Port of Brisbane Sediment Sampling and Analysis Plan Implementation Report – 2019

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Synopsis: **A report describing the physio-chemical characteristics of sediment to be dredging during the maintenance dredging program at the Port of Brisbane (2019). The assessment was carried out in accordance with the project sampling and analysis plan (SAP) and the National Assessment Guidelines for Dredging (2009).**

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Executive Summary

Port of Brisbane Pty Ltd (PBPL) proposes to undertake its annual maintenance dredging within the navigational areas of the Brisbane River and western Moreton Bay, primarily using the Trailer Suction Hopper Dredge 'Brisbane'.

The physical and chemical properties of proposed dredged sediment were characterised in accordance with the National Assessment Guidelines for Dredging (NAGD) to assess the suitability of dredged material for unconfined ocean disposal. The dredge area was divided into different dredging subareas based on existing contaminant data, comprising Zone 2 (Colmslie to Pinkenba), Zone 3 (within Port reaches) and Zone 4 (Entrance Channel). Zone 1 (upstream of the dredge area) is not part of the annual dredging and samples from this zone were collected as 'background' samples upstream of dredged areas. Sediment was also sampled at the Mud Island Dredge Material Placement Area (MIDMPA) and reference sites in Bramble Bay north of the Port of Brisbane.

Sediments within Zone 2 were variable characterised by a higher proportion of fines (clays and silts), whereas Zones 3 and 4 generally were comprised of sands and fines. The Moreton Bay reference sites were comprised almost entirely of fines, whereas the MIDMPA was similar to Zone 4. These results are consistent with previous sampling.

The sediments in the dredging zones were found to be suitable for ocean disposal in accordance with the NAGD based on the following results:

- The upper 95% confidence limits (95% UCL) of the mean concentrations of most analysed metals and metalloids (except nickel and mercury) were less than respective NAGD screening levels, and therefore considered suitable for ocean disposal in accordance with NAGD with respect to these metals and metalloids.
- The 95% UCL nickel concentrations for the overall dredge area (19.6 mg/kg) was less than the NAGD screening level of 21 mg/kg. The 95% UCL for Zone 2 (22.5 mg/kg) exceeded the NAGD screening level, but Zone 3 (20.1 mg/kg) and Zone 4 (18.7 mg/kg) were below. The dredge zones were all less than the reference sites (95% UCL of 25.1 mg/kg).
- The 95% UCL mercury concentration for the overall dredge area (0.18 mg/kg) was slightly greater that the NAGD screening level of 0.15 mg/kg. Zone 2 (0.25 mg/kg) exceeded the NAGD screening level, but Zone 3 (0.07 mg/kg), Zone 4 (0.08 mg/kg) and reference sites (0.09 mg/kg) were less than the NAGD screening level.
- The nickel and mercury concentrations recorded in 2019 were consistent with those recorded in 2013-2018. Also consistent with previous years, Phase 3 bioavailability testing indicated that nickel and mercury were below levels of concern.
- All organic contaminants including organotins, Total Petroleum Hydrocarbons (TPHs), Polyaromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs) and organochlorine pesticides (OCPs) had concentrations below the LOR or the 95% UCLs were below the respective NAGD screening levels, with the exception of DDE. DDE, a break-down product of the persistent pesticide DDT, had a 95% UCL value of 2.3 µg/kg for the overall dredge area, slightly above the screening level of 2.2 µg/kg. DDE exceeded the screening level at Zone 2 (3.75 µg/kg) and Zone 4 (4.24 µg/kg) but was within the screening level at Zone

3 (1.81 µg/kg). The 95% UCL was not calculated at the reference sites due to the large number of non-detects. Bioavailability testing also indicated that DDT and its metabolites were below levels of concern.

- Acid Sulfate Soil testing indicated that while sediments were characterised as potential acid sulfate soils (PASS), the acid neutralizing capacity at all sites was sufficient for neutralising acids upon oxidation.

The evaluation of laboratory and field QA/QC procedures and assessments indicated that all sampling, sample handling and storage and laboratory analysis was undertaken to a high standard providing scientific confidence that the presented results are valid to allow an assessment of sediment quality against the NAGD.

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1 Introduction

1.1 Background

Port of Brisbane Pty Ltd (PBPL) is required to maintain a minimum depth of clearance below the keel of vessels calling at the port to allow for effective shipping access to the port and ensure ship safety. PBPL undertakes an annual maintenance dredging program to ensure these minimum depths are maintained.

PBPL propose to undertake its annual maintenance dredging within the navigational areas of the Brisbane River and Moreton Bay, primarily using the Trailer Suction Hopper Dredge (TSHD) 'Brisbane'. Maintenance dredging works extend from the Hamilton Reach of the Brisbane River to the North West Channel located in northern Moreton Bay.

It is proposed that dredged material is placed at sea within the Mud Island Dredge Material Placement Area (MIDMPA) or on land in the Future Port Expansion (FPE) reclamation area. To assess suitability of dredged material for unconfined ocean placement, characterisation of the physical and chemical properties of proposed dredged sediment was required to be undertaken in accordance with the National Assessment Guidelines for Dredging (Commonwealth of Australia 2009; henceforth NAGD).

This report documents the findings of a sampling campaign conducted in September 2019. The overall aim of this study is to assess the physical and chemical properties of sediments to be dredged from the Port of Brisbane, and based on the approach set out in the NAGD, assess the suitability of dredged material for unconfined ocean disposal (if required). The specific objectives of the study were to:

- Describe and quantify the physical properties of sediments to be dredged;
- Quantify concentrations of potential contaminants in sediments to be dredged;
- Compare contaminant concentrations to screening levels set out in the NAGD to determine whether there is a need for further assessment; and
- Assess the bioavailability of contaminants and potential toxicity effects based on comparisons of contaminant concentrations to guideline values.

1.2 Proposed Dredging

PBPL's area of responsibility in relation to maintenance and capital dredging within port limits can be broadly divided into two locations on the basis of the water body type, navigable depths and nature of dredged material:

- Moreton Bay dredge area (enclosed/open coastal waters); and
- Brisbane River dredge area, including the Port of Brisbane (middle/lower estuary).

This SAP specifically focusses on sediments in the Brisbane River dredge area, as well as the MIDMPA and 'reference' areas in western Moreton Bay. The Brisbane River dredge area extends from Hamilton Reach to the Outer Bar Cutting. Annual maintenance dredging is required to remove sediments accumulated by natural siltation processes within the catchment.

To ensure that declared depths of navigational channels are maintained at all times, PBPL undertakes 'insurance' dredging of up to -0.5 metres below the declared depth. On average, PBPL dredges about 300,000 m^3 to 350,000 m^3 of material each year. Dredging volumes are predominantly driven by catchment rainfall events and subsequently additional dredging needs to be undertaken following major flood events, as occurred in 2011 and 2013.

The Brisbane River zone is divided into different dredging subareas based on existing contaminant data, comprising Zone 2, Zone 3 and Zone 4. It is noted that Zone 1 is not part of the annual dredging and samples from this zone have been used to collect reference samples upstream of the actual dredging areas.

The following average dredge volumes apply to the dredge subareas (Table 1-1).

Table 1-1 Approximate Maintenance Dredge Volumes

Dredging Subarea	Location	Average Dredge Volume (m^3)
Zone 2	Hamilton Reach to Lytton Rocks Cutting	83,000
Zone 3	Pelican Banks to Inner Bar Cutting	241,000
Zone 4	Outer Bar Cutting	26,000

The maintenance dredging program is structured to maximise efficiencies and utilisation of PBPL's largest dredger, the *TSHD Brisbane*. The *TSHD Brisbane* typically carries out the majority of the port's maintenance dredging over a two-month period between January and May (actual period varies depending on other commitments of the *TSHD Brisbane* and siltation patterns). The PBPL may also utilise smaller, more manoeuvrable dredging plant, such as grab dredgers and bed levellers, to maintain more confined areas within the Port Limits.

1.3 Offshore Disposal

The PBPL's policy with regard to dredged material is to maximise its beneficial reuse. In general, most of the material dredged by the PBPL from within Port Limits is used in reclamation works associated with development of the port. The reuse of this dredged material provides several benefits, including:

- Reduced pressure on sea disposal sites;
- The placement of any actual or potential acid sulphate material at depth beneath the water surface; and
- The containment of any contaminated material within a designated boundary, disconnected from the marine system and monitored to ensure the immobility of identified contaminants.

In 2009, the reclamation life of the FPE area was estimated to be approximately 30 years, based on the current level of port development at that time. Following extreme flood events in both 2011 and 2013 and the subsequent disposal of additional material in the FPE area, the estimated life of the FPE area was reduced by 20 years to 10 years. Given the importance of the FPE as an area to

dispose of material unsuitable for ocean disposal, there has been a shift in thinking around the management of the FPE area.

The current proposed management of dredged material is to, where practical, dispose at sea all dredged material deemed suitable for ocean disposal. This proposed management initiative will ensure the long-term viability of the FPE area for the disposal of material deemed unsuitable for ocean disposal.

In the past, significant quantities of dredged material from the Brisbane River have been placed offshore at the MIDMPA. In recent years, only smaller volumes of dredged material from boat harbours in southern Moreton Bay were placed at the MIDMPA. However, it is proposed that the MIDMPA will be utilised for material found suitable for ocean disposal in future PBPL maintenance dredging campaigns.

1.4 Marine Communities and Environmental Values

The loading (dredging) site is located within the lower Brisbane River. The foreshore of the lower Brisbane River is in a highly modified condition, but still retains isolated patches of mangrove forest and tidal flats. The river channel is comprised of muds and sands, and supports a locally important trawl fishery (BMT WBM 2008c).

The Port of Brisbane port facilities are located at the Brisbane River mouth on land reclaimed over a shallow sub-tidal river delta containing a series of low-lying mangrove islands, collectively called the Fisherman Islands. Brisbane River and adjacent waters of Moreton Bay experiences freshwater flows and ongoing inputs of sediments and contaminants derived from human activities in its catchment. Two major sewage treatment plants also have their sewage discharges within kilometres of the Port facilities (Luggage Point and Wynnum North wastewater treatment plant).

Construction of the present-day port facilities over intertidal and subtidal areas has resulted in extensive changes to the environmental character of the Fisherman Islands area. However, significant areas of mangrove, saltmarsh and seagrass have also been retained, and form part of the Fisherman Islands wetland complex on the south eastern side of the Port of Brisbane (BMT WBM 2014). Moreton Bay Marine Park is situated to the south and east of the FPE seawall. This area contains one of the largest semi-contiguous seagrass beds in western Moreton Bay. A Ramsar listed wetland (Moreton Bay Ramsar site) is situated only kilometres to the south of the port facilities, comprising intertidal portions of the Fisherman Islands wetland complex. The seagrass and mudflats of the Ramsar site are recognised for their importance to dugong, marine turtles and migratory and resident shorebirds (BMT WBM 2008a).

MIDMPA is located between Mud Island and Fisherman Islands. Mud Island is an ancient coral reef that is no longer actively accreting coral skeletons, but still contains coral communities (Johnson and Neil 1998). MIDMPA is comprised of a mix of mud and sand substrates that provide habitat for a benthic invertebrate (BMT WBM 2008b) and fish assemblages.

2 Methodology

2.1 Compliance with SAP and Guidelines

All sampling and analysis of sediments was undertaken in accordance with the NAGD (Commonwealth of Australia 2009). All sampling and analysis procedures followed the approach outlined in the sampling and analysis plan (SAP) prepared by BMT WBM on 17 October 2013. A copy of the SAP is provided in Appendix A.

2.2 Timing of Sampling

Sampling was undertaken on the 2nd, 3rd and 4th September 2019 during daylight hours.

2.3 Sampling Locations and Sample Numbers

2.3.1 Sampling Locations

A map showing the sampling locations is provided in Figure 2-1. Thirty-five locations were sampled with a Van Veen grab sampler in accordance with the SAP and NAGD requirements. This included 26 sample locations within the proposed dredging area (Zones 2, 3 and 4) and nine reference locations (Zone 1, MIDMPA and Moreton Bay reference sites).

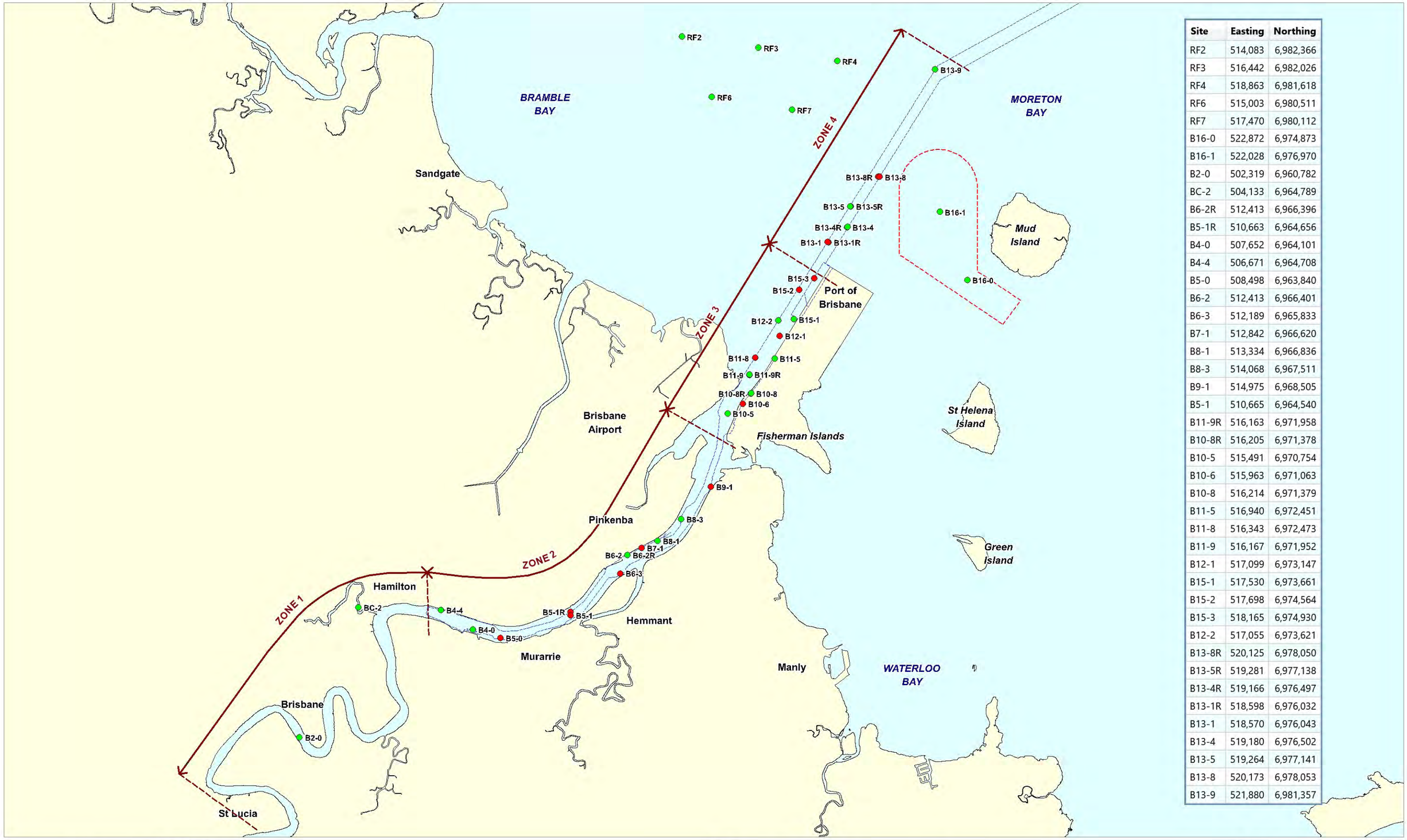
As per the SAP, all samples were analysed for a basic suite with a detailed suite analysed at selected study locations (refer to Figure 2-1 and Section 2.5).

2.3.2 Additional Field QA/QC Samples

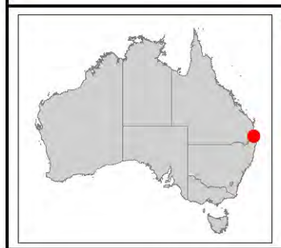
In accordance with NAGD requirements and based on the number of sample locations, the following field and laboratory quality control samples were taken:

- Three field triplicate samples at 10% of locations to determine the small scale (measured in metres) spatial variability of the sediment physical and chemical characteristics, i.e. two additional grab samples at locations 5-1 (Zone 2), 11-9 (Zone 3) and 13-4 (Zone 4);
- Two triplicate split samples (primary sample from 5% of locations thoroughly mixed and split into three sample container sets) to assess laboratory variation, with one of the three samples sent to a second (reference) laboratory for analysis. Split samples were obtained at location 6-2 (Zone 2) and 10-6 (Zone 3); and
- Three trip blank containers (one per sampling day) filled with inert material (e.g. chromatographic sand) to be analysed concurrent with the analysis of volatile organic substances such as BTEX and TPH C6-C9.

All samples were submitted to the primary and secondary laboratories in one batch, so no inter-batch samples were required.



Site	Easting	Northing
RF2	514,083	6,982,366
RF3	516,442	6,982,026
RF4	518,863	6,981,618
RF6	515,003	6,980,511
RF7	517,470	6,980,112
B16-0	522,872	6,974,873
B16-1	522,028	6,976,970
B2-0	502,319	6,960,782
BC-2	504,133	6,964,789
B6-2R	512,413	6,966,396
B5-1R	510,663	6,964,656
B4-0	507,652	6,964,101
B4-4	506,671	6,964,708
B5-0	508,498	6,963,840
B6-2	512,413	6,966,401
B6-3	512,189	6,965,833
B7-1	512,842	6,966,620
B8-1	513,334	6,966,836
B8-3	514,068	6,967,511
B9-1	514,975	6,968,505
B5-1	510,665	6,964,540
B11-9R	516,163	6,971,958
B10-8R	516,205	6,971,378
B10-5	515,491	6,970,754
B10-6	515,963	6,971,063
B10-8	516,214	6,971,379
B11-5	516,940	6,972,451
B11-8	516,343	6,972,473
B11-9	516,167	6,971,952
B12-1	517,099	6,973,147
B15-1	517,530	6,973,661
B15-2	517,698	6,974,564
B15-3	518,165	6,974,930
B12-2	517,055	6,973,621
B13-8R	520,125	6,978,050
B13-5R	519,281	6,977,138
B13-4R	519,166	6,976,497
B13-1R	518,598	6,976,032
B13-1	518,570	6,976,043
B13-4	519,180	6,976,502
B13-5	519,264	6,977,141
B13-8	520,173	6,978,053
B13-9	521,880	6,981,357



LEGEND

- Basic Suite
- Basic Suite and Detailed Suite
- Dredge Area
- Dredge Material Placement Area

Title:

Actual Sediment Sampling Locations

Figure: **2-1**

Rev: **A**

N

0 2.5 5km

Approx. Scale

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Filepath: I:\B20259_I_BRH Port of Brisbane DLR\DRG\ECO_022_131212 Sediment Sampling Locations.wor

2.3.3 Elutriate and Bioavailability Analyses

Phase III testing was undertaken for parameters which have frequently exceeded the NAGD screening levels in the past. Based on the review of historical data in the SAP this included:

- Metals and metalloids;
- Organotins (TBT); and
- Organochlorine Pesticides (DDT, DDD, DDE, chlordane).

Phase III testing for metals/metalloids (and potential other metals/metalloids) was undertaken from the primary samples collected for the sediment quality assessment and based on the initial analysis results. Analysis was performed on the samples with the highest concentrations.

Bioavailability analysis for the organic contaminants (organotins and organochlorine pesticides) required porewater testing as per NAGD. Additional samples were collected for porewater testing at the locations which have historically shown the highest percentage of screening level exceedances. To meet required holding times, elutriate and bioavailability analysis for the organic contaminants was undertaken concurrent with the analysis of the primary samples.

As per the SAP, additional samples for porewater testing were obtained from five locations in Zone 2 and six locations in Zone 3.

2.4 Sample Collection and Handling

2.4.1 Survey Vessel, Sampling Equipment and Personnel

The vessel *Abyss Dive*, which is owned and operated by Abyss Commercial Diving, was used for sampling the sediments. Both handheld GPS and differential GPS (dGPS) was used on the survey vessel for position fixing and navigation to each sampling location. All sediment sampling was undertaken by a team of two qualified marine scientists with experience in the implementation of sediment sampling and analysis programs.

2.4.2 Sampling Procedure

Sediment samples were collected using a stainless steel Van Veen grab sampler (0.14 m^2 grab). Only samples obtained with properly closed grab jaws were processed to ensure that the fine sediment fractions were retained.

In order to overcome issues with potential high variability at sampling locations, a minimum of two grabs were collected at each sampling location and pooled as one sample. An adequate number of grabs was obtained and pooled for each sample location ensuring that sufficient sediment was collected for all analyses.

2.4.3 Survey Vessel and Equipment House-Keeping

The vessel was thoroughly inspected and washed down prior to the beginning of sediment sampling each day. The workspace on the vessel was washed down regularly with ambient seawater to clean all surfaces and minimize the potential for dust contamination of samples. All sample processing was

undertaken away from any potential contamination sources such as engine exhausts, fuels, oils, greases, lead weights, zinc anodes, antifouling paint etc.

The grab sampler was thoroughly cleaned with De-con 90 solution prior to use and cleaned and rinsed with seawater between samples to prevent cross contamination between samples.

2.4.4 Sample Collection, Handling and Storage

Photographs of the grab samples were taken and grab samples were logged for its physical characteristics and variations in sediment type and texture (refer Appendix B). The grab samples from each location were carefully homogenized in a clean container prior to the filling of analytical laboratory-supplied clean sampling jars.

Nitrile gloves were worn by all field personnel handling the sediment, and gloves were disposed of after processing of each sample.

Sample bottles were labelled with a waterproof marker pen on the bottle label and lid. Sample bottles for organic analyses were filled with zero headspace to minimise volatilisation. A field trip blank sample container filled with clean chromatographic sand was placed with opened lid near the sample processing site while a sediment sample was completely processed.

All storage containers were chilled on ice immediately following sample collection. The samples were then transferred to BMT office in sealed eskies at the end of each sampling day. Acid Sulfate Soil samples were frozen at the end of each sampling day to minimise potential oxidation of the sediment material.

At the end of the sampling campaign, all samples were submitted to the primary and secondary analytical laboratories. All samples were submitted to the laboratories with Chain of Custody documentation (Appendices C and D).

2.5 Laboratory Analysis

As per the SAP, all samples were analysed for a basic suite with a detailed suite analysed at selected study locations (refer to Figure 2-1 and Appendix A).

2.5.1 Analytical Tests

Primary analysis of sediment samples was conducted by Australian Laboratory Services (ALS). The analysis of Particle Size Distribution was conducted by Microanalysis Australia. Symbio Laboratories was selected as the secondary (reference) laboratory for inter-laboratory quality testing.

A total of 35 locations were analysed for a basic suite of parameters. Of these, 12 locations were also analysed for a detailed list of contaminants. Furthermore, elutriate and bioavailability (porewater and dilute acid extraction) testing was undertaken at selected locations as per the SAP.

Basic List of Parameters:

- Analysis included contaminants of (potential) concern and supplementary parameters:
  - Metals/Metalloids (As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn, Al, Fe);
  - Organotins (MBT, DBT, TBT);

- Organochlorine pesticides (including DDT, DDD, DDE, chlordane);
- Particle Size Distribution (PSD);
- Moisture content; and
- Total Organic Carbon (TOC).

Detailed List of Parameters:

- Analysis included 'low risk' parameters that have been detected in the past but generally in concentrations below Limit of Reporting (LOR) or NAGD screening levels:
  - Polycyclic Aromatic Hydrocarbons (PAHs);
  - Total Petroleum Hydrocarbons (TPHs);
  - Polychlorinated Biphenyls (PCBs);
  - Acid Sulfate Soils;
  - Nutrients (TP, TN, NO_x, TKN); and
  - Radionuclides.

Elutriate and Bioavailability Testing:

- Metals/Metalloids;
- Organotins (TBT); and
- Organochlorine pesticides (DDT, DDD, DDE, chlordane).

2.5.2 Laboratory Quality Control

Both laboratories followed laboratory Quality Control (QC) procedures in accordance with requirements outlined in Appendix F of NAGD. This included analysis of laboratory blanks, duplicates, certified surrogate materials and spiked samples.

Validation of all laboratory QC analyses was conducted in accordance with Appendix A of NAGD to confirm suitable data quality for undertaking a rigorous characterisation of the proposed dredge material.

2.5.2.1 Laboratory Blanks

The purpose of this assessment is to monitor potential laboratory contamination of samples due to potential cross-contamination of samples during laboratory preparation, extraction or analysis. Blank sample concentrations should be at or near the LOR of the method used.

2.5.2.2 Laboratory Duplicates

This assessment refers to a randomly selected intra-laboratory split sample, which provides information regarding the method precision and sample heterogeneity. Results are presented as Relative Percent Difference (RPD) values of two sample concentrations for a specific contaminant.

NAGD recommends that duplicates should agree within a typical RPD of the method of ±35 %. This recommended RPD is typically not adopted by analytical laboratories as it does not account for the greater uncertainty for contaminant concentrations close to the method's LOR. NAGD also notes that RPDs may not always agree within these limits where sediments are very inhomogeneous or vary greatly in grain size.

The primary laboratory AAA uses the following approach to assess duplicate RPD's:

- Result <10 times LOR – no limit to RPD; and
- Result >10 times LOR – RPD between 0% and 50%.

The secondary laboratory ALS follows this approach:

- Result <10 times LOR – no limit to RPD;
- Result between 10 and 20 times LOR – RPD between 0% and 50%; and
- Result >20 times LOR – RPD between 0% and 20%.

Refer to Appendices C and D for the acceptance criteria of subcontracted laboratories.

2.5.2.3 Surrogate and Matrix Spikes

Laboratory Control Samples are either certified reference materials or a blank sample spiked with known concentrations of the analytes of interest. The purpose of this measurement is to monitor method accuracy.

Matrix spikes refer to an intra-laboratory split sample spiked with a representative set of target analytes of known concentration. Matrix spikes are assessed to monitor potential sample matrix effects on analyte recoveries.

Surrogate spikes are used for organic analytes. Surrogates are known additions to samples which mimic the compounds of interested and are not normally expected to be present in the sample.

For both surrogate and matrix spikes, a calculation of the percent recovery of the spiked amount against the returned concentration is performed indicating analytical performance in terms of extraction efficiency.

NAGD states that recovery limits of 75% - 125% are generally acceptable. Analytical laboratories typically adopt specific surrogate and matrix spike recovery limits for the various contaminant compound groups. It is also noted that ideal recovery ranges may be waived in the event of sample matrix interference.

The primary laboratory AAA adopts the following acceptable surrogate and matrix spike recovery limits:

- Trace elements: 70-130%;
- Organic analyses: 50-150%;
- SVOC & speciated phenols: 10-140%; and
- Surrogates: 10-140%.

The secondary laboratory ALS adopts specific recovery limits for individual compounds.

2.6 Data Analysis

2.6.1 Sediment Contaminants

Concentrations of chemicals measured in sediment samples were compared to screening levels listed in Table 2 of NAGD to determine whether the material is suitable for unconfined placement at sea or if further analyses, such as elutriate, bioavailability or toxicity testing, are required.

Specifically, mean concentrations of chemical parameters at the upper 95% confidence level (95% UCL) were compared against NAGD guideline levels. This involved the following steps.

Data pre-treatment

Analytical values below LOR were set to one-half of the laboratory Limit of Reporting (LOR) as per NAGD recommendation to facilitate 95% UCL calculation. This was only undertaken where there was greater than 30% detections within the dredge zone. Any replacement technique is a source of bias (Croghan and Egeghy 2003). Only parameters with greater than 30% detections were subject to analysis due to the high probability of bias created by the replacement technique.

Organic contaminant results were normalised to 1% TOC where the measured value is within the range of 0.2-10%. If TOC values were outside of this range, the highest (10%) or lowest (0.2%) value was adopted as appropriate. Organic parameters with concentrations below LORs were not normalised to 1% TOC but were included at half their LOR.

One assumption in the calculation of the 95% UCL is that the samples are statistically independent. Therefore, field triplicate samples and laboratory split samples were averaged for each location in the 95% UCL calculation.

Selection of appropriate 95% UCL Calculation Method

ProUCL Version 4.1.00 was used to calculate the 95% UCL (Singh *et al.* 2010). In accordance with NAGD, for normally distributed data, the arithmetic mean was calculated, and the 95% UCL was calculated using the one-tailed Student's *t* UCL test. For data that followed a log-normal distribution, the geometric mean was calculated and the 95% UCL was calculated using Chebyshev method. For data that did not follow either a normal or log-normal distribution, the 95% UCL was calculated using non-parametric techniques as per NAGD. Should 95% UCL values for all analysed parameters fall below NAGD screening levels, the sediment were considered chemically acceptable for ocean disposal.

In accordance with NAGD, ambient baseline concentrations of chemicals were determined by sampling of sediment at reference areas near the existing disposal site. The 80th percentile value was calculated from reference site data. The mean of the sediment concentrations at the dredge site was then compared with the 80th percentile of ambient baseline levels. Sediment was chemically acceptable for ocean disposal the mean concentration at the dredge site was less than or at the 80th percentile value.

If chemicals were found to be above ambient baseline levels and the screening level, they were considered a Contaminant of Potential Concern and Phase III testing was required.

2.6.2 Elutriate and Bioavailability Testing

Elutriate and bioavailability testing was undertaken as per NAGD for a range of contaminants which have regularly exceeded screening levels in the past.

Elutriate Testing:

The elutriate test is designed to simulate release of contaminants from sediment during dredged material disposal. Testing was carried out using the USEPA's standard seawater elutriate test which involves shaking the sediment samples with four times the volume of seawater at room temperature for 30 minutes. The sample was allowed to settle for one hour and the supernatant was centrifuged or filtered (0.45 µm) within 60 minutes and analysed using analytical methods appropriate for determining ultra-trace levels in seawater.

Results were compared to the respective ANZECC/ARMCANZ (2000) marine water quality trigger value (for 95% protection of species).

Bioavailability Testing:

The Dilute Acid Extraction (DAE) method was used to provide an estimate of the bioavailable fraction of metals/metalloids. The sediment samples were extracted using a weak acid and result compared against the respective NAGD screening levels.

For organic contaminants, analysis of pore water is the recommended bioavailability test as per NAGD. Porewater is assumed to represent the major route of exposure to sediment contaminants by benthic organisms. Porewater results were compared to the respective ANZECC/ARMCANZ (2000) marine water quality trigger value (for 95% protection of species).

Should both elutriate and bioavailability tests result in values less than the respective guideline limits, the material would be considered clean and suitable for ocean disposal.

2.6.3 Acid Sulfate Soils

The results of the chromium-suite acid sulfate analysis were assessed against the Australian framework for Acid Sulfate Soil management in coastal systems (Ahern *et al.* 1998). The risk of acidification was determined by the acid-base accounting approach (Ahern *et al.* 2004). Net acidity was calculated from the results as a measure of the acid producing capacity of the sampled sediment upon complete oxidation.

The calculated net acidity was then compared to the QASSIT action criteria of 0.03% S or 18 mol H^+/tonne to assess the need for acid sulfate soil management if the dredged sediments were to be placed on land. The liming rate indicates the amount of lime that needs to be added to the soil to manage its acid generating capacity.

3 Results

Sediment logs of the sampled sediments are shown in Appendix B. Detailed laboratory results are provided in Appendices C and D for the primary and secondary laboratory, respectively.

3.1 Physical Sediment characteristics

Table 3-1 presents sediment grain particle size distribution (PSD) results for each location.

Zone 2

Results were broadly consistent with previous years. The average sand content was 28% which was slightly higher than 2018 (21%). Most sites had greater than 50% of fine material (silts and clays), with the exception being sites B6-2 (25%), B9-1 (29%). Gravel was present in small proportions, typically less than 5%.

Zone 3 and 4

Sediments in Zones 3 and 4 were spatially variable, but fines generally dominated (average Zone 3 = 52%, Zone 4 = 58%). These zones had a higher proportion of sand than Zone 2, with an average of 44% and 40% in Zones 3 and 4, respectively. These patterns are consistent with 2018 survey results.

MIDMPA and Reference/Background

The MIDMPA had a high sand fraction (46-72%), similar to previous years. Moreton Bay reference sites were characterised by a high proportion of fine sediment (85% on average). This was consistent with results from 2018 (89%), 2017 (84%), 2016 (90%), 2015 (85% fines), 2014 (86%) and 2013 (89%).

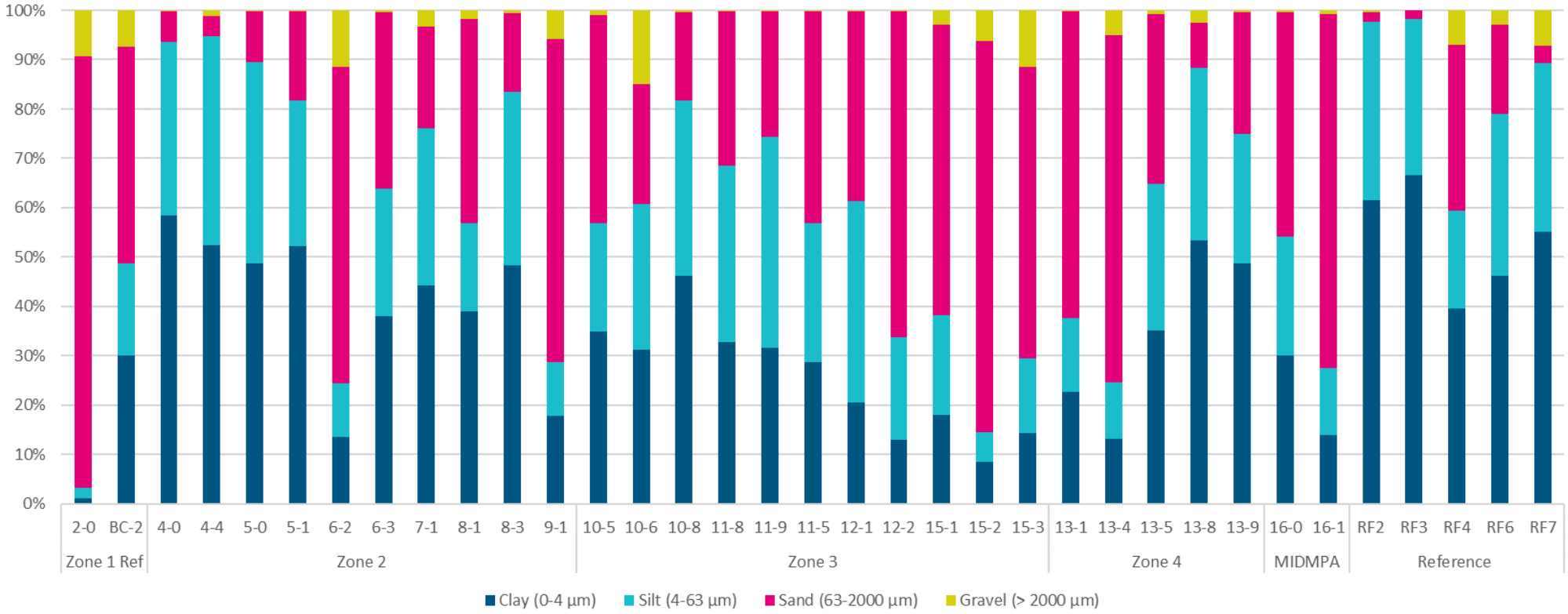

Figure 3-1 Sediment Particle Size Distribution Analysis – 2019

3.2 Analytical Results

3.2.1 Metals and Metalloids

3.2.1.1 Bulk Sediment

Summary data for metals and metalloids are presented in Table 3-1. Silver and cadmium had concentrations less than the LOR (0.1 mg/kg) in several samples at Zones 2, 3 and 4, consistent with 2016, 2017 and 2018, survey results. All other metals and metalloids were detected in 100% of samples from Zones 2, 3 and 4.

Concentrations of most metals and metalloids were generally below NAGD screening levels across the study area, except nickel and mercury. The trace metal and metalloid concentrations recorded at reference locations followed similar trends to those at the dredge sites, and were also consistent with trends observed in 2013, 2014, 2015, 2016, 2017 and 2018.

Nickel

The 95% UCL of the mean for nickel was 19.6 mg/kg within the dredged areas (Zones 2, 3 and 4), which was just under the NAGD screening level of 21 mg/kg. The 95% UCL was similar to 2018 (23.1 mg/kg), 2017 (21.8 mg/kg) and 2016 (22.1 mg/kg), but less than 2015 (28.6 mg/kg), 2014 (28.3 mg/kg) and 2013 (35.5 mg/kg). The 95% UCL value exceeded the NAGD nickel screening level for Zone 2 (22.5 mg/kg) but was below guideline values for Zone 3 and 4 (20.1 and 18.7 mg/kg, respectively).

In accordance with NAGD, nickel concentrations at the dredge site were compared to reference sites. The 95% UCL at the reference sites was 25.1 mg/kg, compared to the dredge site 95% UCL of 19.6 mg/kg and the median value of 18.9 mg/kg (Table 3-1). This indicates that the overall dredge site had nickel concentrations that were less than reference samples. While not required under NAGD, Phase 3 testing was conservatively undertaken to assess nickel bioavailability (Section 3.2.1.2).

Table 3-1 Summary statistics and 95% UCLs for combined locations in Zones 2, 3, and 4 – trace metals/metalloids and nutrients. Values highlighted in orange indicate exceedance of NAGD screening level

Parameter	LOR	# Non-Detects	Screening Level	Statistical Distribution	95% UCL	Min	Max	Mean	Geometric Average
Moisture Content	1	0	n/a	Log Normal	51.8	28.1	64.1	48.4	48.4
Aluminium	50	0	n/a	Normal	12075	5110	16200	11069	11068.9
Arsenic	1	0	20	Log Normal	7.682	3.1	9.4	7.2	7.2
Cadmium	0.1	23	1.5	n/a	n/a	0.1	0.3	0.2	0.2
Chromium	1	0	80	Log Normal	30	14.8	37.3	27.8	27.8
Copper	1	0	65	Normal	24.4	6.3	45.3	21.0	21.0
Iron	50	0	n/a	Log Normal	30572	13900	37800	28421	28421.4
Lead	1	0	50	Non-Parametric	17.6	3.8	32	14.6	14.6
Mercury	0.01	0	0.15	Non-Parametric	0.18	0.02	0.63	0.08	0.08
Nickel	1	0	21	Non-Parametric	19.6	9.2	24.4	18.2	18.2
Silver	0.1	15	1	Non-Parametric	0.2	0.05	0.6	0.1	0.1
Zinc	1	0	200	Non-Parametric	90.8	28.1	150	80.7	80.7
Total Organic Carbon	0.02	0	n/a	Non-Parametric	0.8	0.2	1.3	0.69	0.7
Total Kjeldahl Nitrogen	20	0	n/a	Log Normal	1954	903.8	3281	1559	1559.4
Total Nitrogen	20	0	n/a	Log Normal	1954	903.8	3281	1559	1559.4
Phosphorus	2	0	n/a	Non-Parametric	671.8	293	892	571.2	571.2

Blue shading = parameter not detected; Orange shading = UCL95% > screening level; ND = No Data, NC1 = not calculated due to no detections; NC2 = not calculated due to >30% of values being non-detects (applicable only to parameters with screening levels); n/a = no NAGD screening level

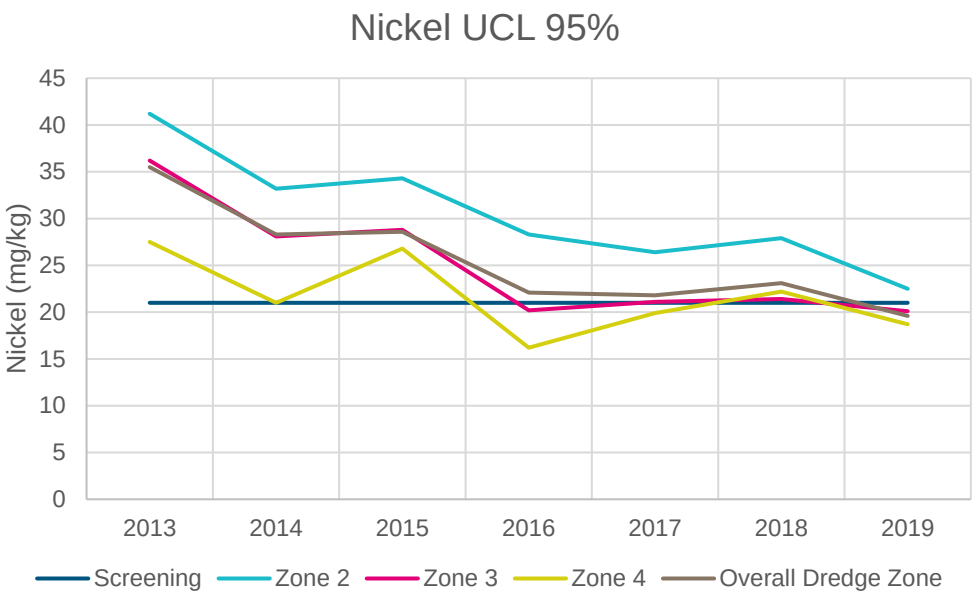

Figure 3-2 UCL 95% Nickel (mg/l) at each dredge zone over time

Mercury

The 95% UCL across all dredge zones was 0.18 mg/kg, which was slightly above the NAGD screening level (0.15 mg/kg). One sample had a particularly high mercury concentration (Zone 2 B4-4 = 0.63 mg/kg), which represents an outlier in both Zone 2 and other dredge areas. No samples in Zone 3 and 4 exceeded NAGD screening level. The 95% UCL value exceeded the NAGD screening level for Zone 2 (0.25 mg/kg) but was below guideline values for Zone 3 and 4 (0.07 and 0.08 mg/kg, respectively). By comparison, the 95% UCL value in 2018 for Zones 2, 3 and 4 was 0.11, 0.07 and 0.07 mg/kg, respectively. The 95% UCL at the reference sites was below the NAGD screening level at 0.09 mg/kg. Phase 3 testing was conservatively undertaken to assess mercury bioavailability (Section 3.2.1.2).

3.2.1.2 Bioavailability Testing

Samples with the highest recorded nickel concentrations were conservatively selected for analysis from dredge Zones 2 and 3. A total of 12 samples for nickel were analysed as per NAGD. The only sample to exceed the mercury screening level in bulk sediment (B4-4) was also analysed.

The dilute acid extraction (DAE) results indicate:

- All nickel samples were below the NAGD screening level (Table 3-2). Nickel concentrations derived from DAE were consistent with levels recorded by BMT from previous years (BMT WBM 2013, 2015a, 2015c, 2016, 2017, 2018).
- The one mercury sample had a concentration below the LOR and therefore the NAGD screening level.

The elutriate results were below the ANZECC/ARMCANZ (2000) marine trigger limit of 7 µg/L (99% species protection) for nickel and 0.00004 mg/L for mercury (Table 3-3).

These results indicate that the bioavailable fraction of nickel and mercury is unlikely to result in adverse impacts to sediment biota.

Based on the Phase II and Phase III testing for metals and metalloids, dredge sediments are considered suitable for ocean disposal as per NAGD.

Table 3-2 Nickel Bioavailability Results

Zone	Sample	Nickel	
		Bulk sediment (mg/kg)	DAE (mg/kg)
Guideline Value		**21***	
2	B4-0	24.4	10.9
2	B4-4	22.8	10.2
2	B5-0	24.2	11.6
2	B8-3	22.7	8.2
2	B9-1	21.1	7.3
3	B10-8	21.2	8.8
3	B11-8	22.5	7.5
3	B15-1	24.2	8.6
Reference	RF2	21.2	8.2
Reference	RF3	26	8.9
Reference	RF6	21.3	7.4
Reference	RF7	22.9	8.7

1 - orange shading – sample exceeds screening level; NM = not measured (concentration in bulk sediment less than screening level). * NAGD Screening Level; ** ANZECC/ARMCANZ water quality guideline value (99% species protection)

2 – ANZECC/ARMCANZ (2000) guideline value for 99% protection level

Table 3-3 Nickel and Mercury Elutriate Results

Zone	Sample	Mercury (mg/L)	Nickel (µg/L)
LOR		**0.00004**	**0.5**
Guideline Value		**0.0001****	**7****
2	B4-0	<0.00004	1
2	B5-0A	<0.00004	0.5
2	B5-0B	<0.00004	<0.5
2	B6-2	<0.00004	1.7
2	B7-1	<0.00004	<0.5
2	B8-3	<0.00004	2.4
3	B10-5A	<0.00004	1.8
3	B10-5B	<0.00004	1.2
3	B10-6	<0.00004	0.9
3	B10-8	<0.00004	1.1
3	B11-8A	<0.00004	0.6
3	B11-8B	<0.00004	0.9
3	B11-9	<0.00004	2.2
3	B12-1	<0.00004	1

orange shading –exceeds screening level; ** ANZECC/ARMCANZ water quality guideline value (99% species protection)

3.2.2 Nutrients and Carbon Content

Total Nitrogen (TN) and Total Kjeldahl Nitrogen (TKN) concentrations across the dredge zones ranged between 470 and 1440 mg/kg. These values were similar to 2018 (420 and 1600 mg/kg), 2017 (360 and 1810 mg/kg), 2016 (100 and 1650 mg/kg) and 2015 (320 and 1530 mg/kg), and higher than recorded in 2014 (220 to 1320 mg/kg). The 95% UCL concentration for the dredge zones for TN and TKN was 1169 mg/kg.

Total Phosphorus (TP) concentrations across dredge zones ranged between 293 and 889 mg/kg (95% UCL = 672 mg/kg). TP concentrations across dredge zones in 2018 was lower than values reported in 2018 (180 and 1800 mg/kg), 2017 (310 to 1600 mg/kg), 2016 (270 to 1500 mg/kg), 2015 (390 to 1200 mg/kg) and 2014 (260 - 1300 mg/kg).

Total organic carbon content ranged between 0.07 to 2.1% across the dredge zones. The TOC 95% UCL for dredge zones was 0.79%, which was less than for reference sites (1.03%). TOC in 2014 - 2018 were within the range recorded in 2019.

3.2.3 Organotins

Organotins were detected at low concentrations or less than the LOR (Table 3-4). The 95% UCL for TBT in dredge zones was 4.7 µg/kg, which was below the NAGD screening level of 9 µgSn/kg. Most samples had TBT concentrations below the screening level except B6-4 at Zone 2 (43 µgSn/kg, normalised to 1% TOC). Sample B6-4 represents an outlier and was likely due to the presence of a small paint flake.

At the reference locations, organotin concentrations were either below the LOR and detected at very low concentrations.

3.2.4 Total Petroleum Hydrocarbons (TPHs)

Concentrations of TPHs were either below the LOR or detected at low concentrations (Table 3-4). Concentrations of TPHs were at or below the LOR for C6-C9, consistent with 2018 and 2017 survey results. There were some low level C10-C14 detections, which were not recorded in 2018.

Low-level detections of TPHs C15-C28 and C29-C36 were recorded at most locations in the dredge area and were below the NAGD screening level of 550 mg/kg. In general, these results are consistent with previous surveys undertaken by BMT.

Table 3-4 Summary Statistics and 95% UCLs (µg/kg) for Combined Locations in Zones 2, 3 and 4 - Organic Compounds (Normalised to 1% TOC). Values Highlighted in Orange Indicate Exceedance of NAGD Screening Levels

Parameter	LOR	# Non-Detects	Screening Level	Distribution	95% UCL	Min	Max	Mean	Geometric Average
Aldrin	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
alpha-BHC	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
beta-BHC	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
gamma-BHC (Lindane)	0.25	28	0.32	n/a	n/a	n/a	n/a	n/a	n/a
delta-BHC	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
cis-Chlordane	0.5	28	0.5	n/a	n/a	n/a	n/a	n/a	n/a
trans-Chlordane	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
p-p'-DDD	0.5	26	2	n/a	n/a	3.2	5.1	4.1	4.1
p-p'-DDE	0.5	13	2.2	Non-Parametric	2.3	0.28	5.6	1.7	1.7
p-p'-DDT	0.5	28	1.6	n/a	n/a	n/a	n/a	n/a	n/a
Dieldrin	0.5	26	280	n/a	n/a	0.8	1.2	1.0	1.0
alpha-Endosulfan	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
beta-Endosulfan	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endosulfan Sulphate	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endrin	0.5	28	10	n/a	n/a	n/a	n/a	n/a	n/a
Endrin ketone	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endrin aldehyde	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Heptachlor	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Heptachlor epoxide	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hexachlorobenzene	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methoxychlor	0.5	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Monobutyltin as Sn	1	28	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dibutyltin as Sn	1	24	n/a	n/a	n/a	1.4	7.1	3.1	3.1

Results

Parameter	LOR	# Non-Detects	Screening Level	Distribution	95% UCL	Min	Max	Mean	Geometric Average
Tributlytin as Sn	0.5	10	9	Log Normal	4.7	0.3	43.0	3.5	3.5
TPH C6-C9	3	12	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TPH C10-C14	3	6	n/a	Non-Parametric	6.3	1.4	9.4	4.8	4.8
TPH C15-C28	3	1	n/a	Non-Parametric	40.2	1.6	59.4	29.6	29.6
TPH C29-C36	5	2	n/a	Log Normal	37.0	2.6	68.8	26.5	26.5
Total TPH	n/a	12	550	Non-Parametric	83.0	5.8	137.5	60.9	60.9
Naphthalene	5	3	n/a	Non-Parametric	17.1	2.7	32.3	13.1	13.1
2-Methylnaphthalene	5	7	n/a	Non-Parametric	7.2	2.6	10.1	5.9	5.9
Acenaphthylene	4	1	n/a	Non-Parametric	23.1	3.8	43.0	17.3	17.3
Acenaphthene	4	11	n/a	n/a	n/a	12.7	12.7	12.7	12.7
Fluorene	4	6	n/a	Non-Parametric	8.3	2.6	15.2	6.2	6.2
Phenanthrene	4	1	n/a	Non-Parametric	55.9	3.8	90.3	34.5	34.5
Anthracene	4	2	n/a	Non-Parametric	22.7	3.8	38.7	17.2	17.2
Fluoranthene	4	1	n/a	Non-Parametric	168.6	3.8	235.5	88.8	88.8
Pyrene	4	1	n/a	Non-Parametric	178.4	3.8	238.7	98.2	98.2
Benz(a)anthracene	4	1	n/a	Normal	74.6	3.8	129.0	55.5	55.5
Chrysene	4	1	n/a	Normal	64.8	3.8	119.4	48.4	48.4
Indeno(1-2-3-cd)pyrene	4	1	n/a	Log Normal	61.3	3.8	100.0	46.4	46.4
Dibenz(a-h)anthracene	4	2	n/a	Non-Parametric	16.9	3.6	25.8	13.0	13.0
Benzo(g-h-i)perylene	4	1	n/a	Non-Parametric	78.1	3.8	122.8	59.2	59.2
Coronene	5	2	n/a	Log Normal	18.6	4.8	26.6	12.9	12.9
Benzo(e)pyrene	4	1	n/a	Log Normal	58.5	3.8	100.0	44.6	44.6
Perylene	4	0	n/a	Non-Parametric	336.5	59.0	584.3	245.0	245.1
Total PAHs (as above)	4	0	10000	Non-Parametric	1261.0	338.5	2089.0	981.6	981.6

Blue shading = parameter not detected; Orange shading = UCL95% > screening level, ND = No Data, NC1 = not calculated due to no detections; NC2 = not calculated due to >30% of values being non-detects (applicable only to parameters with screening levels)

3.2.5 Polyaromatic Hydrocarbons (PAHs)

Low level detections of PAHs were recorded at all locations in all dredge zones (Table 3-4). Total PAHs concentrations (corrected to 1% TOC) ranged from 338.5 to 2089 µg/kg, well below the NAGD screening level of 10,000 µg/kg in all samples. The 95% UCL for total PAHs across all dredge zones was 1261 µg/kg, which was slightly higher than in 2018 (638 µg/kg) and 2017 (524 µg/kg).

Based on these results, the sediments in dredge Zones 2, 3 and 4 would be considered suitable for ocean disposal as per the NAGD guidelines with respect to PAHs.

3.2.6 Organochlorine Pesticides (OCPs)

3.2.6.1 Bulk Sediment

There were several detections of OCPs within the dredge zones:

- Dieldrin – detected at two locations (B7-1 and B5-1) slightly above the LOR. The UCL was not calculated due to the large number of non-detects.
- *p p'-DDD* – detected at two locations (B7-1 and B5-1) just above the LOR. The UCL was not calculated due to the large number of non-detects.
- *p p'-DDE* – detected at 17 of 36 samples. The UCL 95% for all dredge sites was 2.3 µg/kg, which was slightly higher than the screening level of 2.2 µg/kg.

The UCL 95% calculated for individual zones exceeded the DDE screening level at Zone 2 (3.75 µg/kg) and Zone 4 (4.24 µg/kg) but was below the screening level at Zone 3 (1.81 µg/kg). The UCL 95% was not calculated at the reference sites due to the large number of non-detects. Phase III elutriate and bioavailability (porewater) was undertaken to investigate the bioavailability of OCPs (Section 3.2.6.2).

Sampling results were broadly similar to OCP results from 2016 and 2018. As noted by BMT WBM (2017), no OCPs were recorded in 2017, which was likely a laboratory measurement error.

3.2.6.2 Elutriate and Bioavailability Testing

Phase III elutriate and bioavailability (porewater) testing was conservatively undertaken to investigate the potential bioavailability of OCPs. As outlined in Section 2.6.2, five additional samples were analysed from Zone 2 and six samples were analysed from Zone 3. Samples were analysed for locations where OCPs had been previously detected, targeting fine sediments.

OCP concentrations were below the laboratory LOR (0.1 µg/L) for all elutriate and pore water samples. It is noted that no marine trigger limits are given in ANZECC/ARMCANZ (2000) for DDD, DDT, DDE, Dieldrin or Chlordane.

On the basis of Phase II and Phase III testing for OCPs, the sediments in dredge Zones 2, 3 and 4 are considered suitable for ocean disposal as per the NAGD guidelines with respect to OCPs.

3.2.7 Polychlorinated Biphenyls (PCBs)

Concentrations of PCBs were below the laboratory LOR at all investigated locations. No assessment of PCBs was undertaken at the reference locations.

Therefore, the sediments in the dredge zones are considered suitable for ocean disposal as per the NAGD guidelines with respect to PCBs.

3.2.8 Radionuclides

Gross alpha and gross beta activity ranged between <0.5 (LOR) to 0.64 Bq/g and 0.31 to 0.56 Bq/g respectively. These values were within the range recorded in previous years. Note, the primary laboratory had a higher LOR in 2019 (0.5 Bq/g) than previous years from 0.08 Bq/g, but the LOR remained well below the NAGD screening level of 35 Bq/g.

Therefore, the NAGD screening level for the sum of gross alpha and beta (35 Bq/g) was not exceeded in any samples, and on this basis sediments in the dredge zones are considered suitable for ocean disposal as per the NAGD guidelines with respect to radionuclides.

3.2.9 Acid Sulfate Soils

Acid sulfate soil test results are presented in Table 3-5. The pH_{kcl} results ranged from 8.2-9.1 (alkaline) and TAA was below LOR, indicating that there was no existing acidity in sediments.

Potential acid sulfate soils were present, as indicated by chromium reducible sulphur (S_{CR}) exceeding the threshold of 0.03% (0.09 to 0.49% w/w).

Results from acid neutralising capacity (ANC) tests indicate that sediments have a high capacity to self-neutralise if exposed to oxygen, and liming would not be required to treat soils if placed on land.

Table 3-5 Acid Sulfate Soil Results (Chromium Suite and SPOCAS)

Parameter	Units	PQL	Zone 4		Zone 3							Zone 2					
			B13-8	B13-1	B15-3	B15-2	B12-1	B11-8	B10-6	B10-6BTS	B9-1	B5-0	B5-1	B5-1BT	B5-1CT	B6-3	B7-1
Actual Acidity																	
pHkcl TAA	pH Units	0.1	8.6	8.9	8.9	9.1	8.7	8.6	8.6	8.5	8.8	8.2	8.2	8.2	8.2	8.4	8.5
Acid trail Titratable Actual Acidity	mol H+/t	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Sulfidic - TAA Equiv	% pyrite S	0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Potential Acidity																	
Chromium Reducible Sulphur	% S	0.01	0.26	0.10	0.29	0.09	0.27	0.30	0.45	0.49	0.12	0.31	0.47	0.49	0.47	0.26	0.27
Chromium Reducible Sulfur Acidity Units	mol H+/t	10	161	65	178	58	168	189	281	306	73	191	296	307	292	163	169
Sulfur - KCl Extractable	% S	0.02	0.19	0.11	0.12	0.08	0.12	0.14	0.19	0.19	0.10	0.18	0.17	0.18	0.18	0.15	0.18
HCl Extractable Sulfur	% S	0.02	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nett Acid Soluble Sulfur	% S	0.02	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Net Acid Soluble Sulfur Acidity Units	mol H+/t	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Net Acid Soluble Sulfur Equiv S% Pyrite	% S	0.02	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acid Neutralising Capacity and Acid Base Accounting																	
ANCE (Acid Neutralising Capacity)	% CaCO3	0.02	5.74	3.12	2.48	5.41	2.28	2.63	1.88	1.56	2.51	1.44	-	1.13	0.45	1.28	0.89
Acid Neutralising Capacity Acid (ANCbt)	mol H+/t	10	1360	776	721	1080	1060	801	697	712	691	509	542	682	662	549	842
Acid Neutralising Capacity Equiv S%	% S	0.01	2.18	1.24	1.16	1.72	1.69	1.28	1.12	1.14	1.11	0.82	0.87	1.09	1.06	0.88	1.35
ANC Fineness Factor	factor	0.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Net Acidity (Sulfur Units)	% S	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (Acidity Units)	mol H+/t	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Liming Rate	kg CaCO3/t	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

4 Data Validation

4.1 Laboratory QA/QC

Details of the laboratory QA/QC for the primary and secondary laboratories is provided in the following sections. Refer to Section 2.5.2 for a description of laboratory QA/QC procedures.

4.1.1 Limits of Reporting (LORs)

All LORs used by the primary laboratory were below NAGD screening levels.

4.1.2 Sample Holding Times and Storage Conditions

All samples were received by the laboratories in appropriately pre-treated and preserved containers. Samples were chilled with ice whilst in the field and during delivery (ice packs). Most analyses were undertaken by the laboratories within recommended holding times. The exception were organotin compounds and OCPs for Phase 3 tests, which marginally exceeded holding times due to some laboratory delays. However, this was not an issue due to findings from Phase 2 testing.

4.1.3 Laboratory Blanks

Results indicated that the laboratory blank assessment was within the acceptable criteria.

4.1.4 Laboratory Duplicates

Trace element RDP duplicate were generally within the laboratories acceptable criteria. The exceptions were aluminium, iron, mercury and total PAHs. These parameters are flagged as suspect. Aluminium and iron do not have screening levels, nonetheless values were within a similar range to other samples. A suspect mercury sample had a concentration above the screening level, however the UCL for the dredging sites was below the screening level, thus this value does not alter the outcome of this assessment. Total PAH concentration was well below the screening level, and therefore the suspect value does not alter the outcomes of this assessment.

4.1.5 Surrogate and Matrix Spikes

The assessment of surrogate and matrix spike recoveries was satisfactory for all samples. The exception was matrix spike recovery for mercury, nutrients (TKN and total phosphorous), TPH and organotin compounds (MBT) due to recovery outside of the data quality objective range.

4.2 Field QA/QC

4.2.1 Field Trip Blank

No volatile Total Petroleum Hydrocarbons (TPH C6-C9) were detected in any trip blank samples, indicating that samples were not contaminated with volatile organic carbons during field sampling and processing of samples.

4.2.2 Field Triplicates and Splits

Analyses of field triplicate and split samples were within the ±50 % NAGD criterion for RPDs for most samples.

The triplicate split samples reported some variability in ASS, cadmium, nutrients, MBT and some PAHs at location B10-6 and cadmium, TBT, OCPs and one PAH at location B6-2. At sites where field splits were undertaken, the greatest variability occurred between the secondary and primary laboratories, most likely due to differences in laboratory procedures. The exceedance of the RPD criterion is not problematic given that concentrations were mostly below the screening levels. However, the exception was DDD being above screening levels at both one of the primary samples and at the secondary laboratory at site B6-2 and TBT above screening levels at one of the primary laboratory samples at site B6-2.

Three field triplicate sites were sampled: B5-1, B11-9 and B13-4. Field triplicate samples at sites B11-9 (B11-9B and 11-9C) and B13-4 (B13-4B and B13-C) were within the RPDs for most parameters except TBT and lead, respectively. However, these concentrations were well below screening levels. Field triplicate site B5-1 did report some variability, namely with ASS and some OCP samples. ASS parameter RPD exceedances were not problematic as they were below screening level/did not have screening levels. There was some small-scale (within-site) heterogeneity in OCPs, namely DDD/DDE/DDT, but concentrations were below or slightly greater than the screening levels. The PSD samples reported some small-scale variability which may have contributed to the differences in concentrations reported.

While the variability in RPD exceedances of OCPs may suggest data uncertainties, it is noted that elutriate and bioavailability (porewater) testing for OCPs including DDD/DDE/DDT was below the LOR.

4.3 Summary of Data Validation

Results from the present study indicated that the survey was undertaken to a high standard providing scientific confidence that the presented results are valid to allow an assessment of sediment quality against the NAGD guidelines.

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Appendix A Sampling and Analysis Plan

BMT WBM

Port of Brisbane Maintenance Dredging - Sediment Sampling and Analysis Plan 2013

Reference: R.B20259.001.02.SAP.docx
Date: October 2013
Confidential

Port of Brisbane Maintenance Dredging - Sediment Sampling and Analysis Plan 2013

Prepared for:	Port of Brisbane Pty Ltd
Prepared by:	BMT WBM Pty Ltd (Member of the BMT group of companies)

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Document:	R.B20259.001.02.SAP.docx
Title:	Port of Brisbane Maintenance Dredging - Sediment Sampling and Analysis Plan 2013
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Client Reference:	

Synopsis: **A sediment sampling and analysis plan for the assessment of physical and chemical sediment properties associated with Port of Brisbane maintenance dredging**

REVISION/CHECKING HISTORY

Revision Number	Date	Checked by		Issued by	
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Destination	Revision										
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BMT WBM File	PDF	PDF									
BMT WBM Library	PDF	PDF									

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1 Introduction

Port of Brisbane Pty Ltd (PBPL) is required to maintain a minimum depth of clearance below the keel of vessels calling at the port to allow for effective shipping access to the port and ensure ship safety. Channel depths are declared by the Harbour Master (Maritime Safety Queensland) and displayed on various shipping charts. PBPL undertakes an annual maintenance dredging program to ensure these minimum depths are maintained.

PBPL propose to undertake its annual maintenance dredging within the navigational areas of the Brisbane River and Moreton Bay, primarily using the Trailer Suction Hopper Dredge (TSHD) 'Brisbane'. Maintenance dredging works extend from the Hamilton Reach of the Brisbane River to the North West Channel located in northern Moreton Bay.

PBPL aims to ensure that all dredging activities, including extraction and placement of material, are undertaken in accordance with existing legislation and with minimal environmental harm. A key component of achieving this aim is to undertake a contaminant assessment of the material proposed for dredging prior to the commencement of the dredging program.

1.1 Sediment Sampling and Analysis Plan (SAP) Objectives

The aim of this SAP is to provide a set of procedures that will allow a statistically valid evaluation of the physical and chemical sediment properties of the sediments to be dredged. The results of this assessment will assist in determining the likely impacts of unconfined offshore disposal of the dredged sediment.

The assessment of physico-chemical sediment properties will be undertaken on the basis of the approach set out in the National Assessment Guidelines for Dredging (Commonwealth of Australia 2009; henceforth NAGD).

The specific SAP objectives are to:

- Provide a summary of proposed dredging and disposal operations for the project;
- Identify a list of contaminants based on a review of existing data and potential contaminant sources;
- Determine the number of samples required to provide an adequate characterisation of the physical and chemical sediment properties;
- Develop procedures for adequate field collection and handling of sediment samples;
- Outline adequate quality assurance and quality control (QA/QC) procedures for field sampling and laboratory analysis;
- Provide a description of statistical procedures used to determine the contaminant status of the dredged material;
- Describe procedures for validating the analytical data to assess whether the sample collection, handling and laboratory analysis was undertaken to a standard allowing assessment of sediment quality against the NAGD guidelines; and

- Outline the proposed reporting framework for the sediment quality results that will address the requirements of the Determining Authority.

1.2 Proposed Dredging

PBPL's area of responsibility in relation to maintenance and capital dredging within port limits can be broadly divided into two zones on the basis of the water body type, navigable depths and nature of dredged material:

- Moreton Bay zone (enclosed/open coastal waters); and
- Brisbane River zone including the Port of Brisbane (middle/lower estuary).

This SAP only considers assessment of sediments for the Brisbane River zone. The Brisbane River zone extends from Hamilton Reach to the Outer Bar Cutting. Annual maintenance dredging is required to remove sediments accumulated by natural siltation processes within the catchment and sediment loads from residential and commercial developments.

To ensure that declared depths of navigational channels are maintained at all times, PBPL undertakes 'insurance' dredging of up to -0.5 metres below the declared depth.

On average, PBPL dredges about 400,000 m^3 to 450,000 m^3 of material each year. Additional dredging needs to be undertaken following major flood events, i.e. in 2011 and 2013.

The Brisbane River zone is divided into different dredging subareas based on existing contaminant data (Figure 2-1), comprising Zone 2, Zone 3 and Zone 4. It is noted that Zone 1 is not part of the annual dredging and samples from this zone have been used to collect control samples upstream of the actual dredging areas.

The following average dredge volumes apply to the dredge subareas (Table 1-1):

Table 1-1 Approximate Maintenance Dredge Volumes

Dredging Subarea	Extents	Average Dredge Volume (m^3)
Zone 2	Colmslie to Pinkenba	150,000
Zone 3	Within port reaches	250,000
Zone 4	Moreton Bay entrance channel	30,000

The maintenance dredging program is structured to maximise efficiencies and utilisation of PBPL's largest dredger, the trailing suction hopper dredge *TSHD Brisbane*. The *TSHD Brisbane* typically carries out the majority of the ports maintenance dredging over a two month period between January and May (actual period varies depending on other commitments of the *TSHD Brisbane* and siltation patterns). The PBPL may also utilise smaller, more manoeuvrable dredging plant, such as grab dredgers and bed levellers, to maintain more confined areas within the Port Limits.

1.3 Offshore Disposal

The PBPL's policy with regard to dredged material is to maximise its beneficial reuse. In general, most of the material dredged by the PBPL from within Port Limits is used in reclamation works

associated with development of the port. The reuse of this dredged material provides several benefits, including:

- Reduced pressure on sea disposal sites;
- The placement of any actual or potential acid sulphate material at depth beneath the water surface; and
- The containment of any contaminated material within a designated boundary, disconnected from the marine system and monitored to ensure the immobility of identified contaminants.

In 2009, the reclamation life of the Future Port Expansion (FPE) area was estimated to be approximately 30 years, based on the current level of port development at that time. Following extreme flood events in both 2011 and 2013 and the subsequent disposal of additional material in the FPE area, the estimated life of the FPE area was reduced by 20 years to 10 years. Given the importance of the FPE as an area to dispose of material unsuitable for ocean disposal, there has been a shift in thinking around the management of the FPE area.

The current proposed management of dredged material is to, where practical, dispose at sea all dredged material deemed suitable for ocean disposal. This proposed management initiative will ensure the long term viability of the FPE area for the disposal of material deemed unsuitable for ocean disposal.

In the past, significant quantities of dredged material from the Brisbane River have been placed offshore at the Mud Island Dredge Material Placement Area (DMPA) (Figure 2-1). In recent years only smaller volumes of dredged material from boat harbours in southern Moreton Bay were placed at the Mud Island DMPA. However, it is proposed that the Mud Island DMPA will be utilised for material found suitable for ocean disposal in future PBPL maintenance dredging campaigns.

2 Review of Existing Information

Prior to each annual maintenance dredging campaign, PBPL undertook assessments of sediment quality at 45 sampling locations within the dredging zones 2 to 4 (Figure 2-1).

Additional samples were obtained from three locations in Zone 1 and Breakfast Creek upstream of the dredging area in order to assess potential sediment quality impacts from the upstream catchment. The sediment quality results for the annual sampling program between 2000 and 2013 are summarised in Section 2.1.

Due to major flooding in the Brisbane River catchment in early January 2011 and late January 2013, emergency dredging was required to maintain declared depths. Twelve to twenty locations were sampled within the port and three to four locations within the Mud Island DMPA for the 2011 and 2013 flood sampling campaigns, respectively. The sediment quality assessments included elutriate and bioavailability analyses for selected trace metals and organic contaminants.

Additionally, a comparison of sediment quality (organochlorine pesticides and dioxins) at 14 sampling locations at the Mud Island DMPA and seven reference sites in Moreton Bay (Sites RF1 to RF7 in Figure 2-1) was undertaken in 2013 to assess if the emergency dredging and disposal activities impacted on sediment and water quality in Moreton Bay. The sediment quality results for the 2011 and 2013 flood sampling are summarised in Section 2.2.

Conclusions based on the review of the annual and flood sampling data are provided in Section 2.3.

2.1 Annual Sediment Quality Data 2000 – 2013

Detailed sediment quality studies have been undertaken within the Port of Brisbane since 1998. This review considers sediment quality data collected between 2000 and 2012. This comprises the studies detailed in Table 2-1.

In addition to the routine monitoring documented in Table 2-1, further sampling was carried in 2011 and 2013 (Worley Parsons 2011b, 2013b, 2013c, 2013d) to assess the effects of floods on sediment quality. Refer to Section 2.2 for a description of these studies.

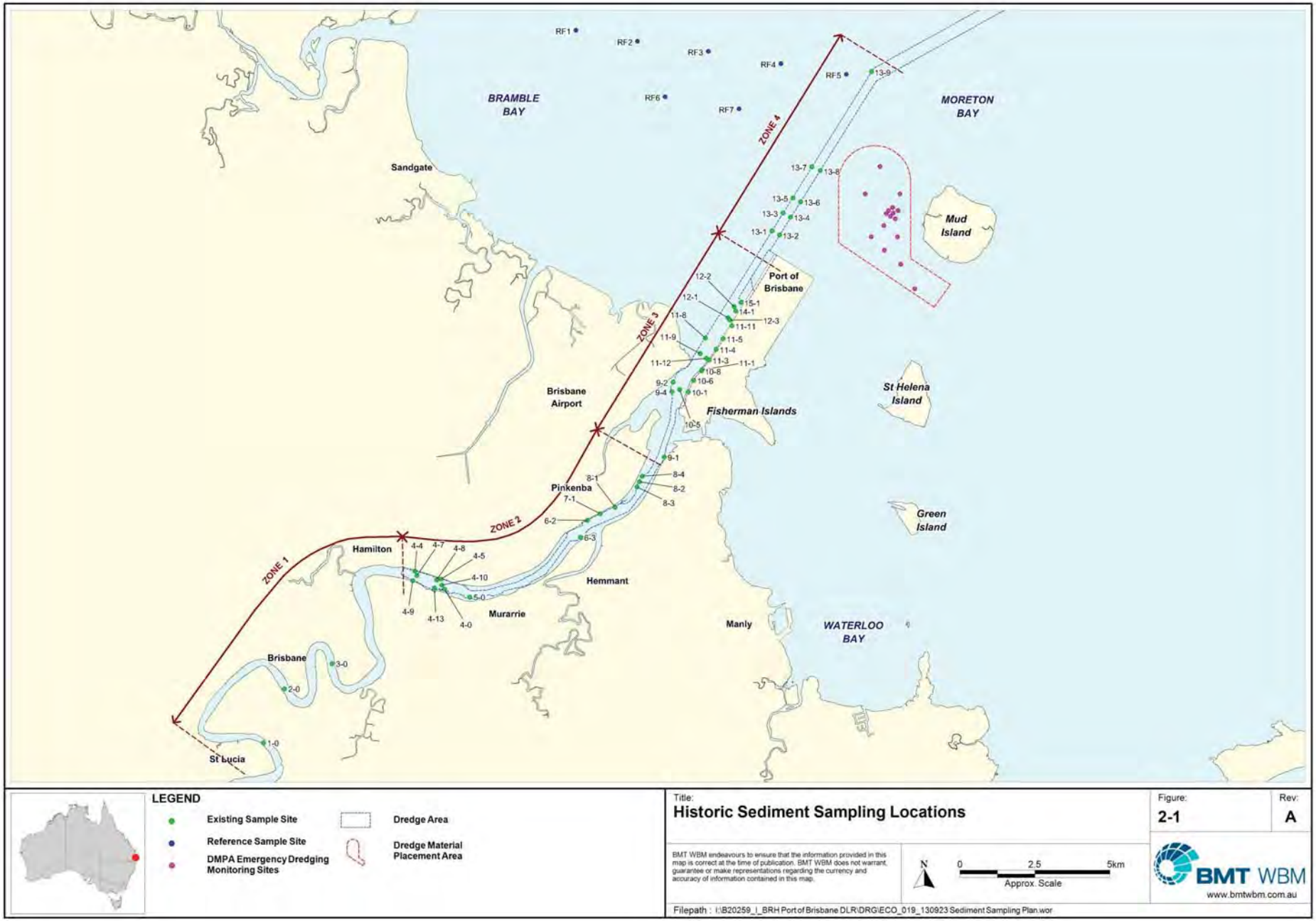
Table 2-1 Previous Routine Annual Sediment Quality Studies

Reference	Sampling Date
Maunsell McIntyre (2001)	November 2000
Butler Partners (2002)	November 2001
Hydrobiology (2003)	November 2002
Hydrobiology (2004)	November 2003
SKM (2005)	November 2004
SKM (2006)	January 2006
SKM (2007)	February 2007
Worley Parsons (2008)	January 2008
Worley Parsons (2009)	February 2009
GHD (2010)	January 2010
Worley Parsons (2011a)	December 2010
Worley Parsons (2012)	December 2011
Worley Parsons (2013a)	December 2012

A wide range of analytical parameters have been measured between 2000 and 2012 as summarised in Table 2-2. Analysis was undertaken at a total of 45 locations within the dredge areas. Additional samples were collected from three control locations upstream of the dredging areas as well as from Breakfast Creek (these locations are not within the dredge areas).

Table 2-2 Summary of Sediment Quality Data 2000 - 2012

Analytical Parameter	Measurement Events
Inorganics	
Metals & Metalloids	2000-2012
Organics	
Organotins	2000-2012
Total Petroleum Hydrocarbons (TPHs)	2000-2012
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	2000-2012
Polycyclic Aromatic Hydrocarbons (PAHs)	2000-2012 (30% of locations)
Organophosphate and Organochlorine Pesticides (OPPs and OCPs)	2000-2012 (40% of locations between 2000 and 2006)
Polychlorinated Biphenyls (PCBs)	2000-2012 (30% of locations)
Radionuclides	2010-2012
Acid Sulfate Soils	2000-2012


RF1
RF2
RF3
RF4
RF5
RF6
RF7
BRAMBLE BAY
MORETON BAY
Sandgate
Mud Island
Port of Brisbane
ZONE 4
ZONE 3
ZONE 2
ZONE 1
Brisbane Airport
Fisherman Islands
St Helena Island
Pinkenba
Green Island
Hamilton
Hemmant
Murarrie
Manly
WATERLOO BAY
Brisbane
St Lucia
LEGEND
Existing Sample Site
Reference Sample Site
DMPA Emergency Dredging Monitoring Sites
Dredge Area
Dredge Material Placement Area
Title:
Historic Sediment Sampling Locations
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2.1.1 Metals and Metalloids

Testing for metals and metalloids has included analysis of arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc between 2000 and 2012. Antimony and silver were also tested between 2001 and 2004.

The main contaminants of potential concern in terms of metals and metalloids were mercury and nickel. Mercury and nickel concentrations frequently exceeded the NAGD screening level at the 95% Upper Confidence Limit of the mean (95% UCL). Silver exceeded the NAGD screening level at the 95% UCL between 2002 and 2004. All other metals and metalloid 95% UCL concentrations were generally below the 95% UCL between 2000 and 2013.

The temporal and spatial trends observed for trace metals between 2000 and 2012 are detailed in the following sections.

2.1.1.1 Mercury

The NAGD screening level for mercury (0.15 mg/kg) was exceeded on numerous occasions in the Brisbane River dredge zones, particularly in Zone 2. Figure 2-2 shows the number of occasions when the screening level was exceeded between 2000 and 2012 and the number of sites for dredge zones 2 to 4 where exceedances were noted.

For Zone 2, mercury concentrations exceeded the screening level on 61 - 70% of occasions at 25% of locations. At a similar number of sites in Zone 2 exceedances were noted on 20 – 40% of occasions between 2000 and 2012.

Some exceedances of the mercury screening level were noted also for Zone 3 and Zone 4. However, those exceedances occurred only at a limited number of sites whilst no screening level exceedances were noted at 70 – 80% of locations in Zone 3 and Zone 4 between 2000 and 2012.

In Zone 3 most exceedances of the mercury screening level occurred at three sites (9-2, 10-6 and 11-8) occurring on 31 – 69% of occasions. In Zone 4, exceedances were only noted at two sites (13-5 and 13-6) on 8 – 23% of occasions.

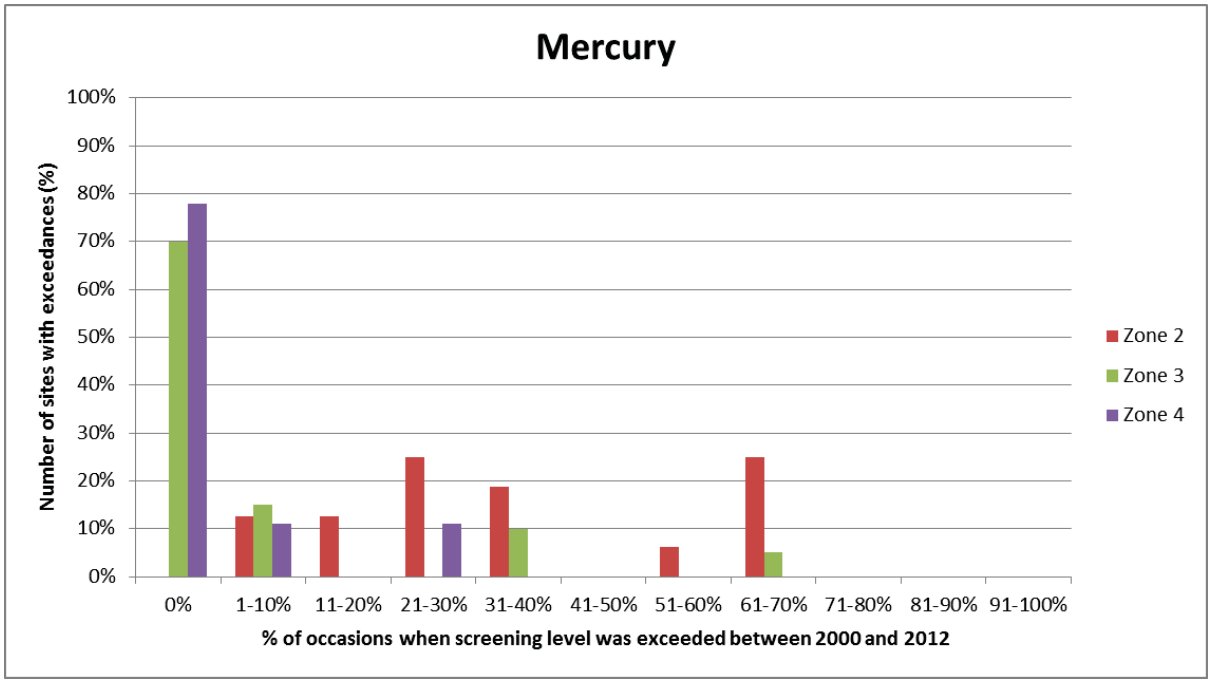


Figure 2-2 Exceedances of the NAGD Screening Level for Mercury between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.2 Nickel

Exceedances of the nickel screening level (21 mg/kg) were noted for most locations across all dredge zones (Figure 2-3). Exceedances of the screening level on more than 80% of occasions were noted at a cumulative 56% of sites in Zone 2, 20% of sites in Zone 3 and 11% of sites in Zone 4. Average Nickel concentrations were 24.2 mg/kg for Zone 2, 20.1 mg/kg for Zone 3 and 21.4 mg/kg for Zone 4, i.e. close to the nickel screening level of 21 mg/kg.

Given the widespread exceedances of the nickel screening level across all dredge zones and that exceedances were also commonly noted for the upstream control sites, it appears likely that the elevated nickel concentrations are of natural origin. It is recognised that sediments in Australia including South-East Queensland commonly have high natural levels of nickel (NAGD 2009 and Preda & Cox 2002).

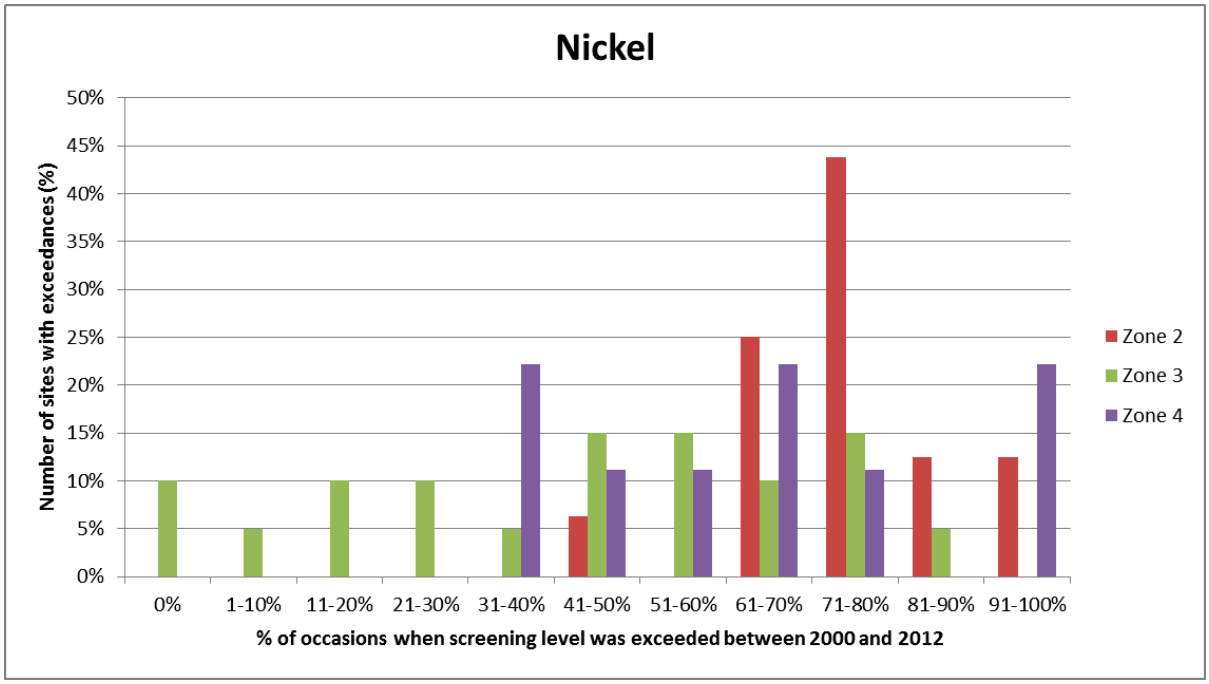


Figure 2-3 Exceedances of the NAGD Screening Level for Nickel between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.3 Arsenic

Concentrations for arsenic were below the NAGD screening level of 20 mg/kg at all locations and dredge zones between 2000 and 2012.

2.1.1.4 Cadmium

Cadmium concentrations were below the NAGD screening level of 1.5 mg/kg with the exception of one site in Zone 2 (Site 6-2) where the screening level was met or exceeded between 2007 and 2009 with concentrations ranging between 1.5 – 6.3 mg/kg.

However, cadmium concentrations were below screening level at all locations between 2010 and 2012. The 95% UCL for cadmium was below the screening level between 2000 and 2013 for all dredge zones.

Average cadmium concentrations between 2000 and 2012 were 0.30 mg/kg for Zone 2, 0.20 mg/kg for Zone 3 and 0.17 mg/kg for Zone 4, i.e. well below the screening level across all dredge zones.

2.1.1.5 Chromium

Chromium concentrations were mostly below the screening level of 80 mg/kg. The only exceptions were noted at site 9-1 in Zone 3 where the screening level was exceeded in 2002 and 2012 with concentrations ranging between 94 – 100 mg/kg. However, the 95% UCL remained below the screening level. Furthermore, exceedances of the chromium screening level were noted at four sites in Zone 2 in 2000 with concentrations ranging between 88.6 – 101 mg/kg.

2.1.1.6 Copper

Copper concentrations exceeded the NAGD screening level of 65 mg/kg on a few occasions in Zone 2 and Zone 3. No exceedances of the copper screening level were noted for Zone 4 (Figure 2-4).

In Zone 2 exceedances were noted at five out of sixteen locations, with only one to two detections noted at four of these locations between 2000 and 2012. At site 6-2 in Zone 2 exceedances of the screening level occurred on 46% of occasions. However, in 2011 and 2012 copper concentrations were below the screening level at this site.

The only exceedances of the copper screening level in Zone 3 were noted for site 9-1 in 2000 and 2008.

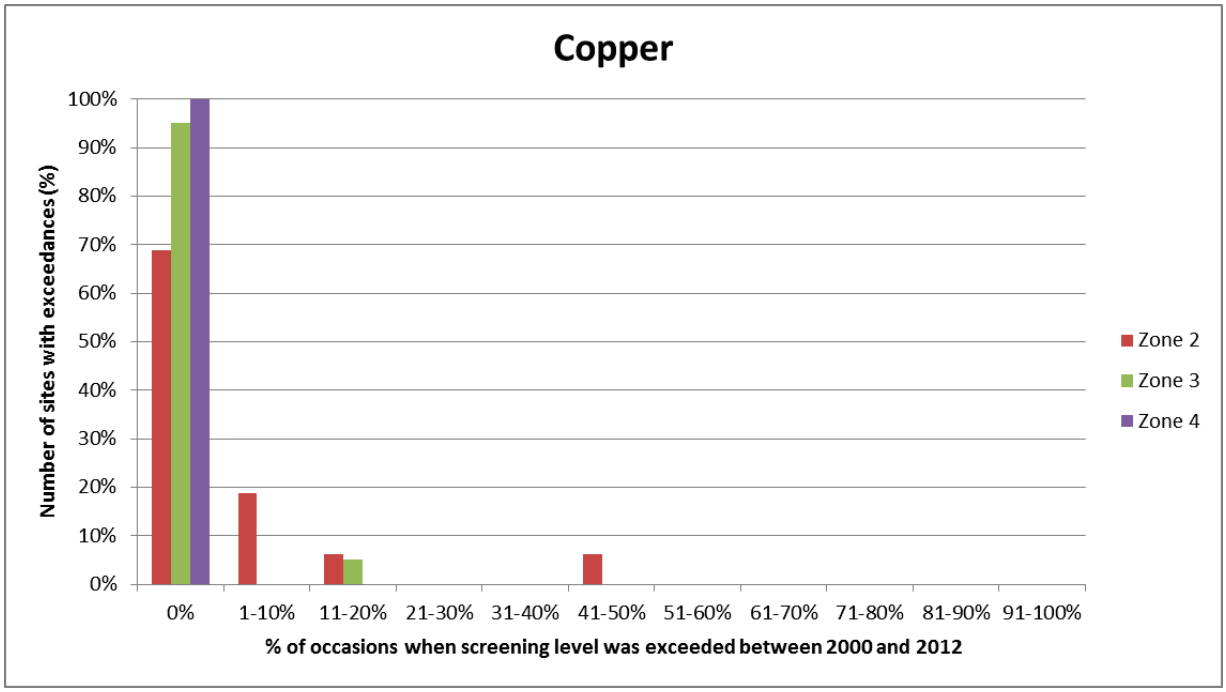


Figure 2-4 Exceedances of the NAGD Screening Level for Copper between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.7 Lead

Some individual exceedances of the lead screening level (50 mg/kg) were noted, in particular in Zone 2 where exceedances were noted at seven locations (Figure 2-5). Since 2001 there were only single detections of lead above the screening level noted per annual sampling event. The 95% UCL for lead was below the NAGD screening level since 2001.

Exceedances on individual sites were noted on less than 20% of occasions, i.e. only once or twice between 2000 and 2012 in Zone 2. In Zone 3 and Zone 4, the only exceedances of the lead screening level were noted at single sites (9-1 in Zone 3 and 13-4 in Zone 4) and only on one or two occasions between 2000 and 2012.

The last screening level exceedance was noted in 2009 for Zone 2, in 2000 for Zone 3 and in 2010 for Zone 4. The average concentrations of lead between 2000 and 2012 were 26.9 mg/kg for Zone

2, 13.7 mg/kg for Zone 3 and 12.3 mg/kg for Zone 4, i.e. well below the screening level across all dredge zones.

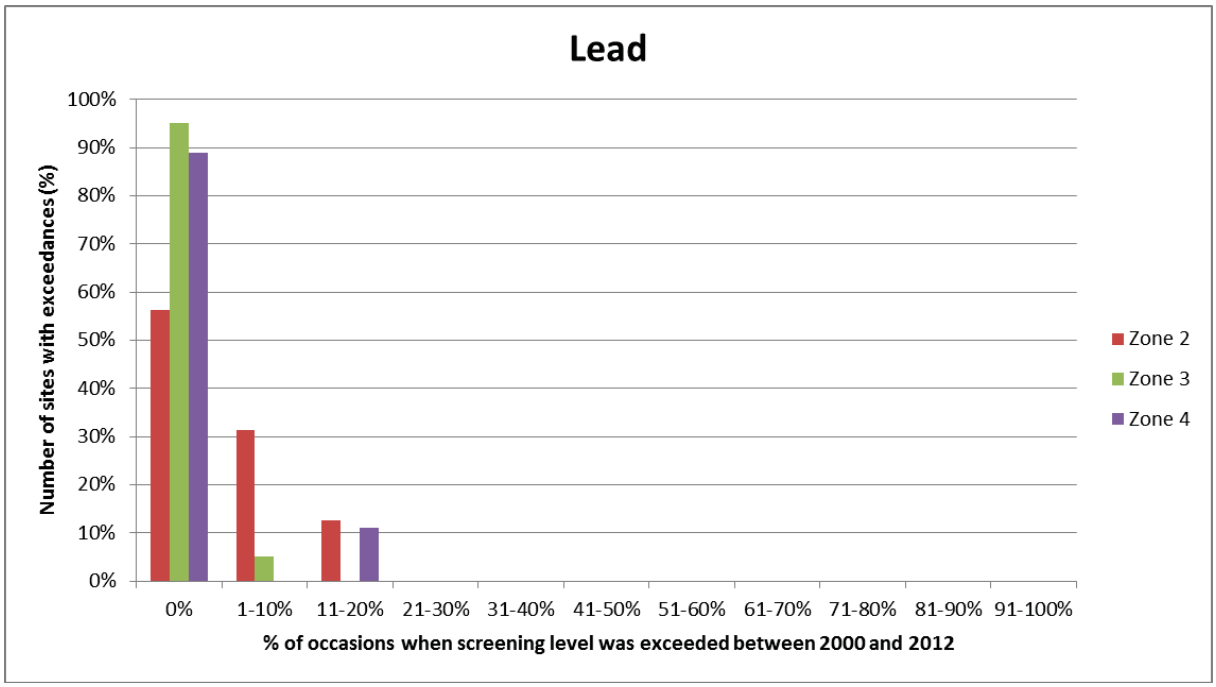


Figure 2-5 Exceedances of the NAGD Screening Level for Lead between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.8 Zinc

Individual exceedances of the zinc screening level (200 mg/kg) were noted at eight locations in Zone 2. However, most of these exceedances occurred only once or twice (<15% occurrence) between 2000 and 2012 (Figure 2-6). Only at location 6-2 exceedances occurred on more than 30% of occasions (four times between 2000 and 2012). It is noted that the last exceedance of the zinc screening level in Zone 2 occurred in 2010.

In Zone 3 only a single exceedances was noted at location 9-1 in 2000. No exceedances of the zinc screening level were noted in Zone 4.

The average zinc concentration between 2000 and 2012 was 130.3 mg/kg for Zone 2, 74.0 mg/kg for Zone 3 and 57.1 mg/kg for Zone 4, i.e. well below the NAGD screening level across all dredge zones.

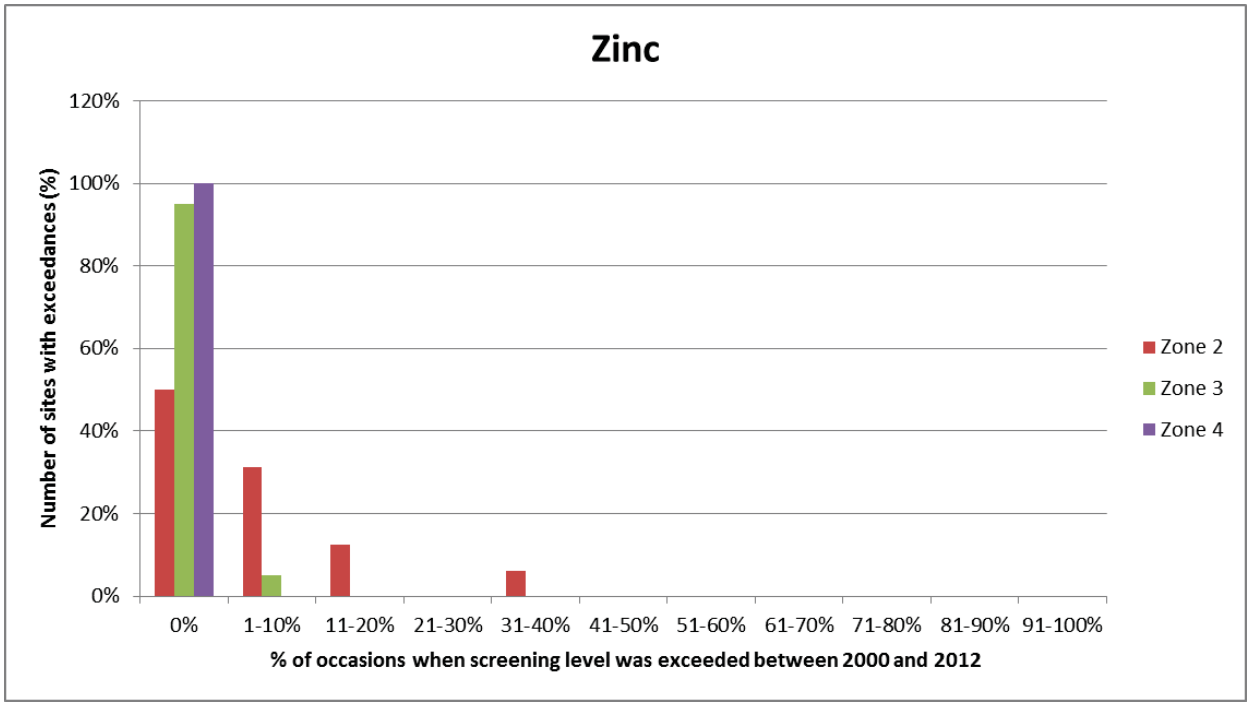


Figure 2-6 Exceedances of the NAGD Screening Level for Zinc between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.1.9 Antimony and Silver

In addition to the metals and metalloids outlined above, antimony and silver were tested between 2001 and 2004. While antimony concentrations remained below the Limit of Reporting (LOR) for all sampling events, silver was detected at several locations and concentrations exceeded the screening level at one site in Zone 3 (11-8) between 2002 and 2004.

2.1.2 Organotins

Concentrations of TBT at the 95% UCL frequently exceeded the NAGD screening level (9 µg Sn/kg) between 2000 and 2012, particularly in dredge zones 2 and 3.

Exceedances of the TBT screening level were noted predominantly in Zone 2, including several exceedances of the NAGD high level of 70 µg Sn/kg (Figure 2-7). At sampling site 4-4 in Zone 2, the screening level was exceeded during all sampling events except in 2001, including six exceedances of the NAGD high level. At several other locations in Zone 2, screening level exceedances were noted between 20 to 70% of occasions.

In Zone 3, exceedances of the TBT screening level were typically only noted once or twice between 2000 and 2013, corresponding to 8% and 15% of occasions in Figure 2-7. The only exception was site 9-1, where exceedances of the screening level were noted on 69% of occasions. This included five sampling events where the NAGD high level was exceeded. This corresponds to a generally higher occurrence of metal/metalloid exceedances at this site as outlined in Section 1.1.1. It is noted that site 9-1 is the site located closest to Zone 2.

Only a single exceedance of the TBT screening level was noted at site 13-1 in Zone 4 in 2006.

The average normalised TBT concentration between 2000 and 2012 was 28.8 µg Sn/kg for Zone 2, 21.8 µg Sn/kg for Zone 3 and 0.7 µg Sn/kg for Zone 4. If site 9-1 is excluded from Zone 3, the average concentration is 4.4 µg Sn/kg, i.e. less than the NAGD screening level.

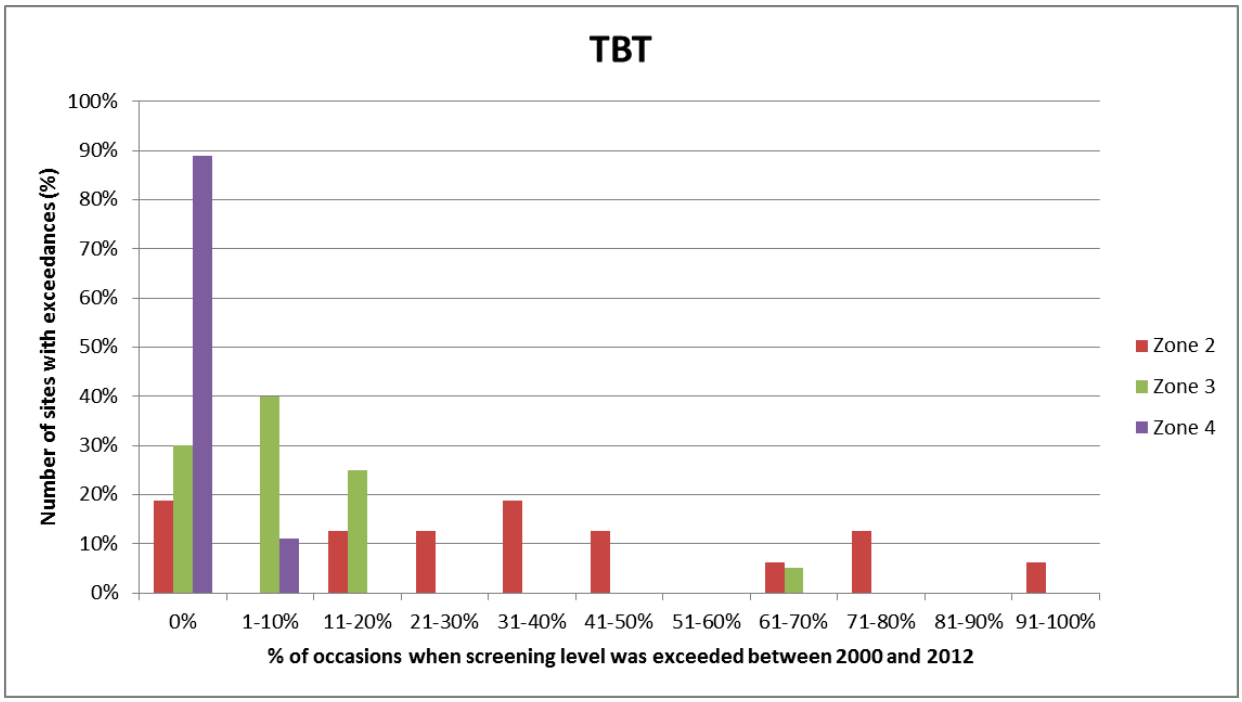


Figure 2-7 Exceedances of the NAGD Screening Level for TBT between 2000 and 2012 in Dredge Zones 2, 3 and 4

2.1.3 Benzene, Toluene, Ethylbenzene and Xylene (BTEX)

BTEX concentrations were below LOR in all samples and all zones between 2000 and 2012.

2.1.4 Total Petroleum Hydrocarbons (TPHs)

While TPHs were detected on several occasions across all dredge zones, the total TPH concentration was below the NAGD screening level of 550 mg/kg at all sampling locations between 2000 and 2012. Most detections of TPHs were noted in Zone 2, with less detections noted for Zone 3 and only some isolated detections recorded in Zone 4.

2.1.5 Polycyclic Aromatic Hydrocarbons (PAHs)

Total PAHs concentrations were mostly below the NAGD screening level of 10,000 µg/kg except for two individual detections above screening level in Zone 2 and Zone 3 in 2001. The 95% UCL for PAHs exceeded the screening level in 2011. However, since 2001, the total PAHs concentrations remained well below the screening level for all dredge zones.

2.1.6 Polychlorinated Biphenyls (PCBs)

Total PCBs concentrations were mostly well below the NAGD screening level of 23 µg/kg or below LOR. The only exceptions were site 10-6 in Zone 3 where detections above the screening level were noted in 2001 and 2012 and site 13-1 in Zone 4, where a detection above screening level was noted in 2011.

2.1.7 Organochlorine Pesticides (OCPs)

The 95% UCL concentrations of the OCPs dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethane (DDD) and Dichlordiphenyldichloroethylene (DDE) frequently exceeded the NAGD screening level between 2000 and 2013. In some cases the 95% UCL concentrations of chlordane also exceeded the NAGD screening level.

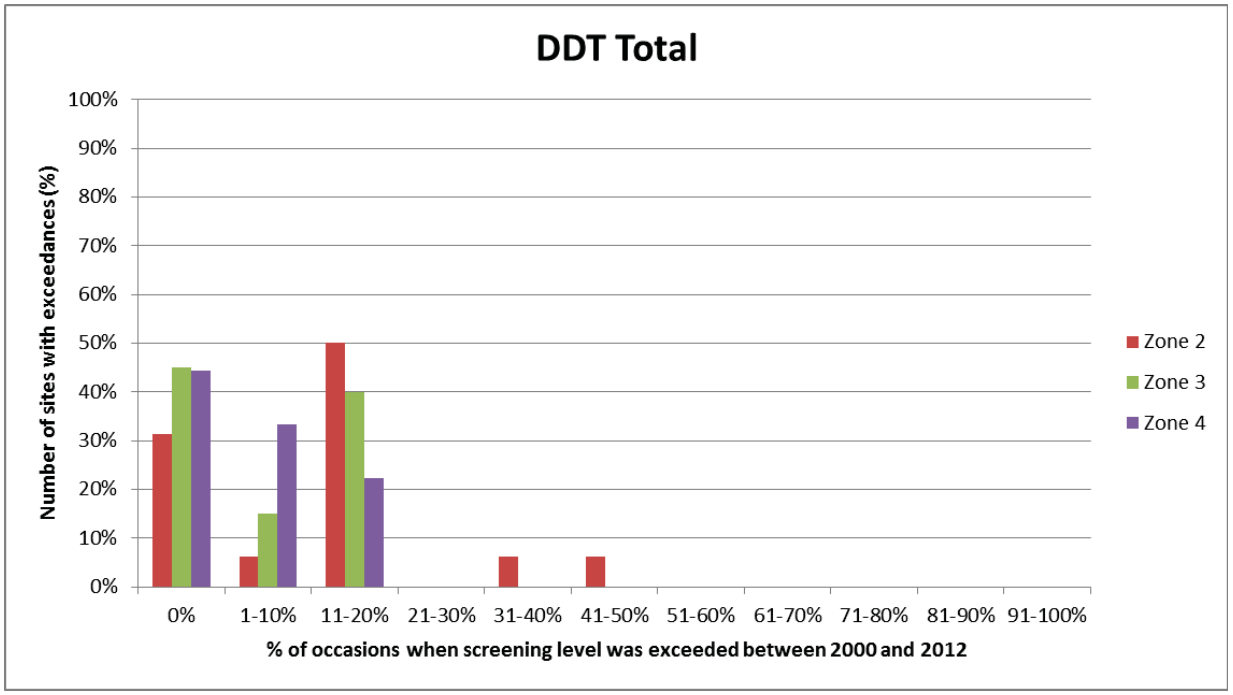
Total DDT concentrations and its metabolites DDD and DDE exceeded their respective screening levels (1.6, 2 and 2.2 µg/kg for DDT, DDD and DDE, respectively) on numerous occasions across all dredge zones (). This includes some exceedances of the NAGD high levels for DDT (46 µg/kg) and DDD (20 µg/kg), but DDE concentrations did not exceed the NADG high level of 27 µg/kg.

Most of these screening level exceedances for DDT, DDD and DDE were recorded at Zone 2, occasional exceedances of all three parameters were also recorded in Zone 3 and 4 between 2000 and 2012. The DDT breakdown product DDE was generally detected more frequently than DDT and DDD (Figure 2-8).

The presence of DDT and its metabolites across all dredge zones and consistent detections over the last decade demonstrates the long term environmental persistence of DDT and its metabolites.

Furthermore, several exceedances of the chlordane NAGD screening level of 0.5 µg/kg and the NAGD high level of 6 µg/kg were noted between 2000 and 2012.

In 2002, chlordane concentrations exceeded the screening level at all tested sampling locations in Zone 2, 3 and 4. Whilst no screening level exceedances were noted between 2003 and 2007, one to three locations in Zone 2 had concentrations higher than the screening level in 2008, 2009 and 2011 (sites 4-0, 4-4, 4-5, 4-7 and 4-8). One exceedance of the chlordane screening level was also noted in 2011 in Zone 3 (site 11-8).



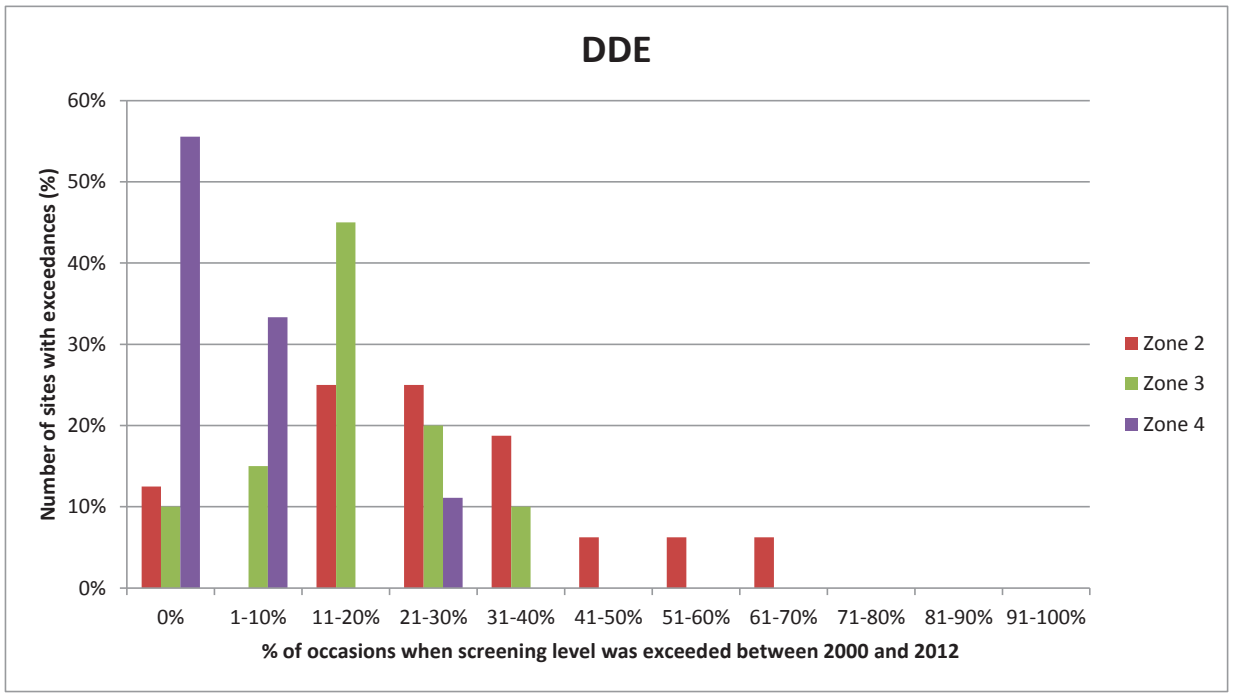


Figure 2-8 Exceedances of the NAGD Screening Level for total DDT (upper plot) and DDE (lower plot) between 2000 and 2012 in Dredge Zones 2, 3 and 4. Similar Trends for DDD.

2.1.9 Organophosphorus Pesticides (OPPs)

Concentrations of OPPs were below LOR for all sampled locations between 2000 and 2012.

2.1.10 Radionuclides

Radionuclides (gross alpha and beta) were analysed at eight sites across all dredge zones between 2010 and 2012.

Concentrations of radionuclides were detected in the January 2010 sampling but in concentrations well below the NAGD screening level of 35 Bq/g (maximum concentration 0.97 Bq/g). Radionuclide concentrations were below the LOR at all sites in all following sampling campaigns.

2.1.11 Acid Sulfate Potential

Acid sulfate soil testing indicates that the sediments in the dredge zone have no actual acidity but are generally considered to be Potential Acid Sulfate Soils (PASS). Assessments of the buffer capacity indicate that the sediments in all dredge zones have sufficient acid neutralizing capacity to buffer any acid potentially generated through onshore disposal.

Acid Sulfate Soil test results were generally consistent between 2000 and 2012.

2.2 Flood Sampling 2011 and 2013

The review of flood sampling sediment quality results included Worley Parsons (2011b, 2013b, 2013c, 2013d).

The 2011 and 2013 sampling campaigns (Worley Parsons 2011b and 2013b) included all parameters as per Table 1 of the NAGD. Additionally, porewater ammonium concentrations were measured and acid sulfate soils assessed in 2011. For both studies elutriate and bioavailability testing for nickel and mercury was undertaken.

Further testing for DDT, DDD, DDE and dioxins/furans was undertaken in 2013 including a comparison of 14 sampling locations at the Mud Island DMPA against seven Moreton Bay reference locations to assess whether the emergency dredging and disposal has affected sediment quality in Moreton Bay (Worley Parsons 2013c and 2013d).

2.2.1 Metals and Metalloids

In 2011, nickel (9 of 15 locations), mercury (3 of 15 locations) and lead (1 location) were the only metals to exceed their respective NAGD screening levels. In 2013, nickel was the only metal to exceed screening levels at 18 of the 24 locations sampled. All other metals/metalloids were below their respective screening levels.

Elutriate and bioavailability testing was undertaken for nickel and mercury in 2011 and 2013. For both sampling events, the elutriate concentrations for mercury were below LOR and nickel elutriate concentrations were well below the ANZECC/AMRCANZ (2000) 95% species protection level of 70 µg/L or below LOR. Furthermore, dilute acid extraction results for mercury and nickel indicated low bioavailability of these metals with concentrations below their respective NAGD screening level in all samples in 2011 and 2013.

These results indicated low likelihood for adverse water quality and sediment quality impacts during dredging and disposal for mercury and nickel.

2.2.1.1 Comparison to Annual Sampling

Consistent with the annual sampling undertaken between 2000 and 2012, nickel and mercury concentrations were the main contaminants of concern within the dredge areas with concentrations similar to the annual sampling events. Lead was detected above the screening level on some occasions during the annual sampling. Similar to the flood sampling, detections were noted only at single locations per annual event and 95% UCL concentrations were below the NAGD screening level.

2.2.2 Organochlorine Pesticides (OCPs)

DDT and its metabolites were detected in 2011 with DDE detected in nine of 15 locations. Whilst normalised DDD and DDE concentrations remained below their respective screening levels, normalised DDT concentrations exceeded the NAGD screening level at two locations. All other OCPs were below LOR at all locations in 2011.

In 2013, DDD was detected in one sample with a concentration exceeding the NAGD screening level. DDE exceeded the NAGD screening level of 2.2 µg/kg in all samples with a 95% UCL of 5.25 µg/kg.

2.2.2.1 Comparison to Annual Sampling

Similar to the annual sampling events, DDT and its metabolites were detected above the NAGD screening level in the flood sampling. Concentrations were similar to those detected in the annual sampling.

2.2.2.2 Comparison to Background Concentrations (2013)

Total DDT concentrations were below the LOR at all locations, including those at Mud Island DMPA and reference locations.

Sampling carried out prior to the 2013 emergency dredged material disposal event detected DDE at all 20 sampling locations within the dredged area, and one of the four locations within the DMPA. DDD was above the LOR in one sample within the dredged area (10µg/kg normalised to % TOC), and was also above the NAGD Screening level of 2 µg/kg.

Further more detailed sampling was carried out to compare contaminant concentrations at 14 locations in the DMPA and seven reference locations, following the 2013 emergency dredged material disposal event. The results of this sampling indicated that:

- DDT was again below the LOR at all locations, including those at Mud Island DMPA and reference locations.
- DDE was detected at all sampling locations with 95% UCL concentrations exceeding the NAGD screening level at both the DMPA and reference locations. This indicates that DDE was widespread throughout the study area.
- A comparison of the 80th percentile DDE of the reference locations was higher than historical levels of DDE in the Brisbane River. This indicates that the Brisbane River flood plume in

January 2013 impacted on the Brisbane River, Bramble Bay and the wider Moreton Bay region and the maintenance dredging operations undertaken by PBPL were not likely to have caused or spread this contamination.

- Additional elutriate and pore water analyses for OCPs indicated that DDD and DDE are likely adsorbed to the clay fraction of the sediment and thus not bioavailable.

2.2.3 Dioxins

Dioxins and furans were detected in the 2011 and 2013 flood sampling events. A toxic effect factor is allocated to each compounds which allows the total toxicity of combined dioxins and furans to be determined using the toxic equivalence (TEQ).

In 2011, the WHO-TEQ$_{(0.5\ LOR)}$ value (concentrations below LOR are assigned a concentration equal to half the LOR) was elevated at one location in Zone 3 with a concentration of 25.36 pg/g. All other sampling locations, including at the DMPA had concentrations between 6.02 and 10.89 pg/g WHO-TEQ.

In 2013, the WHO-TEQ concentrations were generally lower ranging between 0.5 pg/g to 5.3 pg/g.

There are no sediment quality guideline values for comparison that would apply to Australian sediments.

2.2.3.1 Comparison to Background Concentrations (2013)

The WHO-TEQ concentrations at the Mud Island DMPA sites ranged between 4.24 to 4.94 pg/g. The WHO-TEQ concentrations were higher at the reference site in comparison ranging between 7.87 to 7.97 pg/g. Approximately 99% of the sediment concentrations at all sampling locations comprised of 99% dioxins and 1% furans.

Pore water WHO-TEQs ranged between 0.5 and 7.3 pg/g at the DMPA and between 3.1 and 8.0 pg/g at the reference sites. Mean values and 95% UCL concentrations were lower than the 80th percentile of dioxins/furans at the reference area.

A comparison with historical data (Hermanussen et al. 2004; Mueller et al. 2004) shows that dioxins/furans have been historically present within Moreton Bay in elevated concentrations and that their concentrations are not directly related to dredging activities.

2.2.4 Organotins

Organotin concentrations were below the NAGD screening level or below LOR in 2011 and 2013.

2.2.4.1 Comparison to Annual Sampling

The relatively low concentrations of organotins in the flood sampling of 2011 and 2013 appear to be different to the pattern observed in the annual sampling campaigns. However, it should be noted that TBT was only detected at three locations above the NAGD screening for the annual 2010 and 2012 sampling events.

The overall low organotin concentrations across the dredge area after the 2011 and 2013 floods may be due to burial and mixing with sediments from the catchment.

2.2.5 Polychlorinated Biphenyls (PCBs)

PCB concentrations were below LOR at all sampling locations in 2011. In 2013, one location in Zone 3 had a normalised total PCB concentration (38.9 µg/kg) exceeding the NAGD screening level of 23 µg/kg. PCB concentrations were below LOR at all other locations in 2013.

2.2.5.1 Comparison to Annual Sampling

Similar to the annual sampling events, PCBs exceeded the NAGD screening level at only one location or were not detected.

2.2.6 Other Organic Contaminants

Concentrations of BTEX, TPHs, PAHs, OPPs, Phenols, Chlorobenzenes, halogenated compounds and non-organochlorine pesticides were either below LOR or below their respective screening levels in 2011 and 2013.

2.2.6.1 Comparison to Annual Sampling

The pattern observed for BTEX, TPHs, PAHs, OPPs were similar to the those observed in the annual sampling events, i.e. BTEX and OPPs were below their laboratory LORs whereas TPHs and PAHs were typically detected but at concentrations well below the respective NAGD screening levels.

2.2.7 Porewater Ammonia

Sediments at all locations had porewater concentrations below the literature derived guideline level of 11 mg/L (Batley and Simpson 2009). The only exception was one site in Zone 2 where the guideline level was marginally exceeded (16.6 mg/L).

2.2.8 Acid Sulfate Soil

Acid sulfate soils were tested in the 2011 flood sampling. Actual acidity was below the laboratory LOR for all samples, but potential acidity exceeded the QASSIT guideline limit identifying the samples as potential acid sulfate soils (PASS).

The acid neutralising capacity was sufficient in all samples resulting in a net acidity less than the LOR indicating that no liming would be required if the material would be placed on land.

2.2.8.1 Comparison to Annual Sampling

Results for the flood sampling were consistent with the annual maintenance dredge sampling.

2.3 Summary of Annual and Flood Sampling Data

Consistent across the annual and flood sampling events, the main contaminants of concern in the Brisbane River dredge area were the metals nickel and mercury, and DDT metabolites. TBT was also found above screening levels during routine annual monitoring, but was below screening levels in the 2011 and 2013 post-flood sampling episodes. This could suggest that the flood events had dispersed, diluted or buried TBT contaminated material.

Exceedances of the NAGD screening level for mercury, organochlorine pesticides and organotins were most frequently detected upstream of the Port area, i.e. in Zone 2 with a lower occurrence of screening level exceedances in the Port area (Zone 3) and the Entrance Channel area (Zone 4).

The similar spatial patterns of contaminant distribution observed between the regular annual sampling and the flood sampling indicates that catchment runoff from the urbanised and industrialised area upstream of the Port and not the Port of Brisbane is likely the main contributor of contaminants in the dredge area.

Organochlorine pesticides may be present due to broad non-point catchment sources or as legacy material. TBT is mainly originating from local marine industry sources and ships. Mercury may be introduced to the system via sewage treatment plant discharges (including trade waste) or other industrial point sources along the river.

The wide distribution of high nickel concentrations across the entire dredge area and upstream reference locations indicates that nickel is of natural origin (due to local mineralogy) across the broader catchment.

3 Sampling and Analysis

3.1 Sampling Rationale

3.1.1 Number of Sampling Locations

As per NAGD, the number of sample locations for medium sized projects (up to 500,000 m^3) should be divided into distinct sites based on their chemical characteristics. Based on the review of historical data (Section 2) and consistent with previous sampling campaigns, the dredge area was divided into three zones (Table 3-1).

Table 6 of NAGD was used to determine the number of sampling locations for each dredging subarea. Given that current, good quality data were available to support the classification, the number of sampling locations was halved and rounded up as per NAGD. Table 3-1 also shows the required number of sampling locations for Phase III testing (elutriate and bioavailability).

In addition to the required samples to be obtained from the dredge areas, samples will be collected also from upstream and downstream 'reference' areas. This includes two locations from Zone 1 which were sampled in previous sampling campaigns and five locations from Moreton Bay which were sampled as part of additional sediment sampling following the 2011 and 2013 flooding. Furthermore, two samples will be collected from the Mud Island DMPA.

Table 3-1 Number of Sampling Locations as per NAGD

Dredging Subarea	Classification	Dredge Volume (m^3)	# Locations – Phase II	# Locations – Phase III
Zone 2	Probably contaminated	150,000	10	5 + 1 replicate
Zone 3	Probably clean	250,000	11	6 + 2 replicates
Zone 4	Probably clean	30,000	5	3 + 1 replicate
Additional Samples				
Zone 1	Upstream Reference	N/A	2	N/A
Moreton Bay	Downstream Reference	N/A	5	N/A
Mud Island	DMPA	N/A	2	N/A

3.1.2 QA/QC Samples

In accordance with NAGD requirements, the following field and laboratory quality control samples will be obtained:

- Field triplicate samples (two additional grab samples at 10% of sample locations) to determine the small scale variability of the sediment physical and chemical characteristics. Based on a total of 26 primary locations in dredged areas (Zones 2, 3 and 4), field triplicate samples would be required at three locations. Two additional samples would therefore be collected at location 5-1 (Zone 2), 11-9 (Zone 3) and 13-4 (Zone 4).
- Triplicate split samples (primary sample from 5% of locations thoroughly mixed and split into three sample container sets) to assess laboratory variation, with one of the three samples sent to a second (reference) laboratory for analysis. Based on a total of 26 primary locations in dredged areas (Zones 2, 3 and 4), field split samples would be required at two locations. Split samples would be undertaken at location 6-2 (Zone 2) and 10-6 (Zone 3).

- One trip blank container per sampling day filled with inert material (e.g. chromatographic sand) to be analysed concurrent with the analysis of volatile organic substances such as; and
- One inter-batch sample from a previous batch of samples if more than one batch is submitted to the laboratory, to determine the analytical variation between batches. However, it is anticipated that all samples will be submitted in one batch.

Table 3-2 provides a summary of QA/QC samples to be obtained for the three dredging subareas.

Table 3-2 Number of Primary and QA/QC Samples

Dredging Subarea	Primary Samples	Field Triplicate Samples	Triplicate Split Samples	Trip blanks
Zone 2	10	2	2	1 per sampling day
Zone 3	11	2	2	
Zone 4	5	2		

3.1.3 Sampling for Elutriate and Bioavailability Testing

The sediment sampling will include additional sediment samples for Phase III testing (elutriate and bioavailability). Phase III testing will be undertaken for parameters which have frequently exceeded the NAGD screening levels in the past. Based on the review of historical data (Section 2) this will include:

- Metals and metalloids (nickel and mercury);
- Organotins (TBT); and
- Organochlorine Pesticides (DDT, DDD, DDE, chlordane).

Exceedances of NAGD screening levels were predominantly detected in Zone 2 and Zone 3. In accordance with Table 7 of NAGD, five locations would need to be sampled for Zone 2 and six locations for Zone 3 (Table 3-1).

In order to allow elutriate analysis, 20 L of seawater will be collected from the Mud Island DMPA.

Phase III testing for nickel and mercury (and potential other metals/metalloids) can be undertaken from the primary samples collected for the sediment quality assessment. The bioavailability analysis for nickel and mercury will involve dilute acid extraction as per NAGD. Analysis will be performed on the samples with the highest concentrations.

Bioavailability analysis for the organic contaminants (organotins and organochlorine pesticides) will require porewater testing as per NAGD. Additional samples will be collected for porewater testing at the locations which have historically shown the highest percentage of screening level exceedances. The proposed sampling locations for this testing are provided in Section 3.2.1. In order to meet required holding times, elutriate and bioavailability analysis for the organic contaminants will be undertaken concurrent with the analysis of the primary samples.

3.2 Sampling Locations

A map with the proposed sampling locations is provided in Figure 3-1. In order to provide consistency with previous sampling and to facilitate comparisons with historical data, most of the proposed sampling locations were selected from the set of historical sampling locations, and to

also focus on areas that are most frequently dredged. Additionally, sampling locations were added to close spatial gaps in sediment quality data. These include sampling locations 5-1 in Zone 2 as well as locations 9-5 and 9-6 in Zone 3 (Figure 3-1).

As outlined in more detail in Section 3.5, samples from all locations will be analysed for a basic suite of parameters. A selection of these sites will also be analysed for a detailed suite in addition to the basic suite including 'low risk' parameters that have been detected in the past but were typically below their respective NAGD screening levels.

3.2.1 Sampling Locations for Porewater Testing

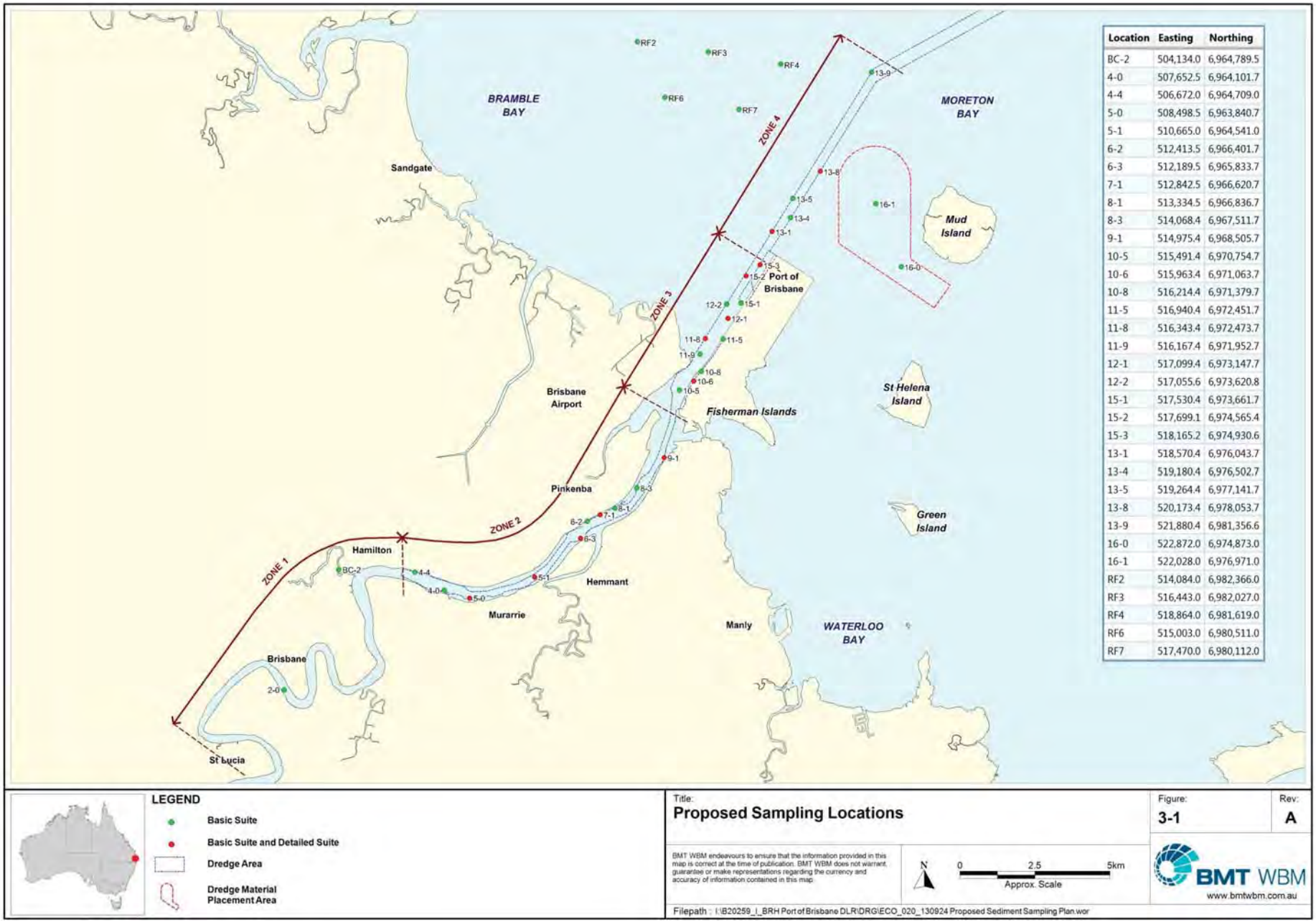
Additional sediment samples will be collected at selected locations for pore water testing of organic contaminants as part of the Phase III elutriate and bioavailability assessments (refer to Section 3.1.3).

Exceedances of NAGD screening levels were predominantly detected in Zone 2 and Zone 3. Five additional pore water samples (plus one replicate) and six samples (plus two replicates) will be collected from zones 2 and 3, respectively (see also Table 3-1). Four samples will be collected from Zone 4 however based on the historical data samples will only be analysed if contaminants exceed screening levels during Phase II sampling.

Based on the review of historical data, sample locations with the highest percentage of screening level exceedances between 2000 and 2012 were chosen for the additional pore water testing:

Zone 2: Locations 4-0, 5-0, 6-2, 7-1 and 8-3.

Zone 3: Locations 10-5, 10-6, 10-8, 11-8, 11-9 and 12-1.



Location	Easting	Northing
BC-2	504,134.0	6,964,789.5
4-0	507,652.5	6,964,101.7
4-4	506,672.0	6,964,709.0
5-0	508,498.5	6,963,840.7
5-1	510,665.0	6,964,541.0
6-2	512,413.5	6,966,401.7
6-3	512,189.5	6,965,833.7
7-1	512,842.5	6,966,620.7
8-1	513,334.5	6,966,836.7
8-3	514,068.4	6,967,511.7
9-1	514,975.4	6,968,505.7
10-5	515,491.4	6,970,754.7
10-6	515,963.4	6,971,063.7
10-8	516,214.4	6,971,379.7
11-5	516,940.4	6,972,451.7
11-8	516,343.4	6,972,473.7
11-9	516,167.4	6,971,952.7
12-1	517,099.4	6,973,147.7
12-2	517,055.6	6,973,620.8
15-1	517,530.4	6,973,661.7
15-2	517,699.1	6,974,565.4
15-3	518,165.2	6,974,930.6
13-1	518,570.4	6,976,043.7
13-4	519,180.4	6,976,502.7
13-5	519,264.4	6,977,141.7
13-8	520,173.4	6,978,053.7
13-9	521,880.4	6,981,356.6
16-0	522,872.0	6,974,873.0
16-1	522,028.0	6,976,971.0
RF2	514,084.0	6,982,366.0
RF3	516,443.0	6,982,027.0
RF4	518,864.0	6,981,619.0
RF6	515,003.0	6,980,511.0
RF7	517,470.0	6,980,112.0

3.3 Sample Collection Methodology

3.3.1 Survey Vessel and Positioning

A suitable sampling vessel will be used to undertake sediment sampling. Navigation to the sampling locations will be undertaken using a differentially corrected global positioning system (GPS) with an accuracy of approximately ±1 m.

3.3.2 Sediment Grab Sampling

NAGD Appendix D states that:

'*grab samplers may be used, i.e., for maintenance dredging surveys in frequently dredged areas with substantial shipping traffic. Here, because the sediments are mixed continually, samples taken with a grab sampler can be representative as long as the grab is designed to retain the entire sample.*'

It is also noted that the one metre long sediment cores obtained in all previous sampling campaigns were always composited to single samples. Furthermore, highest contamination levels are typically expected in the top sediment layer, which would be sampled using a grab sampler. It is therefore proposed that a grab sampler will be used to obtain representative sediment samples.

All sediment sampling will be undertaken by experienced personnel. A Van Veen grab sampler (0.14 m^2 gape) will be used to collect surface sediments from all sample locations. Only samples obtained with properly closed grab jaws will be processed to ensure that the fine sediment fractions are retained.

The grab sampler will be thoroughly cleaned with De-con 90 solution prior to use and cleaned and rinsed with seawater to prevent cross contamination between samples.

In order to overcome issues with potential high variability at sampling locations, a minimum of two grabs will be collected at each sampling location and pooled as one sample. An adequate number of grabs will be obtained and pooled for each sample location to ensure that sufficient sediment is collected for all analyses.

3.3.3 Sample Handling

3.3.3.1 Sample Processing

Sample management procedures on the sampling vessel will include the careful processing of sediment samples following the recovery of the sediment grab sample from the seabed.

Photographs of the grab samples will be taken and field personnel will log each sample for its physical characteristics and variations in sediment type and texture. The grab samples from each location will be carefully homogenized in a clean container prior to the filling of analytical laboratory-supplied clean sampling jars.

Sample bottles will be labelled with a waterproof marker pen on the bottle label and lid. Sample bottles for organic analyses will be filled with zero headspace to prevent volatilisation. QA/QC samples will be blind-labelled to ensure that the laboratories cannot relate the QA sample back to the primary sample.

3.3.3.2 Sample Log

All sediment samples will be geotechnically logged upon collection on a standardised pro-forma. The following information will be recorded:

- Project name and number;
- The name of the sample collector;
- Date and Time of sampling;
- Type of grab sampler used;
- Field sample number;
- Northing and Easting of sample location (from onboard DGPS);
- Sediment colour;
- Sediment odour;
- Field texture (fine sand, silt, clay, sand, clayey sand);
- Tidal predictions and water depth at sample location (derived from onboard depth sounder);
- Weather and sea state conditions at the time of sampling; and
- General comments pertaining to the sample (e.g. presence of organic matter or benthic organisms, etc.

3.3.3.3 Sample Processing QA/QC

All sample handling and processing will be performed to minimise contamination and sample mix-ups. All sample equipment will be cleaned prior to sample collection using a scrub with decontamination solution followed by a rinse with seawater.

The workspace on the vessel will be washed down regularly with ambient seawater to clean all surfaces and minimize the potential for dust contamination of samples. All sample processing will be undertaken away from any potential contamination sources such as engine exhausts, fuels, oils, greases, lead weights, zinc anodes, antifouling paint etc.

Nitrile gloves will be worn by all field personnel handling the sediment, and gloves will be disposed of after processing of each sample.

Utmost care will be maintained in ensuring that cross-contamination between samples is not possible. Samples collected from each location will be placed into appropriately cleaned and preserved containers (labelled prior to filling) provided by the analytical laboratories.

Following sample processing and filling of sample containers, all samples will be immediately chilled on ice following sample collection. All acid sulfate soil samples will be transferred to a freezer at the end of each sampling day to minimise potential oxidation of the samples.

3.3.3.4 Sample Submission and Chain of Custody

All samples will be traced using Chain of Custody (COC) documentation submitted to the laboratory. This will ensure that sample possession and processing can be traced from sample collection to reporting of results.

The COC record may include, but is not limited to, the following information:

- Project name and number;
- Name(s) of sampler(s);
- Sample type, identification number and location;
- Date of collection;
- Number and types of containers;
- Required analyses;
- Preservatives (if any) and storage conditions; and
- Signatures documenting change of sample custody.

At the conclusion of the sampling program the sediment samples will be submitted to the analytical laboratories for processing and analysis in a single batch within prescribed holding times.

3.4 Health & Safety and Contingency Plan

3.4.1 Health and Safety

The vessel skipper will keep in close contact with Brisbane VTS/Harbour Control during sampling. Grab sampling can be completed at each location in around 20 minutes with logging and processing undertaken in locations out of the path of large vessels (as necessary and dependent upon shipping movements).

A single anchor may be used to anchor the vessel. The anchor would be placed upstream and upwind of the vessel. A marker buoy may be placed on the anchor if required.

The sampling vessel will display appropriate flags (R over Y) for the work being carried out at all times. Interactions with other vessel traffic will be minimised by being mindful of approaching vessels.

3.4.2 Adverse Weather

The planning of field sampling will involve regular checking of available weather forecast services for the study area. There are no unusual hazards in operating the grab sampler in wet weather.

In case of adverse weather conditions that would make sampling unacceptable due to strong winds and high waves, the sampling team and vessel operator would remain on stand-by until weather conditions improve to allow rigorous and safe collection of sediment samples.

3.4.3 Equipment Failure

The grab sampler and lifting arrangement is sufficiently robust and no failure of the equipment is expected to occur during the sampling. Prior to sampling, all equipment will be thoroughly checked and repaired if necessary.

In the unlikely event of equipment failure during sampling, repairs to any equipment would be undertaken as soon as possible to minimise delays as far as practical.

3.5 Contaminants List

3.5.1 Rationale for Selection of Sampling Parameters

In accordance with NAGD, the contaminants to be investigated should include:

- Toxic substances known, from previous investigations, to occur in dredge area sediments at levels greater than one-tenth of the screening levels; or
- Based on the historical review, substances potentially present at such levels in the sediments to be dredged.

Based on the review of existing sediment quality data (Section 2), samples will be analysed as follows:

Basic List of Parameters:

- Analysis undertaken at all sampling locations;
- Analysis includes contaminants of (potential) concern and supplementary parameters:
  - Metals/Metalloids (As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn, Al, Fe);
  - Organotins (MBT, DBT, TBT);
  - Organochlorine Pesticides (including DDT, DDD, DDE, chlordane);
  - Particle size distribution;
  - Moisture content; and
  - Total Organic Carbon.

Detailed List of Parameters:

- Analysis undertaken at 30% of sampling locations and new sampling locations (i.e. 5-1, 9-5 and 9-6).
- Analysis includes ‘low risk’ parameters that have been detected in the past but generally in concentrations below LOR or NAGD screening levels:
  - Polycyclic Aromatic Hydrocarbons (PAHs);
  - Total Petroleum Hydrocarbons (TPHs);
  - Polychlorinated Biphenyls (PCBs);
  - Acid Sulfate Soils;
  - Nutrients (TP, TN, NOx, TKN); and

- Radionuclides.

Elutriate and Bioavailability Testing:

- Metals/Metalloids (Hg and Ni);
- Organotins (TBT); and
- Organochlorine Pesticides (DDT, DDD, DDE, chlordane).

3.6 Laboratory Analysis

3.6.1 Analytical Laboratories

Primary analysis of the sediment samples will be conducted by Advanced Analytical Australia Pty Ltd (AAA). Australian Laboratory Services (ALS) will be used as the secondary (reference) laboratory for inter-laboratory quality testing.

Both analytical laboratories are fully accredited by the National Association of Testing Authorities (NATA). AAA will subcontract some of the analyses to specialised NATA accredited laboratories, i.e. Sydney Analytical Laboratories (ammonia, Total Organic Carbon) and Microanalysis (Particle Size Distribution).

3.6.2 Analytical Tests

The primary laboratory Advanced Analytical Australia will perform all analyses in accordance with NAGD and will meet or provide better practical quantitation limits (PQL) than the target PQL's (Table 3-3).

Table 3-3 Analytical Parameters and Practical Quantitation Limits

Parameter	Target Practical Quantitation Limit (required)	Practical Quantitation Limit (Advanced Analytical Australia)
Moisture Content	0.1%	0.1%
Particle Size (sieve and sedigraph)	Size distribution (sieve + hydrometer or equivalent) and rates of settlement after 50% and 90% of settlement in seawater if possible.	10 to 0.001mm Settling velocities in m/s for all particle size fractions
Total Organic Carbon	0.1%	0.01%
Total Petroleum Hydrocarbons	100 mg/kg	10-50 mg/kg
Polychlorinated Biphenyls	5 µg/kg	5 µg/kg
PAHs (naphthalene, acenaphthalene, acenapthene, fluorene, phenanthene, anthracene, total fluoranthene, benzo [a]anthracene, benzo [a] pyrene, chrysene, dibenz[a,h] anthracene, pyrene, 2-methylnapthalene)	Individual - 5 µg/kg; Sum of PAHs - 100 µg/kg	Individual - 5 µg/kg; Sum of PAHs - 100 µg/kg

Parameter	Target Practical Quantitation Limit (required)	Practical Quantitation Limit (Advanced Analytical Australia)
Trace Metals and Metalloids (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc)	0.1 – 100 mg/kg, Hg- 0.01 mg/kg	0.1 – 5 mg/kg, Hg – 0.01 mg/kg
Organotins (MBT, DBT, TBT)	1 µg Sn/kg	0.5 µg Sn/kg
OCP Pesticides	1 µg/kg	OCP-1 µg/kg
Total Nitrogen Total Kjeldahl Nitrogen Nitrate & Nitrite as N Total Phosphorus	N/A N/A 0.1 mg/kg N/A	20 mg/kg 20 mg/kg 0.1 mg/kg 1 mg/kg
Acid Sulfate Soils	N/A	2 mole H^+/tonne
Radionuclides	N/A	35 Bq/g

3.6.3 Sample Containers

Based on the proposed analyses, the following sample containers would be required per sample:

- 2 x 250 mL glass jar – organic/inorganic chemical analysis;
- 1 x 125 mL glass jar – nutrient analyses;
- 1 x medium plastic clipseal bag (50-100 g) – particle size distribution; and
- 1 x small clipseal bag (200 g) – acid sulfate soil.

3.6.4 Quality Control – Laboratory Analysis

Both laboratories will follow laboratory QC procedures in accordance with requirements outlined in Appendix F of NAGD. This includes analysis of laboratory blanks, duplicates, certified reference materials and spiked samples.

3.6.4.1 Laboratory Blanks

The purpose of this assessment is to monitor a potential laboratory contamination of samples due to potential cross-contamination of samples during laboratory preparation, extraction or analysis. Blank sample concentrations should be at or near the detection limit of the method used.

3.6.4.2 Laboratory Duplicates

This assessment refers to a randomly selected intra-laboratory split sample, which provides information regarding the method precision and sample heterogeneity. Results are presented as Relative Percent Difference (RPD) values of two sample concentrations for a specific contaminant.

NAGD recommends that duplicates should agree within a typical RPD of the method of ±35 %. This recommended RPD is typically not adopted by analytical laboratories as it does not account for the greater uncertainty for contaminant concentrations close to the method's detection limit.

The primary laboratory AAA uses the following approach to assess duplicate RPD's:

- Result <10 times LOR – no limit to RPD; and
- Result >10 times LOR – RPD between 0% and 50%.

The secondary laboratory ALS adopts specific RPDs for individual compounds.

3.6.4.3 Surrogate and Matrix Spikes

Laboratory Control Samples are either certified reference materials or a blank sample spiked with known concentrations of the analytes of interest. The purpose of this measurement is to monitor method accuracy.

Matrix spikes refer to an intra-laboratory split sample spiked with a representative set of target analytes of known concentration. Matrix spikes are assessed to monitor potential sample matrix effects on analyte recoveries.

Surrogate spikes are used for organic analytes. Surrogates are known additions to samples which mimic the compounds of interest and are not normally expected to be present in the sample.

For both surrogate and matrix spikes, a calculation of the percent recovery of the spiked amount against the returned concentration is performed indicating analytical performance in terms of extraction efficiency.

NAGD states that recovery limits of 75% - 125% are generally acceptable. Analytical laboratories typically adopt specific surrogate and matrix spike recovery limits for the various contaminant compound groups. It is also noted that ideal recovery ranges may be waived in the event of sample matrix interference.

The primary laboratory AAA adopts the following acceptable surrogate and matrix spike recovery limits:

- Trace elements: 70-130%;
- Organic analyses: 50-150%;
- SVOC & speciated phenols: 10-140%; and
- Surrogates: 10-140%.

The secondary laboratory ALS adopts specific recovery limits for individual compounds.

3.7 Data Analysis

3.7.1 Sediment Contaminants

Concentrations of chemicals measured in sediment samples at each dredging sub-area (or reference area) will be compared to screening levels listed in Table 2 of NAGD. This will provide a basis for determining whether dredged material is suitable for unconfined placement at sea or if further analyses, such as elutriate, bioavailability or toxicity testing, are required.

For each dredging sub-area, the mean concentrations of chemical parameters at the upper 95% confidence level (95% UCL) will be calculated and compared against NAGD guideline levels. This involves the following steps.

Data pre-treatment

Analytical values below detection limit will be set to one-half of the laboratory Limit of Reporting (LOR) as per NAGD recommendation to facilitate 95% UCL calculation. Organic contaminant results will be normalised to 1% Total Organic Carbon (TOC) where the measured value is within the range of 0.2-10%. If TOC values are outside of this range, the highest (10%) or lowest (0.2%) value will be adopted as appropriate. Organic parameters with concentrations below detection limits will not be normalised to 1% TOC but included at half their LOR.

One assumption in the calculation of the 95% UCL is that the samples are statistically independent. Therefore, field triplicate samples and laboratory split samples will not be included in the 95% UCL calculation.

Outliers

Outliers will be treated in accordance with the procedure in NAGD. In summary this will involve:

(a) Outliers (for all parameters) will be identified as any data points greater than two standard deviations.

(b) For TBT, where outliers are detected, the stored portion of the sample will be analysed in triplicate.

(c) If the original result is not confirmed through the re-analysis, it will be discarded in favour of the mean of the three triplicate samples.

NAGD does not provided guidance on treatment of outliers for other parameters. Outliers for other parameters will be noted in the report but included in calculation of the 95% UCL.

Selection of appropriate 95% UCL Calculation Method

The methodology for calculating the 95% UCL follows the approach recommended in Appendix A of NAGD. A Shapiro-Wilk test will be used to determine whether data followed a normal distribution. The ProUCL (Version 4.1.00) software package will be used for these calculations (Singh et al. 2010).

Calculation of 95% UCL and Comparison to Screening Levels

ProUCL Version 4.1.00 will be used to calculate the 95% UCL. For normally distributed data, the arithmetic mean and standard deviation will be calculated, and the 95% UCL calculated using the one-tailed Student's *t* UCL test. For data that follows a log-normal (or other) distribution, the geomean will be calculated, and the 95% UCL analysed using non-parametric Jack-Knife analysis as per NAGD recommendation.

In cases where an insufficient number of discrete values in the dataset would not allow calculation of the 95% UCL (e.g. most values below LOR), the maximum recorded value of the dataset will be conservatively used instead for comparison against NAGD trigger levels.

Should 95% UCL values for all analysed parameters fall below NAGD screening levels, the sediment would be considered clean and suitable for unconfined disposal at sea.

3.7.2 Baseline Concentrations

NAGD states that ambient baseline concentrations can be determined by sampling of sediment at reference areas in the vicinity of an existing disposal site. Similar to the approach followed in Worley Parsons (2013c, d), the data collected from the five reference locations in Moreton Bay would be used to derive ambient baseline concentrations if required (RF2, 3, 4, 6 and 7 in Figure 3-1).

3.8 Elutriate and Bioavailability Testing

As outlined on Section 3.1.3, elutriate and bioavailability testing will be undertaken as per NAGD for a range of contaminants which have regularly exceeded screening levels in the past.

Elutriate Testing:

The elutriate test is designed to simulate release of contaminants from sediment during dredged material disposal. Testing will be carried out using the USEPA's standard seawater elutriate test which involves shaking the sediment samples with four times the volume of seawater at room temperature for 30 minutes. The sample will be allowed to settle for one hour and the supernatant centrifuged or filtered (0.45 µm) within sixty minutes, and analysed using analytical methods appropriate for determining ultra-trace levels in seawater.

Results will be compared to the respective ANZECC/ARMCANZ (2000) marine water quality trigger value (for 95% or 99% protection of species, as appropriate).

Bioavailability Testing:

The Dilute Acid Extraction (DAE) method will be used to provide an estimate of the bioavailable fraction of the contaminant of concern in case of metal/metalloid analysis. The sediment samples will be extracted using a weak acid and the results compared against the respective NAGD screening levels.

Porewater analysis would be undertaken for organic contaminants such as TBT. Porewater is assumed to represent the major route of exposure to sediment contaminants by benthic organisms and is the recommended bioavailability test for organic contaminants as per NAGD. Porewater results would be compared to the respective ANZECC/ARMCANZ (2000) marine water quality trigger value (for 95% protection of species).

Should both elutriate and bioavailability tests result in values less than the respective guideline limits, the material would be considered clean and suitable for ocean disposal.

3.8.1 Acid Sulfate Soils

The results of the chromium-suite acid sulfate analysis will be assessed against the Australian framework for Acid Sulfate Soil management in coastal systems (Ahern et al. 1998). The risk of acidification will be determined by the acid-base accounting approach (Ahern et al. 2004). Net acidity will be calculated from the results as a measure of the acid producing capacity of the sampled sediment upon complete oxidation.

The calculated net acidity will then be compared to the QASSIT action criteria of 0.03% S or 18 mol H+/tonne to assess the need for acid sulfate soil management if the dredged sediments were to be placed on land.

The liming rate will indicate the amount of lime that needs to be added to the soil to manage its acid generating capacity.

3.9 Data Validation

All laboratory analyses will be validated in accordance with Appendix A of NAGD to confirm suitable data quality for undertaking a rigorous characterisation of the proposed dredge material.

Data Validation will involve assessment of the following:

- Sample holding times and storage conditions;
- Laboratory blanks, duplicates and surrogate/matrix spikes; and
- Field triplicates samples, triplicate sample splits and trip blank.

The proposed data quality objectives for data validation are outlined in Table 3-4.

Table 3-4 Data Quality Objectives for Data Validation

Parameter	Data Quality Objective
Holding Time	Samples received within specified holding time (NAGD Appendix H)
Field Triplicate Samples	Relative Standard Deviation <50%
Triplicate Split Samples, including inter-laboratory samples	Relative Standard Deviation <50%
Laboratory Blanks	At or near the Limit of Reporting (LOR)
Laboratory Duplicate Samples	Relative Percent Difference (RPD) <35% or as per laboratory requirements
Laboratory Matrix Spikes	Recovery as per laboratory requirements
Surrogate Spikes	Recovery as per laboratory requirements

3.10 Reporting

The reporting of sediment quality results will be undertaken in a SAP Implementation Report in accordance with NAGD including the following components:

- Summary of the SAP, or SAP appended to the report;
- Outline of potential problems encountered and deviations from the SAP, including justification;
- Description of the sampling carried out, along with the actual sampling locations, sample numbers (including replicates and QA samples), completed COC forms, field logs and description of sediments;
- Comparison of the 95% UCL of mean chemical concentrations of sediments in the dredge subareas;
- Assessment of QA/QC procedures for both field and laboratory data;

- Data validation including comparison to data quality objectives;
- Appendices including all laboratory and field data; and
- Conclusions as to the acceptability or otherwise of the dredge material for unconfined ocean disposal and recommendations as to further work required.

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Worley Parsons (2013d) Emergency Dredging Sediment Sampling – Round 2 Dioxin Results. Report prepared for Port of Brisbane Pty Ltd.

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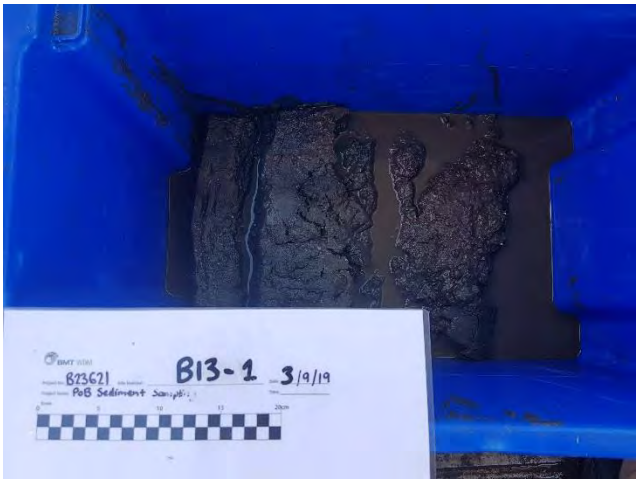
Appendix B Sediment Photos

Sediment Photos

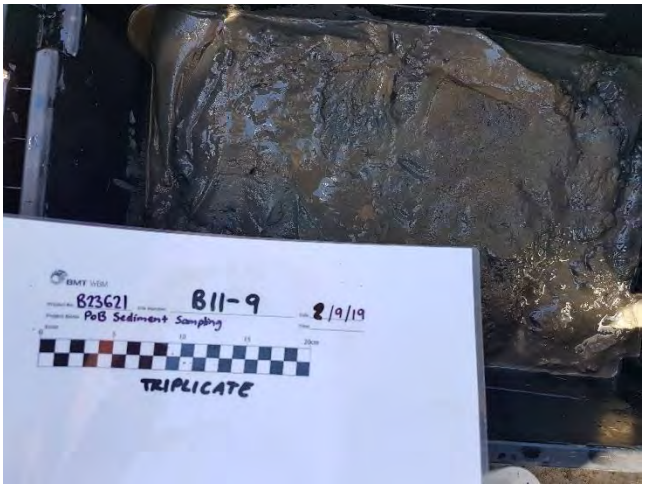
Sediment Photos

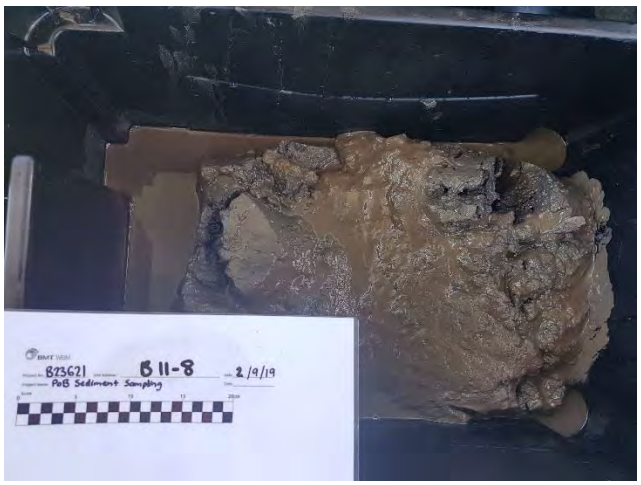


Sediment Photos

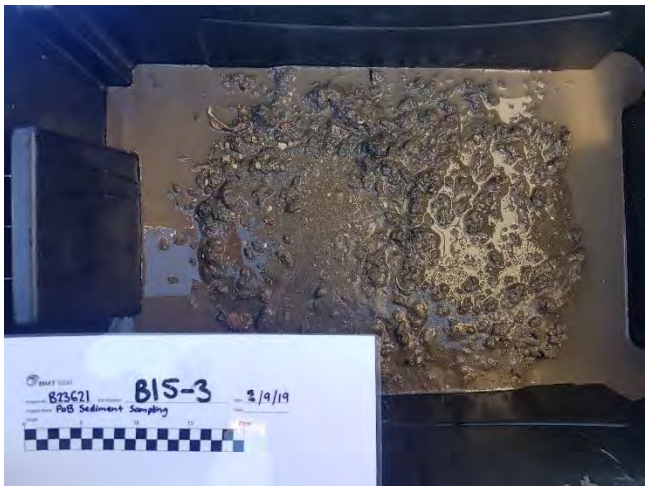
Sediment Photos

Sediment Photos





Sediment Photos



Appendix C Sediment Sampling Log

Project no:	B23621				Date:	2/9/19					
Project name:	Port of Brisbane SAP				Weather:	Sunny					
Samplers:	GB + WB + Abyss				Sea state:	Calm, light winds					
Site	WPT	Time	Depth	Colour	Odour	Composition	Texture	Plasticity	Organic matter	Benthic flora/fauna	Comments
B15-3		9:22	11m	dark grey/ brown	nil	sandy clay	gritty	low	leaves	nil	Shell grit 2%
B15-2		9:50	16.4m	dark grey/ brown	slight anoxic	sandy clay	gritty	low	roots/wood	nil	shell grit 5%
B15-1		10:10	16.8m	grey brown	nil	silty clay	smooth	low - mod	nil	nil	shell grit 1%
B12-2		10:25	16.8m	grey brown	nil	clayey sand	gritty	NO	low organics	nil	shell grit 1%
B12-1		10:45	18.2m	grey brown	nil	sandy clay	gritty	low	low organics	nil	shell grit 2%
B11-5		11:00	16.0m	grey brown	slight anoxic	sandy clay	gritty	slight	urchins	urchin	shell grit 1%
B11-8		11:25	11.0m	grey brown	nil - slight anoxic	silty clay	smooth	low - mod	low	nil	shell grit 1%
B11-9 TRIP		11:50	17.0m	grey-brown	nil - slight anoxic	silty clay	smooth	low - mod	low - tree matter	nil	nil
B11-10 TRIP (B11-9B)		12:05	17.0m	"	"	"	"	"	"	"	"
B11-11 TRIP (B11-9C)		12:15	17.0m	"	"	"	"	"	"	"	"

Project no:	B23621				Date:	2/2/19					
Project name:	Port of Brisbane SAP				Weather:	sunny					
Samplers:	GB + WB + Abyss				Sea state:	calm, light winds					
Site	**WPT**	**Time**	**Depth**	**Colour**	**Odour**	**Composition**	**Texture**	**Plasticity**	**Organic matter**	**Benthic flora/fauna**	**Comments**
B10-6		12:40	16m	grey brown	nil	silty clay	smooth - clumps of clay	low - mod	nil	nil	Split trip - 10-7 + 10-6C
B10-5		13:10	16.6m	grey brown	nil	silty clay	smooth - clumps of clay	low - mod clumps - high	nil	nil	-
B9-1		13:45	12.5m	grey brown	nil - slight anoxic	sandy clay	gritty	mod - high plastic.	low	some - worms	-
B8-3		14:05	12m	grey brown	nil	silty clay	smooth	mod plastic.	low - wood.	nil	-

Project no:	B28621				Date:	3/9/19					
Project name:	Port of Brisbane				Weather:	sunny					
Samplers:	GBT WB				Sea state:	calm					
Site	WPT	Time	Depth	Colour	Odour	Composition	Texture	Plasticity	Organic matter	Benthic flora/fauna	Comments
RF2		8:00	11m	grey brown	nil	silty clay	smooth	moderate plasticity	–	–	shell 1%
RF6		8:20	8m	grey brown	nil	silty clay	smooth	moderate plasticity	–	–	shell 1%
RF3		8:35	9.5m	grey brown	nil	silty clay	smooth	moderate plasticity	–	–	–
RF7		8:55	9.0m	grey brown	nil	silty clay	smooth	moderate plasticity	–	worms	shell 1%
RF4		9:10	10.1m	grey brown	nil	silty clay	smooth	moderate plasticity	–	–	shell 2%
B13-9		9:35	13.5m	grey brown	nil	silty clay	smooth	moderate plasticity		rubbish	–
B13-8		10:05	10.0m	grey brown	nil	silty clay	smooth	moderate plasticity	–	–	shell 3%
B16-1		10:20	9.3m	grey brown	nil	silty sand w/ clay	gritty	low plasticity	–	–	shell grit
B16-0		10:35	9.7m	grey brown	nil	silty clay	smooth	moderate plasticity	–	–	shell grit <1%
B13-5		11:10	9.4m	grey brown	nil	silty clay	smooth	moderate-high plasticity	–	worms	shell grit 1%.

Project no:	B23621				Date:	3/9/19					
Project name:	Port of Brisbane SAP				Weather:	sunny					
Samplers:	GB + WB + Abyss				Sea state:	calm					
Site	WPT	Time	Depth	Colour	Odour	Composition	Texture	Plasticity	Organic matter	Benthic flora/fauna	Comments
TRIP B13-4		11:30	8.5m	grey brown	nil	sandy silt	gritty	low plasticity	nil	shrimp	shell grit 5%
TRIP B13-6 (B13-4B)		11:45	8.5m	grey brown	nil	sandy silt	gritty	low	nil	some fauna	shell grit 5%
TRIP B13-7 (B13-4C)		11:55	8.5m	grey brown	nil	sandy silt	gritty	low	nil	some fauna	shell grit 5%.
B13-1		12:10	6.7m	grey brown	nil	clayey silt w/ sand	gritty	low - mod	nil	nil	shell grit 2%
B10-8		13:00	16.2m	grey brown	nil	clayey silt	smooth	low	nil	nil	-
B8-1		13:25	14.2m	grey brown	nil	silty clay	smooth	moderate	low	nil	shell grit

Project no:	B23621				Date:	4/9/19					
Project name:	Port of Brisbane SAP				Weather:	Sunny					
Samplers:	GB + WB + Abyss				Sea state:	Calm					
Site	WPT	Time	Depth	Colour	Odour	Composition	Texture	Plasticity	Organic matter	Benthic flora/fauna	Comments
B7-1		7:20	11.7m	grey brown	slight anoxic	clayey silt	gritty	low-moderate	low-	nil	shell grit- 5%.
B6-2		7:45	11.7m	grey brown	nil	clayey silt w/ sand	gritty	low	leaves	worm	shell grit 5%
B6-3		8:05	12.4m	grey brown	nil	clayey silt	smooth	low	–	–	–
TRIP B5-1		8:35	9.0m	grey brown	nil	silty clay	smooth	moderate-high	–	–	shell grit 1%
TRIP B5-2 (B5-2B)		8:45	9.0m	grey brown	nil	silty clay	smooth	moderate-high	–	–	shell grit 1%
TRIP B5-3 (B52-C)		9:00	9.0m	grey brown	nil	silty clay	smooth	moderate-high	–	–	shell grit 1%
B5-0		10:20	9.0m	grey brown	nil-slight anoxic	silty clay	smooth	low-mod	low	nil	–
B4-0		10:30	9.9m	grey brown	slight anoxic	silty clay	smooth	moderate	low	–	–
B4-4		10:45	10.3m	grey brown	slight anoxic	silty clay	smooth	moderate	low-leaves	–	–
BC-2		11:15	3.7m	grey brown	anoxic	silt w/ coarse sand	gritty	low-none	mod-leaves	worm	–

Project no:	B23621				Date:	4/9/19					
Project name:	Part of Brisbane SAP				Weather:	sunny					
Samplers:	GB + WB + Abyss				Sea state:	calm					
Site	**WPT**	**Time**	**Depth**	**Colour**	**Odour**	**Composition**	**Texture**	**Plasticity**	**Organic matter**	**Benthic flora/fauna**	**Comments**
B2-0		11:55	13.0m	yellow-brown	nil	silty sand	gritty	nil	–	n/a	some pebbles

Appendix D Sediment Quality Results – Primary Laboratory

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1923225**	Page	: 1 of 59
Amendment	: **1**		
Client	: **BMT EASTERN AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR DARREN RICHARDSON	Contact	: Customer Services EB
Address	: PO BOX 203 SPRING HILL BRISBANE QLD 4004	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3831 6744	Telephone	: +61-7-3243 7222
Project	: B23621 Port of Brisbane	Date Samples Received	: 04-Sep-2019 15:05
Order number	:	Date Analysis Commenced	: 05-Sep-2019
C-O-C number	: ----	Issue Date	: 30-Sep-2019 15:36
Sampler	: GRACE BOURKE, Wills Brassil		
Site	: ----		
Quote number	: BN/016/19		
No. of samples received	: 46		
No. of samples analysed	: 46		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, Stafford, QLD

General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP090: Sample 'B15-2' shows poor matrix spike recovery due to matrix interference. Confirmed by re-extraction and re-analysis.
- EP090: Samples 'B13-8' and 'BC-2' shows poor matrix spike recovery due to matrix interference.
- EP090: The LOR for dibutyltin for sample 'B12-1' has been raised due to matrix interference.
- EG005T (Total Metals): Sample EB1923225-011 (B10-6) shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- EG035T LL (Total Mercury by FIMS - Low Level): Sample EB1923225-041 (B4-4) shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- EP131B : LOR is raised due to high amount of moistures is present.
- EP130: LOR for sample raised due to the high amount of moisture present.
- **Ultra Trace Organics analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- ASS: EA029 (SPOCAS): Retained Acidity not required because pH KCl greater than or equal to 4.5
- EP132B-SD : Poor duplicate precision due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- Amendment (30/09/2019): This report has been amended following changes to the analytical data reported. The specific data affected includes Total Mercury (EG035T-LL) results for sample B5-3 (EB1923225-038). The quality system is being utilised to resolve this issue and all details are recorded under client query 19BNCC464 and a full investigation is detailed in 19BNC164.
- EK061G (Total Kjeldahl Nitrogen as N) / EK067G (Total Phosphorus as P): Sample EB1923225_002 (B15-2) shows poor matrix spike recovery due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EP131B : Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EP090: The LOR for dibutyltin for sample 'B5-0' has been raised due to matrix interference.
- EP071: Sample B15-2 shows poor matrix spike recovery due to sample heterogeneity. Confirmed by visual analysis.
- EG035T-LL (Total Mercury Low Level) Sample EB1923225-010 (B15-2) shows poor matrix spike recovery due to sample heterogeneity. Confirmed by visual inspection.
- EG035T-LL (Total Mercury Low Level) Sample EB1923225-021 (B13-9) shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- ASS: EA033 (CRS Suite): 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'.
- ASS: EA029 (SPOCAS): 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.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B15-3	B15-2	B15-1	B12-2	B12-1
			Client sampling date / time	02-Sep-2019 09:20	02-Sep-2019 09:50	02-Sep-2019 10:10	02-Sep-2019 10:25	02-Sep-2019 10:45
Compound	CAS Number	LOR	Unit	EB1923225-001	EB1923225-002	EB1923225-003	EB1923225-004	EB1923225-005
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**8.9**	**9.1**	----	----	**8.7**
pH OX (23B)	----	0.1	pH Unit	**8.0**	**8.5**	----	----	**8.0**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	----	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	----	----	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	----	----	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	<0.020	<0.020	----	----	<0.020
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	<0.020	<0.020	----	----	<0.020
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	<0.020	<0.020	----	----	<0.020
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	**0.115**	**0.075**	----	----	**0.115**
Peroxide Sulfur (23De)	----	0.020	% S	**0.400**	**0.159**	----	----	**0.440**
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	**0.285**	**0.084**	----	----	**0.325**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**178**	**52**	----	----	**203**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	**0.288**	**0.266**	----	----	**0.339**
Peroxide Calcium (23Wh)	----	0.020	% Ca	**1.20**	**2.19**	----	----	**1.93**
Acid Reacted Calcium (23X)	----	0.020	% Ca	**0.907**	**1.93**	----	----	**1.60**
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**452**	**962**	----	----	**796**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	**0.725**	**1.54**	----	----	**1.28**
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	**0.148**	**0.084**	----	----	**0.186**
Peroxide Magnesium (23Tm)	----	0.020	% Mg	**0.264**	**0.196**	----	----	**0.291**
Acid Reacted Magnesium (23U)	----	0.020	% Mg	**0.115**	**0.111**	----	----	**0.105**
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**95**	**92**	----	----	**86**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	**0.152**	**0.147**	----	----	**0.138**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**2.48**	**5.41**	----	----	**2.28**
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**496**	**1080**	----	----	**456**
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**0.794**	**1.73**	----	----	**0.730**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B15-3	B15-2	B15-1	B12-2	B12-1
				Client sampling date / time	02-Sep-2019 09:20	02-Sep-2019 09:50	02-Sep-2019 10:10	02-Sep-2019 10:25	02-Sep-2019 10:45
Compound	CAS Number	LOR	Unit		EB1923225-001	EB1923225-002	EB1923225-003	EB1923225-004	EB1923225-005
					Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued									
EA029-H: Acid Base Accounting									
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
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		0.28	0.08	----	----	0.32
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		178	52	----	----	203
Liming Rate excluding ANC	----	1	kg CaCO3/t		13	4	----	----	15
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		8.9	9.1	----	----	8.7
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	----	----	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	----	----	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		0.285	0.093	----	----	0.269
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		178	58	----	----	168
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		3.61	5.38	----	----	5.29
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		721	1080	----	----	1060
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		1.16	1.72	----	----	1.69
EA033-E: Acid Base Accounting									
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
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		0.28	0.09	----	----	0.27
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		178	58	----	----	168
Liming Rate excluding ANC	----	1	kg CaCO3/t		13	4	----	----	13
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		----	----	49.4	28.1	----
Moisture Content	----	1.0	%		31.1	40.6	----	----	40.0
EG005(ED093)T: Total Metals by ICP-AES									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B15-3	B15-2	B15-1	B12-2	B12-1
			Client sampling date / time	02-Sep-2019 09:20	02-Sep-2019 09:50	02-Sep-2019 10:10	02-Sep-2019 10:25	02-Sep-2019 10:45
Compound	CAS Number	LOR	Unit	EB1923225-001	EB1923225-002	EB1923225-003	EB1923225-004	EB1923225-005
				Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued								
Aluminium	7429-90-5	50	mg/kg	7300	7060	13500	5110	8400
Iron	7439-89-6	50	mg/kg	20800	20500	33100	13900	26100
EG020-SD: Total Metals in Sediments by ICPMS								
Arsenic	7440-38-2	1.00	mg/kg	6.59	6.17	7.92	3.13	6.15
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	19.4	19.2	31.4	14.8	25.0
Copper	7440-50-8	1.0	mg/kg	7.6	9.3	19.4	6.3	20.4
Lead	7439-92-1	1.0	mg/kg	4.3	7.4	10.4	3.8	15.2
Nickel	7440-02-0	1.0	mg/kg	13.6	13.4	24.2	9.2	18.4
Silver	7440-22-4	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Zinc	7440-66-6	1.0	mg/kg	35.1	47.4	72.5	28.1	89.4
EG035T: Total Recoverable Mercury by FIMS (Low Level)								
Mercury	7439-97-6	0.01	mg/kg	0.02	0.03	0.05	0.02	0.08
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	0.2	0.2	----	----	<0.1
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	470	1050	----	----	850
EK062: Total Nitrogen as N (TKN + NOx)								
^ Total Nitrogen as N	----	20	mg/kg	470	1050	----	----	850
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	2	mg/kg	293	413	----	----	650
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.52	0.32	0.70	0.24	0.79
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
>C10 - C16 Fraction	----	3	mg/kg	<3	5	----	----	10
>C16 - C34 Fraction	----	3	mg/kg	6	30	----	----	69
>C34 - C40 Fraction	----	5	mg/kg	<5	13	----	----	24
>C10 - C40 Fraction (sum)	----	3	mg/kg	6	48	----	----	103
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg	<3	5	----	----	10
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	3	mg/kg	<3	<3	----	----	<3
C10 - C14 Fraction	----	3	mg/kg	<3	3	----	----	6
C15 - C28 Fraction	----	3	mg/kg	4	19	----	----	45

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B15-3	B15-2	B15-1	B12-2	B12-1
				Client sampling date / time	02-Sep-2019 09:20	02-Sep-2019 09:50	02-Sep-2019 10:10	02-Sep-2019 10:25	02-Sep-2019 10:45
Compound	CAS Number	LOR	Unit		EB1923225-001	EB1923225-002	EB1923225-003	EB1923225-004	EB1923225-005
					Result	Result	Result	Result	Result
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	5	mg/kg		<5	22	----	----	42
^ C10 - C36 Fraction (sum)	----	3	mg/kg		4	44	----	----	93
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		<3	<3	----	----	<3
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		<3.0	<3.0	----	----	<3.0
EP080-SD: BTEXN									
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
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	----	----	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	----	<0.2
Naphthalene	91-20-3	0.2	mg/kg		<0.2	<0.2	----	----	<0.2
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		<1	<1	<1	<1	<2
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	6.5	<0.5	0.5	0.6
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<10	<10	<10	<10	<10
Carbophenothion	786-19-6	10	µg/kg		<10	<10	<10	<10	<10
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<10.0	<10.0	<10.0	<10.0	<10.0
Chlorfenvinphos (Z)	18708-87-7	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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B15-3	B15-2	B15-1	B12-2	B12-1
			Client sampling date / time	02-Sep-2019 09:20	02-Sep-2019 09:50	02-Sep-2019 10:10	02-Sep-2019 10:25	02-Sep-2019 10:45
Compound	CAS Number	LOR	Unit	EB1923225-001	EB1923225-002	EB1923225-003	EB1923225-004	EB1923225-005
				Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
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	**0.64**	**1.45**	<0.50	**1.06**
4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.50	µg/kg	<0.50	**0.64**	**1.45**	<0.50	**1.06**
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
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	0.50	µg/kg	<0.50	<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	<0.50
^ Total Chlordane (sum)	----	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Oxychlordane	27304-13-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B15-3	B15-2	B15-1	B12-2	B12-1
				Client sampling date / time	02-Sep-2019 09:20	02-Sep-2019 09:50	02-Sep-2019 10:10	02-Sep-2019 10:25	02-Sep-2019 10:45
Compound	CAS Number	LOR	Unit		EB1923225-001	EB1923225-002	EB1923225-003	EB1923225-004	EB1923225-005
					Result	Result	Result	Result	Result
EP131B: Polychlorinated Biphenyls (as Aroclors) - Continued									
^ Total Polychlorinated biphenyls	----	5.0	µg/kg		<5.0	<5.0	----	----	<5.0
Aroclor 1016	12674-11-2	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	----	----	15
2-Methylnaphthalene	91-57-6	5	µg/kg		<5	<5	----	----	8
Acenaphthylene	208-96-8	4	µg/kg		<4	5	----	----	34
Acenaphthene	83-32-9	4	µg/kg		<4	<4	----	----	10
Fluorene	86-73-7	4	µg/kg		<4	<4	----	----	12
Phenanthrene	85-01-8	4	µg/kg		<4	5	----	----	60
Anthracene	120-12-7	4	µg/kg		<4	<4	----	----	28
Fluoranthene	206-44-0	4	µg/kg		<4	20	----	----	150
Pyrene	129-00-0	4	µg/kg		<4	26	----	----	159
Benz(a)anthracene	56-55-3	4	µg/kg		<4	11	----	----	90
Chrysene	218-01-9	4	µg/kg		<4	10	----	----	74
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		<4	18	----	----	125
Benzo(k)fluoranthene	207-08-9	4	µg/kg		<4	12	----	----	57
Benzo(e)pyrene	192-97-2	4	µg/kg		<4	10	----	----	66
Benzo(a)pyrene	50-32-8	4	µg/kg		<4	16	----	----	120
Perylene	198-55-0	4	µg/kg		176	32	----	----	429
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		<4	14	----	----	97
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		<4	6	----	----	20
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		<4	14	----	----	79
Coronene	191-07-1	5	µg/kg		<5	<5	----	----	21
^ Sum of PAHs	----	4	µg/kg		176	199	----	----	1650
^ Benzo(a)pyrene TEQ (zero)	----	4	µg/kg		<4	28	----	----	177
^ Benzo(a)pyrene TEQ (half LOR)	----	4	µg/kg		5	28	----	----	177
^ Benzo(a)pyrene TEQ (LOR)	----	4	µg/kg		10	28	----	----	177
EP080-SD: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B15-3	B15-2	B15-1	B12-2	B12-1
				Client sampling date / time	02-Sep-2019 09:20	02-Sep-2019 09:50	02-Sep-2019 10:10	02-Sep-2019 10:25	02-Sep-2019 10:45
Compound	CAS Number	LOR	Unit		EB1923225-001	EB1923225-002	EB1923225-003	EB1923225-004	EB1923225-005
					Result	Result	Result	Result	Result
EP080-SD: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		65.1	77.3	----	----	73.2
Toluene-D8	2037-26-5	0.2	%		47.1	68.3	----	----	57.4
4-Bromofluorobenzene	460-00-4	0.2	%		66.0	81.7	----	----	79.1
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		86.2	85.5	85.6	91.0	112
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		56.2	45.7	40.0	45.3	66.3
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		60.5	59.3	47.7	61.8	76.7
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		72.1	73.9	----	----	88.2
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		84.6	85.1	----	----	90.8
Anthracene-d10	1719-06-8	10	%		83.2	88.7	----	----	104
4-Terphenyl-d14	1718-51-0	10	%		77.6	82.0	----	----	93.4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B11-5	B11-8	B11-9	B11-10	B11-11
			Client sampling date / time	02-Sep-2019 11:00	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:05	02-Sep-2019 12:15
Compound	CAS Number	LOR	Unit	EB1923225-006	EB1923225-007	EB1923225-008	EB1923225-009	EB1923225-010
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	8.6	----	----	----
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)	----	0.020	% pyrite S	----	<0.020	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	<0.020	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	<0.020	----	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	0.141	----	----	----
Peroxide Sulfur (23De)	----	0.020	% S	----	0.507	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	0.366	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	228	----	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	0.354	----	----	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	1.36	----	----	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	1.00	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	501	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	0.803	----	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	0.208	----	----	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	0.352	----	----	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	0.144	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	118	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	0.190	----	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	2.63	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	526	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	0.843	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B11-5	B11-8	B11-9	B11-10	B11-11
				Client sampling date / time	02-Sep-2019 11:00	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:05	02-Sep-2019 12:15
Compound	CAS Number	LOR	Unit		EB1923225-006	EB1923225-007	EB1923225-008	EB1923225-009	EB1923225-010
					Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued									
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		----	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t		----	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		----	**0.36**	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		----	**228**	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t		----	**17**	----	----	----
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		----	**8.6**	----	----	----
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)	----	0.005	% S		----	**0.303**	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		----	**189**	----	----	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	**4.01**	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	**801**	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	**1.28**	----	----	----
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	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		----	**0.30**	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		----	**189**	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t		----	**14**	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**44.4**	----	**55.3**	**47.6**	**51.0**
Moisture Content	----	1.0	%		----	**50.6**	----	----	----
EG005(ED093)T: Total Metals by ICP-AES									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B11-5	B11-8	B11-9	B11-10	B11-11
				Client sampling date / time	02-Sep-2019 11:00	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:05	02-Sep-2019 12:15
Compound	CAS Number	LOR	Unit		EB1923225-006	EB1923225-007	EB1923225-008	EB1923225-009	EB1923225-010
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Aluminium	7429-90-5	50	mg/kg		10200	13200	10900	10200	12000
Iron	7439-89-6	50	mg/kg		25300	34100	28100	29000	30500
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg		6.81	8.72	8.13	8.69	8.25
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		26.4	35.8	29.4	29.1	31.2
Copper	7440-50-8	1.0	mg/kg		17.8	23.9	20.5	20.0	22.1
Lead	7439-92-1	1.0	mg/kg		9.5	15.6	11.4	10.2	11.2
Nickel	7440-02-0	1.0	mg/kg		16.2	22.5	18.6	18.2	19.5
Silver	7440-22-4	0.1	mg/kg		<0.1	0.1	<0.1	<0.1	<0.1
Zinc	7440-66-6	1.0	mg/kg		73.9	97.7	74.0	70.5	78.2
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg		0.05	0.08	0.07	0.05	0.07
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		----	0.3	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		----	1110	----	----	----
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		----	1110	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		----	594	----	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.56	0.70	0.76	0.70	0.71
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		----	4	----	----	----
>C16 - C34 Fraction	----	3	mg/kg		----	28	----	----	----
>C34 - C40 Fraction	----	5	mg/kg		----	10	----	----	----
>C10 - C40 Fraction (sum)	----	3	mg/kg		----	42	----	----	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg		----	4	----	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg		----	<3	----	----	----
C10 - C14 Fraction	----	3	mg/kg		----	4	----	----	----
C15 - C28 Fraction	----	3	mg/kg		----	19	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B11-5	B11-8	B11-9	B11-10	B11-11
				Client sampling date / time	02-Sep-2019 11:00	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:05	02-Sep-2019 12:15
Compound	CAS Number	LOR	Unit		EB1923225-006	EB1923225-007	EB1923225-008	EB1923225-009	EB1923225-010
					Result	Result	Result	Result	Result
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	5	mg/kg		----	**16**	----	----	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg		----	**39**	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		----	<3	----	----	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		----	<3.0	----	----	----
EP080-SD: BTEXN									
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	----	----	----
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	----	----	----
Naphthalene	91-20-3	0.2	mg/kg		----	<0.2	----	----	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		<1	<1	<1	<1	<1
Tributyltin	56573-85-4	0.5	µgSn/kg		**0.5**	<0.5	<0.5	**1.9**	<0.5
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<10	<10	<10	<10	<10
Carbophenothion	786-19-6	10	µg/kg		<10	<10	<10	<10	<10
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<10.0	<10.0	<10.0	<10.0	<10.0
Chlorfenvinphos (Z)	18708-87-7	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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B11-5	B11-8	B11-9	B11-10	B11-11
			Client sampling date / time	02-Sep-2019 11:00	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:05	02-Sep-2019 12:15
Compound	CAS Number	LOR	Unit	EB1923225-006	EB1923225-007	EB1923225-008	EB1923225-009	EB1923225-010
				Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
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
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	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
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	0.50	µg/kg	<0.50	<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	<0.50
^ Total Chlordane (sum)	----	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Oxychlordane	27304-13-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B11-5	B11-8	B11-9	B11-10	B11-11
				Client sampling date / time	02-Sep-2019 11:00	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:05	02-Sep-2019 12:15
Compound	CAS Number	LOR	Unit		EB1923225-006	EB1923225-007	EB1923225-008	EB1923225-009	EB1923225-010
					Result	Result	Result	Result	Result
EP131B: Polychlorinated Biphenyls (as Aroclors) - Continued									
^ Total Polychlorinated biphenyls	----	5.0	µg/kg		----	<6.2	----	----	----
Aroclor 1016	12674-11-2	5.0	µg/kg		----	<6.2	----	----	----
Aroclor 1221	11104-28-2	5.0	µg/kg		----	<6.2	----	----	----
Aroclor 1232	11141-16-5	5.0	µg/kg		----	<6.2	----	----	----
Aroclor 1242	53469-21-9	5.0	µg/kg		----	<6.2	----	----	----
Aroclor 1248	12672-29-6	5.0	µg/kg		----	<6.2	----	----	----
Aroclor 1254	11097-69-1	5.0	µg/kg		----	<6.2	----	----	----
Aroclor 1260	11096-82-5	5.0	µg/kg		----	<6.2	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		----	13	----	----	----
2-Methylnaphthalene	91-57-6	5	µg/kg		----	6	----	----	----
Acenaphthylene	208-96-8	4	µg/kg		----	13	----	----	----
Acenaphthene	83-32-9	4	µg/kg		----	<5	----	----	----
Fluorene	86-73-7	4	µg/kg		----	5	----	----	----
Phenanthrene	85-01-8	4	µg/kg		----	34	----	----	----
Anthracene	120-12-7	4	µg/kg		----	16	----	----	----
Fluoranthene	206-44-0	4	µg/kg		----	78	----	----	----
Pyrene	129-00-0	4	µg/kg		----	84	----	----	----
Benz(a)anthracene	56-55-3	4	µg/kg		----	63	----	----	----
Chrysene	218-01-9	4	µg/kg		----	50	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		----	93	----	----	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		----	32	----	----	----
Benzo(e)pyrene	192-97-2	4	µg/kg		----	45	----	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg		----	78	----	----	----
Perylene	198-55-0	4	µg/kg		----	112	----	----	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		----	61	----	----	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		----	12	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		----	48	----	----	----
Coronene	191-07-1	5	µg/kg		----	14	----	----	----
^ Sum of PAHs	----	4	µg/kg		----	857	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	4	µg/kg		----	115	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	4	µg/kg		----	115	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	4	µg/kg		----	115	----	----	----
EP080-SD: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B11-5	B11-8	B11-9	B11-10	B11-11
				Client sampling date / time	02-Sep-2019 11:00	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:05	02-Sep-2019 12:15
Compound	CAS Number	LOR	Unit		EB1923225-006	EB1923225-007	EB1923225-008	EB1923225-009	EB1923225-010
					Result	Result	Result	Result	Result
EP080-SD: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	68.0	----	----	----
Toluene-D8	2037-26-5	0.2	%		----	50.6	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	71.0	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		110	97.7	94.7	94.0	74.8
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		46.5	42.4	39.1	40.8	47.8
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		67.1	52.5	61.0	45.2	47.5
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		----	62.0	----	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		----	78.9	----	----	----
Anthracene-d10	1719-06-8	10	%		----	96.5	----	----	----
4-Terphenyl-d14	1718-51-0	10	%		----	80.8	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B10-6	B10-7	B10-5	B9-1	B8-3
			Client sampling date / time	02-Sep-2019 12:40	02-Sep-2019 12:40	02-Sep-2019 13:10	02-Sep-2019 13:45	02-Sep-2019 14:05
Compound	CAS Number	LOR	Unit	EB1923225-011	EB1923225-012	EB1923225-013	EB1923225-014	EB1923225-015
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**8.6**	**8.5**	----	**8.8**	----
pH OX (23B)	----	0.1	pH Unit	**7.9**	**7.8**	----	**8.2**	----
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)	----	0.020	% pyrite S	<0.020	<0.020	----	<0.020	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	<0.020	<0.020	----	<0.020	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	<0.020	<0.020	----	<0.020	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	**0.187**	**0.185**	----	**0.099**	----
Peroxide Sulfur (23De)	----	0.020	% S	**0.719**	**0.825**	----	**0.226**	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	**0.532**	**0.640**	----	**0.127**	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**332**	**399**	----	**79**	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	**0.378**	**0.378**	----	**0.306**	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	**1.18**	**1.18**	----	**1.01**	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	**0.798**	**0.799**	----	**0.708**	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**398**	**399**	----	**354**	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	**0.638**	**0.639**	----	**0.567**	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	**0.264**	**0.246**	----	**0.153**	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	**0.431**	**0.459**	----	**0.269**	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	**0.167**	**0.212**	----	**0.115**	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**138**	**174**	----	**95**	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	**0.220**	**0.280**	----	**0.152**	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**1.88**	**1.56**	----	**2.51**	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**375**	**311**	----	**501**	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**0.601**	**0.499**	----	**0.802**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B10-6	B10-7	B10-5	B9-1	B8-3
			Client sampling date / time	02-Sep-2019 12:40	02-Sep-2019 12:40	02-Sep-2019 13:10	02-Sep-2019 13:45	02-Sep-2019 14:05
Compound	CAS Number	LOR	Unit	EB1923225-011	EB1923225-012	EB1923225-013	EB1923225-014	EB1923225-015
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
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	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.53	0.64	----	0.13	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	332	399	----	79	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	25	30	----	6	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	8.6	8.5	----	8.8	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.451	0.490	----	0.117	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	281	306	----	73	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	3.49	3.56	----	3.46	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	697	712	----	691	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	1.12	1.14	----	1.11	----
EA033-E: Acid Base Accounting								
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	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.45	0.49	----	0.12	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	281	306	----	73	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	21	23	----	5	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	51.8	----	57.7
Moisture Content	----	1.0	%	50.4	48.6	----	35.0	----
EG005(ED093)T: Total Metals by ICP-AES								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B10-6	B10-7	B10-5	B9-1	B8-3
				Client sampling date / time	02-Sep-2019 12:40	02-Sep-2019 12:40	02-Sep-2019 13:10	02-Sep-2019 13:45	02-Sep-2019 14:05
Compound	CAS Number	LOR	Unit		EB1923225-011	EB1923225-012	EB1923225-013	EB1923225-014	EB1923225-015
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Aluminium	7429-90-5	50	mg/kg		10400	11200	11100	9160	14200
Iron	7439-89-6	50	mg/kg		27400	28200	27500	26200	35500
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg		8.42	7.50	6.99	5.58	8.15
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		35.3	30.9	29.2	26.8	35.8
Copper	7440-50-8	1.0	mg/kg		21.4	20.2	20.5	19.0	28.5
Lead	7439-92-1	1.0	mg/kg		12.2	10.6	11.3	8.3	15.3
Nickel	7440-02-0	1.0	mg/kg		18.0	17.1	19.5	21.1	22.7
Silver	7440-22-4	0.1	mg/kg		0.4	0.3	0.1	<0.1	0.1
Zinc	7440-66-6	1.0	mg/kg		78.0	72.7	74.2	69.8	97.5
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg		0.09	0.07	0.07	0.04	0.08
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		0.3	0.3	----	0.3	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		900	880	----	680	----
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		900	880	----	680	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		428	483	----	400	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.70	0.71	0.83	0.43	0.97
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		<3	4	----	6	----
>C16 - C34 Fraction	----	3	mg/kg		24	21	----	28	----
>C34 - C40 Fraction	----	5	mg/kg		9	10	----	8	----
>C10 - C40 Fraction (sum)	----	3	mg/kg		33	35	----	42	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg		<3	4	----	6	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg		<3	<3	----	<3	----
C10 - C14 Fraction	----	3	mg/kg		<3	4	----	4	----
C15 - C28 Fraction	----	3	mg/kg		14	13	----	22	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B10-6	B10-7	B10-5	B9-1	B8-3
				Client sampling date / time	02-Sep-2019 12:40	02-Sep-2019 12:40	02-Sep-2019 13:10	02-Sep-2019 13:45	02-Sep-2019 14:05
Compound	CAS Number	LOR	Unit		EB1923225-011	EB1923225-012	EB1923225-013	EB1923225-014	EB1923225-015
					Result	Result	Result	Result	Result
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	5	mg/kg		**14**	**13**	----	**12**	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg		**28**	**30**	----	**38**	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		<3	<3	----	<3	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		<3.0	<3.0	----	<3.0	----
EP080-SD: BTEXN									
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	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	----
Naphthalene	91-20-3	0.2	mg/kg		<0.2	<0.2	----	<0.2	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		**1**	**2**	<1	<1	<1
Tributyltin	56573-85-4	0.5	µgSn/kg		**0.8**	**0.9**	<0.5	**0.6**	**0.7**
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<10	<10	<10	<10	<10
Carbophenothion	786-19-6	10	µg/kg		<10	<10	<10	<10	<10
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<10.0	<10.0	<10.0	<10.0	<10.0
Chlorfenvinphos (Z)	18708-87-7	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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B10-6	B10-7	B10-5	B9-1	B8-3
				Client sampling date / time	02-Sep-2019 12:40	02-Sep-2019 12:40	02-Sep-2019 13:10	02-Sep-2019 13:45	02-Sep-2019 14:05
Compound	CAS Number	LOR	Unit		EB1923225-011	EB1923225-012	EB1923225-013	EB1923225-014	EB1923225-015
					Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued									
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	**1.25**	<0.50	**1.79**
4.4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.50	µg/kg		<0.50	<0.50	**1.25**	<0.50	**1.79**
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
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	0.50	µg/kg		<0.50	<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	<0.50
^ Total Chlordane (sum)	----	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B10-6	B10-7	B10-5	B9-1	B8-3
				Client sampling date / time	02-Sep-2019 12:40	02-Sep-2019 12:40	02-Sep-2019 13:10	02-Sep-2019 13:45	02-Sep-2019 14:05
Compound	CAS Number	LOR	Unit		EB1923225-011	EB1923225-012	EB1923225-013	EB1923225-014	EB1923225-015
					Result	Result	Result	Result	Result
EP131B: Polychlorinated Biphenyls (as Aroclors) - Continued									
^ Total Polychlorinated biphenyls	----	5.0	µg/kg		<6.2	<5.0	----	<5.0	----
Aroclor 1016	12674-11-2	5.0	µg/kg		<6.2	<5.0	----	<5.0	----
Aroclor 1221	11104-28-2	5.0	µg/kg		<6.2	<5.0	----	<5.0	----
Aroclor 1232	11141-16-5	5.0	µg/kg		<6.2	<5.0	----	<5.0	----
Aroclor 1242	53469-21-9	5.0	µg/kg		<6.2	<5.0	----	<5.0	----
Aroclor 1248	12672-29-6	5.0	µg/kg		<6.2	<5.0	----	<5.0	----
Aroclor 1254	11097-69-1	5.0	µg/kg		<6.2	<5.0	----	<5.0	----
Aroclor 1260	11096-82-5	5.0	µg/kg		<6.2	<5.0	----	<5.0	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		9	8	----	5	----
2-Methylnaphthalene	91-57-6	5	µg/kg		<5	<5	----	<5	----
Acenaphthylene	208-96-8	4	µg/kg		6	5	----	6	----
Acenaphthene	83-32-9	4	µg/kg		<5	<4	----	<4	----
Fluorene	86-73-7	4	µg/kg		<5	<4	----	<4	----
Phenanthrene	85-01-8	4	µg/kg		12	7	----	9	----
Anthracene	120-12-7	4	µg/kg		7	5	----	5	----
Fluoranthene	206-44-0	4	µg/kg		38	23	----	25	----
Pyrene	129-00-0	4	µg/kg		42	28	----	29	----
Benz(a)anthracene	56-55-3	4	µg/kg		24	14	----	18	----
Chrysene	218-01-9	4	µg/kg		22	14	----	15	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		35	25	----	28	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		13	8	----	14	----
Benzo(e)pyrene	192-97-2	4	µg/kg		18	12	----	20	----
Benzo(a)pyrene	50-32-8	4	µg/kg		29	19	----	26	----
Perylene	198-55-0	4	µg/kg		409	270	----	46	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		24	17	----	31	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		<5	<4	----	6	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		19	13	----	19	----
Coronene	191-07-1	5	µg/kg		6	<5	----	7	----
^ Sum of PAHs	----	4	µg/kg		713	468	----	309	----
^ Benzo(a)pyrene TEQ (zero)	----	4	µg/kg		38	25	----	40	----
^ Benzo(a)pyrene TEQ (half LOR)	----	4	µg/kg		40	27	----	40	----
^ Benzo(a)pyrene TEQ (LOR)	----	4	µg/kg		42	29	----	40	----
EP080-SD: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B10-6	B10-7	B10-5	B9-1	B8-3
				Client sampling date / time	02-Sep-2019 12:40	02-Sep-2019 12:40	02-Sep-2019 13:10	02-Sep-2019 13:45	02-Sep-2019 14:05
Compound	CAS Number	LOR	Unit		EB1923225-011	EB1923225-012	EB1923225-013	EB1923225-014	EB1923225-015
					Result	Result	Result	Result	Result
EP080-SD: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		68.2	81.2	----	78.2	----
Toluene-D8	2037-26-5	0.2	%		53.6	57.1	----	57.9	----
4-Bromofluorobenzene	460-00-4	0.2	%		73.8	81.5	----	84.0	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		87.2	104	97.2	117	84.9
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		47.2	44.4	67.3	56.8	68.6
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		58.4	48.8	58.0	40.3	65.5
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		70.5	49.2	----	55.6	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		94.1	87.4	----	86.7	----
Anthracene-d10	1719-06-8	10	%		119	94.7	----	86.4	----
4-Terphenyl-d14	1718-51-0	10	%		110	90.7	----	76.9	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	RF2	RF6	RF3	RF7	RF4
				Client sampling date / time	03-Sep-2019 08:00	03-Sep-2019 08:20	03-Sep-2019 08:35	03-Sep-2019 08:55	03-Sep-2019 09:10
Compound	CAS Number	LOR	Unit		EB1923225-016	EB1923225-017	EB1923225-018	EB1923225-019	EB1923225-020
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		57.8	51.8	66.0	55.0	40.3
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		16100	15100	18700	15000	11600
Iron	7439-89-6	50	mg/kg		36000	36100	42400	33800	28000
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg		6.37	8.93	10.8	7.81	7.34
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		40.8	44.8	46.2	36.9	27.9
Copper	7440-50-8	1.0	mg/kg		17.6	17.0	21.2	20.7	11.1
Lead	7439-92-1	1.0	mg/kg		15.8	17.1	17.7	15.2	10.6
Nickel	7440-02-0	1.0	mg/kg		21.2	21.3	26.0	22.9	15.3
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	0.1	<0.1
Zinc	7440-66-6	1.0	mg/kg		83.2	76.8	93.7	79.0	53.1
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg		0.09	0.08	0.09	0.08	0.06
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.84	0.75	0.99	1.08	0.65
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		<1	<1	<1	<1	<1
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	<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	<10
Carbophenothion	786-19-6	10	µg/kg		<10	<10	<10	<10	<10
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<10.0	<10.0	<10.0	<10.0	<10.0
Chlorfenvinphos (Z)	18708-87-7	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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	RF2	RF6	RF3	RF7	RF4
				Client sampling date / time	03-Sep-2019 08:00	03-Sep-2019 08:20	03-Sep-2019 08:35	03-Sep-2019 08:55	03-Sep-2019 09:10
Compound	CAS Number	LOR	Unit		EB1923225-016	EB1923225-017	EB1923225-018	EB1923225-019	EB1923225-020
					Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued									
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	**0.56**	**0.62**	<0.50
4.4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.50	µg/kg		<0.50	<0.50	**0.56**	**0.62**	<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
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	0.50	µg/kg		<0.50	<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	<0.50
^ Total Chlordane (sum)	----	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	RF2	RF6	RF3	RF7	RF4
				Client sampling date / time	03-Sep-2019 08:00	03-Sep-2019 08:20	03-Sep-2019 08:35	03-Sep-2019 08:55	03-Sep-2019 09:10
Compound	CAS Number	LOR	Unit		EB1923225-016	EB1923225-017	EB1923225-018	EB1923225-019	EB1923225-020
					Result	Result	Result	Result	Result
EP131A: Organochlorine Pesticides - Continued									
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		**81.1**	**89.2**	**105**	**92.8**	**104**
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		**59.6**	**58.2**	**49.2**	**50.9**	**63.1**
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		**62.7**	**80.4**	**58.7**	**58.2**	**63.1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B13-9	B13-8	B16-1	B16-0	B13-5
			Client sampling date / time	03-Sep-2019 09:35	03-Sep-2019 10:05	03-Sep-2019 10:20	03-Sep-2019 10:35	03-Sep-2019 11:10
Compound	CAS Number	LOR	Unit	EB1923225-021	EB1923225-022	EB1923225-023	EB1923225-024	EB1923225-025
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	8.6	----	----	----
pH OX (23B)	----	0.1	pH Unit	----	8.0	----	----	----
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)	----	0.020	% pyrite S	----	<0.020	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	<0.020	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	<0.020	----	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	0.193	----	----	----
Peroxide Sulfur (23De)	----	0.020	% S	----	0.511	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	0.318	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	198	----	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	0.425	----	----	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	2.44	----	----	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	2.02	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	1010	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	1.62	----	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	0.286	----	----	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	0.560	----	----	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	0.274	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	225	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	0.362	----	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	5.74	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	1150	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	1.84	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-9	B13-8	B16-1	B16-0	B13-5
				Client sampling date / time	03-Sep-2019 09:35	03-Sep-2019 10:05	03-Sep-2019 10:20	03-Sep-2019 10:35	03-Sep-2019 11:10
Compound	CAS Number	LOR	Unit		EB1923225-021	EB1923225-022	EB1923225-023	EB1923225-024	EB1923225-025
					Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued									
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		----	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t		----	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		----	**0.32**	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		----	**198**	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t		----	**15**	----	----	----
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		----	**8.6**	----	----	----
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)	----	0.005	% S		----	**0.258**	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		----	**161**	----	----	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	**6.81**	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	**1360**	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	**2.18**	----	----	----
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	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		----	**0.26**	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		----	**161**	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t		----	**12**	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**58.8**	----	**36.8**	**50.1**	**47.6**
Moisture Content	----	1.0	%		----	**57.6**	----	----	----
EG005(ED093)T: Total Metals by ICP-AES									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-9	B13-8	B16-1	B16-0	B13-5
				Client sampling date / time	03-Sep-2019 09:35	03-Sep-2019 10:05	03-Sep-2019 10:20	03-Sep-2019 10:35	03-Sep-2019 11:10
Compound	CAS Number	LOR	Unit		EB1923225-021	EB1923225-022	EB1923225-023	EB1923225-024	EB1923225-025
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Aluminium	7429-90-5	50	mg/kg		14600	13200	5600	10400	11100
Iron	7439-89-6	50	mg/kg		35100	31800	14800	25900	29600
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg		9.21	9.38	4.10	7.41	8.68
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		32.8	31.2	15.0	24.9	29.3
Copper	7440-50-8	1.0	mg/kg		16.0	15.0	6.8	16.3	17.5
Lead	7439-92-1	1.0	mg/kg		14.9	13.7	5.7	12.0	16.0
Nickel	7440-02-0	1.0	mg/kg		19.1	18.2	9.2	16.5	16.5
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	0.2
Zinc	7440-66-6	1.0	mg/kg		63.1	61.4	29.9	64.1	82.8
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg		0.06	0.06	0.02	0.05	0.12
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		----	<0.1	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		----	1180	----	----	----
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		----	1180	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		----	602	----	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.86	0.95	0.42	0.60	0.83
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		----	<3	----	----	----
>C16 - C34 Fraction	----	3	mg/kg		----	<3	----	----	----
>C34 - C40 Fraction	----	5	mg/kg		----	<5	----	----	----
>C10 - C40 Fraction (sum)	----	3	mg/kg		----	<3	----	----	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg		----	<3	----	----	----
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	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-9	B13-8	B16-1	B16-0	B13-5
				Client sampling date / time	03-Sep-2019 09:35	03-Sep-2019 10:05	03-Sep-2019 10:20	03-Sep-2019 10:35	03-Sep-2019 11:10
Compound	CAS Number	LOR	Unit		EB1923225-021	EB1923225-022	EB1923225-023	EB1923225-024	EB1923225-025
					Result	Result	Result	Result	Result
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	5	mg/kg		----	<5	----	----	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg		----	<3	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		----	<3	----	----	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		----	<3.0	----	----	----
EP080-SD: BTEXN									
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	----	----	----
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	----	----	----
Naphthalene	91-20-3	0.2	mg/kg		----	<0.2	----	----	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		<1	<1	<1	<1	<1
Tributyltin	56573-85-4	0.5	µgSn/kg		**0.5**	<0.5	<0.5	**0.5**	<0.5
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<12	<12	<10	<12	<10
Carbophenothion	786-19-6	10	µg/kg		<12	<12	<10	<12	<10
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<12.0	<12.0	<10.0	<12.0	<10.0
Chlorfenvinphos (Z)	18708-87-7	10	µg/kg		<12	<12	<10	<12	<10
Chlorpyrifos	2921-88-2	10	µg/kg		<12	<12	<10	<12	<10
Chlorpyrifos-methyl	5598-13-0	10	µg/kg		<12	<12	<10	<12	<10
Demeton-S-methyl	919-86-8	10	µg/kg		<12	<12	<10	<12	<10
Diazinon	333-41-5	10	µg/kg		<12	<12	<10	<12	<10
Dichlorvos	62-73-7	10	µg/kg		<12	<12	<10	<12	<10
Dimethoate	60-51-5	10	µg/kg		<12	<12	<10	<12	<10
Ethion	563-12-2	10	µg/kg		<12	<12	<10	<12	<10
Fenamiphos	22224-92-6	10	µg/kg		<12	<12	<10	<12	<10
Fenthion	55-38-9	10	µg/kg		<12	<12	<10	<12	<10
Malathion	121-75-5	10	µg/kg		<12	<12	<10	<12	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-9	B13-8	B16-1	B16-0	B13-5
				Client sampling date / time	03-Sep-2019 09:35	03-Sep-2019 10:05	03-Sep-2019 10:20	03-Sep-2019 10:35	03-Sep-2019 11:10
Compound	CAS Number	LOR	Unit		EB1923225-021	EB1923225-022	EB1923225-023	EB1923225-024	EB1923225-025
					Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued									
Azinphos Methyl	86-50-0	10	µg/kg		<12	<12	<10	<12	<10
Monocrotophos	6923-22-4	10	µg/kg		<12	<12	<10	<12	<10
Parathion	56-38-2	10	µg/kg		<12	<12	<10	<12	<10
Parathion-methyl	298-00-0	10	µg/kg		<12	<12	<10	<12	<10
Pirimphos-ethyl	23505-41-1	10	µg/kg		<12	<12	<10	<12	<10
Prothiofos	34643-46-4	10	µg/kg		<12	<12	<10	<12	<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	**2.08**
4.4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	**2.08**
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
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	0.50	µg/kg		<0.50	<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	<0.50
^ Total Chlordane (sum)	----	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-9	B13-8	B16-1	B16-0	B13-5
				Client sampling date / time	03-Sep-2019 09:35	03-Sep-2019 10:05	03-Sep-2019 10:20	03-Sep-2019 10:35	03-Sep-2019 11:10
Compound	CAS Number	LOR	Unit		EB1923225-021	EB1923225-022	EB1923225-023	EB1923225-024	EB1923225-025
					Result	Result	Result	Result	Result
EP131B: Polychlorinated Biphenyls (as Aroclors) - Continued									
^ Total Polychlorinated biphenyls	----	5.0	µg/kg		----	<31.2	----	----	----
Aroclor 1016	12674-11-2	5.0	µg/kg		----	<31.2	----	----	----
Aroclor 1221	11104-28-2	5.0	µg/kg		----	<31.2	----	----	----
Aroclor 1232	11141-16-5	5.0	µg/kg		----	<31.2	----	----	----
Aroclor 1242	53469-21-9	5.0	µg/kg		----	<31.2	----	----	----
Aroclor 1248	12672-29-6	5.0	µg/kg		----	<31.2	----	----	----
Aroclor 1254	11097-69-1	5.0	µg/kg		----	<31.2	----	----	----
Aroclor 1260	11096-82-5	5.0	µg/kg		----	<31.2	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		----	9	----	----	----
2-Methylnaphthalene	91-57-6	5	µg/kg		----	<5	----	----	----
Acenaphthylene	208-96-8	4	µg/kg		----	10	----	----	----
Acenaphthene	83-32-9	4	µg/kg		----	<5	----	----	----
Fluorene	86-73-7	4	µg/kg		----	<5	----	----	----
Phenanthrene	85-01-8	4	µg/kg		----	30	----	----	----
Anthracene	120-12-7	4	µg/kg		----	15	----	----	----
Fluoranthene	206-44-0	4	µg/kg		----	68	----	----	----
Pyrene	129-00-0	4	µg/kg		----	81	----	----	----
Benz(a)anthracene	56-55-3	4	µg/kg		----	30	----	----	----
Chrysene	218-01-9	4	µg/kg		----	28	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		----	46	----	----	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		----	16	----	----	----
Benzo(e)pyrene	192-97-2	4	µg/kg		----	23	----	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg		----	36	----	----	----
Perylene	198-55-0	4	µg/kg		----	56	----	----	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		----	30	----	----	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		----	6	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		----	23	----	----	----
Coronene	191-07-1	5	µg/kg		----	6	----	----	----
^ Sum of PAHs	----	4	µg/kg		----	513	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	4	µg/kg		----	54	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	4	µg/kg		----	54	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	4	µg/kg		----	54	----	----	----
EP080-SD: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-9	B13-8	B16-1	B16-0	B13-5
				Client sampling date / time	03-Sep-2019 09:35	03-Sep-2019 10:05	03-Sep-2019 10:20	03-Sep-2019 10:35	03-Sep-2019 11:10
Compound	CAS Number	LOR	Unit		EB1923225-021	EB1923225-022	EB1923225-023	EB1923225-024	EB1923225-025
					Result	Result	Result	Result	Result
EP080-SD: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	75.5	----	----	----
Toluene-D8	2037-26-5	0.2	%		----	64.3	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	75.2	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		104	100	90.2	108	60.4
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		65.6	58.6	50.5	55.4	72.0
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		53.4	46.3	50.0	43.6	118
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		----	70.6	----	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		----	87.4	----	----	----
Anthracene-d10	1719-06-8	10	%		----	91.6	----	----	----
4-Terphenyl-d14	1718-51-0	10	%		----	87.4	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B13-4	B13-6	B13-7	B13-1	B10-8
			Client sampling date / time	03-Sep-2019 11:30	03-Sep-2019 11:45	03-Sep-2019 11:55	03-Sep-2019 12:10	03-Sep-2019 13:00
Compound	CAS Number	LOR	Unit	EB1923225-026	EB1923225-027	EB1923225-028	EB1923225-029	EB1923225-030
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	----	----	8.9	----
pH OX (23B)	----	0.1	pH Unit	----	----	----	8.2	----
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)	----	0.020	% pyrite S	----	----	----	<0.020	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	----	----	<0.020	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	----	----	<0.020	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	----	----	0.113	----
Peroxide Sulfur (23De)	----	0.020	% S	----	----	----	0.225	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	----	----	0.112	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	----	----	70	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	----	----	0.296	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	----	----	1.14	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	----	----	0.846	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	----	----	422	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	----	----	0.677	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	----	----	0.162	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	----	----	0.334	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	----	----	0.171	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	----	----	141	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	----	----	0.226	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	----	----	3.12	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	623	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	----	----	0.998	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-4	B13-6	B13-7	B13-1	B10-8
				Client sampling date / time	03-Sep-2019 11:30	03-Sep-2019 11:45	03-Sep-2019 11:55	03-Sep-2019 12:10	03-Sep-2019 13:00
Compound	CAS Number	LOR	Unit		EB1923225-026	EB1923225-027	EB1923225-028	EB1923225-029	EB1923225-030
					Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued									
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		----	----	----	<10	----
Liming Rate	----	1	kg CaCO3/t		----	----	----	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		----	----	----	**0.11**	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		----	----	----	**70**	----
Liming Rate excluding ANC	----	1	kg CaCO3/t		----	----	----	**5**	----
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)	----	0.005	% S		----	----	----	**0.104**	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		----	----	----	**65**	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	----	----	**3.88**	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	----	----	**776**	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	----	----	**1.24**	----
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	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		----	----	----	**0.10**	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		----	----	----	**65**	----
Liming Rate excluding ANC	----	1	kg CaCO3/t		----	----	----	**5**	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**32.3**	**36.8**	**32.1**	----	**58.4**
Moisture Content	----	1.0	%		----	----	----	**41.5**	----
EG005(ED093)T: Total Metals by ICP-AES									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-4	B13-6	B13-7	B13-1	B10-8
				Client sampling date / time	03-Sep-2019 11:30	03-Sep-2019 11:45	03-Sep-2019 11:55	03-Sep-2019 12:10	03-Sep-2019 13:00
Compound	CAS Number	LOR	Unit		EB1923225-026	EB1923225-027	EB1923225-028	EB1923225-029	EB1923225-030
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Aluminium	7429-90-5	50	mg/kg		6530	6980	5510	13300	13100
Iron	7439-89-6	50	mg/kg		19100	19400	17000	33100	33500
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg		5.55	5.03	5.90	7.38	8.63
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		16.1	17.6	14.6	28.0	31.5
Copper	7440-50-8	1.0	mg/kg		7.9	10.6	6.1	20.1	24.1
Lead	7439-92-1	1.0	mg/kg		9.5	18.0	8.2	21.0	15.3
Nickel	7440-02-0	1.0	mg/kg		11.2	11.6	9.6	19.7	21.2
Silver	7440-22-4	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	0.1
Zinc	7440-66-6	1.0	mg/kg		44.5	72.8	35.6	124	86.5
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg		0.03	0.03	0.03	0.07	0.07
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		----	----	----	<0.1	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		----	----	----	690	----
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		----	----	----	690	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		----	----	----	415	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.44	0.43	0.32	0.31	0.70
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		----	----	----	<3	----
>C16 - C34 Fraction	----	3	mg/kg		----	----	----	15	----
>C34 - C40 Fraction	----	5	mg/kg		----	----	----	<5	----
>C10 - C40 Fraction (sum)	----	3	mg/kg		----	----	----	15	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg		----	----	----	<3	----
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		----	----	----	10	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-4	B13-6	B13-7	B13-1	B10-8
				Client sampling date / time	03-Sep-2019 11:30	03-Sep-2019 11:45	03-Sep-2019 11:55	03-Sep-2019 12:10	03-Sep-2019 13:00
Compound	CAS Number	LOR	Unit		EB1923225-026	EB1923225-027	EB1923225-028	EB1923225-029	EB1923225-030
					Result	Result	Result	Result	Result
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	5	mg/kg		----	----	----	8	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg		----	----	----	18	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		----	----	----	<3	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		----	----	----	<3.0	----
EP080-SD: BTEXN									
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	----
^ Total Xylenes	----	0.5	mg/kg		----	----	----	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		----	----	----	<0.2	----
Naphthalene	91-20-3	0.2	mg/kg		----	----	----	<0.2	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		<1	<1	<1	<1	<1
Tributyltin	56573-85-4	0.5	µgSn/kg		<0.5	<0.5	<0.5	<0.5	1.0
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<10	<10	<10	<10	<12
Carbophenothion	786-19-6	10	µg/kg		<10	<10	<10	<10	<12
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<10.0	<10.0	<10.0	<10.0	<12.0
Chlorfenvinphos (Z)	18708-87-7	10	µg/kg		<10	<10	<10	<10	<12
Chlorpyrifos	2921-88-2	10	µg/kg		<10	<10	<10	<10	<12
Chlorpyrifos-methyl	5598-13-0	10	µg/kg		<10	<10	<10	<10	<12
Demeton-S-methyl	919-86-8	10	µg/kg		<10	<10	<10	<10	<12
Diazinon	333-41-5	10	µg/kg		<10	<10	<10	<10	<12
Dichlorvos	62-73-7	10	µg/kg		<10	<10	<10	<10	<12
Dimethoate	60-51-5	10	µg/kg		<10	<10	<10	<10	<12
Ethion	563-12-2	10	µg/kg		<10	<10	<10	<10	<12
Fenamiphos	22224-92-6	10	µg/kg		<10	<10	<10	<10	<12
Fenthion	55-38-9	10	µg/kg		<10	<10	<10	<10	<12
Malathion	121-75-5	10	µg/kg		<10	<10	<10	<10	<12

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-4	B13-6	B13-7	B13-1	B10-8
				Client sampling date / time	03-Sep-2019 11:30	03-Sep-2019 11:45	03-Sep-2019 11:55	03-Sep-2019 12:10	03-Sep-2019 13:00
Compound	CAS Number	LOR	Unit		EB1923225-026	EB1923225-027	EB1923225-028	EB1923225-029	EB1923225-030
					Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued									
Azinphos Methyl	86-50-0	10	µg/kg		<10	<10	<10	<10	<12
Monocrotophos	6923-22-4	10	µg/kg		<10	<10	<10	<10	<12
Parathion	56-38-2	10	µg/kg		<10	<10	<10	<10	<12
Parathion-methyl	298-00-0	10	µg/kg		<10	<10	<10	<10	<12
Pirimphos-ethyl	23505-41-1	10	µg/kg		<10	<10	<10	<10	<12
Prothiofos	34643-46-4	10	µg/kg		<10	<10	<10	<10	<12
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	**0.80**	**1.40**
4.4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.50	µg/kg		<0.50	<0.50	<0.50	**0.80**	**1.40**
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
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	0.50	µg/kg		<0.50	<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	<0.50
^ Total Chlordane (sum)	----	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-4	B13-6	B13-7	B13-1	B10-8
				Client sampling date / time	03-Sep-2019 11:30	03-Sep-2019 11:45	03-Sep-2019 11:55	03-Sep-2019 12:10	03-Sep-2019 13:00
Compound	CAS Number	LOR	Unit		EB1923225-026	EB1923225-027	EB1923225-028	EB1923225-029	EB1923225-030
					Result	Result	Result	Result	Result
EP131B: Polychlorinated Biphenyls (as Aroclors) - Continued									
^ Total Polychlorinated biphenyls	----	5.0	µg/kg		----	----	----	<12.5	----
Aroclor 1016	12674-11-2	5.0	µg/kg		----	----	----	<12.5	----
Aroclor 1221	11104-28-2	5.0	µg/kg		----	----	----	<12.5	----
Aroclor 1232	11141-16-5	5.0	µg/kg		----	----	----	<12.5	----
Aroclor 1242	53469-21-9	5.0	µg/kg		----	----	----	<12.5	----
Aroclor 1248	12672-29-6	5.0	µg/kg		----	----	----	<12.5	----
Aroclor 1254	11097-69-1	5.0	µg/kg		----	----	----	<12.5	----
Aroclor 1260	11096-82-5	5.0	µg/kg		----	----	----	<12.5	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		----	----	----	10	----
2-Methylnaphthalene	91-57-6	5	µg/kg		----	----	----	<5	----
Acenaphthylene	208-96-8	4	µg/kg		----	----	----	10	----
Acenaphthene	83-32-9	4	µg/kg		----	----	----	<4	----
Fluorene	86-73-7	4	µg/kg		----	----	----	<4	----
Phenanthrene	85-01-8	4	µg/kg		----	----	----	28	----
Anthracene	120-12-7	4	µg/kg		----	----	----	12	----
Fluoranthene	206-44-0	4	µg/kg		----	----	----	73	----
Pyrene	129-00-0	4	µg/kg		----	----	----	74	----
Benz(a)anthracene	56-55-3	4	µg/kg		----	----	----	40	----
Chrysene	218-01-9	4	µg/kg		----	----	----	37	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		----	----	----	59	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		----	----	----	21	----
Benzo(e)pyrene	192-97-2	4	µg/kg		----	----	----	31	----
Benzo(a)pyrene	50-32-8	4	µg/kg		----	----	----	49	----
Perylene	198-55-0	4	µg/kg		----	----	----	71	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		----	----	----	38	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		----	----	----	8	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		----	----	----	30	----
Coronene	191-07-1	5	µg/kg		----	----	----	8	----
^ Sum of PAHs	----	4	µg/kg		----	----	----	599	----
^ Benzo(a)pyrene TEQ (zero)	----	4	µg/kg		----	----	----	73	----
^ Benzo(a)pyrene TEQ (half LOR)	----	4	µg/kg		----	----	----	73	----
^ Benzo(a)pyrene TEQ (LOR)	----	4	µg/kg		----	----	----	73	----
EP080-SD: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B13-4	B13-6	B13-7	B13-1	B10-8
				Client sampling date / time	03-Sep-2019 11:30	03-Sep-2019 11:45	03-Sep-2019 11:55	03-Sep-2019 12:10	03-Sep-2019 13:00
Compound	CAS Number	LOR	Unit		EB1923225-026	EB1923225-027	EB1923225-028	EB1923225-029	EB1923225-030
					Result	Result	Result	Result	Result
EP080-SD: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	----	----	106	----
Toluene-D8	2037-26-5	0.2	%		----	----	----	80.3	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	----	----	101	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		124	95.3	97.8	117	86.1
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		61.6	77.3	63.8	59.5	72.9
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		65.6	81.5	78.2	60.5	86.9
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		----	----	----	89.5	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		----	----	----	98.0	----
Anthracene-d10	1719-06-8	10	%		----	----	----	119	----
4-Terphenyl-d14	1718-51-0	10	%		----	----	----	116	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B8-1	B7-1	B6-2	B6-4	B6-3
			Client sampling date / time	03-Sep-2019 13:25	04-Sep-2019 07:20	04-Sep-2019 07:45	04-Sep-2019 07:45	04-Sep-2019 08:05
Compound	CAS Number	LOR	Unit	EB1923225-031	EB1923225-032	EB1923225-033	EB1923225-034	EB1923225-035
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	8.5	----	----	8.4
pH OX (23B)	----	0.1	pH Unit	----	7.9	----	----	7.1
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	<2	----	----	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	<2	----	----	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	----	<0.020	----	----	<0.020
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	<0.020	----	----	<0.020
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	<0.020	----	----	<0.020
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	0.179	----	----	0.153
Peroxide Sulfur (23De)	----	0.020	% S	----	0.475	----	----	0.436
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	0.296	----	----	0.283
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	185	----	----	176
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	0.410	----	----	0.381
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	1.42	----	----	0.636
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	1.02	----	----	0.256
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	506	----	----	128
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	0.812	----	----	0.204
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	0.290	----	----	0.286
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	0.400	----	----	0.397
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	0.110	----	----	0.110
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	90	----	----	91
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	0.144	----	----	0.146
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	0.887	----	----	1.28
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	177	----	----	256
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	0.284	----	----	0.409

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B8-1	B7-1	B6-2	B6-4	B6-3
				Client sampling date / time	03-Sep-2019 13:25	04-Sep-2019 07:20	04-Sep-2019 07:45	04-Sep-2019 07:45	04-Sep-2019 08:05
Compound	CAS Number	LOR	Unit		EB1923225-031	EB1923225-032	EB1923225-033	EB1923225-034	EB1923225-035
					Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued									
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	**1.5**	----	----	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		----	<0.02	----	----	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		----	<10	----	----	<10
Liming Rate	----	1	kg CaCO3/t		----	<1	----	----	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		----	**0.30**	----	----	**0.28**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		----	**185**	----	----	**176**
Liming Rate excluding ANC	----	1	kg CaCO3/t		----	**14**	----	----	**13**
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		----	**8.5**	----	----	**8.4**
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)	----	0.005	% S		----	**0.271**	----	----	**0.261**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		----	**169**	----	----	**163**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	**4.21**	----	----	**2.75**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	**842**	----	----	**549**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	**1.35**	----	----	**0.88**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	**1.5**	----	----	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		----	<0.02	----	----	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		----	<10	----	----	<10
Liming Rate	----	1	kg CaCO3/t		----	<1	----	----	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		----	**0.27**	----	----	**0.26**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		----	**169**	----	----	**163**
Liming Rate excluding ANC	----	1	kg CaCO3/t		----	**13**	----	----	**12**
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**48.8**	----	**34.5**	**35.4**	----
Moisture Content	----	1.0	%		----	**60.4**	----	----	**55.4**
EG005(ED093)T: Total Metals by ICP-AES									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B8-1	B7-1	B6-2	B6-4	B6-3
				Client sampling date / time	03-Sep-2019 13:25	04-Sep-2019 07:20	04-Sep-2019 07:45	04-Sep-2019 07:45	04-Sep-2019 08:05
Compound	CAS Number	LOR	Unit		EB1923225-031	EB1923225-032	EB1923225-033	EB1923225-034	EB1923225-035
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Aluminium	7429-90-5	50	mg/kg		9110	13100	7560	7510	11300
Iron	7439-89-6	50	mg/kg		24500	31600	21600	22000	29400
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg		5.77	6.89	4.48	4.50	7.04
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	0.2	<0.1	<0.1
Chromium	7440-47-3	1.0	mg/kg		22.7	29.4	19.6	20.1	27.6
Copper	7440-50-8	1.0	mg/kg		19.8	33.4	12.2	13.4	25.6
Lead	7439-92-1	1.0	mg/kg		15.6	26.6	7.9	9.0	15.4
Nickel	7440-02-0	1.0	mg/kg		14.6	20.1	14.8	14.8	19.3
Silver	7440-22-4	0.1	mg/kg		<0.1	0.2	<0.1	<0.1	0.1
Zinc	7440-66-6	1.0	mg/kg		79.3	120	54.0	53.5	87.5
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg		0.06	0.10	0.04	0.04	0.08
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		----	<0.1	----	----	<0.1
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		----	1440	----	----	1130
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		----	1440	----	----	1130
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		----	731	----	----	547
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.29	0.95	0.23	0.47	0.92
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		----	4	----	----	9
>C16 - C34 Fraction	----	3	mg/kg		----	37	----	----	72
>C34 - C40 Fraction	----	5	mg/kg		----	13	----	----	25
>C10 - C40 Fraction (sum)	----	3	mg/kg		----	54	----	----	106
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg		----	4	----	----	9
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg		----	<3	----	----	<3
C10 - C14 Fraction	----	3	mg/kg		----	4	----	----	6
C15 - C28 Fraction	----	3	mg/kg		----	24	----	----	46

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B8-1	B7-1	B6-2	B6-4	B6-3
				Client sampling date / time	03-Sep-2019 13:25	04-Sep-2019 07:20	04-Sep-2019 07:45	04-Sep-2019 07:45	04-Sep-2019 08:05
Compound	CAS Number	LOR	Unit		EB1923225-031	EB1923225-032	EB1923225-033	EB1923225-034	EB1923225-035
					Result	Result	Result	Result	Result
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	5	mg/kg		----	**20**	----	----	**43**
^ C10 - C36 Fraction (sum)	----	3	mg/kg		----	**48**	----	----	**95**
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		----	<3	----	----	<3
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		----	<3.0	----	----	<3.0
EP080-SD: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	----	----	<0.2
Toluene	108-88-3	0.2	mg/kg		----	<0.2	----	----	<0.2
Ethylbenzene	100-41-4	0.2	mg/kg		----	<0.2	----	----	<0.2
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		----	<0.2	----	----	<0.2
ortho-Xylene	95-47-6	0.2	mg/kg		----	<0.2	----	----	<0.2
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	----	----	<0.5
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	----	----	<0.2
Naphthalene	91-20-3	0.2	mg/kg		----	<0.2	----	----	<0.2
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		<1	<1	<1	<1	**2**
Tributyltin	56573-85-4	0.5	µgSn/kg		**0.6**	**0.6**	**9.9**	**0.8**	**3.0**
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<10	<12	<10	<10	<12
Carbophenothion	786-19-6	10	µg/kg		<10	<12	<10	<10	<12
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<10.0	<12.0	<10.0	<10.0	<12.0
Chlorfenvinphos (Z)	18708-87-7	10	µg/kg		<10	<12	<10	<10	<12
Chlorpyrifos	2921-88-2	10	µg/kg		<10	<12	<10	<10	<12
Chlorpyrifos-methyl	5598-13-0	10	µg/kg		<10	<12	<10	<10	<12
Demeton-S-methyl	919-86-8	10	µg/kg		<10	<12	<10	<10	<12
Diazinon	333-41-5	10	µg/kg		<10	<12	<10	<10	<12
Dichlorvos	62-73-7	10	µg/kg		<10	<12	<10	<10	<12
Dimethoate	60-51-5	10	µg/kg		<10	<12	<10	<10	<12
Ethion	563-12-2	10	µg/kg		<10	<12	<10	<10	<12
Fenamiphos	22224-92-6	10	µg/kg		<10	<12	<10	<10	<12
Fenthion	55-38-9	10	µg/kg		<10	<12	<10	<10	<12
Malathion	121-75-5	10	µg/kg		<10	<12	<10	<10	<12

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B8-1	B7-1	B6-2	B6-4	B6-3
				Client sampling date / time	03-Sep-2019 13:25	04-Sep-2019 07:20	04-Sep-2019 07:45	04-Sep-2019 07:45	04-Sep-2019 08:05
Compound	CAS Number	LOR	Unit		EB1923225-031	EB1923225-032	EB1923225-033	EB1923225-034	EB1923225-035
					Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued									
Azinphos Methyl	86-50-0	10	µg/kg		<10	<12	<10	<10	<12
Monocrotophos	6923-22-4	10	µg/kg		<10	<12	<10	<10	<12
Parathion	56-38-2	10	µg/kg		<10	<12	<10	<10	<12
Parathion-methyl	298-00-0	10	µg/kg		<10	<12	<10	<10	<12
Pirimphos-ethyl	23505-41-1	10	µg/kg		<10	<12	<10	<10	<12
Prothiofos	34643-46-4	10	µg/kg		<10	<12	<10	<10	<12
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	**4.80**	<0.50	**2.56**	<0.50
4.4`-DDE	72-55-9	0.50	µg/kg		**1.32**	**3.20**	**1.28**	**2.48**	**2.56**
4.4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.50	µg/kg		**1.32**	**8.00**	**1.28**	**5.04**	**2.56**
Dieldrin	60-57-1	0.50	µg/kg		<0.50	**1.12**	<0.50	**0.60**	<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
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	0.50	µg/kg		<0.50	<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	<0.50
^ Total Chlordane (sum)	----	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg		<0.50	**1.12**	<0.50	**0.60**	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B8-1	B7-1	B6-2	B6-4	B6-3
				Client sampling date / time	03-Sep-2019 13:25	04-Sep-2019 07:20	04-Sep-2019 07:45	04-Sep-2019 07:45	04-Sep-2019 08:05
Compound	CAS Number	LOR	Unit		EB1923225-031	EB1923225-032	EB1923225-033	EB1923225-034	EB1923225-035
					Result	Result	Result	Result	Result
EP131B: Polychlorinated Biphenyls (as Aroclors) - Continued									
^ Total Polychlorinated biphenyls	----	5.0	µg/kg		----	<25.0	----	----	<25.0
Aroclor 1016	12674-11-2	5.0	µg/kg		----	<25.0	----	----	<25.0
Aroclor 1221	11104-28-2	5.0	µg/kg		----	<25.0	----	----	<25.0
Aroclor 1232	11141-16-5	5.0	µg/kg		----	<25.0	----	----	<25.0
Aroclor 1242	53469-21-9	5.0	µg/kg		----	<25.0	----	----	<25.0
Aroclor 1248	12672-29-6	5.0	µg/kg		----	<25.0	----	----	<25.0
Aroclor 1254	11097-69-1	5.0	µg/kg		----	<25.0	----	----	<25.0
Aroclor 1260	11096-82-5	5.0	µg/kg		----	<25.0	----	----	<25.0
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		----	13	----	----	<5
2-Methylnaphthalene	91-57-6	5	µg/kg		----	6	----	----	<5
Acenaphthylene	208-96-8	4	µg/kg		----	24	----	----	6
Acenaphthene	83-32-9	4	µg/kg		----	<5	----	----	<5
Fluorene	86-73-7	4	µg/kg		----	6	----	----	5
Phenanthrene	85-01-8	4	µg/kg		----	27	----	----	27
Anthracene	120-12-7	4	µg/kg		----	19	----	----	9
Fluoranthene	206-44-0	4	µg/kg		----	78	----	----	61
Pyrene	129-00-0	4	µg/kg		----	92	----	----	56
Benz(a)anthracene	56-55-3	4	µg/kg		----	55	----	----	44
Chrysene	218-01-9	4	µg/kg		----	44	----	----	40
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		----	90	----	----	50
Benzo(k)fluoranthene	207-08-9	4	µg/kg		----	36	----	----	19
Benzo(e)pyrene	192-97-2	4	µg/kg		----	48	----	----	28
Benzo(a)pyrene	50-32-8	4	µg/kg		----	75	----	----	45
Perylene	198-55-0	4	µg/kg		----	191	----	----	89
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		----	62	----	----	33
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		----	12	----	----	9
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		----	47	----	----	26
Coronene	191-07-1	5	µg/kg		----	13	----	----	8
^ Sum of PAHs	----	4	µg/kg		----	938	----	----	555
^ Benzo(a)pyrene TEQ (zero)	----	4	µg/kg		----	111	----	----	69
^ Benzo(a)pyrene TEQ (half LOR)	----	4	µg/kg		----	111	----	----	69
^ Benzo(a)pyrene TEQ (LOR)	----	4	µg/kg		----	111	----	----	69
EP080-SD: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B8-1	B7-1	B6-2	B6-4	B6-3
				Client sampling date / time	03-Sep-2019 13:25	04-Sep-2019 07:20	04-Sep-2019 07:45	04-Sep-2019 07:45	04-Sep-2019 08:05
Compound	CAS Number	LOR	Unit		EB1923225-031	EB1923225-032	EB1923225-033	EB1923225-034	EB1923225-035
					Result	Result	Result	Result	Result
EP080-SD: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	61.9	----	----	61.0
Toluene-D8	2037-26-5	0.2	%		----	56.3	----	----	53.4
4-Bromofluorobenzene	460-00-4	0.2	%		----	67.0	----	----	64.4
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		97.2	97.5	93.4	97.0	96.6
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		51.2	77.6	79.0	74.6	66.8
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		115	80.4	114	78.7	73.9
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		----	116	----	----	139
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		----	78.7	----	----	69.2
Anthracene-d10	1719-06-8	10	%		----	103	----	----	88.6
4-Terphenyl-d14	1718-51-0	10	%		----	89.2	----	----	95.7

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B5-1	B5-2	B5-3	B5-0	B4-0
			Client sampling date / time	04-Sep-2019 08:35	04-Sep-2019 08:45	04-Sep-2019 09:00	04-Sep-2019 10:20	04-Sep-2019 10:30
Compound	CAS Number	LOR	Unit	EB1923225-036	EB1923225-037	EB1923225-038	EB1923225-039	EB1923225-040
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.2	8.2	8.2	8.2	----
pH OX (23B)	----	0.1	pH Unit	5.1	6.8	6.7	6.8	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	25	<2	<2	<2	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	25	<2	<2	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	0.040	<0.020	<0.020	<0.020	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	0.040	<0.020	<0.020	<0.020	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	0.174	0.181	0.181	0.176	----
Peroxide Sulfur (23De)	----	0.020	% S	0.674	0.718	0.626	0.474	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	0.499	0.538	0.445	0.298	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	311	335	278	186	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	0.420	0.468	0.483	0.454	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	0.546	0.841	0.597	0.616	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	0.125	0.373	0.114	0.163	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	63	186	57	81	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	0.100	0.298	0.091	0.130	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	0.280	0.304	0.286	0.341	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	0.340	0.453	0.354	0.438	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	0.060	0.148	0.067	0.096	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	49	122	55	79	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	0.079	0.196	0.089	0.127	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	1.13	0.452	1.44	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	226	90	288	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	0.362	0.144	0.461	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B5-1	B5-2	B5-3	B5-0	B4-0
			Client sampling date / time	04-Sep-2019 08:35	04-Sep-2019 08:45	04-Sep-2019 09:00	04-Sep-2019 10:20	04-Sep-2019 10:30
Compound	CAS Number	LOR	Unit	EB1923225-036	EB1923225-037	EB1923225-038	EB1923225-039	EB1923225-040
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
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	0.19	<0.02	0.05	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	120	<10	32	<10	----
Liming Rate	----	1	kg CaCO3/t	9	<1	2	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.50	0.54	0.44	0.30	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	311	335	278	186	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	23	25	21	14	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	8.2	8.2	8.2	8.2	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.474	0.493	0.469	0.307	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	296	307	292	191	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	2.71	3.41	3.32	2.55	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	542	682	662	509	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.87	1.09	1.06	0.82	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.47	0.49	0.47	0.31	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	296	307	292	191	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	22	23	22	14	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	----	61.7
Moisture Content	----	1.0	%	52.6	56.4	54.1	60.8	----
EG005(ED093)T: Total Metals by ICP-AES								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B5-1	B5-2	B5-3	B5-0	B4-0
				Client sampling date / time	04-Sep-2019 08:35	04-Sep-2019 08:45	04-Sep-2019 09:00	04-Sep-2019 10:20	04-Sep-2019 10:30
Compound	CAS Number	LOR	Unit		EB1923225-036	EB1923225-037	EB1923225-038	EB1923225-039	EB1923225-040
					Result	Result	Result	Result	Result
EG005(ED093)T: Total Metals by ICP-AES - Continued									
Aluminium	7429-90-5	50	mg/kg		14000	15600	14300	15100	15200
Iron	7439-89-6	50	mg/kg		34400	37400	35900	37400	37700
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg		7.93	9.11	8.91	7.96	8.47
Cadmium	7440-43-9	0.1	mg/kg		0.3	0.3	0.3	<0.1	<0.1
Chromium	7440-47-3	1.0	mg/kg		37.3	41.7	39.6	34.4	36.6
Copper	7440-50-8	1.0	mg/kg		33.3	35.1	35.8	36.5	45.3
Lead	7439-92-1	1.0	mg/kg		32.0	38.0	31.9	25.1	27.9
Nickel	7440-02-0	1.0	mg/kg		20.4	22.0	20.4	24.2	24.4
Silver	7440-22-4	0.1	mg/kg		0.6	0.6	0.6	0.2	0.2
Zinc	7440-66-6	1.0	mg/kg		116	129	116	123	150
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg		0.15	0.16	0.17	0.06	0.07
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		1230	1250	1200	1420	----
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		1230	1250	1200	1420	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		892	875	959	889	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.85	1.06	0.98	1.06	1.14
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
>C10 - C16 Fraction	----	3	mg/kg		<3	<3	<3	<3	----
>C16 - C34 Fraction	----	3	mg/kg		26	28	24	10	----
>C34 - C40 Fraction	----	5	mg/kg		10	10	8	<5	----
>C10 - C40 Fraction (sum)	----	3	mg/kg		36	38	32	10	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	3	mg/kg		<3	<3	<3	<3	----
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		15	17	15	7	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B5-1	B5-2	B5-3	B5-0	B4-0
				Client sampling date / time	04-Sep-2019 08:35	04-Sep-2019 08:45	04-Sep-2019 09:00	04-Sep-2019 10:20	04-Sep-2019 10:30
Compound	CAS Number	LOR	Unit		EB1923225-036	EB1923225-037	EB1923225-038	EB1923225-039	EB1923225-040
					Result	Result	Result	Result	Result
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	5	mg/kg		**16**	**16**	**14**	**6**	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg		**31**	**33**	**29**	**13**	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		<3	<3	<3	<3	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		<3.0	<3.0	<3.0	<3.0	----
EP080-SD: BTEXN									
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	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Naphthalene	91-20-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	<1	<1
Dibutyltin	1002-53-5	1	µgSn/kg		**6**	**5**	**8**	<2	**2**
Tributyltin	56573-85-4	0.5	µgSn/kg		**3.9**	**2.3**	**4.1**	**2.0**	**6.8**
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<12	<12	<12	<12	<12
Carbophenothion	786-19-6	10	µg/kg		<12	<12	<12	<12	<12
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<12.0	<12.0	<12.0	<12.0	<12.0
Chlorfenvinphos (Z)	18708-87-7	10	µg/kg		<12	<12	<12	<12	<12
Chlorpyrifos	2921-88-2	10	µg/kg		<12	<12	<12	<12	<12
Chlorpyrifos-methyl	5598-13-0	10	µg/kg		<12	<12	<12	<12	<12
Demeton-S-methyl	919-86-8	10	µg/kg		<12	<12	<12	<12	<12
Diazinon	333-41-5	10	µg/kg		<12	<12	<12	<12	<12
Dichlorvos	62-73-7	10	µg/kg		<12	<12	<12	<12	<12
Dimethoate	60-51-5	10	µg/kg		<12	<12	<12	<12	<12
Ethion	563-12-2	10	µg/kg		<12	<12	<12	<12	<12
Fenamiphos	22224-92-6	10	µg/kg		<12	<12	<12	<12	<12
Fenthion	55-38-9	10	µg/kg		<12	<12	<12	<12	<12
Malathion	121-75-5	10	µg/kg		<12	<12	<12	<12	<12

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B5-1	B5-2	B5-3	B5-0	B4-0
				Client sampling date / time	04-Sep-2019 08:35	04-Sep-2019 08:45	04-Sep-2019 09:00	04-Sep-2019 10:20	04-Sep-2019 10:30
Compound	CAS Number	LOR	Unit		EB1923225-036	EB1923225-037	EB1923225-038	EB1923225-039	EB1923225-040
					Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued									
Azinphos Methyl	86-50-0	10	µg/kg		<12	<12	<12	<12	<12
Monocrotophos	6923-22-4	10	µg/kg		<12	<12	<12	<12	<12
Parathion	56-38-2	10	µg/kg		<12	<12	<12	<12	<12
Parathion-methyl	298-00-0	10	µg/kg		<12	<12	<12	<12	<12
Pirimphos-ethyl	23505-41-1	10	µg/kg		<12	<12	<12	<12	<12
Prothiofos	34643-46-4	10	µg/kg		<12	<12	<12	<12	<12
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		**2.74**	<0.50	**1.84**	<0.50	<0.50
4.4`-DDE	72-55-9	0.50	µg/kg		**3.89**	**1.63**	**1.87**	**2.06**	<0.50
4.4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	**5.61**	<0.50	<0.50
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.50	µg/kg		**6.63**	**1.63**	**9.32**	**2.06**	<0.50
Dieldrin	60-57-1	0.50	µg/kg		**0.66**	<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
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	0.50	µg/kg		<0.50	<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	<0.50
^ Total Chlordane (sum)	----	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg		**0.66**	<0.50	<0.50	<0.50	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B5-1	B5-2	B5-3	B5-0	B4-0
				Client sampling date / time	04-Sep-2019 08:35	04-Sep-2019 08:45	04-Sep-2019 09:00	04-Sep-2019 10:20	04-Sep-2019 10:30
Compound	CAS Number	LOR	Unit		EB1923225-036	EB1923225-037	EB1923225-038	EB1923225-039	EB1923225-040
					Result	Result	Result	Result	Result
EP131B: Polychlorinated Biphenyls (as Aroclors) - Continued									
^ Total Polychlorinated biphenyls	----	5.0	µg/kg		<25.0	<25.0	<25.0	<25.0	----
Aroclor 1016	12674-11-2	5.0	µg/kg		<25.0	<25.0	<25.0	<25.0	----
Aroclor 1221	11104-28-2	5.0	µg/kg		<25.0	<25.0	<25.0	<25.0	----
Aroclor 1232	11141-16-5	5.0	µg/kg		<25.0	<25.0	<25.0	<25.0	----
Aroclor 1242	53469-21-9	5.0	µg/kg		<25.0	<25.0	<25.0	<25.0	----
Aroclor 1248	12672-29-6	5.0	µg/kg		<25.0	<25.0	<25.0	<25.0	----
Aroclor 1254	11097-69-1	5.0	µg/kg		<25.0	<25.0	<25.0	<25.0	----
Aroclor 1260	11096-82-5	5.0	µg/kg		<25.0	<25.0	<25.0	<25.0	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		9	11	24	14	----
2-Methylnaphthalene	91-57-6	5	µg/kg		5	6	9	5	----
Acenaphthylene	208-96-8	4	µg/kg		12	13	16	16	----
Acenaphthene	83-32-9	4	µg/kg		<5	<5	<5	<5	----
Fluorene	86-73-7	4	µg/kg		6	7	9	6	----
Phenanthrene	85-01-8	4	µg/kg		21	27	36	29	----
Anthracene	120-12-7	4	µg/kg		14	15	23	16	----
Fluoranthene	206-44-0	4	µg/kg		54	61	67	70	----
Pyrene	129-00-0	4	µg/kg		76	82	100	78	----
Benz(a)anthracene	56-55-3	4	µg/kg		34	43	46	44	----
Chrysene	218-01-9	4	µg/kg		33	34	44	39	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		59	67	75	73	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		23	30	36	31	----
Benzo(e)pyrene	192-97-2	4	µg/kg		33	37	46	38	----
Benzo(a)pyrene	50-32-8	4	µg/kg		46	52	62	58	----
Perylene	198-55-0	4	µg/kg		313	318	400	163	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		38	43	53	49	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		8	9	11	10	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		29	33	40	38	----
Coronene	191-07-1	5	µg/kg		7	7	9	9	----
^ Sum of PAHs	----	4	µg/kg		820	895	1110	786	----
^ Benzo(a)pyrene TEQ (zero)	----	4	µg/kg		69	79	94	87	----
^ Benzo(a)pyrene TEQ (half LOR)	----	4	µg/kg		69	79	94	87	----
^ Benzo(a)pyrene TEQ (LOR)	----	4	µg/kg		69	79	94	87	----
EP080-SD: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B5-1	B5-2	B5-3	B5-0	B4-0
				Client sampling date / time	04-Sep-2019 08:35	04-Sep-2019 08:45	04-Sep-2019 09:00	04-Sep-2019 10:20	04-Sep-2019 10:30
Compound	CAS Number	LOR	Unit		EB1923225-036	EB1923225-037	EB1923225-038	EB1923225-039	EB1923225-040
					Result	Result	Result	Result	Result
EP080-SD: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		62.3	64.9	68.6	70.4	----
Toluene-D8	2037-26-5	0.2	%		51.6	55.8	71.1	62.0	----
4-Bromofluorobenzene	460-00-4	0.2	%		64.0	65.9	79.1	70.0	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		122	110	125	107	87.2
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		50.9	59.3	51.7	62.7	60.0
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		61.2	81.8	52.3	49.0	88.8
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		100	100	76.5	82.0	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		78.3	87.6	89.0	88.2	----
Anthracene-d10	1719-06-8	10	%		90.6	96.6	100	100	----
4-Terphenyl-d14	1718-51-0	10	%		89.4	91.4	97.5	89.0	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B4-4	BC-2	B2-0	TRIP BLANK	TRIP BLANK
				Client sampling date / time	04-Sep-2019 10:45	04-Sep-2019 11:15	04-Sep-2019 11:55	02-Sep-2019 00:00	03-Sep-2019 00:00
Compound	CAS Number	LOR	Unit		EB1923225-041	EB1923225-042	EB1923225-043	EB1923225-044	EB1923225-045
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		64.1	47.0	16.6	----	----
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		16200	7870	2430	----	----
Iron	7439-89-6	50	mg/kg		37800	18400	9010	----	----
EG020-SD: Total Metals in Sediments by ICPMS									
Arsenic	7440-38-2	1.00	mg/kg		9.04	5.70	1.45	----	----
Cadmium	7440-43-9	0.1	mg/kg		<0.1	0.1	<0.1	----	----
Chromium	7440-47-3	1.0	mg/kg		34.2	16.1	7.7	----	----
Copper	7440-50-8	1.0	mg/kg		44.7	28.1	2.9	----	----
Lead	7439-92-1	1.0	mg/kg		26.5	40.1	2.7	----	----
Nickel	7440-02-0	1.0	mg/kg		22.8	10.9	7.6	----	----
Silver	7440-22-4	0.1	mg/kg		0.2	0.2	<0.1	----	----
Zinc	7440-66-6	1.0	mg/kg		135	134	16.5	----	----
EG035T: Total Recoverable Mercury by FIMS (Low Level)									
Mercury	7439-97-6	0.01	mg/kg		0.63	0.07	<0.01	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		1.33	2.09	0.07	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	----	----	<10	<10
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	----	----	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	----	----	<10	<10
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	----	----	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		----	----	----	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		----	----	----	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	----	----	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		----	----	----	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		----	----	----	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		----	----	----	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		----	----	----	<1	<1
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		<1	<1	<1	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B4-4	BC-2	B2-0	TRIP BLANK	TRIP BLANK
				Client sampling date / time	04-Sep-2019 10:45	04-Sep-2019 11:15	04-Sep-2019 11:55	02-Sep-2019 00:00	03-Sep-2019 00:00
Compound	CAS Number	LOR	Unit		EB1923225-041	EB1923225-042	EB1923225-043	EB1923225-044	EB1923225-045
					Result	Result	Result	Result	Result
EP090: Organotin Compounds - Continued									
Dibutyltin	1002-53-5	1	µgSn/kg		<1	<1	<1	----	----
Tributyltin	56573-85-4	0.5	µgSn/kg		**1.3**	**0.7**	<0.5	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<12	<10	<10	----	----
Carbophenothion	786-19-6	10	µg/kg		<12	<10	<10	----	----
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<12.0	<10.0	<10.0	----	----
Chlorfenvinphos (Z)	18708-87-7	10	µg/kg		<12	<10	<10	----	----
Chlorpyrifos	2921-88-2	10	µg/kg		<12	<10	<10	----	----
Chlorpyrifos-methyl	5598-13-0	10	µg/kg		<12	<10	<10	----	----
Demeton-S-methyl	919-86-8	10	µg/kg		<12	<10	<10	----	----
Diazinon	333-41-5	10	µg/kg		<12	<10	<10	----	----
Dichlorvos	62-73-7	10	µg/kg		<12	<10	<10	----	----
Dimethoate	60-51-5	10	µg/kg		<12	<10	<10	----	----
Ethion	563-12-2	10	µg/kg		<12	<10	<10	----	----
Fenamiphos	22224-92-6	10	µg/kg		<12	<10	<10	----	----
Fenthion	55-38-9	10	µg/kg		<12	<10	<10	----	----
Malathion	121-75-5	10	µg/kg		<12	<10	<10	----	----
Azinphos Methyl	86-50-0	10	µg/kg		<12	<10	<10	----	----
Monocrotophos	6923-22-4	10	µg/kg		<12	<10	<10	----	----
Parathion	56-38-2	10	µg/kg		<12	<10	<10	----	----
Parathion-methyl	298-00-0	10	µg/kg		<12	<10	<10	----	----
Pirimphos-ethyl	23505-41-1	10	µg/kg		<12	<10	<10	----	----
Prothiofos	34643-46-4	10	µg/kg		<12	<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		**2.38**	<0.50	<0.50	----	----
4.4`-DDT	50-29-3	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.50	µg/kg		**2.38**	<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	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B4-4	BC-2	B2-0	TRIP BLANK	TRIP BLANK
				Client sampling date / time	04-Sep-2019 10:45	04-Sep-2019 11:15	04-Sep-2019 11:55	02-Sep-2019 00:00	03-Sep-2019 00:00
Compound	CAS Number	LOR	Unit		EB1923225-041	EB1923225-042	EB1923225-043	EB1923225-044	EB1923225-045
					Result	Result	Result	Result	Result
EP131A: Organochlorine Pesticides - Continued									
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	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
trans-Chlordane	5103-74-2	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
^ Total Chlordane (sum)	----	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.50	µg/kg		<0.50	<0.50	<0.50	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	----	----	87.4	65.8
Toluene-D8	2037-26-5	0.2	%		----	----	----	76.3	75.0
4-Bromofluorobenzene	460-00-4	0.2	%		----	----	----	86.5	85.9
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		88.9	76.9	110	----	----
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		60.6	58.3	54.8	----	----
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		625	60.1	57.8	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TRIP BLANK	----	----	----	----
			Client sampling date / time	04-Sep-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1923225-046	--------	--------	--------	--------
				Result	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**85.5**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	**77.3**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**87.9**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	53	134
Toluene-D8	2037-26-5	60	131
4-Bromofluorobenzene	460-00-4	59	127
EP080-SD: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	145
Toluene-D8	2037-26-5	42	144
4-Bromofluorobenzene	460-00-4	58	142
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130
EP130S: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	14	102
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	119
EP131T: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	10	106
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	55	135
Anthracene-d10	1719-06-8	70	136
4-Terphenyl-d14	1718-51-0	57	127

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1923231**	Page	: 1 of 15
Client	: **BMT EASTERN AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR DARREN RICHARDSON	Contact	: Customer Services EB
Address	: PO BOX 203 SPRING HILL BRISBANE QLD 4004	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3831 6744	Telephone	: +61-7-3243 7222
Project	: B23621 Port of Brisbane	Date Samples Received	: 04-Sep-2019 15:05
Order number	:	Date Analysis Commenced	: 09-Sep-2019
C-O-C number	: ----	Issue Date	: 27-Sep-2019 16:34
Sampler	: GRACE BOURKE, Wills Brassil		
Site	: ----		
Quote number	: BN/016/19		
No. of samples received	: 33		
No. of samples analysed	: 29		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG035T-LL (Total Mercury by FIMS - Low Level): Limit of reporting for sample EB1923231-033 (B6-2) was raised due to insufficient sample volume.
- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders (EB1923225, EB1923230, EB1923231) due to the size of the sample numbers and analysis requested. Standard as-received analysis will be reported under EB1923225, Radionuclide analysis under EB1923230, and Elutriate/Porewater analysis under EB1923231. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- EP090S (TBT): Insufficient porewater was recoverable for standard analysis. Where applicable LOR values have been adjusted accordingly.
- EP090S: High surrogate recovery deemed acceptable as all associated analyte results are less than LOR
- EG093-T (Total Metals in Saline Water by ORC-ICP-MS): Limit of reporting raised for sample EB1923231-020 (B11-8A) due to matrix interference.
- EG035T-LL (Total Mercury Low Level): Sample EB1923231-031 and -036 have insufficient sample remaining to perform positive result check.
- EN68: This analysis in accordance with National Ocean Disposal Guidelines, Commonwealth of Australia, 2002 - (modified). Results reported are those determined on a 1:4 sediment/seawater elutriate without blank correction.
- EG093: Samples containing high levels of sulfate may precipitate barium under the acidic conditions of this method and may therefore bias results low.

Analytical Results

Sub-Matrix: ELUTRIATE (Matrix: WATER)				Client sample ID	B12-1	B11-8A	B11-8B	B11-9	B10-6
				Client sampling date / time	02-Sep-2019 10:45	02-Sep-2019 11:25	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:40
Compound	CAS Number	LOR	Unit		EB1923231-001	EB1923231-002	EB1923231-003	EB1923231-004	EB1923231-005
					Result	Result	Result	Result	Result
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.00004	mg/L		<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG093T: Total Metals in Saline Water by ORC-ICPMS									
Nickel	7440-02-0	0.5	µg/L		**1.0**	**0.6**	**0.9**	**2.2**	**0.9**
EP090: Organotin Compounds (Soluble)									
Tributyltin	56573-85-4	2	ngSn/L		<2	<2	<2	<2	<2
EP090S: Organotin Surrogate									
Tripropyltin	----	5	%		**88.1**	**79.4**	**143**	**77.9**	**61.3**

Analytical Results

Sub-Matrix: ELUTRIATE (Matrix: WATER)				Client sample ID	B10-5A	B10-5B	B8-3	B10-8	B7-1
				Client sampling date / time	02-Sep-2019 13:10	02-Sep-2019 13:10	02-Sep-2019 14:05	03-Sep-2019 13:00	04-Sep-2019 07:20
Compound	CAS Number	LOR	Unit		EB1923231-006	EB1923231-007	EB1923231-008	EB1923231-013	EB1923231-014
					Result	Result	Result	Result	Result
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.00004	mg/L		<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG093T: Total Metals in Saline Water by ORC-ICPMS									
Nickel	7440-02-0	0.5	µg/L		**1.8**	**1.2**	**2.4**	**1.1**	<0.5
EP090: Organotin Compounds (Soluble)									
Tributyltin	56573-85-4	2	ngSn/L		<2	<2	<2	<2	<2
EP090S: Organotin Surrogate									
Tripropyltin	----	5	%		**51.3**	**68.5**	**74.4**	**53.8**	**97.8**

Analytical Results

Sub-Matrix: ELUTRIATE (Matrix: WATER)				Client sample ID	B6-2	B5-0A	B5-0B	B4-0	Elutriate Blank
				Client sampling date / time	04-Sep-2019 07:45	04-Sep-2019 10:20	04-Sep-2019 10:20	04-Sep-2019 10:30	02-Sep-2019 00:00
Compound	CAS Number	LOR	Unit		EB1923231-015	EB1923231-016	EB1923231-017	EB1923231-018	EB1923231-037
					Result	Result	Result	Result	Result
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.00004	mg/L		<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG093T: Total Metals in Saline Water by ORC-ICPMS									
Nickel	7440-02-0	0.5	µg/L		**1.7**	**0.5**	<0.5	**1.0**	<0.5
EP090: Organotin Compounds (Soluble)									
Tributyltin	56573-85-4	2	ngSn/L		<2	**5**	<2	<2	<2
EP090S: Organotin Surrogate									
Tripropyltin	----	5	%		**73.9**	**78.1**	**77.5**	**80.6**	**102**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	B12-1 Pore Water	B11-8A Pore Water	B11-8B Pore Water	B11-9 Pore Water	B10-6 Pore Water
				Client sampling date / time	02-Sep-2019 01:04	02-Sep-2019 11:25	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:40
					EB1923231-019	EB1923231-020	EB1923231-021	EB1923231-022	EB1923231-023
					Result	Result	Result	Result	Result
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.00004	mg/L		<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG093T: Total Metals in Saline Water by ORC-ICPMS									
Nickel	7440-02-0	0.5	µg/L		**2.3**	<2.6	**2.6**	**1.7**	**12.8**
EP090: Organotin Compounds (Soluble)									
Tributyltin	56573-85-4	2	ngSn/L		<3	<3	<3	<7	<8
EP131A: Organochlorine Pesticides									
Aldrin	309-00-2	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
alpha-BHC	319-84-6	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
beta-BHC	319-85-7	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
delta-BHC	319-86-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDD	72-54-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDE	72-55-9	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDT	50-29-3	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Dieldrin	60-57-1	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
alpha-Endosulfan	959-98-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
beta-Endosulfan	33213-65-9	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Endosulfan sulfate	1031-07-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
^ **Endosulfan (sum)**	115-29-7	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Endrin	72-20-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Endrin aldehyde	7421-93-4	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Endrin ketone	53494-70-5	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Heptachlor	76-44-8	0.005	µg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	1024-57-3	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobenzene (HCB)	118-74-1	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
gamma-BHC	58-89-9	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Methoxychlor	72-43-5	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cis-Chlordane	5103-71-9	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
trans-Chlordane	5103-74-2	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
^ **Total Chlordane (sum)**	----	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Oxychlordane	27304-13-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
EP090S: Organotin Surrogate									

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	B12-1 Pore Water	B11-8A Pore Water	B11-8B Pore Water	B11-9 Pore Water	B10-6 Pore Water
				Client sampling date / time	02-Sep-2019 01:04	02-Sep-2019 11:25	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:40
					EB1923231-019	EB1923231-020	EB1923231-021	EB1923231-022	EB1923231-023
					Result	Result	Result	Result	Result
EP090S: Organotin Surrogate - Continued									
Tripropyltin	----	5	%		**53.4**	**65.4**	**68.7**	**43.3**	**72.4**
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.010	%		**89.4**	**93.0**	**83.6**	**82.0**	**90.9**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	B10-5A Pore Water	B10-5B Pore Water	B8-3 Pore Water	B10-8 Pore Water	B7-1 Pore Water
				Client sampling date / time	02-Sep-2019 13:10	02-Sep-2019 13:10	02-Sep-2019 14:05	03-Sep-2019 13:00	04-Sep-2019 07:20
					EB1923231-024	EB1923231-025	EB1923231-026	EB1923231-031	EB1923231-032
					Result	Result	Result	Result	Result
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.00004	mg/L		<0.00004	<0.00004	<0.00004	**0.00005**	<0.00004
EG093T: Total Metals in Saline Water by ORC-ICPMS									
Nickel	7440-02-0	0.5	µg/L		**7.0**	**5.6**	**17.3**	**20.6**	**8.4**
EP090: Organotin Compounds (Soluble)									
Tributyltin	56573-85-4	2	ngSn/L		<5	<9	<4	<8	<5
EP131A: Organochlorine Pesticides									
Aldrin	309-00-2	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
alpha-BHC	319-84-6	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
beta-BHC	319-85-7	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
delta-BHC	319-86-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDD	72-54-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDE	72-55-9	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDT	50-29-3	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Dieldrin	60-57-1	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
alpha-Endosulfan	959-98-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
beta-Endosulfan	33213-65-9	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Endosulfan sulfate	1031-07-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
^ **Endosulfan (sum)**	115-29-7	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Endrin	72-20-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Endrin aldehyde	7421-93-4	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Endrin ketone	53494-70-5	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Heptachlor	76-44-8	0.005	µg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	1024-57-3	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobenzene (HCB)	118-74-1	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
gamma-BHC	58-89-9	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Methoxychlor	72-43-5	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cis-Chlordane	5103-71-9	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
trans-Chlordane	5103-74-2	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
^ **Total Chlordane (sum)**	----	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
Oxychlordane	27304-13-8	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.010	µg/L		<0.010	<0.010	<0.010	<0.010	<0.010
EP090S: Organotin Surrogate									

Analytical Results

Sub-Matrix: PORE WATER (Matrix: WATER)				Client sample ID	B10-5A Pore Water	B10-5B Pore Water	B8-3 Pore Water	B10-8 Pore Water	B7-1 Pore Water
				Client sampling date / time	02-Sep-2019 13:10	02-Sep-2019 13:10	02-Sep-2019 14:05	03-Sep-2019 13:00	04-Sep-2019 07:20
Compound	CAS Number	LOR	Unit		EB1923231-024	EB1923231-025	EB1923231-026	EB1923231-031	EB1923231-032
					Result	Result	Result	Result	Result
EP090S: Organotin Surrogate - Continued									
Tripropyltin	----	5	%		46.0	67.7	61.7	49.6	71.7
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.010	%		88.6	92.0	112	95.9	85.8

Analytical Results

Sub-Matrix: PORE WATER (Matrix: WATER)			Client sample ID	B6-2 Pore Water	B5-0A Pore Water	B5-0B Pore Water	B4-0 Pore Water	----
			Client sampling date / time	04-Sep-2019 07:45	04-Sep-2019 10:20	04-Sep-2019 10:20	04-Sep-2019 10:30	----
Compound	CAS Number	LOR	Unit	EB1923231-033	EB1923231-034	EB1923231-035	EB1923231-036	--------
				Result	Result	Result	Result	----
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00020	<0.00004	<0.00004	**0.00004**	----
EG093T: Total Metals in Saline Water by ORC-ICPMS								
Nickel	7440-02-0	0.5	µg/L	**2.5**	**7.8**	**3.4**	**18.4**	----
EP090: Organotin Compounds (Soluble)								
Tributyltin	56573-85-4	2	ngSn/L	<5	<7	<6	<10	----
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
alpha-BHC	319-84-6	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
beta-BHC	319-85-7	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
delta-BHC	319-86-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
4.4`-DDD	72-54-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
4.4`-DDE	72-55-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
4.4`-DDT	50-29-3	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Dieldrin	60-57-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
alpha-Endosulfan	959-98-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
beta-Endosulfan	33213-65-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Endosulfan sulfate	1031-07-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
^ Endosulfan (sum)	115-29-7	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Endrin	72-20-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Endrin aldehyde	7421-93-4	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Endrin ketone	53494-70-5	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Heptachlor	76-44-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Heptachlor epoxide	1024-57-3	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Hexachlorobenzene (HCB)	118-74-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
gamma-BHC	58-89-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Methoxychlor	72-43-5	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
cis-Chlordane	5103-71-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
trans-Chlordane	5103-74-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
^ Total Chlordane (sum)	----	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
Oxychlordane	27304-13-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	----
EP090S: Organotin Surrogate								

Analytical Results

Sub-Matrix: PORE WATER (Matrix: WATER)				Client sample ID	B6-2 Pore Water	B5-0A Pore Water	B5-0B Pore Water	B4-0 Pore Water	----
				Client sampling date / time	04-Sep-2019 07:45	04-Sep-2019 10:20	04-Sep-2019 10:20	04-Sep-2019 10:30	----
Compound	CAS Number	LOR	Unit		EB1923231-033	EB1923231-034	EB1923231-035	EB1923231-036	--------
					Result	Result	Result	Result	----
EP090S: Organotin Surrogate - Continued									
Tripropyltin	----	5	%		**58.8**	**67.8**	**72.1**	**58.2**	**----**
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.010	%		**92.0**	**86.6**	**84.6**	**109**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B12-1	B11-8A	B11-8B	B11-9	B10-6
			Client sampling date / time	02-Sep-2019 10:45	02-Sep-2019 11:25	02-Sep-2019 11:25	02-Sep-2019 11:50	02-Sep-2019 12:40
Compound	CAS Number	LOR	Unit	EB1923231-001	EB1923231-002	EB1923231-003	EB1923231-004	EB1923231-005
				Result	Result	Result	Result	Result
EN68: Seawater Elutriate Testing Procedure								
Seawater Sampling Date	----	-	-	**25/09/2019**	**25/09/2019**	**25/09/2019**	**25/09/2019**	**25/09/2019**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B10-5A	B10-5B	B8-3	B10-8	B7-1
			Client sampling date / time	02-Sep-2019 13:10	02-Sep-2019 13:10	02-Sep-2019 14:05	03-Sep-2019 13:00	04-Sep-2019 07:20
Compound	CAS Number	LOR	Unit	EB1923231-006	EB1923231-007	EB1923231-008	EB1923231-013	EB1923231-014
				Result	Result	Result	Result	Result
EN68: Seawater Elutriate Testing Procedure								
Seawater Sampling Date	----	-	-	**25/09/2019**	**25/09/2019**	**25/09/2109**	**25/09/2019**	**25/09/2019**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B6-2	B5-0A	B5-0B	B4-0	Elutriate Blank
			Client sampling date / time	04-Sep-2019 07:45	04-Sep-2019 10:20	04-Sep-2019 10:20	04-Sep-2019 10:30	02-Sep-2019 00:00
Compound	CAS Number	LOR	Unit	EB1923231-015	EB1923231-016	EB1923231-017	EB1923231-018	EB1923231-037
				Result	Result	Result	Result	Result
EN68: Seawater Elutriate Testing Procedure								
Seawater Sampling Date	----	-	-	**25/09/2019**	**25/09/2019**	**25/09/2019**	**25/09/2019**	**25/09/2019**

Surrogate Control Limits

Sub-Matrix: **ELUTRIATE**		Recovery Limits (%)	
Compound	*CAS Number*	**Low**	**High**
EP090S: Organotin Surrogate			
Tripropyltin	----	24	116

Sub-Matrix: **PORE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	**Low**	**High**
EP090S: Organotin Surrogate			
Tripropyltin	----	24	116
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	14	166

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1925939**	Page	: 1 of 5
Client	: **BMT COMMERCIAL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR DARREN RICHARDSON	Contact	: Customer Services EB
Address	: PO BOX 203 SPRING HILL BRISBANE QLD 4004	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3831 6744	Telephone	: +61-7-3243 7222
Project	: B23621 Port of Brisbane	Date Samples Received	: 24-Sep-2019 18:37
Order number	: ----	Date Analysis Commenced	: 01-Oct-2019
C-O-C number	: ----	Issue Date	: 10-Oct-2019 16:07
Sampler	: GRACE BOURKE, WILLS BRASSIL		
Site	: ----		
Quote number	: BN/016/19		
No. of samples received	: 14		
No. of samples analysed	: 14		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG035-SDH (1M HCl Extractable Mercury by FIMS): Sample EB1925939-013 (B4-4) shows poor matrix spike recovery due to matrix interference. Confirmed by re-extraction and re-analysis.
- EG035-SDH (1M HCl Extractable Mercury) : EB1925939-013 shows poor matrix spike recovery due to sample heterogeneity. Confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B15-1	B11-8	B9-1	B8-3	RF2
				Client sampling date / time	02-Sep-2019 10:10	02-Sep-2019 11:25	02-Sep-2019 13:45	02-Sep-2019 14:05	03-Sep-2019 08:00
Compound	CAS Number	LOR	Unit		EB1925939-001	EB1925939-002	EB1925939-003	EB1925939-004	EB1925939-005
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**47.5**	**53.6**	**35.5**	**55.0**	**54.4**
EG005(ED093)-SDH: 1M HCl-Extractable Metals by ICPAES									
Nickel	7440-02-0	1.0	mg/kg		**8.6**	**7.5**	**7.3**	**8.2**	**8.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	RF6	RF3	RF7	B10-8	B5-2
				Client sampling date / time	03-Sep-2019 08:20	03-Sep-2019 08:35	03-Sep-2019 08:55	03-Sep-2019 13:00	04-Sep-2019 08:07
Compound	CAS Number	LOR	Unit		EB1925939-006	EB1925939-007	EB1925939-008	EB1925939-009	EB1925939-010
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**52.2**	**64.4**	**59.3**	**57.4**	**55.4**
EG005(ED093)-SDH: 1M HCl-Extractable Metals by ICPAES									
Nickel	7440-02-0	1.0	mg/kg		**7.4**	**8.9**	**8.7**	**8.8**	**11.6**
EG035-SDH: 1M HCl extractable Mercury by FIMS									
Mercury	7439-97-6	0.10	mg/kg		**----**	**----**	**----**	**----**	<0.10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B5-0	B4-0	B4-4	B5-3	----
				Client sampling date / time	04-Sep-2019 10:20	04-Sep-2019 10:30	04-Sep-2019 10:45	04-Sep-2019 09:00	----
Compound	CAS Number	LOR	Unit		EB1925939-011	EB1925939-012	EB1925939-013	EB1925939-014	--------
					Result	Result	Result	Result	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**60.5**	**58.4**	**64.3**	**56.0**	**----**
EG005(ED093)-SDH: 1M HCl-Extractable Metals by ICPAES									
Nickel	7440-02-0	1.0	mg/kg		**11.6**	**10.9**	**10.2**	**----**	**----**
EG035-SDH: 1M HCl extractable Mercury by FIMS									
Mercury	7439-97-6	0.10	mg/kg		**----**	**----**	<0.10	<0.10	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1923230**	Page	: 1 of 5
Client	: **BMT EASTERN AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR DARREN RICHARDSON	Contact	: Customer Services EB
Address	: PO BOX 203 SPRING HILL BRISBANE QLD 4004	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3831 6744	Telephone	: +61-7-3243 7222
Project	: B23621 Port of Brisbane	Date Samples Received	: 04-Sep-2019 15:05
Order number	:	Date Analysis Commenced	: 06-Sep-2019
C-O-C number	: ----	Issue Date	: 30-Sep-2019 12:32
Sampler	: GRACE BOURKE, Wills Brassil		
Site	: ----		
Quote number	: BN/016/19		
No. of samples received	: 15		
No. of samples analysed	: 15		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane External Subcontracting, Stafford, QLD

General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Radiological work undertaken by ALS Laboratory Group (Ceska Lipa) under CAI accreditation No. L1163. Report No. $$. NATA and CAI accreditations' are both recognised under ILAC.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)				Client sample ID	B15-3	B15-2	B12-1	B11-8	B10-6
				Client sampling date / time	02-Sep-2019 09:20	02-Sep-2019 09:50	02-Sep-2019 10:45	02-Sep-2019 11:25	02-Sep-2019 12:40
Compound	*CAS Number*	*LOR*	*Unit*		**EB1923230-001**	**EB1923230-002**	**EB1923230-005**	**EB1923230-007**	**EB1923230-011**
					Result	Result	Result	Result	Result
Radionuclides / Activity									
Gross alpha	----	500	Bq/kg DW		<500	<500	<500	<500	<500
Gross beta	----	500	Bq/kg DW		<500	<500	<500	<500	<500

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	B10-7	B9-1	B13-8	B13-1	B7-1
			Client sampling date / time	02-Sep-2019 12:40	02-Sep-2019 13:45	03-Sep-2019 10:05	03-Sep-2019 12:10	04-Sep-2019 07:20
Compound	CAS Number	LOR	Unit	EB1923230-012	EB1923230-014	EB1923230-022	EB1923230-029	EB1923230-032
				Result	Result	Result	Result	Result
Radionuclides / Activity								
Gross alpha	----	500	Bq/kg DW	<500	<500	<500	<500	<500
Gross beta	----	500	Bq/kg DW	**500**	<500	<500	**560**	**510**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)				Client sample ID	**B6-3**	**B5-1**	**B5-2**	**B5-3**	**B5-0**
				Client sampling date / time	04-Sep-2019 08:05	04-Sep-2019 08:35	04-Sep-2019 08:45	04-Sep-2019 09:00	04-Sep-2019 10:20
Compound	*CAS Number*	*LOR*	*Unit*		**EB1923230-035**	**EB1923230-036**	**EB1923230-037**	**EB1923230-038**	**EB1923230-039**
					Result	Result	Result	Result	Result
Radionuclides / Activity									
Gross alpha	----	500	Bq/kg DW		<500	**640**	<500	**600**	**570**
Gross beta	----	500	Bq/kg DW		<500	**540**	**510**	<500	**510**

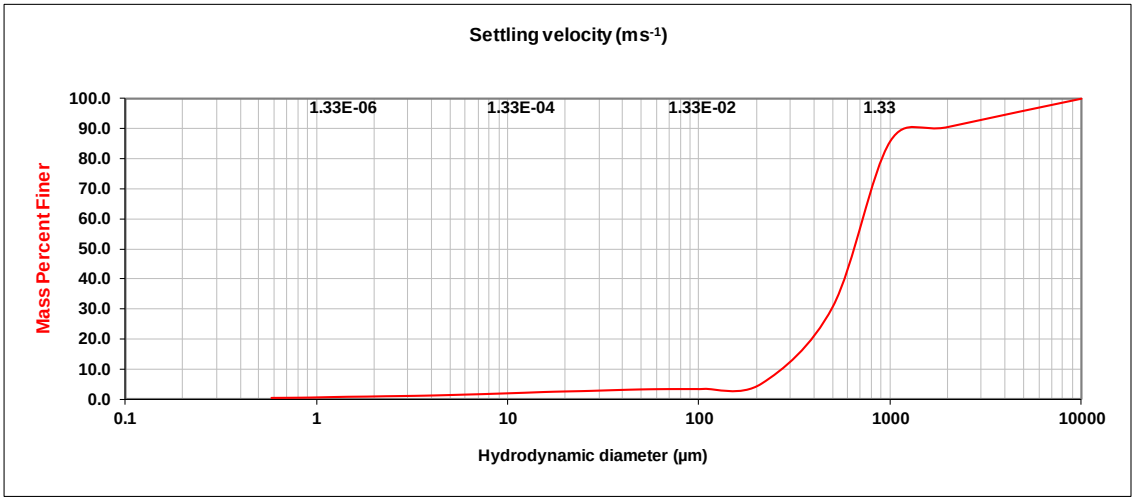
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B2-0
Job No:	19_1531
Laboratory ID:	19_1531_41

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	9.4	1.64E+01	12.23	9.17	0.3	9.20E-05
2000.00	1000.00	4.7	1.64E+00	9.17	7.29	0.2	5.48E-05
1000.00	500.00	55.2	4.10E-01	7.29	5.79	0.2	3.46E-05
500.00	212.00	25.6	8.69E-02	5.79	4.60	0.2	2.18E-05
212.00	106.00	1.7	1.84E-02	4.60	3.65	0.2	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	0.1	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	0.1	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	0.1	3.45E-06
61.31	48.70	0.1	2.45E-03	1.83	1.45	0.1	2.18E-06
48.70	38.68	0.2	1.54E-03	1.45	1.15	0.1	1.37E-06
38.68	30.73	0.2	9.75E-04	1.15	0.92	0.1	8.68E-07
30.73	24.41	0.2	6.15E-04	0.92	0.73	0.1	5.51E-07
24.41	19.39	0.1	3.88E-04	0.73	0.58	0.0	3.47E-07
19.39	15.40	0.2	2.45E-04	0.58	0.10	0.4	4.76E-08
15.40	12.23	0.2	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

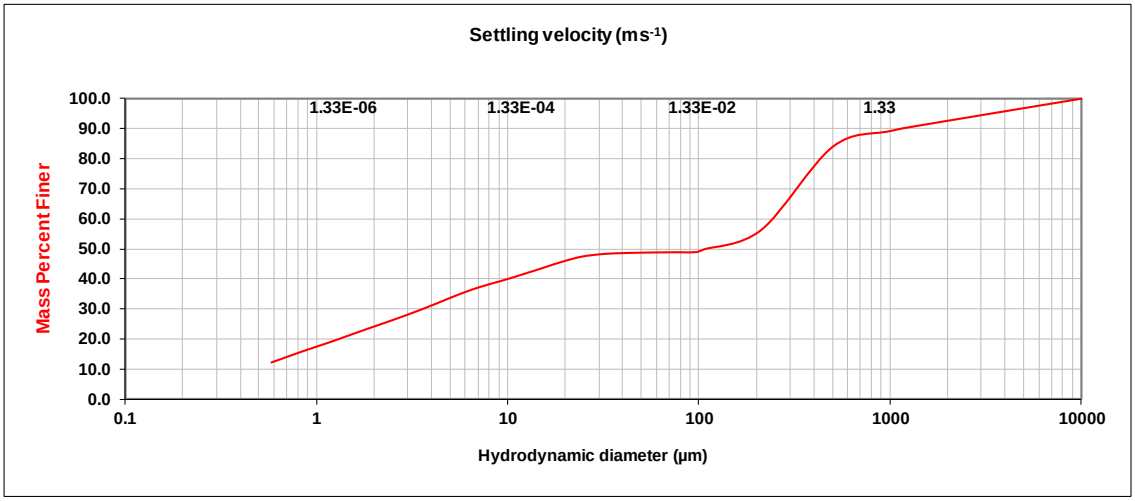
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	BC-2
Job No:	19_1531
Laboratory ID:	19_1531_40

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	7.4	1.64E+01	12.23	9.17	2.4	9.20E-05
2000.00	1000.00	3.4	1.64E+00	9.17	7.29	1.8	5.48E-05
1000.00	500.00	5.3	4.10E-01	7.29	5.79	2.2	3.46E-05
500.00	212.00	27.7	8.69E-02	5.79	4.60	2.5	2.18E-05
212.00	106.00	6.5	1.84E-02	4.60	3.65	2.6	1.38E-05
106.00	97.16	0.9	8.45E-03	3.65	2.90	2.4	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	2.3	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	2.2	3.45E-06
61.31	48.70	0.1	2.45E-03	1.83	1.45	2.3	2.18E-06
48.70	38.68	0.1	1.54E-03	1.45	1.15	2.3	1.37E-06
38.68	30.73	0.3	9.75E-04	1.15	0.92	2.0	8.68E-07
30.73	24.41	0.8	6.15E-04	0.92	0.73	2.2	5.51E-07
24.41	19.39	1.6	3.88E-04	0.73	0.58	2.3	3.47E-07
19.39	15.40	2.0	2.45E-04	0.58	0.10	12.1	4.76E-08
15.40	12.23	2.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Sediment Quality Results – Primary Laboratory

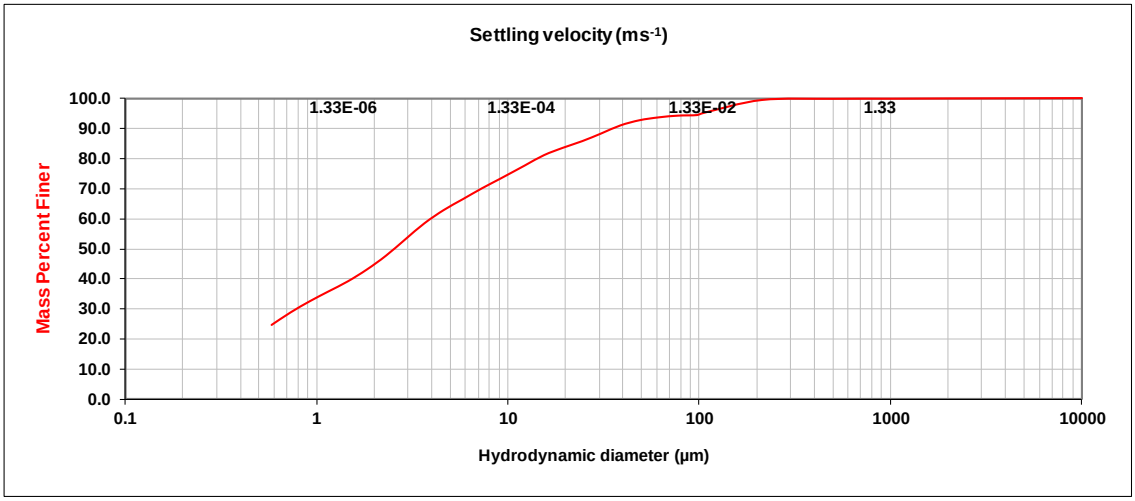
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B4-0
Job No:	19_1531
Laboratory ID:	19_1531_38

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	4.3	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	3.3	5.48E-05
1000.00	500.00	0.0	4.10E-01	7.29	5.79	3.6	3.46E-05
500.00	212.00	0.4	8.69E-02	5.79	4.60	3.6	2.18E-05
212.00	106.00	4.2	1.84E-02	4.60	3.65	4.4	1.38E-05
106.00	97.16	0.8	8.45E-03	3.65	2.90	5.3	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	5.4	5.47E-06
77.18	61.31	0.6	3.88E-03	2.30	1.83	4.6	3.45E-06
61.31	48.70	1.0	2.45E-03	1.83	1.45	4.0	2.18E-06
48.70	38.68	1.7	1.54E-03	1.45	1.15	3.3	1.37E-06
38.68	30.73	2.7	9.75E-04	1.15	0.92	3.2	8.68E-07
30.73	24.41	2.6	6.15E-04	0.92	0.73	3.7	5.51E-07
24.41	19.39	2.2	3.88E-04	0.73	0.58	4.2	3.47E-07
19.39	15.40	2.5	2.45E-04	0.58	0.10	24.6	4.76E-08
15.40	12.23	3.4	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Sediment Quality Results – Primary Laboratory

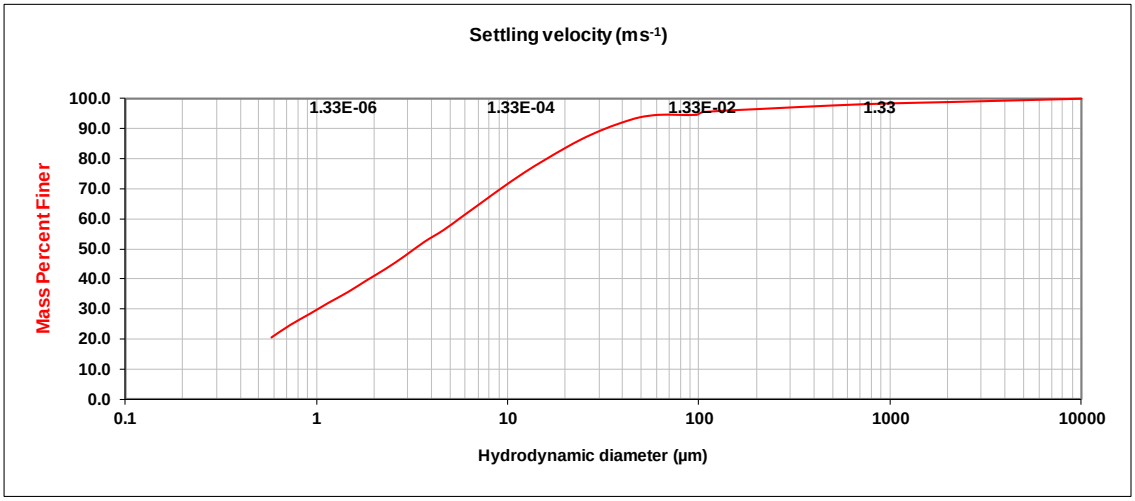
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B4-4
Job No:	19_1531
Laboratory ID:	19_1531_39

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	1.1	1.64E+01	12.23	9.17	5.4	9.20E-05
2000.00	1000.00	0.4	1.64E+00	9.17	7.29	4.6	5.48E-05
1000.00	500.00	0.7	4.10E-01	7.29	5.79	4.6	3.46E-05
500.00	212.00	1.1	8.69E-02	5.79	4.60	4.6	2.18E-05
212.00	106.00	1.0	1.84E-02	4.60	3.65	3.9	1.38E-05
106.00	97.16	1.0	8.45E-03	3.65	2.90	4.6	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	4.3	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	3.8	3.45E-06
61.31	48.70	0.9	2.45E-03	1.83	1.45	4.0	2.18E-06
48.70	38.68	1.9	1.54E-03	1.45	1.15	3.5	1.37E-06
38.68	30.73	2.4	9.75E-04	1.15	0.92	3.6	8.68E-07
30.73	24.41	2.9	6.15E-04	0.92	0.73	3.6	5.51E-07
24.41	19.39	3.4	3.88E-04	0.73	0.58	4.2	3.47E-07
19.39	15.40	3.7	2.45E-04	0.58	0.10	20.6	4.76E-08
15.40	12.23	3.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.

* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

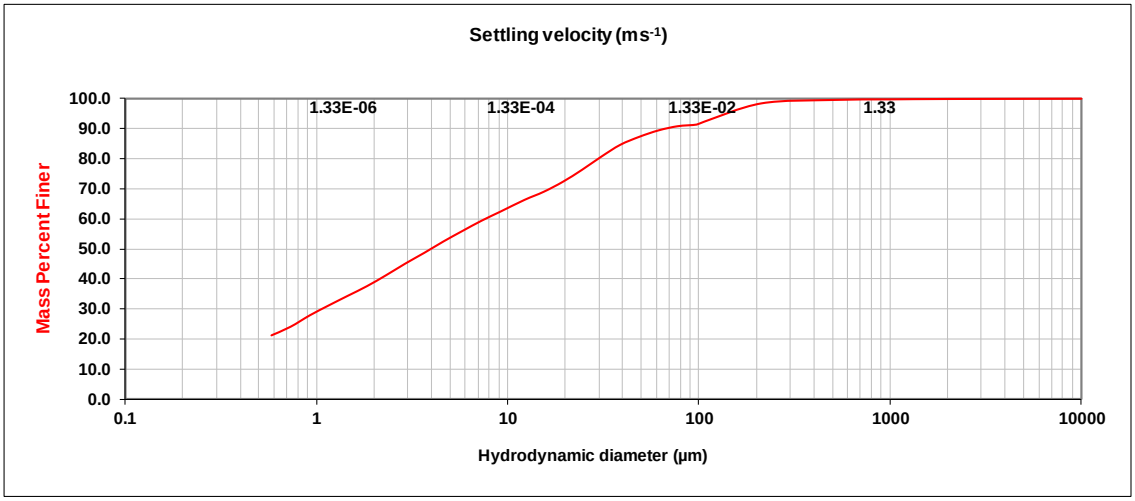
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B5-0
Job No:	19_1531
Laboratory ID:	19_1531_37

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	3.9	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	3.0	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	3.4	3.46E-05
500.00	212.00	1.1	8.69E-02	5.79	4.60	3.5	2.18E-05
212.00	106.00	6.1	1.84E-02	4.60	3.65	3.8	1.38E-05
106.00	97.16	0.9	8.45E-03	3.65	2.90	3.6	8.68E-06
97.16	77.18	0.6	6.15E-03	2.90	2.30	3.9	5.47E-06
77.18	61.31	1.4	3.88E-03	2.30	1.83	3.6	3.45E-06
61.31	48.70	2.1	2.45E-03	1.83	1.45	3.2	2.18E-06
48.70	38.68	2.7	1.54E-03	1.45	1.15	3.2	1.37E-06
38.68	30.73	4.0	9.75E-04	1.15	0.92	3.2	8.68E-07
30.73	24.41	4.3	6.15E-04	0.92	0.73	3.8	5.51E-07
24.41	19.39	4.0	3.88E-04	0.73	0.58	2.9	3.47E-07
19.39	15.40	3.3	2.45E-04	0.58	0.10	21.3	4.76E-08
15.40	12.23	2.7	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

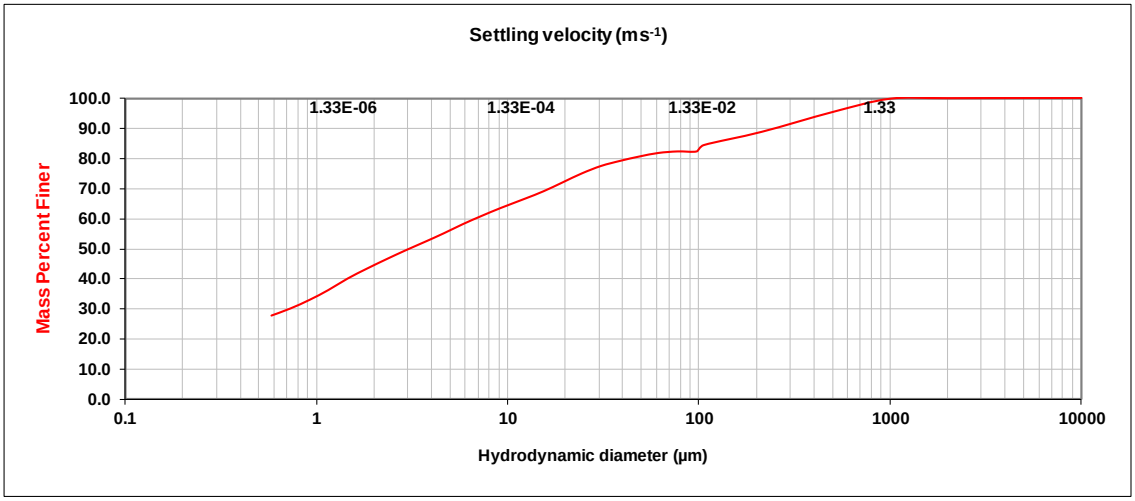
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B5-1
Job No:	19_1531
Laboratory ID:	19_1531_34

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.1	1.64E+01	12.23	9.17	3.0	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	2.6	5.48E-05
1000.00	500.00	4.4	4.10E-01	7.29	5.79	2.8	3.46E-05
500.00	212.00	6.6	8.69E-02	5.79	4.60	3.0	2.18E-05
212.00	106.00	4.4	1.84E-02	4.60	3.65	2.9	1.38E-05
106.00	97.16	2.1	8.45E-03	3.65	2.90	2.8	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	3.0	5.47E-06
77.18	61.31	0.5	3.88E-03	2.30	1.83	3.0	3.45E-06
61.31	48.70	1.2	2.45E-03	1.83	1.45	3.3	2.18E-06
48.70	38.68	1.4	1.54E-03	1.45	1.15	3.8	1.37E-06
38.68	30.73	1.7	9.75E-04	1.15	0.92	3.2	8.68E-07
30.73	24.41	2.4	6.15E-04	0.92	0.73	2.9	5.51E-07
24.41	19.39	3.0	3.88E-04	0.73	0.58	2.4	3.47E-07
19.39	15.40	3.0	2.45E-04	0.58	0.10	27.9	4.76E-08
15.40	12.23	2.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

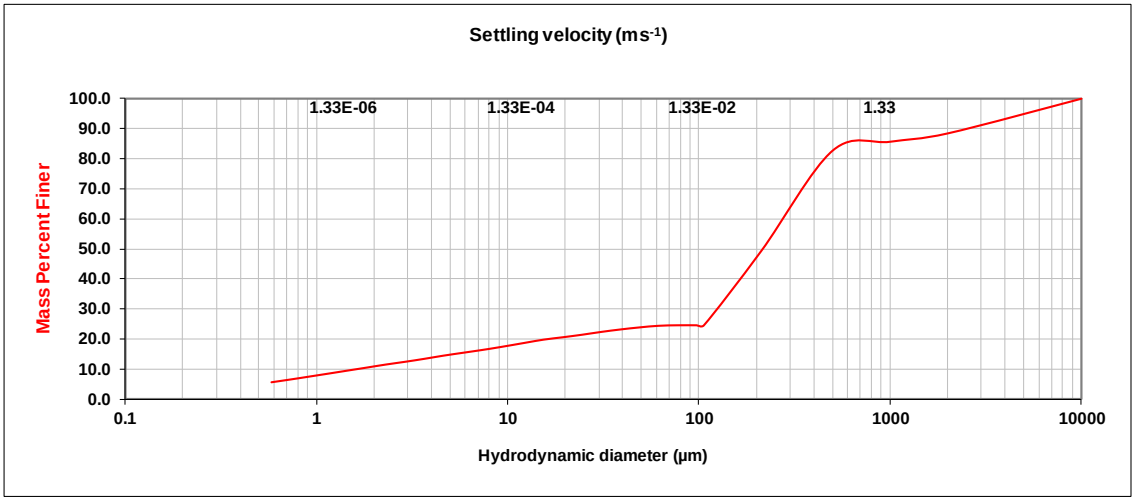
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B6-2
Job No:	19_1531
Laboratory ID:	19_1531_32

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	11.5	1.64E+01	12.23	9.17	1.4	9.20E-05
2000.00	1000.00	2.8	1.64E+00	9.17	7.29	1.0	5.48E-05
1000.00	500.00	2.9	4.10E-01	7.29	5.79	0.9	3.46E-05
500.00	212.00	33.3	8.69E-02	5.79	4.60	0.9	2.18E-05
212.00	106.00	24.8	1.84E-02	4.60	3.65	1.1	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	1.0	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	0.9	5.47E-06
77.18	61.31	0.2	3.88E-03	2.30	1.83	1.0	3.45E-06
61.31	48.70	0.5	2.45E-03	1.83	1.45	1.0	2.18E-06
48.70	38.68	0.7	1.54E-03	1.45	1.15	1.0	1.37E-06
38.68	30.73	0.8	9.75E-04	1.15	0.92	1.0	8.68E-07
30.73	24.41	0.9	6.15E-04	0.92	0.73	1.0	5.51E-07
24.41	19.39	0.8	3.88E-04	0.73	0.58	0.9	3.47E-07
19.39	15.40	0.8	2.45E-04	0.58	0.10	5.6	4.76E-08
15.40	12.23	1.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

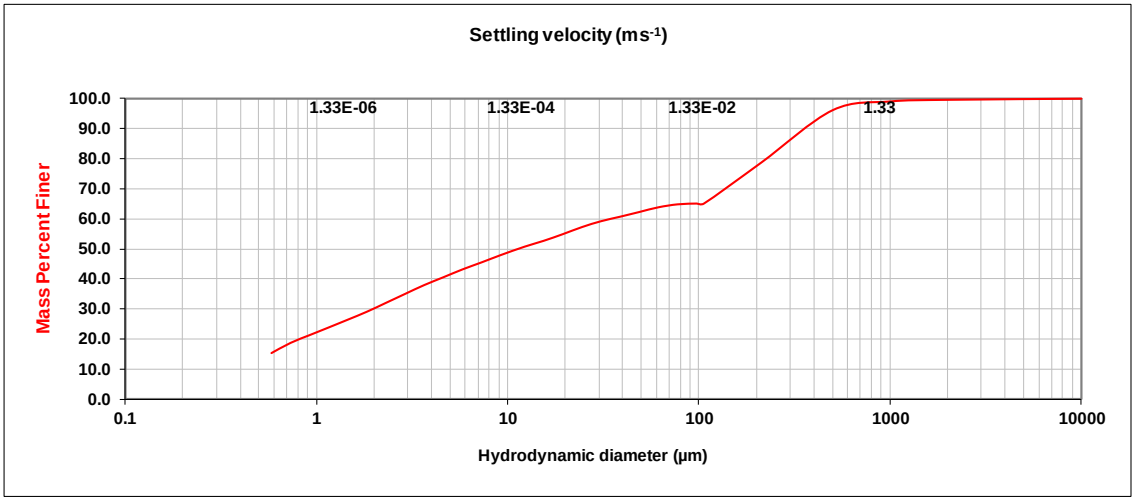
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B6-3
Job No:	19_1531
Laboratory ID:	19_1531_33

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.4	1.64E+01	12.23	9.17	2.8	9.20E-05
2000.00	1000.00	0.5	1.64E+00	9.17	7.29	2.4	5.48E-05
1000.00	500.00	2.9	4.10E-01	7.29	5.79	2.3	3.46E-05
500.00	212.00	17.4	8.69E-02	5.79	4.60	2.6	2.18E-05
212.00	106.00	13.7	1.84E-02	4.60	3.65	2.6	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	2.9	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	3.0	5.47E-06
77.18	61.31	1.0	3.88E-03	2.30	1.83	2.9	3.45E-06
61.31	48.70	1.6	2.45E-03	1.83	1.45	2.7	2.18E-06
48.70	38.68	1.6	1.54E-03	1.45	1.15	2.6	1.37E-06
38.68	30.73	1.5	9.75E-04	1.15	0.92	2.5	8.68E-07
30.73	24.41	2.0	6.15E-04	0.92	0.73	2.6	5.51E-07
24.41	19.39	2.3	3.88E-04	0.73	0.58	3.4	3.47E-07
19.39	15.40	2.2	2.45E-04	0.58	0.10	15.4	4.76E-08
15.40	12.23	2.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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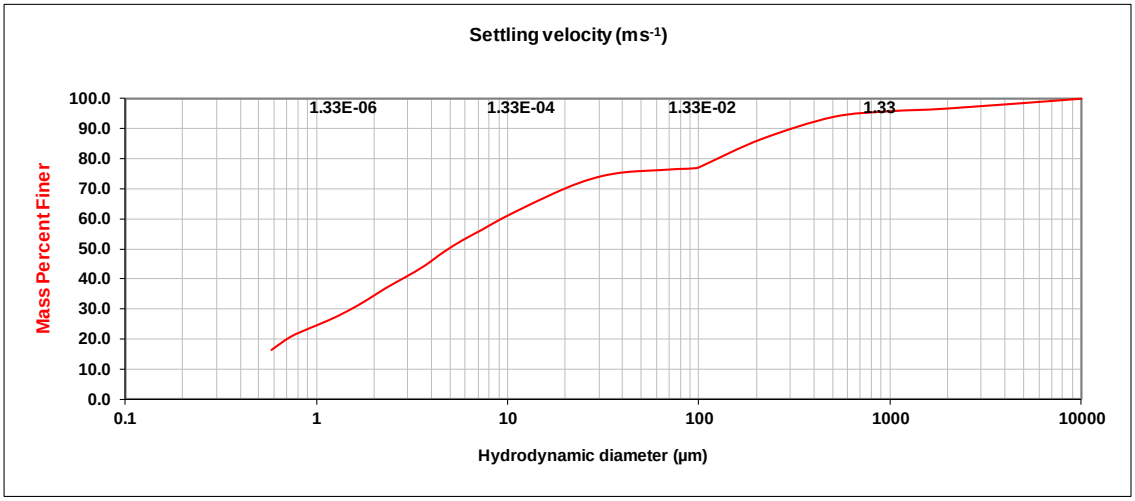
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B7-1
Job No:	19_1531
Laboratory ID:	19_1531_31

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	3.3	1.64E+01	12.23	9.17	4.0	9.20E-05
2000.00	1000.00	0.9	1.64E+00	9.17	7.29	3.6	5.48E-05
1000.00	500.00	1.9	4.10E-01	7.29	5.79	3.4	3.46E-05
500.00	212.00	7.3	8.69E-02	5.79	4.60	4.0	2.18E-05
212.00	106.00	8.6	1.84E-02	4.60	3.65	4.6	1.38E-05
106.00	97.16	1.0	8.45E-03	3.65	2.90	3.7	8.68E-06
97.16	77.18	0.3	6.15E-03	2.90	2.30	3.6	5.47E-06
77.18	61.31	0.4	3.88E-03	2.30	1.83	4.0	3.45E-06
61.31	48.70	0.3	2.45E-03	1.83	1.45	3.7	2.18E-06
48.70	38.68	0.5	1.54E-03	1.45	1.15	3.1	1.37E-06
38.68	30.73	1.2	9.75E-04	1.15	0.92	2.6	8.68E-07
30.73	24.41	1.9	6.15E-04	0.92	0.73	2.9	5.51E-07
24.41	19.39	2.5	3.88E-04	0.73	0.58	4.4	3.47E-07
19.39	15.40	2.9	2.45E-04	0.58	0.10	16.4	4.76E-08
15.40	12.23	3.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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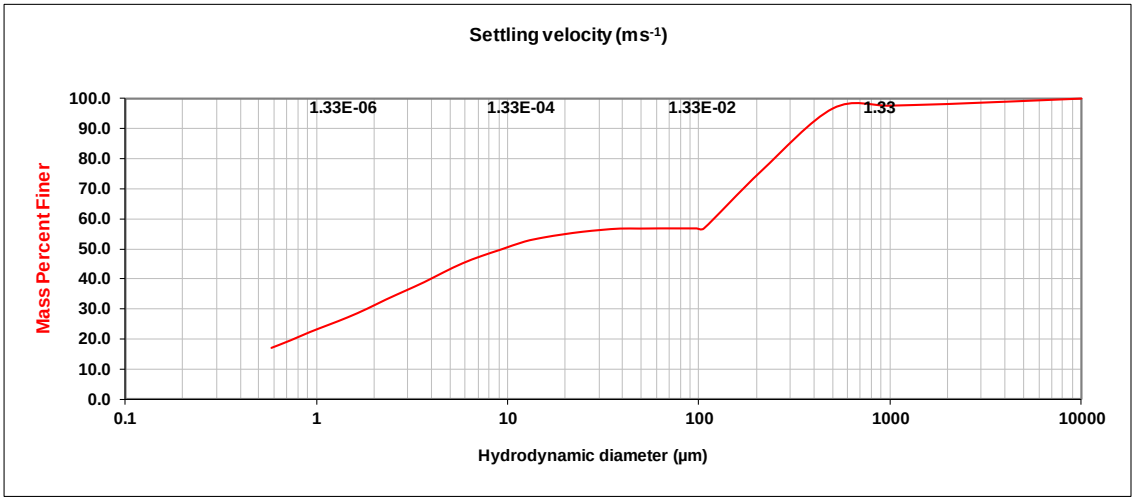
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B8-1
Job No:	19_1531
Laboratory ID:	19_1531_30

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	1.8	1.64E+01	12.23	9.17	2.7	9.20E-05
2000.00	1000.00	0.5	1.64E+00	9.17	7.29	2.1	5.48E-05
1000.00	500.00	1.0	4.10E-01	7.29	5.79	2.4	3.46E-05
500.00	212.00	20.7	8.69E-02	5.79	4.60	3.0	2.18E-05
212.00	106.00	19.1	1.84E-02	4.60	3.65	3.2	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	2.9	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	2.9	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	3.1	3.45E-06
61.31	48.70	0.1	2.45E-03	1.83	1.45	2.8	2.18E-06
48.70	38.68	0.0	1.54E-03	1.45	1.15	2.5	1.37E-06
38.68	30.73	0.5	9.75E-04	1.15	0.92	2.4	8.68E-07
30.73	24.41	0.6	6.15E-04	0.92	0.73	2.7	5.51E-07
24.41	19.39	0.9	3.88E-04	0.73	0.58	2.5	3.47E-07
19.39	15.40	1.0	2.45E-04	0.58	0.10	17.2	4.76E-08
15.40	12.23	1.4	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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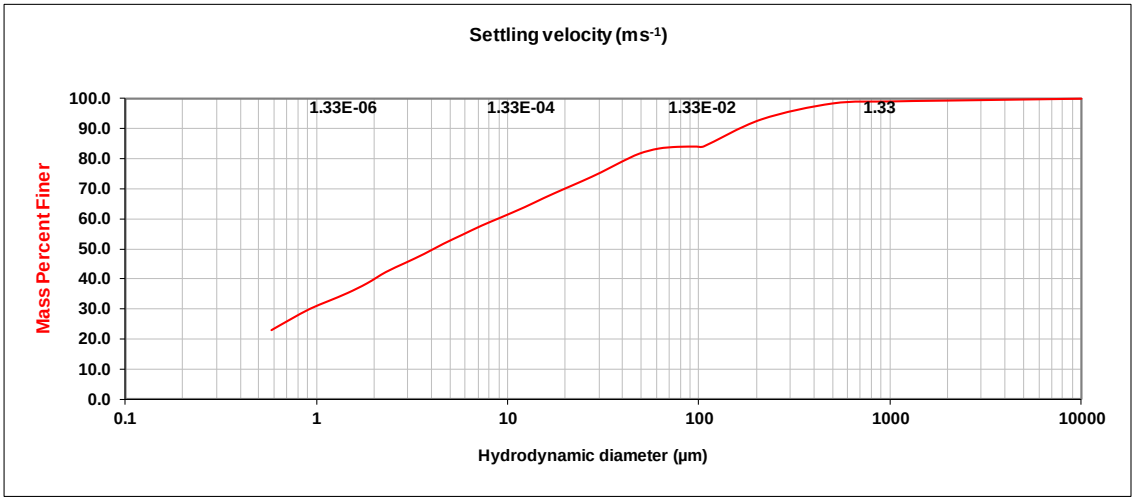
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B8-3
Job No:	19_1531
Laboratory ID:	19_1531_14

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.6	1.64E+01	12.23	9.17	3.4	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	2.7	5.48E-05
1000.00	500.00	0.7	4.10E-01	7.29	5.79	3.0	3.46E-05
500.00	212.00	5.3	8.69E-02	5.79	4.60	3.0	2.18E-05
212.00	106.00	9.0	1.84E-02	4.60	3.65	3.4	1.38E-05
106.00	97.16	0.1	8.45E-03	3.65	2.90	3.0	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	3.0	5.47E-06
77.18	61.31	0.6	3.88E-03	2.30	1.83	3.8	3.45E-06
61.31	48.70	1.7	2.45E-03	1.83	1.45	3.2	2.18E-06
48.70	38.68	2.9	1.54E-03	1.45	1.15	2.7	1.37E-06
38.68	30.73	3.3	9.75E-04	1.15	0.92	2.6	8.68E-07
30.73	24.41	2.9	6.15E-04	0.92	0.73	3.4	5.51E-07
24.41	19.39	2.8	3.88E-04	0.73	0.58	3.6	3.47E-07
19.39	15.40	2.9	2.45E-04	0.58	0.10	22.9	4.76E-08
15.40	12.23	3.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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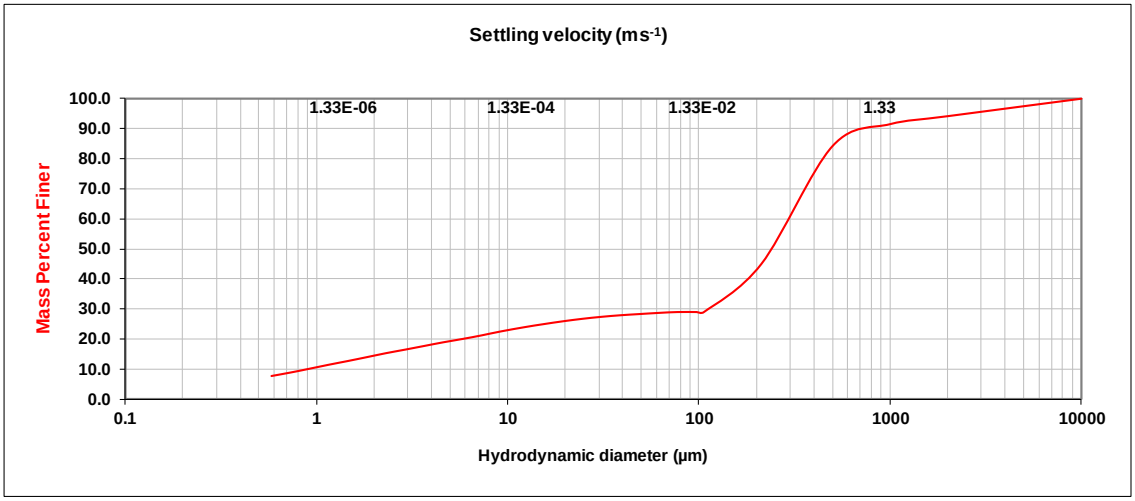
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B9-1
Job No:	19_1531
Laboratory ID:	19_1531_13

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	5.8	1.64E+01	12.23	9.17	1.4	9.20E-05
2000.00	1000.00	2.6	1.64E+00	9.17	7.29	1.3	5.48E-05
1000.00	500.00	7.2	4.10E-01	7.29	5.79	1.2	3.46E-05
500.00	212.00	39.2	8.69E-02	5.79	4.60	1.1	2.18E-05
212.00	106.00	16.0	1.84E-02	4.60	3.65	1.2	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	1.2	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	1.2	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	1.3	3.45E-06
61.31	48.70	0.4	2.45E-03	1.83	1.45	1.3	2.18E-06
48.70	38.68	0.4	1.54E-03	1.45	1.15	1.2	1.37E-06
38.68	30.73	0.5	9.75E-04	1.15	0.92	1.3	8.68E-07
30.73	24.41	0.7	6.15E-04	0.92	0.73	1.3	5.51E-07
24.41	19.39	0.8	3.88E-04	0.73	0.58	1.2	3.47E-07
19.39	15.40	0.9	2.45E-04	0.58	0.10	7.8	4.76E-08
15.40	12.23	1.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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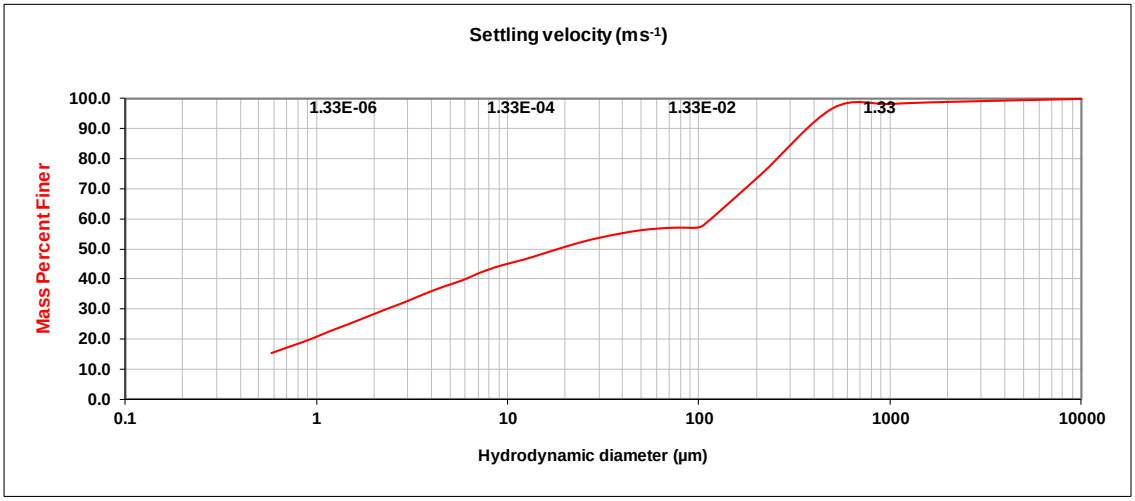
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B10-5
Job No:	19_1531
Laboratory ID:	19_1531_12

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.34 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	1.0	1.64E+01	12.23	9.17	2.1	9.20E-05
2000.00	1000.00	0.7	1.64E+00	9.17	7.29	2.1	5.48E-05
1000.00	500.00	1.4	4.10E-01	7.29	5.79	2.7	3.46E-05
500.00	212.00	21.9	8.69E-02	5.79	4.60	2.1	2.18E-05
212.00	106.00	17.0	1.84E-02	4.60	3.65	2.4	1.38E-05
106.00	97.16	0.9	8.45E-03	3.65	2.90	2.7	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	2.4	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	2.5	3.45E-06
61.31	48.70	0.6	2.45E-03	1.83	1.45	2.6	2.18E-06
48.70	38.68	1.0	1.54E-03	1.45	1.15	2.4	1.37E-06
38.68	30.73	1.3	9.75E-04	1.15	0.92	2.6	8.68E-07
30.73	24.41	1.5	6.15E-04	0.92	0.73	2.3	5.51E-07
24.41	19.39	1.9	3.88E-04	0.73	0.58	2.3	3.47E-07
19.39	15.40	2.0	2.45E-04	0.58	0.10	15.3	4.76E-08
15.40	12.23	2.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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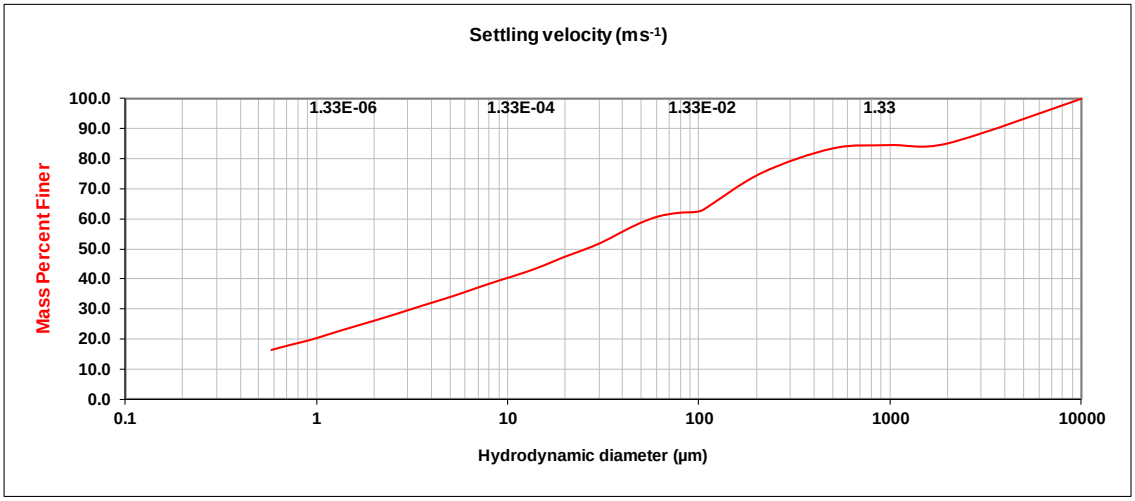
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B10-6
Job No:	19_1531
Laboratory ID:	19_1531_11

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	14.9	1.64E+01	12.23	9.17	2.5	9.20E-05
2000.00	1000.00	0.6	1.64E+00	9.17	7.29	2.1	5.48E-05
1000.00	500.00	1.1	4.10E-01	7.29	5.79	2.2	3.46E-05
500.00	212.00	8.2	8.69E-02	5.79	4.60	2.1	2.18E-05
212.00	106.00	12.1	1.84E-02	4.60	3.65	2.0	1.38E-05
106.00	97.16	0.8	8.45E-03	3.65	2.90	2.0	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	2.0	5.47E-06
77.18	61.31	1.1	3.88E-03	2.30	1.83	1.9	3.45E-06
61.31	48.70	2.3	2.45E-03	1.83	1.45	1.9	2.18E-06
48.70	38.68	3.2	1.54E-03	1.45	1.15	2.0	1.37E-06
38.68	30.73	3.3	9.75E-04	1.15	0.92	1.9	8.68E-07
30.73	24.41	2.6	6.15E-04	0.92	0.73	1.6	5.51E-07
24.41	19.39	2.3	3.88E-04	0.73	0.58	1.7	3.47E-07
19.39	15.40	2.7	2.45E-04	0.58	0.10	16.3	4.76E-08
15.40	12.23	2.3	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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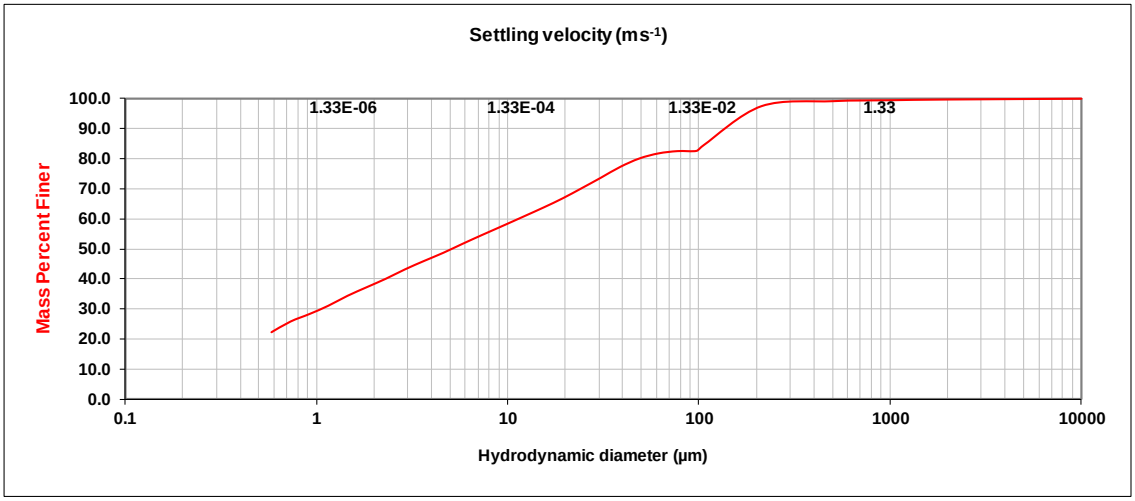
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B10-8
Job No:	19_1531
Laboratory ID:	19_1531_29

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.3	1.64E+01	12.23	9.17	3.6	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	2.8	5.48E-05
1000.00	500.00	0.3	4.10E-01	7.29	5.79	2.9	3.46E-05
500.00	212.00	1.7	8.69E-02	5.79	4.60	3.0	2.18E-05
212.00	106.00	12.9	1.84E-02	4.60	3.65	2.7	1.38E-05
106.00	97.16	1.9	8.45E-03	3.65	2.90	2.8	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	3.1	5.47E-06
77.18	61.31	0.8	3.88E-03	2.30	1.83	2.8	3.45E-06
61.31	48.70	1.7	2.45E-03	1.83	1.45	2.9	2.18E-06
48.70	38.68	2.8	1.54E-03	1.45	1.15	3.3	1.37E-06
38.68	30.73	3.6	9.75E-04	1.15	0.92	2.7	8.68E-07
30.73	24.41	3.5	6.15E-04	0.92	0.73	2.5	5.51E-07
24.41	19.39	3.4	3.88E-04	0.73	0.58	3.6	3.47E-07
19.39	15.40	3.0	2.45E-04	0.58	0.10	22.4	4.76E-08
15.40	12.23	2.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

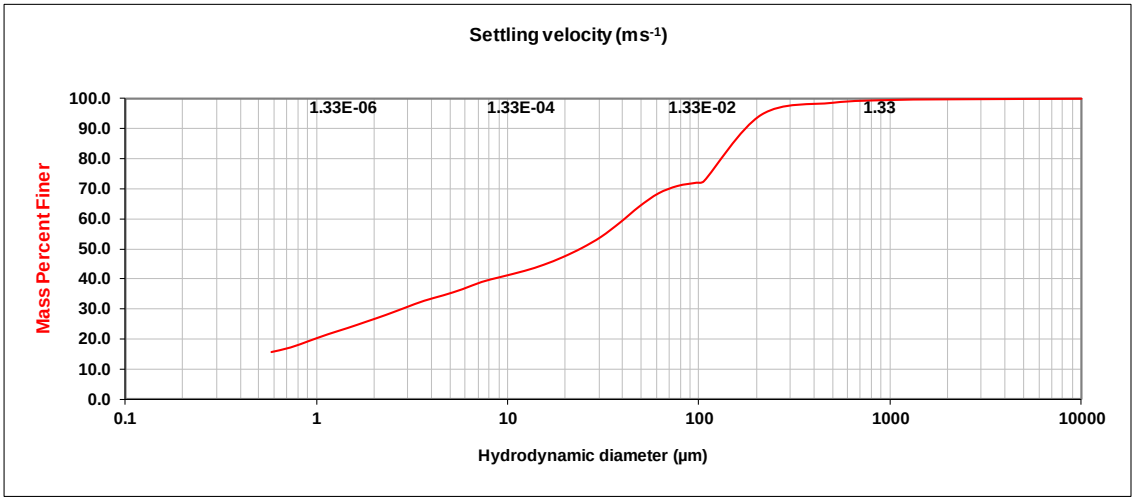
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B11-8
Job No:	19_1531
Laboratory ID:	19_1531_07

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	2.0	9.20E-05
2000.00	1000.00	0.2	1.64E+00	9.17	7.29	1.7	5.48E-05
1000.00	500.00	0.9	4.10E-01	7.29	5.79	2.4	3.46E-05
500.00	212.00	4.0	8.69E-02	5.79	4.60	2.0	2.18E-05
212.00	106.00	22.1	1.84E-02	4.60	3.65	1.8	1.38E-05
106.00	97.16	0.5	8.45E-03	3.65	2.90	2.3	8.68E-06
97.16	77.18	1.1	6.15E-03	2.90	2.30	2.4	5.47E-06
77.18	61.31	2.5	3.88E-03	2.30	1.83	2.2	3.45E-06
61.31	48.70	4.4	2.45E-03	1.83	1.45	2.2	2.18E-06
48.70	38.68	5.3	1.54E-03	1.45	1.15	2.0	1.37E-06
38.68	30.73	4.8	9.75E-04	1.15	0.92	2.2	8.68E-07
30.73	24.41	3.7	6.15E-04	0.92	0.73	2.3	5.51E-07
24.41	19.39	3.0	3.88E-04	0.73	0.58	1.5	3.47E-07
19.39	15.40	2.5	2.45E-04	0.58	0.10	15.8	4.76E-08
15.40	12.23	2.0	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

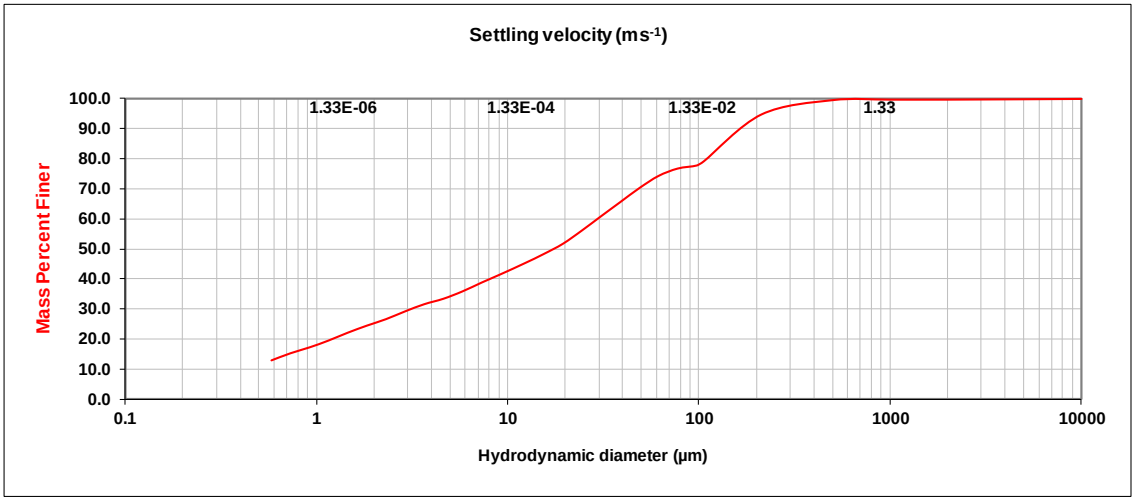
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B11-9
Job No:	19_1531
Laboratory ID:	19_1531_08

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	3.6	9.20E-05
2000.00	1000.00	0.0	1.64E+00	9.17	7.29	2.8	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	2.9	3.46E-05
500.00	212.00	4.8	8.69E-02	5.79	4.60	2.5	2.18E-05
212.00	106.00	15.6	1.84E-02	4.60	3.65	1.8	1.38E-05
106.00	97.16	1.4	8.45E-03	3.65	2.90	2.4	8.68E-06
97.16	77.18	1.0	6.15E-03	2.90	2.30	2.6	5.47E-06
77.18	61.31	2.5	3.88E-03	2.30	1.83	2.1	3.45E-06
61.31	48.70	4.0	2.45E-03	1.83	1.45	2.4	2.18E-06
48.70	38.68	4.7	1.54E-03	1.45	1.15	2.6	1.37E-06
38.68	30.73	4.7	9.75E-04	1.15	0.92	2.2	8.68E-07
30.73	24.41	4.8	6.15E-04	0.92	0.73	2.0	5.51E-07
24.41	19.39	4.4	3.88E-04	0.73	0.58	2.4	3.47E-07
19.39	15.40	3.4	2.45E-04	0.58	0.10	12.9	4.76E-08
15.40	12.23	3.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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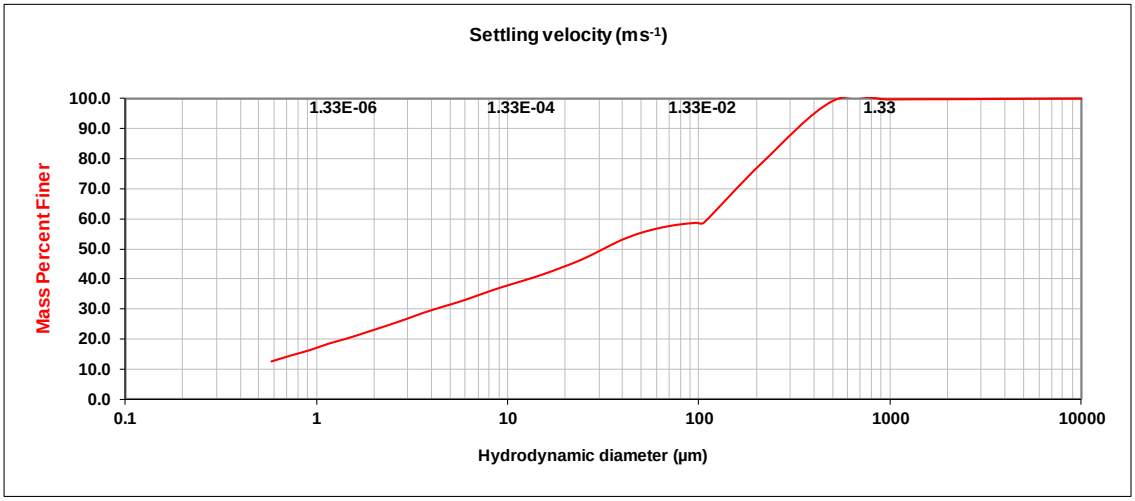
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B11-5
Job No:	19_1531
Laboratory ID:	19_1531_06

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	2.4	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	2.2	5.48E-05
1000.00	500.00	0.5	4.10E-01	7.29	5.79	2.2	3.46E-05
500.00	212.00	20.7	8.69E-02	5.79	4.60	1.9	2.18E-05
212.00	106.00	19.7	1.84E-02	4.60	3.65	2.0	1.38E-05
106.00	97.16	0.1	8.45E-03	3.65	2.90	2.3	8.68E-06
97.16	77.18	0.6	6.15E-03	2.90	2.30	2.2	5.47E-06
77.18	61.31	1.2	3.88E-03	2.30	1.83	2.1	3.45E-06
61.31	48.70	1.7	2.45E-03	1.83	1.45	2.1	2.18E-06
48.70	38.68	2.4	1.54E-03	1.45	1.15	1.8	1.37E-06
38.68	30.73	3.2	9.75E-04	1.15	0.92	2.1	8.68E-07
30.73	24.41	3.1	6.15E-04	0.92	0.73	1.8	5.51E-07
24.41	19.39	2.5	3.88E-04	0.73	0.58	1.9	3.47E-07
19.39	15.40	2.3	2.45E-04	0.58	0.10	12.5	4.76E-08
15.40	12.23	2.1	1.54E-04	Total:		100.0	

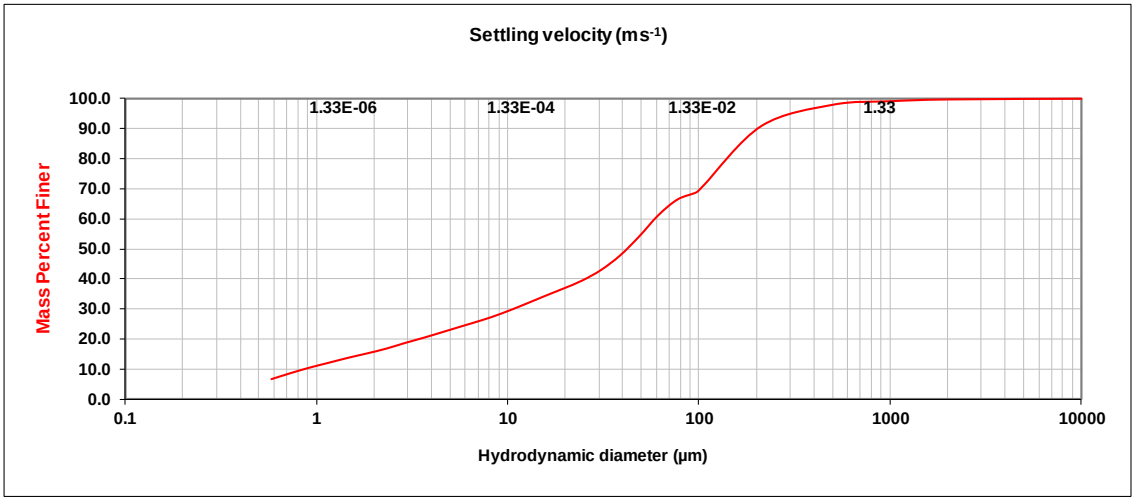
Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B12-1
Job No:	19_1531
Laboratory ID:	19_1531_05

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	3.1	9.20E-05
2000.00	1000.00	0.6	1.64E+00	9.17	7.29	2.1	5.48E-05
1000.00	500.00	1.2	4.10E-01	7.29	5.79	1.9	3.46E-05
500.00	212.00	7.0	8.69E-02	5.79	4.60	1.9	2.18E-05
212.00	106.00	19.7	1.84E-02	4.60	3.65	1.9	1.38E-05
106.00	97.16	2.4	8.45E-03	3.65	2.90	1.8	8.68E-06
97.16	77.18	2.4	6.15E-03	2.90	2.30	1.9	5.47E-06
77.18	61.31	5.2	3.88E-03	2.30	1.83	1.6	3.45E-06
61.31	48.70	7.1	2.45E-03	1.83	1.45	1.5	2.18E-06
48.70	38.68	6.3	1.54E-03	1.45	1.15	1.6	1.37E-06
38.68	30.73	4.8	9.75E-04	1.15	0.92	1.6	8.68E-07
30.73	24.41	3.6	6.15E-04	0.92	0.73	1.9	5.51E-07
24.41	19.39	2.7	3.88E-04	0.73	0.58	2.0	3.47E-07
19.39	15.40	2.6	2.45E-04	0.58	0.10	6.7	4.76E-08
15.40	12.23	2.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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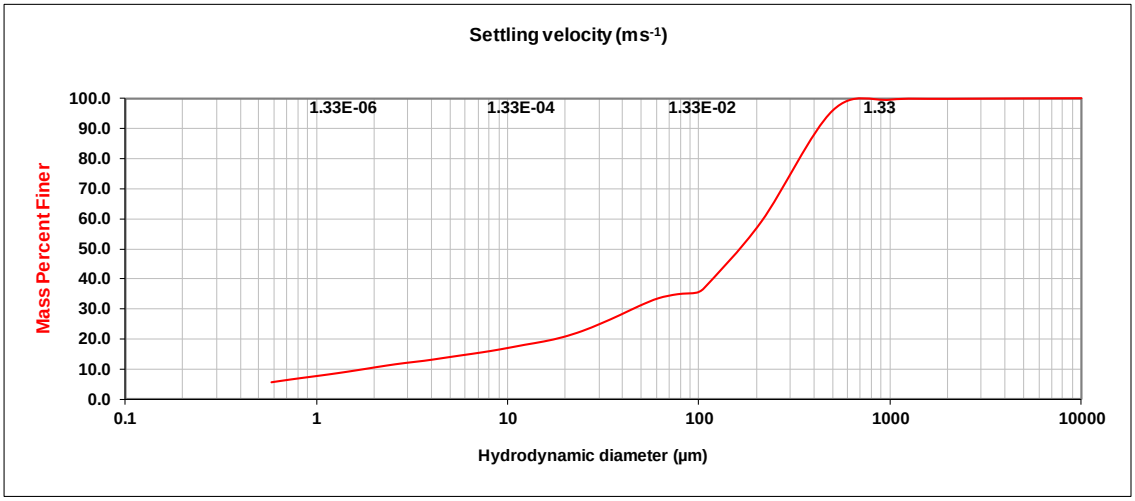
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B12-2
Job No:	19_1531
Laboratory ID:	19_1531_04

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	1.5	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	1.0	5.48E-05
1000.00	500.00	3.6	4.10E-01	7.29	5.79	0.9	3.46E-05
500.00	212.00	36.8	8.69E-02	5.79	4.60	0.9	2.18E-05
212.00	106.00	22.2	1.84E-02	4.60	3.65	0.9	1.38E-05
106.00	97.16	1.4	8.45E-03	3.65	2.90	0.7	8.68E-06
97.16	77.18	0.5	6.15E-03	2.90	2.30	0.9	5.47E-06
77.18	61.31	1.3	3.88E-03	2.30	1.83	1.0	3.45E-06
61.31	48.70	2.6	2.45E-03	1.83	1.45	1.0	2.18E-06
48.70	38.68	3.0	1.54E-03	1.45	1.15	0.9	1.37E-06
38.68	30.73	2.8	9.75E-04	1.15	0.92	0.8	8.68E-07
30.73	24.41	2.6	6.15E-04	0.92	0.73	0.9	5.51E-07
24.41	19.39	2.0	3.88E-04	0.73	0.58	0.9	3.47E-07
19.39	15.40	1.4	2.45E-04	0.58	0.10	5.8	4.76E-08
15.40	12.23	1.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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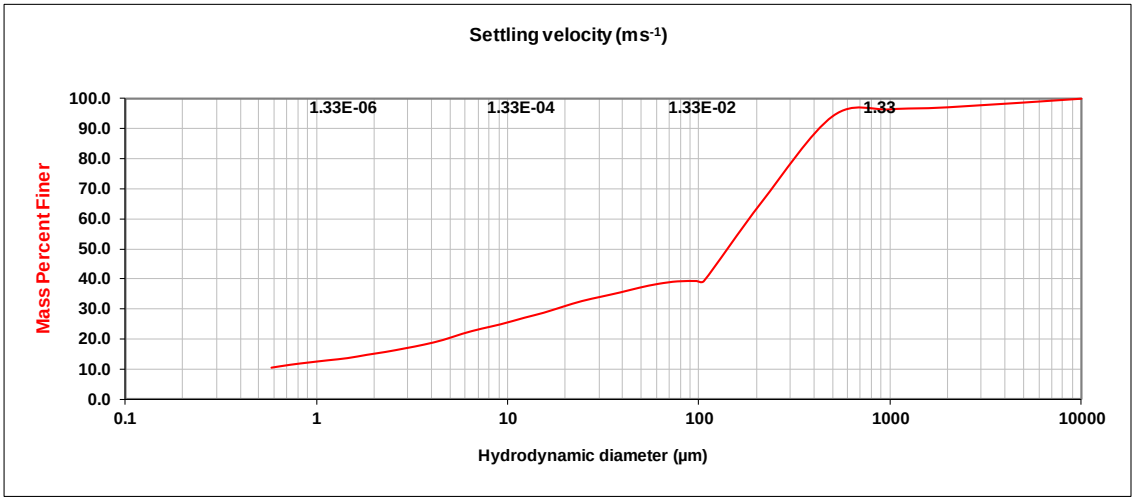
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B15-1
Job No:	19_1531
Laboratory ID:	19_1531_03

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	2.9	1.64E+01	12.23	9.17	2.2	9.20E-05
2000.00	1000.00	0.7	1.64E+00	9.17	7.29	1.5	5.48E-05
1000.00	500.00	2.3	4.10E-01	7.29	5.79	1.7	3.46E-05
500.00	212.00	28.7	8.69E-02	5.79	4.60	2.0	2.18E-05
212.00	106.00	26.2	1.84E-02	4.60	3.65	1.6	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	1.3	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	1.2	5.47E-06
77.18	61.31	0.8	3.88E-03	2.30	1.83	1.0	3.45E-06
61.31	48.70	1.3	2.45E-03	1.83	1.45	1.1	2.18E-06
48.70	38.68	1.6	1.54E-03	1.45	1.15	0.7	1.37E-06
38.68	30.73	1.4	9.75E-04	1.15	0.92	0.7	8.68E-07
30.73	24.41	1.5	6.15E-04	0.92	0.73	0.8	5.51E-07
24.41	19.39	1.9	3.88E-04	0.73	0.58	1.0	3.47E-07
19.39	15.40	2.0	2.45E-04	0.58	0.10	10.4	4.76E-08
15.40	12.23	1.6	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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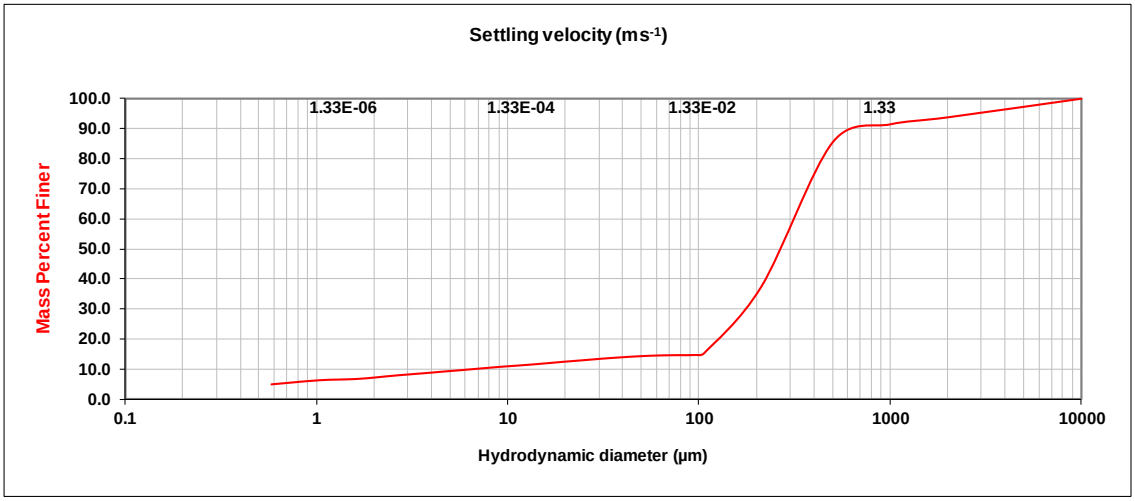
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B15-2
Job No:	19_1531
Laboratory ID:	19_1531_02

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)	
Liquid density:	0.994	g/cm^3	**Critical diameter:** 54.35 µm
Liquid viscosity:	0.724	cp	



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	6.2	1.64E+01	12.23	9.17	0.6	9.20E-05
2000.00	1000.00	2.3	1.64E+00	9.17	7.29	0.5	5.48E-05
1000.00	500.00	6.0	4.10E-01	7.29	5.79	0.5	3.46E-05
500.00	212.00	48.0	8.69E-02	5.79	4.60	0.5	2.18E-05
212.00	106.00	22.3	1.84E-02	4.60	3.65	0.5	1.38E-05
106.00	97.16	0.5	8.45E-03	3.65	2.90	0.5	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	0.6	5.47E-06
77.18	61.31	0.1	3.88E-03	2.30	1.83	0.6	3.45E-06
61.31	48.70	0.3	2.45E-03	1.83	1.45	0.4	2.18E-06
48.70	38.68	0.4	1.54E-03	1.45	1.15	0.2	1.37E-06
38.68	30.73	0.5	9.75E-04	1.15	0.92	0.4	8.68E-07
30.73	24.41	0.5	6.15E-04	0.92	0.73	0.6	5.51E-07
24.41	19.39	0.5	3.88E-04	0.73	0.58	0.6	3.47E-07
19.39	15.40	0.6	2.45E-04	0.58	0.10	4.8	4.76E-08
15.40	12.23	0.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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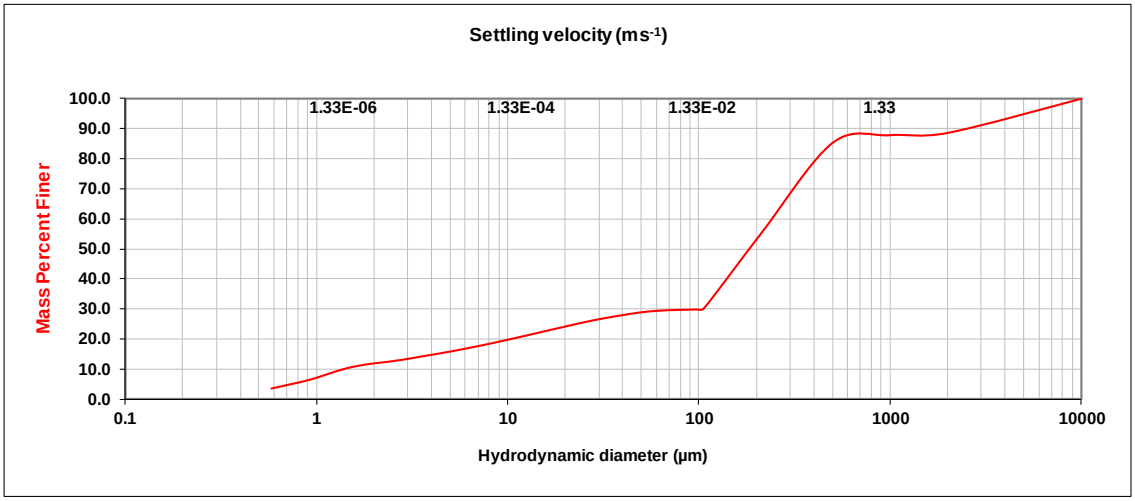
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B15-3
Job No:	19_1531
Laboratory ID:	19_1531_01

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	11.4	1.64E+01	12.23	9.17	1.8	9.20E-05
2000.00	1000.00	0.8	1.64E+00	9.17	7.29	1.4	5.48E-05
1000.00	500.00	2.5	4.10E-01	7.29	5.79	1.3	3.46E-05
500.00	212.00	30.0	8.69E-02	5.79	4.60	1.2	2.18E-05
212.00	106.00	25.1	1.84E-02	4.60	3.65	1.1	1.38E-05
106.00	97.16	0.4	8.45E-03	3.65	2.90	1.1	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	0.9	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	0.8	3.45E-06
61.31	48.70	0.6	2.45E-03	1.83	1.45	1.2	2.18E-06
48.70	38.68	1.0	1.54E-03	1.45	1.15	1.9	1.37E-06
38.68	30.73	1.1	9.75E-04	1.15	0.92	2.0	8.68E-07
30.73	24.41	1.3	6.15E-04	0.92	0.73	1.5	5.51E-07
24.41	19.39	1.5	3.88E-04	0.73	0.58	1.4	3.47E-07
19.39	15.40	1.5	2.45E-04	0.58	0.10	3.6	4.76E-08
15.40	12.23	1.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

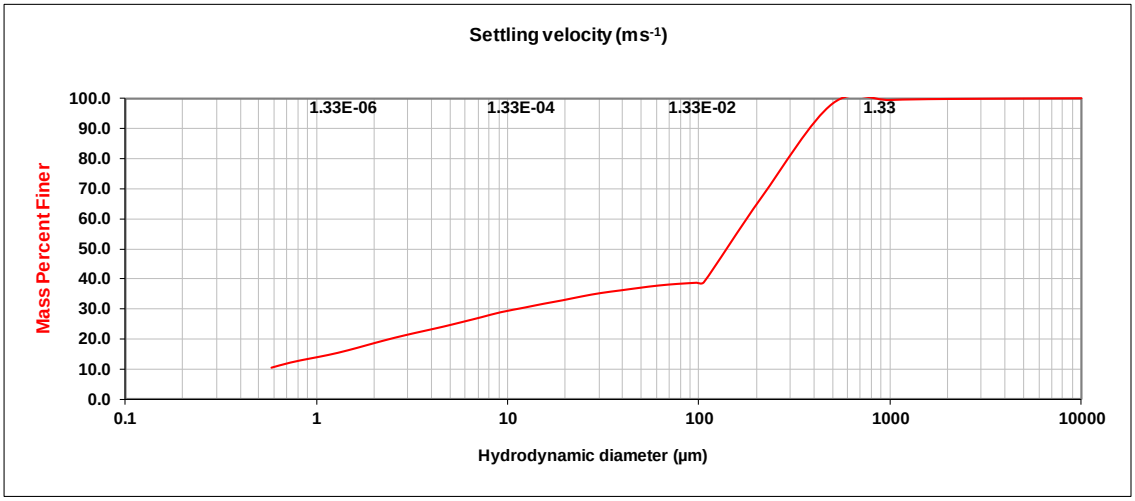
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B13-1
Job No:	19_1531
Laboratory ID:	19_1531_28

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.65	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.31 µm
Liquid viscosity:	0.723	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.2	1.64E+01	12.23	9.17	1.6	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	1.6	5.48E-05
1000.00	500.00	1.2	4.10E-01	7.29	5.79	1.6	3.46E-05
500.00	212.00	31.3	8.69E-02	5.79	4.60	1.6	2.18E-05
212.00	106.00	28.2	1.84E-02	4.60	3.65	1.4	1.38E-05
106.00	97.16	0.2	8.45E-03	3.65	2.90	1.4	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	1.6	5.47E-06
77.18	61.31	0.5	3.88E-03	2.30	1.83	1.7	3.45E-06
61.31	48.70	0.8	2.45E-03	1.83	1.45	1.7	2.18E-06
48.70	38.68	0.9	1.54E-03	1.45	1.15	1.5	1.37E-06
38.68	30.73	0.9	9.75E-04	1.15	0.92	1.2	8.68E-07
30.73	24.41	1.1	6.15E-04	0.92	0.73	1.3	5.51E-07
24.41	19.39	1.3	3.88E-04	0.73	0.58	1.7	3.47E-07
19.39	15.40	1.2	2.45E-04	0.58	0.10	10.4	4.76E-08
15.40	12.23	1.3	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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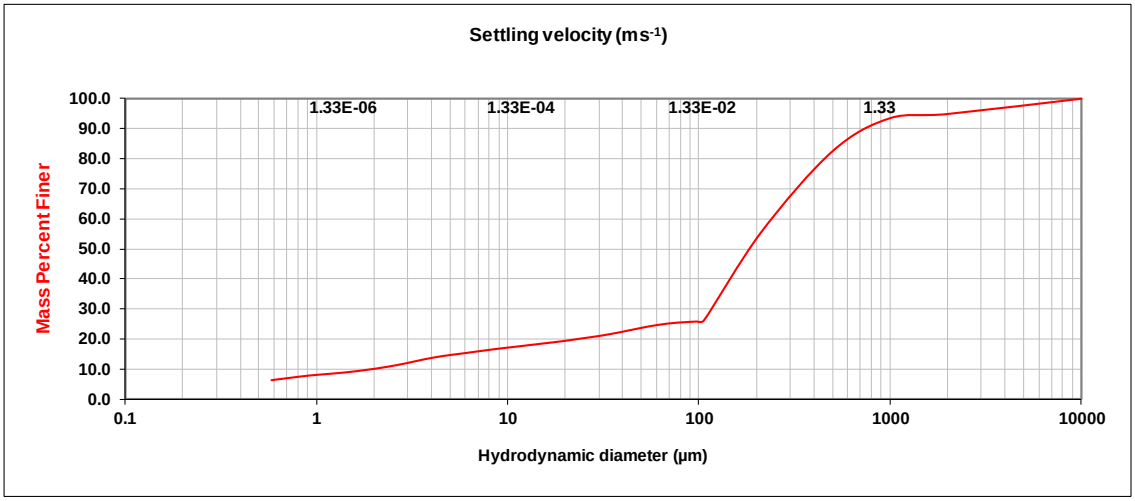
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B13-4
Job No:	19_1531
Laboratory ID:	19_1531_25

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	5.1	1.64E+01	12.23	9.17	0.9	9.20E-05
2000.00	1000.00	1.4	1.64E+00	9.17	7.29	0.8	5.48E-05
1000.00	500.00	11.0	4.10E-01	7.29	5.79	0.9	3.46E-05
500.00	212.00	26.9	8.69E-02	5.79	4.60	0.8	2.18E-05
212.00	106.00	29.5	1.84E-02	4.60	3.65	1.1	1.38E-05
106.00	97.16	0.4	8.45E-03	3.65	2.90	1.4	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	1.2	5.47E-06
77.18	61.31	0.7	3.88E-03	2.30	1.83	0.9	3.45E-06
61.31	48.70	1.1	2.45E-03	1.83	1.45	0.8	2.18E-06
48.70	38.68	1.3	1.54E-03	1.45	1.15	0.6	1.37E-06
38.68	30.73	1.1	9.75E-04	1.15	0.92	0.5	8.68E-07
30.73	24.41	0.9	6.15E-04	0.92	0.73	0.8	5.51E-07
24.41	19.39	0.9	3.88E-04	0.73	0.58	0.8	3.47E-07
19.39	15.40	0.8	2.45E-04	0.58	0.10	6.2	4.76E-08
15.40	12.23	0.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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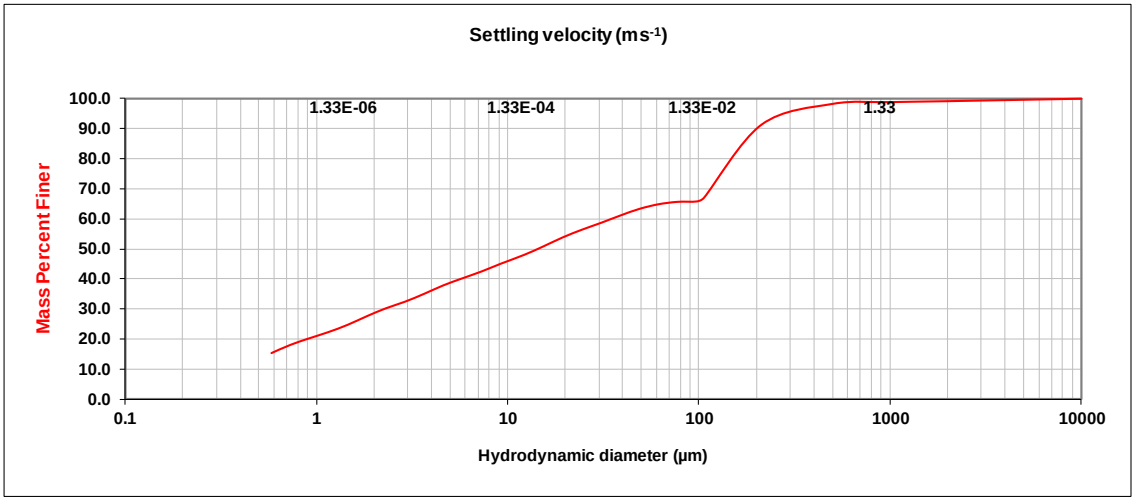
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B13-5
Job No:	19_1531
Laboratory ID:	19_1531_24

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.37 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.8	1.64E+01	12.23	9.17	3.0	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	2.5	5.48E-05
1000.00	500.00	0.6	4.10E-01	7.29	5.79	2.3	3.46E-05
500.00	212.00	6.9	8.69E-02	5.79	4.60	2.3	2.18E-05
212.00	106.00	24.3	1.84E-02	4.60	3.65	2.8	1.38E-05
106.00	97.16	1.2	8.45E-03	3.65	2.90	2.6	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	2.2	5.47E-06
77.18	61.31	0.8	3.88E-03	2.30	1.83	2.6	3.45E-06
61.31	48.70	1.5	2.45E-03	1.83	1.45	2.9	2.18E-06
48.70	38.68	2.2	1.54E-03	1.45	1.15	2.4	1.37E-06
38.68	30.73	2.4	9.75E-04	1.15	0.92	2.0	8.68E-07
30.73	24.41	2.3	6.15E-04	0.92	0.73	2.2	5.51E-07
24.41	19.39	2.5	3.88E-04	0.73	0.58	2.7	3.47E-07
19.39	15.40	2.9	2.45E-04	0.58	0.10	15.4	4.76E-08
15.40	12.23	2.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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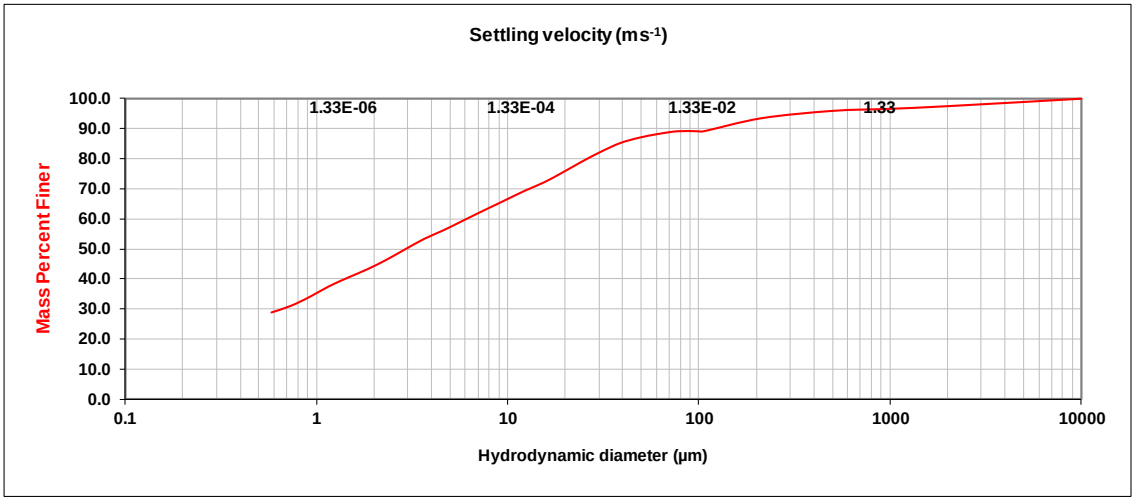
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B13-8
Job No:	19_1531
Laboratory ID:	19_1531_21

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	2.5	1.64E+01	12.23	9.17	3.8	9.20E-05
2000.00	1000.00	0.9	1.64E+00	9.17	7.29	3.0	5.48E-05
1000.00	500.00	0.7	4.10E-01	7.29	5.79	3.1	3.46E-05
500.00	212.00	2.4	8.69E-02	5.79	4.60	3.1	2.18E-05
212.00	106.00	4.3	1.84E-02	4.60	3.65	2.9	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	3.5	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	3.6	5.47E-06
77.18	61.31	0.9	3.88E-03	2.30	1.83	3.1	3.45E-06
61.31	48.70	1.2	2.45E-03	1.83	1.45	2.8	2.18E-06
48.70	38.68	1.8	1.54E-03	1.45	1.15	2.9	1.37E-06
38.68	30.73	2.9	9.75E-04	1.15	0.92	3.4	8.68E-07
30.73	24.41	3.3	6.15E-04	0.92	0.73	3.0	5.51E-07
24.41	19.39	3.6	3.88E-04	0.73	0.58	2.1	3.47E-07
19.39	15.40	3.4	2.45E-04	0.58	0.10	29.0	4.76E-08
15.40	12.23	2.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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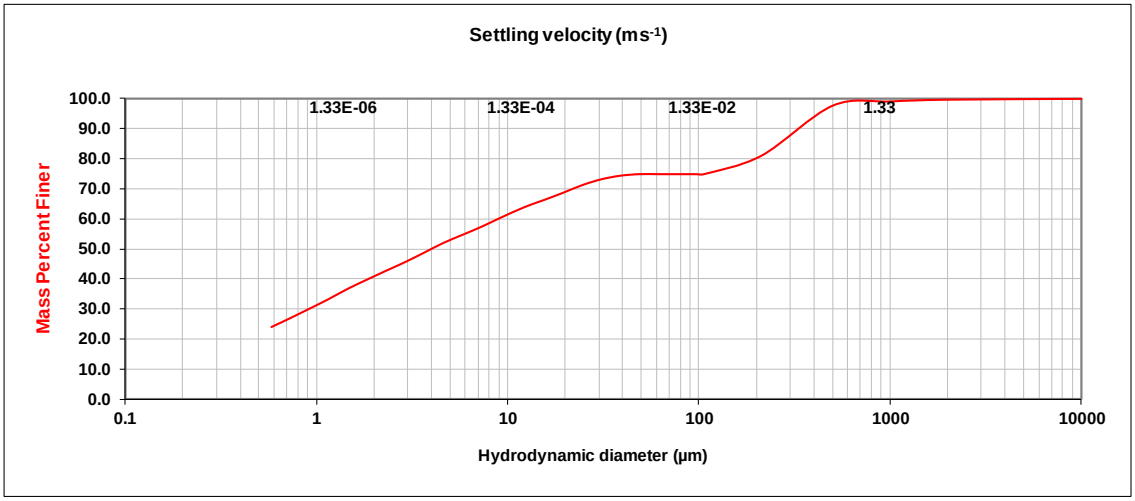
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B13-9
Job No:	19_1531
Laboratory ID:	19_1531_20

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.3	1.64E+01	12.23	9.17	3.5	9.20E-05
2000.00	1000.00	0.6	1.64E+00	9.17	7.29	3.0	5.48E-05
1000.00	500.00	1.4	4.10E-01	7.29	5.79	2.7	3.46E-05
500.00	212.00	16.6	8.69E-02	5.79	4.60	2.7	2.18E-05
212.00	106.00	6.1	1.84E-02	4.60	3.65	3.2	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	3.1	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	2.9	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	2.9	3.45E-06
61.31	48.70	0.0	2.45E-03	1.83	1.45	3.1	2.18E-06
48.70	38.68	0.5	1.54E-03	1.45	1.15	3.4	1.37E-06
38.68	30.73	1.2	9.75E-04	1.15	0.92	3.1	8.68E-07
30.73	24.41	1.9	6.15E-04	0.92	0.73	3.1	5.51E-07
24.41	19.39	2.5	3.88E-04	0.73	0.58	3.0	3.47E-07
19.39	15.40	2.4	2.45E-04	0.58	0.10	24.1	4.76E-08
15.40	12.23	2.3	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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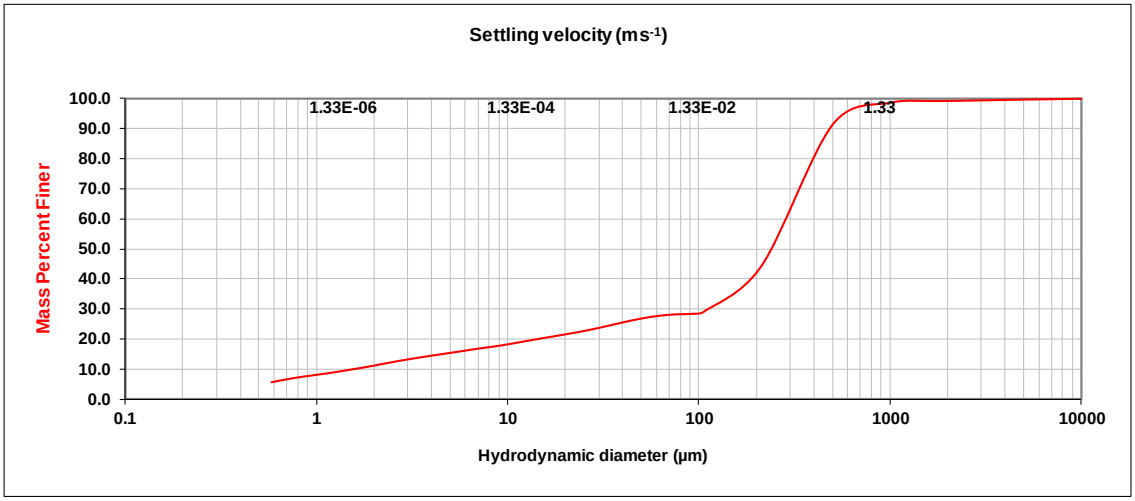
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	B16-1
Job No:	19_1531
Laboratory ID:	19_1531_22

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.8	1.64E+01	12.23	9.17	1.4	9.20E-05
2000.00	1000.00	0.6	1.64E+00	9.17	7.29	0.9	5.48E-05
1000.00	500.00	7.3	4.10E-01	7.29	5.79	1.0	3.46E-05
500.00	212.00	47.1	8.69E-02	5.79	4.60	1.0	2.18E-05
212.00	106.00	15.2	1.84E-02	4.60	3.65	1.0	1.38E-05
106.00	97.16	0.7	8.45E-03	3.65	2.90	1.0	8.68E-06
97.16	77.18	0.2	6.15E-03	2.90	2.30	1.2	5.47E-06
77.18	61.31	0.5	3.88E-03	2.30	1.83	1.2	3.45E-06
61.31	48.70	1.0	2.45E-03	1.83	1.45	1.1	2.18E-06
48.70	38.68	1.4	1.54E-03	1.45	1.15	1.0	1.37E-06
38.68	30.73	1.5	9.75E-04	1.15	0.92	0.8	8.68E-07
30.73	24.41	1.3	6.15E-04	0.92	0.73	1.0	5.51E-07
24.41	19.39	1.1	3.88E-04	0.73	0.58	1.2	3.47E-07
19.39	15.40	1.1	2.45E-04	0.58	0.10	5.6	4.76E-08
15.40	12.23	1.1	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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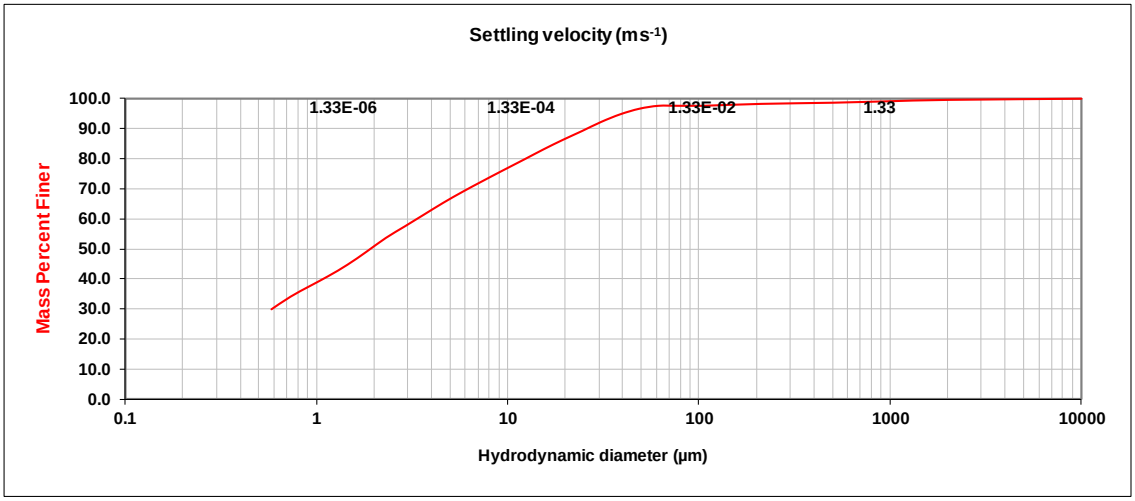
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	RF2
Job No:	19_1531
Laboratory ID:	19_1531_15

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.33 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.4	1.64E+01	12.23	9.17	4.1	9.20E-05
2000.00	1000.00	0.4	1.64E+00	9.17	7.29	3.3	5.48E-05
1000.00	500.00	0.5	4.10E-01	7.29	5.79	3.4	3.46E-05
500.00	212.00	0.4	8.69E-02	5.79	4.60	3.6	2.18E-05
212.00	106.00	0.6	1.84E-02	4.60	3.65	3.9	1.38E-05
106.00	97.16	0.0	8.45E-03	3.65	2.90	3.9	8.68E-06
97.16	77.18	0.0	6.15E-03	2.90	2.30	3.9	5.47E-06
77.18	61.31	0.0	3.88E-03	2.30	1.83	4.5	3.45E-06
61.31	48.70	1.0	2.45E-03	1.83	1.45	4.4	2.18E-06
48.70	38.68	1.9	1.54E-03	1.45	1.15	3.8	1.37E-06
38.68	30.73	2.5	9.75E-04	1.15	0.92	3.3	8.68E-07
30.73	24.41	3.0	6.15E-04	0.92	0.73	3.5	5.51E-07
24.41	19.39	2.9	3.88E-04	0.73	0.58	4.2	3.47E-07
19.39	15.40	3.1	2.45E-04	0.58	0.10	30.0	4.76E-08
15.40	12.23	3.3	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

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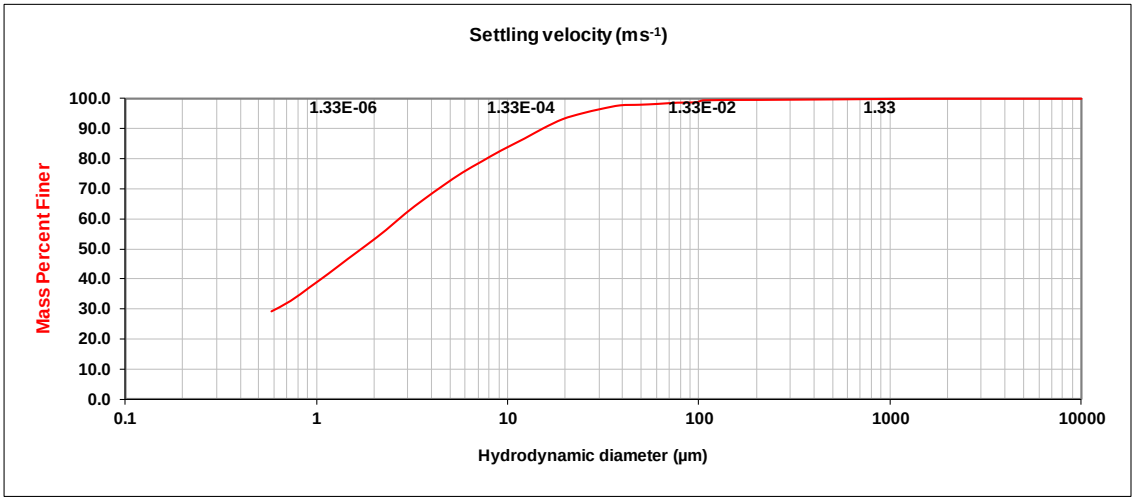
37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	RF3
Job No:	19_1531
Laboratory ID:	19_1531_17

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.36 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	0.0	1.64E+01	12.23	9.17	4.1	9.20E-05
2000.00	1000.00	0.1	1.64E+00	9.17	7.29	3.6	5.48E-05
1000.00	500.00	0.2	4.10E-01	7.29	5.79	3.7	3.46E-05
500.00	212.00	0.2	8.69E-02	5.79	4.60	4.3	2.18E-05
212.00	106.00	0.1	1.84E-02	4.60	3.65	4.6	1.38E-05
106.00	97.16	0.7	8.45E-03	3.65	2.90	4.9	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	5.5	5.47E-06
77.18	61.31	0.4	3.88E-03	2.30	1.83	4.9	3.45E-06
61.31	48.70	0.3	2.45E-03	1.83	1.45	4.8	2.18E-06
48.70	38.68	0.2	1.54E-03	1.45	1.15	4.9	1.37E-06
38.68	30.73	1.2	9.75E-04	1.15	0.92	4.5	8.68E-07
30.73	24.41	1.5	6.15E-04	0.92	0.73	4.6	5.51E-07
24.41	19.39	1.9	3.88E-04	0.73	0.58	3.5	3.47E-07
19.39	15.40	3.0	2.45E-04	0.58	0.10	29.1	4.76E-08
15.40	12.23	3.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

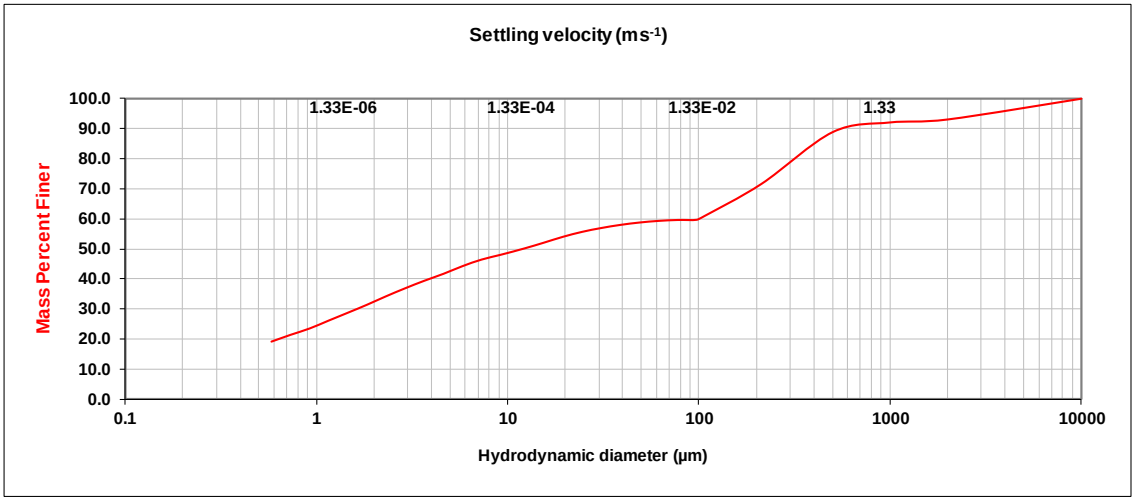
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	RF4
Job No:	19_1531
Laboratory ID:	19_1531_19

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.724	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	6.9	1.64E+01	12.23	9.17	2.1	9.20E-05
2000.00	1000.00	1.0	1.64E+00	9.17	7.29	1.6	5.48E-05
1000.00	500.00	3.2	4.10E-01	7.29	5.79	2.2	3.46E-05
500.00	212.00	17.2	8.69E-02	5.79	4.60	2.6	2.18E-05
212.00	106.00	10.8	1.84E-02	4.60	3.65	2.3	1.38E-05
106.00	97.16	1.2	8.45E-03	3.65	2.90	2.5	8.68E-06
97.16	77.18	0.1	6.15E-03	2.90	2.30	2.7	5.47E-06
77.18	61.31	0.3	3.88E-03	2.30	1.83	2.8	3.45E-06
61.31	48.70	0.5	2.45E-03	1.83	1.45	2.7	2.18E-06
48.70	38.68	0.8	1.54E-03	1.45	1.15	2.6	1.37E-06
38.68	30.73	1.0	9.75E-04	1.15	0.92	2.6	8.68E-07
30.73	24.41	1.3	6.15E-04	0.92	0.73	2.1	5.51E-07
24.41	19.39	1.6	3.88E-04	0.73	0.58	2.3	3.47E-07
19.39	15.40	1.9	2.45E-04	0.58	0.10	19.2	4.76E-08
15.40	12.23	1.9	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

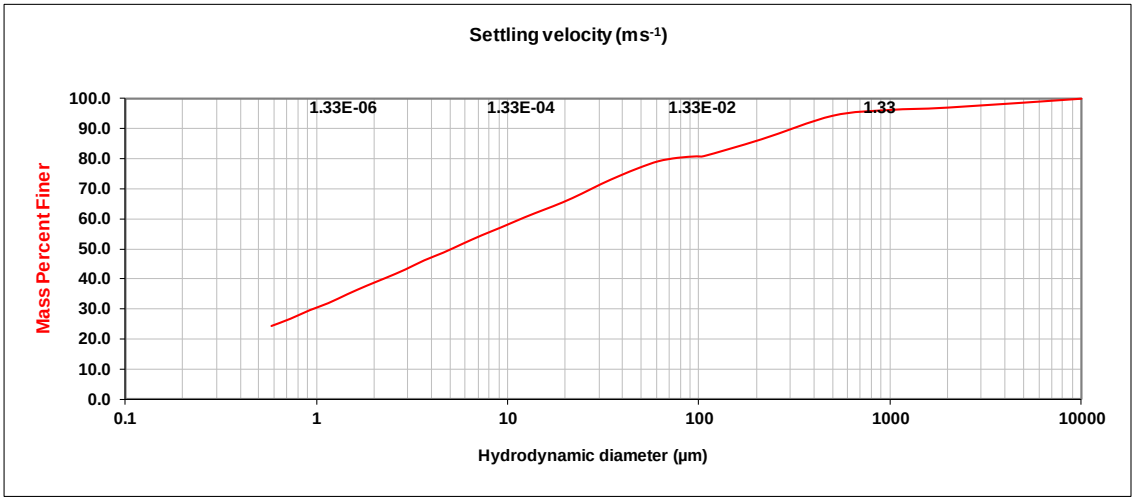
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	RF6
Job No:	19_1531
Laboratory ID:	19_1531_16

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	3.0	1.64E+01	12.23	9.17	3.4	9.20E-05
2000.00	1000.00	0.8	1.64E+00	9.17	7.29	2.6	5.48E-05
1000.00	500.00	1.9	4.10E-01	7.29	5.79	2.8	3.46E-05
500.00	212.00	7.8	8.69E-02	5.79	4.60	2.9	2.18E-05
212.00	106.00	5.6	1.84E-02	4.60	3.65	2.6	1.38E-05
106.00	97.16	0.1	8.45E-03	3.65	2.90	3.1	8.68E-06
97.16	77.18	0.5	6.15E-03	2.90	2.30	2.8	5.47E-06
77.18	61.31	1.1	3.88E-03	2.30	1.83	2.6	3.45E-06
61.31	48.70	2.2	2.45E-03	1.83	1.45	2.8	2.18E-06
48.70	38.68	2.6	1.54E-03	1.45	1.15	3.0	1.37E-06
38.68	30.73	2.8	9.75E-04	1.15	0.92	2.3	8.68E-07
30.73	24.41	3.2	6.15E-04	0.92	0.73	2.8	5.51E-07
24.41	19.39	2.9	3.88E-04	0.73	0.58	2.4	3.47E-07
19.39	15.40	2.5	2.45E-04	0.58	0.10	24.3	4.76E-08
15.40	12.23	2.5	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

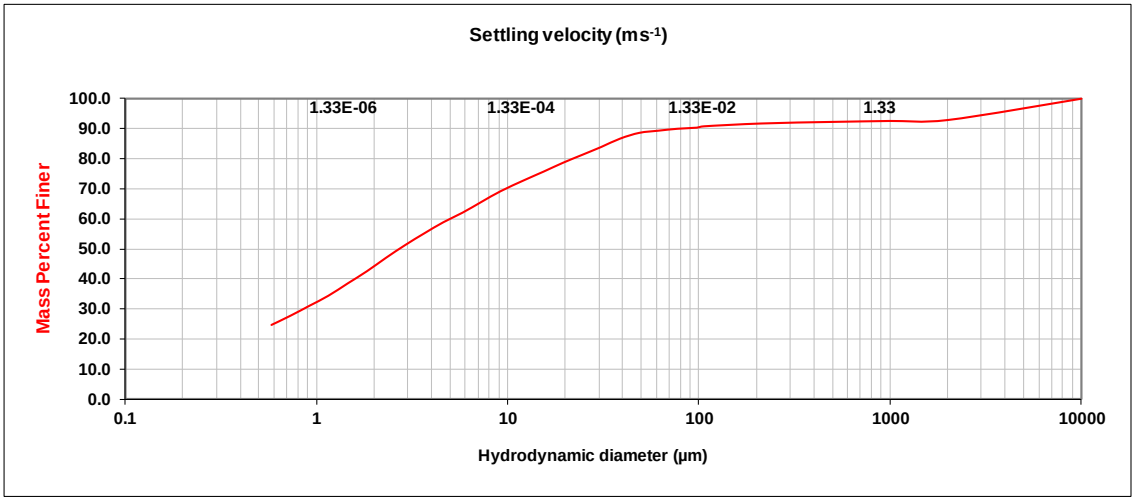
microanalysis australia

37 Kensington Street
East Perth
WA 6004

Client:	BMT Eastern Australia Pty Ltd
Client ID:	RF7
Job No:	19_1531
Laboratory ID:	19_1531_18

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7 ºC
Dispersant:	Water	**Sonication:**	10 min
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650	g/cm^3 (assumed)		
Liquid density:	0.994	g/cm^3	**Critical diameter:**	54.31 µm
Liquid viscosity:	0.723	cp		



Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})	Max size (µm)	Min size (µm)	In %	Mean settling velocity* (ms^{-1})
10000.00	2000.00	7.1	1.64E+01	12.23	9.17	3.7	9.20E-05
2000.00	1000.00	0.3	1.64E+00	9.17	7.29	3.5	5.48E-05
1000.00	500.00	0.3	4.10E-01	7.29	5.79	3.6	3.46E-05
500.00	212.00	0.5	8.69E-02	5.79	4.60	3.2	2.18E-05
212.00	106.00	0.9	1.84E-02	4.60	3.65	3.7	1.38E-05
106.00	97.16	0.5	8.45E-03	3.65	2.90	3.9	8.68E-06
97.16	77.18	0.4	6.15E-03	2.90	2.30	4.3	5.47E-06
77.18	61.31	0.6	3.88E-03	2.30	1.83	4.4	3.45E-06
61.31	48.70	0.7	2.45E-03	1.83	1.45	4.1	2.18E-06
48.70	38.68	1.9	1.54E-03	1.45	1.15	4.1	1.37E-06
38.68	30.73	2.8	9.75E-04	1.15	0.92	3.3	8.68E-07
30.73	24.41	2.6	6.15E-04	0.92	0.73	3.4	5.51E-07
24.41	19.39	2.6	3.88E-04	0.73	0.58	3.1	3.47E-07
19.39	15.40	2.9	2.45E-04	0.58	0.10	24.6	4.76E-08
15.40	12.23	2.8	1.54E-04	Total:		100.0	

Note : Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Appendix E Sediment Quality Results – Secondary Laboratory

Symbio LABORATORIES

CERTIFICATE OF ANALYSIS - Preliminary Certificate

Certificate Number	B824050-A [R00]	**Page**	1/5
Client	BMT WBM - QLD	**Registering Laboratory**	Brisbane
Contact	Grace Bourke	**Contact**	Customer Service Team
Address	Level 8 200 Creek Street QLD 4000	**Address**	52 Brandl Street, Eight Mile Plains, QLD 4113
		Email	admin@symbiolabs.com.au
Telephone	07 3831 6744	**Telephone**	1300 703 166
Order Number	---	**Date Samples Received**	06/09/2019
Project ID	Sediment - B23621 Brisbane River	**Date Analysis Commenced**	06/09/2019
Sampler	---	**Issue Date**	24/09/2019{interim}
Client Job Reference	---	**Receipt Temperature (°C)**	9.3
Number of Samples Received	2	**Storage Temperature (°C)**	4
Number of Samples Analysed	Normal	**Quote Number**	---

Symbio LABORATORIES
Proudly AUSTRALIAN
ABN: 82 079 645 015

NATA
Accreditation No: 2455
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous revision with this reference. This document must not be reproduced, except in full. Water results are reported on an 'as received' basis. Soil and sediment results are reported on a 'dry weight' basis. For other matrices the basis of reporting will be confirmed in the 'Report Comments' section. Sampling was conducted by the customer and results pertain only to the samples submitted. Responsibility for representative sampling rests with the customer. Measurement Uncertainty is available upon request or via www.symbiolabs.com.au/login. If the laboratory was authorised to conduct testing on samples received outside specified conditions, results may be impacted depending on the nature of the deviation.

Definitions

| <: Less Than | >: Greater Than | RP: Result Pending | MPN: Most Probable Number | CFU: Colony Forming Units | ---: Not Received/Not Requested | NA: Not Applicable | ND: Not Detected | LOR: Level of Reporting | [NT]: Not Tested |

| ~: Estimated | ^ Subcontracted Analysis | TBA: To Be Advised | ** Potential Holding Time Concern | * Test not covered by NATA scope of accreditation | # Result derived from a calculation and includes results equal to or greater than the LOR |

Authorised By

Name	Position	Accreditation Category
QA Department	Symbio Laboratories QA Department	Subcontracted Analytical Testing

Client	BMT WBM - QLD	**Project ID**	Sediment - B23621 Brisbane River
Certificate Number	B824050-A [R00]	**Sampler**	---
Page	2/5	**Order Number**	---

Sample Information - *Client Supplied*

Sample ID	B824050-A/1	B824050-A/2
Sample Description	B6_2C	B10_6C
Sample Date/Time	04/09/2019 07:45	02/09/2019 12:40
Sample Matrix	Sediment	Sediment

Client	BMT WBM - QLD	Project ID	Sediment - B23621 Brisbane River
Certificate Number	B824050-A [R00]	Sampler	---
Page	3/5	Order Number	---

Analytical Results

Compound/Analyte	LOR	Units	B6_2C	B10_6C
Client Sample Description			B6_2C	B10_6C
Client Sampling date/time			04/09/2019 07:45	02/09/2019 12:40
			B824050-A/1	B824050-A/2
			Results	Results
Total Organic Carbon (TOC)				
S023.02 - Total Organic Carbon by LECO				
Total Organic Carbon (TOC)^	0.01	%	0.51	1.1
Acid Sulphate Soil - Cr Reduci				
ENV274 - Acid Sulphate Soil - Cr Reducible Sulphur Suite				
Chromium Reducible Sulphur^	0.005	% S	---	0.400
pHkcl TAA^	0.1	pH Units	---	8.7
ANCE (Acid Neutralising Capacity)^	0.01	% CaCO3	---	3.80
Net Acid Soluble Sulpur^	0.02	% S	---	N/A
Acid trail Titratable Actual Acidity^	2	mol H+/t	---	<2.00
Sulfidic - TAA equiv^	0.02	% pyrite S	---	<0.00
Chromium Reducible Sulfur Acidity Units^	3	mol H+/t	---	250.00
Sulfur - KCl Extractable^	0.02	% S	---	N/A
HCl Extractable Sulfur^	0.02	% S	---	N/A
Net Acid Soluble Sulfur Acidity Units^	10	mol H+/t	---	N/A
Net Acid Soluble Sulfur Equiv S% Pyrite^	0.02	% S	---	N/A
Acid Neutralising Capacity Acid (ANCbt)^	2	mol H+/t	---	760.00
Acid Neutralising Capacity Equiv S%^	0.02	% S	---	1.20

Client	BMT WBM - QLD	Project ID	Sediment - B23621 Brisbane River
Certificate Number	B824050-A [R00]	Sampler	---
Page	4/5	Order Number	---

Analytical Results

Compound/Analyte	LOR	Units	B6_2C	B10_6C
Client Sample Description			B6_2C	B10_6C
Client Sampling date/time			04/09/2019 07:45	02/09/2019 12:40
			B824050-A/1	B824050-A/2
			Results	Results
Acid Sulphate Soil - Cr Reduci - Continued				
ENV274 - Acid Sulphate Soil - Cr Reducible Sulphur Suite - Continued				
ANC Fineness Factor^	---	factor	---	1.50
Net Acidity (Sulfur Units)^	0.02	% S	---	<0.02
Net Acidity (Acidity Units)^	10	mol H+/t	---	<10.00
Liming Rate^	1	kg CaCO3/t	---	<1.00
S004.09A Total Phosphorus				
S004.09 - Determination of Total Phosphorus				
Total Phosphorus^^	1	mg/kg	---	630
S004.03A Total Nitrogen				
S004.03 - Determination of Total Nitrogen				
Total Nitrogen^^	20	mg/kg	---	800
S004.08A NOx as N				
S004.08 - Determination of NOx as N				
NOx as N^^	0.1	mg/kg	---	<0.1
S004.04A TKN				
S004.04 - Determination of Total Kjeldahl Nitrogen				
Total Kjeldahl Nitrogen^^	20	mg/kg	---	<20

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Subcontract Laboratory.

Client	BMT WBM - QLD	**Project ID**	Sediment - B23621 Brisbane River
Certificate Number	B824050-A [R00]	**Sampler**	---
Page	5/5	**Order Number**	---

Symbio LABORATORIES Proudly AUSTRALIAN

Report Comments

Please note: Testing performed by an external subcontracted NATA certified Laboratory.
Accreditation No.: 1261(20794) Report No: 676204-S
Please note: Testing performed by an external subcontracted NATA certified Laboratory.
Accreditation No.: 1884 Report No: SAL27351
Please note: Total Organic Carbon Testing performed by an external subcontracted NATA certified Laboratory.
Accreditation No.: 14960 Report No:i5683

Symbio LABORATORIES

CERTIFICATE OF ANALYSIS

Certificate Number	B824050-B [R00]	**Page**	1/3
Client	BMT WBM - QLD	**Registering Laboratory**	Brisbane
Contact	Grace Bourke	**Contact**	Customer Service Team
Address	Level 8 200 Creek Street QLD 4000	**Address**	52 Brandl Street, Eight Mile Plains, QLD 4113
		Email	admin@symbiolabs.com.au
Telephone	07 3831 6744	**Telephone**	1300 703 166
Order Number	---	**Date Samples Received**	06/09/2019
Project ID	Sediment - B23621 Brisbane River	**Date Analysis Commenced**	06/09/2019
Sampler	---	**Issue Date**	01/10/2019
Client Job Reference	---	**Receipt Temperature (°C)**	9.3
Number of Samples Received	1	**Storage Temperature (°C)**	4
Number of Samples Analysed	Normal	**Quote Number**	---

Symbio LABORATORIES
Proudly AUSTRALIAN
ABN: 82 079 645 015

NATA
Accreditation No: 2455
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous revision with this reference. This document must not be reproduced, except in full. Water results are reported on an 'as received' basis. Soil and sediment results are reported on a 'dry weight' basis. For other matrices the basis of reporting will be confirmed in the 'Report Comments' section. Sampling was conducted by the customer and results pertain only to the samples submitted. Responsibility for representative sampling rests with the customer. Measurement Uncertainty is available upon request or via www.symbiolabs.com.au/login. If the laboratory was authorised to conduct testing on samples received outside specified conditions, results may be impacted depending on the nature of the deviation.

Definitions

| <: Less Than | >: Greater Than | RP: Result Pending | MPN: Most Probable Number | CFU: Colony Forming Units | ---: Not Received/Not Requested | NA: Not Applicable | ND: Not Detected | LOR: Level of Reporting | [NT]: Not Tested |

| ~: Estimated | ^ Subcontracted Analysis | TBA: To Be Advised | ** Potential Holding Time Concern | * Test not covered by NATA scope of accreditation | # Result derived from a calculation and includes results equal to or greater than the LOR |

Authorised By

Name	Position	Accreditation Category
QA Department	Symbio Laboratories QA Department	Subcontracted Analytical Testing

Client	BMT WBM - QLD	**Project ID**	Sediment - B23621 Brisbane River
Certificate Number	B824050-B [R00]	**Sampler**	---
Page	2/3	**Order Number**	---

Sample Information - *Client Supplied*

Sample ID	B824050-B/2
Sample Description	B10_6C
Sample Date/Time	02/09/2019 12:40
Sample Matrix	Sediment

Client	BMT WBM - QLD	**Project ID**	Sediment - B23621 Brisbane River
Certificate Number	B824050-B [R00]	**Sampler**	---
Page	3/3	**Order Number**	---

Analytical Results

		Client Sample Description	B10_6C
		Client Sampling date/time	02/09/2019 12:40
Compound/Analyte	**LOR**	**Units**	**B824050-B/2**
			Results
Radiation Analysis*			
S014.00 - Determination of Gross Alpha and Beta			
Gross Alpha* (including K-40 correction)^	0.08	Bq/g	0.20
Gross Beta* (including K-40 correction)^	0.25	Bq/g	0.55

Analysis Location

All in-house analysis was completed by Symbio Laboratories - Subcontract Laboratory.

Report Comments

Please note: Testing performed by an external subcontracted Laboratory.
Report No:ME311854

Appendix F Data Analysis by Dredge Zone

Table F-1 Zone 2 Summary Statistics

Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
Aluminium	50	0	n/a	Non-Parametric	14240	7560	16200	12493	13550
Arsenic	1	0	20	Non-Parametric	7.977	4.48	9.04	7.131	7.485
Cadmium	0.1	8	1.5	n/a	n/a	0.2	0.3	0.25	0.25
Chromium	1	0	80	Non-Parametric	34.02	19.6	37.3	30.44	31.8
Copper	1	0	65	Non-Parametric	36.17	12.2	45.3	29.83	30.9
Iron	50	0	n/a	Non-Parametric	35049	21600	37800	31610	33000
Lead	1	0	50	Non-Parametric	25.04	7.9	32	20.06	20.35
Mercury	0.01	0	0.15	Log Normal	0.247	0.04	0.63	0.131	0.075
Nickel	1	0	21	Non-Parametric	22.45	14.6	24.4	20.44	20.75
Phosphorus	2	0	n/a	Non-Parametric	897.7	400	892	691.8	731
Silver	0.1	3	1	Non-Parametric	0.326	0.05	0.6	0.175	0.15
Zinc	1	0	200	Non-Parametric	120.9	54	150	103.2	106.8
Moisture Content	1	0	n/a	Normal	59.29	34.5	64.1	53.1	56.55
Total Organic Carbon	0.02	0	n/a	Non-Parametric	1.033	0.23	1.33	0.817	0.935
Aldrin	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
alpha-BHC	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
beta-BHC	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
gamma-BHC (Lindane)	0.25	10	0.32	n/a	n/a	n/a	n/a	n/a	n/a
delta-BHC	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
cis-Chlordane	0.5	10	0.5	n/a	n/a	n/a	n/a	n/a	n/a
trans-Chlordane	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Data Analysis by Dredge Zone

Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
p-p'-DDD	0.5	8	2	n/a	n/a	3.224	5.053	4.138	4.138
p-p'-DDE	0.5	2	2.2	Log Normal	3.752	0.219	5.565	2.722	2.363
p-p'-DDT	0.5	10	1.6	n/a	n/a	n/a	n/a	n/a	n/a
Dieldrin	0.5	8	280	n/a	n/a	0.776	1.179	0.978	0.978
alpha-Endosulfan	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
beta-Endosulfan	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endosulfan Sulphate	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endrin	0.5	10	10	n/a	n/a	n/a	n/a	n/a	n/a
Endrin ketone	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endrin aldehyde	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Heptachlor	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Heptachlor epoxide	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hexachlorobenzene	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methoxychlor	0.5	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Monobutyltin as Sn	1	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dibutyltin as Sn	1	7	n/a	Non-Parametric	3.623	0.376	7.059	1.841	1.443
Tributlytin as Sn	0.5	0	n/a	Non-Parametric	19.06	0.632	43.04	6.454	1.978
TPH C6-C9	3	5	9	n/a	n/a	n/a	n/a	n/a	n/a
TPH C10-C14	3	2	n/a	Non-Parametric	7.81	1.415	9.302	4.643	4.211
TPH C15-C28	3	0	n/a	Non-Parametric	49.02	6.604	51.16	30.14	25.26
TPH C29-C36	5	0	n/a	Non-Parametric	38.37	5.66	46.74	24.04	21.05
Total TPH	n/a	5	550	Non-Parametric	93.77	13.68	103.3	58.81	50.53
Naphthalene	5	1	n/a	Non-Parametric	14.61	2.717	13.68	10.37	11.63

Data Analysis by Dredge Zone

Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
2-Methylnaphthalene	5	2	n/a	Non-Parametric	6.473	2.717	6.316	5.089	5.814
Acenaphthylene	4	0	n/a	Non-Parametric	21.37	6.522	25.26	14.99	14.12
Acenaphthene	4	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fluorene	4	1	n/a	Non-Parametric	6.693	4.651	7.059	5.824	5.66
Phenanthrene	4	0	n/a	Non-Parametric	29.39	20.93	29.35	26.15	27.36
Anthracene	4	0	n/a	Non-Parametric	18.44	9.783	20	14.6	15.09
Fluoranthene	4	0	n/a	Non-Parametric	75.75	58.14	82.11	67.22	66.04
Pyrene	4	0	n/a	Non-Parametric	92	60.87	96.84	77.63	73.58
Benz(a)anthracene	4	0	n/a	Non-Parametric	52.86	40	57.89	45.82	41.86
Chrysene	4	0	n/a	Non-Parametric	44.58	34.88	46.32	40.06	38.82
Indeno(1-2-3-cd)pyrene	4	0	n/a	Non-Parametric	46.41	28.26	49.47	38.38	35.85
Dibenz(a-h)anthracene	4	0	n/a	Non-Parametric	13.06	9.412	13.95	11.04	9.783
Benzo(g-h-i)perylene	4	0	n/a	Non-Parametric	67.31	35.87	72.09	52.83	46.23
Coronene	5	0	n/a	Non-Parametric	14.59	8.235	16.28	11.08	8.696
Benzo(e)pyrene	4	0	n/a	Non-Parametric	48.15	30.43	50.53	40.43	38.82
Perylene	4	0	n/a	Non-Parametric	290.5	96.74	368.2	185.4	153.8
Total PAHs (as above)	4	0	n/a	Non-Parametric	961.9	603.3	987.4	803.1	741.5
Total Kjeldahl Nitrogen	20	0	n/a	Non-Parametric	1474	680	1440	1180	1230
Total Nitrogen	20	0	n/a	Non-Parametric	1474	680	1440	1180	1230

Table F-2 Zone 3 Summary Statistics

Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
Aluminium	50	0	n/a	Non-Parametric	11538	5110	13500	10025	10400
Arsenic	1	0	20	Non-Parametric	7.946	3.13	8.72	7.06	6.99
Cadmium	0.1	9	1.5	n/a	n/a	0.1	0.1	0.1	0.1
Chromium	1	0	80	Non-Parametric	30.78	14.8	35.8	27.04	29.2
Copper	1	0	65	Non-Parametric	20.83	6.3	24.1	17.38	20.4
Iron	50	0	n/a	Non-Parametric	29775	13900	34100	26391	27400
Lead	1	0	50	Non-Parametric	12.83	3.8	15.6	10.58	11.3
Mercury	0.01	0	0.15	Non-Parametric	0.0709	0.02	0.09	0.0573	0.07
Nickel	1	0	21	Non-Parametric	20.1	9.2	24.2	17.71	18.4
Phosphorus	2	0	n/a	Non-Parametric	613.7	293	650	475.6	428
Silver	0.1	6	1	Non-Parametric	0.235	0.05	0.4	0.1	0.05
Zinc	1	0	200	Normal	81.02	28.1	97.7	68.8	74
Moisture Content	1	0	n/a	Non-Parametric	50.74	28.1	58.4	45.46	49.4
Total Organic Carbon	0.02	0	n/a	Normal	0.725	0.24	0.83	0.62	0.7
Aldrin	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
alpha-BHC	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
beta-BHC	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
gamma-BHC (Lindane)	0.25	11	0.32	n/a	n/a	n/a	n/a	n/a	n/a
delta-BHC	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
cis-Chlordane	0.5	11	0.5	n/a	n/a	n/a	n/a	n/a	n/a
trans-Chlordane	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
p-p'-DDD	0.5	11	2	n/a	n/a	n/a	n/a	n/a	n/a

Data Analysis by Dredge Zone

Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
p-p'-DDE	0.5	6	2.2	Log Normal	1.809	0.329	2.071	1.085	1.042
p-p'-DDT	0.5	11	1.6	n/a	n/a	n/a	n/a	n/a	n/a
Dieldrin	0.5	11	280	n/a	n/a	n/a	n/a	n/a	n/a
alpha-Endosulfan	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
beta-Endosulfan	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endosulfan Sulphate	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endrin	0.5	11	10	n/a	n/a	n/a	n/a	n/a	n/a
Endrin ketone	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endrin aldehyde	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Heptachlor	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Heptachlor epoxide	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hexachlorobenzene	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methoxychlor	0.5	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Monobutyltin as Sn	1	11	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dibutyltin as Sn	1	10	n/a	n/a	n/a	1.429	1.429	1.429	1.429
Tributlytin as Sn	0.5	5	n/a	Log Normal	10.35	0.301	20.31	2.586	0.759
TPH C6-C9	3	5	9	n/a	n/a	n/a	n/a	n/a	n/a
TPH C10-C14	3	2	n/a	Non-Parametric	8.464	2.143	9.375	5.542	5.714
TPH C15-C28	3	0	n/a	Non-Parametric	56.11	7.692	59.38	34.23	27.14
TPH C29-C36	5	1	n/a	Non-Parametric	58.9	4.808	68.75	33.92	22.86
Total TPH	n/a	5	550	Non-Parametric	123.1	15.38	137.5	73.69	55.71
Naphthalene	5	2	n/a	Non-Parametric	18.64	4.808	18.99	12.61	12.86
2-Methylnaphthalene	5	3	n/a	Non-Parametric	9.565	3.571	10.13	6.978	7.813

Data Analysis by Dredge Zone

Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
Acenaphthylene	4	1	n/a	Non-Parametric	32.41	3.846	43.04	17.93	15.63
Acenaphthene	4	4	n/a	n/a	n/a	12.66	12.66	12.66	12.66
Fluorene	4	3	n/a	Non-Parametric	11.7	3.571	15.19	7.2	6.25
Phenanthrene	4	1	n/a	Non-Parametric	60.38	3.846	75.95	32.23	17.14
Anthracene	4	2	n/a	Non-Parametric	28.32	3.846	35.44	15.68	10
Fluoranthene	4	1	n/a	Non-Parametric	151.3	3.846	189.9	84.39	62.5
Pyrene	4	1	n/a	Non-Parametric	163.4	3.846	201.3	93.27	81.25
Benz(a)anthracene	4	1	n/a	Non-Parametric	98.37	3.846	113.9	55.29	34.38
Chrysene	4	1	n/a	Non-Parametric	80.45	3.846	93.67	46.32	31.43
Indeno(1-2-3-cd)pyrene	4	1	n/a	Non-Parametric	84.1	3.846	100	48.66	43.75
Dibenz(a-h)anthracene	4	2	n/a	Non-Parametric	22.92	3.571	25.32	13.73	17.14
Benzo(g-h-i)perylene	4	1	n/a	Non-Parametric	102.9	3.846	122.8	58.36	43.75
Coronene	5	2	n/a	Non-Parametric	22.42	4.808	26.58	13.55	8.571
Benzo(e)pyrene	4	1	n/a	Non-Parametric	72.1	3.846	83.54	41.73	31.25
Perylene	4	0	n/a	Non-Parametric	553.4	100	584.3	345.2	338.5
Total PAHs (as above)	4	0	n/a	Non-Parametric	1698	338.5	2089	1058	1019
Total Kjeldahl Nitrogen	20	0	n/a	Non-Parametric	1115	470	1110	876	900
Total Nitrogen	20	0	n/a	Non-Parametric	1115	470	1110	876	900

Table F-3 Zone 4 Summary Statistics

Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
Aluminium	50	0	n/a	Non-Parametric	13218	5600	14600	10676	11100
Arsenic	1	0	20	Non-Parametric	8.83	4.1	9.38	7.387	7.41
Cadmium	0.1	6	1.5	n/a	n/a	0.1	0.1	0.1	0.1
Chromium	1	0	80	Non-Parametric	30.57	15	32.8	25.33	28
Copper	1	0	65	Log Normal	17.88	6.8	20.1	14.23	16
Iron	50	0	n/a	Non-Parametric	32627	14800	35100	27057	29600
Lead	1	0	50	Non-Parametric	16.84	5.7	21	13.26	13.7
Mercury	0.01	0	0.15	Non-Parametric	0.0823	0.02	0.12	0.0586	0.06
Nickel	1	0	21	Log Normal	18.73	9.2	19.7	15.77	16.5
Phosphorus	2	0	n/a	n/a	n/a	415	602	508.5	508.5
Silver	0.1	6	1	n/a	n/a	0.2	0.2	0.2	0.2
Zinc	1	0	200	Non-Parametric	89.22	29.9	124	67.11	63.1
Moisture Content	1	0	n/a	Non-Parametric	53.79	32.3	58.8	46.39	47.6
Total Organic Carbon	0.02	0	n/a	Non-Parametric	0.815	0.31	0.95	0.63	0.6
Aldrin	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
alpha-BHC	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
beta-BHC	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
gamma-BHC (Lindane)	0.25	7	0.32	n/a	n/a	n/a	n/a	n/a	n/a
delta-BHC	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
cis-Chlordane	0.5	7	0.5	n/a	n/a	n/a	n/a	n/a	n/a
trans-Chlordane	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
p-p'-DDD	0.5	7	2	n/a	n/a	n/a	n/a	n/a	n/a

Data Analysis by Dredge Zone

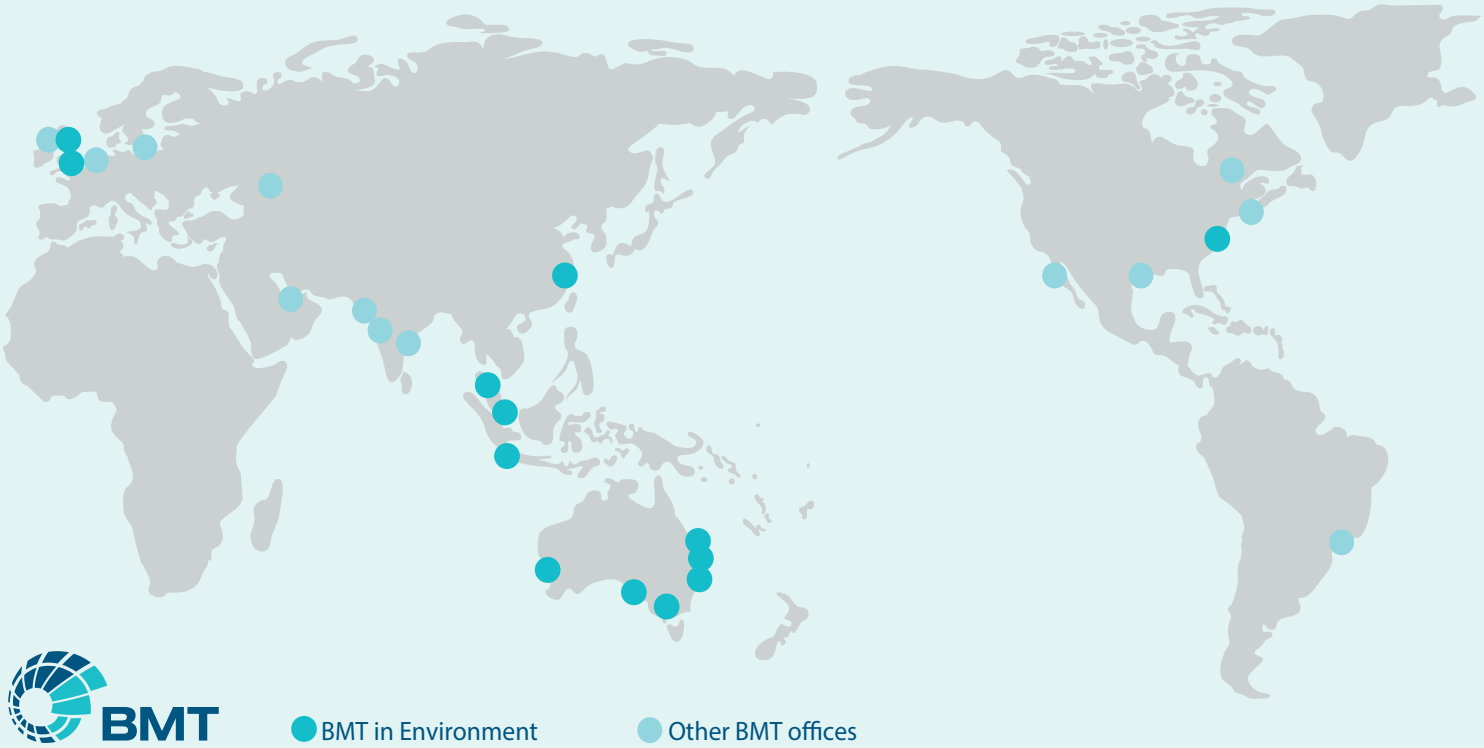
Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
p-p'-DDE	0.5	5	2.2	Non-Parametric	4.237	0.263	2.581	1.032	0.568
p-p'-DDT	0.5	7	1.6	n/a	n/a	n/a	n/a	n/a	n/a
Dieldrin	0.5	7	280	n/a	n/a	n/a	n/a	n/a	n/a
alpha-Endosulfan	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
beta-Endosulfan	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endosulfan Sulphate	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endrin	0.5	7	10	n/a	n/a	n/a	n/a	n/a	n/a
Endrin ketone	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Endrin aldehyde	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Heptachlor	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Heptachlor epoxide	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hexachlorobenzene	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methoxychlor	0.5	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Monobutyltin as Sn	1	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dibutyltin as Sn	1	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tributlytin as Sn	0.5	5	n/a	Non-Parametric	0.726	0.263	0.833	0.564	0.581
TPH C6-C9	3	2	9	n/a	n/a	n/a	n/a	n/a	n/a
TPH C10-C14	3	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TPH C15-C28	3	1	n/a	n/a	n/a	1.579	32.26	16.92	16.92
TPH C29-C36	5	1	n/a	n/a	n/a	2.632	25.81	14.22	14.22
Total TPH	n/a	2	550	n/a	n/a	4.211	58.06	31.14	31.14
Naphthalene	5	0	n/a	n/a	n/a	9.474	32.26	20.87	20.87
2-Methylnaphthalene	5	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Data Analysis by Dredge Zone

Parameter	LOR	No. of Non-Detects	Screening Level	Distribution	95% UCL	min	max	mean	median
Acenaphthylene	4	0	n/a	n/a	n/a	10.53	32.26	21.39	21.39
Acenaphthene	4	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fluorene	4	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phenanthrene	4	0	n/a	n/a	n/a	31.58	90.32	60.95	60.95
Anthracene	4	0	n/a	n/a	n/a	15.79	38.71	27.25	27.25
Fluoranthene	4	0	n/a	n/a	n/a	71.58	235.5	153.5	153.5
Pyrene	4	0	n/a	n/a	n/a	85.26	238.7	162	162
Benz(a)anthracene	4	0	n/a	n/a	n/a	31.58	129	80.31	80.31
Chrysene	4	0	n/a	n/a	n/a	29.47	119.4	74.41	74.41
Indeno(1-2-3-cd)pyrene	4	0	n/a	n/a	n/a	24.21	96.77	60.49	60.49
Dibenz(a-h)anthracene	4	0	n/a	n/a	n/a	6.316	25.81	16.06	16.06
Benzo(g-h-i)perylene	4	0	n/a	n/a	n/a	31.58	122.6	77.08	77.08
Coronene	5	0	n/a	n/a	n/a	6.316	25.81	16.06	16.06
Benzo(e)pyrene	4	0	n/a	n/a	n/a	24.21	100	62.11	62.11
Perylene	4	0	n/a	n/a	n/a	58.95	229	144	144
Total PAHs (as above)	4	0	n/a	n/a	n/a	540	1932	1236	1236
Total Kjeldahl Nitrogen	20	0	n/a	n/a	n/a	690	1180	935	935
Total Nitrogen	20	0	n/a	n/a	n/a	690	1180	935	935

BMT has a proven record in addressing today's engineering and environmental issues.

Our dedication to developing innovative approaches and solutions enhances our ability to meet our client's most challenging needs.



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