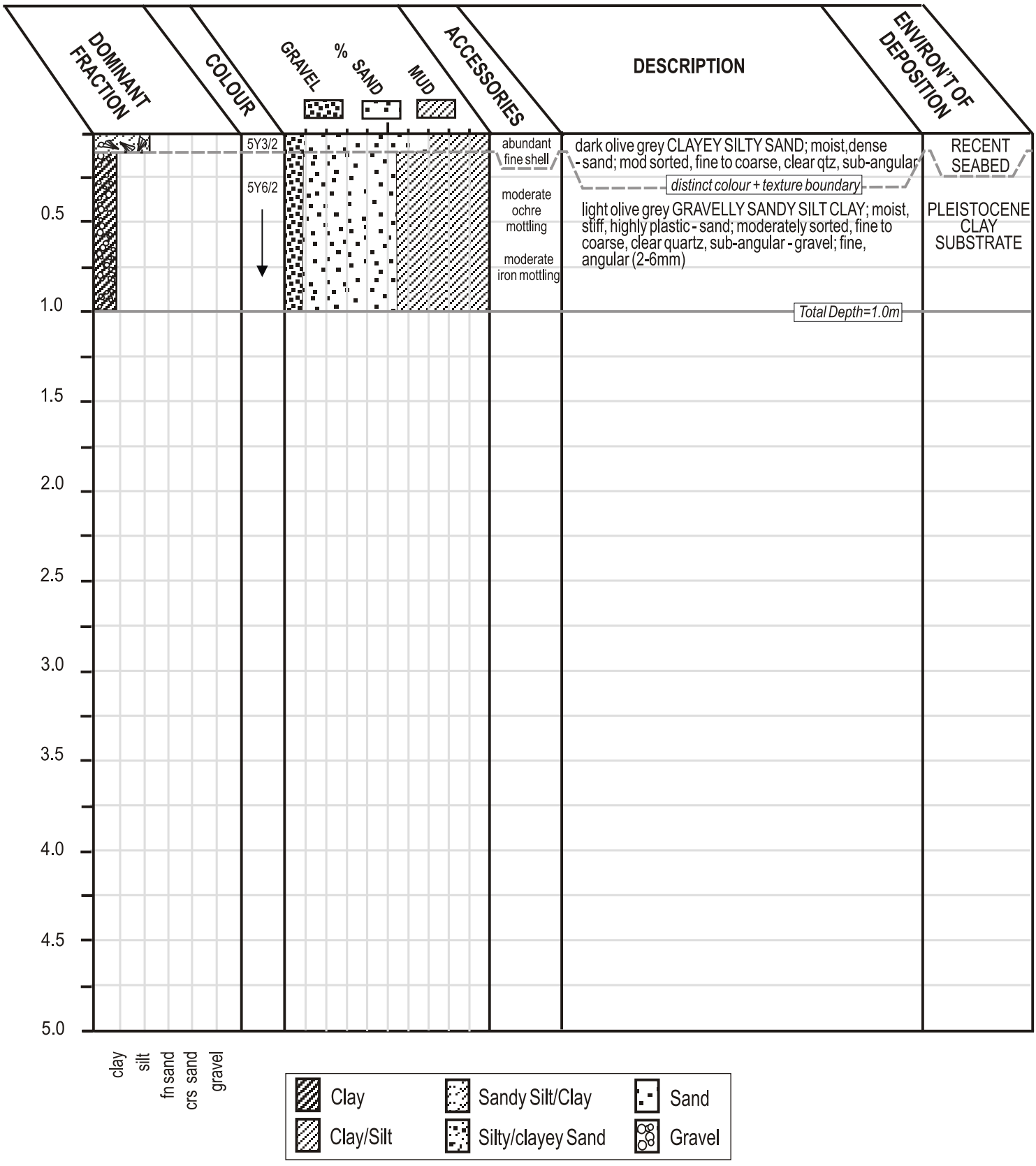
SITE: GC/ BH2A-14

LOCATION: Port of Gladstone
23°45.654' **S** 151°10.689 **E**
R.L. 6.2m L.A.T. (Port Datum)

DATE: 4/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-15

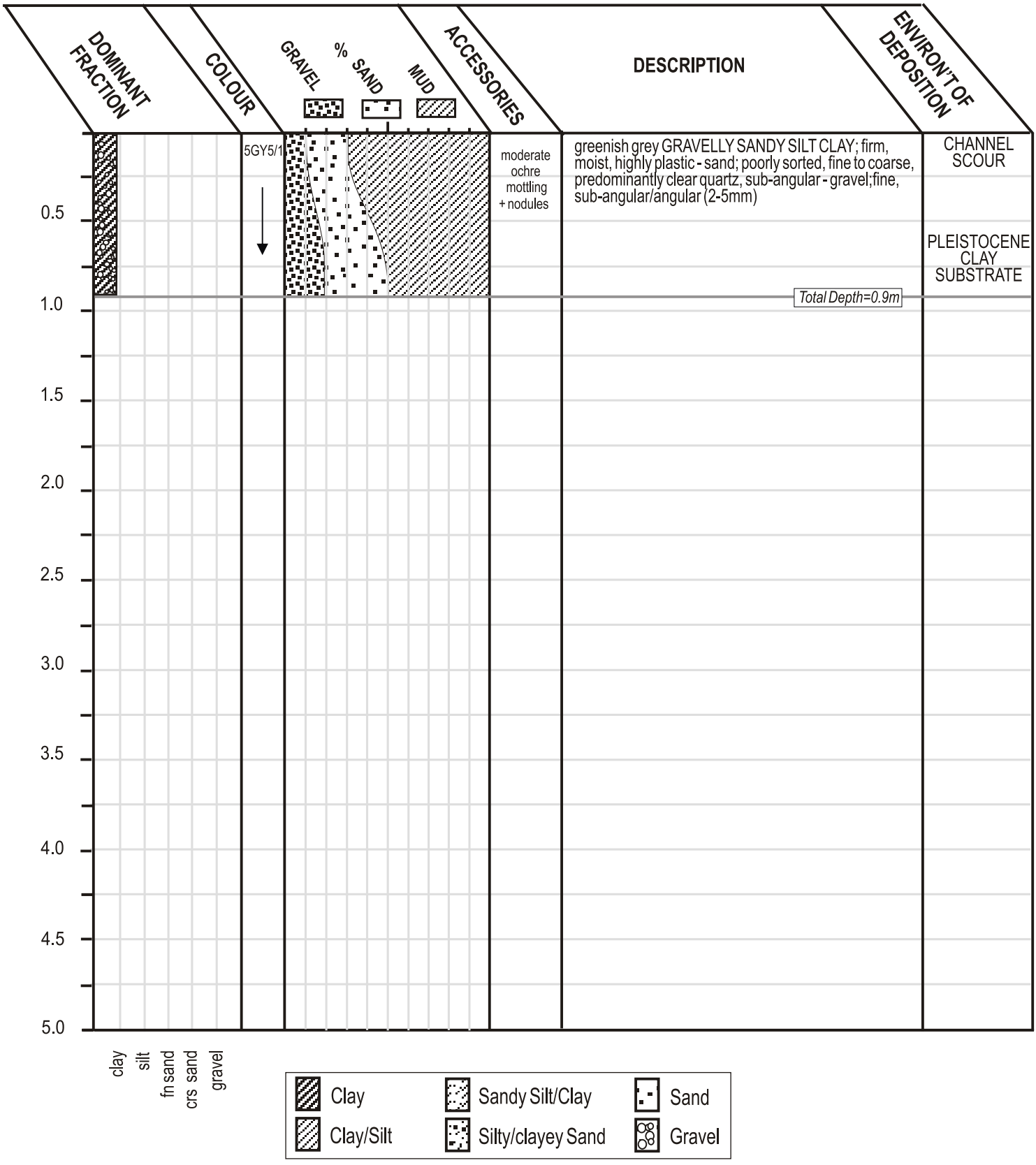
SITE: GC/ BH2A-15

DATE: 29/07/09

LOCATION: Port of Gladstone
23°45.679' **S** 151°10.811 **E**
R.L. 4.7m L.A.T. (Port Datum)

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-16

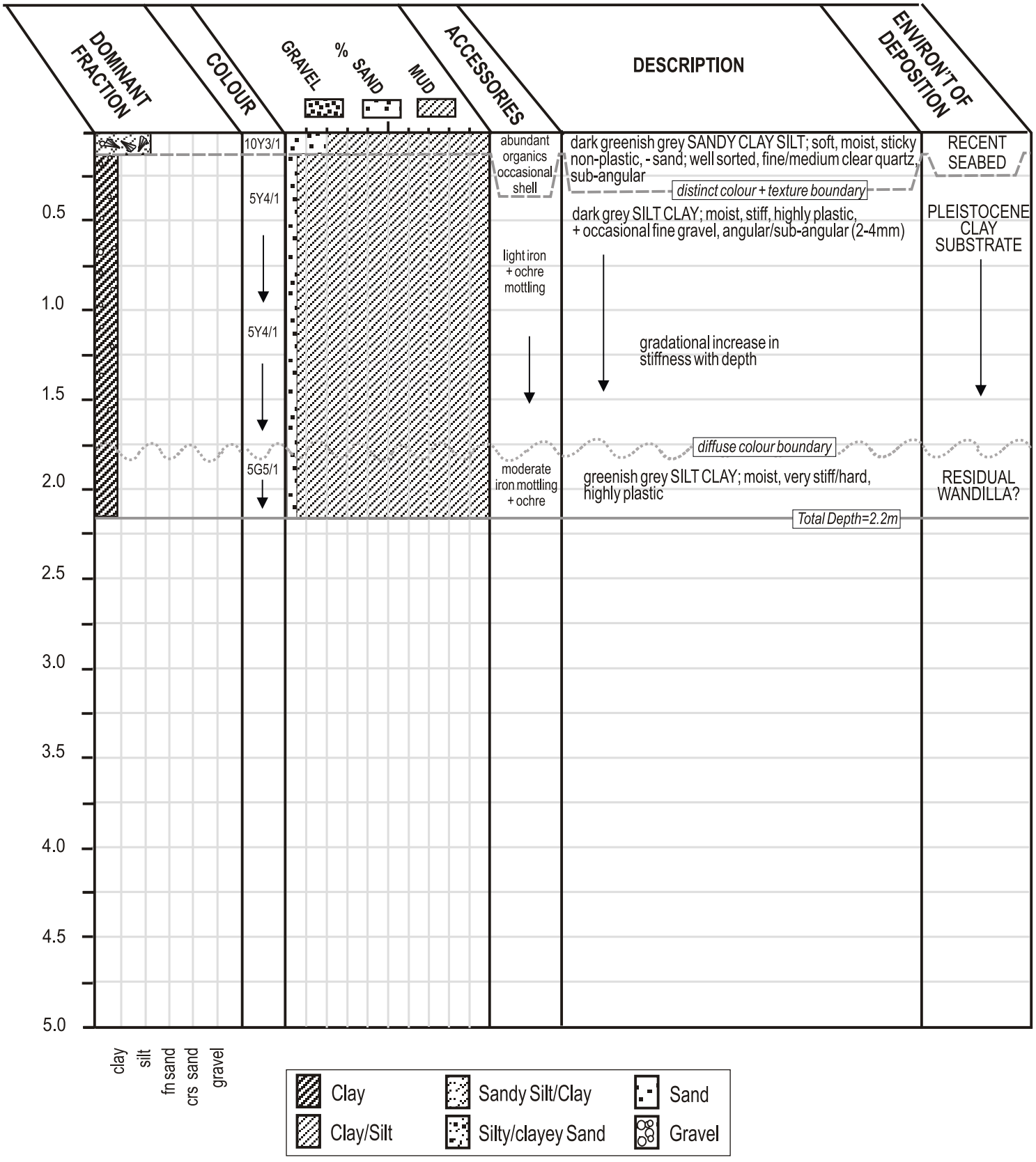
SITE: GC/ BH2A-16

LOCATION: Port of Gladstone
23°45.700' **S** 151°10.932 **E**
R.L. 0.9m L.A.T. (Port Datum)

DATE: 29/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-17

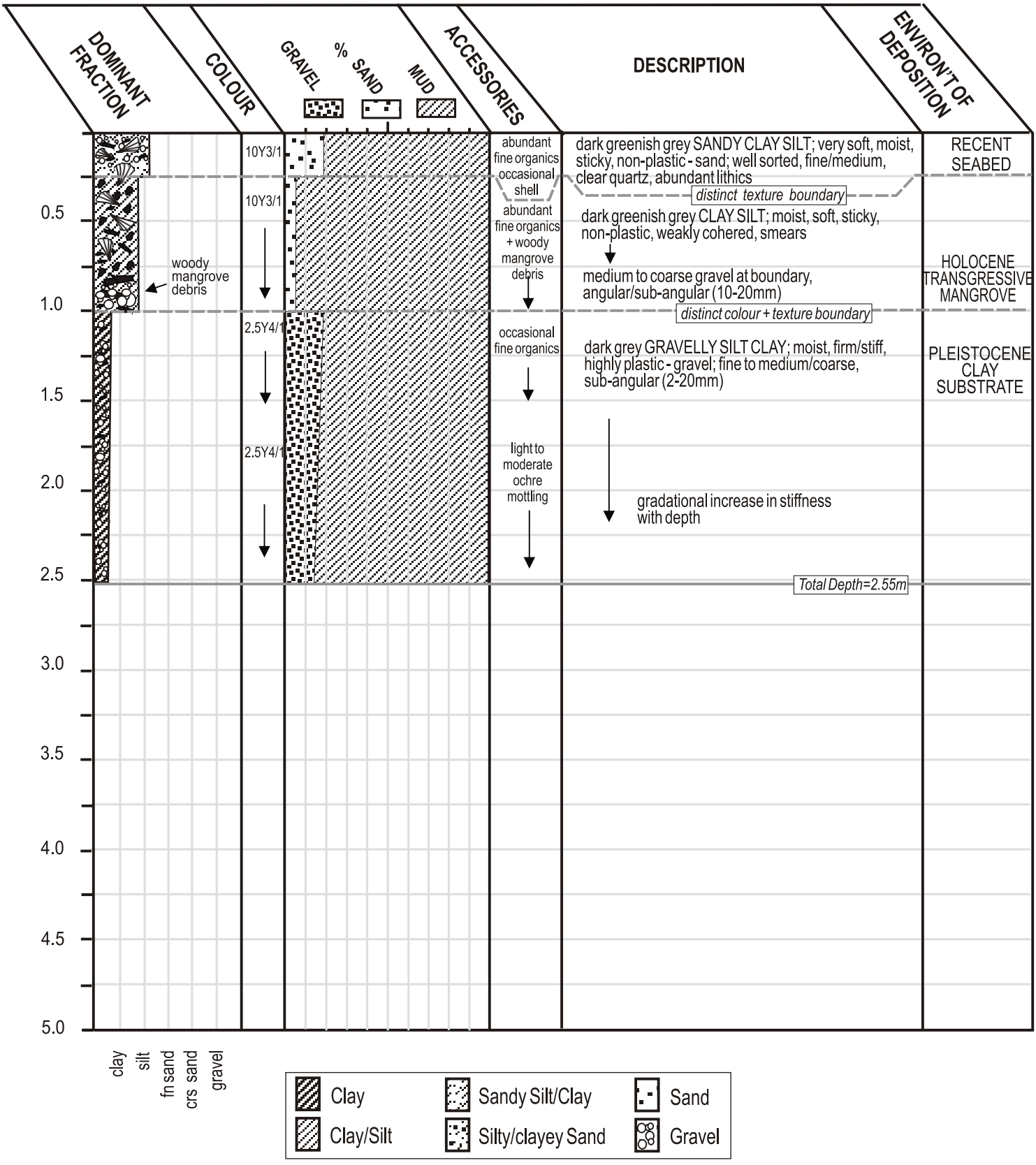
SITE: GC/ BH2A-17

LOCATION: Port of Gladstone
23°45.735' **S** 151°11.046 **E**
R.L. -0.9m L.A.T. (Port Datum)

DATE: 29/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-18

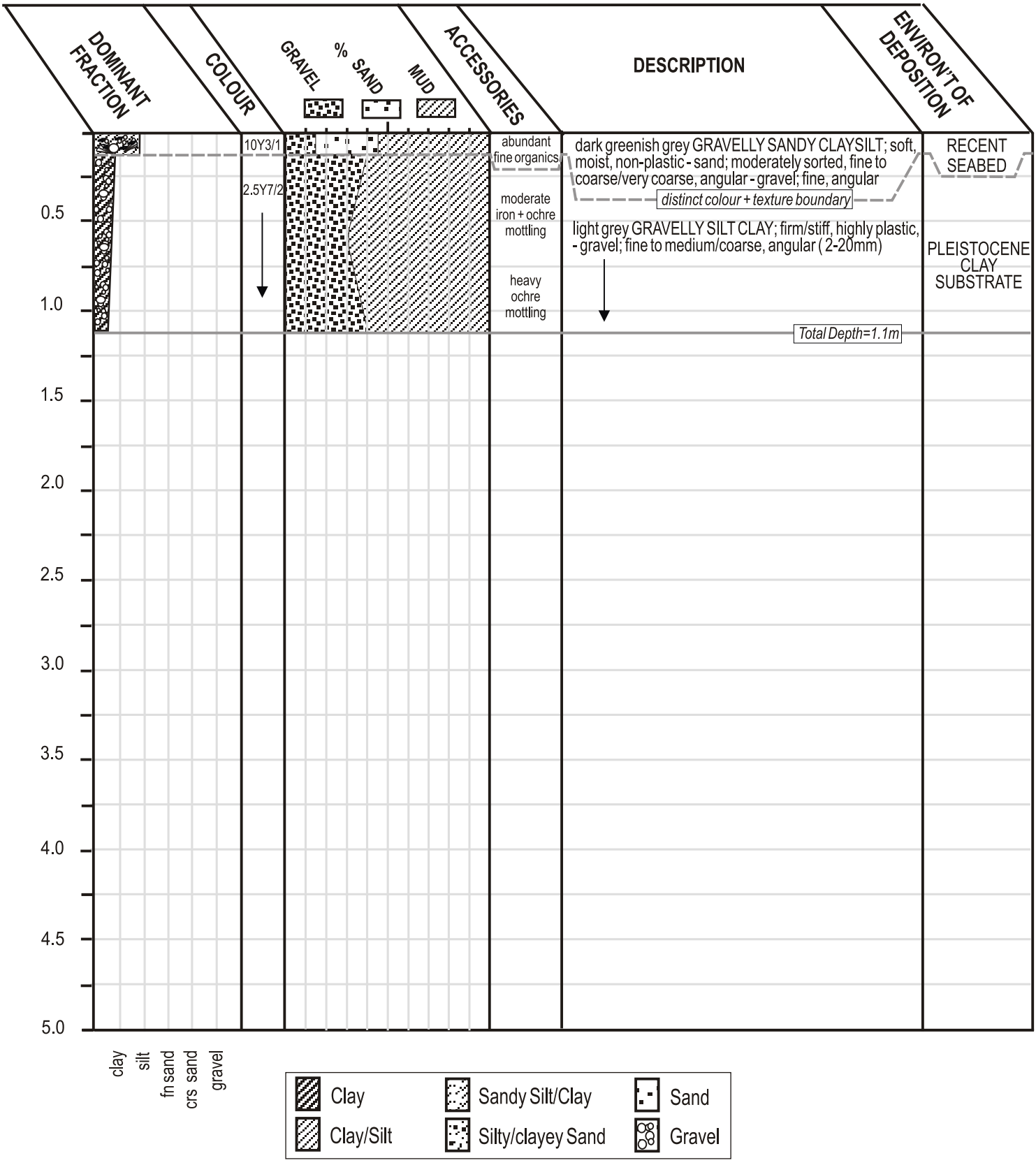
SITE: GC/ BH2A-18

LOCATION: Port of Gladstone
23°45.749' **S** 151°11.167 **E**
R.L. -2.51 m L.A.T. (Port Datum)

DATE: 29/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-19

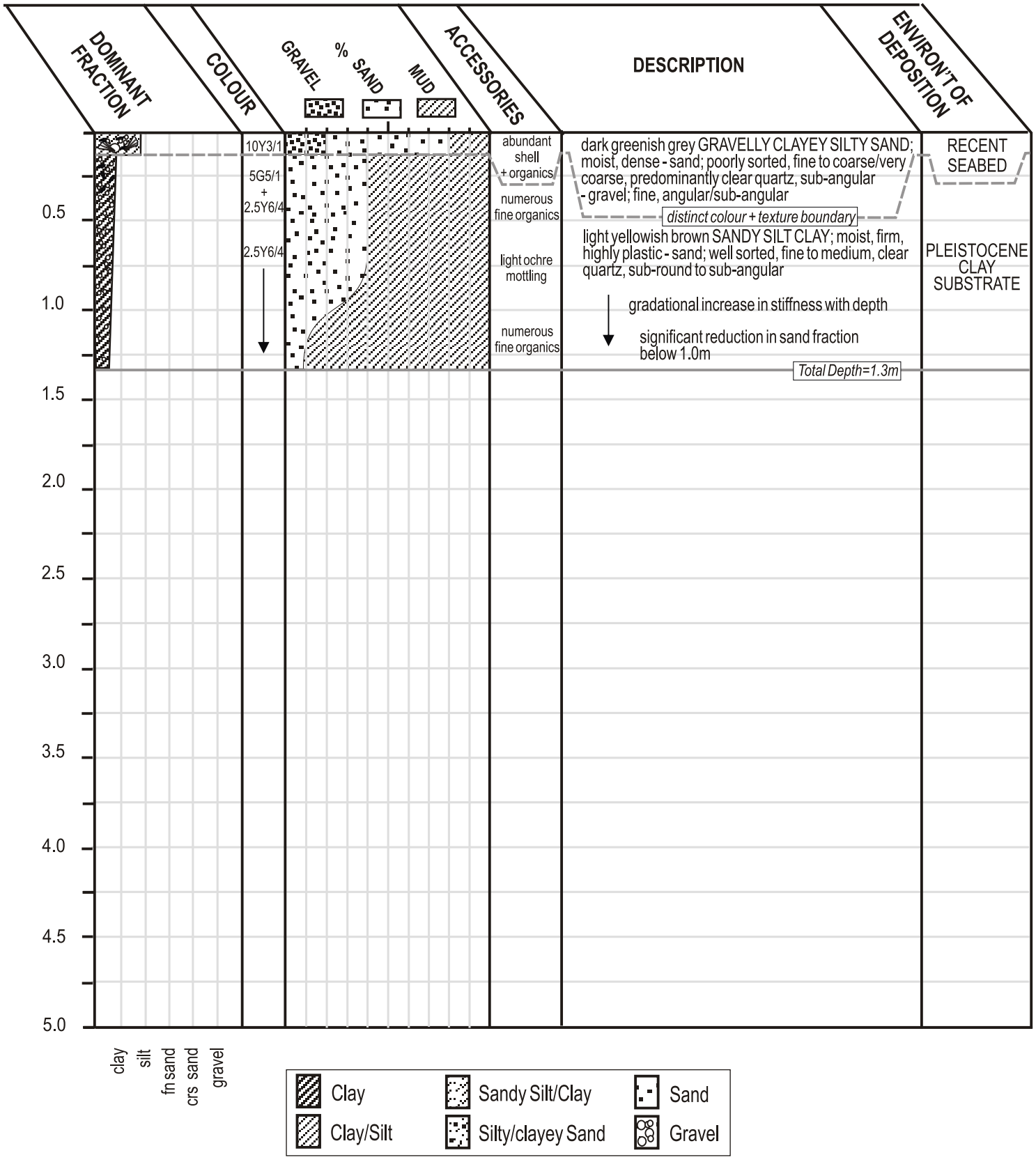
SITE: GC/ BH2A-19

LOCATION: Port of Gladstone
23°45.761' **S** 151°10.753 **E**
R.L. 5.9 m L.A.T. (Port Datum)

DATE: 30/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-20

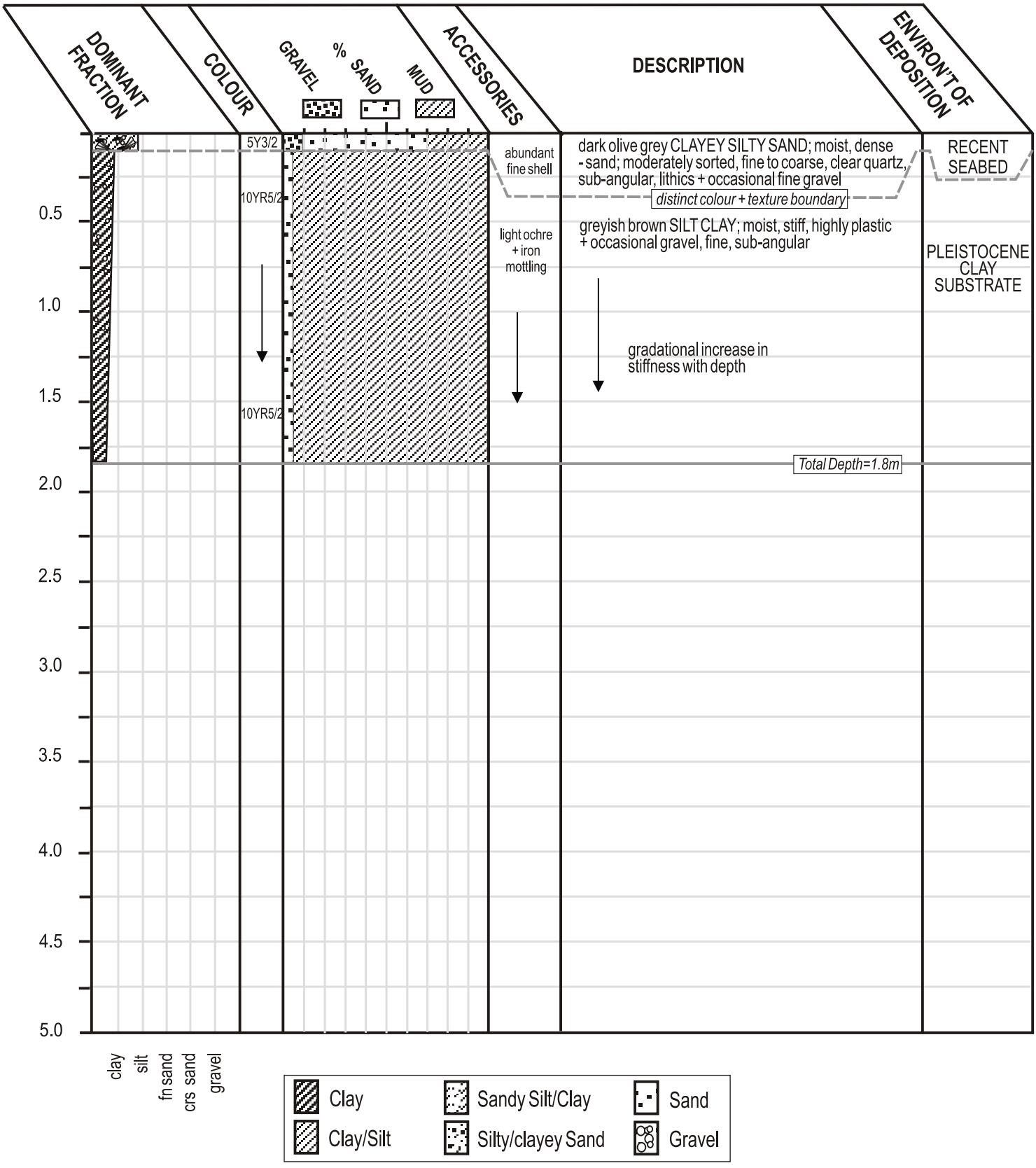
SITE: GC/ BH2A-20

LOCATION: Port of Gladstone
23°45.810' **S** 151°10.899 **E**
R.L. 5.4 m L.A.T. (Port Datum)

DATE: 4/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-21

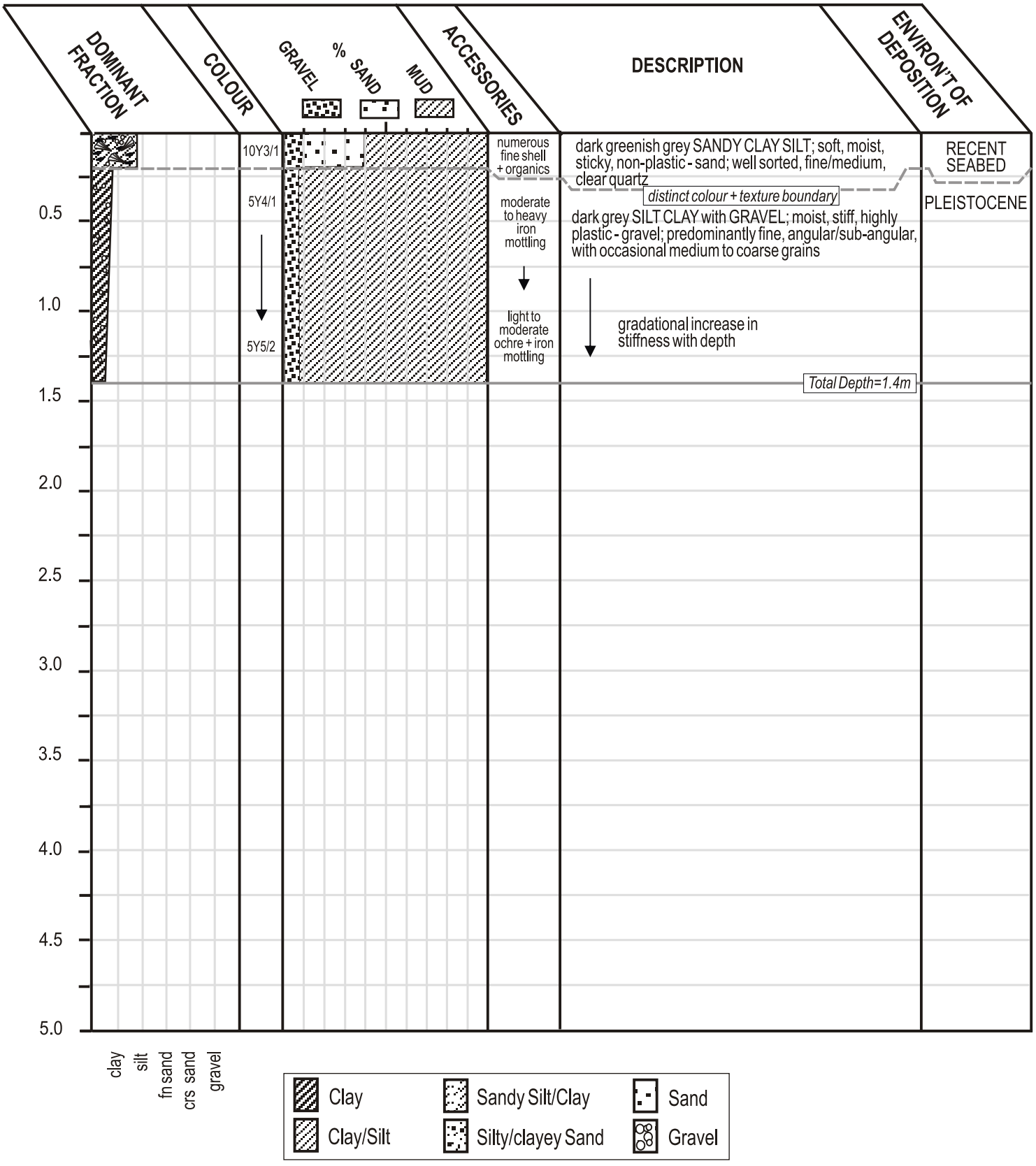
SITE: GC/ BH2A-21

LOCATION: Port of Gladstone
23°45.825' **S** 151°11.017 **E**
R.L. 1.95 m L.A.T. (Port Datum)

DATE: 1/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-22

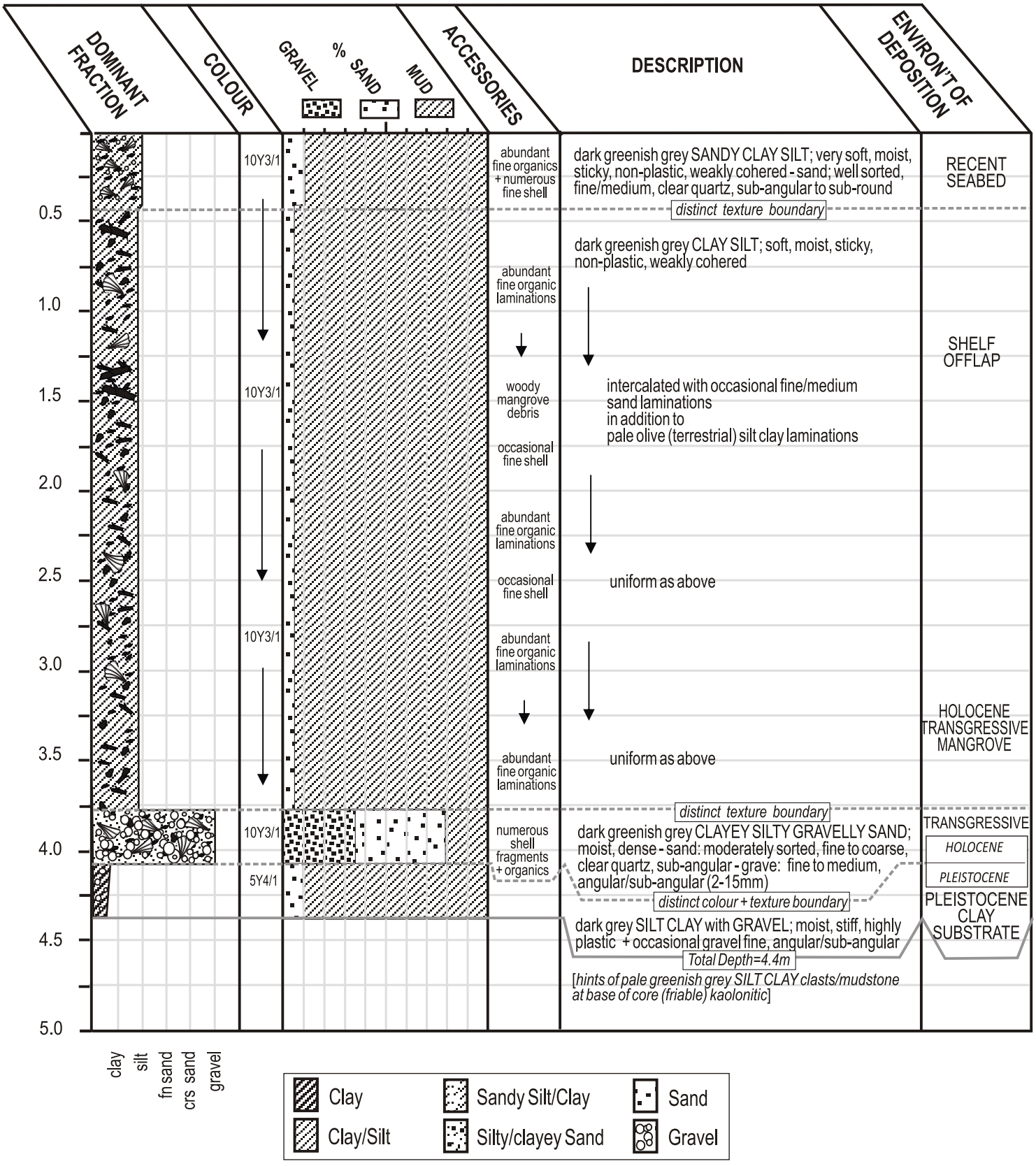
SITE: GC/ BH2A-22

LOCATION: Port of Gladstone
23°45.863' **S** 151°11.143 **E**
R.L. -0.7 m L.A.T. (Port Datum)

DATE: 3/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-23

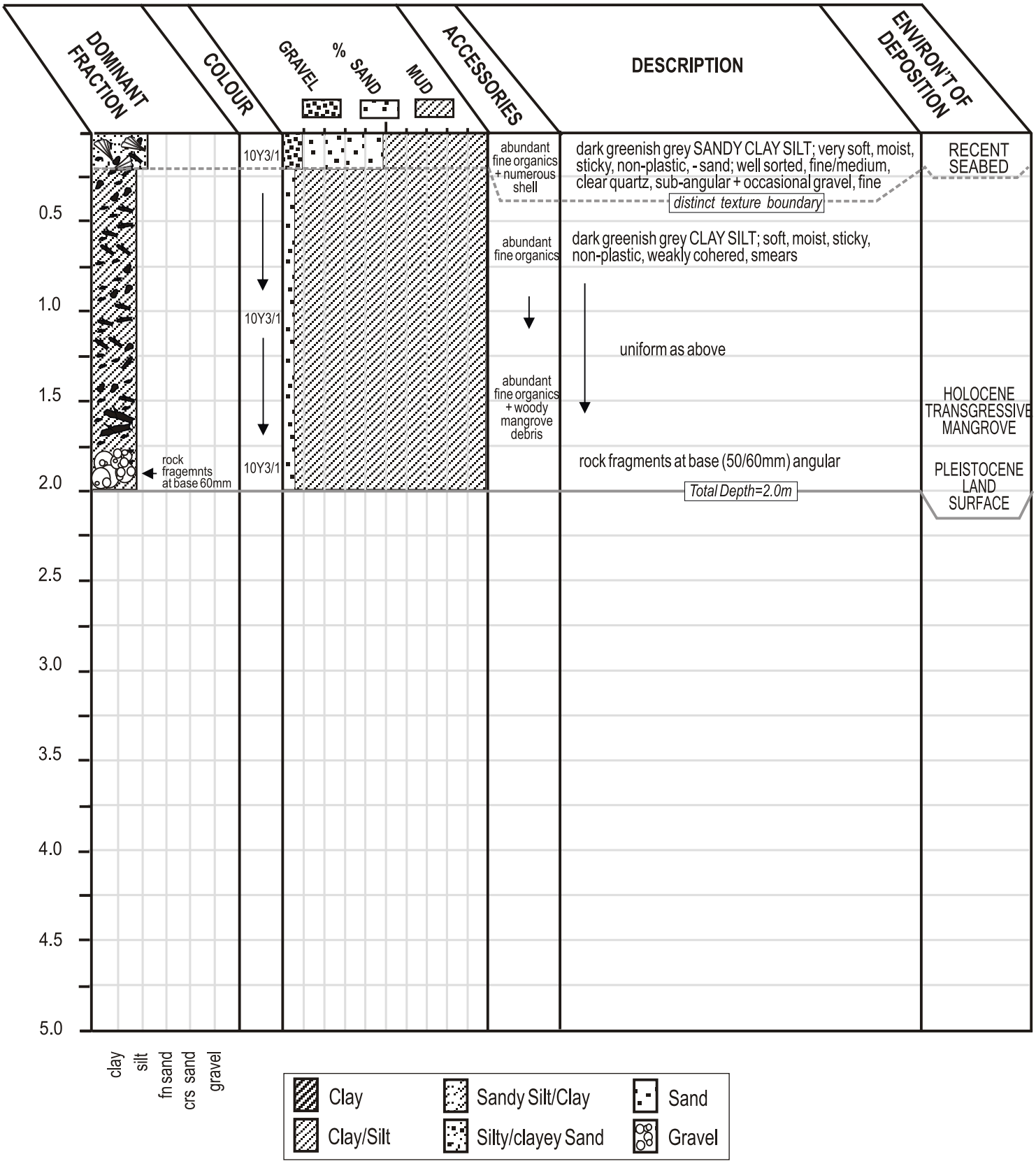
SITE: GC/ BH2A-23

LOCATION: Port of Gladstone
23°45.862' **S** 151°11.255 **E**
R.L. -2.8m L.A.T. (Port Datum)

DATE: 3/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-24

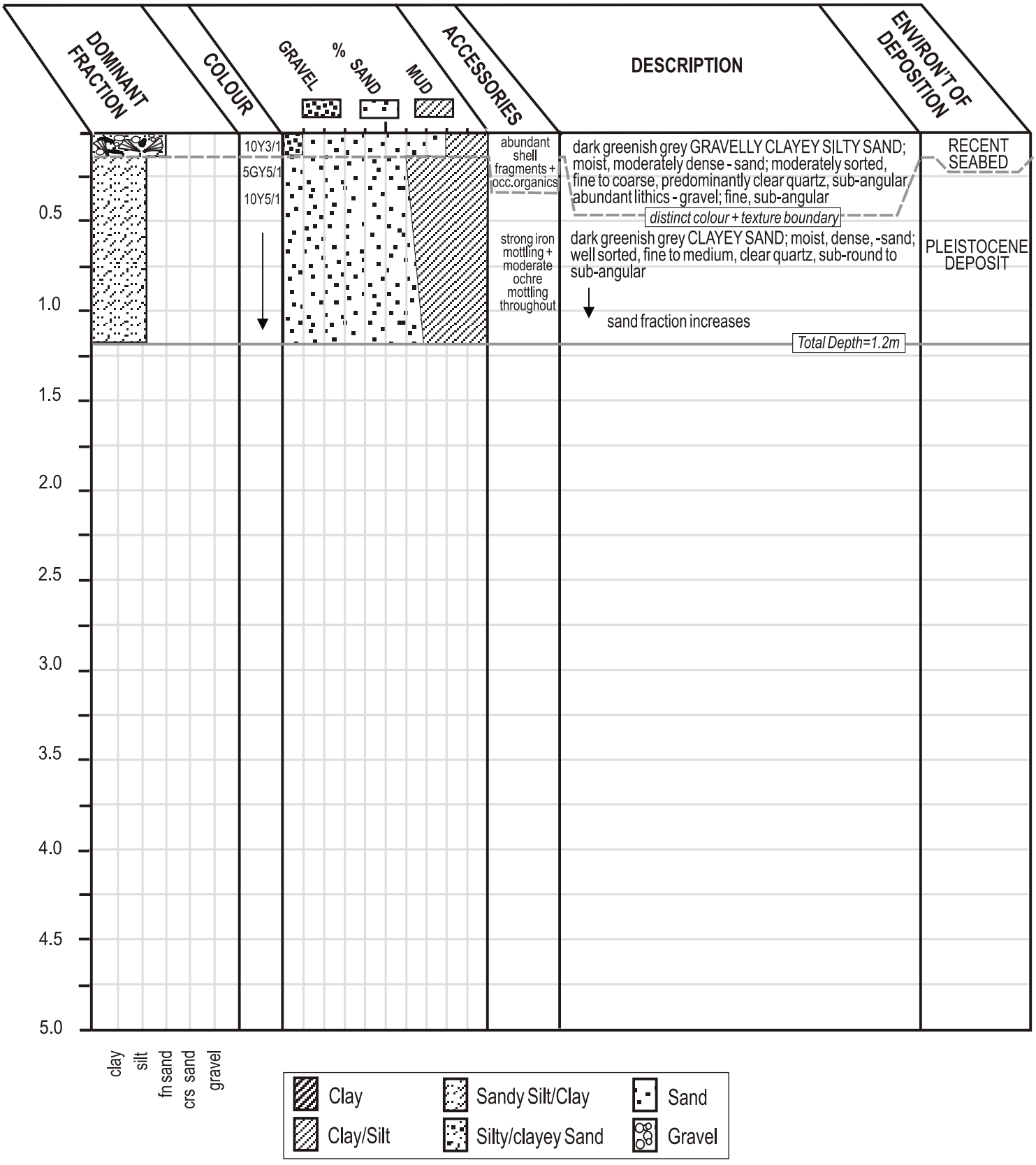
SITE: GC/ BH2A-24

LOCATION: Port of Gladstone
23°45.907' **S** 151°10.874 **E**
R.L. 5.8m L.A.T. (Port Datum)

DATE: 7/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-25

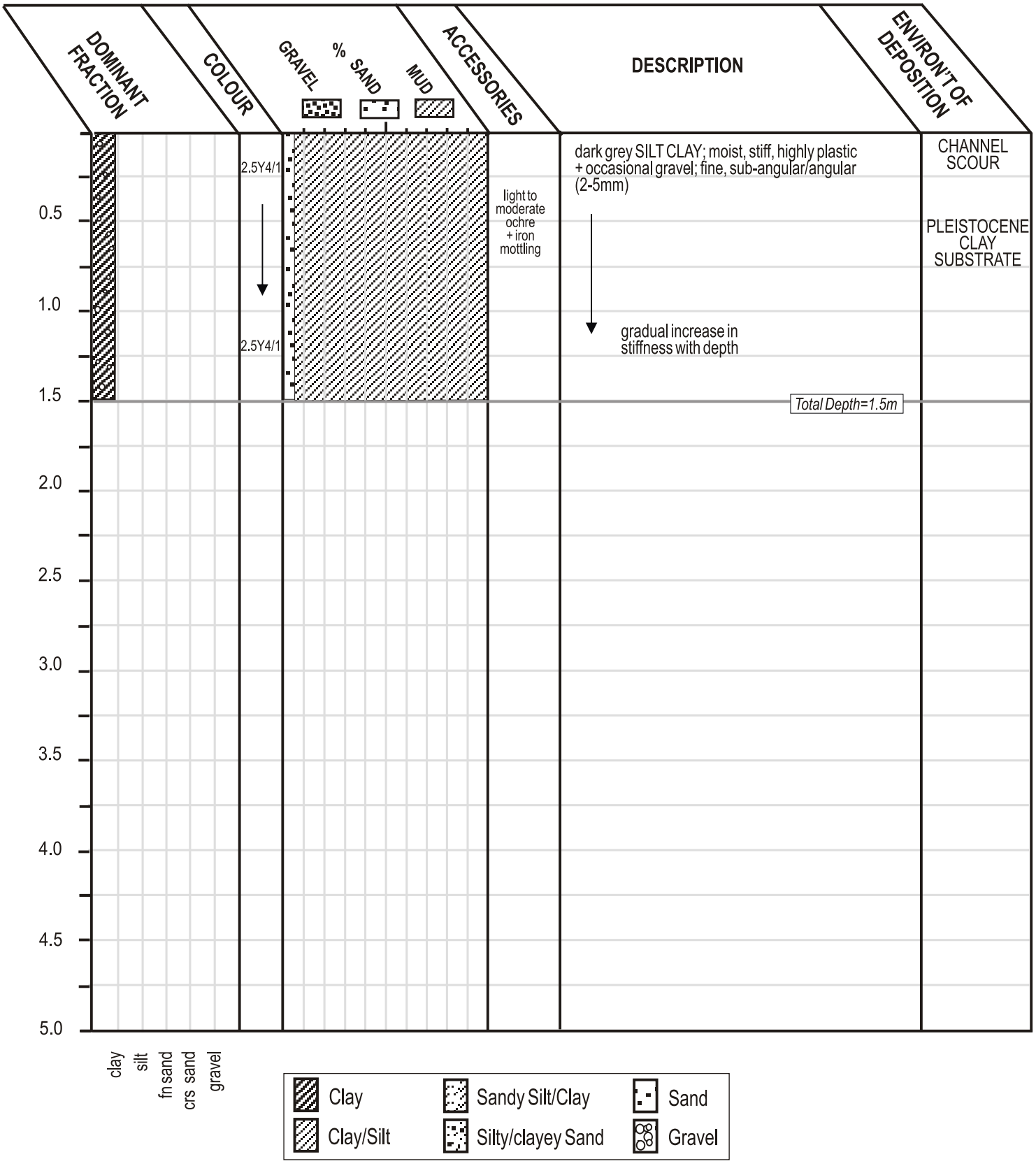
SITE: GC/ BH2A-25

LOCATION: Port of Gladstone
23°45.944' **S** 151°11.001 **E**
R.L. 5.85m L.A.T. (Port Datum)

DATE: 1/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-26

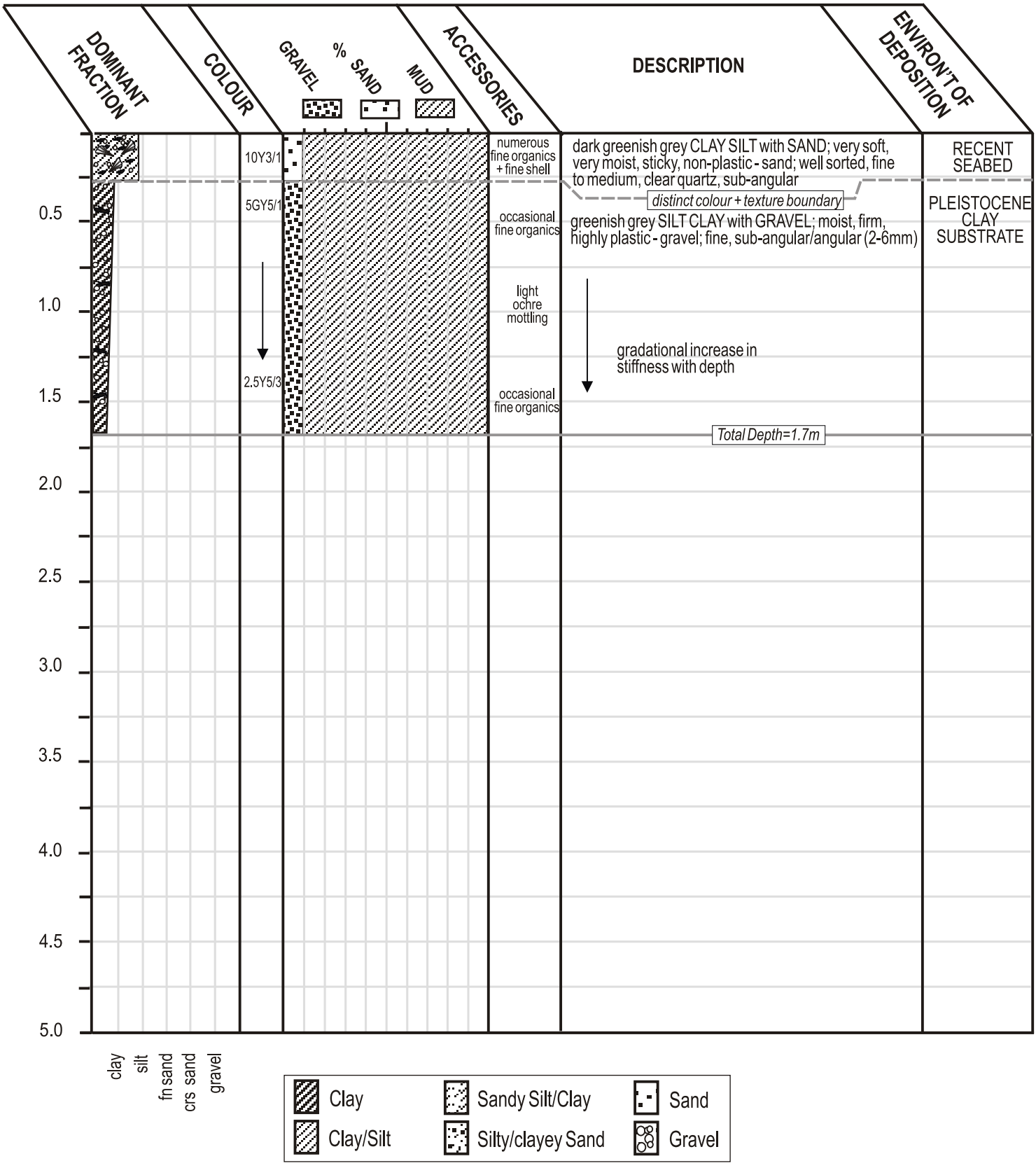
SITE: GC/ BH2A-26

LOCATION: Port of Gladstone
23°45.958 **S** 151°11.104 **E**
R.L. 2.6 m L.A.T. (Port Datum)

DATE: 6/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-27

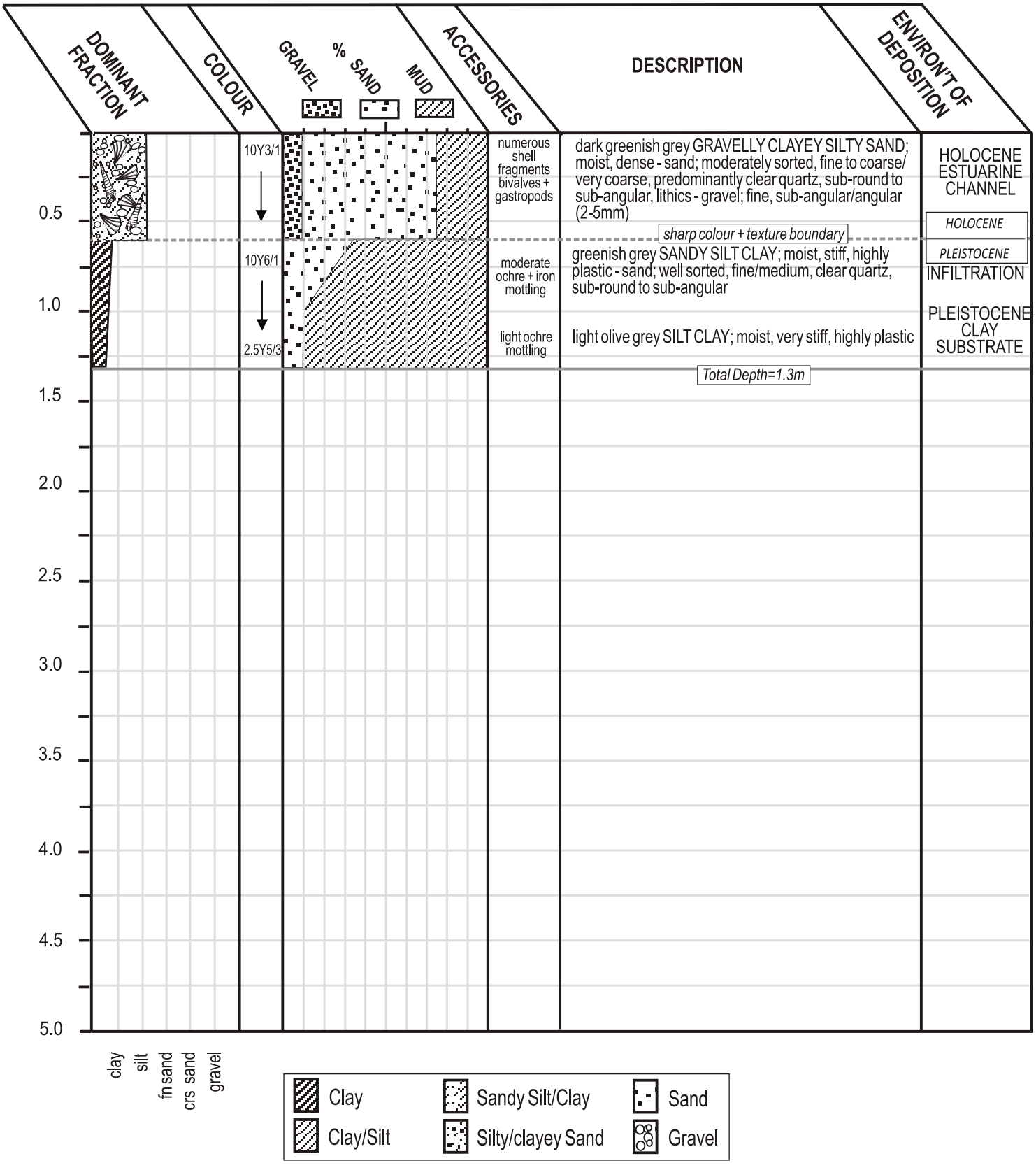
SITE: GC/ BH2A-27

LOCATION: Port of Gladstone
23°46.035 **S** 151°10.970 **E**
R.L. 5.1 m L.A.T. (Port Datum)

DATE: 5/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-28

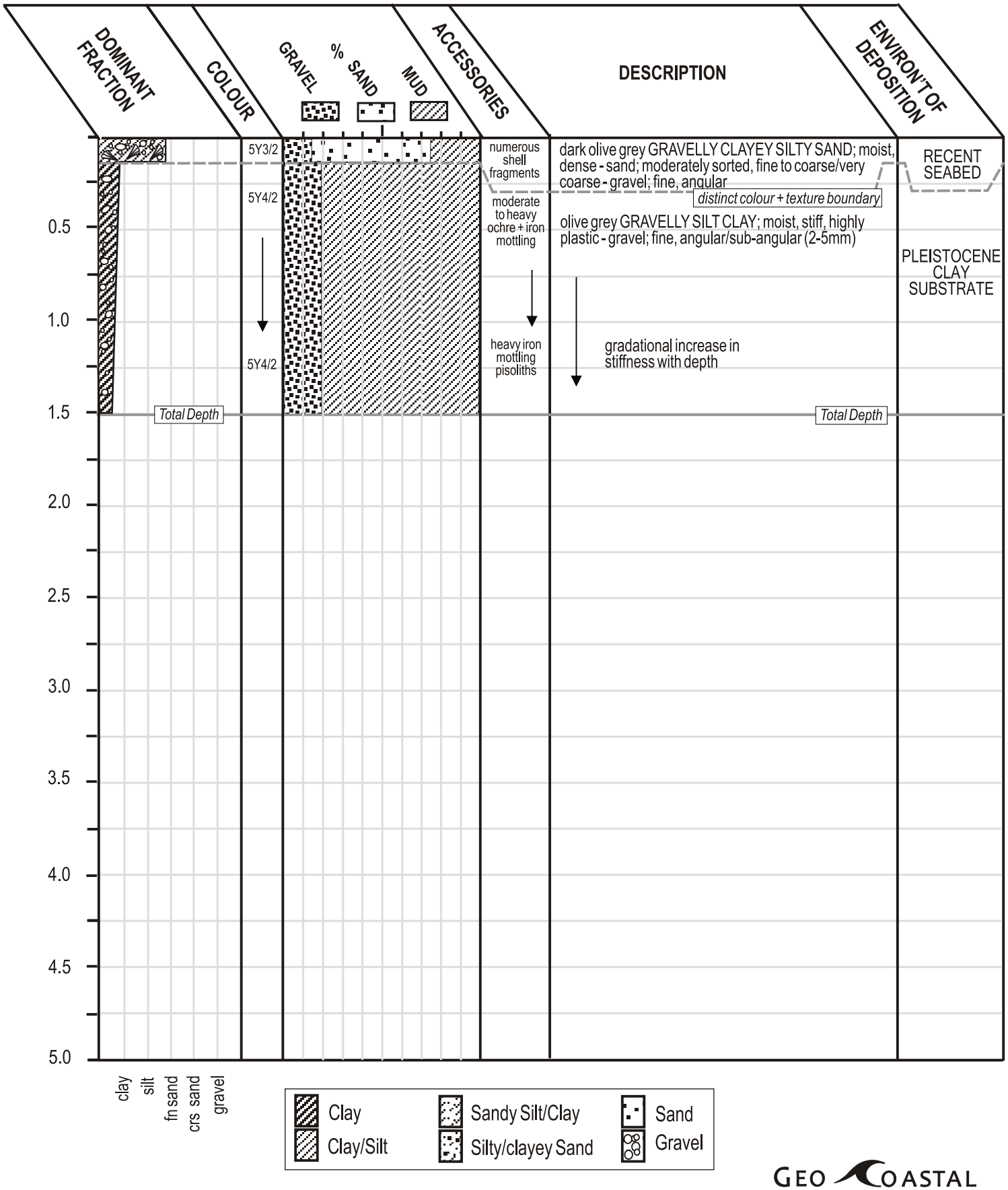
SITE: GC/ BH2A-28

LOCATION: Port of Gladstone
23°46.037 **S** 151°11.087 **E**
R.L. 5.6 m L.A.T. (Port Datum)

DATE: 31/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-29

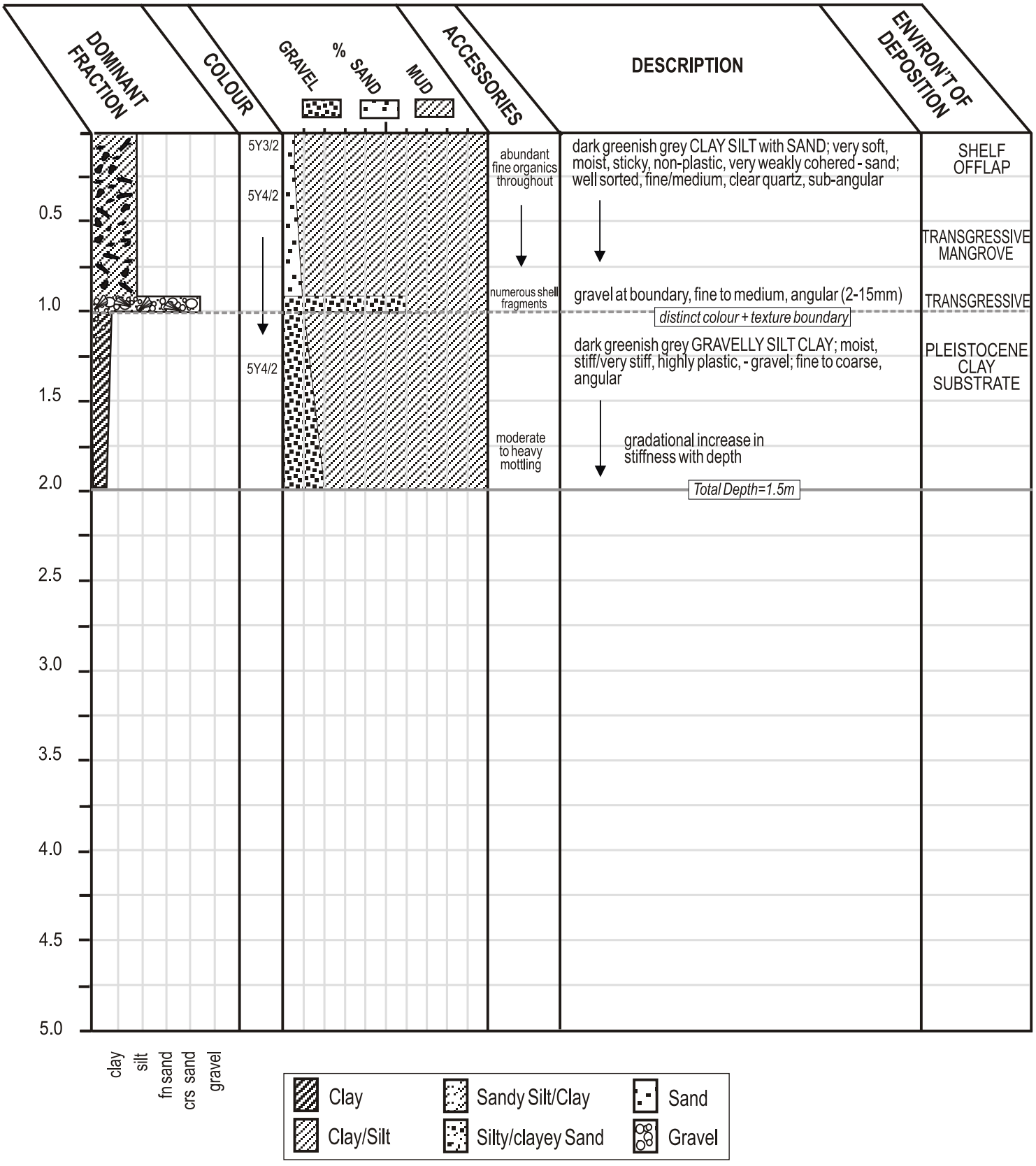
SITE: GC/ BH2A-29

LOCATION: Port of Gladstone
23°46.057 **S** 151°11.174 **E**
R.L. 2.8 m L.A.T. (Port Datum)

DATE: 8/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-30

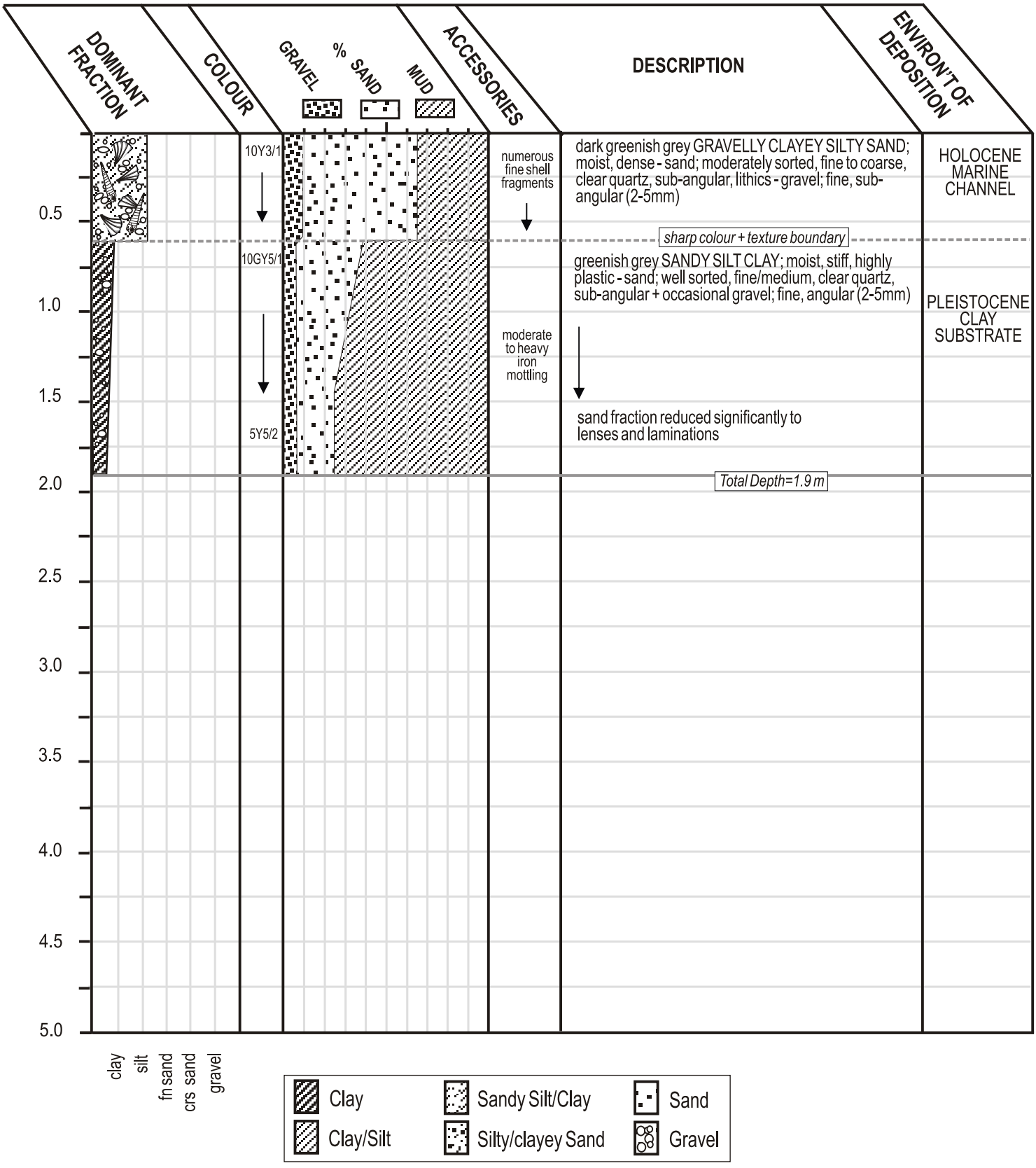
SITE: GC/ BH2A-30

LOCATION: Port of Gladstone
23°46.136 **S** 151°11.066 **E**
R.L. 5.47 m L.A.T. (Port Datum)

DATE: 31/7/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-31

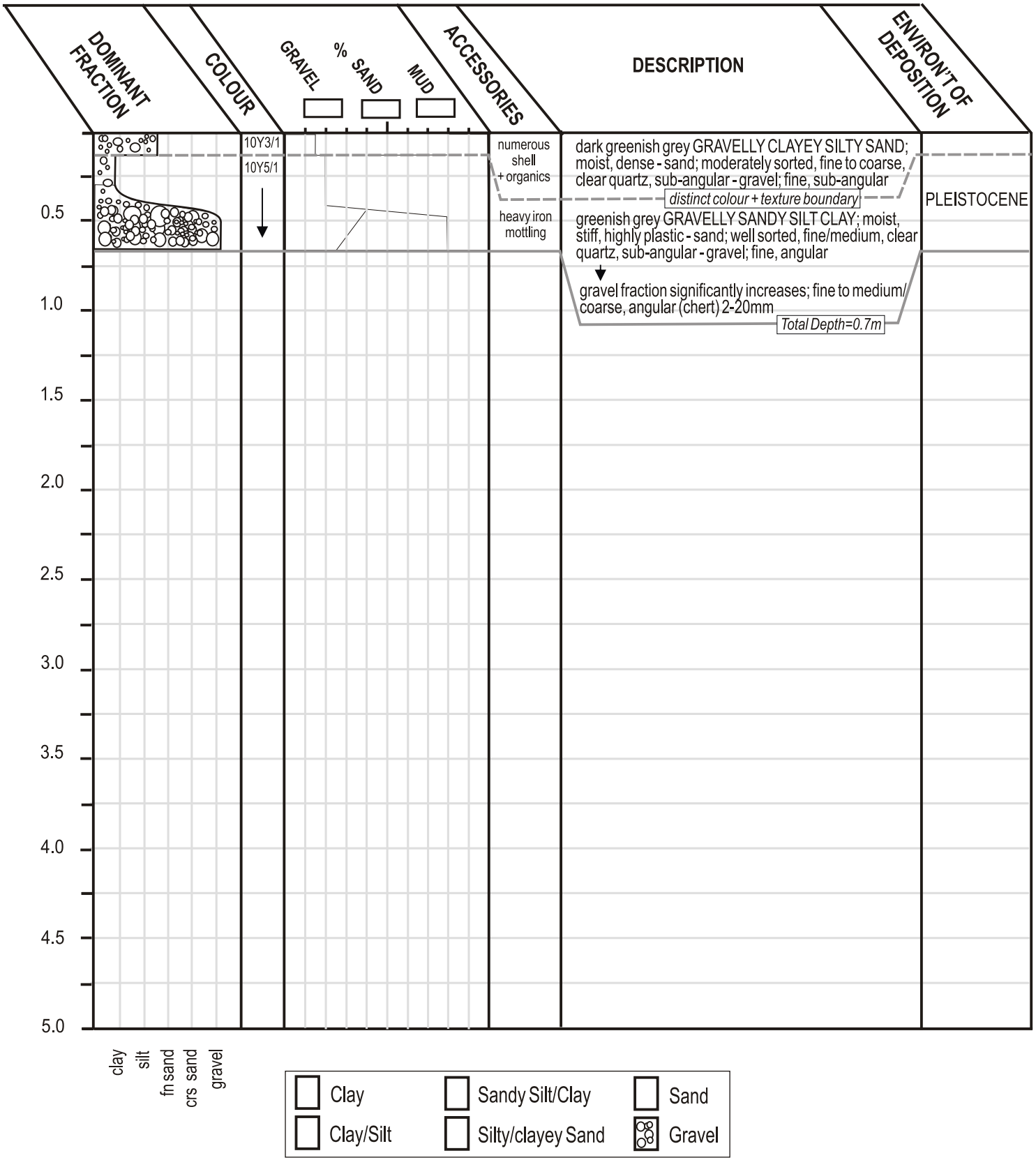
SITE: GC/ BH2A-31

LOCATION: Port of Gladstone
23°46.178 **S** 151°11.200 **E**
R.L. 4.7 m L.A.T. (Port Datum)

DATE: 31/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-32

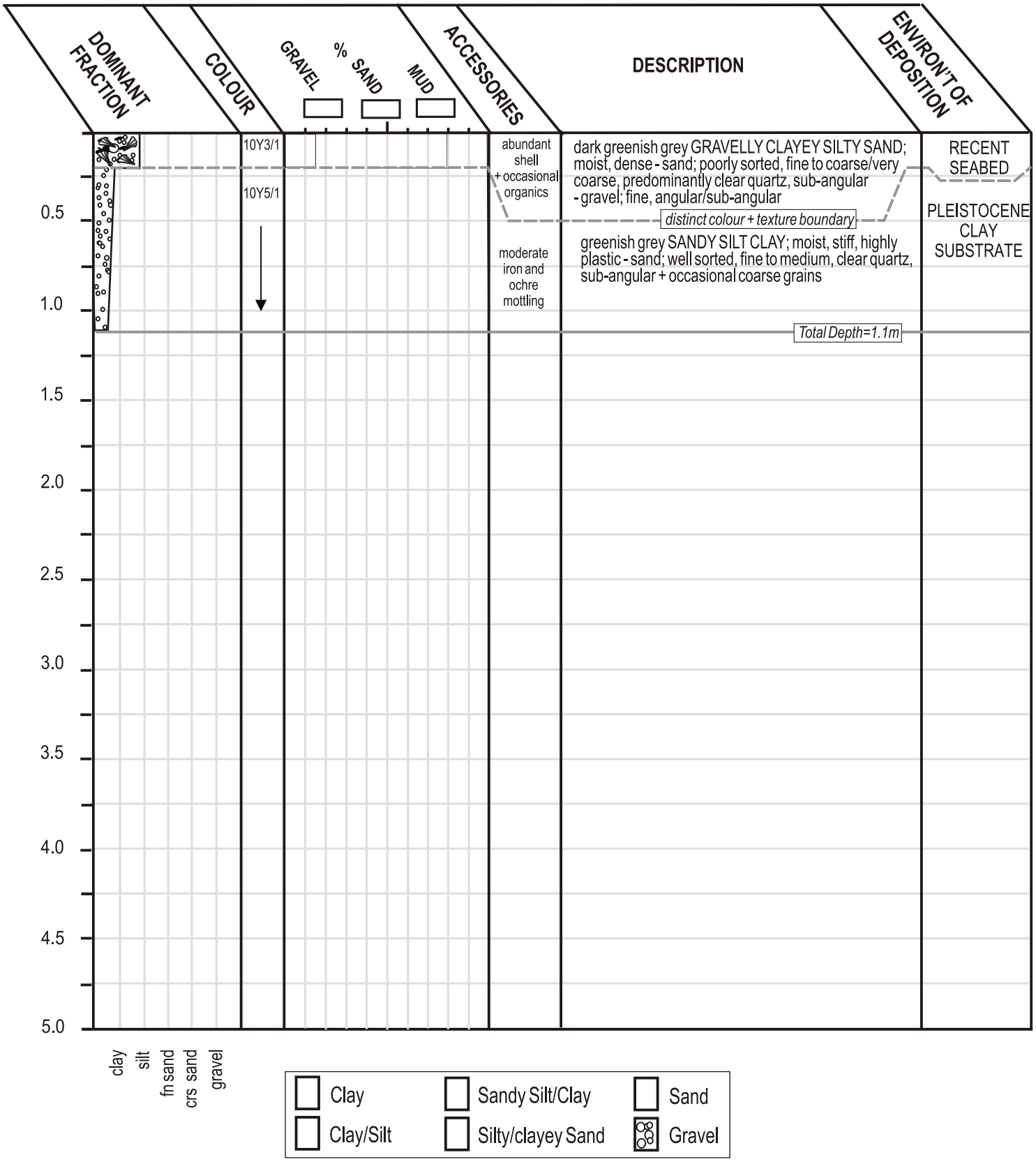
SITE: GC/ BH2A-32

LOCATION: Port of Gladstone
23°46.249' **S** 151°11.116 **E**
R.L. 5.1 m L.A.T. (Port Datum)

DATE: 31/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-33

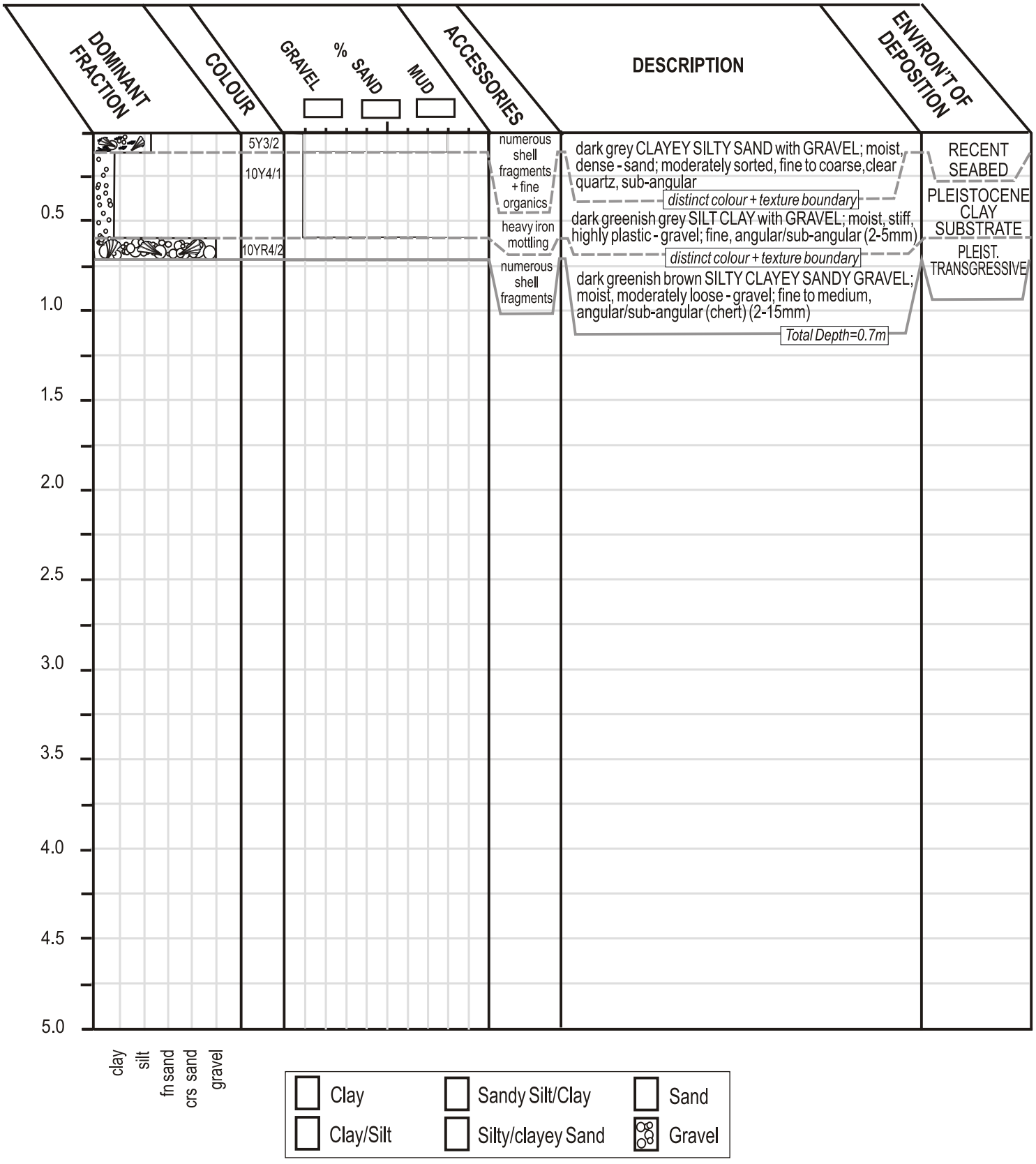
SITE: GC/ BH2A-33

LOCATION: Port of Gladstone
23°46.283' **S** 151°11.216 **E**
R.L. 5.5 m L.A.T. (Port Datum)

DATE: 5/08/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

BOREHOLE #BH2A-34

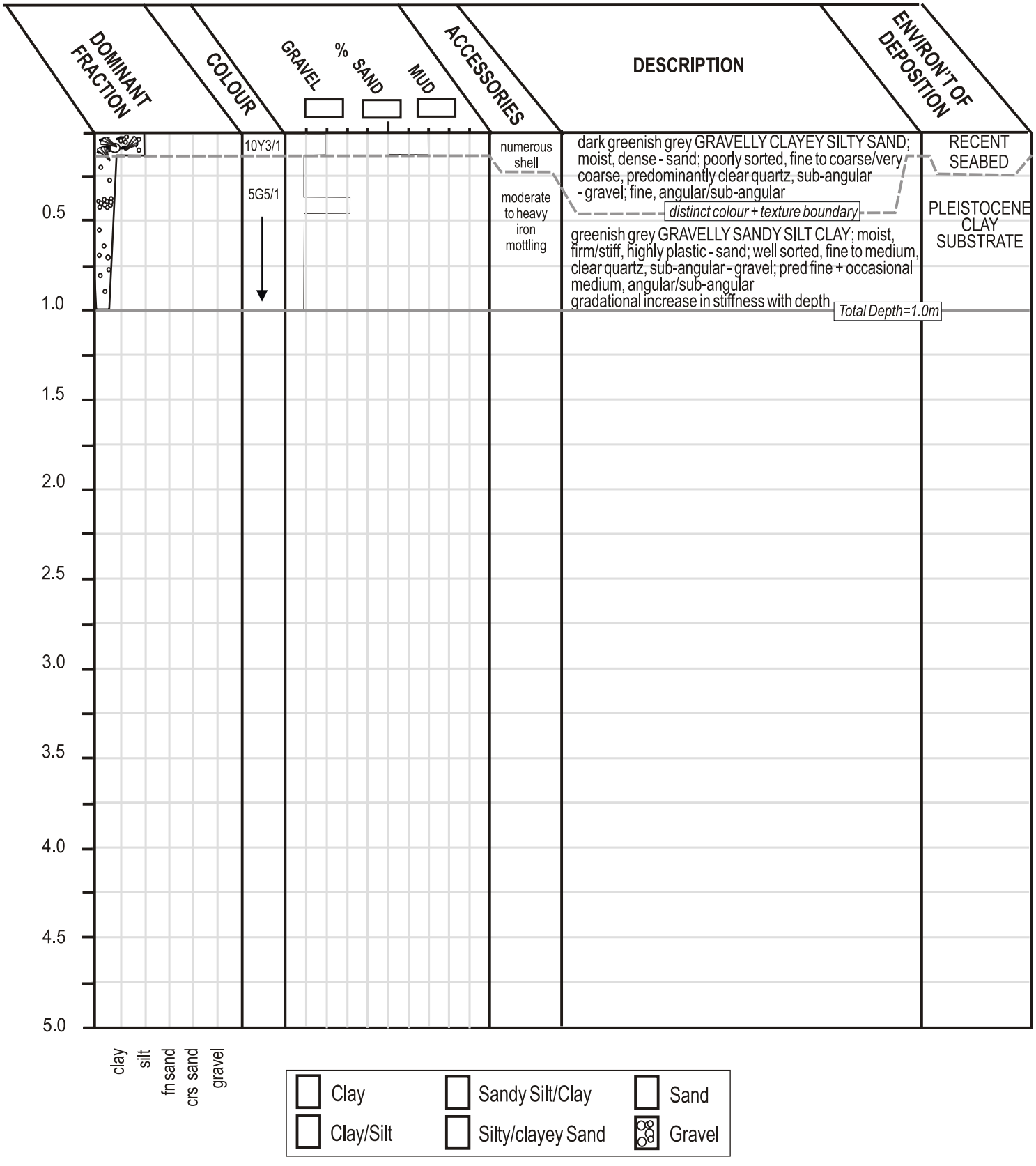
SITE: GC/ BH2A-34

LOCATION: Port of Gladstone
23°46.364' **S** 151°11.209 **E**
R.L. 8.32 m L.A.T. (Port Datum)

DATE: 30/07/09

FEATURE: Shallow seabed

SAMPLING METHOD: GeoCoastal percussion-vacuum corer



GEO COASTAL Australia

APPENDIX B

Laboratory Test Results

Golder Associates Pty Ltd
ABN: 64 006 107 857
(Bisbane Laboratory)

611 Coronation Drive
TOOWONG QLD 4066
(PO Box 1734, MILTON BC QLD 4064)
Telephone: (61-7) 3721 5400
Facsimile: (61-7) 3721 5401
http://www.golder.com

Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**6/08/2009**			**Drilled: 04/08/2009**			
BH2A-01 0.00-0.25m	7.5	1.8	PASS	BH2A-02 0.00-0.25m	8.7	7.4	Nil ASS/PASS
BH2A-01 0.25-0.50m	7.8	1.8	PASS	BH2A-02 0.25-0.50m	8.2	7.6	Nil ASS/PASS
BH2A-01 0.50-0.75m	7.8	1.8	PASS	BH2A-02 0.50-0.75m	7.9	7.6	Nil ASS/PASS
BH2A-01 0.75-1.00m	7.8	2.3	Probable PASS	BH2A-02 0.75-0.90m	7.4	7.2	Nil ASS/PASS
BH2A-01 1.00-1.25m	7.9	1.9	PASS				
BH2A-01 1.25-1.50m	8.0	2.1	Probable PASS				
BH2A-01 1.50-1.80m	8.0	1.7	PASS				
BH2A-01 1.80-2.00m	8.1	2.7	Probable PASS				
BH2A-01 2.00-2.25m	8.2	3.4	Possible PASS				
BH2A-01 2.25-2.50m	8.4	6.8	Nil ASS/PASS				
BH2A-01 2.50-2.75m	8.5	8.2	Nil ASS/PASS				
BH2A-01 2.75-3.00m	8.5	7.9	Nil ASS/PASS				

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-01 0.00-0.50m	18	<2	245	LMC, dk grey, orgs	1.21*	590	--*	66
BH2A-01 0.50-1.00m	18	<2	266	MC, dk grey, orgs	1.44*	720	--*	81
BH2A-01 1.00-1.50m	18	<2	--	MC, dk grey, trace orgs	1.18	680	2.1	76
BH2A-01 1.50-1.80m	18	<2	--	MC, dk grey, trace orgs	1.91	1180	1.9	132
BH2A-01 1.80-2.25m	18	<2	--	MHC, dk grey	0.74	390	2.5	44
BH2A-01 2.25-2.50m	18	<2	--	HC, dk grey	0.34	155	3.1	18

Remarks: TAA - Total Actual Acidity, ANC - Acid Neutralisng Capacity, SPOS - Peroxide Oxidisable Sulfur
Liming rates are indicative and based on a FOS of 1.5, assumed density of 1.5 and 1.7 tonne/m^3 for clay and sand respectively and 'net potential acidity' as determined by analysis.
Samples denoted * have undergone the Chromium Reducible Sulfur analysis suite (S_{Cr}), pHox is not determined.
ANC is the 'as reported' value and reflects ANC by the S_{Cr} method and 'excess' ANC if by SPOCAS.

Australian Soil and Land Survey Field Handbook (3rd ed) - Field texture grade

S - Sand	ZL - Silty loam	LC - Light clay
LS - Loamy sand	SCL - Sandy clay loam	LMC - Light medium clay
CS - Clayey sand	CL - Clay loam	MC - Medium clay
SL - Sandy loam	CLS - Clay loam, sandy	MHC - Medium heavy clay
L - Loam	ZCL - Silty clay loam	HC - Heavy clay

Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	CLW	Checked By:	HP

Golder Associates Pty Ltd
ABN: 64 006 107 857
(Bisbane Laboratory)

611 Coronation Drive
TOOWONG QLD 4066
(PO Box 1734, MILTON BC QLD 4064)
Telephone: (61-7) 3721 5400
Facsimile: (61-7) 3721 5401
http://www.golder.com

Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**6/08/2009**			**Drilled: 04/08/2009**			
BH2A-03 0.00-0.25m	7.0	1.7	PASS	BH2A-04 0.00-0.25m	8.8	2.4	Probable PASS
BH2A-03 0.25-0.50m	7.4	1.8	PASS	BH2A-04 0.25-0.50m	8.9	2.0	Probable PASS
BH2A-03 0.50-0.75m	7.6	1.9	PASS	BH2A-04 0.50-0.75m	8.5	1.8	PASS
BH2A-03 0.75-1.00m	7.6	1.9	PASS	BH2A-04 0.75-1.00m	8.4	1.8	PASS
BH2A-03 1.00-1.25m	7.6	1.9	PASS	BH2A-04 1.00-1.25m	8.2	1.9	PASS
BH2A-03 1.25-1.60m	7.7	1.6	PASS	BH2A-04 1.25-1.50m	8.1	1.8	PASS
BH2A-03 1.60-1.75m	7.9	5.0	Nil ASS/PASS	BH2A-04 1.50-1.75m	8.1	1.8	PASS
BH2A-03 1.75-2.00m	8.0	2.6	Probable PASS	BH2A-04 1.75-1.90m	8.1	1.9	PASS
BH2A-03 2.00-2.25m	8.1	2.8	Probable PASS	BH2A-04 1.90-2.25m	8.3	2.6	Probable PASS
BH2A-03 2.25-2.50m	8.4	5.0	Nil ASS/PASS	BH2A-04 2.25-2.50m	8.3	4.8	Nil ASS/PASS
BH2A-03 2.50-2.75m	8.3	2.4	Probable PASS	BH2A-04 2.50-2.75m	8.3	6.0	Nil ASS/PASS
BH2A-03 2.75-2.90m	8.3	6.7	Nil ASS/PASS	BH2A-04 2.75-3.00m	8.8	8.0	Nil ASS/PASS

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-03 0.00-0.25m	18	<2	212	LMC,dk grey, org	1.88*	1030	--*	105
BH2A-03 1.25-1.60m	18	5	--	LMC,dk grey, org	1.19	749	1.9	84
BH2A-03 2.50-2.75m	18	<2	--	HC,dk grey	0.69	335	2.5	38
BH2A-04 0.50-0.75m	18	<2	170	MC,dk grey, org	1.48*	809	--*	92
BH2A-04 1.90-2.25m	18	<2	--	HC,dk grey	0.87	494	2.1	56

Remarks: TAA - Total Actual Acidity, ANC - Acid Neutralisng Capacity, SPOS - Peroxide Oxidisable Sulfur
Liming rates are indicative and based on a FOS of 1.5, assumed density of 1.5 and 1.7 tonne/m^3 for clay and sand respectively and 'net potential acidity' as determined by analysis.
Samples denoted * have undergone the Chromium Reducible Sulfur analysis suite (S_{Cr}), pHox is not determined.
ANC is the 'as reported' value and reflects ANC by the S_{Cr} method and 'excess' ANC if by SPOCAS.

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L - Loam	ZCL - Silty clay loam	HC - Heavy clay

Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	CLW	Checked By:	HP

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Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**6/08/2009**			**Drilled:**	**7/08/2009**		
BH2A-05 0.00-0.25m	7.5	2.2	Probable PASS	BH2A-06 0.00-0.25m	6.6	6.0	Nil ASS/PASS
BH2A-05 0.25-0.50m	7.5	2.0	Probable PASS	BH2A-06 0.25-0.50m	6.5	6.0	Nil ASS/PASS
BH2A-05 0.50-0.75m	7.5	1.7	PASS	BH2A-06 0.50-0.75m	6.6	6.1	Nil ASS/PASS
BH2A-05 0.75-1.00m	7.5	1.7	PASS	BH2A-06 0.75-1.00m	6.5	6.5	Nil ASS/PASS
BH2A-05 1.00-1.25m	7.6	1.9	PASS	BH2A-06 1.00-1.25m	6.5	6.1	Nil ASS/PASS
BH2A-05 1.25-1.50m	7.5	1.9	PASS	BH2A-06 1.25-1.50m	6.5	6.2	Nil ASS/PASS
BH2A-05 1.50-1.75m	7.6	1.9	PASS	BH2A-06 1.50-1.75m	6.5	6.3	Nil ASS/PASS
BH2A-05 1.75-2.00m	7.6	1.7	PASS	BH2A-06 1.75-2.00m	6.6	6.3	Nil ASS/PASS
BH2A-05 2.00-2.25m	7.5	2.0	Probable PASS	BH2A-06 2.00-2.25m	6.5	6.2	Nil ASS/PASS
BH2A-05 2.25-2.40m	7.6	1.9	PASS	BH2A-06 2.25-2.40m	6.5	6.1	Nil ASS/PASS
BH2A-05 2.40-2.75m	7.7	3.9	Possible PASS				
BH2A-05 2.75-3.00m	7.9	6.5	Nil ASS/PASS				
BH2A-05 3.00-3.25m	7.9	6.1	Nil ASS/PASS				
BH2A-05 3.25-3.60m	8.0	6.5	Nil ASS/PASS				

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-05 0.50-0.75m	18	4	--	MC, dk grey, orgs	1.50*	941	--*	106
BH2A-05 1.75-2.00m	18	4	--	MC, dk grey, orgs	1.52*	951	--*	106
BH2A-05 2.40-2.75m	18	<2	--	MHC, dk grey	0.85	489	2.4	56
BH2A-06 0.00-0.50m	18	4	--	LMC, grey & brown	<0.02	11	5.6	nil
BH2A-06 0.50-1.00m	18	5	--	MHC, grey & brown	<0.02	<10	5.6	nil
BH2A-06 1.00-1.50m	18	8	--	MHC, grey & brown	<0.02	<10	5.7	nil
BH2A-06 1.50-2.00m	18	6	--	HC, grey & brown	<0.02	<10	5.9	nil
BH2A-06 2.00-2.40m	18	7	--	HC, grey & brown	<0.02	<10	5.8	nil

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Samples denoted * have undergone the Chromium Reducible Sulfur analysis suite (S_{Cr}), pHox is not determined.
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Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	CWH	Checked By:	HP

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Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**3/08/2009**			**Drilled:**	**31/07/2009**		
BH2A-07 0.00-0.25m	8.8	2.0	Probable PASS	BH2A-9 0.00-0.25m	8.5	1.9	PASS
BH2A-07 0.25-0.50m	8.7	1.7	PASS	BH2A-9 0.25-0.50m	8.6	2.0	Probable PASS
BH2A-07 0.50-0.75m	8.4	1.7	PASS	BH2A-9 0.50-0.75m	8.5	1.9	PASS
BH2A-07 0.75-1.00m	8.2	1.8	PASS	BH2A-9 0.80-1.0m	8.5	2.0	Probable PASS
BH2A-07 1.00-1.25m	8.5	4.2	Improbable PASS	BH2A-9 1.00-1.25m	8.2	1.9	PASS
BH2A-07 1.25-1.50m	8.4	2.3	Probable PASS	BH2A-9 1.25-1.60m	8.2	1.8	PASS
BH2A-07 1.50-1.75m	8.5	2.2	Probable PASS	BH2A-9 1.60-1.75m	8.4	2.8	Probable PASS
BH2A-07 1.75-2.00m	8.5	6.9	Nil ASS/PASS	BH2A-9 1.75-2.00m	8.5	3.4	Possible PASS
BH2A-07 2.00-2.25m	8.3	7.3	Nil ASS/PASS	BH2A-9 2.00-2.25m	8.5	5.1	Nil ASS/PASS
BH2A-07 2.25-2.40m	8.3	4.5	Nil ASS/PASS	BH2A-9 2.25-2.50m	8.5	5.3	Nil ASS/PASS
				BH2A-9 2.50-2.75m	8.5	2.6	Probable PASS
Drilled:	**07/08/2009**			BH2A-9 2.75-3.10m	8.5	6.8	Nil ASS/PASS
BH2A-08 0.00-0.25m	8.6	7.0	Nil ASS/PASS				
BH2A-08 0.25-0.50m	7.9	6.2	Nil ASS/PASS				
BH2A-08 0.50-0.75m	7.8	5.9	Nil ASS/PASS				
BH2A-08 0.75-1.00m	7.5	5.4	Nil ASS/PASS				
BH2A-08 1.00-1.20m	7.3	5.3	Nil ASS/PASS				

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-07 0.25-0.50m	18	7	-	LMC, dk grey, org	1.70*	1070	--*	120
BH2A-07 1.50-1.75m	18	<2	-	HC, dk grey	0.76	391	2.4	44
BH2A-07 2.25-2.40m	18	<2	-	HC, dk grey	0.43	197	2.8	23
BH2A-08 1.00-1.20m	18	14	-	MC, grey & red-brown	<0.02	12	5.3	nil
BH2A09 0.00-0.50m	18	<2	546	LC, dk grey, orgs, shell	1.39	<10	7.5	nil
BH2A-09 0.50-1.00m	18	<2	320	LC, dk grey, orgs, shell	1.68*	832	--*	93
BH2A-09 1.00-1.60m	18	<2	278	LC, dk grey, orgs, shell	1.78*	924	--*	104
BH2A-09 1.60-2.00m	18	<2	--	LMC, dk grey	0.52	261	3.1	30
BH2A-09 2.00-2.25m	18	<2	--	MC, grey	0.44	212	3.0	24
BH2A-09 2.50-2.75m	18	<2	--	MC, grey	0.90	502	2.3	57

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L - Loam	ZCL - Silty clay loam	HC - Heavy clay

Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	IMW	Checked By:	HP

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http://www.golder.com

Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**7/08/2009**			**Drilled:**	**30/07/2009**		
BH2A-10 0.00-0.25m	8.4	7.6	Nil ASS/PASS	BH2A-12 0.00-0.25m	8.3	1.8	PASS
BH2A-10 0.25-0.50m	7.2	6.3	Nil ASS/PASS	BH2A-12 0.25-0.50m	8.3	1.8	PASS
BH2A-10 0.50-0.75m	6.7	5.7	Nil ASS/PASS	BH2A-12 0.50-0.75m	8.1	1.6	PASS
BH2A-10 0.75-1.00m	6.3	5.4	Nil ASS/PASS	BH2A-12 0.75-1.0m	8.0	1.8	PASS
BH2A-10 1.00-1.20m	6.2	6.2	Nil ASS/PASS	BH2A-12 1.00-1.25m	7.8	1.5	PASS
				BH2A-12 1.25-1.40m	7.9	1.7	PASS
Drilled:	**30/07/2009**			BH2A-12 1.40-1.75m	8.2	2.9	Probable PASS
BH2A-11 0.00-0.25m	8.7	2.4	Probable PASS	BH2A-12 1.75-2.00m	8.6	6.8	Nil ASS/PASS
BH2A-11 0.25-0.50m	8.6	1.6	PASS	BH2A-12 2.00-2.30m	8.6	6.8	Nil ASS/PASS
BH2A-11 0.50-0.80m	8.9	4.0	Improbable PASS				
BH2A-11 0.80-1.00m	8.6	2.1	Probable PASS				
BH2A-11 1.00-1.25m	8.6	3.3	Possible PASS				
BH2A-11 1.25-1.50m	8.7	6.7	Nil ASS/PASS				
BH2A-11 1.50-1.80m	8.8	7.9	Nil ASS/PASS				

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-10 0.75-1.00m	18	13	--	LMC, dk grey & red-brown	<0.02	16	5.6	nil
BH2A-11 0.25-0.50m	18	<2	237	LMC, dk grey, orgs, shell	1.76*	942	--*	106
BH2A-11 0.80-1.0m	18	<2	--	MC, dk grey, trace orgs	1.08	584	2.3	66
BH2A-12 1.00-1.25m	18	11	--	MC, dk grey, trace orgs	2.70	1700	2.0	190
BH2A-12 1.40-1.75m	18	<2	--	HC, dk grey	1.47	828	2.2	93

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Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	CLW	Checked By:	HP

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Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**30/07/2009**			**Drilled:**	**29/07/2009**		
BH2A-13 0.00-0.25m	7.8	3.4	Possible PASS	BH2A-15 0.00-0.25m	8.0	7.5	Nil ASS/PASS
BH2A-13 0.25-0.50m	8.1	4.7	Nil ASS/PASS	BH2A-15 0.25-0.50m	7.7	7.5	Nil ASS/PASS
BH2A-13 0.50-0.75m	8.2	6.7	Nil ASS/PASS	BH2A-15 0.50-0.75m	7.6	7.3	Nil ASS/PASS
BH2A-13 0.75-1.00m	8.0	7.4	Nil ASS/PASS	BH2A-15 0.75-0.90m	7.2	6.9	Nil ASS/PASS
BH2A-13 1.00-1.30m	8.5	8.2	Nil ASS/PASS				
Drilled:	**14/08/2009**			**Drilled:**	**29/07/2009**		
BH2A-14 0.00-0.25m	8.5	7.5	Nil ASS/PASS	BH2A-16 0.00-0.10m	8.4	4.3	Improbable PASS
BH2A-14 0.25-0.50m	8.0	6.9	Nil ASS/PASS	BH2A-16 0.25-0.50m	9.1	8.5	Nil ASS/PASS
BH2A-14 0.50-0.75m	7.7	6.9	Nil ASS/PASS	BH2A-16 0.50-0.75m	9.0	8.5	Nil ASS/PASS
BH2A-14 0.75-1.00m	7.3	7.0	Nil ASS/PASS	BH2A-16 0.75-1.00m	8.8	8.3	Nil ASS/PASS
				BH2A-16 1.00-1.25m	8.9	7.8	Nil ASS/PASS
				BH2A-16 1.25-1.50m	8.7	7.8	Nil ASS/PASS
				BH2A-16 1.50-1.75m	8.6	7.5	Nil ASS/PASS
				BH2A-16 1.75-2.00m	8.5	7.6	Nil ASS/PASS
				BH2A-16 2.00-2.20m	8.4	7.3	Nil ASS/PASS

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-13 0.00-0.25m	18	<2	--	LC, dk grey, orgs, shell	0.72	301	2.6	33
BH2A-13 0.25-0.50m	18	<2	--	MC, grey & red-brown	0.23	83	3.6	9
BH2A-14 0.25-0.50m	18	<2	--	MC, grey & red-bwn, some gravel	<0.02	<10	6.2	nil
BH2A-15 0.00-0.50m	18	<2	<10	MC, grey & red-brown	<0.02	<10	6.8	nil
BH2A-15 0.50-0.90m	18	5	--	MC, grey & red-brown	<0.02	<10	6.4	nil
BH2A-16 0.00-0.10m	18	<2	--	LMC, dk grey, shells	0.48	100	6.1	12

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Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	CLW	Checked By:	HP

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Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**29/07/2009**			**Drilled:**	**30/07/2009**		
BH2A-17 0.00-0.25m	7.9	4.4	Improbable PASS	BH2A-19 0.00-0.10m	8.4	6.4	Nil ASS/PASS
BH2A-17 0.25-0.50m	8.4	1.9	PASS	BH2A-19 0.10-0.25m	8.9	8.0	Nil ASS/PASS
BH2A-17 0.50-0.75m	8.6	2.7	Probable PASS	BH2A-19 0.25-0.50m	8.6	7.1	Nil ASS/PASS
BH2A-17 0.75-1.00m	8.5	3.0	Possible PASS	BH2A-19 0.50-0.75m	8.6	7.6	Nil ASS/PASS
BH2A-17 1.00-1.25m	8.6	6.2	Nil ASS/PASS	BH2A-19 0.75-1.00m	8.4	7.7	Nil ASS/PASS
BH2A-17 1.25-1.50m	8.7	6.8	Nil ASS/PASS	BH2A-19 1.00-1.30m	8.1	6.9	Nil ASS/PASS
BH2A-17 1.50-1.75m	8.5	7.1	Nil ASS/PASS				
BH2A-17 1.75-2.00m	8.5	6.5	Nil ASS/PASS	**Drilled:**	**4/08/2009**		
BH2A-17 2.00-2.20m	8.2	6.2	Nil ASS/PASS	BH2A-20 0.00-0.25m	7.8	7.5	Nil ASS/PASS
BH2A-17 2.25-2.50m	7.8	6.1	Nil ASS/PASS	BH2A-20 0.25-0.50m	7.3	6.4	Nil ASS/PASS
				BH2A-20 0.50-0.75m	6.3	5.2	Nil ASS/PASS
Drilled:	**29/07/2009**			BH2A-20 0.75-1.00m	5.6	4.8	Nil ASS/PASS
BH2A-18 0.00-0.25m	8.4	2.9	Probable PASS	BH2A-20 1.00-1.25m	5.3	4.7	Nil ASS/PASS
BH2A-18 0.25-0.50m	7.3	4.4	Improbable PASS	BH2A-20 1.25-1.50m	5.3	4.5	Nil ASS/PASS
BH2A-18 0.50-0.75m	5.1	4.4	Improbable PASS	BH2A-20 1.50-1.80m	5.1	4.6	Nil ASS/PASS
BH2A-18 0.75-1.10m	4.6	4.7	Nil ASS/PASS				

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-17 0.00-0.5m	18	<2	1040	LMC, dk grey, orgs, shell	1.94*	515	--*	58
BH2A-17 0.50-1.0m	18	<2	--	MC, dk grey, orgs, shell	2.38	1280	2.0	144
BH2A-17 1.00-1.5m	18	<2	48	MC/HC, dk grey	0.12	<10	6.7	nil
BH2A-18 0.00-0.25m	18	<2	712	LMC, dk grey, orgs, shell	0.52*	<10	--*	nil
BH2A-18 0.75-1.10m	18	19	--	HC, lt grey & or'ge-brown	0.02	34	4.6	3
BH2A-19 0.00-0.10m	18	<2	1450	LMC, dk grey, orgs, shell	0.07*	<10	--*	nil
BH2A-20 1.25-1.50m	18	30	--	HC, grey & red-brown	<0.02	30	4.8	3

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Samples denoted * have undergone the Chromium Reducible Sulfur analysis suite (S_{Cr}), pHox is not determined.
ANC is the 'as reported' value and reflects ANC by the S_{Cr} method and 'excess' ANC if by SPOCAS.
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Australian Soil and Land Survey Field Handbook (3rd ed) - Field texture grade

S - Sand	ZL - Silty loam	LC - Light clay
LS - Loamy sand	SCL - Sandy clay loam	LMC - Light medium clay
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L - Loam	ZCL - Silty clay loam	HC - Heavy clay

Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	CLW	Checked By:	HP

Golder Associates Pty Ltd
ABN: 64 006 107 857
(Bisbane Laboratory)

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(PO Box 1734, MILTON BC QLD 4064)
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http://www.golder.com

Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**1/08/2009**			**Drilled:**	**3/08/2009**		
BH2A-21 0.00-0.20m	8.3	6.5	Nil ASS/PASS	BH2A-22 2.50-2.75m	8.6	5.9	Nil ASS/PASS
BH2A-21 0.20-0.50m	8.8	7.8	Nil ASS/PASS	BH2A-22 2.75-3.00m	8.6	5.3	Nil ASS/PASS
BH2A-21 0.50-0.75m	8.6	7.4	Nil ASS/PASS	BH2A-22 3.00-3.25m	8.5	1.8	PASS
BH2A-21 0.75-1.00m	8.3	6.8	Nil ASS/PASS	BH2A-22 3.25-3.50m	8.4	6.0	Nil ASS/PASS
BH2A-21 1.00-1.25m	8.0	6.0	Nil ASS/PASS	BH2A-22 3.50-3.75m	8.6	2.3	Probable PASS
BH2A-21 1.25-1.40m	6.5	5.6	Nil ASS/PASS	BH2A-22 3.75-4.10m	8.6	2.3	Probable PASS
				BH2A-22 4.10-4.25m	8.8	7.3	Nil ASS/PASS
				BH2A-22 4.25-4.50m	8.8	7.9	Nil ASS/PASS
Drilled:	**3/08/2009**						
BH2A-22 0.00-0.25m	7.6	2.2	Probable PASS	**Drilled:**	**3/08/2009**		
BH2A-22 0.25-0.50m	8.2	6.2	Nil ASS/PASS	BH2A-23 0.00-0.25m	7.6	2.9	Probable PASS
BH2A-22 0.50-0.75m	8.4	6.5	Nil ASS/PASS	BH2A-23 0.25-0.50m	8.9	6.7	Nil ASS/PASS
BH2A-22 0.75-1.00m	8.4	6.8	Nil ASS/PASS	BH2A-23 0.50-0.75m	8.8	5.6	Nil ASS/PASS
BH2A-22 1.00-1.25m	8.5	4.7	Nil ASS/PASS	BH2A-23 0.75-1.00m	8.9	3.9	Possible PASS
BH2A-22 1.25-1.50m	8.5	4.2	Improbable PASS	BH2A-23 1.00-1.25m	8.8	2.8	Probable PASS
BH2A-22 1.50-1.75m	8.5	6.0	Nil ASS/PASS	BH2A-23 1.25-1.50m	8.7	2.4	Probable PASS
BH2A-22 1.75-2.00m	8.4	2.1	Probable PASS	BH2A-23 1.50-1.75m	8.6	1.7	PASS
BH2A-22 2.00-2.25m	8.5	5.5	Nil ASS/PASS	BH2A-23 1.75-2.00m	8.5	1.6	PASS
BH2A-22 2.25-2.50m	8.5	5.4	Nil ASS/PASS	refusal on cobbles			

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-22 0.00-0.25m	18	<2	371	LMC, dk grey, org, shell	1.14*	462	--*	52
BH2A-22 1.75-2.00m	18	<2	--	LMC, dk grey, trace orgs	1.15	512	2.4	56
BH2A-22 3.00-3.25m	18	<2	--	LMC, dk grey, trace orgs	1.13	510	2.4	56
BH2A-23 0.00-0.50m	18	<2	1320	LMC, dk grey, orgs, shell	0.76*	<10	--*	nil
BH2A-23 0.50-1.00m	18	<2	--	MC, dk grey, trace orgs	0.92	448	2.3	51
BH2A-23 1.00-1.50m	18	<2	--	MC, dk grey	1.09	557	2.3	63
BH2A-23 1.50-2.00m	18	20	--	MC, dk grey	1.74	1110	1.9	125

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Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	CLW	Checked By:	HP

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http://www.golder.com

Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**7/08/2009**			**Drilled:**	**8/08/2009**		
BH2A-24 0.00-0.10m	8.9	6.6	Nil ASS/PASS	BH2A-26 0.00-0.25m	8.4	3.9	Possible PASS
BH2A-24 0.10-0.25m	9.2	8.3	Nil ASS/PASS	BH2A-26 0.25-0.50m	9.0	6.8	Nil ASS/PASS
BH2A-24 0.25-0.50m	8.2	7.3	Nil ASS/PASS	BH2A-26 0.50-0.75m	8.1	7.4	Nil ASS/PASS
BH2A-24 0.50-0.75m	7.9	7.1	Nil ASS/PASS	BH2A-26 0.75-1.00m	7.6	6.1	Nil ASS/PASS
BH2A-24 0.75-1.00m	7.8	7.0	Nil ASS/PASS	BH2A-26 1.00-1.25m	6.9	5.6	Nil ASS/PASS
BH2A-24 1.00-1.20m	7.7	7.0	Nil ASS/PASS	BH2A-26 1.25-1.50m	6.3	5.4	Nil ASS/PASS
				BH2A-26 1.50-1.70m	5.7	4.9	Nil ASS/PASS
Drilled:	**1/08/2009**						
BH2A-25 0.00-0.25m	7.2	7.5	Nil ASS/PASS	**Drilled:**	**5/08/2009**		
BH2A-25 0.25-0.50m	7.3	6.6	Nil ASS/PASS	BH2A-27 0.00-0.25m	8.9	6.7	Nil ASS/PASS
BH2A-25 0.50-0.75m	7.0	6.0	Nil ASS/PASS	BH2A-27 0.25-0.60m	9.2	6.7	Nil ASS/PASS
BH2A-25 0.75-1.00m	6.7	5.8	Nil ASS/PASS	BH2A-27 0.60-0.75m	9.4	8.4	Nil ASS/PASS
BH2A-25 1.00-1.25m	6.5	5.6	Nil ASS/PASS	BH2A-27 0.75-1.00m	8.3	7.3	Nil ASS/PASS
BH2A-25 1.25-1.50m	6.2	5.6	Nil ASS/PASS	BH2A-27 1.00-1.30m	7.9	7.1	Nil ASS/PASS

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-24 0.00-0.10m	18	<2	2910	CS, dk grey, orgs, shell	0.17*	<10	--*	nil
BH2A-25 0.00-0.50m	18	<2	50	HC, dk grey & or'ge brown	<0.02	<10	6.7	nil
BH2A-25 0.50-1.00m	18	<2	--	MC, grey & org'e-brown	<0.02	16	5.5	nil
BH2A-25 1.00-1.50m	18	<2	--	MC, grey & red brown	<0.02	15	5.2	nil
BH2A-26 0.00-0.25m	18	<2	192	LC, dk grey, org, sand	0.48*	170	--*	20
BH2A-26 1.50-1.70m	18	<2	66	HMC, grey & lt brown	<0.02	<10	7.4	nil
BH2A-27 0.25-0.60m	18	<2	952	LC, dk grey, org's, shell	0.34	<10	7.9	nil

Remarks: TAA - Total Actual Acidity, ANC - Acid Neutralisng Capacity, SPOS - Peroxide Oxidisable Sulfur
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Samples denoted * have undergone the Chromium Reducible Sulfur analysis suite (S_{Cr}), pHox is not determined.
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L - Loam	ZCL - Silty clay loam	HC - Heavy clay

Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	CLW	Checked By:	HP

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http://www.golder.com

Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**31/07/2009**			**Drilled:**	**8/08/2009**		
BH2A-28 0.00-0.10m	8.6	6.5	Nil ASS/PASS	BH2A-29 0.00-0.25m	8.7	4.8	Nil ASS/PASS
BH2A-28 0.10-0.25m	9.1	8.0	Nil ASS/PASS	BH2A-29 0.25-0.50m	8.6	5.2	Nil ASS/PASS
BH2A-28 0.25-0.50m	8.5	7.5	Nil ASS/PASS	BH2A-29 0.50-0.75m	8.8	5.9	Nil ASS/PASS
BH2A-28 0.50-0.75m	8.2	6.7	Nil ASS/PASS	BH2A-29 0.75-1.00m	8.8	4.8	Nil ASS/PASS
BH2A-28 0.75-1.00m	7.3	5.9	Nil ASS/PASS	BH2A-29 1.00-1.25m	9.3	7.2	Nil ASS/PASS
BH2A-28 1.00-1.25m	6.5	5.5	Nil ASS/PASS	BH2A-29 1.25-1.50m	9.0	8.1	Nil ASS/PASS
BH2A-28 1.25-1.50m	5.4	4.6	Nil ASS/PASS	BH2A-29 1.50-1.75m	8.8	7.7	Nil ASS/PASS

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-28 0.00-0.10m	18	<2	254	LC, grey, shells	0.10	<10	7.9	nil
BH2A-28 1.25-1.50m	18	24	--	MC, grey & red-bwn, sand, gravel	<0.02	32	4.9	3
BH2A-29 0.00-0.50m	18	<2	309	LC, dk grey, organics	0.58*	159	--*	18
BH2A-29 0.50-1.00m	18	<2	127	LC, dk grey	0.85	92	6.7	10
BH2A-29 1.00-1.50m	18	<2	--	MHC, grey & red-brown	0.27	80	4.3	9
BH2A-29 1.50-2.00m	18	<2	40	MHC, grey & red-brown, gravel	<0.02	<10	7.2	nil

Remarks: TAA - Total Actual Acidity, ANC - Acid Neutralisng Capacity, SPOS - Peroxide Oxidisable Sulfur
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ANC is the 'as reported' value and reflects ANC by the S_{Cr} method and 'excess' ANC if by SPOCAS.

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L - Loam	ZCL - Silty clay loam	HC - Heavy clay

Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
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Client:	Worley Parsons	Sampled By:	Golder
Project:	Laird Point Dredging Study	Job No:	097633052
Location:	Dredge Foortprint - Option 2A		

pH_{FOX} Screening Test Results

Location	pH_F	pH_{FOX}	Indication	Location	pH_F	pH_{FOX}	Indication
Drilled:	**31/07/2009**			**Drilled:**	**31/07/2009**		
BH2A-30 0.00-0.25m	8.8	5.5	Nil ASS/PASS	BH2A-32 0.00-0.10m	8.4	7.1	Nil ASS/PASS
BH2A-30 0.25-0.60m	8.7	4.9	Nil ASS/PASS	BH2A-32 0.10-0.25m	8.9	7.6	Nil ASS/PASS
BH2A-30 0.60-0.75m	9.5	8.5	Nil ASS/PASS	BH2A-32 0.25-0.50m	9.2	8.0	Nil ASS/PASS
BH2A-30 0.75-1.00m	9.5	8.1	Nil ASS/PASS	BH2A-32 0.50-0.75m	8.8	7.9	Nil ASS/PASS
BH2A-30 1.00-1.25m	8.7	7.8	Nil ASS/PASS	BH2A-32 0.75-1.10m	8.6	7.8	Nil ASS/PASS
BH2A-30 1.25-1.50m	8.5	7.5	Nil ASS/PASS	**Drilled:**	**5/08/2009**		
BH2A-30 1.50-1.90m	8.2	7.2	Nil ASS/PASS	BH2A-33 0.00-0.25m	9.0	8.3	ASS/PASS
				BH2A-33 0.25-0.50m	8.4	7.8	Nil ASS/PASS
Drilled:	**31/07/2009**			BH2A-33 0.50-0.70m	7.9	6.9	Nil ASS/PASS
BH2A-31 0.00-0.10m	8.6	7.1	Nil ASS/PASS	**Drilled:**	**29/07/2009**		
BH2A-31 0.10-0.25m	9.2	8.1	Nil ASS/PASS	BH2A-34 0.00-0.10m	8.5	6.5	ASS/PASS
BH2A-31 0.25-0.50m	8.5	7.4	Nil ASS/PASS	BH2A-34 0.10-0.25m	9.0	7.4	ASS/PASS
BH2A-31 0.50-0.70m	8.4	6.8	Nil ASS/PASS	BH2A-34 0.25-0.50m	8.2	7.3	Nil ASS/PASS
				BH2A-34 0.50-0.75m	8.3	7.5	Nil ASS/PASS
				BH2A-34 0.75-1.00m	8.3	7.1	Nil ASS/PASS

Quantitative Test Results

Location	Action Criteria (mole H^+/t)	TAA (mole H^+/t)	ANC (mole H^+/t)	Texture Description	S_{POS} (%)	'Net Acidity' (mole H^+/t)	pH_{OX}	Lime Rate (kg/m^3)
BH2A-31 0.0-0.10m	18	<2	470	CS, dark grey, shells	0.19	<10	8.0	nil
BH2A-30 0.25-0.60m	18	<2	914	LC, dk grey, sand, shell	0.57	<10	7.9	nil
BH2A-32 0.00-0.10m	18	<2	1560	LC, grey, sand, org's, shell	0.09*	<10	--*	nil
BH2A-32 0.10-0.50m	18	<2	169	LMC, grey & red-brown	0.04	<10	7.9	nil
BH2A-32 0.50-1.10m	18	<2	34	MC, grey & red-brown, some sand & gravel	0.02	<10	7.3	nil
BH2A-33 0.0-0.25m	18	<2	203	LC, dk grey, sandy	0.02	<10	8.3	nil
BH2A-34 0.1-0.25m	18	<2	622	LC/CS, dk grey, sandy	0.12	<10	8.3	nil

Remarks: TAA - Total Actual Acidity, ANC - Acid Neutralisng Capacity, SPOS - Peroxide Oxidisable Sulfur
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Test Procedures: pH_{FOX} "ASS Screening Test" (rapid oxidation with Hydrogen Peroxide) – Golder Associates
SPOCAS and SCr Methods – ALS Brisbane

Prepared By:	IMW	Checked By:	HP

CERTIFICATE OF ANALYSIS

Work Order	: **EB0912185**	Page	: 1 of 15
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR HENRY PARSONS	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: hparsons@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 04-AUG-2009
Sampler	: Ian Wallace	Issue Date	: 07-AUG-2009
Site	: Laird Pnt Dredge Study-Opt 2A		
		No. of samples received	: 31
Quote number	: BN/354/09 V2	No. of samples analysed	: 31

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

- **Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**
- **Retained Acidity not required because pH KCl greater than or equal to 4.5**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 15 0.00-0.50	BH2-A 15 0.50-0.90	BH2-A 16 0.00-0.10	BH2-A 17 0.00-0.50m	BH2-A 17 0.50-1.00m
Client sampling date / time				29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00
				EB0912185-001	EB0912185-002	EB0912185-003	EB0912185-004	EB0912185-005
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.4	6.1	8.4	----	7.1
pH OX (23B)	----	0.1	pH Unit	6.8	6.4	6.1	----	2.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	5	<2	----	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	----	1180
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	----	1180
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	----	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	----	1.89
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	----	1.89
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.03	<0.02	0.18	----	0.13
Peroxide Sulfur (23De)	----	0.02	% S	<0.02	<0.02	0.66	----	2.51
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	<0.02	0.48	----	2.38
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	300	----	1480
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.04	0.03	0.32	----	0.13
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.04	0.03	0.64	----	0.16
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.32	----	0.03
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	162	----	16
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.26	----	0.03
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.08	0.06	0.28	----	0.23
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.08	0.06	0.38	----	0.29
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.10	----	0.06
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	84	----	47
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.14	----	0.07
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.02	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.02	----	----	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	----	1.5

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 15 0.00-0.50	BH2-A 15 0.50-0.90	BH2-A 16 0.00-0.10	BH2-A 17 0.00-0.50m	BH2-A 17 0.50-1.00m
				Client sampling date / time: 29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00
				EB0912185-001	EB0912185-002	EB0912185-003	EB0912185-004	EB0912185-005
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	**0.16**	----	**2.05**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	**100**	----	**1280**
Liming Rate	----	1	kg CaCO3/t	<1	<1	**8**	----	**96**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	----	**8.2**	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	----	----	----	**1.94**	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	----	**1210**	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	**5.22**	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	**1040**	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	**1.67**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	----	**1.5**	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	----	**0.82**	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	----	**515**	----
Liming Rate	----	1	kg CaCO3/t	----	----	----	**39**	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 17 1.00-1.50m Client sampling date / time: 29-JUL-2009 15:00 EB0912185-006	Client sample ID: BH2-A 18 0.00-0.25m Client sampling date / time: 29-JUL-2009 15:00 EB0912185-007	Client sample ID: BH2-A 18 0.75-1.10m Client sampling date / time: 29-JUL-2009 15:00 EB0912185-008	Client sample ID: BH2-A 11 0.25-0.50m Client sampling date / time: 30-JUL-2009 15:00 EB0912185-009	Client sample ID: BH2-A 11 0.80-1.00m Client sampling date / time: 30-JUL-2009 15:00 EB0912185-010
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**6.9**	----	**4.8**	----	**6.8**
pH OX (23B)	----	0.1	pH Unit	**6.7**	----	**4.6**	----	**2.3**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	**19**	----	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	**22**	----	**540**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	**3**	----	**540**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	**0.03**	----	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	**0.04**	----	**0.87**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	<0.02	----	**0.87**
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.03**	----	**0.02**	----	**0.08**
Peroxide Sulfur (23De)	----	0.02	% S	**0.15**	----	**0.05**	----	**1.16**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	**0.12**	----	**0.02**	----	**1.08**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**75**	----	**15**	----	**672**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	**0.07**	----	**0.07**	----	**0.12**
Peroxide Calcium (23Wh)	----	0.02	% Ca	**0.15**	----	**0.07**	----	**0.14**
Acid Reacted Calcium (23X)	----	0.02	% Ca	**0.08**	----	<0.02	----	**0.02**
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**40**	----	<10	----	**10**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	**0.06**	----	<0.02	----	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	**0.11**	----	**0.09**	----	**0.19**
Peroxide Magnesium (23Tm)	----	0.02	% Mg	**0.20**	----	**0.10**	----	**0.22**
Acid Reacted Magnesium (23U)	----	0.02	% Mg	**0.09**	----	<0.02	----	**0.03**
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**73**	----	**10**	----	**26**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	**0.12**	----	<0.02	----	**0.04**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	**0.24**	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**48**	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	**0.08**	----	----	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	**1.5**	----	**1.5**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 17 1.00-1.50m	BH2-A 18 0.00-0.25m	BH2-A 18 0.75-1.10m	BH2-A 11 0.25-0.50m	BH2-A 11 0.80-1.00m
Client sampling date / time				29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	30-JUL-2009 15:00	30-JUL-2009 15:00
				EB0912185-006	EB0912185-007	EB0912185-008	EB0912185-009	EB0912185-010
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	**0.05**	----	**0.94**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	**34**	----	**584**
Liming Rate	----	1	kg CaCO3/t	<1	----	**2**	----	**44**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	**8.5**	----	**7.2**	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	----	**0.52**	----	**1.76**	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	**322**	----	**1100**	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	**3.56**	----	**1.19**	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	**712**	----	**237**	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	**1.14**	----	**0.38**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	**1.5**	----	**1.5**	----
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	**1.51**	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	**942**	----
Liming Rate	----	1	kg CaCO3/t	----	<1	----	**71**	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 12 1.00-1.25m	BH2-A 12 1.40-1.75m	BH2-A 13 0.00-0.25m	BH2-A 13 0.25-0.50m	BH2-A 19 0.0-0.1m
Client sampling date / time				30-JUL-2009 15:00	30-JUL-2009 15:00	30-JUL-2009 15:00	30-JUL-2009 15:00	30-JUL-2009 15:00
				EB0912185-011	EB0912185-012	EB0912185-013	EB0912185-014	EB0912185-015
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.1	6.7	8.4	7.0	----
pH OX (23B)	----	0.1	pH Unit	2.0	2.2	2.6	3.6	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	11	<2	<2	<2	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	1640	784	227	54	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	1630	784	227	54	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	2.62	1.26	0.36	0.09	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	2.61	1.26	0.36	0.09	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.16	0.05	0.13	0.04	----
Peroxide Sulfur (23De)	----	0.02	% S	2.87	1.52	0.84	0.27	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.70	1.47	0.72	0.23	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1690	917	447	143	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.12	0.09	0.25	0.04	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.13	0.08	0.40	0.08	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.14	0.04	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	73	20	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.12	0.03	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.22	0.12	0.16	0.08	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.23	0.16	0.21	0.12	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.04	0.05	0.04	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	11	30	39	36	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.05	0.06	0.06	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	2.72	1.33	0.48	0.13	----
Net Acidity (acidity units)	----	10	mole H+ / t	1700	828	301	83	----
Liming Rate	----	1	kg CaCO3/t	127	62	22	6	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	----	----	8.9
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	----	----	<2

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2-A 12 1.00-1.25m	BH2-A 12 1.40-1.75m	BH2-A 13 0.00-0.25m	BH2-A 13 0.25-0.50m	BH2-A 19 0.0-0.1m
				Client sampling date / time	30-JUL-2009 15:00	30-JUL-2009 15:00	30-JUL-2009 15:00	30-JUL-2009 15:00	30-JUL-2009 15:00
Compound	CAS Number	LOR	Unit		EB0912185-011	EB0912185-012	EB0912185-013	EB0912185-014	EB0912185-015
EA033-A: Actual Acidity - Continued									
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	----	----	----	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		----	----	----	----	**0.07**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		----	----	----	----	**42**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	----	----	----	**7.28**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	----	----	----	**1450**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	----	----	----	**2.33**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	----	----	----	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		----	----	----	----	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		----	----	----	----	<10
Liming Rate	----	1	kg CaCO3/t		----	----	----	----	<1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 9 0.0-0.5m Client sampling date / time: 31-JUL-2009 15:00 EB0912185-016	BH2-A 9 0.5-1.0m 31-JUL-2009 15:00 EB0912185-017	BH2-A 9 1.0-1.6m 31-JUL-2009 15:00 EB0912185-018	BH2-A 9 1.6-2.0m 31-JUL-2009 15:00 EB0912185-019	BH2-A 9 2.0-2.5m 31-JUL-2009 15:00 EB0912185-020
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**8.4**	----	----	**7.1**	**7.1**
pH OX (23B)	----	0.1	pH Unit	**7.5**	----	----	**3.1**	**3.0**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	**228**	**180**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	**228**	**180**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	**0.36**	**0.29**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	**0.36**	**0.29**
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.14**	----	----	**0.05**	**0.04**
Peroxide Sulfur (23De)	----	0.02	% S	**1.53**	----	----	**0.58**	**0.48**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	**1.39**	----	----	**0.52**	**0.44**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**867**	----	----	**328**	**277**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	**0.30**	----	----	**0.09**	**0.06**
Peroxide Calcium (23Wh)	----	0.02	% Ca	**2.58**	----	----	**0.13**	**0.09**
Acid Reacted Calcium (23X)	----	0.02	% Ca	**2.28**	----	----	**0.04**	**0.02**
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**1140**	----	----	**18**	**11**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	**1.83**	----	----	**0.03**	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	**0.18**	----	----	**0.17**	**0.13**
Peroxide Magnesium (23Tm)	----	0.02	% Mg	**0.23**	----	----	**0.20**	**0.18**
Acid Reacted Magnesium (23U)	----	0.02	% Mg	**0.05**	----	----	**0.03**	**0.05**
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**41**	----	----	**28**	**38**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	**0.07**	----	----	**0.04**	**0.06**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	**2.73**	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**546**	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	**0.87**	----	----	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	**1.5**	**1.5**

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2-A 9 0.0-0.5m	BH2-A 9 0.5-1.0m	BH2-A 9 1.0-1.6m	BH2-A 9 1.6-2.0m	BH2-A 9 2.0-2.5m
				Client sampling date / time	31-JUL-2009 15:00	31-JUL-2009 15:00	31-JUL-2009 15:00	31-JUL-2009 15:00	31-JUL-2009 15:00
Compound	CAS Number	LOR	Unit		EB0912185-016	EB0912185-017	EB0912185-018	EB0912185-019	EB0912185-020
EA029-H: Acid Base Accounting - Continued									
Net Acidity (sulfur units)	----	0.02	% S		<0.02	----	----	**0.42**	**0.34**
Net Acidity (acidity units)	----	10	mole H+ / t		<10	----	----	**261**	**212**
Liming Rate	----	1	kg CaCO3/t		<1	----	----	**20**	**16**
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		----	**8.1**	**7.9**	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	<2	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	<0.02	<0.02	----	----
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		----	**1.68**	**1.78**	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		----	**1040**	**1110**	----	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	**1.60**	**1.39**	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	**320**	**278**	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	**0.51**	**0.45**	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	**1.5**	**1.5**	----	----
Net Acidity (sulfur units)	----	0.02	% S		----	**1.33**	**1.48**	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		----	**832**	**924**	----	----
Liming Rate	----	1	kg CaCO3/t		----	**62**	**69**	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 9 2.5-3.1m Client sampling date / time: 31-JUL-2009 15:00 EB0912185-021	BH2-A 28 0.0-0.1m 31-JUL-2009 15:00 EB0912185-022	BH2-A 28 1.25-1.5m 31-JUL-2009 15:00 EB0912185-023	BH2-A 30 0.25-0.6m 31-JUL-2009 15:00 EB0912185-024	BH2-A 32 0.0-0.1m 31-JUL-2009 15:00 EB0912185-025
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**6.8**	**8.8**	**4.9**	**8.7**	----
pH OX (23B)	----	0.1	pH Unit	**2.3**	**7.9**	**4.9**	**7.9**	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	**24**	<2	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	**474**	<2	**17**	<2	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	**474**	<2	<2	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	**0.04**	<0.02	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	**0.76**	<0.02	**0.03**	<0.02	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	**0.76**	<0.02	<0.02	<0.02	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.04**	**0.09**	**0.03**	**0.09**	----
Peroxide Sulfur (23De)	----	0.02	% S	**0.94**	**0.19**	**0.05**	**0.66**	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	**0.90**	**0.10**	<0.02	**0.57**	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**560**	**62**	<10	**354**	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	**0.06**	**0.22**	**0.06**	**0.26**	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	**0.07**	**0.74**	**0.05**	**2.40**	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	**0.52**	<0.02	**2.14**	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	**259**	<10	**1070**	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	**0.42**	<0.02	**1.71**	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	**0.13**	**0.17**	**0.08**	**0.13**	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	**0.16**	**0.20**	**0.08**	**0.22**	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	**0.03**	**0.03**	<0.02	**0.09**	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**23**	**23**	<10	**73**	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	**0.04**	**0.04**	<0.02	**0.12**	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	**1.27**	----	**4.57**	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	**254**	----	**914**	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	**0.41**	----	**1.46**	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 9 2.5-3.1m	BH2-A 28 0.0-0.1m	BH2-A 28 1.25-1.5m	BH2-A 30 0.25-0.6m	BH2-A 32 0.0-0.1m
Client sampling date / time				31-JUL-2009 15:00	31-JUL-2009 15:00	31-JUL-2009 15:00	31-JUL-2009 15:00	31-JUL-2009 15:00
				EB0912185-021	EB0912185-022	EB0912185-023	EB0912185-024	EB0912185-025
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	**0.80**	<0.02	**0.05**	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	**502**	<10	**32**	<10	----
Liming Rate	----	1	kg CaCO3/t	**38**	<1	**2**	<1	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	----	----	**8.9**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	----	----	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	----	----	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	----	----	----	----	**0.09**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	----	----	**57**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	----	**7.80**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	----	**1560**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	----	**2.50**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	----	----	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	----	----	----	----	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	----	----	<10
Liming Rate	----	1	kg CaCO3/t	----	----	----	----	<1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 32 0.1-0.5m Client sampling date / time: 31-JUL-2009 15:00 EB0912185-026	BH2-A 32 0.5-1.1m 31-JUL-2009 15:00 EB0912185-027	BH2-A 21 0.0-0.2m 01-AUG-2009 15:00 EB0912185-028	BH2-A 25 0.0-0.5m 01-AUG-2009 15:00 EB0912185-029	BH2-A 25 0.5-1.0m 01-AUG-2009 15:00 EB0912185-030
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**9.0**	**7.6**	----	**6.3**	**5.2**
pH OX (23B)	----	0.1	pH Unit	**7.9**	**7.3**	----	**6.7**	**5.5**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	**5**	**17**
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	----	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	----	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	----	<0.02	**0.03**
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	----	<0.02	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	----	<0.02	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.03**	<0.02	----	**0.04**	**0.03**
Peroxide Sulfur (23De)	----	0.02	% S	**0.06**	**0.02**	----	**0.03**	**0.03**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	**0.04**	**0.02**	----	<0.02	<0.02
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**22**	**15**	----	<10	<10
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	**0.15**	**0.13**	----	**0.07**	**0.06**
Peroxide Calcium (23Wh)	----	0.02	% Ca	**0.31**	**0.13**	----	**0.07**	**0.06**
Acid Reacted Calcium (23X)	----	0.02	% Ca	**0.16**	<0.02	----	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**82**	<10	----	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	**0.13**	<0.02	----	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	**0.06**	**0.11**	----	**0.13**	**0.11**
Peroxide Magnesium (23Tm)	----	0.02	% Mg	**0.10**	**0.12**	----	**0.14**	**0.10**
Acid Reacted Magnesium (23U)	----	0.02	% Mg	**0.03**	<0.02	----	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**29**	<10	----	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	**0.05**	<0.02	----	<0.02	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	**0.85**	**0.17**	----	**0.25**	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**169**	**34**	----	**50**	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	**0.27**	**0.05**	----	**0.08**	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	----	**1.5**	**1.5**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A 32 0.1-0.5m Client sampling date / time: 31-JUL-2009 15:00 EB0912185-026	BH2-A 32 0.5-1.1m 31-JUL-2009 15:00 EB0912185-027	BH2-A 21 0.0-0.2m 01-AUG-2009 15:00 EB0912185-028	BH2-A 25 0.0-0.5m 01-AUG-2009 15:00 EB0912185-029	BH2-A 25 0.5-1.0m 01-AUG-2009 15:00 EB0912185-030
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	----	<0.02	**0.03**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	----	<10	**16**
Liming Rate	----	1	kg CaCO3/t	<1	<1	----	<1	**1**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	**8.5**	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	----	----	**0.24**	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	**152**	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	**2.06**	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	**413**	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	**0.66**	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	**1.5**	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2-A 25 1.0-1.5m	----	----	----	----
				Client sampling date / time	01-AUG-2009 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB0912185-031	----	----	----	----
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		**5.0**	----	----	----	----
pH OX (23B)	----	0.1	pH Unit		**5.2**	----	----	----	----
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**17**	----	----	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		<2	----	----	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		<2	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.03**	----	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		<0.02	----	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		<0.02	----	----	----	----
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.03**	----	----	----	----
Peroxide Sulfur (23De)	----	0.02	% S		**0.03**	----	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		<0.02	----	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		<10	----	----	----	----
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		**0.07**	----	----	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca		**0.07**	----	----	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca		<0.02	----	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		<10	----	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		<0.02	----	----	----	----
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		**0.11**	----	----	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg		**0.10**	----	----	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg		<0.02	----	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		<10	----	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		<0.02	----	----	----	----
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S		**0.02**	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		**15**	----	----	----	----
Liming Rate	----	1	kg CaCO3/t		**1**	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **EB0912185**	Page	: 1 of 9
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR HENRY PARSONS	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: hparsons@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Laird Pnt Dredge Study-Opt 2A		
C-O-C number	: ----	Date Samples Received	: 04-AUG-2009
Sampler	: Ian Wallace	Issue Date	: 07-AUG-2009
Order number	: ----		
		No. of samples received	: 31
Quote number	: BN/354/09 V2	No. of samples analysed	: 31

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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA029-A: pH Measurements (QC Lot: 1061004)									
EB0912185-001	BH2-A 15 0.00-0.50	EA029: pH KCl (23A)	----	0.1	pH Unit	6.4	6.6	3.1	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	6.8	6.8	0.0	0% - 20%
EB0912185-014	BH2-A 13 0.25-0.50m	EA029: pH KCl (23A)	----	0.1	pH Unit	7.0	6.7	4.4	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	3.6	3.7	2.7	0% - 20%
EA029-A: pH Measurements (QC Lot: 1061006)									
EB0912185-029	BH2-A 25 0.0-0.5m	EA029: pH KCl (23A)	----	0.1	pH Unit	6.3	6.4	1.6	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	6.7	6.7	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 1061004)									
EB0912185-001	BH2-A 15 0.00-0.50	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EB0912185-014	BH2-A 13 0.25-0.50m	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.09	0.08	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.09	0.08	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	54	52	4.2	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	54	52	4.2	0% - 20%
EA029-B: Acidity Trail (QC Lot: 1061006)									
EB0912185-029	BH2-A 25 0.0-0.5m	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	5	2	65.7	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-C: Sulfur Trail (QC Lot: 1061004)									
EB0912185-001	BH2-A 15 0.00-0.50	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.03	<0.02	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA029-C: Sulfur Trail (QC Lot: 1061004) - continued									
EB0912185-001	BH2-A 15 0.00-0.50	EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0912185-014	BH2-A 13 0.25-0.50m	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.04	0.04	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.27	0.30	7.8	0% - 50%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.23	0.25	10.3	0% - 50%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	143	158	10.3	0% - 50%
EA029-C: Sulfur Trail (QC Lot: 1061006)									
EB0912185-029	BH2-A 25 0.0-0.5m	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.04	0.03	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.03	0.03	0.0	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 1061004)									
EB0912185-001	BH2-A 15 0.00-0.50	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.04	0.04	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.04	0.04	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0912185-014	BH2-A 13 0.25-0.50m	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.04	0.04	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.08	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.04	0.05	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.03	0.04	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	20	24	14.8	No Limit
EA029-D: Calcium Values (QC Lot: 1061006)									
EB0912185-029	BH2-A 25 0.0-0.5m	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.07	0.07	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.07	0.07	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 1061004)									
EB0912185-001	BH2-A 15 0.00-0.50	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.08	0.08	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.08	0.08	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA029-E: Magnesium Values (QC Lot: 1061004) - continued									
EB0912185-001	BH2-A 15 0.00-0.50	EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0912185-014	BH2-A 13 0.25-0.50m	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.08	0.08	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.12	0.13	8.8	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.04	0.05	21.1	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.06	0.07	21.1	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	36	45	21.1	No Limit
EA029-E: Magnesium Values (QC Lot: 1061006)									
EB0912185-029	BH2-A 25 0.0-0.5m	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.13	0.12	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.14	0.13	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 1061004)									
EB0912185-001	BH2-A 15 0.00-0.50	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 1061006)									
EB0912185-029	BH2-A 25 0.0-0.5m	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.25	0.25	0.0	0% - 50%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.08	0.08	0.0	No Limit
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	50	50	0.0	No Limit
EA033-A: Actual Acidity (QC Lot: 1061005)									
EB0912185-004	BH2-A 17 0.00-0.50m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	8.2	8.3	1.2	0% - 20%
EA033-B: Potential Acidity (QC Lot: 1061005)									
EB0912185-004	BH2-A 17 0.00-0.50m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.94	1.98	2.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1210	1230	2.0	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 1061005)									
EB0912185-004	BH2-A 17 0.00-0.50m	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	5.22	5.16	1.0	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-C: Acid Neutralising Capacity (QC Lot: 1061005) - continued									
EB0912185-004	BH2-A 17 0.00-0.50m	EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.67	1.65	1.0	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1040	1030	1.0	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: **SOIL**

				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
EA029-B: Acidity Trail (QCLot: 1061004)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 1061006)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 1061004)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 1061006)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 1061004)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 1061006)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----

Sub-Matrix: **SOIL**

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
EA029-D: Calcium Values (QCLot: 1061006) - continued								
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 1061004)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 1061006)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 1061004)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.02	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.02	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 1061006)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.02	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 1061005)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 1061005)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 1061005)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----

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.

- **No Matrix Spike (MS) Results are required to be reported.**

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0912185**

Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR MARTIN CROSSLEY	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: mcrossley@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EB2009GOLASS0340 (BN/354/09 V2)
Site	: Laird Pnt Dredge Study-Opt 2A		
Sampler	: Ian Wallace	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 04-AUG-2009	Issue Date	: 04-AUG-2009 11:23
Client Requested Due Date	: 10-AUG-2009	Scheduled Reporting Date	: **10-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 3.0 C - Ice bricks present
No. of coolers/boxes	: 1 MEDIUM	No. of samples received	: 31
Sercurity Seal	: Intact.	No. of samples analysed	: 31

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: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA029 SPOCAS	SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0912185-001	29-JUL-2009 15:00	BH2-A 15 0.00-0.50	✓	
EB0912185-002	29-JUL-2009 15:00	BH2-A 15 0.50-0.90	✓	
EB0912185-003	29-JUL-2009 15:00	BH2-A 16 0.00-0.10	✓	
EB0912185-004	29-JUL-2009 15:00	BH2-A 17 0.00-0.50m		✓
EB0912185-005	29-JUL-2009 15:00	BH2-A 17 0.50-1.00m	✓	
EB0912185-006	29-JUL-2009 15:00	BH2-A 17 1.00-1.50m	✓	
EB0912185-007	29-JUL-2009 15:00	BH2-A 18 0.00-0.25m		✓
EB0912185-008	29-JUL-2009 15:00	BH2-A 18 0.75-1.10m	✓	
EB0912185-009	30-JUL-2009 15:00	BH2-A 11 0.25-0.50m		✓
EB0912185-010	30-JUL-2009 15:00	BH2-A 11 0.80-1.00m	✓	
EB0912185-011	30-JUL-2009 15:00	BH2-A 12 1.00-1.25m	✓	
EB0912185-012	30-JUL-2009 15:00	BH2-A 12 1.40-1.75m	✓	
EB0912185-013	30-JUL-2009 15:00	BH2-A 13 0.00-0.25m	✓	
EB0912185-014	30-JUL-2009 15:00	BH2-A 13 0.25-0.50m	✓	
EB0912185-015	30-JUL-2009 15:00	BH2-A 19 0.0-0.1m		✓
EB0912185-016	31-JUL-2009 15:00	BH2-A 9 0.0-0.5m	✓	
EB0912185-017	31-JUL-2009 15:00	BH2-A 9 0.5-1.0m		✓
EB0912185-018	31-JUL-2009 15:00	BH2-A 9 1.0-1.6m		✓
EB0912185-019	31-JUL-2009 15:00	BH2-A 9 1.6-2.0m	✓	
EB0912185-020	31-JUL-2009 15:00	BH2-A 9 2.0-2.5m	✓	
EB0912185-021	31-JUL-2009 15:00	BH2-A 9 2.5-3.1m	✓	
EB0912185-022	31-JUL-2009 15:00	BH2-A 28 0.0-0.1m	✓	
EB0912185-023	31-JUL-2009 15:00	BH2-A 28 1.25-1.5m	✓	
EB0912185-024	31-JUL-2009 15:00	BH2-A 30 0.25-0.6m	✓	
EB0912185-025	31-JUL-2009 15:00	BH2-A 32 0.0-0.1m		✓
EB0912185-026	31-JUL-2009 15:00	BH2-A 32 0.1-0.5m	✓	
EB0912185-027	31-JUL-2009 15:00	BH2-A 32 0.5-1.1m	✓	
EB0912185-028	01-AUG-2009 15:00	BH2-A 21 0.0-0.2m		✓
EB0912185-029	01-AUG-2009 15:00	BH2-A 25 0.0-0.5m	✓	
EB0912185-030	01-AUG-2009 15:00	BH2-A 25 0.5-1.0m	✓	
EB0912185-031	01-AUG-2009 15:00	BH2-A 25 1.0-1.5m	✓	

Requested Deliverables

MR HENRY PARSONS

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

MR IAN WALLACE

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

MR MARTIN CROSSLEY

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

THE ACCOUNTS PAYABLE (BRISANE)

- A4 - AU Tax Invoice (INV)	Email	apbrisbane@golder.com.au

SAMPLE CHAIN OF CUSTODY DOCUMENTATION - SOIL

Project ID:	097633052	**Quote/Order No.:**	BN/354/09
Site Location:	Laird Point Dredge Study - Option 2A	**Lab Name:**	
Sampled By:	Ian Wallace		
Turnaround (Days)	Per quotation BN/354/09	**BY:**	
Report Format:	HARD ☐ FAX ☐ DISK ☐ EMAIL ☐ BULLETIN BOARD ☐		
Email Format:	PDF ☑ Excel ☑ Other ☐ **Email Address:**		

GOLDER ASSOCIATES PTY LTD Phone: (07) 3721 5400
611 Coronation Drive, Toowong, Qld 4066 Fax: (07) 3721 5401
Invoice to be sent to Accounts Brisbane: apbrisbane@golder.com.au
Project Manager: Martin Crossley: mcrossley@golder.com.au
Contact Phone: 07 3721 5400 **Email:** hparsons@golder.com.au

Golder Associates

Comments/Special Instructions: Excel required format ESDAT
Copy results to: Ian Wallace iwallace@golder.com.au

Samples from a declared Fire Ant Area: N
Samples taken from a known Weed and or Pest Area: N

ANALYSIS REQUIRED

SAMPLE ID		Location & Depth	SAMPLE MATRIX	SAMPLE DATE	SAMPLE TIME	CONTAINER/ PRESERVATIVE		No CONTAINERS	POSSIBLE HIGH CONCENTRATION	EA029 - SPOCAS	EA-033 Chromium Suite
BH2-A 15	1	0.00-0.50m	Soil	29/07/2009		Bag	frozen	1		X	
BH2-A 15	2	0.50-0.90m	Soil	29/07/2009		Bag	frozen	1		X	
BH2-A 16	3	0.00-0.10m	Soil	29/07/2009		Bag	frozen	1		X	
BH2-A 17	4	0.00-0.50m	Soil	29/07/2009		Bag	frozen	1			X
BH2-A 17	5	0.50-1.00m	Soil	29/07/2009		Bag	frozen	1		X	
BH2-A 17	6	1.00-1.50m	Soil	29/07/2009		Bag	frozen	1		X	
BH2-A 18	7	0.00-0.25m	Soil	29/07/2009		Bag	frozen	1			X
BH2-A 18	8	0.75-1.10m	Soil	29/07/2009		Bag	frozen	1		X	
BH2-A 11	9	0.25-0.50m	Soil	30/07/2009		Bag	frozen	1			X
BH2-A 11	10	0.80-1.00m	Soil	30/07/2009		Bag	frozen	1		X	
BH2-A 12	11	1.00-1.25m	Soil	30/07/2009		Bag	frozen	1		X	
BH2-A 12	12	1.40-1.75m	Soil	30/07/2009		Bag	frozen	1		X	
BH2-A 13	13	0.00-0.25m	Soil	30/07/2009		Bag	frozen	1		X	
BH2-A 13	14	0.25-0.50m	Soil	30/07/2009		Bag	frozen	1		X	
BH2-A 19	15	0.0-0.1m	Soil	30/07/2009		Bag	frozen	1			X

Environmental Division
Brisbane
Work Order
EB0912185

Telephone : +61-7-3243 7222

SAMPLE MATRIX = Soil/Sediment/Fill/Other **SAMPLE TYPE** = Core(CR) **HIGH CONCENTRATION:** Tick box and circle expected parameters in analysis list

Container Type and Preservative Codes: P = Natural Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinsed Jar; S = Solvent Washed Acid Rinsed Glass Bottle; VC = Hydrochloric Preserved Vial; VS = Sulphuric Acid P

	SIGNATURE	COMPANY	DATE	TIME
RELEASED BY	I.a Wallace	GOLDER	3/8/09	10:20
RECEIVED BY	N.KING	ALS	4/8/09	0825
RELEASED BY				
RECEIVED BY				
RELEASED BY				
RECEIVED BY				

	SIGNATURE	COMPANY	DATE	TIME	Shipment Method
RELEASED BY					Shipping Ref:
RECEIVED BY					

To Be Filled Out By Analysing Laboratory **LAB. BATCH NUMBER**

Security Seal	✓	Chilled		Bill to:	
Suitable Containers	✓	Frozen	✓	Address	
Cool Box	✓	Ambient			

THIS FORM IS TO BE SIGNED BY GOLDER STAFF; COURIER/S; LABORATORY ON RECEIPT OF SAMPLES.

SAMPLE CHAIN OF CUSTODY DOCUMENTATION - SOIL

Project ID:	097633052	**Quote/Order No.:**	BN/354/09
Site Location:	Laird Point Dredge Study - Option 2A	**Lab Name:**	
Sampled By:	Ian Wallace		
Turnaround (Days)	Per quotation BN/354/09	**BY:**	
Report Format:	HARD ☐ FAX ☐ DISK ☐ EMAIL ☐ BULLETIN BOARD ☐		
Email Format:	PDF ☑ Excel ☑ Other ☐	**Email Address:**	

GOLDER ASSOCIATES PTY LTD Phone: (07) 3721 5400
611 Coronation Drive, Toowong, Qld 4066 Fax: (07) 3721 5401
Invoice to be sent to Accounts Brisbane: apbrisbane@golder.com.au
Project Manager: Martin Crossley: mcrossley@golder.com.au
Contact Phone: 07 3721 5400 **Email:** hparsons@golder.com.au

Comments/Special Instructions: Excel required format ESDAT
Copy results to: Ian Wallace iwallace@golder.com.au

Samples from a declared Fire Ant Area: N
Samples taken from a known Weed and or Pest Area: N

SAMPLE ID	Location & Depth	SAMPLE MATRIX	SAMPLE DATE	SAMPLE TIME	CONTAINER/ PRESERVATIVE		No CONTAINERS	POSSIBLE HIGH CONCENTRATION	EA029 - SPOCAS	EA-033 Chromium Suite
BH2-A 9 16	0.0-0.5m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 9 17	0.5-1.0m	Soil	31/07/2009		Bag	frozen	1			X
BH2-A 9 18	1.0-1.6m	Soil	31/07/2009		Bag	frozen	1			X
BH2-A 9 19	1.6-2.0m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 9 20	2.0-2.5m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 9 21	2.5-3.1m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 28 22	0.0-0.1m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 28 23	1.25-1.5m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 30 24	0.25-0.6m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 32 25	0.0-0.1m	Soil	31/07/2009		Bag	frozen	1			X
BH2-A 32 26	0.1-0.5m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 32 27	0.5-1.1m	Soil	31/07/2009		Bag	frozen	1		X	
BH2-A 21 28	0.0-0.2m	Soil	1/08/2009		Bag	frozen	1			X
BH2-A 25 29	0.0-0.5m	Soil	1/08/2009		Bag	frozen	1		X	
BH2-A 25 30	0.5-1.0m	Soil	1/08/2009		Bag	frozen	1		X	
BH2-A 25 31	1.0-1.5m	Soil	1/08/2009		Bag	frozen	1		X	

ANALYSIS REQUIRED

SAMPLE MATRIX = Soil/Sediment/Fill/Other **SAMPLE TYPE** = Core(CR) **HIGH CONCENTRATION:** Tick box and circle expected parameters in analysis list

Container Type and Preservative Codes: P = Natural Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinsed Jar; S = Solvent Washed Acid Rinsed Glass Bottle; VC = Hydrochloric Preserved Vial; VS = Sulphuric Acid

	SIGNATURE	COMPANY	DATE	TIME
RELEASED BY	Ian Wallace	GOLDER	3/8/09	10:20
RECEIVED BY	N.Kirk	ALS	4/8/09	0825
RELEASED BY				
RECEIVED BY				
RELEASED BY				
RECEIVED BY				

	SIGNATURE	COMPANY	DATE	TIME	Shipment Method
RELEASED BY					Shipping Ref:
RECEIVED BY					

To Be Filled Out By Analysing Laboratory **LAB. BATCH NUMBER**

Security Seal	✓	Chilled		Bill to:	
Suitable Containers	✓	Frozen	✓	Address	
Cool Box	✓	Ambient			

THIS FORM IS TO BE SIGNED BY GOLDER STAFF; COURIER/S; LABORATORY ON RECEIPT OF SAMPLES.

CERTIFICATE OF ANALYSIS

Work Order	: **EB0912458**	Page	: 1 of 10
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR MARTIN CROSSLEY	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: mcrossley@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: Soil	Date Samples Received	: 07-AUG-2009
Sampler	: Ian Wallace	Issue Date	: 13-AUG-2009
Site	: Laird Pnt Dredge Study-Opt 2a		
		No. of samples received	: 16
Quote number	: BN/354/09 V2	No. of samples analysed	: 16

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

- **Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**
- **Retained Acidity not required because pH KCl greater than or equal to 4.5**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-07 0.25-0.5m Client sampling date / time: 03-AUG-2009 15:00 EB0912458-001	BH2A-07 1.50-1.75m 03-AUG-2009 15:00 EB0912458-002	BH2A-07 2.25-2.40m 03-AUG-2009 15:00 EB0912458-003	BH2A-22 0.0-0.25m 03-AUG-2009 15:00 EB0912458-004	BH2A-22 1.75-2.0m 03-AUG-2009 15:00 EB0912458-005
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	**7.1**	**7.4**	----	**7.5**
pH OX (23B)	----	0.1	pH Unit	----	**2.4**	**2.8**	----	**2.4**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	<2	----	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	**350**	**162**	----	**410**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	**350**	**162**	----	**410**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	<0.02	----	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	----	**0.56**	**0.26**	----	**0.66**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	----	**0.56**	**0.26**	----	**0.66**
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	**0.09**	**0.06**	----	**0.13**
Peroxide Sulfur (23De)	----	0.02	% S	----	**0.85**	**0.49**	----	**1.28**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	----	**0.76**	**0.43**	----	**1.15**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	**473**	**267**	----	**717**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	----	**0.07**	**0.06**	----	**0.22**
Peroxide Calcium (23Wh)	----	0.02	% Ca	----	**0.08**	**0.08**	----	**0.35**
Acid Reacted Calcium (23X)	----	0.02	% Ca	----	<0.02	<0.02	----	**0.12**
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	<10	<10	----	**62**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	----	<0.02	<0.02	----	**0.10**
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	----	**0.14**	**0.13**	----	**0.20**
Peroxide Magnesium (23Tm)	----	0.02	% Mg	----	**0.18**	**0.16**	----	**0.31**
Acid Reacted Magnesium (23U)	----	0.02	% Mg	----	**0.04**	**0.04**	----	**0.10**
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	**31**	**30**	----	**83**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	----	**0.05**	**0.05**	----	**0.13**
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	**1.5**	**1.5**	----	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	----	**0.63**	**0.32**	----	**0.82**
Net Acidity (acidity units)	----	10	mole H+ / t	----	**391**	**197**	----	**512**
Liming Rate	----	1	kg CaCO3/t	----	**29**	**15**	----	**38**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.2**	----	----	**8.5**	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**7**	----	----	<2	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2A-07 0.25-0.5m	BH2A-07 1.50-1.75m	BH2A-07 2.25-2.40m	BH2A-22 0.0-0.25m	BH2A-22 1.75-2.0m
				Client sampling date / time	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00
Compound	CAS Number	LOR	Unit		EB0912458-001	EB0912458-002	EB0912458-003	EB0912458-004	EB0912458-005
EA033-A: Actual Acidity - Continued									
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	----	----	<0.02	----
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**1.70**	----	----	**1.14**	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1060**	----	----	**710**	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	----	----	**1.86**	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	----	----	**371**	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	----	----	**0.59**	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	----	----	**1.5**	----
Net Acidity (sulfur units)	----	0.02	% S		**1.71**	----	----	**0.74**	----
Net Acidity (acidity units)	----	10	mole H+ / t		**1070**	----	----	**462**	----
Liming Rate	----	1	kg CaCO3/t		**80**	----	----	**35**	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-22 3.0-3.25m	BH2A-23 0.0-0.5m	BH2A-23 0.5-1.0m	BH2A-23 1.0-1.5m	BH2A-23 1.5-2.0m
				Client sampling date / time: 03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00
				EB0912458-006	EB0912458-007	EB0912458-008	EB0912458-009	EB0912458-010
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**7.2**	----	**7.2**	**6.9**	**5.4**
pH OX (23B)	----	0.1	pH Unit	**2.4**	----	**2.3**	**2.3**	**1.9**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	<2	<2	**20**
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	**412**	----	**385**	**495**	**1900**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	**412**	----	**385**	**495**	**1880**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	<0.02	<0.02	**0.03**
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	**0.66**	----	**0.62**	**0.79**	**3.05**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	**0.66**	----	**0.62**	**0.79**	**3.01**
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.10**	----	**0.13**	**0.11**	**0.19**
Peroxide Sulfur (23De)	----	0.02	% S	**1.24**	----	**1.05**	**1.20**	**1.94**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	**1.13**	----	**0.92**	**1.09**	**1.74**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**706**	----	**572**	**680**	**1090**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	**0.18**	----	**0.14**	**0.12**	**0.13**
Peroxide Calcium (23Wh)	----	0.02	% Ca	**0.33**	----	**0.18**	**0.14**	**0.08**
Acid Reacted Calcium (23X)	----	0.02	% Ca	**0.15**	----	**0.04**	**0.02**	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**74**	----	**20**	**10**	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	**0.12**	----	**0.03**	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	**0.18**	----	**0.19**	**0.19**	**0.20**
Peroxide Magnesium (23Tm)	----	0.02	% Mg	**0.30**	----	**0.24**	**0.23**	**0.12**
Acid Reacted Magnesium (23U)	----	0.02	% Mg	**0.12**	----	**0.04**	**0.04**	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**97**	----	**37**	**35**	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	**0.16**	----	**0.06**	**0.06**	<0.02
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.82**	----	**0.72**	**0.89**	**1.77**
Net Acidity (acidity units)	----	10	mole H+ / t	**510**	----	**448**	**557**	**1110**
Liming Rate	----	1	kg CaCO3/t	**38**	----	**34**	**42**	**83**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	**8.5**	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2A-22 3.0-3.25m	BH2A-23 0.0-0.5m	BH2A-23 0.5-1.0m	BH2A-23 1.0-1.5m	BH2A-23 1.5-2.0m
				Client sampling date / time	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00
Compound	CAS Number	LOR	Unit		EB0912458-006	EB0912458-007	EB0912458-008	EB0912458-009	EB0912458-010
EA033-A: Actual Acidity - Continued									
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	<0.02	----	----	----
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		----	**0.76**	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		----	**475**	----	----	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	**6.63**	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	**1320**	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	**2.12**	----	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	**1.5**	----	----	----
Net Acidity (sulfur units)	----	0.02	% S		----	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		----	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t		----	<1	----	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-03 0.00-0.25m Client sampling date / time: 04-AUG-2009 15:00 EB0912458-011	BH2A-03 1.25-1.60m 04-AUG-2009 15:00 EB0912458-012	BH2A-03 2.50-2.75m 04-AUG-2009 15:00 EB0912458-013	BH2A-14 0.25-0.50m 04-AUG-2009 15:00 EB0912458-014	BH2A-20 1.25-1.50m 04-AUG-2009 15:00 EB0912458-015
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	**6.4**	**7.5**	**6.5**	**4.6**
pH OX (23B)	----	0.1	pH Unit	----	**1.9**	**2.5**	**6.2**	**4.8**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	**5**	<2	<2	**30**
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	**1250**	**288**	<2	**27**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	**1240**	**288**	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	<0.02	<0.02	**0.05**
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	----	**2.00**	**0.46**	<0.02	**0.04**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	----	**1.99**	**0.46**	<0.02	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	**0.19**	**0.06**	**0.03**	**0.04**
Peroxide Sulfur (23De)	----	0.02	% S	----	**1.38**	**0.76**	**0.04**	**0.04**
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	----	**1.19**	**0.69**	<0.02	<0.02
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	**744**	**430**	<10	<10
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	----	**0.12**	**0.07**	**0.07**	**0.06**
Peroxide Calcium (23Wh)	----	0.02	% Ca	----	**0.09**	**0.08**	**0.08**	**0.06**
Acid Reacted Calcium (23X)	----	0.02	% Ca	----	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	----	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	----	**0.22**	**0.14**	**0.10**	**0.11**
Peroxide Magnesium (23Tm)	----	0.02	% Mg	----	**0.15**	**0.18**	**0.10**	**0.12**
Acid Reacted Magnesium (23U)	----	0.02	% Mg	----	<0.02	**0.03**	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	<10	**27**	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	----	<0.02	**0.04**	<0.02	<0.02
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	----	**1.20**	**0.54**	<0.02	**0.05**
Net Acidity (acidity units)	----	10	mole H+ / t	----	**749**	**335**	<10	**30**
Liming Rate	----	1	kg CaCO3/t	----	**56**	**25**	<1	**2**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**7.1**	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2A-03 0.00-0.25m	BH2A-03 1.25-1.60m	BH2A-03 2.50-2.75m	BH2A-14 0.25-0.50m	BH2A-20 1.25-1.50m
				Client sampling date / time	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
Compound	CAS Number	LOR	Unit		EB0912458-011	EB0912458-012	EB0912458-013	EB0912458-014	EB0912458-015
EA033-A: Actual Acidity - Continued									
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	----	----	----	----
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**1.88**	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1170**	----	----	----	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		**1.06**	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		**212**	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		**0.34**	----	----	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S		**1.65**	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		**1030**	----	----	----	----
Liming Rate	----	1	kg CaCO3/t		**77**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2A-27 0.25-0.60m	----	----	----	----
				Client sampling date / time	05-AUG-2009 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB0912458-016	----	----	----	----
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		**9.0**	----	----	----	----
pH OX (23B)	----	0.1	pH Unit		**7.9**	----	----	----	----
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	----	----	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		<2	----	----	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		<2	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	----	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		<0.02	----	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		<0.02	----	----	----	----
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.10**	----	----	----	----
Peroxide Sulfur (23De)	----	0.02	% S		**0.44**	----	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		**0.34**	----	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		**212**	----	----	----	----
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		**0.22**	----	----	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca		**2.71**	----	----	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca		**2.49**	----	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		**1240**	----	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		**1.99**	----	----	----	----
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		**0.09**	----	----	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg		**0.16**	----	----	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg		**0.08**	----	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		**63**	----	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		**0.10**	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity									
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3		**4.76**	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t		**952**	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S		**1.52**	----	----	----	----
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2A-27 0.25-0.60m	----	----	----	----
				Client sampling date / time	05-AUG-2009 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB0912458-016	----	----	----	----
EA029-H: Acid Base Accounting - Continued									
Net Acidity (sulfur units)	----	0.02	% S		<0.02	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		<10	----	----	----	----
Liming Rate	----	1	kg CaCO3/t		<1	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **EB0912458**	Page	: 1 of 7
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR MARTIN CROSSLEY	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: mcrossley@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Laird Pnt Dredge Study-Opt 2a		
C-O-C number	: Soil	Date Samples Received	: 07-AUG-2009
Sampler	: Ian Wallace	Issue Date	: 13-AUG-2009
Order number	: ----		
		No. of samples received	: 16
Quote number	: BN/354/09 V2	No. of samples analysed	: 16

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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA029-A: pH Measurements (QC Lot: 1063604)									
EB0912458-002	BH2A-07 1.50-1.75m	EA029: pH KCl (23A)	----	0.1	pH Unit	7.1	7.3	2.8	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.4	2.4	0.0	0% - 20%
EB0912458-015	BH2A-20 1.25-1.50m	EA029: pH KCl (23A)	----	0.1	pH Unit	4.6	4.6	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	4.8	4.8	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 1063604)									
EB0912458-002	BH2A-07 1.50-1.75m	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.56	0.56	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.56	0.56	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	350	348	0.7	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	350	348	0.7	0% - 20%
EB0912458-015	BH2A-20 1.25-1.50m	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.05	0.04	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.04	0.04	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	30	28	6.1	0% - 50%
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	27	26	0.0	0% - 50%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-C: Sulfur Trail (QC Lot: 1063604)									
EB0912458-002	BH2A-07 1.50-1.75m	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.09	0.07	20.4	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.85	0.85	0.0	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.76	0.78	2.8	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	473	487	2.8	0% - 20%
EB0912458-015	BH2A-20 1.25-1.50m	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.04	0.04	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.04	0.04	0.0	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 1063604)									
EB0912458-002	BH2A-07 1.50-1.75m	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.07	0.07	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.08	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA029-D: Calcium Values (QC Lot: 1063604) - continued									
EB0912458-002	BH2A-07 1.50-1.75m	EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0912458-015	BH2A-20 1.25-1.50m	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.06	0.05	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.06	0.06	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 1063604)									
EB0912458-002	BH2A-07 1.50-1.75m	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.14	0.13	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.18	0.18	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.04	0.04	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.05	0.06	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	31	36	16.4	No Limit
EB0912458-015	BH2A-20 1.25-1.50m	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.11	0.11	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.12	0.12	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA033-A: Actual Acidity (QC Lot: 1063603)									
EB0912458-001	BH2A-07 0.25-0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	7	3	71.5	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.2	6.4	3.2	0% - 20%
EA033-B: Potential Acidity (QC Lot: 1063603)									
EB0912458-001	BH2A-07 0.25-0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.70	1.66	2.4	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1060	1030	2.4	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: **SOIL**

				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
EA029-B: Acidity Trail (QCLot: 1063604)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 1063604)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 1063604)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 1063604)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 1063604)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.02	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 1063603)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 1063603)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----

Sub-Matrix: **SOIL**

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
EA033-C: Acid Neutralising Capacity (QCLot: 1063603)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----

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.

- **No Matrix Spike (MS) Results are required to be reported.**

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0912458**

Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR MARTIN CROSSLEY	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: mcrossley@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	Page	: 1 of 3
Order number	: ----		
C-O-C number	: Soil	Quote number	: EB2009GOLASS0340 (BN/354/09 V2)
Site	: Laird Pnt Dredge Study-Opt 2a		
Sampler	: Ian Wallace	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 07-AUG-2009	Issue Date	: 07-AUG-2009 13:10
Client Requested Due Date	: 14-AUG-2009	Scheduled Reporting Date	: **14-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 10.1 C - Ice bricks present
No. of coolers/boxes	: 1 MEDIUM	No. of samples received	: 16
Sercurity Seal	: Intact.	No. of samples analysed	: 16

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: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA029 SPOCAS	SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0912458-001	03-AUG-2009 15:00	BH2A-07 0.25-0.5m		✓
EB0912458-002	03-AUG-2009 15:00	BH2A-07 1.50-1.75m	✓	
EB0912458-003	03-AUG-2009 15:00	BH2A-07 2.25-2.40m	✓	
EB0912458-004	03-AUG-2009 15:00	BH2A-22 0.0-0.25m		✓
EB0912458-005	03-AUG-2009 15:00	BH2A-22 1.75-2.0m	✓	
EB0912458-006	03-AUG-2009 15:00	BH2A-22 3.0-3.25m	✓	
EB0912458-007	03-AUG-2009 15:00	BH2A-23 0.0-0.5m		✓
EB0912458-008	03-AUG-2009 15:00	BH2A-23 0.5-1.0m	✓	
EB0912458-009	03-AUG-2009 15:00	BH2A-23 1.0-1.5m	✓	
EB0912458-010	03-AUG-2009 15:00	BH2A-23 1.5-2.0m	✓	
EB0912458-011	04-AUG-2009 15:00	BH2A-03 0.00-0.25m		✓
EB0912458-012	04-AUG-2009 15:00	BH2A-03 1.25-1.60m	✓	
EB0912458-013	04-AUG-2009 15:00	BH2A-03 2.50-2.75m	✓	
EB0912458-014	04-AUG-2009 15:00	BH2A-14 0.25-0.50m	✓	
EB0912458-015	04-AUG-2009 15:00	BH2A-20 1.25-1.50m	✓	
EB0912458-016	05-AUG-2009 15:00	BH2A-27 0.25-0.60m	✓	

Requested Deliverables

MR HENRY PARSONS

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

MR IAN WALLACE

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

MR MARTIN CROSSLEY

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

THE ACCOUNTS PAYABLE (BRISANE)

- A4 - AU Tax Invoice (INV)	Email	apbrisbane@golder.com.au

SAMPLE CHAIN OF CUSTODY DOCUMENTATION - SOIL

Sheet..... of.....

Project ID:	097633052	**Quote/Order No.:**	**BN/354/09**
Site Location:	**Laird Point Dredge Study - Option 2A**	**Lab Name:**	
Sampled By:	**Ian Wallace**		
Turnaround (Days)	**Per quotation BN/354/09**	**BY:**	
Report Format:	HARD ☐ FAX ☐ DISK ☐ EMAIL ☐ BULLETIN BOARD ☐		
Email Format:	PDF ☑ Excel ☑ Other ☐ **Email Address:**		

GOLDER ASSOCIATES PTY LTD
611 Coronation Drive, Toowong, Qld 4066
Phone: (07) 3721 5400
Fax: (07) 3721 5401
Invoice to be sent to Accounts Brisbane: apbrisbane@golder.com.au
Project Manager: Martin Crossley: mcrossley@golder.com.au
Contact Phone: 07 3721 5400
Email: hparsons@golder.com.au

Comments/Special Instructions: Excel required format ESDAT
Copy results to: Ian Wallace iwallace@golder.com.au

Samples from a declared Fire Ant Area: N
Samples taken from a known Weed and or Pest Area: N

ANALYSIS REQUIRED

	SAMPLE ID	Location & Depth	SAMPLE MATRIX	SAMPLE DATE	SAMPLE TIME	CONTAINER/ PRESERVATIVE		No CONTAINERS	POSSIBLE HIGH CONCENTRATION	EA029 - SPOCAS	EA-033 Chromium Suite
1	BH2A-07	0.25-0.5m	Soil	3/08/2009		Bag	Frozen	1	N		X
2	BH2A-07	1.50-1.75m	Soil	3/08/2009		Bag	Frozen	1	N	X	
3	BH2A-07	2.25-2.40m	Soil	3/08/2009		Bag	Frozen	1	N	X	
4	BH2A-22	0.0-0.25m	Soil	3/08/2009		Bag	Frozen	1	N		X
5	BH2A-22	1.75-2.0m	Soil	3/08/2009		Bag	Frozen	1	N	X	
6	BH2A-22	3.0-3.25m	Soil	3/08/2009		Bag	Frozen	1	N	X	
7	BH2A-23	0.0-0.5m	Soil	3/08/2009		Bag	Frozen	1	N		X
8	BH2A-23	0.5-1.0m	Soil	3/08/2009		Bag	Frozen	1	N	X	
9	BH2A-23	1.0-1.5m	Soil	3/08/2009		Bag	Frozen	1	N	X	
10	BH2A-23	1.5-2.0m	Soil	3/08/2009		Bag	Frozen	1	N	X	
11	BH2A-03	0.00-0.25m	Soil	4/08/2009		Bag	Frozen	1	N		X
12	BH2A-03	1.25-1.60m	Soil	4/08/2009		Bag	Frozen	1	N	X	
13	BH2A-03	2.50-2.75m	Soil	4/08/2009		Bag	Frozen	1	N	X	
14	BH2A-14	0.25-0.50m	Soil	4/08/2009		Bag	Frozen	1	N	X	
15	BH2A-30	1.25-1.50m	Soil	4/08/2009		Bag	Frozen	1	N	X	
16	BH2A-27	0.25-0.60m	Soil	5/08/2009		Bag	Frozen	1	N	X	

Environmental Division
Brisbane
Work Order
EB0912458

Telephone : +61-7-3243 7222

SAMPLE MATRIX = Soil/Sediment/Fill/Other
SAMPLE TYPE = Core(CR)
HIGH CONCENTRATION: Tick box and circle expected parameters in analysis list

Container Type and Preservative Codes: P = Natural Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinsed Jar; S = Solvent Washed Acid Rinsed Glass Bottle; VC = Hydrochloric Preserved Vial; VS = Sulphuric Acid P

	SIGNATURE	COMPANY	DATE	TIME
RELEASED BY		GOLDER	6/8/09	1300
RECEIVED BY	N.Kirk	ALS	7/8/09	0900
RELEASED BY				
RECEIVED BY				
RELEASED BY				
RECEIVED BY				

	SIGNATURE	COMPANY	DATE	TIME	Shipment Method
RELEASED BY					Shipping Ref:
RECEIVED BY					

To Be Filled Out By Analysing Laboratory

Security Seal	✓	Chilled		LAB. BATCH NUMBER	
Suitable Containers	✓	Frozen		Bill to:	
Cool Box		Ambient		Address	

THIS FORM IS TO BE SIGNED BY GOLDER STAFF; COURIER/S; LABORATORY ON RECEIPT OF SAMPLES.

CERTIFICATE OF ANALYSIS

Work Order	: **EB0913317**	Page	: 1 of 4
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR HENRY PARSONS	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: hparsons@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: SOIL	Date Samples Received	: 24-AUG-2009
Sampler	: Ian Wallace	Issue Date	: 27-AUG-2009
Site	: Laird Pt Drdge Stdy-Opt 2A		
		No. of samples received	: 3
Quote number	: BN/354/09 V2	No. of samples analysed	: 3

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

- **Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**
- **Retained Acidity not required because pH KCl greater than or equal to 4.5**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A31 0.0-0.1m	BH2-A33 0.0-0.25m	BH2-A34 0.1-0.25m	----	----
Client sampling date / time				24-AUG-2009 11:00	24-AUG-2009 11:00	24-AUG-2009 11:00	----	----
				EB0913317-001	EB0913317-002	EB0913317-003	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.6	8.9	9.0	----	----
pH OX (23B)	----	0.1	pH Unit	8.0	8.3	8.3	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.08	0.03	0.06	----	----
Peroxide Sulfur (23De)	----	0.02	% S	0.28	0.05	0.18	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.19	0.02	0.12	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	121	13	75	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.22	0.15	0.18	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	1.32	0.47	1.76	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	1.11	0.32	1.59	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	552	161	793	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.88	0.26	1.27	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.14	0.07	0.11	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.28	0.12	0.18	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.13	0.05	0.07	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	111	39	57	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.18	0.06	0.09	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	2.35	1.02	3.11	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	470	203	622	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.75	0.32	1.00	----	----
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL	Client sample ID	BH2-A31 0.0-0.1m	BH2-A33 0.0-0.25m	BH2-A34 0.1-0.25m	----	----
	Client sampling date / time	24-AUG-2009 11:00	24-AUG-2009 11:00	24-AUG-2009 11:00	----	----
Compound / CAS Number	LOR / Unit	EB0913317-001	EB0913317-002	EB0913317-003	----	----
EA029-H: Acid Base Accounting - Continued						
ANC Fineness Factor ----	0.5 -	**1.5**	**1.5**	**1.5**	----	----
Net Acidity (sulfur units) ----	0.02 % S	<0.02	<0.02	<0.02	----	----
Net Acidity (acidity units) ----	10 mole H+ / t	<10	<10	<10	----	----
Liming Rate ----	1 kg CaCO3/t	<1	<1	<1	----	----

QUALITY CONTROL REPORT

Work Order	: **EB0913317**	Page	: 1 of 6
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR HENRY PARSONS	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: hparsons@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Laird Pt Drdge Stdy-Opt 2A		
C-O-C number	: SOIL	Date Samples Received	: 24-AUG-2009
Sampler	: Ian Wallace	Issue Date	: 27-AUG-2009
Order number	: ----		
		No. of samples received	: 3
Quote number	: BN/354/09 V2	No. of samples analysed	: 3

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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA029-A: pH Measurements (QC Lot: 1081436)									
EB0913317-001	BH2-A31 0.0-0.1m	EA029: pH KCl (23A)	----	0.1	pH Unit	8.6	8.7	1.2	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	8.0	8.0	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 1081436)									
EB0913317-001	BH2-A31 0.0-0.1m	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-C: Sulfur Trail (QC Lot: 1081436)									
EB0913317-001	BH2-A31 0.0-0.1m	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.08	0.09	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.28	0.27	0.0	0% - 50%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.19	0.18	9.4	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	121	110	9.4	0% - 50%
EA029-D: Calcium Values (QC Lot: 1081436)									
EB0913317-001	BH2-A31 0.0-0.1m	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.22	0.23	7.0	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	1.32	1.25	6.1	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	1.11	1.01	9.0	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.88	0.81	9.0	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	552	505	9.0	0% - 20%
EA029-E: Magnesium Values (QC Lot: 1081436)									
EB0913317-001	BH2-A31 0.0-0.1m	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.14	0.16	9.2	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.28	0.27	0.0	0% - 50%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.13	0.11	18.5	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.18	0.15	18.5	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	111	92	18.5	No Limit
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 1081436)									
EB0913317-001	BH2-A31 0.0-0.1m	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	2.35	2.35	0.0	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.75	0.75	0.0	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 1081436) - continued									
EB0913317-001	BH2-A31 0.0-0.1m	EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	470	470	0.0	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: **SOIL**

				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
EA029-B: Acidity Trail (QCLot: 1081436)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 1081436)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 1081436)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 1081436)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 1081436)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.02	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.02	----	----	----	----

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.

- **No Matrix Spike (MS) Results are required to be reported.**

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0913317**

Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR MARTIN CROSSLEY	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: mcrossley@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	Page	: 1 of 3
Order number	: ----		
C-O-C number	: SOIL	Quote number	: EB2009GOLASS0340 (BN/354/09 V2)
Site	: Laird Pt Drdge Stdy-Opt 2A		
Sampler	: Ian Wallace	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 24-AUG-2009	Issue Date	: 25-AUG-2009 10:45
Client Requested Due Date	: 31-AUG-2009	Scheduled Reporting Date	: **31-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 8.1' C - Ice bricks present
No. of coolers/boxes	: 1 MEDIUM	No. of samples received	: 3
Sercurity Seal	: Intact.	No. of samples analysed	: 3

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: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA029 SPOCAS
EB0913317-001	24-AUG-2009 11:00	BH2-A31 0.0-0.1m	✓
EB0913317-002	24-AUG-2009 11:00	BH2-A33 0.0-0.25m	✓
EB0913317-003	24-AUG-2009 11:00	BH2-A34 0.1-0.25m	✓

Requested Deliverables

MR BRETT McLENNAN

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

MR HENRY PARSONS

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

MR IAN WALLACE

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

MR MARTIN CROSSLEY

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

THE ACCOUNTS PAYABLE (BRISANE)

- A4 - AU Tax Invoice (INV)	Email	apbrisbane@golder.com.au

SAMPLE CHAIN OF CUSTODY DOCUMENTATION - SOIL

Project ID:	097633052	**Quote/Order No.:**	BN/354/09
Site Location:	Laird Point Dredge Study - Option 2A	**Lab Name:**	
Sampled By:	Ian Wallace		
Turnaround (Days)	Per quotation BN/354/09	**BY:**	
Report Format:	HARD ☐ FAX ☐ DISK ☐ EMAIL ☐ BULLETIN BOARD ☐		
Email Format:	PDF ☑ Excel ☑ Other ☐ **Email Address:**		

GOLDER ASSOCIATES PTY LTD **Phone:** (07) 3721 5400
611 Coronation Drive, Toowong, Qld 4066 **Fax:** (07) 3721 5401
Invoice to be sent to Accounts Brisbane: apbrisbane@golder.com.au
Project Manager: Martin Crossley: mcrossley@golder.com.au
Contact Phone: 07 3721 5400 **Email:** hparsons@golder.com.au

Comments/Special Instructions: Excel required format ESDAT
Copy results to: Ian Wallace & Brett McLennan iwallace@golder.com.au bmclennan@golder.com.au

Samples from a declared Fire Ant Area: N
Samples taken from a known Weed and or Pest Area: N

	SAMPLE ID	Location & Depth	SAMPLE MATRIX	SAMPLE DATE	SAMPLE TIME	CONTAINER/ PRESERVATIVE	No CONTAINERS	POSSIBLE HIGH CONCENTRATION	EA029 - SPOCAS	EA-033 Chromium Suite
1	BH2-A31	0.0-0.1m	Soil			bag	1		1	
2	BH2-A33	0.0-0.25m	Soil			bag	1		1	
3	BH2-A34	0.1-0.25m	Soil			bag	1		1	

ANALYSIS REQUIRED

Environmental Division
Brisbane
Work Order
EB0913317

Telephone : +61-7-3243 7222

SAMPLE MATRIX = Soil/Sediment/Fill/Other **SAMPLE TYPE** = Core(CR) **HIGH CONCENTRATION:** Tick box and circle expected parameters in analysis list

Container Type and Preservative Codes: P = Natural Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinsed Jar; S = Solvent Washed Acid Rinsed Glass Bottle; VC = Hydrochloric Preserved Vial; VS = Sulphuric Acid P

	SIGNATURE	COMPANY	DATE	TIME
RELEASED BY		GOLDER	24/8/09.	1100.
RECEIVED BY		AES	24.8.09	1210.
RELEASED BY				
RECEIVED BY				
RELEASED BY				
RECEIVED BY				

	SIGNATURE	COMPANY	DATE	TIME	Shipment Method
RELEASED BY					Shipping Ref:
RECEIVED BY					

To Be Filled Out By Analysing Laboratory **LAB. BATCH NUMBER** *

Security Seal		Chilled		Bill to:	
Suitable Containers		Frozen		Address	
Cool Box		Ambient			

THIS FORM IS TO BE SIGNED BY GOLDER STAFF; COURIER/S; LABORATORY ON RECEIPT OF SAMPLES.

APPENDIX C

Study Limitations

LIMITATIONS

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Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

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Toowong Queensland 4066
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Golder Associates

Appendix 3 Particle Size Analysis Reports (ALS)

Certificate of Analysis

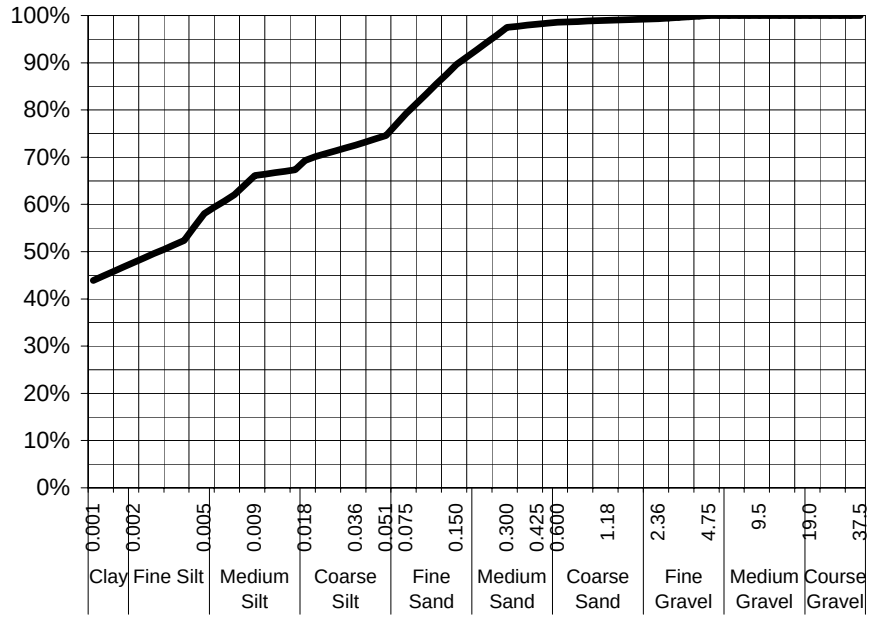
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-002 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-2 0.00-0.50m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	99%
1.18	99%
0.600	99%
0.425	98%
0.300	97%
0.150	90%
0.075	79%
Particle Size (microns)	
51	75%
36	73%
18	69%
9	66%
5	58%
3	52%
1	44%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay, silt & fine sand	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

NATA Accreditation: 825 Site: Newcastle
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Dianne Blane
Senior Analyst
Authorised Signatory

Certificate of Analysis

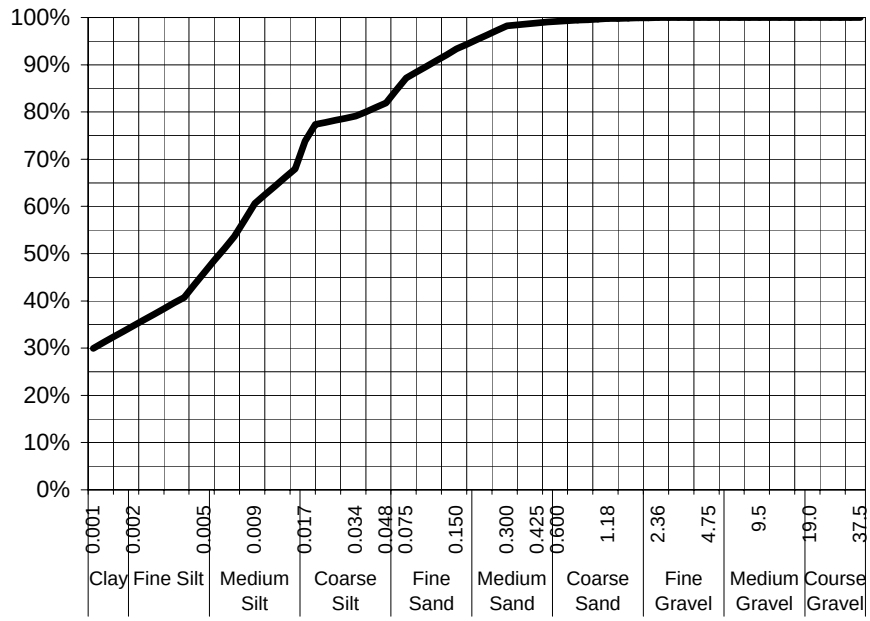
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-003 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-2 0.50-0.90m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	99%
0.425	99%
0.300	98%
0.150	93%
0.075	87%
Particle Size (microns)	
48	82%
34	79%
17	74%
9	61%
5	46%
3	41%
1	30%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Silt, clay & sand	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

NATA Accreditation: 825 Site: Newcastle
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Dianne Blane
Senior Analyst
Authorised Signatory

Certificate of Analysis

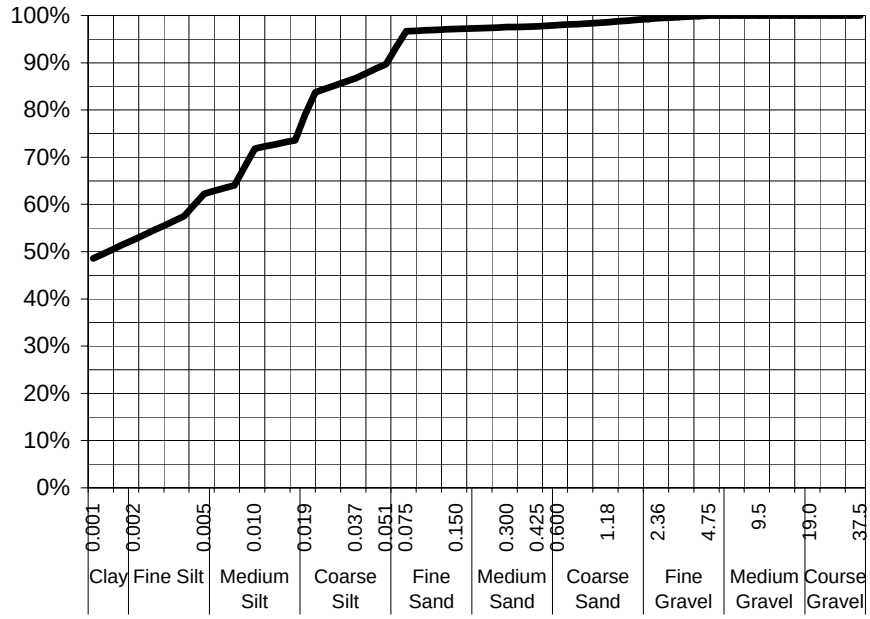
ALS Laboratory Group Pty Ltd
5 Rosegum Road
Warabrook, NSW 2304
pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-004 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-3 0.00-0.50m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	99%
1.18	99%
0.600	98%
0.425	98%
0.300	98%
0.150	97%
0.075	97%
Particle Size (microns)	
51	90%
37	87%
19	79%
10	72%
5	62%
4	58%
1	49%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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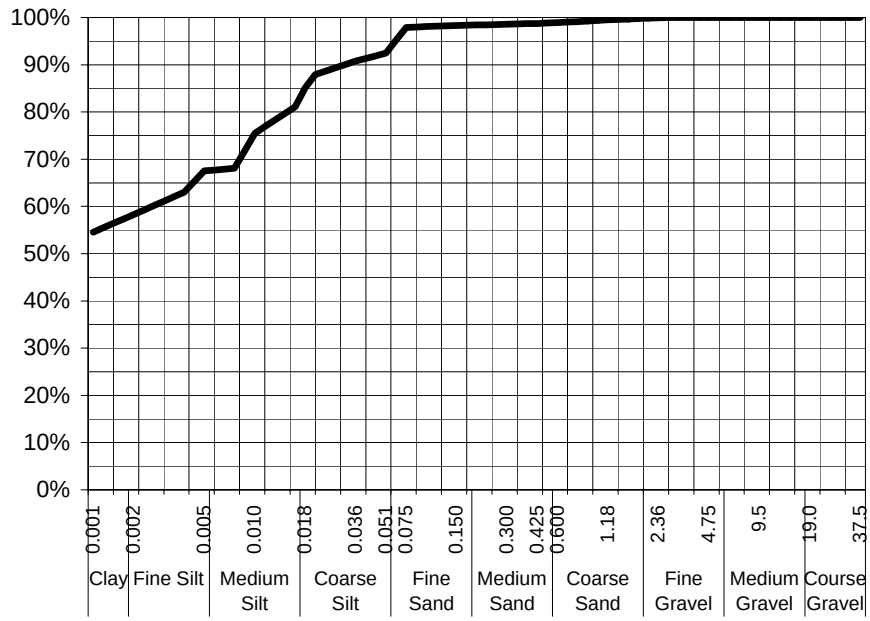
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CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-005 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-3 0.50-1.00m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	99%
0.425	99%
0.300	99%
0.150	98%
0.075	98%
Particle Size (microns)	
51	92%
36	91%
18	85%
10	75%
5	68%
3	63%
1	55%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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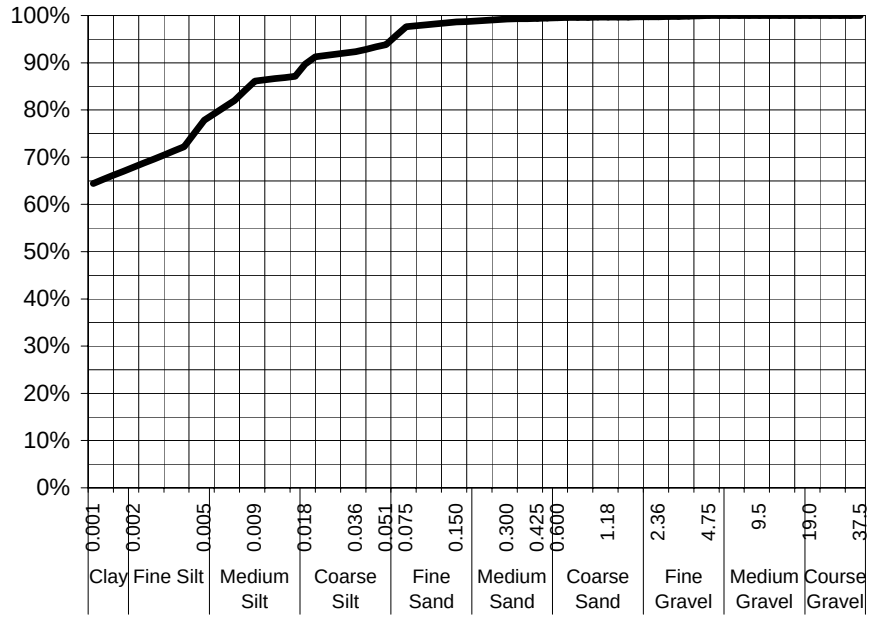
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COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-006 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-3 1.00-1.60m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	100%
0.425	99%
0.300	99%
0.150	99%
0.075	98%
Particle Size (microns)	
51	94%
36	92%
18	90%
9	86%
5	78%
3	72%
1	64%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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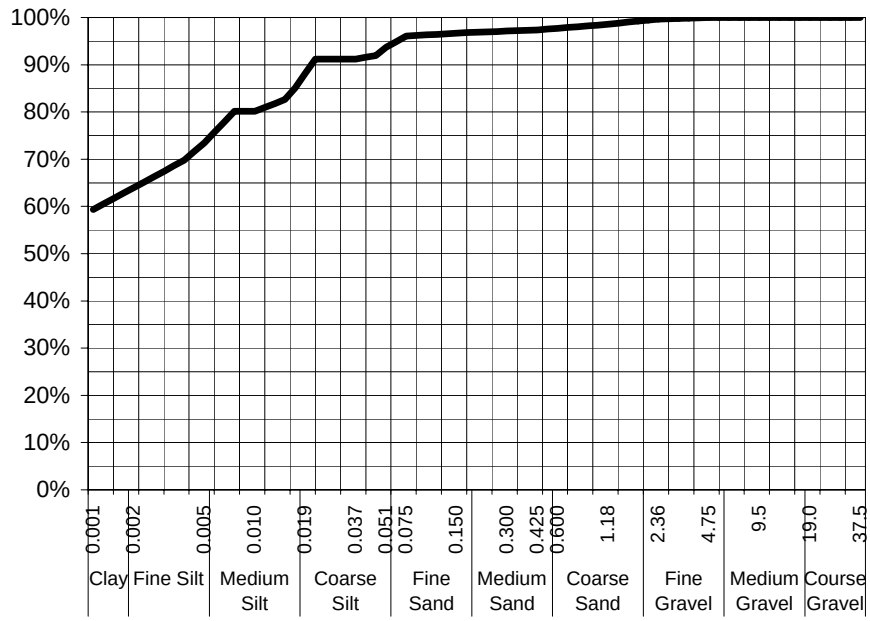
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COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-007 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-3 1.60-2.00m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	98%
0.425	97%
0.300	97%
0.150	97%
0.075	96%
Particle Size (microns)	
51	94%
37	91%
19	88%
10	80%
5	73%
3	70%
1	59%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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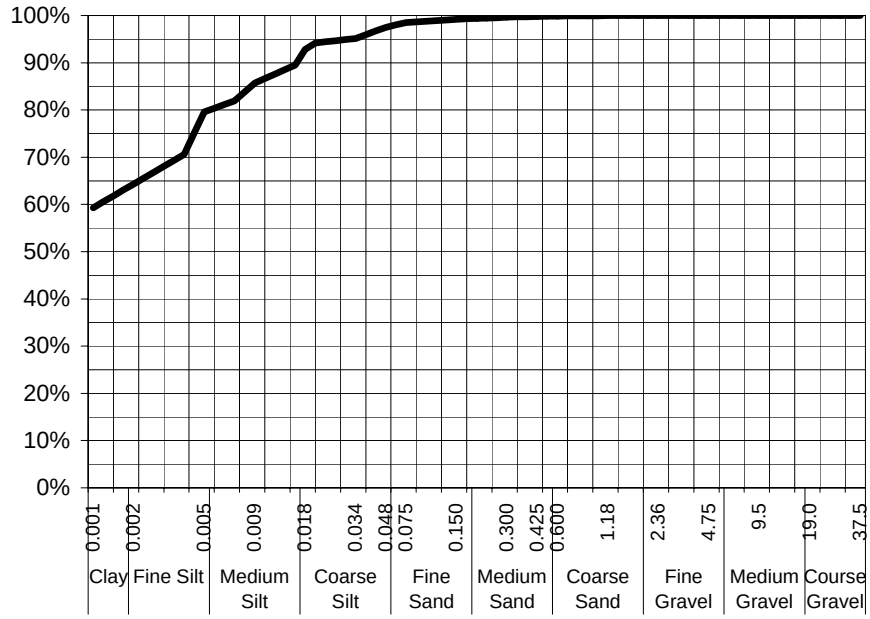
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COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-008 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-3 2.00-2.90m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	100%
0.425	100%
0.300	100%
0.150	99%
0.075	99%
Particle Size (microns)	
48	98%
34	95%
18	93%
9	86%
5	80%
3	71%
1	59%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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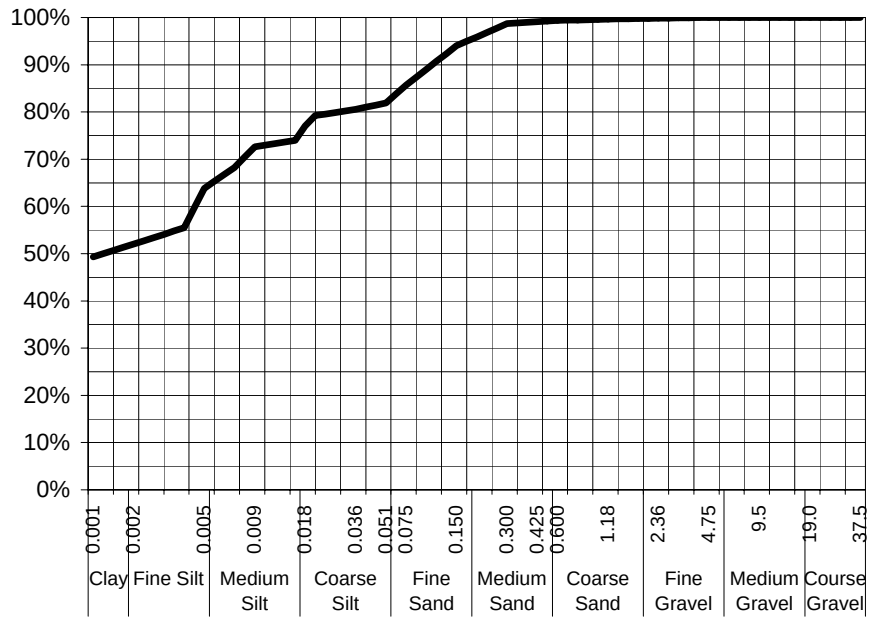
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ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-009 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-14 0.00-0.50m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	99%
0.425	99%
0.300	99%
0.150	94%
0.075	86%
Particle Size (microns)	
51	82%
36	81%
18	77%
9	73%
5	64%
3	55%
1	49%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay, silt & fine sand	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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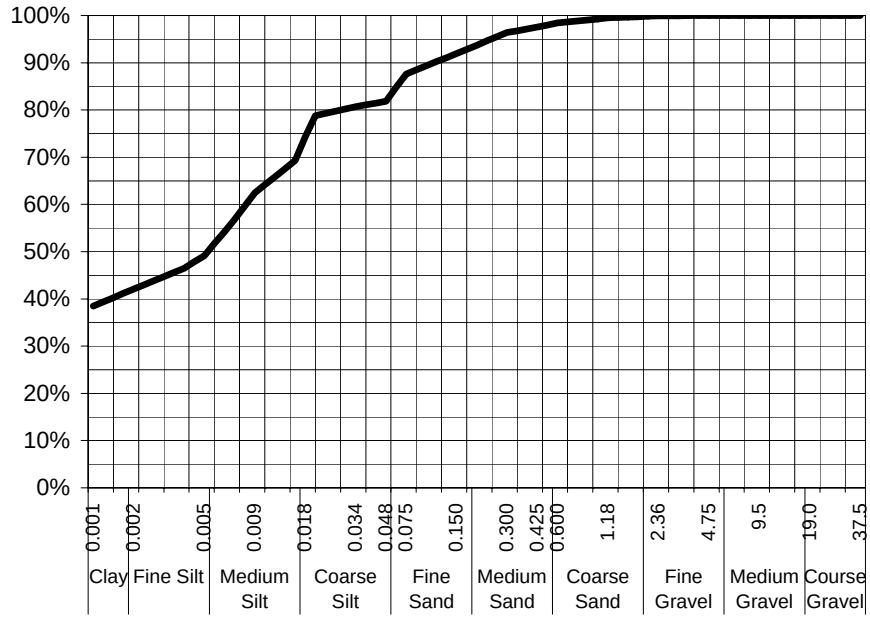
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CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-010 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-14 0.50-1.00m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	98%
0.425	98%
0.300	96%
0.150	92%
0.075	88%
Particle Size (microns)	
48	82%
34	81%
18	74%
9	62%
5	49%
3	46%
1	39%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Silt, clay & sand	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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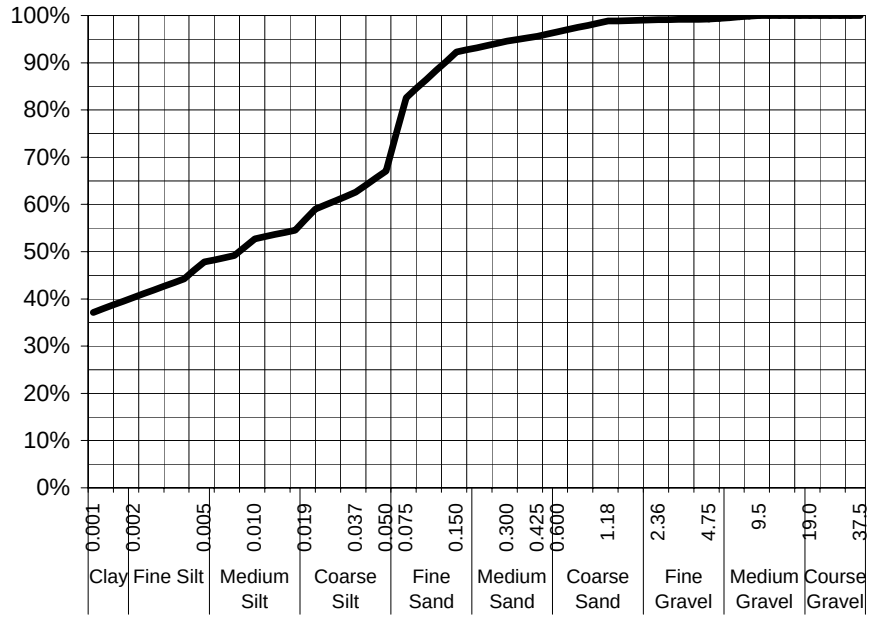
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CLIENT:	Martin Crossley	**DATE REPORTED:**	10-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	31-Jul-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911245-001 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-16 0.00-0.10m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	99%
2.36	99%
1.18	99%
0.600	97%
0.425	96%
0.300	95%
0.150	92%
0.075	83%
Particle Size (microns)	
50	67%
37	63%
19	57%
10	53%
5	48%
4	44%
1	37%

Samples analysed as received.

Sample Comments:		**Analysed:**	3-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Silt & clay	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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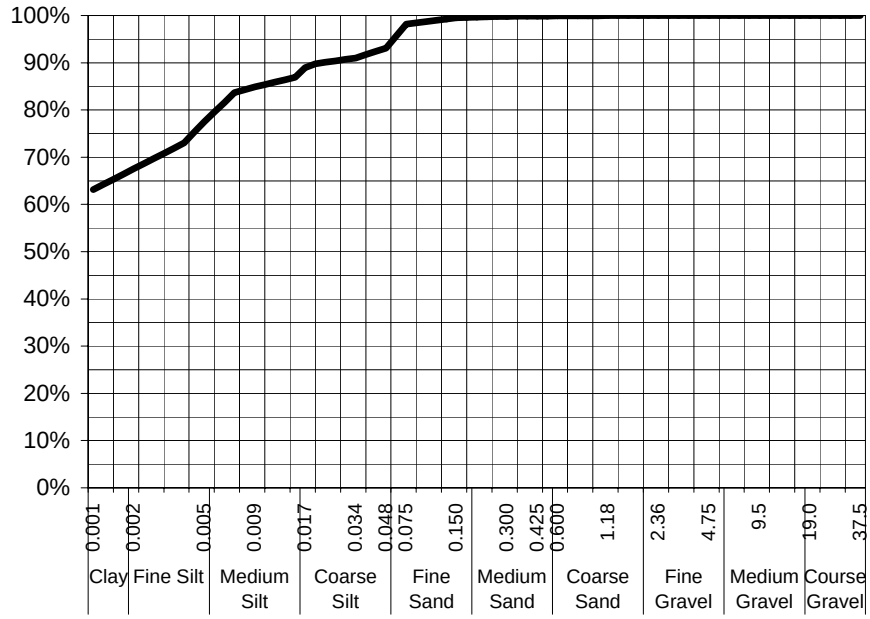
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CLIENT:	Martin Crossley	**DATE REPORTED:**	10-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	31-Jul-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911245-002 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-16 0.10-0.60m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	100%
0.425	100%
0.300	100%
0.150	100%
0.075	98%
Particle Size (microns)	
48	93%
34	91%
17	89%
9	85%
5	77%
3	73%
1	63%

Samples analysed as received.

Sample Comments:		**Analysed:**	3-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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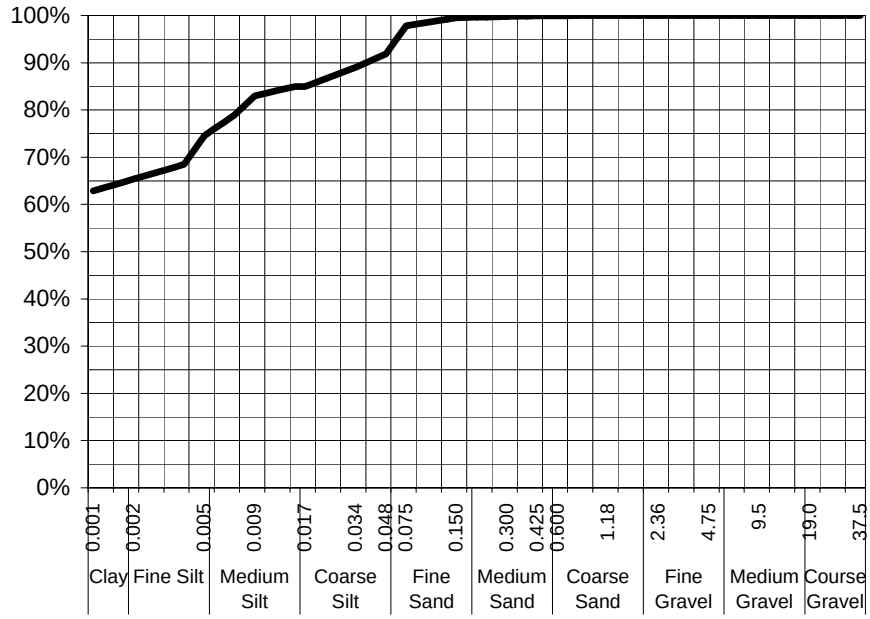
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CLIENT:	Martin Crossley	**DATE REPORTED:**	10-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	31-Jul-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911245-003 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-16 0.60-1.10m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	100%
0.425	100%
0.300	100%
0.150	99%
0.075	98%
Particle Size (microns)	
48	92%
34	89%
17	85%
9	83%
5	75%
3	68%
1	63%

Samples analysed as received.

Sample Comments:		**Analysed:**	3-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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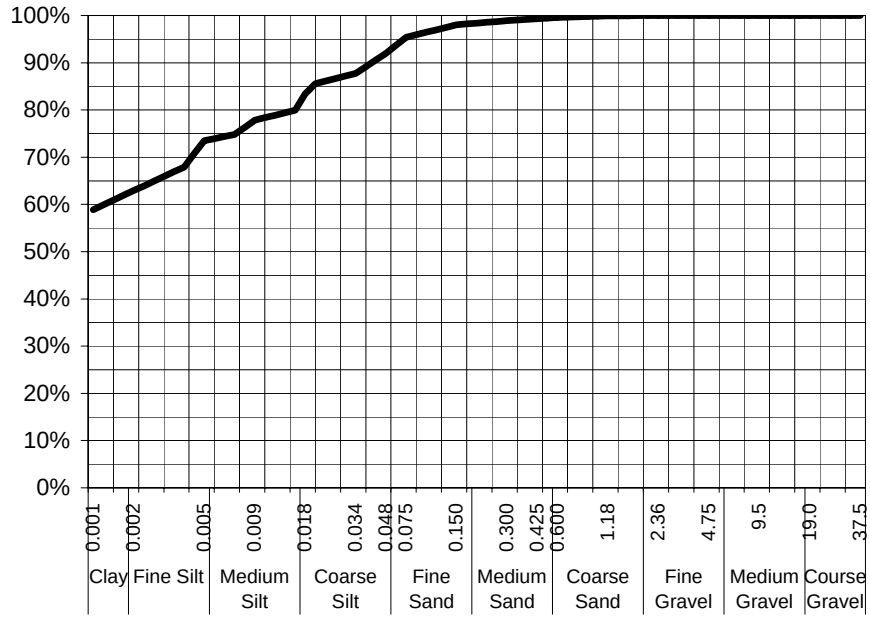
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CLIENT:	Martin Crossley	**DATE REPORTED:**	10-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	31-Jul-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911245-004 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-16 1.10-2.10m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	100%
0.425	99%
0.300	99%
0.150	98%
0.075	95%
Particle Size (microns)	
48	92%
34	88%
18	83%
9	78%
5	74%
3	68%
1	59%

Samples analysed as received.

Sample Comments:		**Analysed:**	3-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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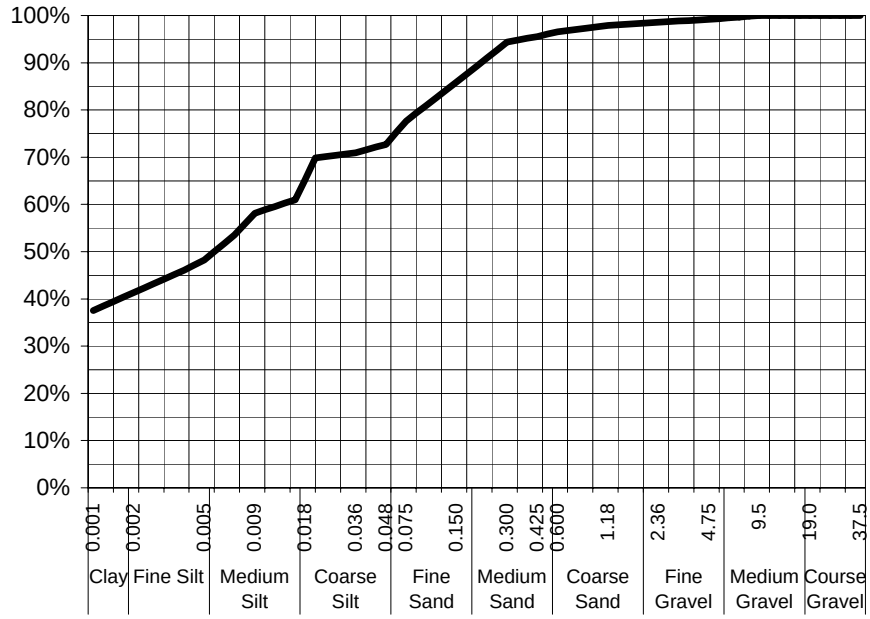
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CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-011 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-20 0.00-0.50m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	99%
2.36	99%
1.18	98%
0.600	97%
0.425	96%
0.300	94%
0.150	86%
0.075	78%
Particle Size (microns)	
48	73%
36	71%
18	65%
9	58%
5	48%
3	46%
1	38%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay, silt & fine sand	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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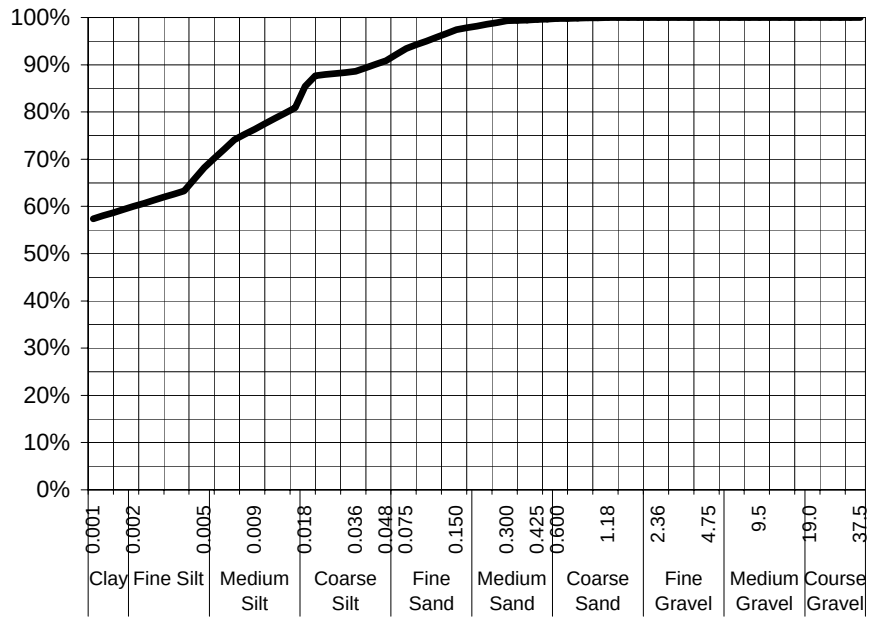
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COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-012 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-20 0.50-1.00m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	100%
0.425	100%
0.300	99%
0.150	97%
0.075	93%
Particle Size (microns)	
48	91%
36	89%
18	85%
9	76%
5	68%
3	63%
1	57%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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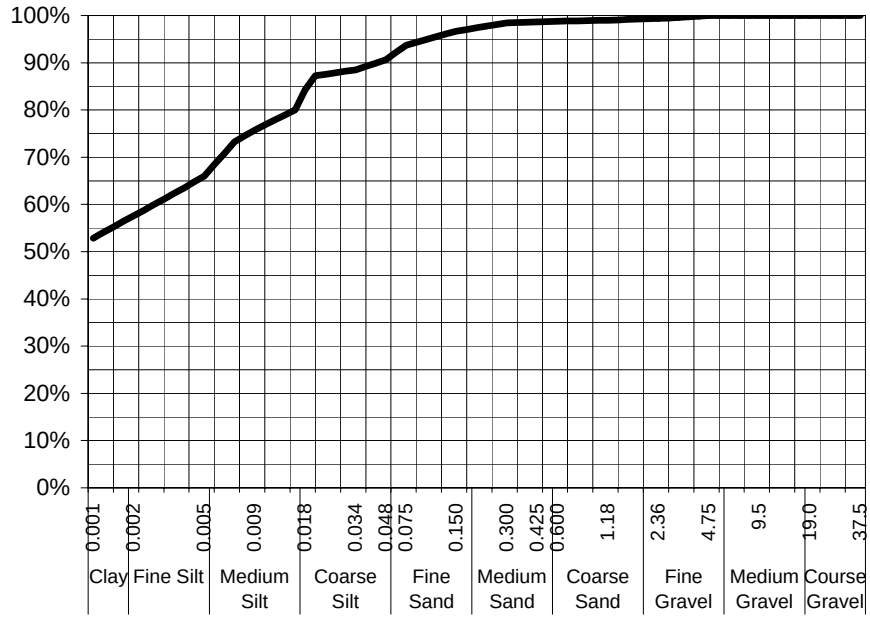
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pH 02 4968 9433
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911551-013 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-20 1.00-1.80m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	99%
1.18	99%
0.600	99%
0.425	99%
0.300	98%
0.150	97%
0.075	94%
Particle Size (microns)	
48	91%
34	89%
18	84%
9	76%
5	66%
3	63%
1	53%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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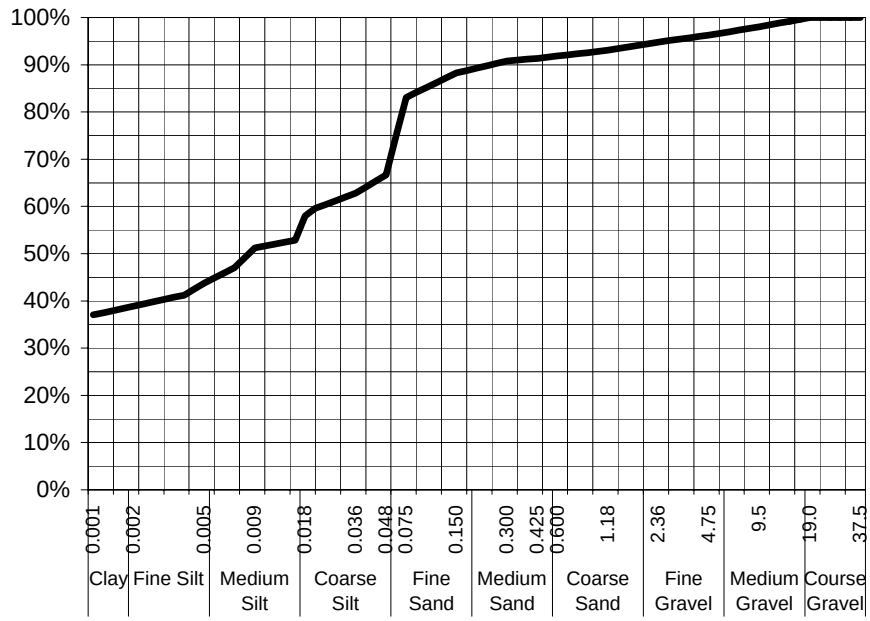
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CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911498-001 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-22 0.00-0.50m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	98%
4.75	96%
2.36	95%
1.18	93%
0.600	92%
0.425	91%
0.300	91%
0.150	88%
0.075	83%
Particle Size (microns)	
48	67%
36	63%
18	58%
9	51%
5	44%
3	41%
1	37%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Silt, clay & sand	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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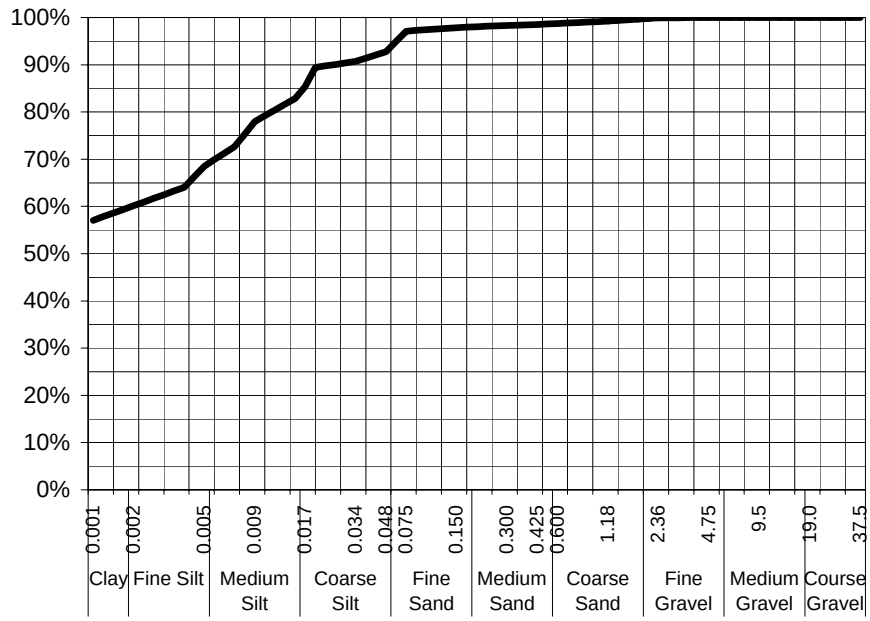
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CLIENT:	Martin Crossley	**DATE REPORTED:**	13-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911498-002 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-22 0.50-1.00m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	99%
0.425	99%
0.300	98%
0.150	98%
0.075	97%
Particle Size (microns)	
48	93%
34	91%
17	85%
9	78%
5	69%
3	64%
1	57%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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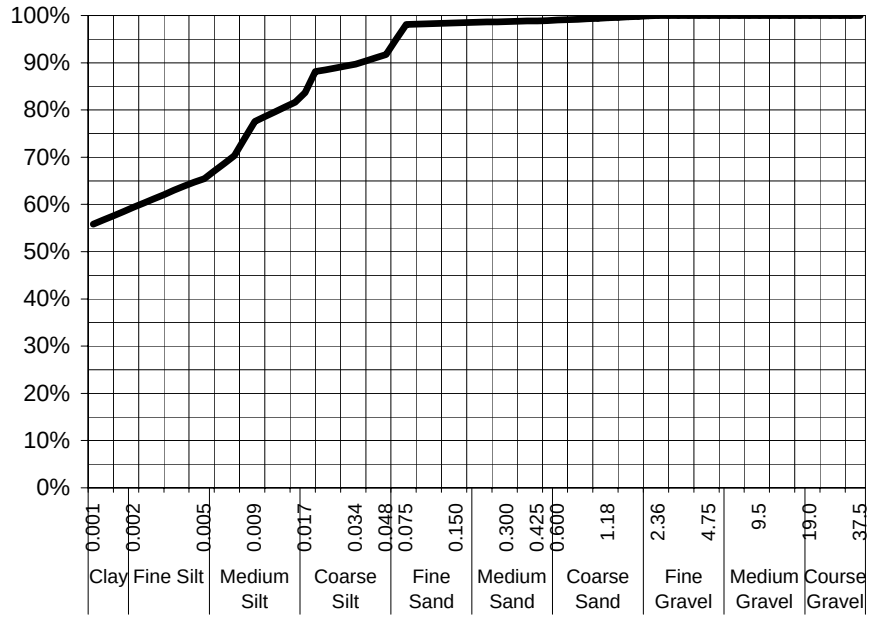
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COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911498-003 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-22 1.00-2.00m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	99%
0.425	99%
0.300	99%
0.150	98%
0.075	98%
Particle Size (microns)	
48	92%
34	90%
17	84%
9	78%
5	65%
3	64%
1	56%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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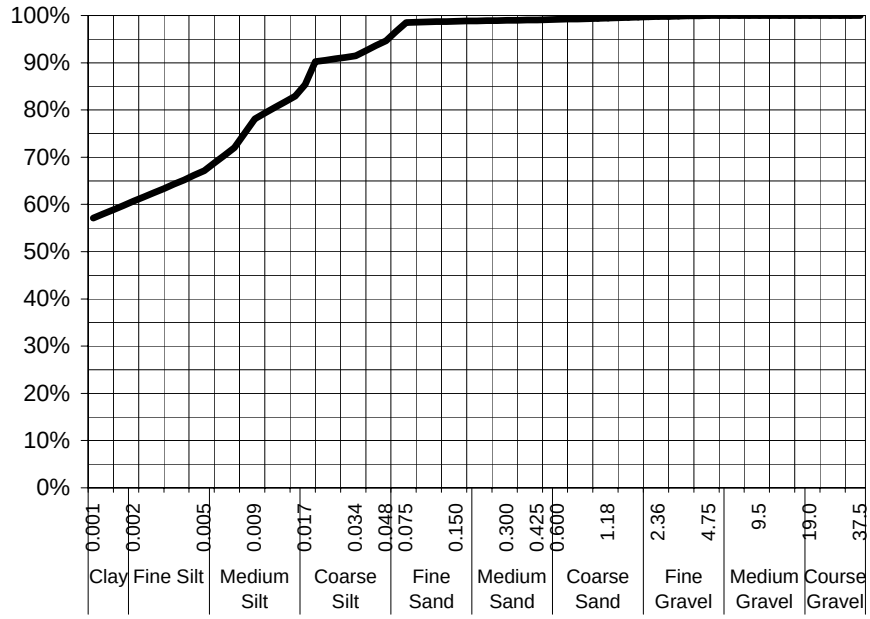
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COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911498-004 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-22 2.00-3.00m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	99%
0.425	99%
0.300	99%
0.150	99%
0.075	99%
Particle Size (microns)	
48	95%
34	91%
17	85%
9	78%
5	67%
3	65%
1	57%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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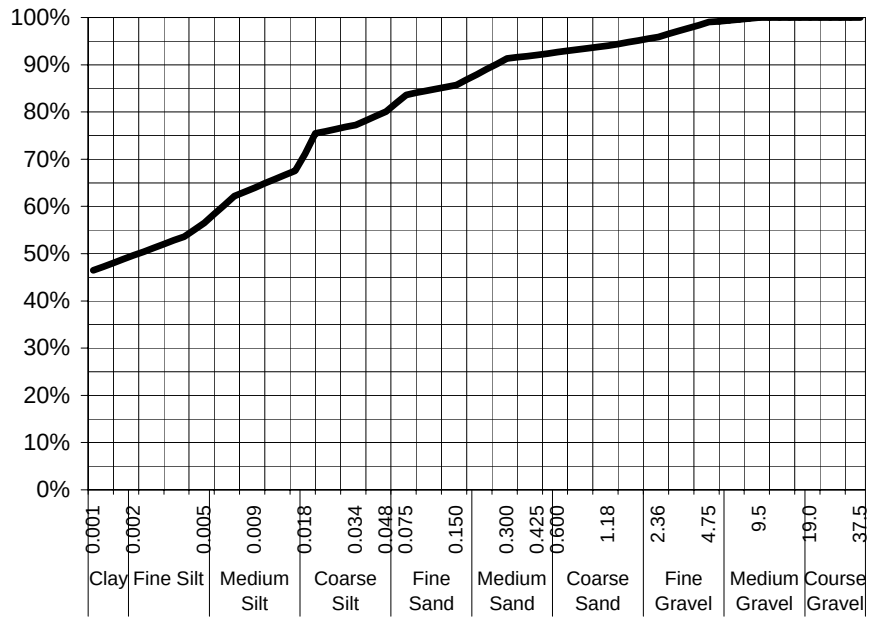
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COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911498-005 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-22 3.00-4.10m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	99%
2.36	96%
1.18	94%
0.600	93%
0.425	92%
0.300	91%
0.150	86%
0.075	84%
Particle Size (microns)	
48	80%
34	77%
18	71%
9	64%
5	56%
3	54%
1	46%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay, silt, sand & shell	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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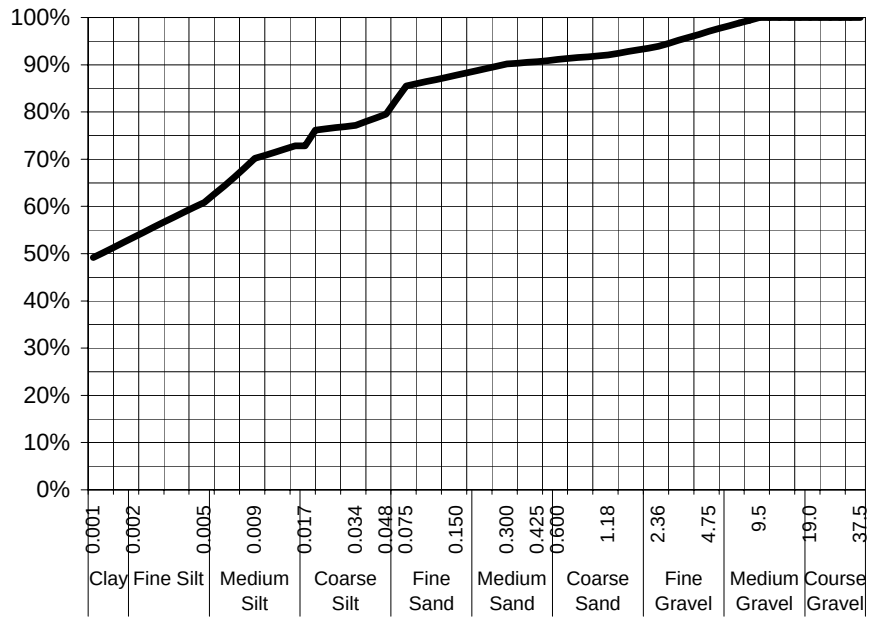
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COMPANY:	Golder Associates	**DATE RECEIVED:**	6-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911498-006 / PSD
PROJECT:	097633052 Gladstone Dredging	**SAMPLE ID:**	BH2A-22 4.10-4.40m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	97%
2.36	94%
1.18	92%
0.600	91%
0.425	91%
0.300	90%
0.150	88%
0.075	85%
Particle Size (microns)	
48	80%
34	77%
17	73%
9	70%
5	61%
3	59%
1	49%

Samples analysed as received.

Sample Comments:		**Analysed:**	7-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay, silt, sand & gravel	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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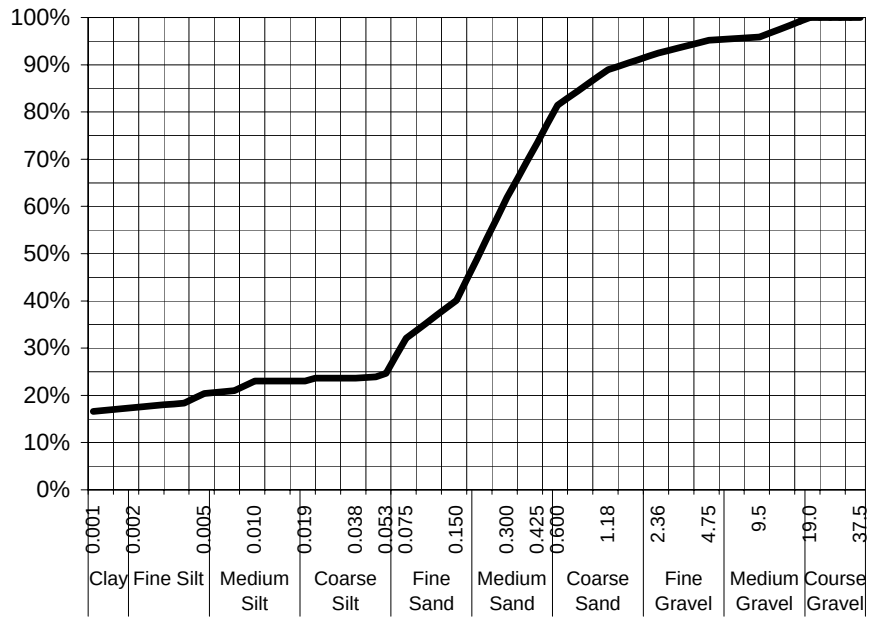
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samples.newcastle@alsenviro.com

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Newcastle, NSW

CLIENT:	Ian Wallace	**DATE REPORTED:**	17-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	7-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911701-001 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-27 0.00-0.60m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	96%
4.75	95%
2.36	92%
1.18	89%
0.600	81%
0.425	74%
0.300	62%
0.150	40%
0.075	32%
Particle Size (microns)	
53	25%
38	24%
19	23%
10	23%
5	20%
4	18%
1	17%

Samples analysed as received.

Sample Comments:		**Analysed:**	11-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Sand, clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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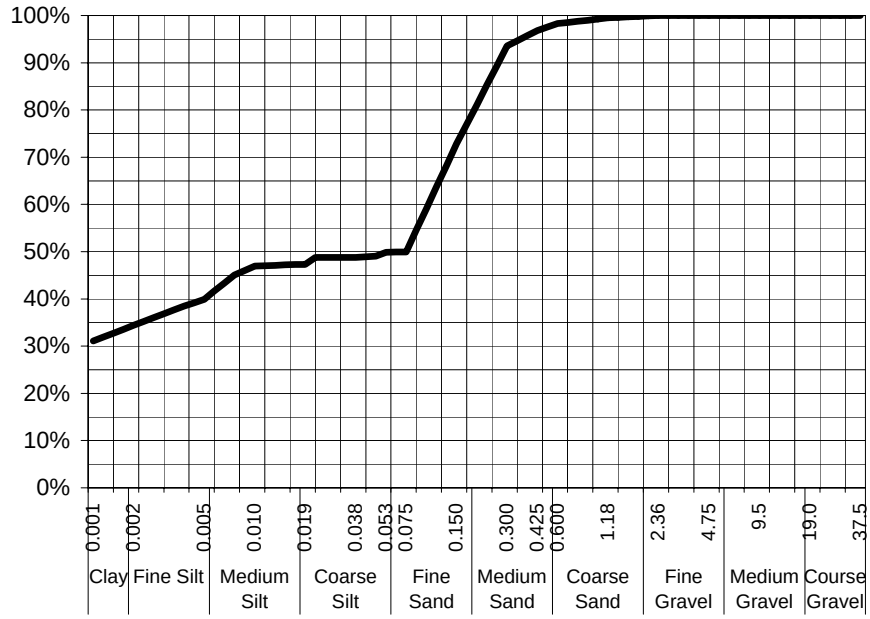
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samples.newcastle@alsenviro.com

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CLIENT:	Ian Wallace	**DATE REPORTED:**	17-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	7-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911701-002 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-27 0.60-1.00m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	98%
0.425	97%
0.300	94%
0.150	73%
0.075	50%
Particle Size (microns)	
53	50%
38	49%
19	47%
10	47%
5	40%
3	38%
1	31%

Samples analysed as received.

Sample Comments:		**Analysed:**	11-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Sand, clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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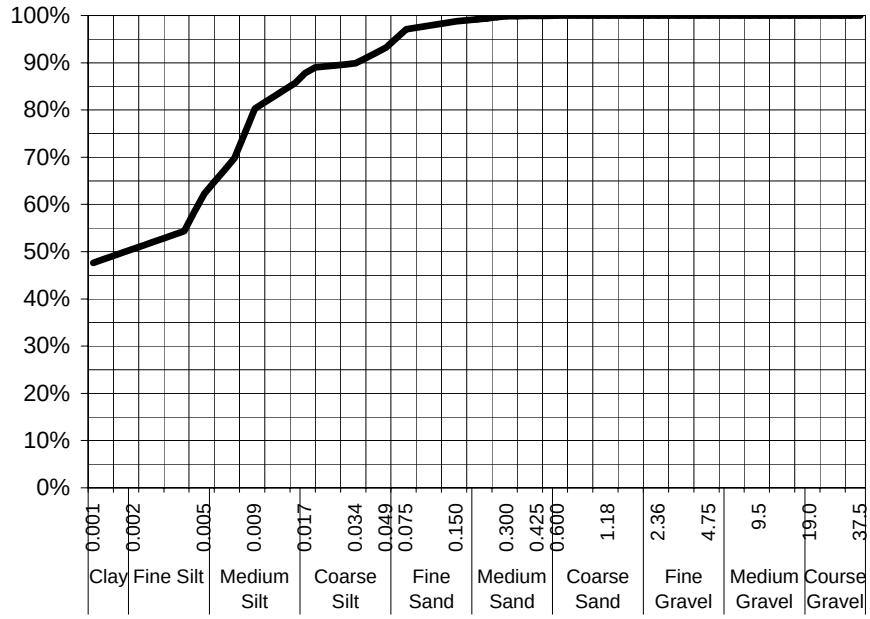
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CLIENT:	Ian Wallace	**DATE REPORTED:**	17-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	7-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911701-003 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-27 1.00-1.30m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	100%
0.600	100%
0.425	100%
0.300	100%
0.150	99%
0.075	97%
Particle Size (microns)	
49	93%
34	90%
17	88%
9	80%
5	62%
3	54%
1	48%

Samples analysed as received.

Sample Comments:		**Analysed:**	11-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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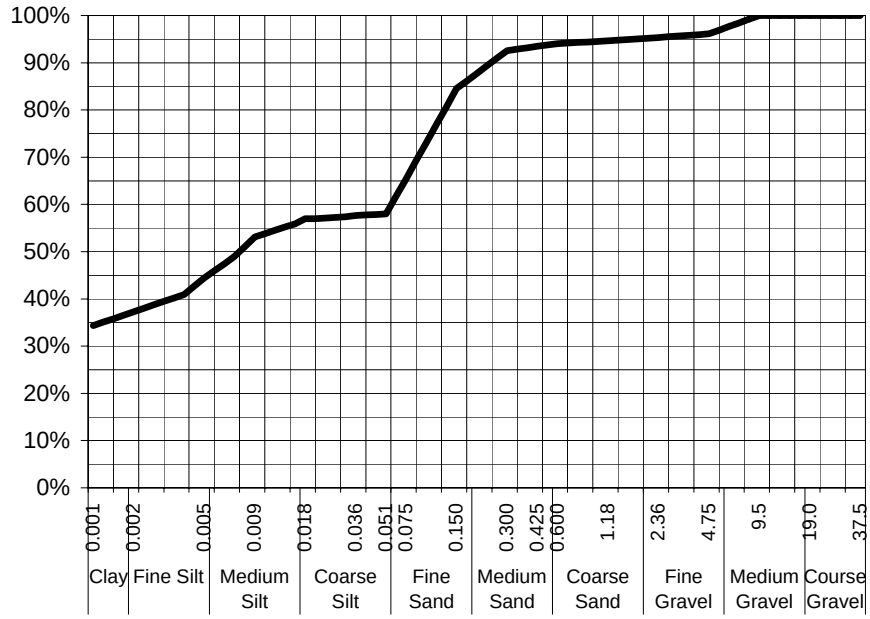
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CLIENT:	Ian Wallace	**DATE REPORTED:**	17-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	7-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911701-004 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-33 0.00-0.50m

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	96%
2.36	95%
1.18	95%
0.600	94%
0.425	93%
0.300	93%
0.150	85%
0.075	65%
Particle Size (microns)	
51	58%
36	58%
18	57%
9	53%
5	44%
3	41%
1	34%

Samples analysed as received.

Sample Comments:		**Analysed:**	11-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Clay, sand & silt	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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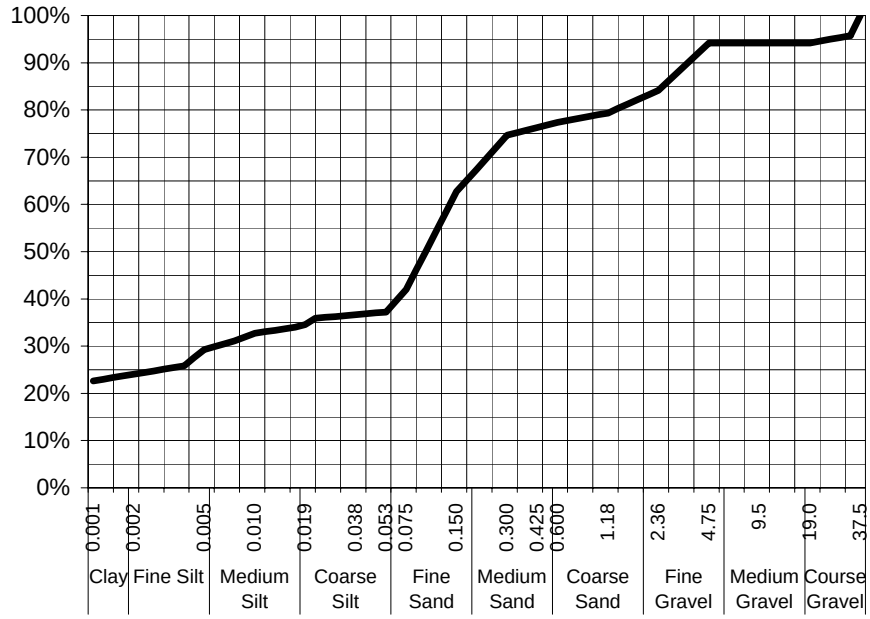
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CLIENT:	Ian Wallace	**DATE REPORTED:**	17-Aug-2009
COMPANY:	Golder Associates	**DATE RECEIVED:**	7-Aug-2009
ADDRESS:	PO Box 1734 Milton, Qld, Australia 4064	**REPORT NO:**	ES0911701-005 / PSD
PROJECT:	97633052	**SAMPLE ID:**	BH2A-33 0.50-0.70m

Particle Size Distribution



Particle Size (mm)	Percent Passing
37.5	100%
19.0	94%
9.5	94%
4.75	94%
2.36	84%
1.18	79%
0.600	77%
0.425	76%
0.300	75%
0.150	63%
0.075	42%
Particle Size (microns)	
53	37%
38	37%
19	35%
10	33%
5	29%
4	26%
1	23%

Samples analysed as received.

Sample Comments:		**Analysed:**	11-Aug-09
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:	Sand, clay, silt & gravel	**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.2/AS1289.3.6.3	**Hydrometer Type**	ASTM E100
Soil Particle Density	2.65 Assumed		

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Appendix 4 Primary Laboratory Reports (ALS)

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES0911551**	Page	: 1 of 15
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Sydney
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Project	: 097633052 Gladstone Dredging	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: IW	Issue Date	: 14-AUG-2009
Site	: LAIRD POINT DREDGE STUDY-OPTIO		
		No. of samples received	: 13
Quote number	: BN/354/09 V2	No. of samples analysed	: 13

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*
Celine Conceicao	Spectroscopist	Inorganics
Dianne Blane		Newcastle
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Matt Frost	Organic Instrument Chemist	Organics
Nanthini Coilparampil	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

- **EG005-SD:Poor precision was obtained for Iron on sample ES0911701#1 due to sample heterogeneity.**
- **EG005T:Poor precision was obtained for Manganese on sample ES0911510#1 due to sample heterogeneity. Results have been confirmed by re-extraction and reanalysis.**
- **EG020-SD: Poor precision was obtained for some elements on sample ES0911701#1 due to sample heterogeneity.**
- **EP080-SD: Poor matrix spike recovery due to sample matrix interferences. Confirmed by re-extraction and re-analysis.**
- **LCS recovery for Cadmium falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	QC-1	BH2A-2 0.00-0.50m	BH2A-2 0.50-0.90m	BH2A-3 0.00-0.50m	BH2A-3 0.50-1.00m
				Client sampling date / time	03-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
					ES0911551-001	ES0911551-002	ES0911551-003	ES0911551-004	ES0911551-005
EA150: Particle Sizing									
+75µm	----	1	%		----	21	13	3	2
+150µm	----	1	%		----	11	7	3	2
+300µm	----	1	%		----	3	2	2	1
+425µm	----	1	%		----	2	1	2	1
+600µm	----	1	%		----	2	1	2	1
+1180µm	----	1	%		----	1	<1	1	<1
+2.36mm	----	1	%		----	1	<1	<1	<1
+4.75mm	----	1	%		----	<1	<1	<1	<1
+9.5mm	----	1	%		----	<1	<1	<1	<1
+19.0mm	----	1	%		----	<1	<1	<1	<1
+37.5mm	----	1	%		----	<1	<1	<1	<1
+75.0mm	----	1	%		----	<1	<1	<1	<1
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		58.5	23.8	23.3	43.2	43.6
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		----	44	30	49	55
Silt (2-60 µm)	----	1	%		----	33	55	44	40
Sand (0.06-2.00 mm)	----	1	%		----	22	15	6	5
Gravel (>2mm)	----	1	%		----	1	<1	1	<1
Cobbles (>6cm)	----	1	%		----	<1	<1	<1	<1
EG005-SD: Total Metals in Sediments by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		14200	8310	5450	13700	15700
Iron	7439-89-6	50	mg/kg		36300	19500	21200	30700	28300
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
Arsenic	7440-38-2	1.00	mg/kg		25.4	5.98	10.6	11.6	9.10
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	7440-47-3	1.0	mg/kg		26.1	9.0	7.7	21.3	21.0
Copper	7440-50-8	1.0	mg/kg		24.4	14.8	24.2	32.4	36.3
Cobalt	7440-48-4	0.5	mg/kg		17.2	2.5	2.2	16.2	13.6
Lead	7439-92-1	1.0	mg/kg		11.5	6.5	6.4	9.2	9.8
Manganese	7439-96-5	10	mg/kg		319	19	11	368	280
Nickel	7440-02-0	1.0	mg/kg		14.7	3.4	2.3	12.6	12.3
Selenium	7782-49-2	0.1	mg/kg		1.0	0.6	0.8	1.0	0.9
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	7440-62-2	2.0	mg/kg		54.5	43.6	41.2	85.3	63.6
Zinc	7440-66-6	1.0	mg/kg		48.8	12.4	6.5	35.6	38.6

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	QC-1	BH2A-2 0.00-0.50m	BH2A-2 0.50-0.90m	BH2A-3 0.00-0.50m	BH2A-3 0.50-1.00m
				Client sampling date / time	03-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
					ES0911551-001	ES0911551-002	ES0911551-003	ES0911551-004	ES0911551-005
EG020-SD: Total Metals in Sediments by ICPMS - Continued									
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg		**0.04**	<0.01	<0.01	**0.02**	**0.02**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	0.02	%		**2.06**	**0.24**	**0.10**	**1.64**	**1.84**
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg		<3	<3	<3	----	----
C10 - C14 Fraction	----	3	mg/kg		<3	<3	<3	----	----
C15 - C28 Fraction	----	3	mg/kg		**7**	<3	<3	----	----
C29 - C36 Fraction	----	5	mg/kg		**12**	<5	<5	----	----
EP080-SD: BTEX									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
Ethylbenzene	100-41-4	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
ortho-Xylene	95-47-6	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		----	<0.5	<0.5	<0.5	<0.5
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<10	<10	<10	----	----
Carbophenothion	786-19-6	10	µg/kg		<10	<10	<10	----	----
Chlorfenvinphos (E)	470-90-6	10.0	µg/kg		<10.0	<10.0	<10.0	----	----
Chlorfenvinphos (Z)	470-90-8	10	µg/kg		<10	<10	<10	----	----
Chlorpyrifos	2921-88-2	10	µg/kg		<10	<10	<10	----	----
Chlorpyrifos-methyl	5598-13-0	10	µg/kg		<10	<10	<10	----	----
Demeton-S-methyl	919-86-8	10	µg/kg		<10	<10	<10	----	----
Diazinon	333-41-5	10	µg/kg		<10	<10	<10	----	----
Dichlorvos	62-73-7	10	µg/kg		<10	<10	<10	----	----
Dimethoate	60-51-5	10	µg/kg		<10	<10	<10	----	----
Ethion	563-12-2	10	µg/kg		<10	<10	<10	----	----
Fenamiphos	22224-92-6	10	µg/kg		<10	<10	<10	----	----
Fenthion	55-38-9	10	µg/kg		<10	<10	<10	----	----
Malathion	121-75-5	10	µg/kg		<10	<10	<10	----	----
Azinphos Methyl	86-50-0	10	µg/kg		<10	<10	<10	----	----
Monocrotophos	6923-22-4	10	µg/kg		<10	<10	<10	----	----
Parathion	56-38-2	10	µg/kg		<10	<10	<10	----	----
Parathion-methyl	298-00-0	10	µg/kg		<10	<10	<10	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	QC-1	BH2A-2 0.00-0.50m	BH2A-2 0.50-0.90m	BH2A-3 0.00-0.50m	BH2A-3 0.50-1.00m
				Client sampling date / time	03-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
					ES0911551-001	ES0911551-002	ES0911551-003	ES0911551-004	ES0911551-005
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued									
Pirimphos-ethyl	23505-41-1	10	µg/kg		<10	<10	<10	----	----
Prothiofos	34643-46-4	10	µg/kg		<10	<10	<10	----	----
EP131A: Organochlorine Pesticides									
Aldrin	309-00-2	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
alpha-BHC	319-84-6	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
beta-BHC	319-85-7	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
delta-BHC	319-86-8	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
4.4`-DDD	72-54-8	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
4.4`-DDE	72-55-9	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
4.4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
^ DDT (total)	----	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Dieldrin	60-57-1	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
alpha-Endosulfan	959-98-8	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
beta-Endosulfan	33213-65-9	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Endosulfan sulfate	1031-07-8	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
^ Endosulfan (sum)	115-29-7	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Endrin	72-20-8	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Endrin aldehyde	7421-93-4	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Endrin ketone	53494-70-5	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Heptachlor	76-44-8	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Heptachlor epoxide	1024-57-3	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
gamma-BHC	58-89-9	0.25	µg/kg		<0.25	<0.25	<0.25	----	----
Methoxychlor	72-43-5	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
cis-Chlordane	5103-71-9	0.25	µg/kg		<0.25	<0.25	<0.25	----	----
trans-Chlordane	5103-74-2	0.25	µg/kg		<0.25	<0.25	<0.25	----	----
^ Total Chlordane (sum)	----	0.25	µg/kg		<0.25	<0.25	<0.25	----	----
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors)									
^ Total Polychlorinated biphenyls	----	5.0	µg/kg		<5.0	<5.0	<5.0	----	----
Aroclor 1016	12974-11-2	5.0	µg/kg		<5.0	<5.0	<5.0	----	----
Aroclor 1221	11104-28-2	5.0	µg/kg		<5.0	<5.0	<5.0	----	----
Aroclor 1232	11141-16-5	5.0	µg/kg		<5.0	<5.0	<5.0	----	----
Aroclor 1242	53469-21-9	5.0	µg/kg		<5.0	<5.0	<5.0	----	----
Aroclor 1248	12672-29-6	5.0	µg/kg		<5.0	<5.0	<5.0	----	----
Aroclor 1254	11097-69-1	5.0	µg/kg		<5.0	<5.0	<5.0	----	----
Aroclor 1260	11096-82-5	5.0	µg/kg		<5.0	<5.0	<5.0	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	QC-1	BH2A-2 0.00-0.50m	BH2A-2 0.50-0.90m	BH2A-3 0.00-0.50m	BH2A-3 0.50-1.00m
				Client sampling date / time	03-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
					ES0911551-001	ES0911551-002	ES0911551-003	ES0911551-004	ES0911551-005
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		<5	<5	<5	<5	<5
2-Methylnaphthalene	91-57-6	5	µg/kg		<5	<5	<5	<5	<5
Acenaphthylene	208-96-8	4	µg/kg		<5	<4	<4	<4	<4
Acenaphthene	83-32-9	4	µg/kg		<5	<4	<4	<4	<4
Fluorene	86-73-7	4	µg/kg		<5	<4	<4	<4	<4
Phenanthrene	85-01-8	4	µg/kg		<5	<4	<4	<4	<4
Anthracene	120-12-7	4	µg/kg		<5	<4	<4	<4	<4
Fluoranthene	206-44-0	4	µg/kg		<5	<4	<4	<4	<4
Pyrene	129-00-0	4	µg/kg		<5	<4	<4	<4	5
Benz(a)anthracene	56-55-3	4	µg/kg		<5	<4	<4	<4	<4
Chrysene	218-01-9	4	µg/kg		<5	<4	<4	<4	<4
Benzo(b)fluoranthene	205-99-2	4	µg/kg		<5	<4	<4	<4	<4
Benzo(k)fluoranthene	207-08-9	4	µg/kg		<5	<4	<4	<4	<4
Benzo(e)pyrene	192-97-2	4	µg/kg		<5	<4	<4	<4	<4
Benzo(a)pyrene	50-32-8	4	µg/kg		<5	<4	<4	<4	<4
Perylene	198-55-0	4	µg/kg		19	<4	<4	36	74
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		<5	<4	<4	<4	<4
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		<5	<4	<4	<4	<4
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		<5	<4	<4	<4	<4
Coronene	191-07-1	5	µg/kg		<5	<5	<5	<5	<5
^ Sum of PAHs	----	4	µg/kg		19	<4	<4	36	78
EP080-SD: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		90.6	106	94.6	----	----
Toluene-D8	2037-26-5	0.1	%		88.6	99.3	102	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		90.4	116	89.6	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.1	%		----	64.3	71.9	54.8	60.8
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%		72.5	67.0	63.7	----	----
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%		127	72.8	76.5	----	----
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		108	68.7	84.7	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		81.0	84.8	89.8	82.7	95.1
Anthracene-d10	1719-06-8	0.1	%		101	91.4	103	95.1	114

Analytical Results

Sub-Matrix: SOIL	Client sample ID	QC-1	BH2A-2 0.00-0.50m	BH2A-2 0.50-0.90m	BH2A-3 0.00-0.50m	BH2A-3 0.50-1.00m
	Client sampling date / time	03-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
Compound	CAS Number / LOR / Unit	ES0911551-001	ES0911551-002	ES0911551-003	ES0911551-004	ES0911551-005
EP132T: Base/Neutral Extractable Surrogates - Continued						
4-Terphenyl-d14	1718-51-0 / 0.1 / %	**100**	**92.2**	**105**	**97.7**	**109**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	BH2A-3 1.00-1.60m	BH2A-3 1.60-2.00m	BH2A-3 2.00-2.90m	BH2A-14 0.00-0.50m	BH2A-14 0.50-1.00m
				Client sampling date / time	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
					ES0911551-006	ES0911551-007	ES0911551-008	ES0911551-009	ES0911551-010
EA150: Particle Sizing									
+75µm	----	1	%		**2**	**4**	**1**	**14**	**12**
+150µm	----	1	%		**1**	**3**	<1	**6**	**8**
+300µm	----	1	%		<1	**3**	<1	**1**	**3**
+425µm	----	1	%		<1	**3**	<1	**1**	**2**
+600µm	----	1	%		<1	**2**	<1	<1	**1**
+1180µm	----	1	%		<1	**1**	<1	<1	<1
+2.36mm	----	1	%		<1	<1	<1	<1	<1
+4.75mm	----	1	%		<1	<1	<1	<1	<1
+9.5mm	----	1	%		<1	<1	<1	<1	<1
+19.0mm	----	1	%		<1	<1	<1	<1	<1
+37.5mm	----	1	%		<1	<1	<1	<1	<1
+75.0mm	----	1	%		<1	<1	<1	<1	<1
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		**47.6**	**28.2**	**30.6**	**18.9**	**21.9**
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		**64**	**59**	**59**	**49**	**39**
Silt (2-60 µm)	----	1	%		**31**	**36**	**37**	**33**	**46**
Sand (0.06-2.00 mm)	----	1	%		**5**	**5**	**4**	**18**	**15**
Gravel (>2mm)	----	1	%		<1	<1	<1	<1	<1
Cobbles (>6cm)	----	1	%		<1	<1	<1	<1	<1
EG005-SD: Total Metals in Sediments by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		----	----	----	**5880**	**5070**
Iron	7439-89-6	50	mg/kg		----	----	----	**11600**	**3560**
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		**13200**	**14400**	**11200**	----	----
Antimony	7440-36-0	5	mg/kg		<5	<5	<5	----	----
Arsenic	7440-38-2	5	mg/kg		**10**	<5	<5	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg		**16**	**12**	**9**	----	----
Cobalt	7440-48-4	2	mg/kg		**16**	**4**	**3**	----	----
Copper	7440-50-8	5	mg/kg		**42**	**38**	**41**	----	----
Iron	7439-89-6	50	mg/kg		**35500**	**4410**	**7290**	----	----
Lead	7439-92-1	5	mg/kg		**9**	**12**	**11**	----	----
Manganese	7439-96-5	5	mg/kg		**288**	**28**	**42**	----	----
Nickel	7440-02-0	2	mg/kg		**12**	**8**	**9**	----	----
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	----	----
Silver	7440-22-4	2	mg/kg		<2	<2	<2	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-3 1.00-1.60m	BH2A-3 1.60-2.00m	BH2A-3 2.00-2.90m	BH2A-14 0.00-0.50m	BH2A-14 0.50-1.00m
				Client sampling date / time: 04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
				ES0911551-006	ES0911551-007	ES0911551-008	ES0911551-009	ES0911551-010
EG005T: Total Metals by ICP-AES - Continued								
Vanadium	7440-62-2	5	mg/kg	**72**	**38**	**35**	----	----
Zinc	7440-66-6	5	mg/kg	**28**	**13**	**16**	----	----
EG020-SD: Total Metals in Sediments by ICPMS								
Antimony	7440-36-0	0.50	mg/kg	----	----	----	<0.50	<0.50
Arsenic	7440-38-2	1.00	mg/kg	----	----	----	**3.61**	<1.00
Cadmium	7440-43-9	0.1	mg/kg	----	----	----	**0.1**	<0.1
Chromium	7440-47-3	1.0	mg/kg	----	----	----	**9.4**	**6.8**
Copper	7440-50-8	1.0	mg/kg	----	----	----	**23.6**	**8.2**
Cobalt	7440-48-4	0.5	mg/kg	----	----	----	**9.4**	**5.0**
Lead	7439-92-1	1.0	mg/kg	----	----	----	**6.2**	**5.6**
Manganese	7439-96-5	10	mg/kg	----	----	----	**21**	**17**
Nickel	7440-02-0	1.0	mg/kg	----	----	----	**7.3**	**3.2**
Selenium	7782-49-2	0.1	mg/kg	----	----	----	**0.8**	**0.4**
Silver	7440-22-4	0.1	mg/kg	----	----	----	<0.1	<0.1
Vanadium	7440-62-2	2.0	mg/kg	----	----	----	**39.0**	**15.7**
Zinc	7440-66-6	1.0	mg/kg	----	----	----	**14.2**	**7.8**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.01	mg/kg	----	----	----	<0.01	**0.03**
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	0.02	%	**2.46**	**3.83**	**0.46**	**0.06**	**0.04**
EP090: Organotin Compounds								
Tributyltin	56573-85-4	0.5	µgSn/kg	----	----	----	<0.5	<0.5
EP132B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	5	µg/kg	<5	<5	<5	<5	<5
2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	<5	<5	<5
Acenaphthylene	208-96-8	4	µg/kg	<4	<4	<4	<4	<4
Acenaphthene	83-32-9	4	µg/kg	<4	<4	<4	<4	<4
Fluorene	86-73-7	4	µg/kg	<4	<4	<4	<4	<4
Phenanthrene	85-01-8	4	µg/kg	<4	<4	<4	<4	<4
Anthracene	120-12-7	4	µg/kg	<4	<4	<4	<4	<4
Fluoranthene	206-44-0	4	µg/kg	<4	**5**	<4	<4	<4
Pyrene	129-00-0	4	µg/kg	**11**	**15**	<4	<4	<4
Benz(a)anthracene	56-55-3	4	µg/kg	**18**	**28**	<4	<4	<4
Chrysene	218-01-9	4	µg/kg	**10**	**7**	<4	<4	<4
Benzo(b)fluoranthene	205-99-2	4	µg/kg	**4**	**14**	<4	<4	<4

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	BH2A-3 1.00-1.60m	BH2A-3 1.60-2.00m	BH2A-3 2.00-2.90m	BH2A-14 0.00-0.50m	BH2A-14 0.50-1.00m
				Client sampling date / time	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00
					ES0911551-006	ES0911551-007	ES0911551-008	ES0911551-009	ES0911551-010
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(k)fluoranthene	207-08-9	4	µg/kg		<4	**10**	<4	<4	<4
Benzo(e)pyrene	192-97-2	4	µg/kg		<4	**9**	<4	<4	<4
Benzo(a)pyrene	50-32-8	4	µg/kg		<4	<4	<4	<4	<4
Perylene	198-55-0	4	µg/kg		**42**	**12**	**12**	<4	<4
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		**5**	**16**	<4	<4	<4
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		<4	<4	<4	<4	<4
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		<4	<4	<4	<4	<4
Coronene	191-07-1	5	µg/kg		<5	<5	<5	<5	<5
^ Sum of PAHs	----	4	µg/kg		**90**	**116**	**12**	<4	<4
EP090S: Organotin Surrogate									
Tripropyltin	----	0.1	%		----	----	----	**89.5**	**75.1**
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		**80.2**	**85.5**	**92.4**	**83.3**	**89.5**
Anthracene-d10	1719-06-8	0.1	%		**94.0**	**104**	**114**	**96.4**	**87.8**
4-Terphenyl-d14	1718-51-0	0.1	%		**89.3**	**111**	**112**	**99.3**	**89.2**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-20 0.00-0.50m	BH2A-20 0.50-1.00m	BH2A-20 1.00-1.80m	----	----
				Client sampling date / time: 04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	----	----
				ES0911551-011	ES0911551-012	ES0911551-013	----	----
EA150: Particle Sizing								
+75µm	----	1	%	22	7	6	----	----
+150µm	----	1	%	14	3	3	----	----
+300µm	----	1	%	5	1	1	----	----
+425µm	----	1	%	4	1	1	----	----
+600µm	----	1	%	3	1	1	----	----
+1180µm	----	1	%	2	<1	1	----	----
+2.36mm	----	1	%	1	<1	<1	----	----
+4.75mm	----	1	%	<1	<1	<1	----	----
+9.5mm	----	1	%	<1	<1	<1	----	----
+19.0mm	----	1	%	<1	<1	<1	----	----
+37.5mm	----	1	%	<1	<1	<1	----	----
+75.0mm	----	1	%	<1	<1	<1	----	----
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	20.7	19.5	20.5	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	38	57	53	----	----
Silt (2-60 µm)	----	1	%	39	35	41	----	----
Sand (0.06-2.00 mm)	----	1	%	22	8	5	----	----
Gravel (>2mm)	----	1	%	1	<1	1	----	----
Cobbles (>6cm)	----	1	%	<1	<1	<1	----	----
EG005-SD: Total Metals in Sediments by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	6010	5730	----	----	----
Iron	7439-89-6	50	mg/kg	4660	9550	----	----	----
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	----	----	7870	----	----
Antimony	7440-36-0	5	mg/kg	----	----	<5	----	----
Arsenic	7440-38-2	5	mg/kg	----	----	8	----	----
Cadmium	7440-43-9	1	mg/kg	----	----	<1	----	----
Chromium	7440-47-3	2	mg/kg	----	----	12	----	----
Cobalt	7440-48-4	2	mg/kg	----	----	<2	----	----
Copper	7440-50-8	5	mg/kg	----	----	14	----	----
Iron	7439-89-6	50	mg/kg	----	----	13900	----	----
Lead	7439-92-1	5	mg/kg	----	----	7	----	----
Manganese	7439-96-5	5	mg/kg	----	----	25	----	----
Nickel	7440-02-0	2	mg/kg	----	----	<2	----	----
Selenium	7782-49-2	5	mg/kg	----	----	<5	----	----
Silver	7440-22-4	2	mg/kg	----	----	<2	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	BH2A-20 0.00-0.50m	BH2A-20 0.50-1.00m	BH2A-20 1.00-1.80m	----	----
				Client sampling date / time	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	----	----
					ES0911551-011	ES0911551-012	ES0911551-013	----	----
EG005T: Total Metals by ICP-AES - Continued									
Vanadium	7440-62-2	5	mg/kg		----	----	**45**	----	----
Zinc	7440-66-6	5	mg/kg		----	----	**8**	----	----
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg		<0.50	<0.50	----	----	----
Arsenic	7440-38-2	1.00	mg/kg		<1.00	**2.73**	----	----	----
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	----	----	----
Chromium	7440-47-3	1.0	mg/kg		**6.1**	**6.9**	----	----	----
Copper	7440-50-8	1.0	mg/kg		**17.4**	**12.7**	----	----	----
Cobalt	7440-48-4	0.5	mg/kg		**1.3**	**1.0**	----	----	----
Lead	7439-92-1	1.0	mg/kg		**4.6**	**6.0**	----	----	----
Manganese	7439-96-5	10	mg/kg		<10	<10	----	----	----
Nickel	7440-02-0	1.0	mg/kg		**1.4**	<1.0	----	----	----
Selenium	7782-49-2	0.1	mg/kg		**0.1**	**0.1**	----	----	----
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	----	----	----
Vanadium	7440-62-2	2.0	mg/kg		**15.6**	**25.4**	----	----	----
Zinc	7440-66-6	1.0	mg/kg		**5.6**	**4.9**	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg		**0.01**	<0.01	----	----	----
Mercury	7439-97-6	0.1	mg/kg		----	----	<0.1	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	0.02	%		**0.12**	**0.12**	**0.11**	----	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	<0.5	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		<5	<5	<5	----	----
2-Methylnaphthalene	91-57-6	5	µg/kg		<5	<5	<5	----	----
Acenaphthylene	208-96-8	4	µg/kg		<4	<4	<4	----	----
Acenaphthene	83-32-9	4	µg/kg		<4	<4	<4	----	----
Fluorene	86-73-7	4	µg/kg		<4	<4	<4	----	----
Phenanthrene	85-01-8	4	µg/kg		<4	<4	<4	----	----
Anthracene	120-12-7	4	µg/kg		<4	<4	<4	----	----
Fluoranthene	206-44-0	4	µg/kg		<4	<4	<4	----	----
Pyrene	129-00-0	4	µg/kg		<4	<4	<4	----	----
Benz(a)anthracene	56-55-3	4	µg/kg		<4	<4	<4	----	----
Chrysene	218-01-9	4	µg/kg		<4	<4	<4	----	----
Benzo(b)fluoranthene	205-99-2	4	µg/kg		<4	<4	<4	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	BH2A-20 0.00-0.50m	BH2A-20 0.50-1.00m	BH2A-20 1.00-1.80m	----	----
			Client sampling date / time	04-AUG-2009 15:00	04-AUG-2009 15:00	04-AUG-2009 15:00	----	----
Compound	CAS Number	LOR	Unit	ES0911551-011	ES0911551-012	ES0911551-013	----	----
EP132B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	<4	----	----
Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	<4	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	<4	----	----
Perylene	198-55-0	4	µg/kg	<4	<4	<4	----	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	<4	<4	----	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	<4	<4	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	<4	<4	----	----
Coronene	191-07-1	5	µg/kg	<5	<5	<5	----	----
^ Sum of PAHs	----	4	µg/kg	<4	<4	<4	----	----
EP090S: Organotin Surrogate								
Tripropyltin	----	0.1	%	**59.7**	**77.4**	----	----	----
EP132T: Base/Neutral Extractable Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**88.9**	**92.2**	**89.0**	----	----
Anthracene-d10	1719-06-8	0.1	%	**93.6**	**92.9**	**91.3**	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**94.5**	**92.8**	**88.4**	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080-SD: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	74.7	127
Toluene-D8	2037-26-5	74.8	129
4-Bromofluorobenzene	460-00-4	75.3	127
EP090S: Organotin Surrogate			
Tripropyltin	----	34	108
EP130S: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	51.3	136.9
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	136
EP131T: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	10	164
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	30	115
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	18	137

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0914143**	Page	: 1 of 9
Client	: GOLDER ASSOCIATES	Laboratory	: Environmental Division Brisbane
Contact	: MR IAN WALLACE	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: iwallace@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Laird Point - Geotech-1-B,2-A		
C-O-C number	: SOIL	Date Samples Received	: 07-SEP-2009
Sampler	: Florian Hittinger	Issue Date	: 15-SEP-2009
Order number	: ----		
		No. of samples received	: 57
Quote number	: EN/002/09	No. of samples analysed	: 57

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: **SOIL**

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
EA055: Moisture Content								
Snap Lock Bag								
BH2-A14G - 1.5-1.95,	BH2-A14G - 2.5-2.95,	**23-AUG-2009**	**----**	----	----	**08-SEP-2009**	30-AUG-2009	✗
BH2-A14G - 3.5-3.95,	BH2-A14G - 4.5-4.95,							
BH2-A14G - 6.5-6.95,	BH2-A14G - 7.5-7.95,							
BH2-A20G - 2.5-2.95,	BH2-A20G - 4-4.42,							
BH2-A20G - 5-5.45,	BH2-A20G - 6-6.45,							
BH2-A20G - 7-7.45,	BH2-A20G - 8-8.45							
Snap Lock Bag								
BH2-A16G - 3-3.45,	BH2-A16G - 4-4.45,	**24-AUG-2009**	**----**	----	----	**08-SEP-2009**	31-AUG-2009	✗
BH2-A16G - 6-6.23,	BH2-A16G - 7-7.4,							
BH2-A16G - 8-8.36,	BH2-A16G - 9-9.38,							
BH2-A16G - 11-11.45,	BH2-A16G - 12-12.45,							
BH2-A16G - 13-13.45,	BH2-A22G - 5-5.45,							
BH2-A22G - 6-6.45,	BH2-A22G - 8-8.45,							
BH2-A22G - 9-9.45,	BH2-A22G - 10.-10.45,							
BH2-A22G - 12-12.4,	BH2-A22G - 13-13.44,							
BH2-A22G - 14-14.34								
Snap Lock Bag								
BH1-B02G - 5-5.45,	BH1-B02G - 6-6.45,	**25-AUG-2009**	**----**	----	----	**08-SEP-2009**	01-SEP-2009	✗
BH1-B02G - 8-8.45,	BH2-A27G - 1.5-1.95,							
BH2-A27G - 2.5-2.95,	BH2-A27G - 3.5-3.95							
Snap Lock Bag								
BH1-B02G - 9-9.45,	BH1-B02G - 10-10.45	**25-SEP-2009**	**----**	----	----	**11-SEP-2009**	02-OCT-2009	✓

Matrix: **SOIL**

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
EA055: Moisture Content - Continued								
Snap Lock Bag								
BH1-B01G - 2.5-2.66,	BH1-B01G - 4.5-4.95,	**26-AUG-2009**	**----**	----	----	**08-SEP-2009**	02-SEP-2009	✘
BH1-B01G - 5.5-5.95,	BH1-B01G - 6.5-6.95,							
BH1-B01G - 7.5-7.95,	BH1-B03G - 4-4.45,							
BH1-B03G - 5-5.45,	BH2-A02G - 1-1.45,							
BH2-A02G - 3-3.45,	BH2-A02G - 4-4.45,							
BH2-A03G - 3-3.45,	BH2-A03G - 5-5.45,							
BH2-A03G - 7-7.45,	BH2-A03G - 8-8.45,							
BH2-A03G - 9-9.45,	BH2-A03G - 10-10.45							
Snap Lock Bag								
BH2-A03G - 6.0-6.45		**26-AUG-2009**	**----**	----	----	**09-SEP-2009**	02-SEP-2009	✘
Snap Lock Bag								
BH2-A33G - 1-1.38,	BH2-A33G - 3-3.41,	**27-AUG-2009**	**----**	----	----	**08-SEP-2009**	03-SEP-2009	✘
BH2-A33G - 4-4.45								

Matrix: **SOIL**

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
EG005T: Total Metals by ICP-AES							
Snap Lock Bag							
BH2-A14G - 1.5-1.95, BH2-A14G - 2.5-2.95, BH2-A14G - 3.5-3.95, BH2-A14G - 4.5-4.95, BH2-A14G - 6.5-6.95, BH2-A14G - 7.5-7.95, BH2-A20G - 2.5-2.95, BH2-A20G - 4-4.42, BH2-A20G - 5-5.45, BH2-A20G - 6-6.45, BH2-A20G - 7-7.45, BH2-A20G - 8-8.45	**23-AUG-2009**	**10-SEP-2009**	20-SEP-2009	✓	**14-SEP-2009**	19-FEB-2010	✓
Snap Lock Bag							
BH2-A16G - 3-3.45, BH2-A16G - 4-4.45, BH2-A16G - 6-6.23, BH2-A16G - 7-7.4, BH2-A16G - 8-8.36, BH2-A16G - 9-9.38, BH2-A16G - 11-11.45, BH2-A16G - 12-12.45, BH2-A16G - 13-13.45, BH2-A22G - 5-5.45, BH2-A22G - 6-6.45, BH2-A22G - 8-8.45, BH2-A22G - 9-9.45, BH2-A22G - 10.-10.45, BH2-A22G - 12-12.4, BH2-A22G - 13-13.44, BH2-A22G - 14-14.34	**24-AUG-2009**	**10-SEP-2009**	21-SEP-2009	✓	**14-SEP-2009**	20-FEB-2010	✓
Snap Lock Bag							
BH1-B02G - 5-5.45, BH1-B02G - 6-6.45, BH1-B02G - 8-8.45, BH2-A27G - 1.5-1.95, BH2-A27G - 2.5-2.95, BH2-A27G - 3.5-3.95	**25-AUG-2009**	**10-SEP-2009**	22-SEP-2009	✓	**14-SEP-2009**	21-FEB-2010	✓
Snap Lock Bag							
BH1-B02G - 9-9.45, BH1-B02G - 10-10.45	**25-SEP-2009**	**10-SEP-2009**	23-OCT-2009	✓	**14-SEP-2009**	24-MAR-2010	✓
Snap Lock Bag							
BH1-B01G - 2.5-2.66, BH1-B01G - 4.5-4.95, BH1-B01G - 5.5-5.95, BH1-B01G - 6.5-6.95, BH1-B01G - 7.5-7.95, BH1-B03G - 4-4.45, BH1-B03G - 5-5.45, BH2-A02G - 1-1.45, BH2-A02G - 3-3.45, BH2-A02G - 4-4.45, BH2-A03G - 3-3.45, BH2-A03G - 5-5.45, BH2-A03G - 7-7.45, BH2-A03G - 8-8.45, BH2-A03G - 9-9.45, BH2-A03G - 10-10.45, BH2-A03G - 6.0-6.45	**26-AUG-2009**	**10-SEP-2009**	23-SEP-2009	✓	**14-SEP-2009**	22-FEB-2010	✓
Snap Lock Bag							
BH2-A33G - 1-1.38, BH2-A33G - 3-3.41, BH2-A33G - 4-4.45	**27-AUG-2009**	**10-SEP-2009**	24-SEP-2009	✓	**14-SEP-2009**	23-FEB-2010	✓

Matrix: **SOIL**

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
EG035T: Total Recoverable Mercury by FIMS								
Snap Lock Bag								
BH2-A14G - 1.5-1.95,	BH2-A14G - 2.5-2.95,	**23-AUG-2009**	**10-SEP-2009**	20-SEP-2009	✓	**14-SEP-2009**	20-SEP-2009	✓
BH2-A14G - 3.5-3.95,	BH2-A14G - 4.5-4.95,							
BH2-A14G - 6.5-6.95,	BH2-A14G - 7.5-7.95,							
BH2-A20G - 2.5-2.95,	BH2-A20G - 4-4.42,							
BH2-A20G - 5-5.45,	BH2-A20G - 6-6.45,							
BH2-A20G - 7-7.45,	BH2-A20G - 8-8.45							
Snap Lock Bag								
BH2-A16G - 3-3.45,	BH2-A16G - 4-4.45,	**24-AUG-2009**	**10-SEP-2009**	21-SEP-2009	✓	**14-SEP-2009**	21-SEP-2009	✓
BH2-A16G - 6-6.23,	BH2-A16G - 7-7.4,							
BH2-A16G - 8-8.36,	BH2-A16G - 9-9.38,							
BH2-A16G - 11-11.45,	BH2-A16G - 12-12.45,							
BH2-A16G - 13-13.45,	BH2-A22G - 5-5.45,							
BH2-A22G - 6-6.45,	BH2-A22G - 8-8.45,							
BH2-A22G - 9-9.45,	BH2-A22G - 10.-10.45,							
BH2-A22G - 12-12.4,	BH2-A22G - 13-13.44,							
BH2-A22G - 14-14.34								
Snap Lock Bag								
BH1-B02G - 5-5.45,	BH1-B02G - 6-6.45,	**25-AUG-2009**	**10-SEP-2009**	22-SEP-2009	✓	**14-SEP-2009**	22-SEP-2009	✓
BH1-B02G - 8-8.45,	BH2-A27G - 1.5-1.95,							
BH2-A27G - 2.5-2.95,	BH2-A27G - 3.5-3.95							
Snap Lock Bag								
BH1-B02G - 9-9.45,	BH1-B02G - 10-10.45	**25-SEP-2009**	**10-SEP-2009**	23-OCT-2009	✓	**14-SEP-2009**	23-OCT-2009	✓
Snap Lock Bag								
BH1-B01G - 2.5-2.66,	BH1-B01G - 4.5-4.95,	**26-AUG-2009**	**10-SEP-2009**	23-SEP-2009	✓	**14-SEP-2009**	23-SEP-2009	✓
BH1-B01G - 5.5-5.95,	BH1-B01G - 6.5-6.95,							
BH1-B01G - 7.5-7.95,	BH1-B03G - 4-4.45,							
BH1-B03G - 5-5.45,	BH2-A02G - 1-1.45,							
BH2-A02G - 3-3.45,	BH2-A02G - 4-4.45,							
BH2-A03G - 3-3.45,	BH2-A03G - 5-5.45,							
BH2-A03G - 7-7.45,	BH2-A03G - 8-8.45,							
BH2-A03G - 9-9.45,	BH2-A03G - 10-10.45,							
BH2-A03G - 6.0-6.45								
Snap Lock Bag								
BH2-A33G - 1-1.38,	BH2-A33G - 3-3.41,	**27-AUG-2009**	**10-SEP-2009**	24-SEP-2009	✓	**14-SEP-2009**	24-SEP-2009	✓
BH2-A33G - 4-4.45								

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: **SOIL**

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)							
Moisture Content	EA055-103	11	94	**11.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	8	77	**10.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	8	80	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Total Mercury by FIMS	EG035T	4	77	**5.2**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	80	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	4	77	**5.2**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	80	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	4	77	**5.2**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	4	80	**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
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (1999) Schedule B(3) (Method 102)
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)

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: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EB0914143-049	BH2-A22G 13-13.44	**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.**
- **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: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content							
Snap Lock Bag							
BH2-A14G - 1.5-1.95,	BH2-A14G - 2.5-2.95,	----	----	----	08-SEP-2009	30-AUG-2009	**9**
BH2-A14G - 3.5-3.95,	BH2-A14G - 4.5-4.95,						
BH2-A14G - 6.5-6.95,	BH2-A14G - 7.5-7.95,						
BH2-A20G - 2.5-2.95,	BH2-A20G - 4-4.42,						
BH2-A20G - 5-5.45,	BH2-A20G - 6-6.45,						
BH2-A20G - 7-7.45,	BH2-A20G - 8-8.45						

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content - Analysis Holding Time Compliance						
Snap Lock Bag						
BH2-A16G - 3-3.45, BH2-A16G - 4-4.45, BH2-A16G - 6-6.23, BH2-A16G - 7-7.4, BH2-A16G - 8-8.36, BH2-A16G - 9-9.38, BH2-A16G - 11-11.45, BH2-A16G - 12-12.45, BH2-A16G - 13-13.45, BH2-A22G - 5-5.45, BH2-A22G - 6-6.45, BH2-A22G - 8-8.45, BH2-A22G - 9-9.45, BH2-A22G - 10.-10.45, BH2-A22G - 12-12.4, BH2-A22G - 13-13.44, BH2-A22G - 14-14.34	----	----	----	08-SEP-2009	31-AUG-2009	**8**
Snap Lock Bag						
BH1-B02G - 5-5.45, BH1-B02G - 6-6.45, BH1-B02G - 8-8.45, BH2-A27G - 1.5-1.95, BH2-A27G - 2.5-2.95, BH2-A27G - 3.5-3.95	----	----	----	08-SEP-2009	01-SEP-2009	**7**
Snap Lock Bag						
BH1-B01G - 2.5-2.66, BH1-B01G - 4.5-4.95, BH1-B01G - 5.5-5.95, BH1-B01G - 6.5-6.95, BH1-B01G - 7.5-7.95, BH1-B03G - 4-4.45, BH1-B03G - 5-5.45, BH2-A02G - 1-1.45, BH2-A02G - 3-3.45, BH2-A02G - 4-4.45, BH2-A03G - 3-3.45, BH2-A03G - 5-5.45, BH2-A03G - 7-7.45, BH2-A03G - 8-8.45, BH2-A03G - 9-9.45, BH2-A03G - 10-10.45	----	----	----	08-SEP-2009	02-SEP-2009	**6**
Snap Lock Bag						
BH2-A03G - 6.0-6.45	----	----	----	09-SEP-2009	02-SEP-2009	**7**
Snap Lock Bag						
BH2-A33G - 1-1.38, BH2-A33G - 3-3.41, BH2-A33G - 4-4.45	----	----	----	08-SEP-2009	03-SEP-2009	**5**

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.**

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0914143**	Page	: 1 of 9
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR IAN WALLACE	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: iwallace@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Laird Point - Geotech-1-B,2-A		
C-O-C number	: SOIL	Date Samples Received	: 07-SEP-2009
Sampler	: Florian Hittinger	Issue Date	: 15-SEP-2009
Order number	: ----		
		No. of samples received	: 57
Quote number	: EN/002/09	No. of samples analysed	: 57

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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 1094253)									
EB0914070-058	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	27.5	24.6	11.0	0% - 20%
EB0914070-070	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	25.6	26.9	5.1	0% - 20%
EA055: Moisture Content (QC Lot: 1094254)									
EB0914143-013	BH2-A02G 1-1.45	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	16.7	18.2	8.3	0% - 50%
EB0914143-020	BH2-A03G 9-9.45	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	17.4	17.0	2.3	0% - 50%
EA055: Moisture Content (QC Lot: 1094255)									
EB0914143-033	BH2-A16G 9-9.38	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	15.2	14.7	3.7	0% - 50%
EB0914143-040	BH2-A20G 6-6.45	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	12.0	11.9	1.2	0% - 50%
EA055: Moisture Content (QC Lot: 1094256)									
EB0914143-053	BH2-A27G 3.5-3.95	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	19.5	19.5	0.0	0% - 50%
EB0914175-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	3.4	4.2	21.1	No Limit
EA055: Moisture Content (QC Lot: 1094947)									
EB0914143-057	BH2-A03G 6.0-6.45	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	15.4	15.8	2.7	0% - 50%
EA055: Moisture Content (QC Lot: 1098033)									
EB0914179-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	13.0	13.3	2.0	0% - 50%
EB0914195-005	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	20.9	19.7	5.9	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1096498)									
EB0914084-001	Anonymous	EG005T: Arsenic	7440-38-2	----	-	----	----	----	0% - 20%
		EG005T: Cadmium	7440-43-9	----	-	----	----	----	0% - 20%
		EG005T: Chromium	7440-47-3	----	-	----	----	----	0% - 20%
		EG005T: Copper	7440-50-8	----	-	----	----	----	0% - 20%
		EG005T: Lead	7439-92-1	----	-	----	----	----	0% - 20%
		EG005T: Nickel	7440-02-0	----	-	----	----	----	0% - 20%
		EG005T: Zinc	7440-66-6	----	-	----	----	----	0% - 20%
EB0914143-001	BH1-B01G 2.5-2.66	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	2	2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	8	12	34.7	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	23	36	44.0	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1096500)									
EB0914143-008	BH1-B02G 8-8.45	EG005T: Arsenic	7440-38-2	----	-	----	----	----	0% - 20%
		EG005T: Cadmium	7440-43-9	----	-	----	----	----	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1096500) - continued									
EB0914143-008	BH1-B02G 8-8.45	EG005T: Chromium	7440-47-3	----	-	----	----	----	0% - 20%
		EG005T: Copper	7440-50-8	----	-	----	----	----	0% - 20%
		EG005T: Lead	7439-92-1	----	-	----	----	----	0% - 20%
		EG005T: Nickel	7440-02-0	----	-	----	----	----	0% - 20%
		EG005T: Zinc	7440-66-6	----	-	----	----	----	0% - 20%
EB0914143-018	BH2-A03G 7-7.45	EG005T: Arsenic	7440-38-2	----	-	----	----	----	0% - 20%
		EG005T: Cadmium	7440-43-9	----	-	----	----	----	0% - 20%
		EG005T: Chromium	7440-47-3	----	-	----	----	----	0% - 20%
		EG005T: Copper	7440-50-8	----	-	----	----	----	0% - 20%
		EG005T: Lead	7439-92-1	----	-	----	----	----	0% - 20%
		EG005T: Nickel	7440-02-0	----	-	----	----	----	0% - 20%
		EG005T: Zinc	7440-66-6	----	-	----	----	----	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1096502)									
EB0914143-028	BH2-A16G 3-3.45	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	12	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	14	13	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	10	11	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
EB0914143-038	BH2-A20G 4-4.42	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	5	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1096504)									
EB0914143-048	BH2-A22G 12-12.4	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	3	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	7	35.3	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	25	20	21.2	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	61	59	2.8	0% - 50%
EB0914147-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	3	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	4	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1096504) - continued									
EB0914147-001	Anonymous	EG005T: Copper	7440-50-8	5	mg/kg	16	14	13.2	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	28	24	14.5	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1096499)									
EB0914084-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EB0914143-001	BH1-B01G 2.5-2.66	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1096501)									
EB0914143-008	BH1-B02G 8-8.45	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EB0914143-018	BH2-A03G 7-7.45	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1096503)									
EB0914143-028	BH2-A16G 3-3.45	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EB0914143-038	BH2-A20G 4-4.42	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1096505)									
EB0914143-048	BH2-A22G 12-12.4	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EB0914147-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	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: **SOIL**

				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
EG005T: Total Metals by ICP-AES (QCLot: 1096498)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.8 mg/kg	108	78	124
EG005T: Cadmium	7440-43-9	1	mg/kg	----	2.82 mg/kg	96.2	77	117
EG005T: Chromium	7440-47-3	2	mg/kg	----	61.6 mg/kg	102	83	119
EG005T: Copper	7440-50-8	5	mg/kg	----	54.7 mg/kg	104	82	122
EG005T: Lead	7439-92-1	5	mg/kg	----	55.5 mg/kg	96.8	83	117
EG005T: Nickel	7440-02-0	2	mg/kg	----	55.1 mg/kg	97.9	83	121
EG005T: Zinc	7440-66-6	5	mg/kg	----	105 mg/kg	99.7	82	120
EG005T: Total Metals by ICP-AES (QCLot: 1096500)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.8 mg/kg	104	78	124
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.82 mg/kg	94.6	77	117
EG005T: Chromium	7440-47-3	2	mg/kg	<2	61.6 mg/kg	100	83	119
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.7 mg/kg	99.5	82	122
EG005T: Lead	7439-92-1	5	mg/kg	<5	55.5 mg/kg	95.9	83	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.1 mg/kg	96.6	83	121
EG005T: Zinc	7440-66-6	5	mg/kg	<5	105 mg/kg	99.9	82	120
EG005T: Total Metals by ICP-AES (QCLot: 1096502)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.8 mg/kg	113	78	124
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.82 mg/kg	101	77	117
EG005T: Chromium	7440-47-3	2	mg/kg	<2	61.6 mg/kg	105	83	119
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.7 mg/kg	105	82	122
EG005T: Lead	7439-92-1	5	mg/kg	<5	55.5 mg/kg	98.8	83	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.1 mg/kg	103	83	121
EG005T: Zinc	7440-66-6	5	mg/kg	<5	105 mg/kg	102	82	120
EG005T: Total Metals by ICP-AES (QCLot: 1096504)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.8 mg/kg	113	78	124
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.82 mg/kg	105	77	117
EG005T: Chromium	7440-47-3	2	mg/kg	<2	61.6 mg/kg	106	83	119
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.7 mg/kg	102	82	122
EG005T: Lead	7439-92-1	5	mg/kg	<5	55.5 mg/kg	99.6	83	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.1 mg/kg	102	83	121
EG005T: Zinc	7440-66-6	5	mg/kg	<5	105 mg/kg	105	82	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096499)								
EG035T: Mercury	7439-97-6	0.10	mg/kg	<0.1	1.34 mg/kg	112	73	119
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096501)								

Sub-Matrix: **SOIL**

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
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096501) - continued								
EG035T: Mercury	7439-97-6	0.10	mg/kg	<0.1	1.34 mg/kg	102	73	119
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096503)								
EG035T: Mercury	7439-97-6	0.10	mg/kg	<0.1	1.34 mg/kg	104	73	119
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096505)								
EG035T: Mercury	7439-97-6	0.10	mg/kg	<0.1	1.34 mg/kg	106	73	119

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: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1096498)							
EB0914097-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	----	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	----	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	----	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	----	70	130
		EG005T: Lead	7439-92-1	50 mg/kg	----	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	----	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	----	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1096500)							
EB0914143-009	BH1-B02G 9-9.45	EG005T: Arsenic	7440-38-2	50 mg/kg	80.8	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	100	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	75.6	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	89.9	70	130
		EG005T: Lead	7439-92-1	50 mg/kg	93.8	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	92.7	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	81.8	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1096502)							
EB0914143-029	BH2-A16G 4-4.45	EG005T: Arsenic	7440-38-2	50 mg/kg	99.8	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	106	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	110	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	104	70	130
		EG005T: Lead	7439-92-1	50 mg/kg	107	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	105	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	107	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1096504)							
EB0914143-049	BH2-A22G 13-13.44	EG005T: Arsenic	7440-38-2	50 mg/kg	102	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	102	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	103	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	97.8	70	130
		EG005T: Lead	7439-92-1	50 mg/kg	99.6	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	101	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	# Not Determined	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096499)							
EB0914097-001	Anonymous	EG035T: Mercury	7439-97-6	5.0 mg/kg	109	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096501)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096501) - continued							
EB0914143-009	BH1-B02G 9-9.45	EG035T: Mercury	7439-97-6	5.0 mg/kg	106	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096503)							
EB0914143-029	BH2-A16G 4-4.45	EG035T: Mercury	7439-97-6	5.0 mg/kg	115	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1096505)							
EB0914143-049	BH2-A22G 13-13.44	EG035T: Mercury	7439-97-6	5.0 mg/kg	113	70	130

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0914143**	Page	: 1 of 14
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Brisbane
Contact	: MR IAN WALLACE	Contact	: Tim Kilmister
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: iwallace@golder.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3721 5401	Facsimile	: +61-7-3243 7218
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: SOIL	Date Samples Received	: 07-SEP-2009
Sampler	: Florian Hittinger	Issue Date	: 15-SEP-2009
Site	: Laird Point - Geotech-1-B,2-A		
		No. of samples received	: 57
Quote number	: EN/002/09	No. of samples analysed	: 57

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

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH1-B01G 2.5-2.66	BH1-B01G 4.5-4.95	BH1-B01G 5.5-5.95	BH1-B01G 6.5-6.95	BH1-B01G 7.5-7.95
				Client sampling date / time: 26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00
				EB0914143-001	EB0914143-002	EB0914143-003	EB0914143-004	EB0914143-005
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**18.8**	**17.5**	**18.2**	**23.0**	**21.4**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	**13**	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**2**	**4**	**12**	**18**	**11**
Copper	7440-50-8	5	mg/kg	**8**	**24**	**9**	**9**	**7**
Lead	7439-92-1	5	mg/kg	<5	**6**	<5	**84**	<5
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	**3**	**4**
Zinc	7440-66-6	5	mg/kg	**23**	**14**	**7**	**12**	**24**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH1-B02G 5-5.45	BH1-B02G 6-6.45	BH1-B02G 8-8.45	BH1-B02G 9-9.45	BH1-B02G 10-10.45
				Client sampling date / time: 25-AUG-2009 15:00	25-AUG-2009 15:00	25-AUG-2009 15:00	25-SEP-2009 15:00	25-SEP-2009 15:00
				EB0914143-006	EB0914143-007	EB0914143-008	EB0914143-009	EB0914143-010
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**23.3**	**21.6**	**20.8**	**21.1**	**15.2**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**7**	<5	<5	**10**	**6**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**33**	**8**	**6**	**26**	**7**
Copper	7440-50-8	5	mg/kg	**44**	**7**	**16**	**15**	**10**
Lead	7439-92-1	5	mg/kg	**7**	<5	**6**	**8**	<5
Nickel	7440-02-0	2	mg/kg	**12**	**4**	**2**	**9**	**7**
Zinc	7440-66-6	5	mg/kg	**33**	**16**	**10**	**27**	**20**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH1-B03G 4-4.45	BH1-B03G 5-5.45	BH2-A02G 1-1.45	BH2-A02G 3-3.45	BH2-A02G 4-4.45
				Client sampling date / time: 26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00
				EB0914143-011	EB0914143-012	EB0914143-013	EB0914143-014	EB0914143-015
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**22.4**	**16.7**	**16.7**	**20.0**	**24.9**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**21**	<5	<5	<5	**9**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**21**	**7**	**6**	**6**	**16**
Copper	7440-50-8	5	mg/kg	**27**	**11**	**8**	**8**	**9**
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	**6**
Nickel	7440-02-0	2	mg/kg	**38**	**6**	**2**	**3**	**4**
Zinc	7440-66-6	5	mg/kg	**89**	**15**	**5**	**8**	**12**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2-A03G 3-3.45	BH2-A03G 5-5.45	BH2-A03G 7-7.45	BH2-A03G 8-8.45	BH2-A03G 9-9.45
				Client sampling date / time	26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00	26-AUG-2009 15:00
Compound	CAS Number	LOR	Unit		EB0914143-016	EB0914143-017	EB0914143-018	EB0914143-019	EB0914143-020
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		**29.7**	**23.7**	**15.6**	**15.6**	**17.4**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**8**	**8**	**6**	**5**	**5**
Copper	7440-50-8	5	mg/kg		**36**	**33**	<5	**12**	**6**
Lead	7439-92-1	5	mg/kg		**10**	**5**	**6**	<5	<5
Nickel	7440-02-0	2	mg/kg		**8**	**3**	<2	<2	<2
Zinc	7440-66-6	5	mg/kg		**17**	**14**	**5**	**7**	**6**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A03G 10-10.45	BH2-A14G 1.5-1.95	BH2-A14G 2.5-2.95	BH2-A14G 3.5-3.95	BH2-A14G 4.5-4.95
				Client sampling date / time: 26-AUG-2009 15:00	23-AUG-2009 15:00	23-AUG-2009 15:00	23-AUG-2009 15:00	23-AUG-2009 15:00
				EB0914143-021	EB0914143-022	EB0914143-023	EB0914143-024	EB0914143-025
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**14.1**	**18.0**	**17.1**	**17.9**	**11.9**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	**9**	**9**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**6**	**5**	**9**	**19**	**10**
Copper	7440-50-8	5	mg/kg	**9**	<5	**10**	**14**	**5**
Lead	7439-92-1	5	mg/kg	**6**	**5**	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	**2**	<2	**3**	**4**	**3**
Zinc	7440-66-6	5	mg/kg	**8**	<5	**7**	**11**	**6**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A14G 6.5-6.95	BH2-A14G 7.5-7.95	BH2-A16G 3-3.45	BH2-A16G 4-4.45	BH2-A16G 6-6.23
				Client sampling date / time: 23-AUG-2009 15:00	23-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00
				EB0914143-026	EB0914143-027	EB0914143-028	EB0914143-029	EB0914143-030
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**16.2**	**14.8**	**19.1**	**12.2**	**21.1**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	**14**	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**3**	**3**	**12**	**3**	**7**
Copper	7440-50-8	5	mg/kg	<5	<5	**10**	**8**	**8**
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A16G 7-7.4	BH2-A16G 8-8.36	BH2-A16G 9-9.38	BH2-A16G 11-11.45	BH2-A16G 12-12.45
				Client sampling date / time: 24-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00
				EB0914143-031	EB0914143-032	EB0914143-033	EB0914143-034	EB0914143-035
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**14.7**	**17.6**	**15.2**	**17.3**	**11.5**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**37**	**8**	**19**	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**30**	**24**	**19**	**2**	<2
Copper	7440-50-8	5	mg/kg	**6**	<5	<5	<5	<5
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A16G 13-13.45	BH2-A20G 2.5-2.95	BH2-A20G 4-4.42	BH2-A20G 5-5.45	BH2-A20G 6-6.45
				Client sampling date / time: 24-AUG-2009 15:00	23-AUG-2009 15:00	23-AUG-2009 15:00	23-AUG-2009 15:00	23-AUG-2009 15:00
				EB0914143-036	EB0914143-037	EB0914143-038	EB0914143-039	EB0914143-040
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**13.3**	**23.8**	**15.5**	**10.0**	**12.0**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	**26**	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**2**	**21**	**5**	**5**	<2
Copper	7440-50-8	5	mg/kg	<5	**20**	<5	<5	<5
Lead	7439-92-1	5	mg/kg	<5	**5**	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	<2	**5**	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	**23**	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2-A20G 7-7.45	BH2-A20G 8-8.45	BH2-A22G 5-5.45	BH2-A22G 6-6.45	BH2-A22G 8-8.45
				Client sampling date / time: 23-AUG-2009 15:00	23-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00
				EB0914143-041	EB0914143-042	EB0914143-043	EB0914143-044	EB0914143-045
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**12.9**	**12.3**	**22.5**	**22.5**	**22.0**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**16**	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**29**	**5**	<2	<2	**3**
Copper	7440-50-8	5	mg/kg	**6**	<5	<5	<5	**10**
Lead	7439-92-1	5	mg/kg	<5	<5	**6**	<5	**5**
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	**3**
Zinc	7440-66-6	5	mg/kg	<5	<5	**10**	**579**	**44**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2-A22G 9-9.45	BH2-A22G 10.-10.45	BH2-A22G 12-12.4	BH2-A22G 13-13.44	BH2-A22G 14-14.34
				Client sampling date / time	24-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00	24-AUG-2009 15:00
Compound	CAS Number	LOR	Unit		EB0914143-046	EB0914143-047	EB0914143-048	EB0914143-049	EB0914143-050
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		**19.9**	**20.7**	**19.6**	**17.3**	**19.4**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	**14**	**10**	<5	<5
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**6**	**4**	**4**	**4**	**8**
Copper	7440-50-8	5	mg/kg		**17**	**9**	**25**	**22**	**28**
Lead	7439-92-1	5	mg/kg		<5	**14**	<5	**8**	<5
Nickel	7440-02-0	2	mg/kg		**6**	**4**	**5**	**7**	**11**
Zinc	7440-66-6	5	mg/kg		**52**	**38**	**61**	**628**	**146**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	BH2-A27G 1.5-1.95	BH2-A27G 2.5-2.95	BH2-A27G 3.5-3.95	BH2-A33G 1-1.38	BH2-A33G 3-3.41
				Client sampling date / time	25-AUG-2009 15:00	25-AUG-2009 15:00	25-AUG-2009 15:00	27-AUG-2009 15:00	27-AUG-2009 15:00
					EB0914143-051	EB0914143-052	EB0914143-053	EB0914143-054	EB0914143-055
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		**16.6**	**14.0**	**19.5**	**12.5**	**16.7**
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		**10**	**11**	<5	<5	**12**
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		**9**	**8**	**7**	**9**	**25**
Copper	7440-50-8	5	mg/kg		**12**	**10**	**21**	**13**	**16**
Lead	7439-92-1	5	mg/kg		<5	<5	**7**	<5	<5
Nickel	7440-02-0	2	mg/kg		**2**	**2**	**3**	<2	<2
Zinc	7440-66-6	5	mg/kg		**9**	**8**	**9**	<5	<5
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: SOIL			Client sample ID	BH2-A33G 4-4.45	BH2-A03G 6.0-6.45	-----	-----	-----
			Client sampling date / time	27-AUG-2009 15:00	26-AUG-2009 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB0914143-056	EB0914143-057	----	----	----
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**16.4**	**15.4**	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	**16**	**6**	----	----	----
Copper	7440-50-8	5	mg/kg	<5	**36**	----	----	----
Lead	7439-92-1	5	mg/kg	<5	<5	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	<2	----	----	----
Zinc	7440-66-6	5	mg/kg	**6**	**8**	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0911701**	Page	: 1 of 9
Client	: GOLDER ASSOCIATES	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: LAIRD POINT DREDGE STUDY - OPT		
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	: BN/354/09 V2	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: **SOIL**

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
EA055: Moisture Content								
Soil Glass Jar - Unpreserved								
BH2A-27 - 0.00-0.60m,	BH2A-27 - 0.60-1.00m,	**05-AUG-2009**	**----**	----	----	**10-AUG-2009**	12-AUG-2009	✓
BH2A-27 - 1.00-1.30m,	BH2A-33 - 0.00-0.50m,							
BH2A-33 - 0.50-0.70m,	QC-2,							
QC-4								
Soil Glass Jar - Unpreserved								
QC-3		**06-AUG-2009**	**----**	----	----	**10-AUG-2009**	13-AUG-2009	✓
EA150: Particle Sizing								
Snap Lock Bag								
BH2A-27 - 0.00-0.60m,	BH2A-27 - 0.60-1.00m,	**05-AUG-2009**	**---**	---	----	**11-AUG-2009**	01-FEB-2010	✓
BH2A-27 - 1.00-1.30m,	BH2A-33 - 0.00-0.50m,							
BH2A-33 - 0.50-0.70m,	QC-2,							
QC-4								
Snap Lock Bag								
QC-3		**06-AUG-2009**	**---**	---	----	**11-AUG-2009**	02-FEB-2010	✓
EA150: Soil Classification based on Particle Size								
Snap Lock Bag								
BH2A-27 - 0.00-0.60m,	BH2A-27 - 0.60-1.00m,	**05-AUG-2009**	**---**	---	----	**11-AUG-2009**	01-FEB-2010	✓
BH2A-27 - 1.00-1.30m,	BH2A-33 - 0.00-0.50m,							
BH2A-33 - 0.50-0.70m,	QC-2,							
QC-4								
Snap Lock Bag								
QC-3		**06-AUG-2009**	**---**	---	----	**11-AUG-2009**	02-FEB-2010	✓
EG005-SD: Total Metals in Sediments by ICP-AES								
Soil Glass Jar - Unpreserved								
BH2A-27 - 0.00-0.60m,	BH2A-27 - 0.60-1.00m,	**05-AUG-2009**	**11-AUG-2009**	02-SEP-2009	✓	**12-AUG-2009**	01-FEB-2010	✓
BH2A-33 - 0.00-0.50m,	BH2A-33 - 0.50-0.70m,							
QC-2,	QC-4							
Soil Glass Jar - Unpreserved								
QC-3		**06-AUG-2009**	**11-AUG-2009**	03-SEP-2009	✓	**12-AUG-2009**	02-FEB-2010	✓

Matrix: **SOIL**

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
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved							
BH2A-27 - 1.00-1.30m	**05-AUG-2009**	**10-AUG-2009**	02-SEP-2009	✓	**11-AUG-2009**	01-FEB-2010	✓
EG020-SD: Total Metals in Sediments by ICPMS							
Soil Glass Jar - Unpreserved							
BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-33 - 0.00-0.50m, BH2A-33 - 0.50-0.70m, QC-2, QC-4	**05-AUG-2009**	**11-AUG-2009**	02-SEP-2009	✓	**13-AUG-2009**	01-FEB-2010	✓
Soil Glass Jar - Unpreserved							
QC-3	**06-AUG-2009**	**11-AUG-2009**	03-SEP-2009	✓	**13-AUG-2009**	02-FEB-2010	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved							
BH2A-27 - 1.00-1.30m	**05-AUG-2009**	**10-AUG-2009**	02-SEP-2009	✓	**11-AUG-2009**	02-SEP-2009	✓
Soil Glass Jar - Unpreserved							
BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-33 - 0.00-0.50m, BH2A-33 - 0.50-0.70m, QC-2, QC-4	**05-AUG-2009**	**11-AUG-2009**	02-SEP-2009	✓	**12-AUG-2009**	02-SEP-2009	✓
Soil Glass Jar - Unpreserved							
QC-3	**06-AUG-2009**	**11-AUG-2009**	03-SEP-2009	✓	**12-AUG-2009**	03-SEP-2009	✓
EP005: Total Organic Carbon (TOC)							
Soil Glass Jar - Unpreserved							
BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-27 - 1.00-1.30m, BH2A-33 - 0.00-0.50m, BH2A-33 - 0.50-0.70m, QC-2, QC-4	**05-AUG-2009**	**14-AUG-2009**	02-SEP-2009	✓	**14-AUG-2009**	02-SEP-2009	✓
Soil Glass Jar - Unpreserved							
QC-3	**06-AUG-2009**	**14-AUG-2009**	03-SEP-2009	✓	**14-AUG-2009**	03-SEP-2009	✓
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved							
BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-27 - 1.00-1.30m, QC-2, Trip Blank 1	**05-AUG-2009**	**10-AUG-2009**	19-AUG-2009	✓	**10-AUG-2009**	19-AUG-2009	✓
Soil Glass Jar - Unpreserved							
BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-27 - 1.00-1.30m, QC-2	**05-AUG-2009**	**10-AUG-2009**	19-AUG-2009	✓	**11-AUG-2009**	19-SEP-2009	✓
Soil Glass Jar - Unpreserved							
QC-3	**06-AUG-2009**	**10-AUG-2009**	20-AUG-2009	✓	**10-AUG-2009**	20-AUG-2009	✓
Soil Glass Jar - Unpreserved							
QC-3	**06-AUG-2009**	**10-AUG-2009**	20-AUG-2009	✓	**11-AUG-2009**	19-SEP-2009	✓

Matrix: **SOIL**

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
EP080-SD: BTEX							
Soil Glass Jar - Unpreserved BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-27 - 1.00-1.30m, QC-2, Trip Blank 1	**05-AUG-2009**	**10-AUG-2009**	19-AUG-2009	✓	**10-AUG-2009**	19-AUG-2009	✓
Soil Glass Jar - Unpreserved QC-3	**06-AUG-2009**	**10-AUG-2009**	20-AUG-2009	✓	**10-AUG-2009**	20-AUG-2009	✓
EP090: Organotin Compounds							
Soil Glass Jar - Unpreserved BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-33 - 0.00-0.50m, BH2A-33 - 0.50-0.70m, QC-2	**05-AUG-2009**	**14-AUG-2009**	19-AUG-2009	✓	**17-AUG-2009**	23-SEP-2009	✓
Soil Glass Jar - Unpreserved QC-3	**06-AUG-2009**	**14-AUG-2009**	20-AUG-2009	✓	**17-AUG-2009**	23-SEP-2009	✓
EP130A: Organophosphorus Pesticides (Ultra-trace)							
Soil Glass Jar - Unpreserved BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-27 - 1.00-1.30m, QC-2	**05-AUG-2009**	**10-AUG-2009**	19-AUG-2009	✓	**12-AUG-2009**	19-SEP-2009	✓
Soil Glass Jar - Unpreserved QC-3	**06-AUG-2009**	**10-AUG-2009**	20-AUG-2009	✓	**12-AUG-2009**	19-SEP-2009	✓
EP131A: Organochlorine Pesticides							
Soil Glass Jar - Unpreserved BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-27 - 1.00-1.30m, QC-2	**05-AUG-2009**	**10-AUG-2009**	19-AUG-2009	✓	**12-AUG-2009**	19-SEP-2009	✓
Soil Glass Jar - Unpreserved QC-3	**06-AUG-2009**	**10-AUG-2009**	20-AUG-2009	✓	**12-AUG-2009**	19-SEP-2009	✓
EP131B: Polychlorinated Biphenyls (as Aroclors)							
Soil Glass Jar - Unpreserved BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-27 - 1.00-1.30m, QC-2	**05-AUG-2009**	**10-AUG-2009**	19-AUG-2009	✓	**12-AUG-2009**	19-SEP-2009	✓
Soil Glass Jar - Unpreserved QC-3	**06-AUG-2009**	**10-AUG-2009**	20-AUG-2009	✓	**12-AUG-2009**	19-SEP-2009	✓
EP132B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved BH2A-27 - 0.00-0.60m, BH2A-27 - 0.60-1.00m, BH2A-27 - 1.00-1.30m, BH2A-33 - 0.00-0.50m, BH2A-33 - 0.50-0.70m, QC-2, QC-4	**05-AUG-2009**	**10-AUG-2009**	19-AUG-2009	✓	**12-AUG-2009**	19-SEP-2009	✓
Soil Glass Jar - Unpreserved QC-3	**06-AUG-2009**	**10-AUG-2009**	20-AUG-2009	✓	**12-AUG-2009**	19-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: **SOIL**

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)							
Moisture Content	EA055-103	5	40	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Fe and Al in Sediments by ICPAES	EG005-SD	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **SOIL**

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							
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement
Organotin Analysis	EP090	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	6	**16.7**	**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
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (1999) Schedule B(3) (Method 102)
Particle Size Analysis (Sieving)	EA150	SOIL	Particle Size Analysis by Sieving according to AS1289.3.6.1 - 1995
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Total Fe and Al in Sediments by ICPAES	EG005-SD	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3). LORs per NODG
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	(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. Analyte list and LORs per NODG.
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Organic Carbon	EP005	SOIL	In-house. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
TPH - Semivolatile Fraction	EP071-SD	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 504)
TPH Volatiles/BTEX in Sediments	EP080-SD	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

Analytical Methods	Method	Matrix	Method Descriptions
Organotin Analysis	EP090	SOIL	(USEPA SW 846 - 8270D) Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quanitified against an established calibration curve.
Organophosphorus Pesticides (Ultra-trace)	EP130	SOIL	USEPA Method 3640 (GPC cleanup), 8141 (GC/FPD - Capillary Column) This technique is compliant with NEPM (1999) Schedule B(3) (Method 505)
Organochlorine Pesticides (Ultra-trace)	EP131A	SOIL	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504)
PCB's (Ultra-trace)	EP131B	SOIL	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504)
PAHs in Sediments by GCMS(SIM)	EP132B-SD	SOIL	8270 GCMS Capillary column, SIM mode using large volume programmed temperature vaporisation injection.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids/ Sample Cleanup	ORG17A-UTP	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. Samples are extracted, concentrated (by KD) and exchanged into an appropriate solvent for GPC and florisil cleanup as required.
Tumbler Extraction of Solids for LVI (Non-concentrating)	ORG17D	SOIL	In house: 10g of sample, Na2SO4 and surrogate are extracted with 50mL 1:1 DCM/Acetone by end over end tumbling. An aliquot is concentrated by nitrogen blowdown to a reduced volume for analysis if required.
Organotin Sample Preparation	ORG35	SOIL	In house. 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.

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: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005-SD: Total Metals in Sediments by ICP-AES	ES0911701-001	BH2A-27 0.00-0.60m	**Aluminium**	7429-90-5	23.6 %	0-20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	ES0911701-003	BH2A-27 1.00-1.30m	**Aluminium**	7429-90-5	34.2 %	0-20%	**RPD exceeds LOR based limits**
EG020-SD: Total Metals in Sediments by ICPMS	ES0911701-001	BH2A-27 0.00-0.60m	**Manganese**	7439-96-5	21.5 %	0-20%	**RPD exceeds LOR based limits**
Laboratory Control Spike (LCS) Recoveries							
EP090: Organotin Compounds	1228746-002	----	**Tributyltin**	56573-85-4	152 %	28-129%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
EP131B: Polychlorinated Biphenyls (as Aroclors)	ES0911701-001	BH2A-27 0.00-0.60m	**Aroclor 1254**	11097-69-1	53.8 %	61.3-121%	**Recovery less than lower data quality objective**

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

Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP132T: Base/Neutral Extractable Surrogates	ES0911701-005	BH2A-33 0.50-0.70m	**2-Fluorobiphenyl**	321-60-8	120 %	30-115 %	**Recovery greater than upper data quality objective**

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.**

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **ES0911701**	Page	: 1 of 15
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: LAIRD POINT DREDGE STUDY - OPT		
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	: BN/354/09 V2	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*
Celine Conceicao	Spectroscopist	Inorganics
Dianne Blane		Newcastle
Edwandy Fadjar	Senior Organic Chemist	Organics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Matt Frost	Organic Instrument Chemist	Organics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Phyu Phyu Lwin	Inorganic Chemist	Inorganics
Sanjeshni Jyoti Mala	Senior Chemist Volatile	Organics
Sarah Millington	Senior Inorganic Chemist	Inorganics
Victor Kedicioglu	Business Manager - NSW	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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 1063458)									
ES0911644-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	18.6	18.8	1.6	0% - 50%
ES0911654-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	17.2	18.1	5.1	0% - 50%
EA055: Moisture Content (QC Lot: 1063459)									
ES0911701-005	BH2A-33 0.50-0.70m	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	20.6	17.9	14.2	0% - 50%
EA055: Moisture Content (QC Lot: 1064200)									
ES0911661-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	20.9	20.4	2.6	0% - 20%
ES0911662-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	38.2	35.2	8.4	0% - 20%
EG005-SD: Total Metals in Sediments by ICP-AES (QC Lot: 1065394)									
ES0911551-001	Anonymous	EG005-SD: Aluminium	7429-90-5	50	mg/kg	14200	14300	1.0	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	36300	35400	2.3	0% - 20%
ES0911701-001	BH2A-27 0.00-0.60m	EG005-SD: Aluminium	7429-90-5	50	mg/kg	9640	7600	# 23.6	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	22700	20900	8.1	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1064087)									
ES0911701-003	BH2A-27 1.00-1.30m	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	6	29.1	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	8	11	31.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	6	17	87.3	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	11	14	19.9	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	10	45	130	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	6	6	0.0	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	3850	5450	# 34.2	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	4460	4990	11.2	0% - 20%
ES0911747-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	11	12	8.8	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	9	13	35.2	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	14	14	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	5	6	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1064087) - continued									
ES0911747-001	Anonymous	EG005T: Copper	7440-50-8	5	mg/kg	13	14	8.9	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	12	12.3	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	227	261	14.0	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	24	25	6.6	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	35	36	4.2	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	5930	5110	15.0	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	17200	17300	0.7	0% - 20%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 1065393)									
ES0911551-001	Anonymous	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Selenium	7782-49-2	0.1	mg/kg	1.0	1.0	0.0	0% - 50%
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	17.2	17.0	1.2	0% - 20%
		EG020-SD: Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	0.0	No Limit
		EG020-SD: Chromium	7440-47-3	1.0	mg/kg	26.1	27.2	4.2	0% - 20%
		EG020-SD: Copper	7440-50-8	1.0	mg/kg	24.4	24.8	1.6	0% - 20%
		EG020-SD: Lead	7439-92-1	1.0	mg/kg	11.5	11.9	3.7	0% - 50%
		EG020-SD: Nickel	7440-02-0	1.0	mg/kg	14.7	15.3	4.0	0% - 50%
		EG020-SD: Zinc	7440-66-6	1.0	mg/kg	48.8	47.9	1.8	0% - 20%
		EG020-SD: Arsenic	7440-38-2	1.00	mg/kg	25.4	28.5	11.4	0% - 20%
		EG020-SD: Manganese	7439-96-5	10	mg/kg	319	298	6.9	0% - 20%
		EG020-SD: Vanadium	7440-62-2	2.0	mg/kg	54.5	58.1	6.4	0% - 20%
ES0911701-001	BH2A-27 0.00-0.60m	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Selenium	7782-49-2	0.1	mg/kg	0.6	0.5	30.6	No Limit
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	13.0	13.6	3.8	0% - 20%
		EG020-SD: Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	0.0	No Limit
		EG020-SD: Chromium	7440-47-3	1.0	mg/kg	14.6	14.0	4.1	0% - 50%
		EG020-SD: Copper	7440-50-8	1.0	mg/kg	10.5	9.7	7.6	No Limit
		EG020-SD: Lead	7439-92-1	1.0	mg/kg	5.6	5.5	2.4	No Limit
		EG020-SD: Nickel	7440-02-0	1.0	mg/kg	9.5	9.2	3.4	No Limit
		EG020-SD: Zinc	7440-66-6	1.0	mg/kg	27.2	26.0	4.6	0% - 20%
		EG020-SD: Arsenic	7440-38-2	1.00	mg/kg	15.0	13.0	14.4	0% - 50%
		EG020-SD: Manganese	7439-96-5	10	mg/kg	625	503	# 21.5	0% - 20%
		EG020-SD: Vanadium	7440-62-2	2.0	mg/kg	47.1	44.8	5.0	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1064088)									
ES0911701-003	BH2A-27 1.00-1.30m	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES0911747-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1065392)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1065392) - continued									
ES0911551-001	Anonymous	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.04	0.04	0.0	No Limit
ES0911701-001	BH2A-27 0.00-0.60m	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.01	<0.01	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 1069062)									
ES0911701-001	BH2A-27 0.00-0.60m	EP005: Total Organic Carbon	----	0.02	%	0.46	0.46	0.0	0% - 20%
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1063447)									
ES0911701-001	BH2A-27 0.00-0.60m	EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
		EP071-SD: C15 - C28 Fraction	----	3	mg/kg	10	9	0.0	No Limit
		EP071-SD: C29 - C36 Fraction	----	5	mg/kg	8	8	0.0	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1063452)									
ES0911701-001	BH2A-27 0.00-0.60m	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
EP080-SD: BTEX (QC Lot: 1063452)									
ES0911701-001	BH2A-27 0.00-0.60m	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP090: Organotin Compounds (QC Lot: 1068044)									
ES0911701-001	BH2A-27 0.00-0.60m	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	0.0	No Limit
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 1063448)									
ES0911701-001	BH2A-27 0.00-0.60m	EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Carbophenothion	786-19-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Diazinon	333-41-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dichlorvos	62-73-7	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dimethoate	60-51-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Ethion	563-12-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenthion	55-38-9	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Malathion	121-75-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Azinphos Methyl	----	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion	56-38-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Prothiofos	34643-46-4	10	µg/kg	<10	<10	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 1063448) - continued									
ES0911701-001	BH2A-27 0.00-0.60m	EP130: Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	<10.0	0.0	No Limit
EP131A: Organochlorine Pesticides (QC Lot: 1063449)									
ES0911701-001	BH2A-27 0.00-0.60m	EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDE	72-55-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: DDT (total)	----	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
EP131B: Polychlorinated Biphenyls (as Aroclors) (QC Lot: 1063450)									
ES0911701-001	BH2A-27 0.00-0.60m	EP131B: Total Polychlorinated biphenyls	----	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1016	12974-11-2	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1221	11104-28-2	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1232	11141-16-5	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1242	53469-21-9	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1248	12672-29-6	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1254	11097-69-1	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1260	11096-82-5	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1063446)									
ES0911701-001	BH2A-27 0.00-0.60m	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	<4	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1063446) - continued									
ES0911701-001	BH2A-27 0.00-0.60m	EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	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: **SOIL**

				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
EG005-SD: Total Metals in Sediments by ICP-AES (QCLot: 1065394)								
EG005-SD: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005-SD: Iron	7439-89-6	50	mg/kg	<50	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 1064087)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.1 mg/kg	108	90.1	124
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.76 mg/kg	105	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	60.9 mg/kg	106	89.2	117
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	24.5 mg/kg	107	70	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.7 mg/kg	108	90.1	114
EG005T: Iron	7439-89-6	50	mg/kg	<50	----	----	----	----
EG005T: Lead	7439-92-1	5	mg/kg	<5	55.2 mg/kg	109	85.2	111
EG005T: Manganese	7439-96-5	5	mg/kg	<5	----	----	----	----
EG005T: Nickel	7440-02-0	2	mg/kg	<2	54.8 mg/kg	105	88.3	116
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	----	----	----	----
EG005T: Zinc	7440-66-6	5	mg/kg	<5	104 mg/kg	106	88.9	112
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1065393)								
EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	----	----	----	----
EG020-SD: Arsenic	7440-38-2	1.0	mg/kg	<1.00	13.1 mg/kg	106	70	130
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	2.76 mg/kg	99.6	70	130
EG020-SD: Chromium	7440-47-3	1.0	mg/kg	<1.0	60.9 mg/kg	88.9	70	130
EG020-SD: Copper	7440-50-8	1.0	mg/kg	<1.0	54.7 mg/kg	100	70	130
EG020-SD: Cobalt	7440-48-4	10	mg/kg	<10.0	24.5 mg/kg	101	70	130
EG020-SD: Lead	7439-92-1	1.0	mg/kg	<1.0	54.8 mg/kg	90.7	70	130
EG020-SD: Manganese	7439-96-5	10	mg/kg	<10	136 mg/kg	97.8	70	130
EG020-SD: Nickel	7440-02-0	1.0	mg/kg	<1.0	55.2 mg/kg	104	70	130
EG020-SD: Selenium	7782-49-2	0.1	mg/kg	<0.1	----	----	----	----
EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	5.6 mg/kg	95.1	70	130
EG020-SD: Vanadium	7440-62-2	2	mg/kg	<2.0	34 mg/kg	102	70	130
EG020-SD: Zinc	7440-66-6	1.0	mg/kg	<1.0	104 mg/kg	101	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1064088)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	1.4 mg/kg	91.1	67	118

Sub-Matrix: **SOIL**

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
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1065392)								
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.090 mg/kg	93.4	74.2	126
EP005: Total Organic Carbon (TOC) (QCLot: 1069062)								
EP005: Total Organic Carbon	----	0.02	%	<0.02	100 %	100	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1063447)								
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	5 mg/kg	101	75.2	116
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	5 mg/kg	101	75.3	113
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	5 mg/kg	94.0	72.6	117
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1063452)								
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	26 mg/kg	98.6	68.4	128
EP080-SD: BTEX (QCLot: 1063452)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	110	67.5	125
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	1 mg/kg	107	69	122
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	1 mg/kg	115	65.3	126
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	2 mg/kg	122	66.5	124
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	1 mg/kg	123	66.7	123
EP090: Organotin Compounds (QCLot: 1068044)								
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	12.5 µgSn/kg	# 152	28	129
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1063448)								
EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	50 µg/kg	89.4	36.9	142
EP130: Carbophenothion	786-19-6	10	µg/kg	<10	50 µg/kg	90.8	0.5	157
EP130: Chlorfenvinphos (E)	470-90-6	10	µg/kg	<10.0	5 µg/kg	91.9	50.3	137
EP130: Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	50 µg/kg	91.3	55.9	152
EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	50 µg/kg	93.2	49	140
EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	50 µg/kg	88.9	28.1	142
EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	50 µg/kg	83.1	36.6	172
EP130: Diazinon	333-41-5	10	µg/kg	<10	50 µg/kg	86.5	37.2	148
EP130: Dichlorvos	62-73-7	10	µg/kg	<10	50 µg/kg	69.2	32.7	153
EP130: Dimethoate	60-51-5	10	µg/kg	<10	50 µg/kg	93.2	33.2	150
EP130: Ethion	563-12-2	10	µg/kg	<10	50 µg/kg	89.1	44	146
EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	50 µg/kg	100	3.08	162
EP130: Fenthion	55-38-9	10	µg/kg	<10	50 µg/kg	87.8	10.6	157
EP130: Malathion	121-75-5	10	µg/kg	<10	50 µg/kg	90.2	38.1	143
EP130: Azinphos Methyl	----	10	µg/kg	<10	50 µg/kg	80.0	8.13	159
EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	50 µg/kg	94.6	19.7	176
EP130: Parathion	56-38-2	10	µg/kg	<10	50 µg/kg	87.6	39.2	145
EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	50 µg/kg	84.2	23.5	152
EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	50 µg/kg	89.0	47.1	141

Sub-Matrix: **SOIL**

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
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1063448) - continued								
EP130: Prothiofos	34643-46-4	10	µg/kg	<10	50 µg/kg	89.2	36.1	148
EP131A: Organochlorine Pesticides (QCLot: 1063449)								
EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	5 µg/kg	101	31.7	140
EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	5 µg/kg	106	24.5	150
EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	5 µg/kg	69.5	36.9	139
EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	5 µg/kg	109	38.2	137
EP131A: 4.4`-DDD	72-54-8	0.5	µg/kg	<0.50	5 µg/kg	117	42.5	141
EP131A: 4.4`-DDE	72-55-9	0.5	µg/kg	<0.50	5 µg/kg	107	34.8	140
EP131A: 4.4`-DDT	50-29-3	0.5	µg/kg	<0.50	5 µg/kg	114	38	143
EP131A: DDT (total)	----	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	5 µg/kg	124	43.2	134
EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	5 µg/kg	72.9	23.7	139
EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	5 µg/kg	120	35.8	138
EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	5 µg/kg	122	7.45	158
EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	5 µg/kg	133	21.6	162
EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	5 µg/kg	78.6	19.3	131
EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	5 µg/kg	94.3	17.9	141
EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	5 µg/kg	127	31	153
EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	5 µg/kg	115	34.3	138
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	5 µg/kg	87.3	18.6	146
EP131A: gamma-BHC	58-89-9	0.5	µg/kg	<0.50	5 µg/kg	115	30.7	145
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	5 µg/kg	109	15	157
EP131A: cis-Chlordane	5103-71-9	0.5	µg/kg	<0.50	5 µg/kg	115	22.3	145
EP131A: trans-Chlordane	5103-74-2	0.5	µg/kg	<0.50	5 µg/kg	97.0	42.4	139
EP131A: Total Chlordane (sum)	----	0.5	µg/kg	<0.50	----	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 1063450)								
EP131B: Total Polychlorinated biphenyls	----	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1016	12974-11-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1221	11104-28-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1232	11141-16-5	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1242	53469-21-9	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1248	12672-29-6	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1254	11097-69-1	5	µg/kg	<5.0	50 µg/kg	64.6	61.3	121
EP131B: Aroclor 1260	11096-82-5	5	µg/kg	<5.0	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1063446)								
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	111	----	----
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	25 µg/kg	115	----	----
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	96.6	----	----

Sub-Matrix: **SOIL**

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
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1063446) - continued								
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	97.0	----	----
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	106	----	----
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	101	----	----
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	104	----	----
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	112	----	----
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	104	----	----
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	88.5	----	----
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	91.2	----	----
EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	25 µg/kg	95.4	----	----
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	101	----	----
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	25 µg/kg	89.8	----	----
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	85.1	----	----
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	25 µg/kg	90.4	----	----
EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	92.3	----	----
EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	89.4	----	----
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	90.9	----	----
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	25 µg/kg	97.8	----	----
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----

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: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1064087)							
ES0911701-003	BH2A-27 1.00-1.30m	EG005T: Arsenic	7440-38-2	50 mg/kg	94.5	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	106	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	106	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	114	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	112	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	104	70	130
		EG005T: Selenium	7782-49-2	50 mg/kg	100	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	108	70	130
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1065393)							
ES0911551-001	Anonymous	EG020-SD: Arsenic	7440-38-2	50 mg/kg	99.0	70	130
		EG020-SD: Cadmium	7440-43-9	50 mg/kg	98.6	70	130
		EG020-SD: Chromium	7440-47-3	50 mg/kg	84.5	70	130
		EG020-SD: Copper	7440-50-8	250 mg/kg	95.5	70	130
		EG020-SD: Lead	7439-92-1	250 mg/kg	87.3	70	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	103	70	130
		EG020-SD: Zinc	7440-66-6	250 mg/kg	91.4	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1064088)							
ES0911701-003	BH2A-27 1.00-1.30m	EG035T: Mercury	7439-97-6	5 mg/kg	102	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1065392)							
ES0911551-001	Anonymous	EG035T-LL: Mercury	7439-97-6	0.50 mg/kg	74.3	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1063447)							
ES0911701-001	BH2A-27 0.00-0.60m	EP071-SD: C10 - C14 Fraction	----	19.75 mg/kg	95.9	70	130
		EP071-SD: C15 - C28 Fraction	----	87.25 mg/kg	83.5	70	130
		EP071-SD: C29 - C36 Fraction	----	60 mg/kg	93.2	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1063452)							
ES0911701-001	BH2A-27 0.00-0.60m	EP080-SD: C6 - C9 Fraction	----	25 mg/kg	71.1	70	130
EP080-SD: BTEX (QCLot: 1063452)							
ES0911701-001	BH2A-27 0.00-0.60m	EP080-SD: Benzene	71-43-2	2.5 mg/kg	73.5	70	130
		EP080-SD: Toluene	108-88-3	2.5 mg/kg	72.8	70	130
		EP080-SD: Ethylbenzene	100-41-4	2.5 mg/kg	75.1	70	130
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	72.7	70	130
		EP080-SD: ortho-Xylene	95-47-6	2.5 mg/kg	75.0	70	130
EP090: Organotin Compounds (QCLot: 1068044)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP090: Organotin Compounds (QCLot: 1068044) - continued							
ES0911701-002	BH2A-27 0.60-1.00m	EP090: Tributyltin	56573-85-4	12.5 µgSn/kg	107	20	130
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1063448)							
ES0911701-001	BH2A-27 0.00-0.60m	EP130: Bromophos-ethyl	4824-78-6	50 µg/kg	82.8	36.9	142
		EP130: Carbophenothion	786-19-6	50 µg/kg	97.8	0.5	157
		EP130: Chlorfenvinphos (E)	470-90-6	5 µg/kg	87.2	50.3	137
		EP130: Chlorfenvinphos (Z)	470-90-8	50 µg/kg	95.1	55.9	152
		EP130: Chlorpyrifos	2921-88-2	50 µg/kg	81.7	49	140
		EP130: Chlorpyrifos-methyl	5598-13-0	50 µg/kg	72.5	28.1	142
		EP130: Demeton-S-methyl	919-86-8	50 µg/kg	67.4	36.6	172
		EP130: Diazinon	333-41-5	50 µg/kg	68.9	37.2	148
		EP130: Dichlorvos	62-73-7	50 µg/kg	57.0	32.7	153
		EP130: Dimethoate	60-51-5	50 µg/kg	69.7	33.2	150
		EP130: Ethion	563-12-2	50 µg/kg	97.6	44	146
		EP130: Fenamiphos	22224-92-6	50 µg/kg	99.7	3.08	162
		EP130: Fenthion	55-38-9	50 µg/kg	78.8	10.6	157
		EP130: Malathion	121-75-5	50 µg/kg	83.1	38.1	143
		EP130: Azinphos Methyl	----	50 µg/kg	61.1	8.13	159
		EP130: Monocrotophos	6923-22-4	50 µg/kg	75.2	19.7	176
		EP130: Parathion	56-38-2	50 µg/kg	71.8	39.2	145
		EP130: Parathion-methyl	298-00-0	50 µg/kg	61.0	23.5	152
		EP130: Pirimphos-ethyl	23505-41-1	50 µg/kg	82.1	47.1	141
		EP130: Prothiofos	34643-46-4	50 µg/kg	80.2	36.1	148
EP131A: Organochlorine Pesticides (QCLot: 1063449)							
ES0911701-001	BH2A-27 0.00-0.60m	EP131A: Aldrin	309-00-2	5 µg/kg	56.2	31.7	140
		EP131A: alpha-BHC	319-84-6	5 µg/kg	61.2	24.5	150
		EP131A: beta-BHC	319-85-7	5 µg/kg	62.5	36.9	139
		EP131A: delta-BHC	319-86-8	5 µg/kg	78.8	38.2	137
		EP131A: 4.4`-DDD	72-54-8	5 µg/kg	101	42.5	141
		EP131A: 4.4`-DDE	72-55-9	5 µg/kg	73.8	34.8	140
		EP131A: 4.4`-DDT	50-29-3	5 µg/kg	95.0	38	143
		EP131A: Dieldrin	60-57-1	5 µg/kg	82.5	43.2	134
		EP131A: alpha-Endosulfan	959-98-8	5 µg/kg	83.8	23.7	139
		EP131A: beta-Endosulfan	33213-65-9	5 µg/kg	92.5	35.8	138
		EP131A: Endosulfan sulfate	1031-07-8	5 µg/kg	86.2	7.45	158
		EP131A: Endrin	72-20-8	5 µg/kg	124	21.6	162
		EP131A: Endrin aldehyde	7421-93-4	5 µg/kg	71.2	19.3	131
		EP131A: Endrin ketone	53494-70-5	5 µg/kg	67.5	17.9	141
		EP131A: Heptachlor	76-44-8	5 µg/kg	62.5	31	153

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP131A: Organochlorine Pesticides (QCLot: 1063449) - continued							
ES0911701-001	BH2A-27 0.00-0.60m	EP131A: Heptachlor epoxide	1024-57-3	5 µg/kg	81.2	34.3	138
		EP131A: Hexachlorobenzene (HCB)	118-74-1	5 µg/kg	53.8	18.6	146
		EP131A: gamma-BHC	58-89-9	5 µg/kg	135	30.7	145
		EP131A: Methoxychlor	72-43-5	5 µg/kg	86.2	15	157
		EP131A: cis-Chlordane	5103-71-9	5 µg/kg	73.8	22.3	145
		EP131A: trans-Chlordane	5103-74-2	5 µg/kg	72.5	42.4	139
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 1063450)							
ES0911701-001	BH2A-27 0.00-0.60m	EP131B: Aroclor 1254	11097-69-1	50 µg/kg	# 53.8	61.3	121
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1063446)							
ES0911701-001	BH2A-27 0.00-0.60m	EP132B-SD: Naphthalene	91-20-3	25 µg/kg	104	70	130
		EP132B-SD: 2-Methylnaphthalene	91-57-6	25 µg/kg	111	70	130
		EP132B-SD: Acenaphthylene	208-96-8	25 µg/kg	90.3	70	130
		EP132B-SD: Acenaphthene	83-32-9	25 µg/kg	91.0	70	130
		EP132B-SD: Fluorene	86-73-7	25 µg/kg	93.8	70	130
		EP132B-SD: Phenanthrene	85-01-8	25 µg/kg	92.4	70	130
		EP132B-SD: Anthracene	120-12-7	25 µg/kg	93.2	70	130
		EP132B-SD: Fluoranthene	206-44-0	25 µg/kg	100	70	130
		EP132B-SD: Pyrene	129-00-0	25 µg/kg	99.8	70	130
		EP132B-SD: Benz(a)anthracene	56-55-3	25 µg/kg	92.9	70	130
		EP132B-SD: Chrysene	218-01-9	25 µg/kg	92.2	70	130
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	25 µg/kg	96.6	70	130
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	25 µg/kg	84.9	70	130
		EP132B-SD: Benzo(e)pyrene	192-97-2	25 µg/kg	87.8	70	130
		EP132B-SD: Benzo(a)pyrene	50-32-8	25 µg/kg	86.6	70	130
		EP132B-SD: Perylene	198-55-0	25 µg/kg	85.3	70	130
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	25 µg/kg	104	70	130
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	25 µg/kg	102	70	130
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	25 µg/kg	100	70	130
		EP132B-SD: Coronene	191-07-1	25 µg/kg	111	70	130

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES0911701**	Page	: 1 of 13
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052	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	: LAIRD POINT DREDGE STUDY - OPT		
		No. of samples received	: 9
Quote number	: BN/354/09 V2	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
- 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*
Celine Conceicao	Spectroscopist	Inorganics
Dianne Blane		Newcastle
Edwandy Fadjar	Senior Organic Chemist	Organics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Matt Frost	Organic Instrument Chemist	Organics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Phyu Phyu Lwin	Inorganic Chemist	Inorganics
Sanjeshni Jyoti Mala	Senior Chemist Volatile	Organics
Sarah Millington	Senior Inorganic Chemist	Inorganics
Victor Kedicioglu	Business Manager - NSW	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

- **EG005-SD:Poor precision was obtained for Iron on sample ES0911701#1 due to sample heterogeneity.**
- **EG020-SD: Poor precision was obtained for some elements on sample ES0911701#1 due to sample heterogeneity.**
- **TBT: High failing LCS deemed acceptable as all associated analyte results are less than LOR.**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	BH2A-27 0.00-0.60m	BH2A-27 0.60-1.00m	BH2A-27 1.00-1.30m	BH2A-33 0.00-0.50m	BH2A-33 0.50-0.70m
				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
					ES0911701-001	ES0911701-002	ES0911701-003	ES0911701-004	ES0911701-005
EA150: Particle Sizing									
+75µm	----	1	%		68	50	3	35	58
+150µm	----	1	%		60	27	1	16	37
+300µm	----	1	%		38	6	<1	8	25
+425µm	----	1	%		27	3	<1	7	24
+600µm	----	1	%		19	2	<1	6	23
+1180µm	----	1	%		11	<1	<1	6	21
+2.36mm	----	1	%		8	<1	<1	5	16
+4.75mm	----	1	%		5	<1	<1	4	6
+9.5mm	----	1	%		4	<1	<1	<1	6
+19.0mm	----	1	%		<1	<1	<1	<1	6
+37.5mm	----	1	%		<1	<1	<1	<1	<1
+75.0mm	----	1	%		<1	<1	<1	<1	<1
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		33.3	17.1	17.1	20.1	20.6
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		17	31	48	34	23
Silt (2-60 µm)	----	1	%		14	17	48	29	17
Sand (0.06-2.00 mm)	----	1	%		61	52	4	32	44
Gravel (>2mm)	----	1	%		8	<1	<1	5	16
Cobbles (>6cm)	----	1	%		<1	<1	<1	<1	<1
EG005-SD: Total Metals in Sediments by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		9640	5950	----	9210	6480
Iron	7439-89-6	50	mg/kg		22700	21500	----	43700	21800
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		----	----	3850	----	----
Antimony	7440-36-0	5	mg/kg		----	----	<5	----	----
Arsenic	7440-38-2	5	mg/kg		----	----	<5	----	----
Cadmium	7440-43-9	1	mg/kg		----	----	<1	----	----
Chromium	7440-47-3	2	mg/kg		----	----	4	----	----
Cobalt	7440-48-4	2	mg/kg		----	----	<2	----	----
Copper	7440-50-8	5	mg/kg		----	----	8	----	----
Iron	7439-89-6	50	mg/kg		----	----	4460	----	----
Lead	7439-92-1	5	mg/kg		----	----	6	----	----
Manganese	7439-96-5	5	mg/kg		----	----	11	----	----
Nickel	7440-02-0	2	mg/kg		----	----	<2	----	----
Selenium	7782-49-2	5	mg/kg		----	----	<5	----	----
Silver	7440-22-4	2	mg/kg		----	----	<2	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-27 0.00-0.60m	BH2A-27 0.60-1.00m	BH2A-27 1.00-1.30m	BH2A-33 0.00-0.50m	BH2A-33 0.50-0.70m
				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
				ES0911701-001	ES0911701-002	ES0911701-003	ES0911701-004	ES0911701-005
EG005T: Total Metals by ICP-AES - Continued								
Vanadium	7440-62-2	5	mg/kg	----	----	**10**	----	----
Zinc	7440-66-6	5	mg/kg	----	----	**6**	----	----
EG020-SD: Total Metals in Sediments by ICPMS								
Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	----	<0.50	<0.50
Arsenic	7440-38-2	1.00	mg/kg	**15.0**	**11.2**	----	**11.1**	**9.20**
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	----	<0.1	<0.1
Chromium	7440-47-3	1.0	mg/kg	**14.6**	**10.3**	----	**15.0**	**10.2**
Copper	7440-50-8	1.0	mg/kg	**10.5**	**9.8**	----	**15.0**	**10.0**
Cobalt	7440-48-4	0.5	mg/kg	**13.0**	**2.3**	----	**6.0**	**5.5**
Lead	7439-92-1	1.0	mg/kg	**5.6**	**5.0**	----	**9.5**	**5.2**
Manganese	7439-96-5	10	mg/kg	**625**	**29**	----	**40**	**71**
Nickel	7440-02-0	1.0	mg/kg	**9.5**	**2.3**	----	**5.0**	**3.8**
Selenium	7782-49-2	0.1	mg/kg	**0.6**	**0.4**	----	**1.2**	**0.5**
Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	----	<0.1	<0.1
Vanadium	7440-62-2	2.0	mg/kg	**47.1**	**40.4**	----	**65.3**	**39.0**
Zinc	7440-66-6	1.0	mg/kg	**27.2**	**8.2**	----	**16.8**	**13.6**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.01	mg/kg	**0.01**	<0.01	----	<0.01	<0.01
Mercury	7439-97-6	0.1	mg/kg	----	----	<0.1	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	0.02	%	**0.46**	**0.04**	**0.03**	**0.18**	**0.13**
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	3	mg/kg	<3	<3	<3	----	----
C10 - C14 Fraction	----	3	mg/kg	<3	<3	<3	----	----
C15 - C28 Fraction	----	3	mg/kg	**10**	<3	<3	----	----
C29 - C36 Fraction	----	5	mg/kg	**8**	<5	<5	----	----
EP080-SD: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
EP090: Organotin Compounds								
Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	----	<0.5	<0.5
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	<10	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-27 0.00-0.60m	BH2A-27 0.60-1.00m	BH2A-27 1.00-1.30m	BH2A-33 0.00-0.50m	BH2A-33 0.50-0.70m
				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
				ES0911701-001	ES0911701-002	ES0911701-003	ES0911701-004	ES0911701-005
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
Carbophenothion	786-19-6	10	µg/kg	<10	<10	<10	----	----
Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	<10.0	<10.0	----	----
Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	<10	<10	----	----
Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	<10	----	----
Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	<10	----	----
Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	<10	----	----
Diazinon	333-41-5	10	µg/kg	<10	<10	<10	----	----
Dichlorvos	62-73-7	10	µg/kg	<10	<10	<10	----	----
Dimethoate	60-51-5	10	µg/kg	<10	<10	<10	----	----
Ethion	563-12-2	10	µg/kg	<10	<10	<10	----	----
Fenamiphos	22224-92-6	10	µg/kg	<10	<10	<10	----	----
Fenthion	55-38-9	10	µg/kg	<10	<10	<10	----	----
Malathion	121-75-5	10	µg/kg	<10	<10	<10	----	----
Azinphos Methyl	----	10	µg/kg	<10	<10	<10	----	----
Monocrotophos	6923-22-4	10	µg/kg	<10	<10	<10	----	----
Parathion	56-38-2	10	µg/kg	<10	<10	<10	----	----
Parathion-methyl	298-00-0	10	µg/kg	<10	<10	<10	----	----
Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	<10	----	----
Prothiofos	34643-46-4	10	µg/kg	<10	<10	<10	----	----
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
4.4`-DDE	72-55-9	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
^ DDT (total)	----	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
^ Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	<0.50	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-27 0.00-0.60m	BH2A-27 0.60-1.00m	BH2A-27 1.00-1.30m	BH2A-33 0.00-0.50m	BH2A-33 0.50-0.70m
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
				ES0911701-001	ES0911701-002	ES0911701-003	ES0911701-004	ES0911701-005
EP131A: Organochlorine Pesticides - Continued								
Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	<0.25	----	----
Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	<0.25	<0.25	----	----
trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	<0.25	<0.25	----	----
^ Total Chlordane (sum)	----	0.25	µg/kg	<0.25	<0.25	<0.25	----	----
Oxychlordane	27304-13-8	0.50	µg/kg	<0.50	<0.50	<0.50	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors)								
^ Total Polychlorinated biphenyls	----	5.0	µg/kg	<5.0	<5.0	<5.0	----	----
Aroclor 1016	12974-11-2	5.0	µg/kg	<5.0	<5.0	<5.0	----	----
Aroclor 1221	11104-28-2	5.0	µg/kg	<5.0	<5.0	<5.0	----	----
Aroclor 1232	11141-16-5	5.0	µg/kg	<5.0	<5.0	<5.0	----	----
Aroclor 1242	53469-21-9	5.0	µg/kg	<5.0	<5.0	<5.0	----	----
Aroclor 1248	12672-29-6	5.0	µg/kg	<5.0	<5.0	<5.0	----	----
Aroclor 1254	11097-69-1	5.0	µg/kg	<5.0	<5.0	<5.0	----	----
Aroclor 1260	11096-82-5	5.0	µg/kg	<5.0	<5.0	<5.0	----	----
EP132B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	5	µg/kg	<5	<5	<5	<5	<5
2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	<5	<5	<5
Acenaphthylene	208-96-8	4	µg/kg	<4	<4	<4	<4	<4
Acenaphthene	83-32-9	4	µg/kg	<4	<4	<4	<4	<4
Fluorene	86-73-7	4	µg/kg	<4	<4	<4	<4	<4
Phenanthrene	85-01-8	4	µg/kg	<4	<4	<4	<4	<4
Anthracene	120-12-7	4	µg/kg	<4	<4	<4	<4	<4
Fluoranthene	206-44-0	4	µg/kg	<4	<4	<4	<4	<4
Pyrene	129-00-0	4	µg/kg	<4	<4	<4	<4	<4
Benz(a)anthracene	56-55-3	4	µg/kg	<4	<4	<4	<4	<4
Chrysene	218-01-9	4	µg/kg	<4	<4	<4	<4	<4
Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	<4	<4	<4	<4
Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	<4	<4	<4
Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	<4	<4	<4
Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	<4	<4	<4
Perylene	198-55-0	4	µg/kg	<4	<4	<4	<4	<4
Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	<4	<4	<4	<4
Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	<4	<4	<4	<4
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	<4	<4	<4	<4

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-27 0.00-0.60m	BH2A-27 0.60-1.00m	BH2A-27 1.00-1.30m	BH2A-33 0.00-0.50m	BH2A-33 0.50-0.70m
				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
				ES0911701-001	ES0911701-002	ES0911701-003	ES0911701-004	ES0911701-005
EP132B: Polynuclear Aromatic Hydrocarbons - Continued								
Coronene	191-07-1	5	µg/kg	<5	<5	<5	<5	<5
^ Sum of PAHs	----	4	µg/kg	<4	<4	<4	<4	<4
EP080-SD: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**104**	**89.7**	**108**	----	----
Toluene-D8	2037-26-5	0.1	%	**87.0**	**77.8**	**97.2**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**95.0**	**77.3**	**97.0**	----	----
EP090S: Organotin Surrogate								
Tripropyltin	----	0.1	%	**89.0**	**88.7**	----	**163**	**162**
EP130S: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**75.0**	**82.9**	**66.6**	----	----
EP131S: OC Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**74.6**	**76.5**	**71.0**	----	----
EP131T: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**68.4**	**76.1**	**72.5**	----	----
EP132T: Base/Neutral Extractable Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**97.2**	**96.4**	**93.3**	**93.7**	**120**
Anthracene-d10	1719-06-8	0.1	%	**93.1**	**98.4**	**102**	**94.7**	**98.1**
4-Terphenyl-d14	1718-51-0	0.1	%	**94.2**	**106**	**104**	**104**	**104**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	QC-2	QC-3	QC-4	Trip Blank 1	----
				Client sampling date / time	05-AUG-2009 15:00	06-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	----
					ES0911701-006	ES0911701-007	ES0911701-008	ES0911701-009	----
EA150: Particle Sizing									
+75µm	----	1	%		**57**	**68**	**32**	----	----
+150µm	----	1	%		**48**	**60**	**14**	----	----
+300µm	----	1	%		**24**	**30**	**4**	----	----
+425µm	----	1	%		**16**	**19**	**3**	----	----
+600µm	----	1	%		**10**	**12**	**2**	----	----
+1180µm	----	1	%		**4**	**5**	**1**	----	----
+2.36mm	----	1	%		**2**	**2**	**1**	----	----
+4.75mm	----	1	%		<1	<1	<1	----	----
+9.5mm	----	1	%		<1	<1	<1	----	----
+19.0mm	----	1	%		<1	<1	<1	----	----
+37.5mm	----	1	%		<1	<1	<1	----	----
+75.0mm	----	1	%		<1	<1	<1	----	----
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		**38.0**	**42.1**	**18.1**	----	----
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		**26**	**18**	**41**	----	----
Silt (2-60 µm)	----	1	%		**15**	**13**	**25**	----	----
Sand (0.06-2.00 mm)	----	1	%		**57**	**67**	**33**	----	----
Gravel (>2mm)	----	1	%		**2**	**2**	**1**	----	----
Cobbles (>6cm)	----	1	%		<1	<1	<1	----	----
EG005-SD: Total Metals in Sediments by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		**8980**	**7220**	**7590**	----	----
Iron	7439-89-6	50	mg/kg		**20400**	**22400**	**46800**	----	----
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg		<0.50	<0.50	<0.50	----	----
Arsenic	7440-38-2	1.00	mg/kg		**9.20**	**15.5**	**15.0**	----	----
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	<0.1	----	----
Chromium	7440-47-3	1.0	mg/kg		**15.6**	**13.7**	**15.5**	----	----
Copper	7440-50-8	1.0	mg/kg		**12.6**	**9.4**	**16.0**	----	----
Cobalt	7440-48-4	0.5	mg/kg		**12.7**	**14.8**	**6.2**	----	----
Lead	7439-92-1	1.0	mg/kg		**5.9**	**5.0**	**10.0**	----	----
Manganese	7439-96-5	10	mg/kg		**577**	**1030**	**65**	----	----
Nickel	7440-02-0	1.0	mg/kg		**10.1**	**8.8**	**5.2**	----	----
Selenium	7782-49-2	0.1	mg/kg		**0.5**	**0.5**	**1.2**	----	----
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	----	----
Vanadium	7440-62-2	2.0	mg/kg		**45.5**	**48.1**	**77.4**	----	----
Zinc	7440-66-6	1.0	mg/kg		**32.0**	**30.2**	**18.1**	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: QC-2	QC-3	QC-4	Trip Blank 1	----
				Client sampling date / time: 05-AUG-2009 15:00	06-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	----
				ES0911701-006	ES0911701-007	ES0911701-008	ES0911701-009	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.01	mg/kg	**0.01**	<0.01	<0.01	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	0.02	%	**0.62**	**0.44**	**0.22**	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	3	mg/kg	<3	<3	----	<3	----
C10 - C14 Fraction	----	3	mg/kg	<3	<3	----	----	----
C15 - C28 Fraction	----	3	mg/kg	**8**	**13**	----	----	----
C29 - C36 Fraction	----	5	mg/kg	**6**	**8**	----	----	----
EP080-SD: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	----	<0.2	----
EP090: Organotin Compounds								
Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	----	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	----	----	----
Carbophenothion	786-19-6	10	µg/kg	<10	<10	----	----	----
Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	<10.0	----	----	----
Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	<10	----	----	----
Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	----	----	----
Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	----	----	----
Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	----	----	----
Diazinon	333-41-5	10	µg/kg	<10	<10	----	----	----
Dichlorvos	62-73-7	10	µg/kg	<10	<10	----	----	----
Dimethoate	60-51-5	10	µg/kg	<10	<10	----	----	----
Ethion	563-12-2	10	µg/kg	<10	<10	----	----	----
Fenamiphos	22224-92-6	10	µg/kg	<10	<10	----	----	----
Fenthion	55-38-9	10	µg/kg	<10	<10	----	----	----
Malathion	121-75-5	10	µg/kg	<10	<10	----	----	----
Azinphos Methyl	----	10	µg/kg	<10	<10	----	----	----
Monocrotophos	6923-22-4	10	µg/kg	<10	<10	----	----	----
Parathion	56-38-2	10	µg/kg	<10	<10	----	----	----
Parathion-methyl	298-00-0	10	µg/kg	<10	<10	----	----	----
Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	----	----	----
Prothiofos	34643-46-4	10	µg/kg	<10	<10	----	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: QC-2	QC-3	QC-4	Trip Blank 1	----
				Client sampling date / time: 05-AUG-2009 15:00	06-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	----
				ES0911701-006	ES0911701-007	ES0911701-008	ES0911701-009	----
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	----	----	----
alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	----	----	----
beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	----	----	----
delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	----	----	----
4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	<0.50	----	----	----
4.4`-DDE	72-55-9	0.50	µg/kg	<0.50	<0.50	----	----	----
4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	----	----	----
^ DDT (total)	----	0.50	µg/kg	<0.50	<0.50	----	----	----
Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	----	----	----
alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	----	----	----
beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	----	----	----
Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	----	----	----
^ Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	----	----	----
Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	----	----	----
Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	----	----	----
Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	----	----	----
Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	----	----	----
Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	----	----	----
gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	----	----	----
Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	----	----	----
cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	<0.25	----	----	----
trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	<0.25	----	----	----
^ Total Chlordane (sum)	----	0.25	µg/kg	<0.25	<0.25	----	----	----
Oxychlordane	27304-13-8	0.50	µg/kg	<0.50	<0.50	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors)								
^ Total Polychlorinated biphenyls	----	5.0	µg/kg	<5.0	<5.0	----	----	----
Aroclor 1016	12974-11-2	5.0	µg/kg	<5.0	<5.0	----	----	----
Aroclor 1221	11104-28-2	5.0	µg/kg	<5.0	<5.0	----	----	----
Aroclor 1232	11141-16-5	5.0	µg/kg	<5.0	<5.0	----	----	----
Aroclor 1242	53469-21-9	5.0	µg/kg	<5.0	<5.0	----	----	----
Aroclor 1248	12672-29-6	5.0	µg/kg	<5.0	<5.0	----	----	----
Aroclor 1254	11097-69-1	5.0	µg/kg	<5.0	<5.0	----	----	----
Aroclor 1260	11096-82-5	5.0	µg/kg	<5.0	<5.0	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	5	µg/kg	<5	<5	<5	----	----
2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	<5	----	----
Acenaphthylene	208-96-8	4	µg/kg	<4	<4	<4	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	QC-2	QC-3	QC-4	Trip Blank 1	----
				Client sampling date / time	05-AUG-2009 15:00	06-AUG-2009 15:00	05-AUG-2009 15:00	05-AUG-2009 15:00	----
Compound	CAS Number	LOR	Unit		ES0911701-006	ES0911701-007	ES0911701-008	ES0911701-009	----
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Acenaphthene	83-32-9	4	µg/kg		<4	<4	<4	----	----
Fluorene	86-73-7	4	µg/kg		<4	<4	<4	----	----
Phenanthrene	85-01-8	4	µg/kg		<4	<4	<4	----	----
Anthracene	120-12-7	4	µg/kg		<4	<4	<4	----	----
Fluoranthene	206-44-0	4	µg/kg		5	<4	<4	----	----
Pyrene	129-00-0	4	µg/kg		4	<4	<4	----	----
Benz(a)anthracene	56-55-3	4	µg/kg		<4	<4	<4	----	----
Chrysene	218-01-9	4	µg/kg		<4	<4	<4	----	----
Benzo(b)fluoranthene	205-99-2	4	µg/kg		<4	<4	<4	----	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		<4	<4	<4	----	----
Benzo(e)pyrene	192-97-2	4	µg/kg		<4	<4	<4	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg		<4	<4	<4	----	----
Perylene	198-55-0	4	µg/kg		<4	<4	<4	----	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		<4	<4	<4	----	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		<4	<4	<4	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		<4	<4	<4	----	----
Coronene	191-07-1	5	µg/kg		<5	<5	<5	----	----
^ Sum of PAHs	----	4	µg/kg		9	<4	<4	----	----
EP080-SD: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		93.3	94.9	----	112	----
Toluene-D8	2037-26-5	0.1	%		91.6	95.2	----	108	----
4-Bromofluorobenzene	460-00-4	0.1	%		90.1	93.9	----	104	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.1	%		126	122	----	----	----
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%		67.2	76.6	----	----	----
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%		60.0	57.5	----	----	----
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		60.0	57.5	----	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		110	99.3	102	----	----
Anthracene-d10	1719-06-8	0.1	%		93.1	90.8	101	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		108	98.9	103	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080-SD: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	74.7	127
Toluene-D8	2037-26-5	74.8	129
4-Bromofluorobenzene	460-00-4	75.3	127
EP090S: Organotin Surrogate			
Tripropyltin	----	34	108
EP130S: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	51.3	136.9
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	136
EP131T: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	10	164
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	30	115
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	18	137

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0911498**	Page	: 1 of 10
Client	: GOLDER ASSOCIATES	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052 Gladstone Dredging	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: LAIRD POINT DREDGE STUDY - OPT		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: IW	Issue Date	: 14-AUG-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: BN/354/09 V2	No. of samples analysed	: 6

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: **SOIL**

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
EA055: Moisture Content								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**----**	----	----	**06-AUG-2009**	10-AUG-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EA150: Particle Sizing								
Snap Lock Bag								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**---**	---	----	**07-AUG-2009**	30-JAN-2010	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EA150: Soil Classification based on Particle Size								
Snap Lock Bag								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**---**	---	----	**07-AUG-2009**	30-JAN-2010	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EG005-SD: Total Metals in Sediments by ICP-AES								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m	**03-AUG-2009**	**11-AUG-2009**	31-AUG-2009	✓	**12-AUG-2009**	30-JAN-2010	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved								
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,	**03-AUG-2009**	**07-AUG-2009**	31-AUG-2009	✓	**10-AUG-2009**	30-JAN-2010	✓
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EG020-SD: Total Metals in Sediments by ICPMS								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m	**03-AUG-2009**	**11-AUG-2009**	31-AUG-2009	✓	**13-AUG-2009**	30-JAN-2010	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved								
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,	**03-AUG-2009**	**07-AUG-2009**	31-AUG-2009	✓	**07-AUG-2009**	31-AUG-2009	✓
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m	**03-AUG-2009**	**11-AUG-2009**	31-AUG-2009	✓	**12-AUG-2009**	31-AUG-2009	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP005: Total Organic Carbon (TOC)								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**11-AUG-2009**	31-AUG-2009	✓	**11-AUG-2009**	31-AUG-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**06-AUG-2009**	17-AUG-2009	✓	**06-AUG-2009**	17-AUG-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**10-AUG-2009**	16-SEP-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EP080-SD: BTEX								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**06-AUG-2009**	17-AUG-2009	✓	**06-AUG-2009**	17-AUG-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EP090: Organotin Compounds								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m	**03-AUG-2009**	**10-AUG-2009**	17-AUG-2009	✓	**11-AUG-2009**	19-SEP-2009	✓
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EP131A: Organochlorine Pesticides								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							
EP131B: Polychlorinated Biphenyls (as Aroclors)								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							

Matrix: **SOIL**

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
EP132B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved								
BH2A-22 - 0.00-0.50m,	BH2A-22 - 0.50-1.00m,	**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**10-AUG-2009**	16-SEP-2009	✓
BH2A-22 - 1.00-2.00m,	BH2A-22 - 2.00-3.00m,							
BH2A-22 - 3.00-4.10m,	BH2A-22 - 4.10-4.40m							

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: **SOIL**

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)							
Moisture Content	EA055-103	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	2	**50.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Fe and Al in Sediments by ICPAES	EG005-SD	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	2	**50.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	2	**50.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **SOIL**

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							
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Organotin Analysis	EP090	1	2	**50.0**	**5.0**	✓	ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	9	**11.1**	**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
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (1999) Schedule B(3) (Method 102)
Particle Size Analysis (Sieving)	EA150	SOIL	Particle Size Analysis by Sieving according to AS1289.3.6.1 - 1995
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Total Fe and Al in Sediments by ICPAES	EG005-SD	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3). LORs per NODG
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	(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. Analyte list and LORs per NODG.
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Organic Carbon	EP005	SOIL	In-house. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
TPH - Semivolatile Fraction	EP071-SD	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 504)
TPH Volatiles/BTEX in Sediments	EP080-SD	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

Analytical Methods	Method	Matrix	Method Descriptions
Organotin Analysis	EP090	SOIL	(USEPA SW 846 - 8270D) Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quanitified against an established calibration curve.
Organophosphorus Pesticides (Ultra-trace)	EP130	SOIL	USEPA Method 3640 (GPC cleanup), 8141 (GC/FPD - Capillary Column) This technique is compliant with NEPM (1999) Schedule B(3) (Method 505)
Organochlorine Pesticides (Ultra-trace)	EP131A	SOIL	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504)
PCB's (Ultra-trace)	EP131B	SOIL	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504)
PAHs in Sediments by GCMS(SIM)	EP132B-SD	SOIL	8270 GCMS Capillary column, SIM mode using large volume programmed temperature vaporisation injection.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids/ Sample Cleanup	ORG17A-UTP	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. Samples are extracted, concentrated (by KD) and exchanged into an appropriate solvent for GPC and florisil cleanup as required.
Tumbler Extraction of Solids for LVI (Non-concentrating)	ORG17D	SOIL	In house: 10g of sample, Na2SO4 and surrogate are extracted with 50mL 1:1 DCM/Acetone by end over end tumbling. An aliquot is concentrated by nitrogen blowdown to a reduced volume for analysis if required.
Organotin Sample Preparation	ORG35	SOIL	In house. 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.

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: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005-SD: Total Metals in Sediments by ICP-AES	ES0911701-001	Anonymous	**Aluminium**	7429-90-5	23.6 %	0-20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	ES0911510-001	Anonymous	**Manganese**	7439-96-5	22.0 %	0-20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	ES0911510-001	Anonymous	**Zinc**	7440-66-6	27.4 %	0-20%	**RPD exceeds LOR based limits**
EG020-SD: Total Metals in Sediments by ICPMS	ES0911701-001	Anonymous	**Manganese**	7439-96-5	21.5 %	0-20%	**RPD exceeds LOR based limits**
Laboratory Control Spike (LCS) Recoveries							
EG005T: Total Metals by ICP-AES	1221754-002	----	**Cadmium**	7440-43-9	111 %	83.3-111%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons	ES0911498-001	BH2A-22 0.00-0.50m	**C6 - C9 Fraction**	----	45.1 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	BH2A-22 0.00-0.50m	**Benzene**	71-43-2	25.4 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	BH2A-22 0.00-0.50m	**Toluene**	108-88-3	34.2 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	BH2A-22 0.00-0.50m	**Ethylbenzene**	100-41-4	25.6 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	BH2A-22 0.00-0.50m	**meta- & para-Xylene**	108-38-3 106-42-3	26.5 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	BH2A-22 0.00-0.50m	**ortho-Xylene**	95-47-6	28.3 %	70-130%	**Recovery less than lower data quality objective**

- **For all matrices, no Method Blank value 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.**

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **ES0911498**	Page	: 1 of 14
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052 Gladstone Dredging	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: LAIRD POINT DREDGE STUDY - OPT		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: IW	Issue Date	: 14-AUG-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: BN/354/09 V2	No. of samples analysed	: 6

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*
Dianne Blane		Newcastle
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Matt Frost	Organic Instrument Chemist	Organics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Sarah Millington	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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 1061792)									
ES0911498-001	BH2A-22 0.00-0.50m	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	56.4	57.5	1.9	0% - 20%
ES0911510-003	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	7.7	6.9	11.6	No Limit
EG005-SD: Total Metals in Sediments by ICP-AES (QC Lot: 1065394)									
ES0911551-001	Anonymous	EG005-SD: Aluminium	7429-90-5	50	mg/kg	14200	14300	1.0	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	36300	35400	2.3	0% - 20%
ES0911701-001	Anonymous	EG005-SD: Aluminium	7429-90-5	50	mg/kg	9640	7600	# 23.6	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	22700	20900	8.1	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1062004)									
ES0911394-048	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	6	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	6	5	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	7	7	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	9	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	24	20	17.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	9	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	182	183	0.0	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	23	21	6.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	44	43	3.2	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	7400	7580	2.4	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	14400	14400	0.3	0% - 20%
ES0911510-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	30	29	6.4	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	8	8	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	42	35	17.5	0% - 50%
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	23	21	9.2	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	81	65	21.9	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	22	19	16.5	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	474	380	# 22.0	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	26	26	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1062004) - continued									
ES0911510-001	Anonymous	EG005T: Zinc	7440-66-6	5	mg/kg	259	197	# 27.4	0% - 20%
		EG005T: Aluminium	7429-90-5	50	mg/kg	3350	3380	0.8	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	48600	41100	16.6	0% - 20%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 1065393)									
ES0911551-001	Anonymous	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Selenium	7782-49-2	0.1	mg/kg	1.0	1.0	0.0	0% - 50%
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	17.2	17.0	1.2	0% - 20%
		EG020-SD: Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	0.0	No Limit
		EG020-SD: Chromium	7440-47-3	1.0	mg/kg	26.1	27.2	4.2	0% - 20%
		EG020-SD: Copper	7440-50-8	1.0	mg/kg	24.4	24.8	1.6	0% - 20%
		EG020-SD: Lead	7439-92-1	1.0	mg/kg	11.5	11.9	3.7	0% - 50%
		EG020-SD: Nickel	7440-02-0	1.0	mg/kg	14.7	15.3	4.0	0% - 50%
		EG020-SD: Zinc	7440-66-6	1.0	mg/kg	48.8	47.9	1.8	0% - 20%
		EG020-SD: Arsenic	7440-38-2	1.00	mg/kg	25.4	28.5	11.4	0% - 20%
		EG020-SD: Manganese	7439-96-5	10	mg/kg	319	298	6.9	0% - 20%
		EG020-SD: Vanadium	7440-62-2	2.0	mg/kg	54.5	58.1	6.4	0% - 20%
ES0911701-001	Anonymous	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Selenium	7782-49-2	0.1	mg/kg	0.6	0.5	30.6	No Limit
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	13.0	13.6	3.8	0% - 20%
		EG020-SD: Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	0.0	No Limit
		EG020-SD: Chromium	7440-47-3	1.0	mg/kg	14.6	14.0	4.1	0% - 50%
		EG020-SD: Copper	7440-50-8	1.0	mg/kg	10.5	9.7	7.6	No Limit
		EG020-SD: Lead	7439-92-1	1.0	mg/kg	5.6	5.5	2.4	No Limit
		EG020-SD: Nickel	7440-02-0	1.0	mg/kg	9.5	9.2	3.4	No Limit
		EG020-SD: Zinc	7440-66-6	1.0	mg/kg	27.2	26.0	4.6	0% - 20%
		EG020-SD: Arsenic	7440-38-2	1.00	mg/kg	15.0	13.0	14.4	0% - 50%
		EG020-SD: Manganese	7439-96-5	10	mg/kg	625	503	# 21.5	0% - 20%
		EG020-SD: Vanadium	7440-62-2	2.0	mg/kg	47.1	44.8	5.0	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1062005)									
ES0911394-048	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	<0.1	83.2	No Limit
ES0911510-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1065392)									
ES0911551-001	Anonymous	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.04	0.04	0.0	No Limit
ES0911701-001	Anonymous	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.01	<0.01	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 1065073)									
ES0911498-001	BH2A-22 0.00-0.50m	EP005: Total Organic Carbon	----	0.02	%	2.06	1.99	3.4	0% - 20%
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1061666)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1061666) - continued									
ES0911498-001	BH2A-22 0.00-0.50m	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1062027)									
ES0911498-001	BH2A-22 0.00-0.50m	EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
		EP071-SD: C15 - C28 Fraction	----	3	mg/kg	10	11	11.9	No Limit
		EP071-SD: C29 - C36 Fraction	----	5	mg/kg	14	16	12.9	No Limit
EP080-SD: BTEX (QC Lot: 1061666)									
ES0911498-001	BH2A-22 0.00-0.50m	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP090: Organotin Compounds (QC Lot: 1062995)									
ES0911498-001	BH2A-22 0.00-0.50m	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	0.0	No Limit
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 1062189)									
ES0911498-001	BH2A-22 0.00-0.50m	EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Carbophenothion	786-19-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Diazinon	333-41-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dichlorvos	62-73-7	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dimethoate	60-51-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Ethion	563-12-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenthion	55-38-9	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Malathion	121-75-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Azinphos Methyl	86-50-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion	56-38-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Prothiofos	34643-46-4	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	<10.0	0.0	No Limit
EP131A: Organochlorine Pesticides (QC Lot: 1062190)									
ES0911498-001	BH2A-22 0.00-0.50m	EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	<0.25	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP131A: Organochlorine Pesticides (QC Lot: 1062190) - continued									
ES0911498-001	BH2A-22 0.00-0.50m	EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDE	72-55-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: DDT (total)	----	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
EP131B: Polychlorinated Biphenyls (as Aroclors) (QC Lot: 1062191)									
ES0911498-001	BH2A-22 0.00-0.50m	EP131B: Total Polychlorinated biphenyls	----	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1016	12974-11-2	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1221	11104-28-2	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1232	11141-16-5	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1242	53469-21-9	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1248	12672-29-6	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1254	11097-69-1	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1260	11096-82-5	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1062026)									
ES0911498-001	BH2A-22 0.00-0.50m	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	7	5	23.4	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<5	<5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1062026) - continued									
ES0911498-001	BH2A-22 0.00-0.50m	EP132B-SD: Chrysene	218-01-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	7	5	23.4	No Limit
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	0.0	No Limit
ES0911551-005	Anonymous	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	5	5	0.0	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	74	70	5.3	0% - 50%
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	78	75	5.0	0% - 50%
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	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: **SOIL**

				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
EG005-SD: Total Metals in Sediments by ICP-AES (QCLot: 1065394)								
EG005-SD: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005-SD: Iron	7439-89-6	50	mg/kg	<50	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 1062004)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.1 mg/kg	111	90.1	124
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.76 mg/kg	# 111	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	60.9 mg/kg	108	89.2	117
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	24.5 mg/kg	102	70	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.7 mg/kg	111	90.1	114
EG005T: Iron	7439-89-6	50	mg/kg	<50	----	----	----	----
EG005T: Lead	7439-92-1	5	mg/kg	<5	55.2 mg/kg	108	85.2	111
EG005T: Manganese	7439-96-5	5	mg/kg	<5	----	----	----	----
EG005T: Nickel	7440-02-0	2	mg/kg	<2	54.8 mg/kg	108	88.3	116
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	----	----	----	----
EG005T: Zinc	7440-66-6	5	mg/kg	<5	104 mg/kg	108	88.9	112
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1065393)								
EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	----	----	----	----
EG020-SD: Arsenic	7440-38-2	1.0	mg/kg	<1.00	13.1 mg/kg	106	70	130
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	2.76 mg/kg	99.6	70	130
EG020-SD: Chromium	7440-47-3	1.0	mg/kg	<1.0	60.9 mg/kg	88.9	70	130
EG020-SD: Copper	7440-50-8	1.0	mg/kg	<1.0	54.7 mg/kg	100	70	130
EG020-SD: Cobalt	7440-48-4	10	mg/kg	<10.0	24.5 mg/kg	101	70	130
EG020-SD: Lead	7439-92-1	1.0	mg/kg	<1.0	54.8 mg/kg	90.7	70	130
EG020-SD: Manganese	7439-96-5	10	mg/kg	<10	136 mg/kg	97.8	70	130
EG020-SD: Nickel	7440-02-0	1.0	mg/kg	<1.0	55.2 mg/kg	104	70	130
EG020-SD: Selenium	7782-49-2	0.1	mg/kg	<0.1	----	----	----	----
EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	5.6 mg/kg	95.1	70	130
EG020-SD: Vanadium	7440-62-2	2	mg/kg	<2.0	34 mg/kg	102	70	130
EG020-SD: Zinc	7440-66-6	1.0	mg/kg	<1.0	104 mg/kg	101	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1062005)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	1.4 mg/kg	83.7	67	118

Sub-Matrix: **SOIL**

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
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1065392)								
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.090 mg/kg	93.4	74.2	126
EP005: Total Organic Carbon (TOC) (QCLot: 1065073)								
EP005: Total Organic Carbon	----	0.02	%	<0.02	100 %	97.7	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1061666)								
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	26 mg/kg	80.6	68.4	128
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1062027)								
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	5 mg/kg	106	75.2	116
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	5 mg/kg	91.0	75.3	113
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	5 mg/kg	81.0	72.6	117
EP080-SD: BTEX (QCLot: 1061666)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	83.6	67.5	125
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	1 mg/kg	71.2	69	122
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	1 mg/kg	78.8	65.3	126
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	2 mg/kg	81.9	66.5	124
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	1 mg/kg	81.1	66.7	123
EP090: Organotin Compounds (QCLot: 1062995)								
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	12.5 µgSn/kg	79.4	28	129
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1062189)								
EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	50 µg/kg	108	36.9	142
EP130: Carbophenothion	786-19-6	10	µg/kg	<10	50 µg/kg	83.1	0.5	157
EP130: Chlorfenvinphos (E)	470-90-6	10	µg/kg	<10.0	5 µg/kg	122	50.3	137
EP130: Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	50 µg/kg	94.5	55.9	152
EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	50 µg/kg	89.1	49	140
EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	50 µg/kg	94.5	28.1	142
EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	50 µg/kg	63.7	36.6	172
EP130: Diazinon	333-41-5	10	µg/kg	<10	50 µg/kg	104	37.2	148
EP130: Dichlorvos	62-73-7	10	µg/kg	<10	50 µg/kg	70.1	32.7	153
EP130: Dimethoate	60-51-5	10	µg/kg	<10	50 µg/kg	81.8	33.2	150
EP130: Ethion	563-12-2	10	µg/kg	<10	50 µg/kg	112	44	146
EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	50 µg/kg	92.2	3.08	162
EP130: Fenthion	55-38-9	10	µg/kg	<10	50 µg/kg	104	10.6	157
EP130: Malathion	121-75-5	10	µg/kg	<10	50 µg/kg	92.9	38.1	143
EP130: Azinphos Methyl	86-50-0	10	µg/kg	<10	50 µg/kg	118	8.13	159
EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	50 µg/kg	66.7	19.7	176
EP130: Parathion	56-38-2	10	µg/kg	<10	50 µg/kg	102	39.2	145
EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	50 µg/kg	82.6	23.5	152
EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	50 µg/kg	105	47.1	141

Sub-Matrix: **SOIL**

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
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1062189) - continued								
EP130: Prothiofos	34643-46-4	10	µg/kg	<10	50 µg/kg	110	36.1	148
EP131A: Organochlorine Pesticides (QCLot: 1062190)								
EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	5 µg/kg	126	31.7	140
EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	5 µg/kg	104	24.5	150
EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	5 µg/kg	92.7	36.9	139
EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	5 µg/kg	109	38.2	137
EP131A: 4.4`-DDD	72-54-8	0.5	µg/kg	<0.50	5 µg/kg	84.0	42.5	141
EP131A: 4.4`-DDE	72-55-9	0.5	µg/kg	<0.50	5 µg/kg	115	34.8	140
EP131A: 4.4`-DDT	50-29-3	0.5	µg/kg	<0.50	5 µg/kg	118	38	143
EP131A: DDT (total)	----	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	5 µg/kg	132	43.2	134
EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	5 µg/kg	103	23.7	139
EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	5 µg/kg	135	35.8	138
EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	5 µg/kg	128	7.45	158
EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	5 µg/kg	97.8	21.6	162
EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	5 µg/kg	97.9	19.3	131
EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	5 µg/kg	101	17.9	141
EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	5 µg/kg	93.2	31	153
EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	5 µg/kg	132	34.3	138
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	5 µg/kg	109	18.6	146
EP131A: gamma-BHC	58-89-9	0.5	µg/kg	<0.50	5 µg/kg	136	30.7	145
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	5 µg/kg	111	15	157
EP131A: cis-Chlordane	5103-71-9	0.5	µg/kg	<0.50	5 µg/kg	108	22.3	145
EP131A: trans-Chlordane	5103-74-2	0.5	µg/kg	<0.50	5 µg/kg	113	42.4	139
EP131A: Total Chlordane (sum)	----	0.5	µg/kg	<0.50	----	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 1062191)								
EP131B: Total Polychlorinated biphenyls	----	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1016	12974-11-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1221	11104-28-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1232	11141-16-5	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1242	53469-21-9	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1248	12672-29-6	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1254	11097-69-1	5	µg/kg	<5.0	50 µg/kg	90.5	61.3	121
EP131B: Aroclor 1260	11096-82-5	5	µg/kg	<5.0	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1062026)								
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	112	----	----
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	25 µg/kg	106	----	----
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	104	----	----

Sub-Matrix: **SOIL**

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
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1062026) - continued								
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	109	----	----
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	110	----	----
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	115	----	----
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	107	----	----
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	113	----	----
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	112	----	----
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	118	----	----
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	123	----	----
EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	25 µg/kg	125	----	----
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	126	----	----
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	25 µg/kg	123	----	----
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	118	----	----
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	25 µg/kg	120	----	----
EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	114	----	----
EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	119	----	----
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	118	----	----
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	25 µg/kg	106	----	----
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----

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: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1062004)							
ES0911394-048	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	102	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	102	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	100	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	110	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	105	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	100	70	130
		EG005T: Selenium	7782-49-2	50 mg/kg	101	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	101	70	130
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1065393)							
ES0911551-001	Anonymous	EG020-SD: Arsenic	7440-38-2	50 mg/kg	99.0	70	130
		EG020-SD: Cadmium	7440-43-9	50 mg/kg	98.6	70	130
		EG020-SD: Chromium	7440-47-3	50 mg/kg	84.5	70	130
		EG020-SD: Copper	7440-50-8	250 mg/kg	95.5	70	130
		EG020-SD: Lead	7439-92-1	250 mg/kg	87.3	70	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	103	70	130
		EG020-SD: Zinc	7440-66-6	250 mg/kg	91.4	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1062005)							
ES0911394-048	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	87.5	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1065392)							
ES0911551-001	Anonymous	EG035T-LL: Mercury	7439-97-6	0.50 mg/kg	74.3	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1061666)							
ES0911498-001	BH2A-22 0.00-0.50m	EP080-SD: C6 - C9 Fraction	----	26 mg/kg	# 45.1	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1062027)							
ES0911498-001	BH2A-22 0.00-0.50m	EP071-SD: C10 - C14 Fraction	----	19.75 mg/kg	80.8	70	130
		EP071-SD: C15 - C28 Fraction	----	87.25 mg/kg	74.3	70	130
		EP071-SD: C29 - C36 Fraction	----	60 mg/kg	89.7	70	130
EP080-SD: BTEX (QCLot: 1061666)							
ES0911498-001	BH2A-22 0.00-0.50m	EP080-SD: Benzene	71-43-2	2.5 mg/kg	# 25.4	70	130
		EP080-SD: Toluene	108-88-3	2.5 mg/kg	# 34.2	70	130
		EP080-SD: Ethylbenzene	100-41-4	2.5 mg/kg	# 25.6	70	130
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	# 26.5	70	130
		EP080-SD: ortho-Xylene	95-47-6	2.5 mg/kg	# 28.3	70	130
EP090: Organotin Compounds (QCLot: 1062995)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP090: Organotin Compounds (QCLot: 1062995) - continued							
ES0911498-002	BH2A-22 0.50-1.00m	EP090: Tributyltin	56573-85-4	12.5 µgSn/kg	45.2	20	130
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1062189)							
ES0911498-001	BH2A-22 0.00-0.50m	EP130: Bromophos-ethyl	4824-78-6	50 µg/kg	79.9	36.9	142
		EP130: Carbophenothion	786-19-6	50 µg/kg	75.3	0.5	157
		EP130: Chlorfenvinphos (E)	470-90-6	5 µg/kg	100	50.3	137
		EP130: Chlorfenvinphos (Z)	470-90-8	50 µg/kg	76.7	55.9	152
		EP130: Chlorpyrifos	2921-88-2	50 µg/kg	69.2	49	140
		EP130: Chlorpyrifos-methyl	5598-13-0	50 µg/kg	68.7	28.1	142
		EP130: Demeton-S-methyl	919-86-8	50 µg/kg	78.8	36.6	172
		EP130: Diazinon	333-41-5	50 µg/kg	75.4	37.2	148
		EP130: Dichlorvos	62-73-7	50 µg/kg	66.1	32.7	153
		EP130: Dimethoate	60-51-5	50 µg/kg	77.5	33.2	150
		EP130: Ethion	563-12-2	50 µg/kg	93.1	44	146
		EP130: Fenamiphos	22224-92-6	50 µg/kg	87.8	3.08	162
		EP130: Fenthion	55-38-9	50 µg/kg	75.6	10.6	157
		EP130: Malathion	121-75-5	50 µg/kg	69.6	38.1	143
		EP130: Azinphos Methyl	86-50-0	50 µg/kg	95.2	8.13	159
		EP130: Monocrotophos	6923-22-4	50 µg/kg	121	19.7	176
		EP130: Parathion	56-38-2	50 µg/kg	86.2	39.2	145
		EP130: Parathion-methyl	298-00-0	50 µg/kg	66.9	23.5	152
		EP130: Pirimphos-ethyl	23505-41-1	50 µg/kg	77.6	47.1	141
		EP130: Prothiofos	34643-46-4	50 µg/kg	81.6	36.1	148
EP131A: Organochlorine Pesticides (QCLot: 1062190)							
ES0911498-001	BH2A-22 0.00-0.50m	EP131A: Aldrin	309-00-2	5 µg/kg	67.9	31.7	140
		EP131A: alpha-BHC	319-84-6	5 µg/kg	71.4	24.5	150
		EP131A: beta-BHC	319-85-7	5 µg/kg	116	36.9	139
		EP131A: delta-BHC	319-86-8	5 µg/kg	84.9	38.2	137
		EP131A: 4.4`-DDD	72-54-8	5 µg/kg	112	42.5	141
		EP131A: 4.4`-DDE	72-55-9	5 µg/kg	76.5	34.8	140
		EP131A: 4.4`-DDT	50-29-3	5 µg/kg	94.7	38	143
		EP131A: Dieldrin	60-57-1	5 µg/kg	83.9	43.2	134
		EP131A: alpha-Endosulfan	959-98-8	5 µg/kg	82.9	23.7	139
		EP131A: beta-Endosulfan	33213-65-9	5 µg/kg	100	35.8	138
		EP131A: Endosulfan sulfate	1031-07-8	5 µg/kg	96.9	7.45	158
		EP131A: Endrin	72-20-8	5 µg/kg	126	21.6	162
		EP131A: Endrin aldehyde	7421-93-4	5 µg/kg	67.2	19.3	131
		EP131A: Endrin ketone	53494-70-5	5 µg/kg	80.0	17.9	141
		EP131A: Heptachlor	76-44-8	5 µg/kg	73.3	31	153

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Spike Recovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP131A: Organochlorine Pesticides (QCLot: 1062190) - continued							
ES0911498-001	BH2A-22 0.00-0.50m	EP131A: Heptachlor epoxide	1024-57-3	5 µg/kg	75.0	34.3	138
		EP131A: Hexachlorobenzene (HCB)	118-74-1	5 µg/kg	93.8	18.6	146
		EP131A: gamma-BHC	58-89-9	5 µg/kg	58.9	30.7	145
		EP131A: Methoxychlor	72-43-5	5 µg/kg	92.9	15	157
		EP131A: cis-Chlordane	5103-71-9	5 µg/kg	85.7	22.3	145
		EP131A: trans-Chlordane	5103-74-2	5 µg/kg	81.3	42.4	139
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 1062191)							
ES0911498-001	BH2A-22 0.00-0.50m	EP131B: Aroclor 1254	11097-69-1	50 µg/kg	67.5	61.3	121
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1062026)							
ES0911498-001	BH2A-22 0.00-0.50m	EP132B-SD: Naphthalene	91-20-3	25 µg/kg	102	70	130
		EP132B-SD: 2-Methylnaphthalene	91-57-6	25 µg/kg	106	70	130
		EP132B-SD: Acenaphthylene	208-96-8	25 µg/kg	104	70	130
		EP132B-SD: Acenaphthene	83-32-9	25 µg/kg	97.7	70	130
		EP132B-SD: Fluorene	86-73-7	25 µg/kg	102	70	130
		EP132B-SD: Phenanthrene	85-01-8	25 µg/kg	108	70	130
		EP132B-SD: Anthracene	120-12-7	25 µg/kg	105	70	130
		EP132B-SD: Fluoranthene	206-44-0	25 µg/kg	101	70	130
		EP132B-SD: Pyrene	129-00-0	25 µg/kg	92.2	70	130
		EP132B-SD: Benz(a)anthracene	56-55-3	25 µg/kg	124	70	130
		EP132B-SD: Chrysene	218-01-9	25 µg/kg	120	70	130
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	25 µg/kg	120	70	130
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	25 µg/kg	117	70	130
		EP132B-SD: Benzo(e)pyrene	192-97-2	25 µg/kg	115	70	130
		EP132B-SD: Benzo(a)pyrene	50-32-8	25 µg/kg	119	70	130
		EP132B-SD: Perylene	198-55-0	25 µg/kg	118	70	130
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	25 µg/kg	120	70	130
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	25 µg/kg	118	70	130
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	25 µg/kg	119	70	130
		EP132B-SD: Coronene	191-07-1	25 µg/kg	117	70	130

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES0911498**	Page	: 1 of 13
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052 Gladstone Dredging	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: IW	Issue Date	: 14-AUG-2009
Site	: LAIRD POINT DREDGE STUDY - OPT		
		No. of samples received	: 6
Quote number	: BN/354/09 V2	No. of samples analysed	: 6

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*
Dianne Blane		Newcastle
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Matt Frost	Organic Instrument Chemist	Organics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Sarah Millington	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

- **EG005-SD:Poor precision was obtained for Iron on sample ES0911701#1 due to sample heterogeneity.**
- **EG005T:Poor precision was obtained for some elementson sample ES0911510#1 due to sample heterogeneity. Results have been confirmed by re-extraction and reanalysis.**
- **EG020-SD: Poor precision was obtained for some elements on sample ES0911701#1 due to sample heterogeneity.**
- **EP080-SD: Poor matrix spike recovery due to sample matrix interferences. Confirmed by re-extraction and re-analysis.**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-22 0.00-0.50m	BH2A-22 0.50-1.00m	BH2A-22 1.00-2.00m	BH2A-22 2.00-3.00m	BH2A-22 3.00-4.10m
				Client sampling date / time: 03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00
				ES0911498-001	ES0911498-002	ES0911498-003	ES0911498-004	ES0911498-005
EA150: Particle Sizing								
+75µm	----	1	%	17	3	2	1	16
+150µm	----	1	%	12	2	2	1	14
+300µm	----	1	%	9	2	1	1	8
+425µm	----	1	%	9	2	1	<1	8
+600µm	----	1	%	8	1	1	<1	7
+1180µm	----	1	%	7	1	1	<1	6
+2.36mm	----	1	%	5	<1	<1	<1	4
+4.75mm	----	1	%	4	<1	<1	<1	1
+9.5mm	----	1	%	2	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	56.4	48.8	45.4	42.8	43.6
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	37	57	56	57	46
Silt (2-60 µm)	----	1	%	45	40	41	39	37
Sand (0.06-2.00 mm)	----	1	%	13	3	3	4	13
Gravel (>2mm)	----	1	%	5	<1	<1	<1	4
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
EG005-SD: Total Metals in Sediments by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	14100	15300	----	----	----
Iron	7439-89-6	50	mg/kg	40200	27400	----	----	----
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	----	----	17900	17200	17400
Antimony	7440-36-0	5	mg/kg	----	----	<5	<5	<5
Arsenic	7440-38-2	5	mg/kg	----	----	15	12	12
Cadmium	7440-43-9	1	mg/kg	----	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	----	----	25	24	25
Cobalt	7440-48-4	2	mg/kg	----	----	13	12	14
Copper	7440-50-8	5	mg/kg	----	----	36	33	36
Iron	7439-89-6	50	mg/kg	----	----	29700	27900	23300
Lead	7439-92-1	5	mg/kg	----	----	11	10	12
Manganese	7439-96-5	5	mg/kg	----	----	277	474	340
Nickel	7440-02-0	2	mg/kg	----	----	13	12	13
Selenium	7782-49-2	5	mg/kg	----	----	<5	<5	<5
Silver	7440-22-4	2	mg/kg	----	----	<2	<2	<2

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-22 0.00-0.50m	BH2A-22 0.50-1.00m	BH2A-22 1.00-2.00m	BH2A-22 2.00-3.00m	BH2A-22 3.00-4.10m
				Client sampling date / time: 03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00
				ES0911498-001	ES0911498-002	ES0911498-003	ES0911498-004	ES0911498-005
EG005T: Total Metals by ICP-AES - Continued								
Vanadium	7440-62-2	5	mg/kg	----	----	**59**	**54**	**56**
Zinc	7440-66-6	5	mg/kg	----	----	**44**	**42**	**43**
EG020-SD: Total Metals in Sediments by ICPMS								
Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	----	----	----
Arsenic	7440-38-2	1.00	mg/kg	**30.9**	**12.3**	----	----	----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	----	----	----
Chromium	7440-47-3	1.0	mg/kg	**27.1**	**23.2**	----	----	----
Copper	7440-50-8	1.0	mg/kg	**24.6**	**30.0**	----	----	----
Cobalt	7440-48-4	0.5	mg/kg	**17.7**	**13.5**	----	----	----
Lead	7439-92-1	1.0	mg/kg	**12.5**	**10.9**	----	----	----
Manganese	7439-96-5	10	mg/kg	**335**	**380**	----	----	----
Nickel	7440-02-0	1.0	mg/kg	**14.8**	**13.0**	----	----	----
Selenium	7782-49-2	0.1	mg/kg	**1.0**	**0.8**	----	----	----
Silver	7440-22-4	0.1	mg/kg	<0.1	**0.2**	----	----	----
Vanadium	7440-62-2	2.0	mg/kg	**55.1**	**55.0**	----	----	----
Zinc	7440-66-6	1.0	mg/kg	**47.5**	**41.4**	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.01	mg/kg	**0.05**	**0.09**	----	----	----
Mercury	7439-97-6	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	0.02	%	**2.06**	**1.12**	**1.02**	**1.08**	**1.01**
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	3	mg/kg	<3	<3	<3	<3	<3
C10 - C14 Fraction	----	3	mg/kg	<3	<3	<3	<3	<3
C15 - C28 Fraction	----	3	mg/kg	**10**	**6**	**5**	**4**	**6**
C29 - C36 Fraction	----	5	mg/kg	**14**	**13**	**11**	**10**	**12**
EP080-SD: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EP090: Organotin Compounds								
Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	----	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-22 0.00-0.50m	BH2A-22 0.50-1.00m	BH2A-22 1.00-2.00m	BH2A-22 2.00-3.00m	BH2A-22 3.00-4.10m
				Client sampling date / time: 03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00
				ES0911498-001	ES0911498-002	ES0911498-003	ES0911498-004	ES0911498-005
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
Carbophenothion	786-19-6	10	µg/kg	<10	<10	<10	<10	<10
Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	<10.0	<10.0	<10.0	<10.0
Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	<10	<10	<10	<10
Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	<10	<10	<10
Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	<10	<10	<10
Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	<10	<10	<10
Diazinon	333-41-5	10	µg/kg	<10	<10	<10	<10	<10
Dichlorvos	62-73-7	10	µg/kg	<10	<10	<10	<10	<10
Dimethoate	60-51-5	10	µg/kg	<10	<10	<10	<10	<10
Ethion	563-12-2	10	µg/kg	<10	<10	<10	<10	<10
Fenamiphos	22224-92-6	10	µg/kg	<10	<10	<10	<10	<10
Fenthion	55-38-9	10	µg/kg	<10	<10	<10	<10	<10
Malathion	121-75-5	10	µg/kg	<10	<10	<10	<10	<10
Azinphos Methyl	86-50-0	10	µg/kg	<10	<10	<10	<10	<10
Monocrotophos	6923-22-4	10	µg/kg	<10	<10	<10	<10	<10
Parathion	56-38-2	10	µg/kg	<10	<10	<10	<10	<10
Parathion-methyl	298-00-0	10	µg/kg	<10	<10	<10	<10	<10
Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	<10	<10	<10
Prothiofos	34643-46-4	10	µg/kg	<10	<10	<10	<10	<10
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
4.4`-DDE	72-55-9	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
^ DDT (total)	----	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
^ Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-22 0.00-0.50m	BH2A-22 0.50-1.00m	BH2A-22 1.00-2.00m	BH2A-22 2.00-3.00m	BH2A-22 3.00-4.10m
				Client sampling date / time: 03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00
				ES0911498-001	ES0911498-002	ES0911498-003	ES0911498-004	ES0911498-005
EP131A: Organochlorine Pesticides - Continued								
Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
^ Total Chlordane (sum)	----	0.25	µg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
Oxychlordane	27304-13-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)								
^ Total Polychlorinated biphenyls	----	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Aroclor 1016	12974-11-2	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Aroclor 1221	11104-28-2	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Aroclor 1232	11141-16-5	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Aroclor 1242	53469-21-9	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Aroclor 1248	12672-29-6	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Aroclor 1254	11097-69-1	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Aroclor 1260	11096-82-5	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	<5.0
EP132B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	5	µg/kg	<5	<5	<5	<5	<5
2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	<5	<5	<5
Acenaphthylene	208-96-8	4	µg/kg	<5	<4	<4	<4	<4
Acenaphthene	83-32-9	4	µg/kg	<5	<4	<4	<4	<4
Fluorene	86-73-7	4	µg/kg	<5	<4	<4	<4	<4
Phenanthrene	85-01-8	4	µg/kg	<5	<4	<4	<4	<4
Anthracene	120-12-7	4	µg/kg	<5	<4	<4	<4	<4
Fluoranthene	206-44-0	4	µg/kg	<5	<4	<4	<4	<4
Pyrene	129-00-0	4	µg/kg	**7**	<4	<4	<4	<4
Benz(a)anthracene	56-55-3	4	µg/kg	<5	<4	<4	<4	<4
Chrysene	218-01-9	4	µg/kg	<5	<4	<4	<4	<4
Benzo(b)fluoranthene	205-99-2	4	µg/kg	<5	<4	<4	<4	<4
Benzo(k)fluoranthene	207-08-9	4	µg/kg	<5	<4	<4	<4	<4
Benzo(e)pyrene	192-97-2	4	µg/kg	<5	<4	<4	<4	<4
Benzo(a)pyrene	50-32-8	4	µg/kg	<5	<4	<4	<4	<4
Perylene	198-55-0	4	µg/kg	<5	**43**	**48**	**73**	**83**
Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<5	<4	<4	<4	<4
Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<5	<4	<4	<4	<4
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<5	<4	<4	<4	<4

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-22 0.00-0.50m	BH2A-22 0.50-1.00m	BH2A-22 1.00-2.00m	BH2A-22 2.00-3.00m	BH2A-22 3.00-4.10m
				Client sampling date / time: 03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00	03-AUG-2009 15:00
				ES0911498-001	ES0911498-002	ES0911498-003	ES0911498-004	ES0911498-005
EP132B: Polynuclear Aromatic Hydrocarbons - Continued								
Coronene	191-07-1	5	µg/kg	<5	<5	<5	<5	<5
^ Sum of PAHs	----	4	µg/kg	**7**	**43**	**48**	**73**	**83**
EP080-SD: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**96.0**	**110**	**102**	**121**	**97.0**
Toluene-D8	2037-26-5	0.1	%	**102**	**100**	**90.6**	**103**	**89.2**
4-Bromofluorobenzene	460-00-4	0.1	%	**98.6**	**104**	**97.3**	**109**	**89.8**
EP090S: Organotin Surrogate								
Tripropyltin	----	0.1	%	**59.5**	**67.4**	----	----	----
EP130S: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**84.6**	**67.1**	**77.0**	**75.3**	**73.0**
EP131S: OC Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**119**	**87.3**	**72.8**	**78.3**	**86.2**
EP131T: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**89.3**	**78.2**	**65.2**	**71.3**	**73.6**
EP132T: Base/Neutral Extractable Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**106**	**78.5**	**77.2**	**80.7**	**94.6**
Anthracene-d10	1719-06-8	0.1	%	**89.0**	**102**	**88.8**	**104**	**108**
4-Terphenyl-d14	1718-51-0	0.1	%	**85.6**	**105**	**84.4**	**101**	**106**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	BH2A-22 4.10-4.40m	----	----	----	----
			Client sampling date / time	03-AUG-2009 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES0911498-006	----	----	----	----
EA150: Particle Sizing								
+75µm	----	1	%	15	----	----	----	----
+150µm	----	1	%	13	----	----	----	----
+300µm	----	1	%	10	----	----	----	----
+425µm	----	1	%	10	----	----	----	----
+600µm	----	1	%	9	----	----	----	----
+1180µm	----	1	%	8	----	----	----	----
+2.36mm	----	1	%	7	----	----	----	----
+4.75mm	----	1	%	3	----	----	----	----
+9.5mm	----	1	%	<1	----	----	----	----
+19.0mm	----	1	%	<1	----	----	----	----
+37.5mm	----	1	%	<1	----	----	----	----
+75.0mm	----	1	%	<1	----	----	----	----
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	24.8	----	----	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	49	----	----	----	----
Silt (2-60 µm)	----	1	%	33	----	----	----	----
Sand (0.06-2.00 mm)	----	1	%	12	----	----	----	----
Gravel (>2mm)	----	1	%	6	----	----	----	----
Cobbles (>6cm)	----	1	%	<1	----	----	----	----
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	8560	----	----	----	----
Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	6	----	----	----	----
Cobalt	7440-48-4	2	mg/kg	2	----	----	----	----
Copper	7440-50-8	5	mg/kg	33	----	----	----	----
Iron	7439-89-6	50	mg/kg	3740	----	----	----	----
Lead	7439-92-1	5	mg/kg	12	----	----	----	----
Manganese	7439-96-5	5	mg/kg	16	----	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	----	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
Vanadium	7440-62-2	5	mg/kg	10	----	----	----	----
Zinc	7440-66-6	5	mg/kg	29	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-22 4.10-4.40m	----	----	----	----
				Client sampling date / time: 03-AUG-2009 15:00	----	----	----	----
				ES0911498-006	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS - Continued								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	0.02	%	**0.29**	----	----	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	3	mg/kg	<3	----	----	----	----
C10 - C14 Fraction	----	3	mg/kg	<3	----	----	----	----
C15 - C28 Fraction	----	3	mg/kg	<3	----	----	----	----
C29 - C36 Fraction	----	5	mg/kg	**5**	----	----	----	----
EP080-SD: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.2	mg/kg	<0.2	----	----	----	----
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	----	----	----	----
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	----	----	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Bromophos-ethyl	4824-78-6	10	µg/kg	<10	----	----	----	----
Carbophenothion	786-19-6	10	µg/kg	<10	----	----	----	----
Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	----	----	----	----
Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	----	----	----	----
Chlorpyrifos	2921-88-2	10	µg/kg	<10	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	----	----	----	----
Demeton-S-methyl	919-86-8	10	µg/kg	<10	----	----	----	----
Diazinon	333-41-5	10	µg/kg	<10	----	----	----	----
Dichlorvos	62-73-7	10	µg/kg	<10	----	----	----	----
Dimethoate	60-51-5	10	µg/kg	<10	----	----	----	----
Ethion	563-12-2	10	µg/kg	<10	----	----	----	----
Fenamiphos	22224-92-6	10	µg/kg	<10	----	----	----	----
Fenthion	55-38-9	10	µg/kg	<10	----	----	----	----
Malathion	121-75-5	10	µg/kg	<10	----	----	----	----
Azinphos Methyl	86-50-0	10	µg/kg	<10	----	----	----	----
Monocrotophos	6923-22-4	10	µg/kg	<10	----	----	----	----
Parathion	56-38-2	10	µg/kg	<10	----	----	----	----
Parathion-methyl	298-00-0	10	µg/kg	<10	----	----	----	----
Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	----	----	----	----
Prothiofos	34643-46-4	10	µg/kg	<10	----	----	----	----
EP131A: Organochlorine Pesticides								

Analytical Results

Sub-Matrix: SOIL	Client sample ID	BH2A-22 4.10-4.40m	----	----	----	----
	Client sampling date / time	03-AUG-2009 15:00	----	----	----	----
Compound / CAS Number / LOR / Unit		ES0911498-006	----	----	----	----
EP131A: Organochlorine Pesticides - Continued						
Aldrin 309-00-2	0.50 µg/kg	<0.50	----	----	----	----
alpha-BHC 319-84-6	0.50 µg/kg	<0.50	----	----	----	----
beta-BHC 319-85-7	0.50 µg/kg	<0.50	----	----	----	----
delta-BHC 319-86-8	0.50 µg/kg	<0.50	----	----	----	----
4.4`-DDD 72-54-8	0.50 µg/kg	<0.50	----	----	----	----
4.4`-DDE 72-55-9	0.50 µg/kg	<0.50	----	----	----	----
4.4`-DDT 50-29-3	0.50 µg/kg	<0.50	----	----	----	----
^ DDT (total) ----	0.50 µg/kg	<0.50	----	----	----	----
Dieldrin 60-57-1	0.50 µg/kg	<0.50	----	----	----	----
alpha-Endosulfan 959-98-8	0.50 µg/kg	<0.50	----	----	----	----
beta-Endosulfan 33213-65-9	0.50 µg/kg	<0.50	----	----	----	----
Endosulfan sulfate 1031-07-8	0.50 µg/kg	<0.50	----	----	----	----
^ Endosulfan (sum) 115-29-7	0.50 µg/kg	<0.50	----	----	----	----
Endrin 72-20-8	0.50 µg/kg	<0.50	----	----	----	----
Endrin aldehyde 7421-93-4	0.50 µg/kg	<0.50	----	----	----	----
Endrin ketone 53494-70-5	0.50 µg/kg	<0.50	----	----	----	----
Heptachlor 76-44-8	0.50 µg/kg	<0.50	----	----	----	----
Heptachlor epoxide 1024-57-3	0.50 µg/kg	<0.50	----	----	----	----
Hexachlorobenzene (HCB) 118-74-1	0.50 µg/kg	<0.50	----	----	----	----
gamma-BHC 58-89-9	0.25 µg/kg	<0.25	----	----	----	----
Methoxychlor 72-43-5	0.50 µg/kg	<0.50	----	----	----	----
cis-Chlordane 5103-71-9	0.25 µg/kg	<0.25	----	----	----	----
trans-Chlordane 5103-74-2	0.25 µg/kg	<0.25	----	----	----	----
^ Total Chlordane (sum) ----	0.25 µg/kg	<0.25	----	----	----	----
Oxychlordane 27304-13-8	0.50 µg/kg	<0.50	----	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors)						
^ Total Polychlorinated biphenyls ----	5.0 µg/kg	<5.0	----	----	----	----
Aroclor 1016 12974-11-2	5.0 µg/kg	<5.0	----	----	----	----
Aroclor 1221 11104-28-2	5.0 µg/kg	<5.0	----	----	----	----
Aroclor 1232 11141-16-5	5.0 µg/kg	<5.0	----	----	----	----
Aroclor 1242 53469-21-9	5.0 µg/kg	<5.0	----	----	----	----
Aroclor 1248 12672-29-6	5.0 µg/kg	<5.0	----	----	----	----
Aroclor 1254 11097-69-1	5.0 µg/kg	<5.0	----	----	----	----
Aroclor 1260 11096-82-5	5.0 µg/kg	<5.0	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons						
Naphthalene 91-20-3	5 µg/kg	<5	----	----	----	----
2-Methylnaphthalene 91-57-6	5 µg/kg	<5	----	----	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	BH2A-22 4.10-4.40m	----	----	----	----
			Client sampling date / time	03-AUG-2009 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES0911498-006	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthylene	208-96-8	4	µg/kg	<4	----	----	----	----
Acenaphthene	83-32-9	4	µg/kg	<4	----	----	----	----
Fluorene	86-73-7	4	µg/kg	<4	----	----	----	----
Phenanthrene	85-01-8	4	µg/kg	<4	----	----	----	----
Anthracene	120-12-7	4	µg/kg	<4	----	----	----	----
Fluoranthene	206-44-0	4	µg/kg	<4	----	----	----	----
Pyrene	129-00-0	4	µg/kg	<4	----	----	----	----
Benz(a)anthracene	56-55-3	4	µg/kg	<4	----	----	----	----
Chrysene	218-01-9	4	µg/kg	<4	----	----	----	----
Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	----	----	----	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	----	----	----	----
Benzo(e)pyrene	192-97-2	4	µg/kg	<4	----	----	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg	<4	----	----	----	----
Perylene	198-55-0	4	µg/kg	<4	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg	4	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	----	----	----	----
Coronene	191-07-1	5	µg/kg	<5	----	----	----	----
^ Sum of PAHs	----	4	µg/kg	4	----	----	----	----
EP080-SD: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	93.1	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	98.6	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	86.0	----	----	----	----
EP130S: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	69.8	----	----	----	----
EP131S: OC Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	65.9	----	----	----	----
EP131T: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	73.0	----	----	----	----
EP132T: Base/Neutral Extractable Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	94.3	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	104	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	104	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080-SD: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	74.7	127
Toluene-D8	2037-26-5	74.8	129
4-Bromofluorobenzene	460-00-4	75.3	127
EP090S: Organotin Surrogate			
Tripropyltin	----	34	108
EP130S: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	51.3	136.9
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	136
EP131T: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	10	164
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	30	115
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	18	137

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0911245**	Page	: 1 of 8
Client	: GOLDER ASSOCIATES	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: LAIRD POINT DREDGE STUDY-OPTIO		
C-O-C number	: ----	Date Samples Received	: 31-JUL-2009
Sampler	: IW	Issue Date	: 13-AUG-2009
Order number	: ----		
		No. of samples received	: 4
Quote number	: BN/354/09 V2	No. of samples analysed	: 4

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: **SOIL**

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
EA055: Moisture Content								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**----**	----	----	**03-AUG-2009**	05-AUG-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EA150: Particle Sizing								
Snap Lock Bag								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**---**	---	----	**03-AUG-2009**	25-JAN-2010	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EA150: Soil Classification based on Particle Size								
Snap Lock Bag								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**---**	---	----	**03-AUG-2009**	25-JAN-2010	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EG005-SD: Total Metals in Sediments by ICP-AES								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m	**29-JUL-2009**	**05-AUG-2009**	26-AUG-2009	✓	**05-AUG-2009**	25-JAN-2010	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m	**29-JUL-2009**	**04-AUG-2009**	26-AUG-2009	✓	**05-AUG-2009**	25-JAN-2010	✓
EG020-SD: Total Metals in Sediments by ICPMS								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m	**29-JUL-2009**	**05-AUG-2009**	26-AUG-2009	✓	**05-AUG-2009**	25-JAN-2010	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m	**29-JUL-2009**	**04-AUG-2009**	26-AUG-2009	✓	**05-AUG-2009**	26-AUG-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m	**29-JUL-2009**	**05-AUG-2009**	26-AUG-2009	✓	**06-AUG-2009**	26-AUG-2009	✓
EP005: Total Organic Carbon (TOC)								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**06-AUG-2009**	26-AUG-2009	✓	**06-AUG-2009**	26-AUG-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							

Matrix: **SOIL**

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
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**03-AUG-2009**	12-AUG-2009	✓	**03-AUG-2009**	12-AUG-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**04-AUG-2009**	12-AUG-2009	✓	**06-AUG-2009**	13-SEP-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EP080-SD: BTEX								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**03-AUG-2009**	12-AUG-2009	✓	**03-AUG-2009**	12-AUG-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EP090: Organotin Compounds								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**04-AUG-2009**	12-AUG-2009	✓	**04-AUG-2009**	13-SEP-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**04-AUG-2009**	12-AUG-2009	✓	**06-AUG-2009**	13-SEP-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EP131A: Organochlorine Pesticides								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**04-AUG-2009**	12-AUG-2009	✓	**06-AUG-2009**	13-SEP-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EP131B: Polychlorinated Biphenyls (as Aroclors)								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**04-AUG-2009**	12-AUG-2009	✓	**06-AUG-2009**	13-SEP-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							
EP132B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved								
BH2A-16 - 0.00-0.10m,	BH2A-16 - 0.10-0.60m,	**29-JUL-2009**	**04-AUG-2009**	12-AUG-2009	✓	**06-AUG-2009**	13-SEP-2009	✓
BH2A-16 - 0.60-1.10m,	BH2A-16 - 1.10-2.10m							

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: **SOIL**

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)							
Moisture Content	EA055-103	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	2	**50.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	4	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	2	**50.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **SOIL**

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							
Total Mercury by FIMS (Low Level)	EG035T-LL	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	4	**25.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
Organotin Analysis	EP090	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	4	**25.0**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	4	**25.0**	**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
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (1999) Schedule B(3) (Method 102)
Particle Size Analysis (Sieving)	EA150	SOIL	Particle Size Analysis by Sieving according to AS1289.3.6.1 - 1995
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Total Fe and Al in Sediments by ICPAES	EG005-SD	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3). LORs per NODG
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	(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. Analyte list and LORs per NODG.
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Organic Carbon	EP005	SOIL	In-house. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
TPH - Semivolatile Fraction	EP071-SD	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 504)
TPH Volatiles/BTEX in Sediments	EP080-SD	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

Analytical Methods	Method	Matrix	Method Descriptions
Organotin Analysis	EP090	SOIL	(USEPA SW 846 - 8270D) Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quanitified against an established calibration curve.
Organophosphorus Pesticides (Ultra-trace)	EP130	SOIL	USEPA Method 3640 (GPC cleanup), 8141 (GC/FPD - Capillary Column) This technique is compliant with NEPM (1999) Schedule B(3) (Method 505)
Organochlorine Pesticides (Ultra-trace)	EP131A	SOIL	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504)
PCB's (Ultra-trace)	EP131B	SOIL	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504)
PAHs in Sediments by GCMS(SIM)	EP132B-SD	SOIL	8270 GCMS Capillary column, SIM mode using large volume programmed temperature vaporisation injection.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids/ Sample Cleanup	ORG17A-UTP	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. Samples are extracted, concentrated (by KD) and exchanged into an appropriate solvent for GPC and florisil cleanup as required.
Tumbler Extraction of Solids for LVI (Non-concentrating)	ORG17D	SOIL	In house: 10g of sample, Na2SO4 and surrogate are extracted with 50mL 1:1 DCM/Acetone by end over end tumbling. An aliquot is concentrated by nitrogen blowdown to a reduced volume for analysis if required.
Organotin Sample Preparation	ORG35	SOIL	In house. 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.

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: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EG005T: Total Metals by ICP-AES	1217777-002	----	**Cadmium**	7440-43-9	112 %	83.3-111%	**Recovery greater than upper control limit**
EG005T: Total Metals by ICP-AES	1217777-002	----	**Zinc**	7440-66-6	113 %	81.9-112%	**Recovery greater than upper control limit**

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

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **ES0911245**	Page	: 1 of 13
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: LAIRD POINT DREDGE STUDY-OPTIO		
C-O-C number	: ----	Date Samples Received	: 31-JUL-2009
Sampler	: IW	Issue Date	: 13-AUG-2009
Order number	: ----		
		No. of samples received	: 4
Quote number	: BN/354/09 V2	No. of samples analysed	: 4

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*
Dianne Blane		Newcastle
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Matt Frost	Organic Instrument Chemist	Organics
Phyu Phyu Lwin	Inorganic Chemist	Inorganics
Sanjeshni Jyoti Mala	Senior Chemist Volatile	Organics
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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 1057599)									
ES0911168-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	38.0	38.3	0.8	0% - 20%
ES0911287-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	22.8	21.9	3.9	0% - 20%
EG005-SD: Total Metals in Sediments by ICP-AES (QC Lot: 1059443)									
ES0911245-001	BH2A-16 0.00-0.10m	EG005-SD: Aluminium	7429-90-5	50	mg/kg	16900	16400	3.1	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	30700	30400	1.0	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1058808)									
ES0911245-003	BH2A-16 0.60-1.10m	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	11	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	4	5	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	3	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	42	30	30.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	6	<5	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	158	186	16.6	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	88	71	21.2	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	17	15	13.1	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	10600	10600	0.1	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	10900	10500	3.8	0% - 20%
ES0911367-007	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	19	20	5.9	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	2	2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	6	6	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	8	8	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	19	18	5.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	30	32	4.8	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	176	183	3.7	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	44	49	11.3	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	36	48	28.1	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	14000	14600	3.8	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1058808) - continued									
ES0911367-007	Anonymous	EG005T: Iron	7439-89-6	50	mg/kg	27100	30000	10.2	0% - 20%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 1059442)									
ES0911245-001	BH2A-16 0.00-0.10m	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Selenium	7782-49-2	0.1	mg/kg	1.4	1.6	15.3	0% - 50%
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	13.8	15.2	9.9	0% - 20%
		EG020-SD: Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	0.0	No Limit
		EG020-SD: Chromium	7440-47-3	1.0	mg/kg	28.5	30.6	7.0	0% - 20%
		EG020-SD: Copper	7440-50-8	1.0	mg/kg	24.6	26.8	8.5	0% - 20%
		EG020-SD: Lead	7439-92-1	1.0	mg/kg	11.4	12.1	6.2	0% - 50%
		EG020-SD: Nickel	7440-02-0	1.0	mg/kg	14.9	16.2	8.3	0% - 50%
		EG020-SD: Zinc	7440-66-6	1.0	mg/kg	45.4	47.6	4.8	0% - 20%
		EG020-SD: Arsenic	7440-38-2	1.00	mg/kg	17.6	19.1	8.2	0% - 50%
		EG020-SD: Manganese	7439-96-5	10	mg/kg	192	202	5.0	0% - 20%
		EG020-SD: Vanadium	7440-62-2	2.0	mg/kg	59.7	66.4	10.7	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1058809)									
ES0911245-003	BH2A-16 0.60-1.10m	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	<0.1	88.5	No Limit
ES0911367-007	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1059441)									
ES0911245-001	BH2A-16 0.00-0.10m	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.04	0.04	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 1061262)									
ES0911245-001	BH2A-16 0.00-0.10m	EP005: Total Organic Carbon	----	0.02	%	2.44	2.40	1.6	0% - 20%
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1057558)									
ES0911245-001	BH2A-16 0.00-0.10m	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1057670)									
ES0911245-001	BH2A-16 0.00-0.10m	EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
		EP071-SD: C15 - C28 Fraction	----	3	mg/kg	33	27	20.1	No Limit
		EP071-SD: C29 - C36 Fraction	----	5	mg/kg	52	42	19.8	No Limit
EP080-SD: BTEX (QC Lot: 1057558)									
ES0911245-001	BH2A-16 0.00-0.10m	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP090: Organotin Compounds (QC Lot: 1057534)									
ES0911245-001	BH2A-16 0.00-0.10m	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	0.0	No Limit
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 1058478)									
ES0911245-003	BH2A-16 0.60-1.10m	EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 1058478) - continued									
ES0911245-003	BH2A-16 0.60-1.10m	EP130: Carbophenothion	786-19-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Diazinon	333-41-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dichlorvos	62-73-7	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dimethoate	60-51-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Ethion	563-12-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenthion	55-38-9	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Malathion	121-75-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Azinphos Methyl	86-50-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion	56-38-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Prothiofos	34643-46-4	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	<10.0	0.0	No Limit
EP131A: Organochlorine Pesticides (QC Lot: 1058479)									
ES0911245-003	BH2A-16 0.60-1.10m	EP131A: Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDE	72-55-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: DDT (total)	----	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP131A: Organochlorine Pesticides (QC Lot: 1058479) - continued									
ES0911245-003	BH2A-16 0.60-1.10m	EP131A: gamma-BHC	58-89-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: cis-Chlordane	5103-71-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: trans-Chlordane	5103-74-2	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Total Chlordane (sum)	----	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
EP131B: Polychlorinated Biphenyls (as Aroclors) (QC Lot: 1058480)									
ES0911245-003	BH2A-16 0.60-1.10m	EP131B: Total Polychlorinated biphenyls	----	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1016	12974-11-2	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1221	11104-28-2	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1232	11141-16-5	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1242	53469-21-9	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1248	12672-29-6	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1254	11097-69-1	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1260	11096-82-5	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1057669)									
ES0911245-001	BH2A-16 0.00-0.10m	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	4	6	28.1	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	4	6	29.1	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	4	0.0	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	9	16	59.0	No Limit
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	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: **SOIL**

				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
EG005-SD: Total Metals in Sediments by ICP-AES (QCLot: 1059443)								
EG005-SD: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005-SD: Iron	7439-89-6	50	mg/kg	<50	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 1058808)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.1 mg/kg	113	90.1	124
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.76 mg/kg	# 112	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	60.9 mg/kg	108	89.2	117
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	----	----	----	----
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.7 mg/kg	110	90.1	114
EG005T: Iron	7439-89-6	50	mg/kg	<50	----	----	----	----
EG005T: Lead	7439-92-1	5	mg/kg	<5	55.2 mg/kg	107	85.2	111
EG005T: Manganese	7439-96-5	5	mg/kg	<5	----	----	----	----
EG005T: Nickel	7440-02-0	2	mg/kg	<2	54.8 mg/kg	106	88.3	116
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	----	----	----	----
EG005T: Zinc	7440-66-6	5	mg/kg	<5	104 mg/kg	# 113	81.9	112
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1059442)								
EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	----	----	----	----
EG020-SD: Arsenic	7440-38-2	1.0	mg/kg	<1.00	13.1 mg/kg	111	70	130
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	2.76 mg/kg	102	70	130
EG020-SD: Chromium	7440-47-3	1.0	mg/kg	<1.0	60.9 mg/kg	110	70	130
EG020-SD: Copper	7440-50-8	1.0	mg/kg	<1.0	54.7 mg/kg	103	70	130
EG020-SD: Cobalt	7440-48-4	10	mg/kg	<10.0	24.5 mg/kg	107	70	130
EG020-SD: Lead	7439-92-1	1.0	mg/kg	<1.0	54.8 mg/kg	95.6	70	130
EG020-SD: Manganese	7439-96-5	10	mg/kg	<10	136 mg/kg	95.9	70	130
EG020-SD: Nickel	7440-02-0	1.0	mg/kg	<1.0	55.2 mg/kg	110	70	130
EG020-SD: Selenium	7782-49-2	0.1	mg/kg	<0.1	----	----	----	----
EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	5.6 mg/kg	103	70	130
EG020-SD: Vanadium	7440-62-2	2	mg/kg	<2.0	34 mg/kg	111	70	130
EG020-SD: Zinc	7440-66-6	1.0	mg/kg	<1.0	104 mg/kg	100	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1058809)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	1.4 mg/kg	88.5	67	118

Sub-Matrix: **SOIL**

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
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1059441)								
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.090 mg/kg	85.5	74.2	126
EP005: Total Organic Carbon (TOC) (QCLot: 1061262)								
EP005: Total Organic Carbon	----	0.02	%	<0.02	100 %	101	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1057558)								
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	26 mg/kg	91.5	68.4	128
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1057670)								
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	5 mg/kg	105	75.2	116
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	5 mg/kg	101	75.3	113
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	5 mg/kg	94.0	72.6	117
EP080-SD: BTEX (QCLot: 1057558)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	77.4	67.5	125
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	1 mg/kg	84.4	69	122
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	1 mg/kg	75.0	65.3	126
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	2 mg/kg	77.2	66.5	124
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	1 mg/kg	76.4	66.7	123
EP090: Organotin Compounds (QCLot: 1057534)								
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	12.5 µgSn/kg	55.8	28	129
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1058478)								
EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	50 µg/kg	106	36.9	142
EP130: Carbophenothion	786-19-6	10	µg/kg	<10	50 µg/kg	90.2	0.5	157
EP130: Chlorfenvinphos (E)	470-90-6	10	µg/kg	<10.0	5 µg/kg	132	50.3	137
EP130: Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	50 µg/kg	108	55.9	152
EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	50 µg/kg	124	49	140
EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	50 µg/kg	125	28.1	142
EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	50 µg/kg	74.4	36.6	172
EP130: Diazinon	333-41-5	10	µg/kg	<10	50 µg/kg	119	37.2	148
EP130: Dichlorvos	62-73-7	10	µg/kg	<10	50 µg/kg	65.4	32.7	153
EP130: Dimethoate	60-51-5	10	µg/kg	<10	50 µg/kg	97.1	33.2	150
EP130: Ethion	563-12-2	10	µg/kg	<10	50 µg/kg	108	44	146
EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	50 µg/kg	107	3.08	162
EP130: Fenthion	55-38-9	10	µg/kg	<10	50 µg/kg	100	10.6	157
EP130: Malathion	121-75-5	10	µg/kg	<10	50 µg/kg	109	38.1	143
EP130: Azinphos Methyl	86-50-0	10	µg/kg	<10	50 µg/kg	68.9	8.13	159
EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	50 µg/kg	56.2	19.7	176
EP130: Parathion	56-38-2	10	µg/kg	<10	50 µg/kg	107	39.2	145
EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	50 µg/kg	106	23.5	152
EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	50 µg/kg	103	47.1	141

Sub-Matrix: **SOIL**

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
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1058478) - continued								
EP130: Prothiofos	34643-46-4	10	µg/kg	<10	50 µg/kg	118	36.1	148
EP131A: Organochlorine Pesticides (QCLot: 1058479)								
EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	5 µg/kg	92.2	31.7	140
EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	5 µg/kg	101	24.5	150
EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	5 µg/kg	134	36.9	139
EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	5 µg/kg	96.6	38.2	137
EP131A: 4.4`-DDD	72-54-8	0.5	µg/kg	<0.50	5 µg/kg	90.0	42.5	141
EP131A: 4.4`-DDE	72-55-9	0.5	µg/kg	<0.50	5 µg/kg	88.0	34.8	140
EP131A: 4.4`-DDT	50-29-3	0.5	µg/kg	<0.50	5 µg/kg	86.9	38	143
EP131A: DDT (total)	----	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	5 µg/kg	83.7	43.2	134
EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	5 µg/kg	69.8	23.7	139
EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	5 µg/kg	91.2	35.8	138
EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	5 µg/kg	91.2	7.45	158
EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	5 µg/kg	124	21.6	162
EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	5 µg/kg	49.8	19.3	131
EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	5 µg/kg	68.9	17.9	141
EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	5 µg/kg	98.0	31	153
EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	5 µg/kg	85.0	34.3	138
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	5 µg/kg	121	18.6	146
EP131A: gamma-BHC	58-89-9	0.5	µg/kg	<0.50	5 µg/kg	101	30.7	145
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	5 µg/kg	85.0	15	157
EP131A: cis-Chlordane	5103-71-9	0.5	µg/kg	<0.50	5 µg/kg	76.6	22.3	145
EP131A: trans-Chlordane	5103-74-2	0.5	µg/kg	<0.50	5 µg/kg	68.0	42.4	139
EP131A: Total Chlordane (sum)	----	0.5	µg/kg	<0.50	----	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 1058480)								
EP131B: Total Polychlorinated biphenyls	----	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1016	12974-11-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1221	11104-28-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1232	11141-16-5	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1242	53469-21-9	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1248	12672-29-6	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1254	11097-69-1	5	µg/kg	<5.0	50 µg/kg	66.0	61.3	121
EP131B: Aroclor 1260	11096-82-5	5	µg/kg	<5.0	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1057669)								
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	112	----	----
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	25 µg/kg	105	----	----
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	95.8	----	----

Sub-Matrix: **SOIL**

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
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1057669) - continued								
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	101	----	----
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	96.4	----	----
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	113	----	----
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	110	----	----
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	124	----	----
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	126	----	----
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	101	----	----
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	120	----	----
EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	25 µg/kg	96.5	----	----
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	90.1	----	----
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	25 µg/kg	94.4	----	----
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	87.7	----	----
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	25 µg/kg	112	----	----
EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	109	----	----
EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	90.3	----	----
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	89.1	----	----
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	25 µg/kg	118	----	----
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----

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: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1058808)							
ES0911245-003	BH2A-16 0.60-1.10m	EG005T: Arsenic	7440-38-2	50 mg/kg	75.8	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	101	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	97.6	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	105	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	105	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	98.6	70	130
		EG005T: Selenium	7782-49-2	50 mg/kg	88.5	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	106	70	130
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1059442)							
ES0911281-016	Anonymous	EG020-SD: Arsenic	7440-38-2	50 mg/kg	96.6	70	130
		EG020-SD: Cadmium	7440-43-9	50 mg/kg	98.0	70	130
		EG020-SD: Chromium	7440-47-3	50 mg/kg	94.1	70	130
		EG020-SD: Copper	7440-50-8	250 mg/kg	83.8	70	130
		EG020-SD: Lead	7439-92-1	250 mg/kg	84.9	70	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	113	70	130
		EG020-SD: Zinc	7440-66-6	250 mg/kg	87.5	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1058809)							
ES0911245-003	BH2A-16 0.60-1.10m	EG035T: Mercury	7439-97-6	5 mg/kg	92.5	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1059441)							
ES0911245-001	BH2A-16 0.00-0.10m	EG035T-LL: Mercury	7439-97-6	0.50 mg/kg	71.8	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1057558)							
ES0911245-001	BH2A-16 0.00-0.10m	EP080-SD: C6 - C9 Fraction	----	26 mg/kg	74.5	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1057670)							
ES0911245-001	BH2A-16 0.00-0.10m	EP071-SD: C10 - C14 Fraction	----	19.75 mg/kg	97.5	70	130
		EP071-SD: C15 - C28 Fraction	----	87.25 mg/kg	82.6	70	130
		EP071-SD: C29 - C36 Fraction	----	60 mg/kg	93.0	70	130
EP080-SD: BTEX (QCLot: 1057558)							
ES0911245-001	BH2A-16 0.00-0.10m	EP080-SD: Benzene	71-43-2	2.5 mg/kg	80.9	70	130
		EP080-SD: Toluene	108-88-3	2.5 mg/kg	78.4	70	130
		EP080-SD: Ethylbenzene	100-41-4	2.5 mg/kg	73.8	70	130
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	80.6	70	130
		EP080-SD: ortho-Xylene	95-47-6	2.5 mg/kg	79.6	70	130
EP090: Organotin Compounds (QCLot: 1057534)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP090: Organotin Compounds (QCLot: 1057534) - continued							
ES0911245-002	BH2A-16 0.10-0.60m	EP090: Tributyltin	56573-85-4	12.5 µgSn/kg	96.5	20	130
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1058478)							
ES0911245-003	BH2A-16 0.60-1.10m	EP130: Bromophos-ethyl	4824-78-6	50 µg/kg	86.4	36.9	142
		EP130: Carbophenothion	786-19-6	50 µg/kg	95.1	0.5	157
		EP130: Chlorfenvinphos (E)	470-90-6	5 µg/kg	117	50.3	137
		EP130: Chlorfenvinphos (Z)	470-90-8	50 µg/kg	92.9	55.9	152
		EP130: Chlorpyrifos	2921-88-2	50 µg/kg	96.3	49	140
		EP130: Chlorpyrifos-methyl	5598-13-0	50 µg/kg	92.5	28.1	142
		EP130: Demeton-S-methyl	919-86-8	50 µg/kg	90.7	36.6	172
		EP130: Diazinon	333-41-5	50 µg/kg	87.5	37.2	148
		EP130: Dichlorvos	62-73-7	50 µg/kg	81.8	32.7	153
		EP130: Dimethoate	60-51-5	50 µg/kg	85.6	33.2	150
		EP130: Ethion	563-12-2	50 µg/kg	92.8	44	146
		EP130: Fenamiphos	22224-92-6	50 µg/kg	112	3.08	162
		EP130: Fenthion	55-38-9	50 µg/kg	81.0	10.6	157
		EP130: Malathion	121-75-5	50 µg/kg	83.2	38.1	143
		EP130: Azinphos Methyl	86-50-0	50 µg/kg	62.1	8.13	159
		EP130: Monocrotophos	6923-22-4	50 µg/kg	101	19.7	176
		EP130: Parathion	56-38-2	50 µg/kg	90.7	39.2	145
		EP130: Parathion-methyl	298-00-0	50 µg/kg	85.2	23.5	152
		EP130: Pirimphos-ethyl	23505-41-1	50 µg/kg	87.6	47.1	141
		EP130: Prothiofos	34643-46-4	50 µg/kg	94.3	36.1	148
EP131A: Organochlorine Pesticides (QCLot: 1058479)							
ES0911245-003	BH2A-16 0.60-1.10m	EP131A: Aldrin	309-00-2	5 µg/kg	82.7	31.7	140
		EP131A: alpha-BHC	319-84-6	5 µg/kg	110	24.5	150
		EP131A: beta-BHC	319-85-7	5 µg/kg	132	36.9	139
		EP131A: delta-BHC	319-86-8	5 µg/kg	101	38.2	137
		EP131A: 4.4`-DDD	72-54-8	5 µg/kg	108	42.5	141
		EP131A: 4.4`-DDE	72-55-9	5 µg/kg	71.8	34.8	140
		EP131A: 4.4`-DDT	50-29-3	5 µg/kg	95.6	38	143
		EP131A: Dieldrin	60-57-1	5 µg/kg	86.4	43.2	134
		EP131A: alpha-Endosulfan	959-98-8	5 µg/kg	77.1	23.7	139
		EP131A: beta-Endosulfan	33213-65-9	5 µg/kg	88.7	35.8	138
		EP131A: Endosulfan sulfate	1031-07-8	5 µg/kg	83.3	7.45	158
		EP131A: Endrin	72-20-8	5 µg/kg	130	21.6	162
		EP131A: Endrin aldehyde	7421-93-4	5 µg/kg	70.5	19.3	131
		EP131A: Endrin ketone	53494-70-5	5 µg/kg	66.4	17.9	141
		EP131A: Heptachlor	76-44-8	5 µg/kg	102	31	153

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP131A: Organochlorine Pesticides (QCLot: 1058479) - continued							
ES0911245-003	BH2A-16 0.60-1.10m	EP131A: Heptachlor epoxide	1024-57-3	5 µg/kg	80.5	34.3	138
		EP131A: Hexachlorobenzene (HCB)	118-74-1	5 µg/kg	136	18.6	146
		EP131A: gamma-BHC	58-89-9	5 µg/kg	91.4	30.7	145
		EP131A: Methoxychlor	72-43-5	5 µg/kg	95.5	15	157
		EP131A: cis-Chlordane	5103-71-9	5 µg/kg	84.7	22.3	145
		EP131A: trans-Chlordane	5103-74-2	5 µg/kg	79.6	42.4	139
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 1058480)							
ES0911245-003	BH2A-16 0.60-1.10m	EP131B: Aroclor 1254	11097-69-1	50 µg/kg	78.8	61.3	121
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1057669)							
ES0911245-001	BH2A-16 0.00-0.10m	EP132B-SD: Naphthalene	91-20-3	25 µg/kg	99.1	70	130
		EP132B-SD: 2-Methylnaphthalene	91-57-6	25 µg/kg	124	70	130
		EP132B-SD: Acenaphthylene	208-96-8	25 µg/kg	102	70	130
		EP132B-SD: Acenaphthene	83-32-9	25 µg/kg	117	70	130
		EP132B-SD: Fluorene	86-73-7	25 µg/kg	105	70	130
		EP132B-SD: Phenanthrene	85-01-8	25 µg/kg	121	70	130
		EP132B-SD: Anthracene	120-12-7	25 µg/kg	104	70	130
		EP132B-SD: Fluoranthene	206-44-0	25 µg/kg	115	70	130
		EP132B-SD: Pyrene	129-00-0	25 µg/kg	116	70	130
		EP132B-SD: Benz(a)anthracene	56-55-3	25 µg/kg	112	70	130
		EP132B-SD: Chrysene	218-01-9	25 µg/kg	115	70	130
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	25 µg/kg	104	70	130
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	25 µg/kg	84.6	70	130
		EP132B-SD: Benzo(e)pyrene	192-97-2	25 µg/kg	92.1	70	130
		EP132B-SD: Benzo(a)pyrene	50-32-8	25 µg/kg	94.6	70	130
		EP132B-SD: Perylene	198-55-0	25 µg/kg	113	70	130
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	25 µg/kg	117	70	130
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	25 µg/kg	106	70	130
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	25 µg/kg	97.5	70	130
		EP132B-SD: Coronene	191-07-1	25 µg/kg	105	70	130

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES0911245**	Page	: 1 of 9
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 31-JUL-2009
Sampler	: IW	Issue Date	: 13-AUG-2009
Site	: LAIRD POINT DREDGE STUDY-OPTIO		
		No. of samples received	: 4
Quote number	: BN/354/09 V2	No. of samples analysed	: 4

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*
Dianne Blane		Newcastle
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Matt Frost	Organic Instrument Chemist	Organics
Phyu Phyu Lwin	Inorganic Chemist	Inorganics
Sanjeshni Jyoti Mala	Senior Chemist Volatile	Organics
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

- **EG005T:LCS recovery for Cadmium and Zinc falls outside ALS Dynamic Control Limit. However, they are within the acceptance criteria based on ALS DQO. No further action is required.**

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2A-16 0.00-0.10m	BH2A-16 0.10-0.60m	BH2A-16 0.60-1.10m	BH2A-16 1.10-2.10m	----
				Client sampling date / time	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	----
Compound	CAS Number	LOR	Unit		ES0911245-001	ES0911245-002	ES0911245-003	ES0911245-004	----
EA150: Particle Sizing									
+75µm	----	1	%		17	2	2	5	----
+150µm	----	1	%		7	1	<1	2	----
+300µm	----	1	%		5	<1	<1	1	----
+425µm	----	1	%		4	<1	<1	1	----
+600µm	----	1	%		3	<1	<1	1	----
+1180µm	----	1	%		1	<1	<1	<1	----
+2.36mm	----	1	%		<1	<1	<1	<1	----
+4.75mm	----	1	%		<1	<1	<1	<1	----
+9.5mm	----	1	%		<1	<1	<1	<1	----
+19.0mm	----	1	%		<1	<1	<1	<1	----
+37.5mm	----	1	%		<1	<1	<1	<1	----
+75.0mm	----	1	%		<1	<1	<1	<1	----
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		60.7	28.5	27.2	25.8	----
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		37	63	63	59	----
Silt (2-60 µm)	----	1	%		46	31	33	35	----
Sand (0.06-2.00 mm)	----	1	%		19	6	4	6	----
Gravel (>2mm)	----	1	%		1	<1	<1	<1	----
Cobbles (>6cm)	----	1	%		<1	<1	<1	<1	----
EG005-SD: Total Metals in Sediments by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		16900	10900	----	----	----
Iron	7439-89-6	50	mg/kg		30700	8910	----	----	----
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		----	----	10600	11100	----
Antimony	7440-36-0	5	mg/kg		----	----	<5	<5	----
Arsenic	7440-38-2	5	mg/kg		----	----	<5	6	----
Cadmium	7440-43-9	1	mg/kg		----	----	<1	<1	----
Chromium	7440-47-3	2	mg/kg		----	----	12	14	----
Cobalt	7440-48-4	2	mg/kg		----	----	4	11	----
Copper	7440-50-8	5	mg/kg		----	----	42	20	----
Iron	7439-89-6	50	mg/kg		----	----	10900	30700	----
Lead	7439-92-1	5	mg/kg		----	----	6	<5	----
Manganese	7439-96-5	5	mg/kg		----	----	158	83	----
Nickel	7440-02-0	2	mg/kg		----	----	3	9	----
Selenium	7782-49-2	5	mg/kg		----	----	<5	<5	----
Silver	7440-22-4	2	mg/kg		----	----	<2	<2	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2A-16 0.00-0.10m	BH2A-16 0.10-0.60m	BH2A-16 0.60-1.10m	BH2A-16 1.10-2.10m	----
				Client sampling date / time	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	----
Compound	CAS Number	LOR	Unit		ES0911245-001	ES0911245-002	ES0911245-003	ES0911245-004	----
EG005T: Total Metals by ICP-AES - Continued									
Vanadium	7440-62-2	5	mg/kg		----	----	**88**	**99**	----
Zinc	7440-66-6	5	mg/kg		----	----	**17**	**38**	----
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg		<0.50	<0.50	----	----	----
Arsenic	7440-38-2	1.00	mg/kg		**17.6**	<1.00	----	----	----
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	----	----	----
Chromium	7440-47-3	1.0	mg/kg		**28.5**	**8.6**	----	----	----
Copper	7440-50-8	1.0	mg/kg		**24.6**	**34.0**	----	----	----
Cobalt	7440-48-4	0.5	mg/kg		**13.8**	**3.4**	----	----	----
Lead	7439-92-1	1.0	mg/kg		**11.4**	**8.0**	----	----	----
Manganese	7439-96-5	10	mg/kg		**192**	**118**	----	----	----
Nickel	7440-02-0	1.0	mg/kg		**14.9**	**2.1**	----	----	----
Selenium	7782-49-2	0.1	mg/kg		**1.4**	**1.0**	----	----	----
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	----	----	----
Vanadium	7440-62-2	2.0	mg/kg		**59.7**	**32.6**	----	----	----
Zinc	7440-66-6	1.0	mg/kg		**45.4**	**10.6**	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg		**0.04**	**0.01**	----	----	----
Mercury	7439-97-6	0.1	mg/kg		----	----	**0.2**	<0.1	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	0.02	%		**2.44**	**0.28**	**0.26**	**0.19**	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg		<3	<3	<3	<3	----
C10 - C14 Fraction	----	3	mg/kg		<3	<3	<3	<3	----
C15 - C28 Fraction	----	3	mg/kg		**33**	**12**	**10**	**6**	----
C29 - C36 Fraction	----	5	mg/kg		**52**	**20**	**18**	**9**	----
EP080-SD: BTEX									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Ethylbenzene	100-41-4	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
ortho-Xylene	95-47-6	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	<0.5	<0.5	<0.5	----
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<10	<10	<10	<10	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-16 0.00-0.10m	BH2A-16 0.10-0.60m	BH2A-16 0.60-1.10m	BH2A-16 1.10-2.10m	----
Client sampling date / time				29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	----
				ES0911245-001	ES0911245-002	ES0911245-003	ES0911245-004	----
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
Carbophenothion	786-19-6	10	µg/kg	<10	<10	<10	<10	----
Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	<10.0	<10.0	<10.0	----
Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	<10	<10	<10	----
Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	<10	<10	----
Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	<10	<10	----
Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	<10	<10	----
Diazinon	333-41-5	10	µg/kg	<10	<10	<10	<10	----
Dichlorvos	62-73-7	10	µg/kg	<10	<10	<10	<10	----
Dimethoate	60-51-5	10	µg/kg	<10	<10	<10	<10	----
Ethion	563-12-2	10	µg/kg	<10	<10	<10	<10	----
Fenamiphos	22224-92-6	10	µg/kg	<10	<10	<10	<10	----
Fenthion	55-38-9	10	µg/kg	<10	<10	<10	<10	----
Malathion	121-75-5	10	µg/kg	<10	<10	<10	<10	----
Azinphos Methyl	86-50-0	10	µg/kg	<10	<10	<10	<10	----
Monocrotophos	6923-22-4	10	µg/kg	<10	<10	<10	<10	----
Parathion	56-38-2	10	µg/kg	<10	<10	<10	<10	----
Parathion-methyl	298-00-0	10	µg/kg	<10	<10	<10	<10	----
Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	<10	<10	----
Prothiofos	34643-46-4	10	µg/kg	<10	<10	<10	<10	----
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
4.4`-DDE	72-55-9	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
^ DDT (total)	----	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
^ Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	----	<0.50	----
Endosulfan (sum)	115-29-7	0.50	µg/kg	----	----	<0.50	----	----
Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: BH2A-16 0.00-0.10m	BH2A-16 0.10-0.60m	BH2A-16 0.60-1.10m	BH2A-16 1.10-2.10m	----
Client sampling date / time				29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	----
				ES0911245-001	ES0911245-002	ES0911245-003	ES0911245-004	----
EP131A: Organochlorine Pesticides - Continued								
Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
gamma-BHC	58-89-9	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
cis-Chlordane	5103-71-9	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
trans-Chlordane	5103-74-2	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
^ Total Chlordane (sum)	----	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
Oxychlordane	27304-13-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	----
EP131B: Polychlorinated Biphenyls (as Aroclors)								
^ Total Polychlorinated biphenyls	----	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	----
Aroclor 1016	12974-11-2	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	----
Aroclor 1221	11104-28-2	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	----
Aroclor 1232	11141-16-5	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	----
Aroclor 1242	53469-21-9	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	----
Aroclor 1248	12672-29-6	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	----
Aroclor 1254	11097-69-1	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	----
Aroclor 1260	11096-82-5	5.0	µg/kg	<5.0	<5.0	<5.0	<5.0	----
EP132B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	5	µg/kg	<5	<5	<5	<5	----
2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	<5	<5	----
Acenaphthylene	208-96-8	4	µg/kg	<4	<4	<4	<4	----
Acenaphthene	83-32-9	4	µg/kg	<4	<4	<4	<4	----
Fluorene	86-73-7	4	µg/kg	<4	<4	<4	<4	----
Phenanthrene	85-01-8	4	µg/kg	<4	<4	<4	<4	----
Anthracene	120-12-7	4	µg/kg	<4	<4	<4	<4	----
Fluoranthene	206-44-0	4	µg/kg	**4**	<4	<4	<4	----
Pyrene	129-00-0	4	µg/kg	**4**	<4	<4	<4	----
Benz(a)anthracene	56-55-3	4	µg/kg	<4	<4	<4	<4	----
Chrysene	218-01-9	4	µg/kg	<4	<4	<4	<4	----
Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	<4	<4	<4	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	<4	<4	----
Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	<4	<4	----
Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	<4	<4	----
Perylene	198-55-0	4	µg/kg	<4	<4	<4	<4	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	<4	<4	<4	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	<4	<4	<4	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	BH2A-16 0.00-0.10m	BH2A-16 0.10-0.60m	BH2A-16 0.60-1.10m	BH2A-16 1.10-2.10m	----
				Client sampling date / time	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	29-JUL-2009 15:00	----
Compound	CAS Number	LOR	Unit		ES0911245-001	ES0911245-002	ES0911245-003	ES0911245-004	----
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		<4	<4	<4	<4	----
Coronene	191-07-1	5	µg/kg		<5	<5	<5	<5	----
^ Sum of PAHs	----	4	µg/kg		9	<4	<4	<4	----
EP080-SD: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		84.0	101	98.8	108	----
Toluene-D8	2037-26-5	0.1	%		83.5	96.9	97.8	101	----
4-Bromofluorobenzene	460-00-4	0.1	%		78.3	98.1	96.6	99.1	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.1	%		75.0	96.4	97.6	94.8	----
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.1	%		79.0	76.0	85.4	79.5	----
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.1	%		82.5	63.9	70.1	70.3	----
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		71.3	61.5	66.4	66.5	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		93.5	103	105	90.9	----
Anthracene-d10	1719-06-8	0.1	%		88.5	93.7	93.9	82.6	----
4-Terphenyl-d14	1718-51-0	0.1	%		88.6	103	108	90.5	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080-SD: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	74.7	127
Toluene-D8	2037-26-5	74.8	129
4-Bromofluorobenzene	460-00-4	75.3	127
EP090S: Organotin Surrogate			
Tripropyltin	----	34	108
EP130S: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	51.3	136.9
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	136
EP131T: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	10	164
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	30	115
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	18	137

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0911551**	Page	: 1 of 11
Client	: GOLDER ASSOCIATES	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052 Gladstone Dredging	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: LAIRD POINT DREDGE STUDY-OPTIO		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: IW	Issue Date	: 14-AUG-2009
Order number	: ----		
		No. of samples received	: 13
Quote number	: BN/354/09 V2	No. of samples analysed	: 13

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: **SOIL**

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
EA055: Moisture Content								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**----**	----	----	**06-AUG-2009**	10-AUG-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**----**	----	----	**06-AUG-2009**	11-AUG-2009	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-3 - 1.00-1.60m,	BH2A-3 - 1.60-2.00m,							
BH2A-3 - 2.00-2.90m,	BH2A-14 - 0.00-0.50m,							
BH2A-14 - 0.50-1.00m,	BH2A-20 - 0.00-0.50m,							
BH2A-20 - 0.50-1.00m,	BH2A-20 - 1.00-1.80m							
EA150: Particle Sizing								
Snap Lock Bag								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**---**	---	----	**07-AUG-2009**	31-JAN-2010	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-3 - 1.00-1.60m,	BH2A-3 - 1.60-2.00m,							
BH2A-3 - 2.00-2.90m,	BH2A-14 - 0.00-0.50m,							
BH2A-14 - 0.50-1.00m,	BH2A-20 - 0.00-0.50m,							
BH2A-20 - 0.50-1.00m,	BH2A-20 - 1.00-1.80m							
EA150: Soil Classification based on Particle Size								
Snap Lock Bag								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**---**	---	----	**07-AUG-2009**	31-JAN-2010	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-3 - 1.00-1.60m,	BH2A-3 - 1.60-2.00m,							
BH2A-3 - 2.00-2.90m,	BH2A-14 - 0.00-0.50m,							
BH2A-14 - 0.50-1.00m,	BH2A-20 - 0.00-0.50m,							
BH2A-20 - 0.50-1.00m,	BH2A-20 - 1.00-1.80m							

Matrix: **SOIL**

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
EG005-SD: Total Metals in Sediments by ICP-AES								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**11-AUG-2009**	31-AUG-2009	✓	**12-AUG-2009**	30-JAN-2010	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**11-AUG-2009**	01-SEP-2009	✓	**12-AUG-2009**	31-JAN-2010	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-14 - 0.00-0.50m,	BH2A-14 - 0.50-1.00m,							
BH2A-20 - 0.00-0.50m,	BH2A-20 - 0.50-1.00m							
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved								
BH2A-3 - 1.00-1.60m,	BH2A-3 - 1.60-2.00m,	**04-AUG-2009**	**07-AUG-2009**	01-SEP-2009	✓	**10-AUG-2009**	31-JAN-2010	✓
BH2A-3 - 2.00-2.90m,	BH2A-20 - 1.00-1.80m							
EG020-SD: Total Metals in Sediments by ICPMS								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**11-AUG-2009**	31-AUG-2009	✓	**13-AUG-2009**	30-JAN-2010	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**11-AUG-2009**	01-SEP-2009	✓	**13-AUG-2009**	31-JAN-2010	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-14 - 0.00-0.50m,	BH2A-14 - 0.50-1.00m,							
BH2A-20 - 0.00-0.50m,	BH2A-20 - 0.50-1.00m							
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**11-AUG-2009**	31-AUG-2009	✓	**12-AUG-2009**	31-AUG-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-3 - 1.00-1.60m,	BH2A-3 - 1.60-2.00m,	**04-AUG-2009**	**07-AUG-2009**	01-SEP-2009	✓	**07-AUG-2009**	01-SEP-2009	✓
BH2A-3 - 2.00-2.90m,	BH2A-20 - 1.00-1.80m							
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**11-AUG-2009**	01-SEP-2009	✓	**12-AUG-2009**	01-SEP-2009	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-14 - 0.00-0.50m,	BH2A-14 - 0.50-1.00m,							
BH2A-20 - 0.00-0.50m,	BH2A-20 - 0.50-1.00m							
EP005: Total Organic Carbon (TOC)								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**11-AUG-2009**	31-AUG-2009	✓	**11-AUG-2009**	31-AUG-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**11-AUG-2009**	01-SEP-2009	✓	**11-AUG-2009**	01-SEP-2009	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-3 - 1.00-1.60m,	BH2A-3 - 1.60-2.00m,							
BH2A-3 - 2.00-2.90m,	BH2A-14 - 0.00-0.50m,							
BH2A-14 - 0.50-1.00m,	BH2A-20 - 0.00-0.50m,							
BH2A-20 - 0.50-1.00m,	BH2A-20 - 1.00-1.80m							

Matrix: **SOIL**

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
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**06-AUG-2009**	17-AUG-2009	✓	**06-AUG-2009**	17-AUG-2009	✓
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**10-AUG-2009**	16-SEP-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m	**04-AUG-2009**	**06-AUG-2009**	18-AUG-2009	✓	**06-AUG-2009**	18-AUG-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m	**04-AUG-2009**	**07-AUG-2009**	18-AUG-2009	✓	**10-AUG-2009**	16-SEP-2009	✓
EP080-SD: BTEX								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**06-AUG-2009**	17-AUG-2009	✓	**06-AUG-2009**	17-AUG-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m	**04-AUG-2009**	**06-AUG-2009**	18-AUG-2009	✓	**06-AUG-2009**	18-AUG-2009	✓
EP090: Organotin Compounds								
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**10-AUG-2009**	18-AUG-2009	✓	**11-AUG-2009**	19-SEP-2009	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-14 - 0.00-0.50m,	BH2A-14 - 0.50-1.00m,							
BH2A-20 - 0.00-0.50m,	BH2A-20 - 0.50-1.00m							
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m	**04-AUG-2009**	**07-AUG-2009**	18-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓
EP131A: Organochlorine Pesticides								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m	**04-AUG-2009**	**07-AUG-2009**	18-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓
EP131B: Polychlorinated Biphenyls (as Aroclors)								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m	**04-AUG-2009**	**07-AUG-2009**	18-AUG-2009	✓	**11-AUG-2009**	16-SEP-2009	✓

Matrix: **SOIL**

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
EP132B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved								
QC-1		**03-AUG-2009**	**07-AUG-2009**	17-AUG-2009	✓	**10-AUG-2009**	16-SEP-2009	✓
Soil Glass Jar - Unpreserved								
BH2A-2 - 0.00-0.50m,	BH2A-2 - 0.50-0.90m,	**04-AUG-2009**	**07-AUG-2009**	18-AUG-2009	✓	**10-AUG-2009**	16-SEP-2009	✓
BH2A-3 - 0.00-0.50m,	BH2A-3 - 0.50-1.00m,							
BH2A-3 - 1.00-1.60m,	BH2A-3 - 1.60-2.00m,							
BH2A-3 - 2.00-2.90m,	BH2A-14 - 0.00-0.50m,							
BH2A-14 - 0.50-1.00m,	BH2A-20 - 0.00-0.50m,							
BH2A-20 - 0.50-1.00m,	BH2A-20 - 1.00-1.80m							

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: **SOIL**

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)							
Moisture Content	EA055-103	4	35	**11.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	7	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Fe and Al in Sediments by ICPAES	EG005-SD	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Analysis	EP090	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **SOIL**

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							
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Organochlorine Pesticides (Ultra-trace)	EP131A	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Organotin Analysis	EP090	1	7	**14.3**	**5.0**	✓	ALS QCS3 requirement
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
PCB's (Ultra-trace)	EP131B	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS (Low Level)	EG035T-LL	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Total Metals in Sediments by ICPMS	EG020-SD	1	18	**5.6**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071-SD	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX in Sediments	EP080-SD	1	9	**11.1**	**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
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (1999) Schedule B(3) (Method 102)
Particle Size Analysis (Sieving)	EA150	SOIL	Particle Size Analysis by Sieving according to AS1289.3.6.1 - 1995
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Total Fe and Al in Sediments by ICPAES	EG005-SD	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3). LORs per NODG
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	(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. Analyte list and LORs per NODG.
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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)
Total Organic Carbon	EP005	SOIL	In-house. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
TPH - Semivolatile Fraction	EP071-SD	SOIL	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 504)
TPH Volatiles/BTEX in Sediments	EP080-SD	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

Analytical Methods	Method	Matrix	Method Descriptions
Organotin Analysis	EP090	SOIL	(USEPA SW 846 - 8270D) Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quanitified against an established calibration curve.
Organophosphorus Pesticides (Ultra-trace)	EP130	SOIL	USEPA Method 3640 (GPC cleanup), 8141 (GC/FPD - Capillary Column) This technique is compliant with NEPM (1999) Schedule B(3) (Method 505)
Organochlorine Pesticides (Ultra-trace)	EP131A	SOIL	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504)
PCB's (Ultra-trace)	EP131B	SOIL	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504)
PAHs in Sediments by GCMS(SIM)	EP132B-SD	SOIL	8270 GCMS Capillary column, SIM mode using large volume programmed temperature vaporisation injection.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids/ Sample Cleanup	ORG17A-UTP	SOIL	In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. Samples are extracted, concentrated (by KD) and exchanged into an appropriate solvent for GPC and florisil cleanup as required.
Tumbler Extraction of Solids for LVI (Non-concentrating)	ORG17D	SOIL	In house: 10g of sample, Na2SO4 and surrogate are extracted with 50mL 1:1 DCM/Acetone by end over end tumbling. An aliquot is concentrated by nitrogen blowdown to a reduced volume for analysis if required.
Organotin Sample Preparation	ORG35	SOIL	In house. 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.

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: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005-SD: Total Metals in Sediments by ICP-AES	ES0911701-001	Anonymous	**Aluminium**	7429-90-5	23.6 %	0-20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	ES0911510-001	Anonymous	**Manganese**	7439-96-5	22.0 %	0-20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	ES0911510-001	Anonymous	**Zinc**	7440-66-6	27.4 %	0-20%	**RPD exceeds LOR based limits**
EG020-SD: Total Metals in Sediments by ICPMS	ES0911701-001	Anonymous	**Manganese**	7439-96-5	21.5 %	0-20%	**RPD exceeds LOR based limits**
Laboratory Control Spike (LCS) Recoveries							
EG005T: Total Metals by ICP-AES	1221754-002	----	**Cadmium**	7440-43-9	111 %	83.3-111%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons	ES0911498-001	Anonymous	**C6 - C9 Fraction**	----	45.1 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	Anonymous	**Benzene**	71-43-2	25.4 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	Anonymous	**Toluene**	108-88-3	34.2 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	Anonymous	**Ethylbenzene**	100-41-4	25.6 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	Anonymous	**meta- & para-Xylene**	108-38-3 106-42-3	26.5 %	70-130%	**Recovery less than lower data quality objective**
EP080-SD: BTEX	ES0911498-001	Anonymous	**ortho-Xylene**	95-47-6	28.3 %	70-130%	**Recovery less than lower data quality objective**

- **For all matrices, no Method Blank value 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.**

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **ES0911551**	Page	: 1 of 14
Client	: **GOLDER ASSOCIATES**	Laboratory	: Environmental Division Sydney
Contact	: MR HENRY PARSONS	Contact	: Charlie Pierce
Address	: P O BOX 1734 MILTON QLD, AUSTRALIA 4064	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: hparsons@golder.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3721 5400	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3721 5401	Facsimile	: +61-2-8784 8500
Project	: 097633052 Gladstone Dredging	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: LAIRD POINT DREDGE STUDY-OPTIO		
C-O-C number	: ----	Date Samples Received	: 06-AUG-2009
Sampler	: IW	Issue Date	: 14-AUG-2009
Order number	: ----		
		No. of samples received	: 13
Quote number	: BN/354/09 V2	No. of samples analysed	: 13

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*
Celine Conceicao	Spectroscopist	Inorganics
Dianne Blane		Newcastle
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - AY
Matt Frost	Organic Instrument Chemist	Organics
Nanthini Collparampil	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: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 1061792)									
ES0911498-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	56.4	57.5	1.9	0% - 20%
ES0911510-003	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	7.7	6.9	11.6	No Limit
EA055: Moisture Content (QC Lot: 1061793)									
ES0911551-008	BH2A-3 2.00-2.90m	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	30.6	29.7	3.0	0% - 20%
ES0911573-004	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	15.0	14.2	5.5	0% - 50%
EG005-SD: Total Metals in Sediments by ICP-AES (QC Lot: 1065394)									
ES0911551-001	QC-1	EG005-SD: Aluminium	7429-90-5	50	mg/kg	14200	14300	1.0	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	36300	35400	2.3	0% - 20%
ES0911701-001	Anonymous	EG005-SD: Aluminium	7429-90-5	50	mg/kg	9640	7600	# 23.6	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	22700	20900	8.1	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1062004)									
ES0911394-048	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	6	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	6	5	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	7	7	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	9	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	24	20	17.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	9	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	182	183	0.0	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	23	21	6.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	44	43	3.2	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	7400	7580	2.4	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	14400	14400	0.3	0% - 20%
ES0911510-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	30	29	6.4	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	8	8	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	42	35	17.5	0% - 50%
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Antimony	7440-36-0	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	23	21	9.2	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	81	65	21.9	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	22	19	16.5	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1062004) - continued									
ES0911510-001	Anonymous	EG005T: Manganese	7439-96-5	5	mg/kg	474	380	# 22.0	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	26	26	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	259	197	# 27.4	0% - 20%
		EG005T: Aluminium	7429-90-5	50	mg/kg	3350	3380	0.8	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	48600	41100	16.6	0% - 20%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 1065393)									
ES0911551-001	QC-1	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Selenium	7782-49-2	0.1	mg/kg	1.0	1.0	0.0	0% - 50%
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	17.2	17.0	1.2	0% - 20%
		EG020-SD: Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	0.0	No Limit
		EG020-SD: Chromium	7440-47-3	1.0	mg/kg	26.1	27.2	4.2	0% - 20%
		EG020-SD: Copper	7440-50-8	1.0	mg/kg	24.4	24.8	1.6	0% - 20%
		EG020-SD: Lead	7439-92-1	1.0	mg/kg	11.5	11.9	3.7	0% - 50%
		EG020-SD: Nickel	7440-02-0	1.0	mg/kg	14.7	15.3	4.0	0% - 50%
		EG020-SD: Zinc	7440-66-6	1.0	mg/kg	48.8	47.9	1.8	0% - 20%
		EG020-SD: Arsenic	7440-38-2	1.00	mg/kg	25.4	28.5	11.4	0% - 20%
		EG020-SD: Manganese	7439-96-5	10	mg/kg	319	298	6.9	0% - 20%
		EG020-SD: Vanadium	7440-62-2	2.0	mg/kg	54.5	58.1	6.4	0% - 20%
ES0911701-001	Anonymous	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Selenium	7782-49-2	0.1	mg/kg	0.6	0.5	30.6	No Limit
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	13.0	13.6	3.8	0% - 20%
		EG020-SD: Antimony	7440-36-0	0.50	mg/kg	<0.50	<0.50	0.0	No Limit
		EG020-SD: Chromium	7440-47-3	1.0	mg/kg	14.6	14.0	4.1	0% - 50%
		EG020-SD: Copper	7440-50-8	1.0	mg/kg	10.5	9.7	7.6	No Limit
		EG020-SD: Lead	7439-92-1	1.0	mg/kg	5.6	5.5	2.4	No Limit
		EG020-SD: Nickel	7440-02-0	1.0	mg/kg	9.5	9.2	3.4	No Limit
		EG020-SD: Zinc	7440-66-6	1.0	mg/kg	27.2	26.0	4.6	0% - 20%
		EG020-SD: Arsenic	7440-38-2	1.00	mg/kg	15.0	13.0	14.4	0% - 50%
		EG020-SD: Manganese	7439-96-5	10	mg/kg	625	503	# 21.5	0% - 20%
		EG020-SD: Vanadium	7440-62-2	2.0	mg/kg	47.1	44.8	5.0	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1062005)									
ES0911394-048	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	<0.1	83.2	No Limit
ES0911510-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1065392)									
ES0911551-001	QC-1	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.04	0.04	0.0	No Limit
ES0911701-001	Anonymous	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.01	<0.01	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP005: Total Organic Carbon (TOC) (QC Lot: 1065081)									
ES0911551-001	QC-1	EP005: Total Organic Carbon	----	0.02	%	2.06	2.11	2.4	0% - 20%
ES0911551-011	BH2A-20 0.00-0.50m	EP005: Total Organic Carbon	----	0.02	%	0.12	0.11	8.7	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1061666)									
ES0911498-001	Anonymous	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 1062027)									
ES0911498-001	Anonymous	EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
		EP071-SD: C15 - C28 Fraction	----	3	mg/kg	10	11	11.9	No Limit
		EP071-SD: C29 - C36 Fraction	----	5	mg/kg	14	16	12.9	No Limit
EP080-SD: BTEX (QC Lot: 1061666)									
ES0911498-001	Anonymous	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP090: Organotin Compounds (QC Lot: 1063543)									
ES0911551-002	BH2A-2 0.00-0.50m	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	<0.5	0.0	No Limit
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 1062189)									
ES0911498-001	Anonymous	EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Carbophenothion	786-19-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Diazinon	333-41-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dichlorvos	62-73-7	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dimethoate	60-51-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Ethion	563-12-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenthion	55-38-9	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Malathion	121-75-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Azinphos Methyl	86-50-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion	56-38-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Prothiofos	34643-46-4	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorfenvinphos (E)	470-90-6	10.0	µg/kg	<10.0	<10.0	0.0	No Limit
EP131A: Organochlorine Pesticides (QC Lot: 1062190)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP131A: Organochlorine Pesticides (QC Lot: 1062190) - continued									
ES0911498-001	Anonymous	EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDE	72-55-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: DDT (total)	----	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	0.0	No Limit
EP131B: Polychlorinated Biphenyls (as Aroclors) (QC Lot: 1062191)									
ES0911498-001	Anonymous	EP131B: Total Polychlorinated biphenyls	----	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1016	12974-11-2	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1221	11104-28-2	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1232	11141-16-5	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1242	53469-21-9	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1248	12672-29-6	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1254	11097-69-1	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
		EP131B: Aroclor 1260	11096-82-5	5.0	µg/kg	<5.0	<5.0	0.0	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1062026)									
ES0911498-001	Anonymous	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<5	<5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1062026) - continued									
ES0911498-001	Anonymous	EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	7	5	23.4	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	7	5	23.4	No Limit
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	0.0	No Limit
ES0911551-005	BH2A-3 0.50-1.00m	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	5	5	0.0	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	74	70	5.3	0% - 50%
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	78	75	5.0	0% - 50%
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	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: **SOIL**

				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
EG005-SD: Total Metals in Sediments by ICP-AES (QCLot: 1065394)								
EG005-SD: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005-SD: Iron	7439-89-6	50	mg/kg	<50	----	----	----	----
EG005T: Total Metals by ICP-AES (QCLot: 1062004)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Antimony	7440-36-0	5	mg/kg	<5	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.1 mg/kg	111	90.1	124
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.76 mg/kg	# 111	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	60.9 mg/kg	108	89.2	117
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	24.5 mg/kg	102	70	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.7 mg/kg	111	90.1	114
EG005T: Iron	7439-89-6	50	mg/kg	<50	----	----	----	----
EG005T: Lead	7439-92-1	5	mg/kg	<5	55.2 mg/kg	108	85.2	111
EG005T: Manganese	7439-96-5	5	mg/kg	<5	----	----	----	----
EG005T: Nickel	7440-02-0	2	mg/kg	<2	54.8 mg/kg	108	88.3	116
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	----	----	----	----
EG005T: Zinc	7440-66-6	5	mg/kg	<5	104 mg/kg	108	88.9	112
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1065393)								
EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	----	----	----	----
EG020-SD: Arsenic	7440-38-2	1.0	mg/kg	<1.00	13.1 mg/kg	106	70	130
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	2.76 mg/kg	99.6	70	130
EG020-SD: Chromium	7440-47-3	1.0	mg/kg	<1.0	60.9 mg/kg	88.9	70	130
EG020-SD: Copper	7440-50-8	1.0	mg/kg	<1.0	54.7 mg/kg	100	70	130
EG020-SD: Cobalt	7440-48-4	10	mg/kg	<10.0	24.5 mg/kg	101	70	130
EG020-SD: Lead	7439-92-1	1.0	mg/kg	<1.0	54.8 mg/kg	90.7	70	130
EG020-SD: Manganese	7439-96-5	10	mg/kg	<10	136 mg/kg	97.8	70	130
EG020-SD: Nickel	7440-02-0	1.0	mg/kg	<1.0	55.2 mg/kg	104	70	130
EG020-SD: Selenium	7782-49-2	0.1	mg/kg	<0.1	----	----	----	----
EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	5.6 mg/kg	95.1	70	130
EG020-SD: Vanadium	7440-62-2	2	mg/kg	<2.0	34 mg/kg	102	70	130
EG020-SD: Zinc	7440-66-6	1.0	mg/kg	<1.0	104 mg/kg	101	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1062005)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	1.4 mg/kg	83.7	67	118

Sub-Matrix: **SOIL**

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
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1065392)								
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.090 mg/kg	93.4	74.2	126
EP005: Total Organic Carbon (TOC) (QCLot: 1065081)								
EP005: Total Organic Carbon	----	0.02	%	<0.02	100 %	101	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1061666)								
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	26 mg/kg	80.6	68.4	128
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1062027)								
EP071-SD: C10 - C14 Fraction	----	3	mg/kg	<3	5 mg/kg	106	75.2	116
EP071-SD: C15 - C28 Fraction	----	3	mg/kg	<3	5 mg/kg	91.0	75.3	113
EP071-SD: C29 - C36 Fraction	----	5	mg/kg	<5	5 mg/kg	81.0	72.6	117
EP080-SD: BTEX (QCLot: 1061666)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	83.6	67.5	125
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	1 mg/kg	71.2	69	122
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	1 mg/kg	78.8	65.3	126
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	2 mg/kg	81.9	66.5	124
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	1 mg/kg	81.1	66.7	123
EP090: Organotin Compounds (QCLot: 1063543)								
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	12.5 µgSn/kg	115	28	129
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1062189)								
EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	50 µg/kg	108	36.9	142
EP130: Carbophenothion	786-19-6	10	µg/kg	<10	50 µg/kg	83.1	0.5	157
EP130: Chlorfenvinphos (E)	470-90-6	10	µg/kg	<10.0	5 µg/kg	122	50.3	137
EP130: Chlorfenvinphos (Z)	470-90-8	10	µg/kg	<10	50 µg/kg	94.5	55.9	152
EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	50 µg/kg	89.1	49	140
EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	50 µg/kg	94.5	28.1	142
EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	50 µg/kg	63.7	36.6	172
EP130: Diazinon	333-41-5	10	µg/kg	<10	50 µg/kg	104	37.2	148
EP130: Dichlorvos	62-73-7	10	µg/kg	<10	50 µg/kg	70.1	32.7	153
EP130: Dimethoate	60-51-5	10	µg/kg	<10	50 µg/kg	81.8	33.2	150
EP130: Ethion	563-12-2	10	µg/kg	<10	50 µg/kg	112	44	146
EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	50 µg/kg	92.2	3.08	162
EP130: Fenthion	55-38-9	10	µg/kg	<10	50 µg/kg	104	10.6	157
EP130: Malathion	121-75-5	10	µg/kg	<10	50 µg/kg	92.9	38.1	143
EP130: Azinphos Methyl	86-50-0	10	µg/kg	<10	50 µg/kg	118	8.13	159
EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	50 µg/kg	66.7	19.7	176
EP130: Parathion	56-38-2	10	µg/kg	<10	50 µg/kg	102	39.2	145
EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	50 µg/kg	82.6	23.5	152
EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	50 µg/kg	105	47.1	141

Sub-Matrix: **SOIL**

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
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1062189) - continued								
EP130: Prothiofos	34643-46-4	10	µg/kg	<10	50 µg/kg	110	36.1	148
EP131A: Organochlorine Pesticides (QCLot: 1062190)								
EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	5 µg/kg	126	31.7	140
EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	5 µg/kg	104	24.5	150
EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	5 µg/kg	92.7	36.9	139
EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	5 µg/kg	109	38.2	137
EP131A: 4.4`-DDD	72-54-8	0.5	µg/kg	<0.50	5 µg/kg	84.0	42.5	141
EP131A: 4.4`-DDE	72-55-9	0.5	µg/kg	<0.50	5 µg/kg	115	34.8	140
EP131A: 4.4`-DDT	50-29-3	0.5	µg/kg	<0.50	5 µg/kg	118	38	143
EP131A: DDT (total)	----	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	5 µg/kg	132	43.2	134
EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	5 µg/kg	103	23.7	139
EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	5 µg/kg	135	35.8	138
EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	5 µg/kg	128	7.45	158
EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	5 µg/kg	97.8	21.6	162
EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	5 µg/kg	97.9	19.3	131
EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	5 µg/kg	101	17.9	141
EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	5 µg/kg	93.2	31	153
EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	5 µg/kg	132	34.3	138
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	5 µg/kg	109	18.6	146
EP131A: gamma-BHC	58-89-9	0.5	µg/kg	<0.50	5 µg/kg	136	30.7	145
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	5 µg/kg	111	15	157
EP131A: cis-Chlordane	5103-71-9	0.5	µg/kg	<0.50	5 µg/kg	108	22.3	145
EP131A: trans-Chlordane	5103-74-2	0.5	µg/kg	<0.50	5 µg/kg	113	42.4	139
EP131A: Total Chlordane (sum)	----	0.5	µg/kg	<0.50	----	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 1062191)								
EP131B: Total Polychlorinated biphenyls	----	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1016	12974-11-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1221	11104-28-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1232	11141-16-5	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1242	53469-21-9	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1248	12672-29-6	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1254	11097-69-1	5	µg/kg	<5.0	50 µg/kg	90.5	61.3	121
EP131B: Aroclor 1260	11096-82-5	5	µg/kg	<5.0	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1062026)								
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	112	----	----
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	25 µg/kg	106	----	----
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	104	----	----

Sub-Matrix: **SOIL**

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
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1062026) - continued								
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	109	----	----
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	110	----	----
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	115	----	----
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	107	----	----
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	113	----	----
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	112	----	----
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	118	----	----
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	123	----	----
EP132B-SD: Benzo(b)fluoranthene	205-99-2	4	µg/kg	<4	25 µg/kg	125	----	----
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	126	----	----
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	25 µg/kg	123	----	----
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	118	----	----
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	25 µg/kg	120	----	----
EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	114	----	----
EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	119	----	----
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	118	----	----
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	25 µg/kg	106	----	----
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----

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: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1062004)							
ES0911394-048	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	102	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	102	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	100	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	110	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	105	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	100	70	130
		EG005T: Selenium	7782-49-2	50 mg/kg	101	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	101	70	130
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 1065393)							
ES0911551-001	QC-1	EG020-SD: Arsenic	7440-38-2	50 mg/kg	99.0	70	130
		EG020-SD: Cadmium	7440-43-9	50 mg/kg	98.6	70	130
		EG020-SD: Chromium	7440-47-3	50 mg/kg	84.5	70	130
		EG020-SD: Copper	7440-50-8	250 mg/kg	95.5	70	130
		EG020-SD: Lead	7439-92-1	250 mg/kg	87.3	70	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	103	70	130
		EG020-SD: Zinc	7440-66-6	250 mg/kg	91.4	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1062005)							
ES0911394-048	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	87.5	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1065392)							
ES0911551-001	QC-1	EG035T-LL: Mercury	7439-97-6	0.50 mg/kg	74.3	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1061666)							
ES0911498-001	Anonymous	EP080-SD: C6 - C9 Fraction	----	26 mg/kg	# 45.1	70	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 1062027)							
ES0911498-001	Anonymous	EP071-SD: C10 - C14 Fraction	----	19.75 mg/kg	80.8	70	130
		EP071-SD: C15 - C28 Fraction	----	87.25 mg/kg	74.3	70	130
		EP071-SD: C29 - C36 Fraction	----	60 mg/kg	89.7	70	130
EP080-SD: BTEX (QCLot: 1061666)							
ES0911498-001	Anonymous	EP080-SD: Benzene	71-43-2	2.5 mg/kg	# 25.4	70	130
		EP080-SD: Toluene	108-88-3	2.5 mg/kg	# 34.2	70	130
		EP080-SD: Ethylbenzene	100-41-4	2.5 mg/kg	# 25.6	70	130
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	# 26.5	70	130
		EP080-SD: ortho-Xylene	95-47-6	2.5 mg/kg	# 28.3	70	130
EP090: Organotin Compounds (QCLot: 1063543)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP090: Organotin Compounds (QCLot: 1063543) - continued							
ES0911551-003	BH2A-2 0.50-0.90m	EP090: Tributyltin	56573-85-4	12.5 µgSn/kg	69.6	20	130
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 1062189)							
ES0911498-001	Anonymous	EP130: Bromophos-ethyl	4824-78-6	50 µg/kg	79.9	36.9	142
		EP130: Carbophenothion	786-19-6	50 µg/kg	75.3	0.5	157
		EP130: Chlorfenvinphos (E)	470-90-6	5 µg/kg	100	50.3	137
		EP130: Chlorfenvinphos (Z)	470-90-8	50 µg/kg	76.7	55.9	152
		EP130: Chlorpyrifos	2921-88-2	50 µg/kg	69.2	49	140
		EP130: Chlorpyrifos-methyl	5598-13-0	50 µg/kg	68.7	28.1	142
		EP130: Demeton-S-methyl	919-86-8	50 µg/kg	78.8	36.6	172
		EP130: Diazinon	333-41-5	50 µg/kg	75.4	37.2	148
		EP130: Dichlorvos	62-73-7	50 µg/kg	66.1	32.7	153
		EP130: Dimethoate	60-51-5	50 µg/kg	77.5	33.2	150
		EP130: Ethion	563-12-2	50 µg/kg	93.1	44	146
		EP130: Fenamiphos	22224-92-6	50 µg/kg	87.8	3.08	162
		EP130: Fenthion	55-38-9	50 µg/kg	75.6	10.6	157
		EP130: Malathion	121-75-5	50 µg/kg	69.6	38.1	143
		EP130: Azinphos Methyl	86-50-0	50 µg/kg	95.2	8.13	159
		EP130: Monocrotophos	6923-22-4	50 µg/kg	121	19.7	176
		EP130: Parathion	56-38-2	50 µg/kg	86.2	39.2	145
		EP130: Parathion-methyl	298-00-0	50 µg/kg	66.9	23.5	152
		EP130: Pirimphos-ethyl	23505-41-1	50 µg/kg	77.6	47.1	141
		EP130: Prothiofos	34643-46-4	50 µg/kg	81.6	36.1	148
EP131A: Organochlorine Pesticides (QCLot: 1062190)							
ES0911498-001	Anonymous	EP131A: Aldrin	309-00-2	5 µg/kg	67.9	31.7	140
		EP131A: alpha-BHC	319-84-6	5 µg/kg	71.4	24.5	150
		EP131A: beta-BHC	319-85-7	5 µg/kg	116	36.9	139
		EP131A: delta-BHC	319-86-8	5 µg/kg	84.9	38.2	137
		EP131A: 4.4`-DDD	72-54-8	5 µg/kg	112	42.5	141
		EP131A: 4.4`-DDE	72-55-9	5 µg/kg	76.5	34.8	140
		EP131A: 4.4`-DDT	50-29-3	5 µg/kg	94.7	38	143
		EP131A: Dieldrin	60-57-1	5 µg/kg	83.9	43.2	134
		EP131A: alpha-Endosulfan	959-98-8	5 µg/kg	82.9	23.7	139
		EP131A: beta-Endosulfan	33213-65-9	5 µg/kg	100	35.8	138
		EP131A: Endosulfan sulfate	1031-07-8	5 µg/kg	96.9	7.45	158
		EP131A: Endrin	72-20-8	5 µg/kg	126	21.6	162
		EP131A: Endrin aldehyde	7421-93-4	5 µg/kg	67.2	19.3	131
		EP131A: Endrin ketone	53494-70-5	5 µg/kg	80.0	17.9	141
		EP131A: Heptachlor	76-44-8	5 µg/kg	73.3	31	153

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Spike Recovery (%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP131A: Organochlorine Pesticides (QCLot: 1062190) - continued							
ES0911498-001	Anonymous	EP131A: Heptachlor epoxide	1024-57-3	5 µg/kg	75.0	34.3	138
		EP131A: Hexachlorobenzene (HCB)	118-74-1	5 µg/kg	93.8	18.6	146
		EP131A: gamma-BHC	58-89-9	5 µg/kg	58.9	30.7	145
		EP131A: Methoxychlor	72-43-5	5 µg/kg	92.9	15	157
		EP131A: cis-Chlordane	5103-71-9	5 µg/kg	85.7	22.3	145
		EP131A: trans-Chlordane	5103-74-2	5 µg/kg	81.3	42.4	139
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 1062191)							
ES0911498-001	Anonymous	EP131B: Aroclor 1254	11097-69-1	50 µg/kg	67.5	61.3	121
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 1062026)							
ES0911498-001	Anonymous	EP132B-SD: Naphthalene	91-20-3	25 µg/kg	102	70	130
		EP132B-SD: 2-Methylnaphthalene	91-57-6	25 µg/kg	106	70	130
		EP132B-SD: Acenaphthylene	208-96-8	25 µg/kg	104	70	130
		EP132B-SD: Acenaphthene	83-32-9	25 µg/kg	97.7	70	130
		EP132B-SD: Fluorene	86-73-7	25 µg/kg	102	70	130
		EP132B-SD: Phenanthrene	85-01-8	25 µg/kg	108	70	130
		EP132B-SD: Anthracene	120-12-7	25 µg/kg	105	70	130
		EP132B-SD: Fluoranthene	206-44-0	25 µg/kg	101	70	130
		EP132B-SD: Pyrene	129-00-0	25 µg/kg	92.2	70	130
		EP132B-SD: Benz(a)anthracene	56-55-3	25 µg/kg	124	70	130
		EP132B-SD: Chrysene	218-01-9	25 µg/kg	120	70	130
		EP132B-SD: Benzo(b)fluoranthene	205-99-2	25 µg/kg	120	70	130
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	25 µg/kg	117	70	130
		EP132B-SD: Benzo(e)pyrene	192-97-2	25 µg/kg	115	70	130
		EP132B-SD: Benzo(a)pyrene	50-32-8	25 µg/kg	119	70	130
		EP132B-SD: Perylene	198-55-0	25 µg/kg	118	70	130
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	25 µg/kg	120	70	130
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	25 µg/kg	118	70	130
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	25 µg/kg	119	70	130
		EP132B-SD: Coronene	191-07-1	25 µg/kg	117	70	130

Appendix 5 Secondary Laboratory Reports (AAA)

REPORT OF ANALYSIS

Laboratory Reference: A09/2429

Client: Golder Associates Pty Ltd QLD
611 Coronation Drive
Toowong QLD 4066

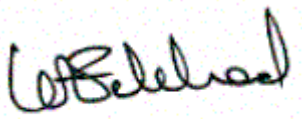
Contact: Ian Wallace

Order No: BN/354/09
Project: Laird Point Dredge Study - Option 2A
Sample Type: Sediment
No. of Samples: 1
Date Received: 7/8/09
Date Completed: 24/08/2009

Laboratory Contact Details:

Client Services Manager: Lilian Wong
Technical Enquiries: Andrew Bradbury
Telephone: +61 7 3268 1228
Fax: +61 7 3268 1238
Email: brisbane@advancedanalytical.com.au
andrew.bradbury@advancedanalytical.com.au

Attached Results Approved By:



Ian Eckhard
Technical Director

Comments:
All samples tested as submitted by client. All attached results have been checked and approved for release.
This is the Final Report and supersedes any reports previously issued with this batch number.
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NATA Accredited Laboratory
Accreditation No: 15109

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Batch Number: A09/2429
Project Reference: Laird Point Dredge Study - Option 2A

Laboratory Reference:	-	-	**/1**
Client Reference:	-	-	**BH2A-33 0.00 - 0.50m**
Date Sampled:	-	-	**5/8/09**
Analysis Description	**Method**	**Units**	
Moisture Content			
Moisture Content	04-004	%	19.3
Trace Elements			
Silver	04-001	mg/kg	<0.1
Aluminium	04-001	mg/kg	10,223
Arsenic	04-001	mg/kg	4.4
Cadmium	04-001	mg/kg	<0.1
Cobalt	04-001	mg/kg	4.1
Copper	04-001	mg/kg	20
Chromium	04-001	mg/kg	14
Iron	04-001	mg/kg	26,000
Manganese	04-001	mg/kg	31
Nickel	04-001	mg/kg	4.0
Selenium	04-001	mg/kg	<0.5
Antimony	04-001	mg/kg	<0.5
Lead	04-001	mg/kg	4.3
Zinc	04-001	mg/kg	13
Vanadium	04-001	mg/kg	47
Poly Aromatic Hydrocarbons			
Naphthalene	04-022	µg/kg	<5
1-Methylnaphthalene	04-022	µg/kg	<5
2-Methylnaphthalene	04-022	µg/kg	<5
Acenaphthylene	04-022	µg/kg	<5
Acenaphthene	04-022	µg/kg	<5
Fluorene	04-022	µg/kg	<5
Phenanthrene	04-022	µg/kg	<5
Anthracene	04-022	µg/kg	<5
Fluoranthene	04-022	µg/kg	<5
Pyrene	04-022	µg/kg	<5
Benz(a)anthracene	04-022	µg/kg	<5
Chrysene	04-022	µg/kg	<5

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Batch Number: A09/2429
Project Reference: Laird Point Dredge Study - Option 2A

Laboratory Reference: **Client Reference:** **Date Sampled:** **Analysis Description**	- - - **Method**	- - - **Units**	**/1** **BH2A-33 0.00 - 0.50m** **5/8/09**
Benzo(b)&(k)fluoranthene	04-022	µg/kg	<10
Benzo(a)pyrene	04-022	µg/kg	<5
Indeno(1,2,3-cd)pyrene	04-022	µg/kg	<5
Dibenz(a,h)anthracene	04-022	µg/kg	<5
Benzo(g,h,i)perylene	04-022	µg/kg	<5
Coronene	04-022	µg/kg	<10
Benzo(e)pyrene	04-022	µg/kg	<5
Total PAHs (as above)	04-022	µg/kg	<100
Surrogate 1 Recovery	04-022	%	86
Surrogate 2 Recovery	04-022	%	105
Surrogate 3 Recovery	04-022	%	105
Date Extracted	04-022	-	19/08/2009
Date Analysed	04-022	-	20/08/2009
Subcontract Analysis			
Particle Size Distribution	SUB		See comments
Total Organic Carbon	SUB	%	0.22

Method	Method Description
04-004	Moisture by gravimetric, %
04-001	Metals by ICP-OES, mg/kg
04-022	Low level PAHs & Phenols by GCMS, µg/kg
SUB	Subcontracted Analyses

Result Comments

[<] Less than
[INS] Insufficient sample for this test
[NA] Test not required

Solid sample results are reported on a dry weight basis.
Total Organic Carbon (TOC) analysis was subcontracted to Ecowise Environmental Pty Ltd (NATA Number 992); reference Ecowise Job Name: XADVAN_2_77900.
PSD analysis was subcontracted to Golder Associates (NATA Number 1446); see attached Golder report number R7985.

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Project Reference: Laird Point Dredge Study - Option 2A

QUALITY ASSURANCE REPORT

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results
Moisture Content	%	N/T	A09/2429-1	19.3 || 19.3 || RPD: 0

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Silver	mg/kg	<0.1	A09/2429-1	<0.1 || <0.1	A09/2432/01	92%
Aluminium	mg/kg	1	A09/2429-1	10223 || 10336 || RPD: 1	A09/2432/01	#
Arsenic	mg/kg	<0.4	A09/2429-1	4.4 || 4.3 || RPD: 2	A09/2432/01	97%
Cadmium	mg/kg	<0.1	A09/2429-1	<0.1 || <0.1	A09/2432/01	90%
Cobalt	mg/kg	<0.10	A09/2429-1	4.1 || 4.1 || RPD: 0	A09/2432/01	89%
Copper	mg/kg	<0.1	A09/2429-1	20 || 20 || RPD: 0	A09/2432/01	96%
Chromium	mg/kg	<0.1	A09/2429-1	14 || 14 || RPD: 0	A09/2432/01	90%
Iron	mg/kg	1.5	A09/2429-1	26000 || 26000 || RPD: 0	A09/2432/01	#
Manganese	mg/kg	<0.1	A09/2429-1	31 || 31 || RPD: 0	A09/2432/01	93%
Nickel	mg/kg	<0.1	A09/2429-1	4.0 || 4.0 || RPD: 0	A09/2432/01	89%
Selenium	mg/kg	<0.5	A09/2429-1	<0.5 || <0.5	A09/2432/01	99%
Antimony	mg/kg	<0.5	A09/2429-1	<0.5 || <0.5	A09/2432/01	88%
Lead	mg/kg	<0.12	A09/2429-1	4.3 || 4.2 || RPD: 2	A09/2432/01	84%
Zinc	mg/kg	0.15	A09/2429-1	13 || 14 || RPD: 7	A09/2432/01	92%
Vanadium	mg/kg	<0.16	A09/2429-1	47 || 46 || RPD: 2	A09/2432/01	95%

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Naphthalene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	80%
1-Methylnaphthalene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	97%
2-Methylnaphthalene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	76%
Acenaphthylene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	96%
Acenaphthene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	97%
Fluorene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	106%
Phenanthrene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	107%
Anthracene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	109%
Fluoranthene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	126%
Pyrene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	125%
Benz(a)anthracene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	123%
Chrysene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	104%
Benzo(b)&(k)fluoranthene	µg/kg	<10	A09/2429-1	<10 || <10	A09/2432/01	102%
Benzo(a)pyrene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	93%
Indeno(1,2,3-cd)pyrene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	84%
Dibenz(a,h)anthracene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	105%
Benzo(g,h,i)perylene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	101%

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Project Reference: Laird Point Dredge Study - Option 2A

TEST	UNITS	Blank	Duplicate Sm#	Duplicate Results	Spike Sm#	Spike Results
Coronene	µg/kg	<10	A09/2429-1	<10 || <10	A09/2432/01	98%
Benzo(e)pyrene	µg/kg	<5	A09/2429-1	<5 || <5	A09/2432/01	93%
Total PAHs (as above)	µg/kg	<100	A09/2429-1	<100 || <100	A09/2432/01	N/A
Surrogate 1 Recovery	%	118	A09/2429-1	86 || 84 || RPD: 2	A09/2432/01	87%
Surrogate 2 Recovery	%	109	A09/2429-1	105 || 104 || RPD: 1	A09/2432/01	106%
Surrogate 3 Recovery	%	123	A09/2429-1	105 || 100 || RPD: 5	A09/2432/01	109%

TEST	UNITS	Blank
Total Organic Carbon	%	<0.02

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Project Reference: Laird Point Dredge Study - Option 2A

Comments:

RPD = Relative Percent Deviation
[NT] = Not Tested
[N/A] = Not Applicable
'#' = Spike recovery data could not be calculated due to high levels of contaminants

Acceptable replicate reproducibility limit or RPD:	Results < 10 times LOR: no limits.
	Results >10 times LOR: 0% - 50%.
Acceptable matrix spike & LCS recovery limits:	Trace elements 70-130%
	Organic analyses 50-150%
	SVOC & speciated phenols 10-140%
	Surrogates 10-140%

When levels outside these limits are obtained, an investigation into the cause of the deviation is performed before the batch is accepted or rejected, and results are released.

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Appendix 6 Bulk Density and Settling Rate Laboratory Reports

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Client: Worley Parsons — Sampled By: Golder
Project: Laird Point Dredging Study — Job No: 097633052
Location: Dredge Foortprint - Option 2A

Bulk Density Results

Sample Location	Depth of core sub-sample	Volume - Calculated by Direct Measurement[1] (cc)	*insitu* Volume - Estimated from Field data [2] (cc)	Wet Sample Weight (g)	Moisture (%)	Bulk Density (t/m_3)	Dry Density (t/m_3)
HOLOCENE							
BH2-A 01	1.3-1.4m	339	398	574	44.9	1.44 - 1.69	0.80 - 0.93
BH2-A 03	0.7-0.8m	467	442	643	51.0	1.38 - 1.46	0.67 - 0.71
BH2-A 04	0.7-0.8m	431	398	729	46.5	1.69 - 1.83	0.90 - 0.98
BH2-A 05	0.7-0.8m	416	411	668	44.3	1.60 - 1.62	0.89 - 0.90
BH2-A 06	1.2-1.3m	391	442	800	23.6	1.81 - 2.05	1.38 - 1.56
BH2-A 27	0.2-0.3m	445	408	585	26.4	1.31 - 1.43	0.97 - 1.06
BH2-A 29	0.7-0.8m	370	398	693	51.3	1.74-1.87	0.85 - 0.91
Averages					**41.2**	**1.62-1.66**	**0.95 - 0.98**
PLEISTOCENE							
BH2-A 01	2.3-2.4m	302	398	639	29.2	1.61 - 2.11	1.14 - 1.50
BH2-A 02	0.2-0.3m	374	393	827	22.2	2.11 - 2.21	1.64 - 1.72
BH2-A 03	2.7-2.8m	383	442	691	27.2	1.56 - 1.80	1.14 - 1.31
BH2-A 04	2.2-2.3m	386	398	820	28.4	2.06 - 2.12	1.48 - 1.52
BH2-A 05	3.3-3.4m	315	411	653	24.9	1.59 - 2.08	1.19 - 1.56
BH2-A 06	2.2-2.3m	392	442	828	19.5	1.87 - 2.11	1.51 - 1.70
BH2-A 08	0.3-0.35m	163	184	334	28.0	1.81 - 2.05	1.31 - 1.48
BH2-A 10	0.7-0.8m	339	442	722	18.1	1.63 - 2.13	1.34 - 1.75
BH2-A 14	0.8-0.89m	284	358	618	23.4	1.73 - 2.18	1.32 - 1.67
BH2-A 20	0.7-0.8m	319	442	643	20.5	1.46 - 2.02	1.16 - 1.60
BH2-A 24	0.7-0.8m	342	442	758	15.6	1.72 - 2.22	1.45 - 1.87
BH2-A 26	1.3-1.4m	396	416	790	25.9	1.90 - 2.00	1.41 - 1.48
BH2-A 27	0.8-0.9m	352	408	792	16.9	1.94 - 2.25	1.61 - 1.87
BH2-A 29	1.7-1.8m	302	398	690	26.3	1.74 - 2.28	1.28 - 1.68
BH2-A 33	0.2-0.3m	374	442	780	18.9	1.77 - 2.09	1.43 - 1.69
Averages					**23.0**	**1.77 - 2.11**	**1.36 - 1.63**

Test Procedure:

The length of the recovered sediment core was measured and reported and compared to the coring length recorded in the field and an estimate of the % core shrinkage or swell was made (ie. to allow correction of a meaasured sub-sample). A measured (approx. 100mm) sub-sample of core was collected from each horizon (Holocene or Pleistocene). An estimated *insitu* volume was calculated based on the recovered sub-sample length and casing diameter (75mm). Each sub-sample was also measured directly for length and diameter and a volume calculated based on these measuremnts. Volumes from both measurement methods were corrected for core shrinkage or swelling. Each sub-sample was weighed and moisture content determined. The following formula were used to determine a 'range' for bulk density based on teh two methods described:

1. Volume of core sub-sample (cc) = (π (65mm/2) x length) / 1,000
2. Volume of core sub-sample (cc) = (π (measured dia/2) x measured length) / 1,000

Correction for *insitu* volume = volume of sub-sample / correction factor

% Moisture = dry weight of solids / wet weight of solids * 100

Bulk Density (g/cc) = wet wt soil / volume

Dry Density (g/cc) = wet wt soil * ((100-% moisture)/100) / *in situ* volume

Prepared By: IMW — Checked By: HP

Golder Associates

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ENVIRONMENTAL SETTLING TEST

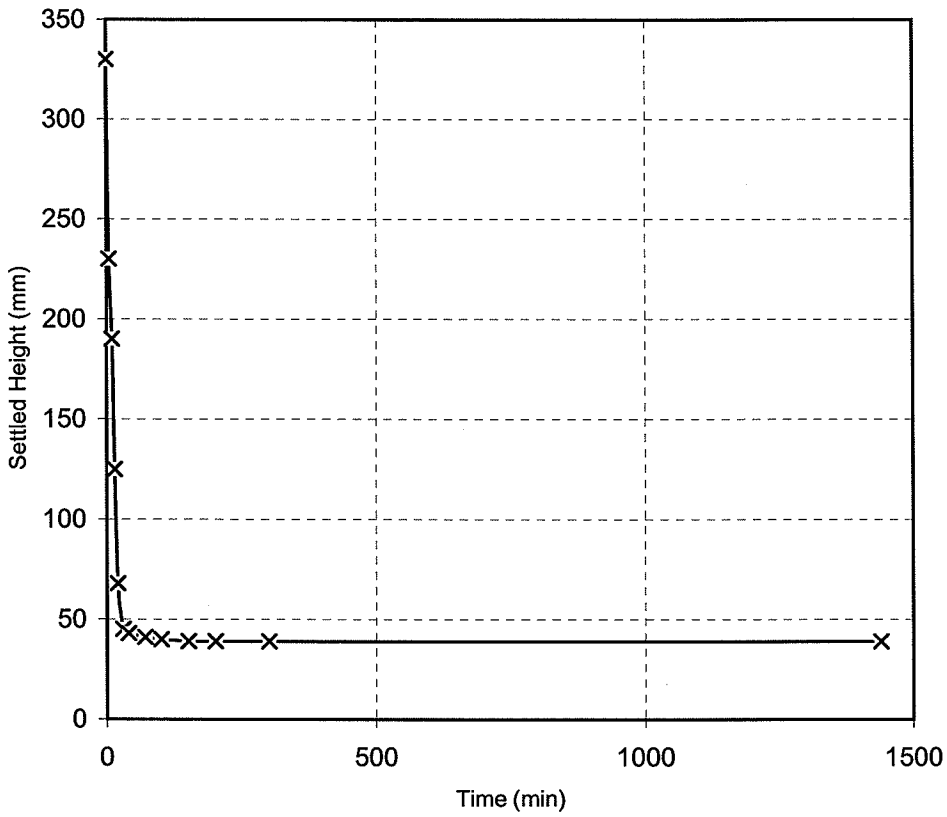
Client :	Worley Parsons	Job No. :	097633052
Project :	Laird Point	Reg'n No. :	0938413
Sample ID. :	BH2A-2 (0.5 - 0.9m)	Date Received:	17/08/2009
		Sampled By :	Golder

TEST CONDITIONS

Weight of solids (g)	90	Volume of Slurry (ml)	940
Starting weight (g)	990	Final Volume (ml)	110
Starting Slurry Density (%)	10	Final Pulp Weight (g)	160

TEST RESULTS

Time (min)	Height (mm)
0	330
5	230
10	190
15	125
20	68
30	45
40	43
70	41
100	40
150	39
200	39
300	39
1440	39



SETTLING RATES

Underflow Density (g/cm³)	1.455
Underflow % Solids	56

Settlement (%)	Settling Height (mm)	Settling Rate (mm/min)
50	185	13.23
90	68	13.10

Remarks :	Clear settling interface after 5 minutes.
Material Description :	(CH) Silty CLAY, brown
Test Procedure :	
Prepared by NP	Checked by JA

Golder Associates

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ENVIRONMENTAL SETTLING TEST

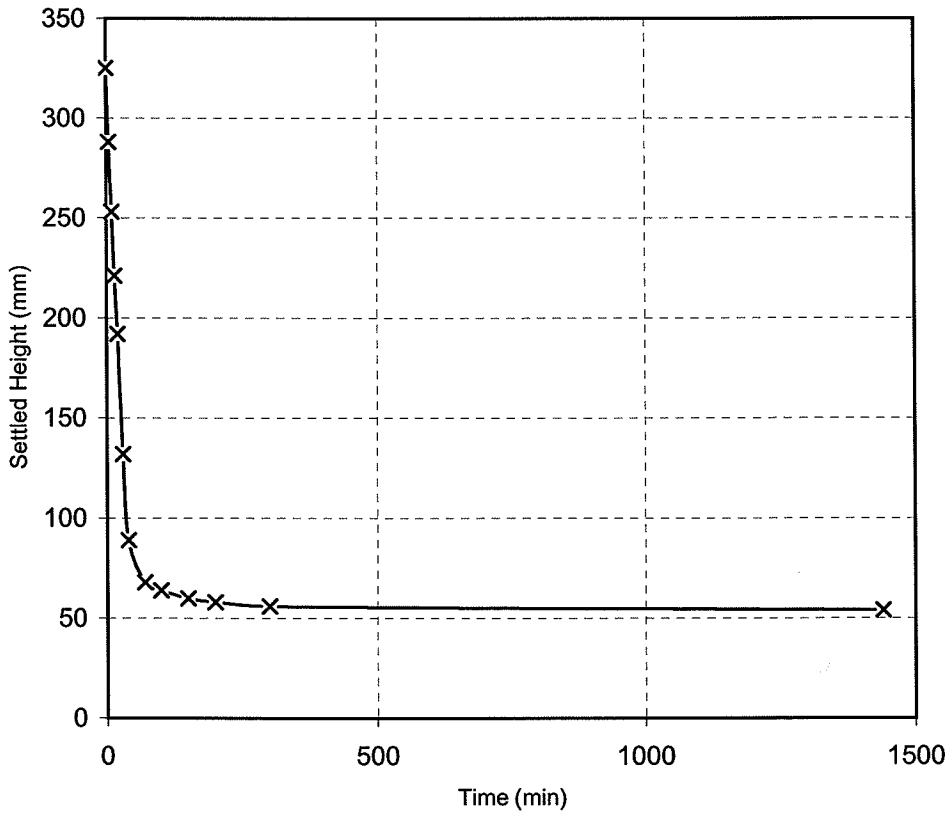
Client :	Worley Parsons	Job No. :	097633052
Project :	Laird Point	Reg'n No. :	0938414
Sample ID. :	BH2A-16 (0.5 - 1.5m)	Date Received:	17/08/2009
		Sampled By :	Golder

TEST CONDITIONS

Weight of solids (g)	90	Volume of Slurry (ml)	930
Starting weight (g)	990	Final Volume (ml)	158
Starting Slurry Density (%)	10	Final Pulp Weight (g)	218

TEST RESULTS

Time (min)	Height (mm)
0	325
5	288
10	253
15	221
20	192
30	132
40	89
70	68
100	64
150	60
200	58
300	56
1440	54



SETTLING RATES

Underflow Density (g/cm³)	1.380
Underflow % Solids	41

Settlement (%)	Settling Height (mm)	Settling Rate (mm/min)
50	190	4.67
90	81	5.42

Remarks :	Clear settling interface after 5 minutes.
Material Description :	(CH) Silty CLAY, grey
Test Procedure :	
Prepared by NF	Checked by JA

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ENVIRONMENTAL SETTLING TEST

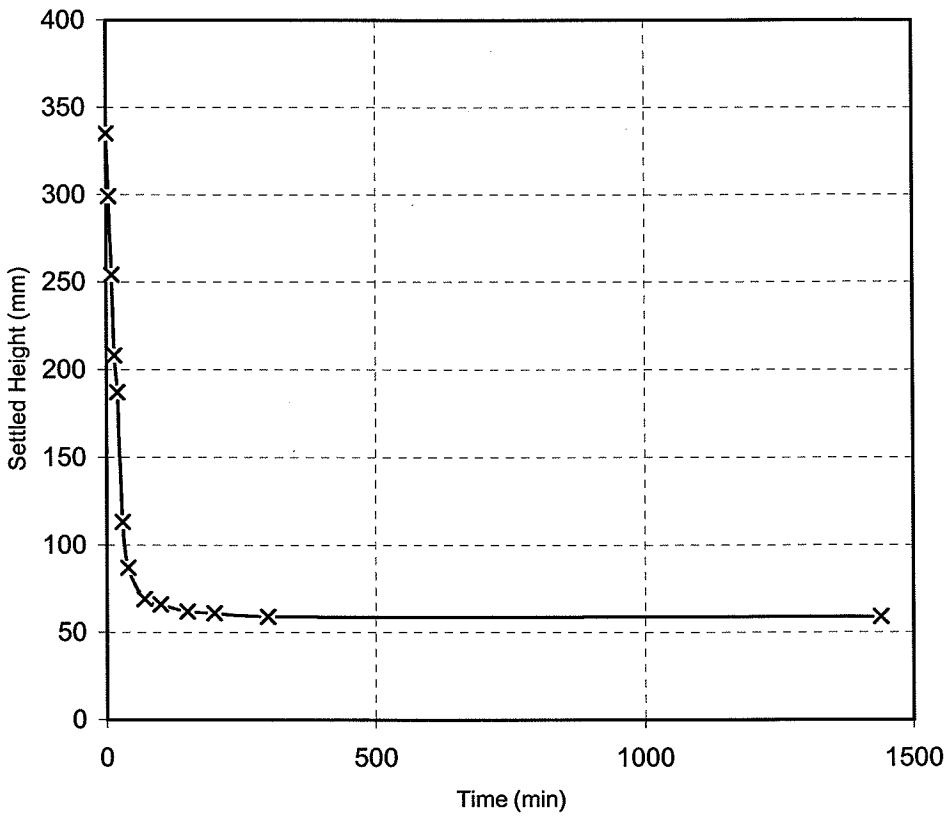
Client :	Worley Parsons	Job No. :	097633052
Project :	Laird Point	Reg'n No. :	0938415
Sample ID. :	BH2A-9 (0.1 - 1.5m)	Date Received:	17/08/2009
		Sampled By :	Golder

TEST CONDITIONS

Weight of solids (g)	90	Volume of Slurry (ml)	925
Starting weight (g)	990	Final Volume (ml)	160
Starting Slurry Density (%)	10	Final Pulp Weight (g)	225

TEST RESULTS

Time (min)	Height (mm)
0	335
5	299
10	254
15	208
20	187
30	113
40	87
70	69
100	66
150	62
200	61
300	59
1440	59



SETTLING RATES

Underflow Density (g/cm³)	1.406
Underflow % Solids	40

Settlement (%)	Settling Height (mm)	Settling Rate (mm/min)
50	197	5.52
90	87	6.21

Remarks :	Clear settling interface after 5 minutes.
Material Description :	(CH) Silty CLAY, grey
Test Procedure :	
Prepared by MV	Checked by JA

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ENVIRONMENTAL SETTLING TEST

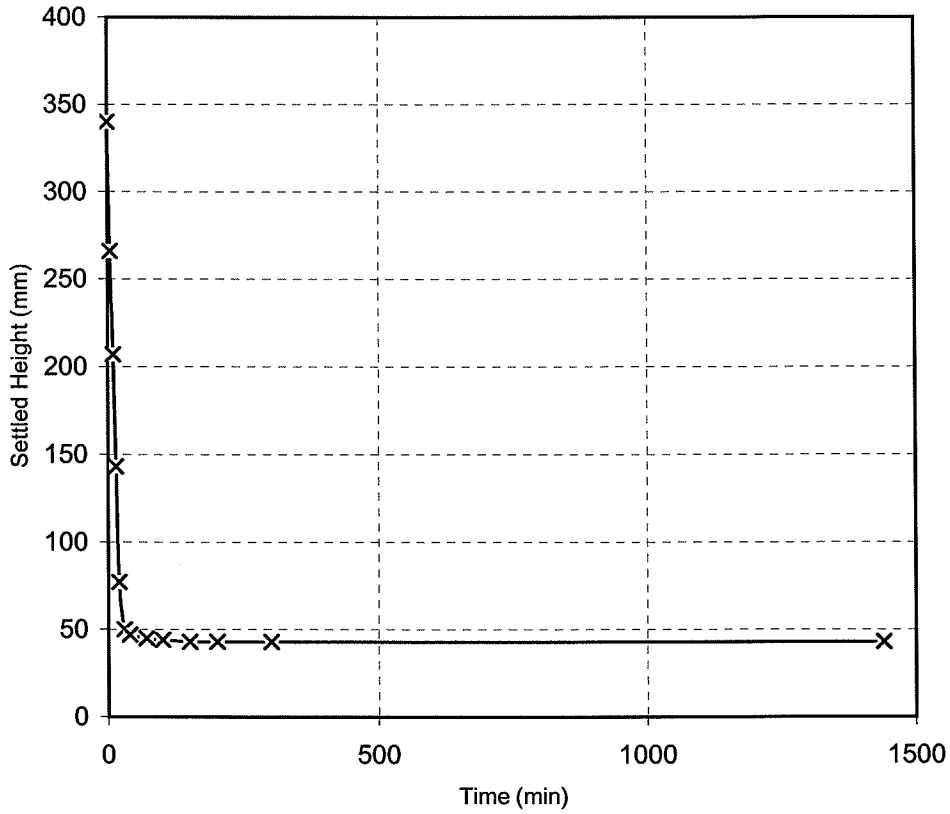
Client :	Worley Parsons	Job No. :	097633052
Project :	Laird Point	Reg'n No. :	0938416
Sample ID. :	BH2A-32 (0.5 - 1.1m)	Date Received:	17/08/2009
		Sampled By :	Golder

TEST CONDITIONS

Weight of solids (g)	90	Volume of Slurry (ml)	935
Starting weight (g)	990	Final Volume (ml)	120
Starting Slurry Density (%)	10	Final Pulp Weight (g)	175

TEST RESULTS

Time (min)	Height (mm)
0	340
5	266
10	207
15	143
20	77
30	50
40	47
70	45
100	44
150	43
200	43
300	43
1440	43



SETTLING RATES

Underflow Density (g/cm³)	1.458
Underflow % Solids	51

Settlement (%)	Settling Height (mm)	Settling Rate (mm/min)
50	192	10.61
90	73	11.62

Remarks :	Clear settling interface after 5 minutes.
Material Description :	(SC) Clayey SAND, brown
Test Procedure :	
Prepared by NF	Checked by JA