REPORT

Western Harbour Tunnel Sampling and Analysis Plan (SAP) Implementation Report

Client: Transport for NSW

Reference: PA1694-SAP IR
Status: 01/S0
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Table of Contents

Tables

Figures

Appendices

1 Introduction

The Greater Sydney Commission's *Greater Sydney Region Plan – A Metropolis of Three Cities* (Greater Sydney Commission, 2018) proposes a vision of three cities where most residents have convenient and easy access to jobs, education and health facilities and services. In addition to this plan, and to accommodate for Sydney's future growth the NSW Government is implementing the *Future Transport Strategy 2056* (Transport for NSW, 2018), a plan that sets the 40 year vision, directions and outcomes framework for customer mobility in NSW. The Western Harbour Tunnel and Beaches Link (WHTBL) program of works is proposed to provide additional road network capacity across Sydney Harbour and to improve transport connectivity with Sydney's northern beaches. The Western Harbour Tunnel and Beaches Link program of works include:

- The Western Harbour Tunnel and Warringah Freeway Upgrade project (WHT project) which comprises a new tolled motorway tunnel connection across Sydney Harbour, and an upgrade of the Warringah Freeway to integrate the new motorway infrastructure with the existing road network and to connect to the Beaches Link and Gore Hill Freeway Connection project
- The Beaches Link and Gore Hill Freeway Connection project (BL project) which comprises a new tolled motorway tunnel connection across Middle Harbour from the Warringah Freeway and Gore Hill Freeway to Balgowlah and Killarney Heights and including the surface upgrade of Wakehurst Parkway from Seaforth to Frenchs Forest and upgrade and integration works to connect to the Gore Hill Freeway at Artarmon.

A combined delivery of the WHTBL program of works would unlock a range of benefits for freight, public transport and private vehicle users. It would support faster travel times for journeys between the Northern Beaches and south, west and north-west of Sydney Harbour. Delivering the program of works would also improve the resilience of the motorway network, given that each project provides an alternative to heavily congested harbour crossings.

The preferred option for both crossings is an Immersed Tube Tunnel (IMT) which involves capital dredging and management of the dredged material. Key features of the WHT component of the program of works are provided in **Figure 1**.

In accordance with the *National Assessment Guidelines for Dredging* (2009), development and implementation of a Sampling and Analysis Plan (SAP) was required in order to assess the suitability of the dredged material for sea disposal. The SAP was reviewed and approved by the Department of the Environment and Energy (DoEE) in July 2018. A copy of the approved SAP is included in **Appendix A**. This report outlines the results and findings of the implemented SAP for sediment investigations within the dredge footprint. Please note that the findings of more recent (2019) investigations of the proposed dredge material carried out at the Waverton side of the dredge footprint will be included in subsequent reporting, and is not discussed herein. The dredge material at the Waverton side is subject to further consideration and discussion with DoEE with regard to dioxins, and does not form part of this SAP Implementation Plan and associated permit application.

The SAP for the WHT project was prepared and implemented by Royal HaskoningDHV (RHDHV) on behalf of Transport for NSW (TfNSW) (formerly Roads and Maritime Services) and was undertaken with regard to the recommendations as outlined in the relevant guidance documents:

- Commonwealth of Australia *National Assessment Guidelines for Dredging* (the NAGD)

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

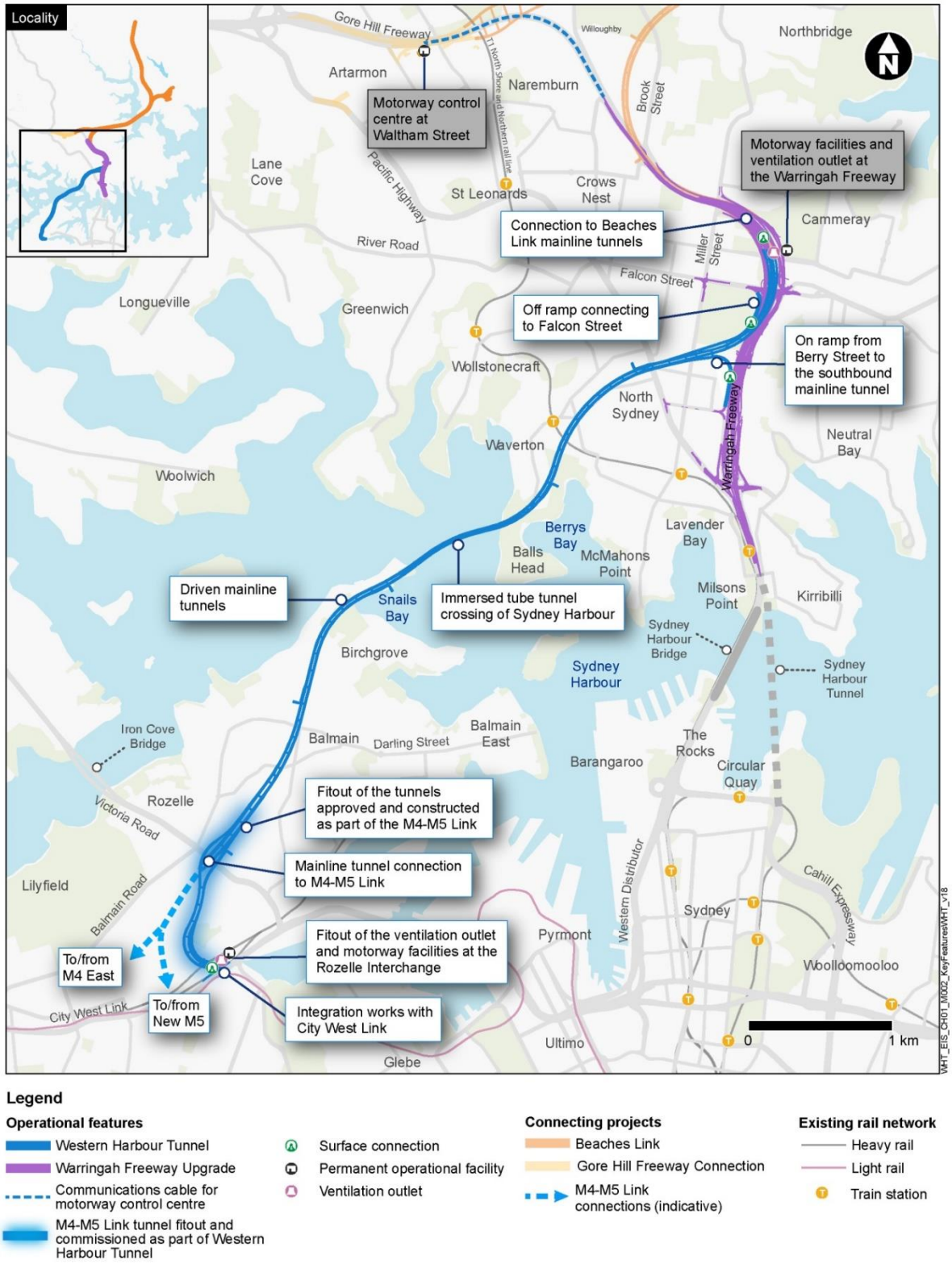

Figure 1 Key features of the Western Harbour Tunnel component of the program of works

1.1 Site Description

The WHT site is located within Port Jackson, which is a drowned river valley formed during a period of natural sea level rise approximately 10,000 years ago. The proposed WHT IMT crossing is located in Sydney Harbour, which is the western branch of Port Jackson, approximately 2 km to the north-west of the Sydney Central Business District (CBD). The IMT alignment and dredge footprint is shown on **Figure 2**.

The proposed WHT alignment involves a 630 m long underwater crossing. The sea bed level along the WHT tunnel alignment is approximately 15 m below Australian Height Datum (AHD).

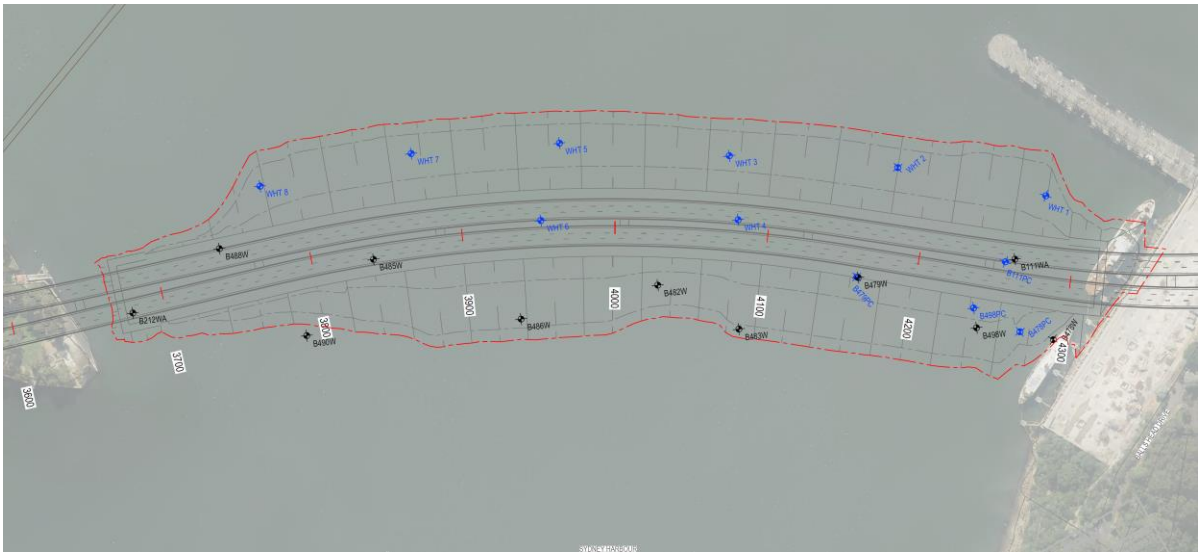

Figure 2 WHT Alignment and Dredge Footprint

1.2 Objectives

Elevated concentrations of copper, lead, mercury, silver, zinc and DDE were observed in sediment quality investigations for the WHTBL project undertaken in 2017 (Golder-Douglas 2017). In addition to the observed contaminants, there has been an adjustment of the IMT alignment for the WHT project since completion of the 2017 sediment quality investigations. The change to the IMT alignment, and corresponding change to the dredge footprint, has resulted in a number of the previous sampling locations now falling outside the dredge footprint. Additional sampling was therefore required to provide sufficient spatial coverage of the footprint and meet the minimum number of sample locations as prescribed by the NAGD.

The objectives of the investigations were to:

- Provide better spatial coverage of the dredge footprint due to the change in IMT alignment and hence the change in dredge footprint
- Meet the minimum number of sample locations as prescribed by the NAGD
- Confirm the observed decrease in contamination with depth in the portion of the dredge footprint not yet sampled
- Recover sufficient volume of sediment representative of the dredge material for use in elutriate and bioavailability testing (Phase III testing in accordance with the NAGD).

2 Methodology

2.1 Sample Locations

Sampling locations were selected based on a judgemental sampling pattern rather than the usual random sampling pattern as an objective of the investigation was to provide better spatial coverage of the dredge footprint by targeting areas not previously sampled. Sampling was undertaken at each location in 0.5m depth increments to the maximum depth of expected contamination (1.5m).

The number and location of samples was determined in accordance with the NAGD. For a volume of 142,500 m^3 of potentially contaminated material, the NAGD recommends sampling at twenty locations. As twelve locations from the Golder-Douglas (2017) investigations fell within the dredge footprint, an additional eight locations were sampled.

Four locations previously sampled as part of the Golder-Douglas work were re-sampled due to the high contaminant concentrations that had been found during the investigations (95% upper confidence limit (UCL) of the mean concentrations observed). These locations were considered likely to have contamination concentrations representative of the dredge material and be suitable for Phase III testing. At these locations, a single composite sample to the previously observed maximum depth of contamination was recovered.

The sampling locations within the WHT dredge footprint are shown on **Figure 3**. The sampling location coordinates are presented in **Table 1**. All sampling locations were within +/- 5 m of the locations proposed in the SAP (RHDHV 2018) except for location B478 which was relocated 20 m to the west due to repeated core refusal on gravels.

Table 1 WHT Sample Location Coordinates (GDA94 MGA56)

Location ID	Easting	Northing
WHT 1	332778	6253698
WHT 2	332682	6253676
WHT 3	332578	6253639
WHT 4	332600	6253603
WHT 5	332473	6253602
WHT 6	332482	6253551
WHT 7	332387	6253557
WHT 8	332305	6253498
B111WA	332771	6253648
B478W	332798	6253610
B498W	332764	6253612
B479W	332686	6253600

Figure 3 WHT Sample Locations

2.2 Sample Collection

Sampling was undertaken on 21 to 23 May 2018. Recovery of all cores was undertaken by Geochemical Assessments Pty Ltd (GA) from their work boat (refer **Photo 1**). RHDHV environmental scientist/engineers supervised the fieldwork and completed all sub sampling from the cores.

An onboard GPS was used to position the sampling vessel at the nominated sampling locations.

Prior to sampling, all equipment was thoroughly inspected and washed down. Any evident sources of contamination were cleaned.

A combination of vibrocoring and piston coring was undertaken. The vibrocoring was undertaken using a Rossfelder P3 Vibrocore with 50 mm stainless steel core tubes. Vibrocores were driven until refusal. The push cores process involved manually pushing a stainless steel core tube into the sediment until refusal. Sampling dates, time, water depth and depth of core penetration were recorded. Cores were sampled and tested for the contaminants of potential concern (CoPC) at 0.5m depth increments to the maximum depth of expected contamination (1.5m), below which a single composite sample was taken.

Photo 1 Geochemical Assessments Pty Ltd (GA) work boat

2.3 Sample Processing

Subsampling was undertaken using nitrile gloves and decontaminated stainless steel equipment. Specific decontamination procedures were also followed for the sampling of potentially dioxin contaminated material. This involved:

- No plastic components coming in contact with the sediment.
- Teflon liners on jar lids were removed and replaced with food grade aluminium.
- All sampling equipment was "rinsed" with n-hexane.

Sampling dates, time, water depth and depth of core penetration were recorded. The cores were extruded, logged, photographed and subsampled on the vessel following recovery. Repeat cores were recovered until sufficient sample volume was obtained. Copies of the core logs are included in **Appendix B**.

Samples for analysis of volatile compounds were not mixed and were recovered at the mid-point of each half metre core section in suitable containers with zero headspace.

Each jar/bag was filled with zero headspace and tightly sealed to avoid loss of sample. To avoid cross contamination, the outside of each sample container was washed with harbour water after sealing.

Three, 20L samples of sea water were also collected in plastic drums for elutriate testing. Clean seawater was collected at a location outside Sydney Heads (i.e. outside the Harbour) to provide samples representative of the spoil ground. All sample handling surfaces were kept clean. A discrete open water sampler was used to eliminate contamination from sample handling.

All samples were clearly labelled with unique sample identification numbers and packed in ice in an esky immediately after sampling to maintain the temperature below 4°C. Samples were then submitted to the analytical laboratory on the same day or the following morning under chain of custody procedures.

2.4 Sediment Analysis

2.4.1 Physical Analysis

Physical testing comprised wet and dry sieving of composite samples. Particle size distribution by sieve analysis was undertaken to determine the percentage of gravel, sand, and silt plus clay (mud).

2.4.2 Chemical Analysis

Chemical testing was undertaken by the National Association of Testing Authorities (NATA) registered Symbio Laboratory. The third spilt triplicate sample was submitted to a secondary NATA accredited laboratory. Both laboratories used the chemical analysis methods listed in the table below and are NATA accredited for these methods. PCDD/F analysis was undertaken by Assure Quality in New Zealand.

Chemical testing of the sediment sample included a suite of heavy metals, total organic carbon (TOC), tributyl-tin (TBT), total petroleum hydrocarbons (TPHs), polyaromatic hydrocarbons (PAHs), organochlorine (OC) pesticides and polychlorinated dibenzo-p-dioxins and furans (PCDD/F).

Elutriate and Bioavailability Testing (Phase III)
Bioavailability testing via dilute acid extraction (DAE) for metals was undertaken to give an indication of the in-situ bioavailability of contaminants in the sediment following sea disposal. If DAE concentrations exceed NAGD screening levels, the metals may be bioavailable.

Mercury is one of only a few elements that may bioaccumulate. Analysis for inorganic and organic Hg was undertaken with determination of methylmercury (MeHg).

Acid volatile sulphide (AVS) and simultaneously extracted metals (SEM) was also undertaken as a further bioavailability test recommended by the NAGD, suitable for metals. If AVS is in excess of SEM, on a molar basis, then it is assumed that the metals are unlikely to be bioavailable. This procedure is only useful for a few metals, principally silver, cadmium, copper, nickel, lead and zinc. Analyses of AVS was also used to assess bioavailability of mercury, as in sediments with significant AVS much of the Hg would be as HgS, which is insoluble.

Elutriate testing was undertaken to assess the effect of dissolved contaminants in the water column during dredging and disposal.

In summary the Phase III testing involved the following:

- DAE of metals
- Mercury speciation
- AVS/SEM testing
- Elutriate testing.

2.4.3 QA/QC Analyses

The following field QA/QC samples were analysed:

- Field triplicates: Triplicate samples (comprising three samples taken from one location) was analysed and used to give an indication of the variability in the chemical properties of the sediment at a sample location.
- Split triplicates: At one location, a split triplicate sample was taken with two of the samples submitted to the primary laboratory and the third sample submitted to the secondary laboratory for geochemical analysis. The split triplicate results were analysed to assess variability in sub-sampling.
- Rinsate sample: One rinsate sample per day from the equipment used in homogenising the sediment samples was submitted to assess if the decontamination of the equipment between samples was effective.
- Field blank: One bank was submitted and analysed with the samples to assess the potential for cross contamination during sample handling, storage and transport.

2.4.4 Statistical Analysis

Results for organics were normalised to 1% TOC (within limits of 0.2 to 10% TOC). Results for each contaminant were statistically analysed to calculate the mean, standard deviation and the 95% UCL of the mean concentration of each analyte. Where concentrations were below the laboratory detection limit, a value of half the detection limit was used in the statistical analysis of the results. The USEPA's ProUCL software was used to calculate the 95% UCL of the mean concentration.

The individual results and the 95% UCL of the mean concentration of each contaminant were compared to the screening levels provided in Appendix A, Table 2 of the NAGD.

3 Findings of the Investigation

3.1 Sediment Physical Characteristics

Sediment from within the Birchgrove end of the dredge area (cores WHT3 to WHT8) was observed to comprise a thin layer of grey brown silty sand with shell overlying stiff orange brown clay (refer **Photo 2**). At the Waverton end of the dredge area (cores B478, B499, WHT1, WHT2) the sediment comprised a brown grey sandy mud which became firmer with depth (refer **Photo 2**). The results of the physical analysis of representative samples of the sediments are shown in **Table 2**.

Table 2 Sediment Textural Properties

Sample ID	% MUD	% SAND	% GRAVEL
	(< 63µm)	(63µm – 2mm)	(> 2mm)
Grey brown silty sand with shell			
WHT3 0-0.6	26.4	62.2	11.5
WHT4 0-0.8	17.8	78	4.2
WHT6 0-0.44	21.1	70.5	8.5
B479	23	76.5	0.5
Stiff orange brown clay			
WHT4 0.8-1.2	31.8	67.5	0.6
WHT3 0.6-1.12	16.2	82.8	0.9
Brown grey sandy mud			
B478	63.3	35.9	0.7
B499W	79.1	20.9	0.1

Photo 2 Grey brown silty sand with shell overlying stiff orange brown clay observed at Birchgrove end of the dredge area (core WHT5)

Photo 3 Brown grey sandy mud at the Waverton end of the dredge area (core WHT2)

The thickness of the grey brown silty sand overlying the stiff orange brown clay increased along the alignment from Birchgrove towards Waverton. The thickness of the grey brown silty sand (or depth from the bed level to the top of the underlying stiff orange clay) is summarised in **Table 3**.

Table 3 Thickness of grey brown silty sand overlying grey brown silty sand from Birchgrove to Waverton

ID	Thickness of unconsolidated material - grey brown silty sand (m)
WHT 8	0.40
WHT 7	0.10
WHT 6	0.44
WHT 5	0.40
WHT 4	0.80
WHT 3	1.00
B478PC	2.06

3.2 Sediment Chemical Characteristics

Laboratory reports for all chemical analysis are provided in **Appendix C**. A discussion of the contaminant concentrations in the sediments in comparison to the NAGD (2009) and NSW EPA Waste Classification Guidelines (2014) is provided below.

It should be noted that there is no NAGD screening level for dioxins. Expert advice has been sought on dioxins for this project from Therese Manning of Environmental Risk Services Pty Ltd (EnRiskS). Following a review of background information and initial consultation with DoEE, the probable effect level adopted by the Canadian Council of Ministers of the Environment (CCME) in *the Canadian sediment quality guidelines for the protection of aquatic life: Polychlorinated dioxins and furan* (PCDD/Fs) (CCME 2001) was considered by EnRiskS at this point in time to be the most appropriate international guideline to use as a screening level for the suitability material for unconfined sea disposal. Further consideration of international guidelines and discussions with DoEE will be undertaken on this matter to confirm an appropriate and suitable limit on dioxin levels for unconfined sea disposal of dredged material from the project.

3.2.1 Phase II Sediment Contaminant Concentrations

The individual results of each contaminant were compared to the screening levels (SL) provided in Appendix A, Table 2 of the NAGD (2009) and specific contaminant concentrations (SCC) provided in the NSW EPA Waste Classification Guidelines (2014). A summary of the 95% UCL of the mean concentrations is provided in **Table 4** and shown on **Figure 4**.

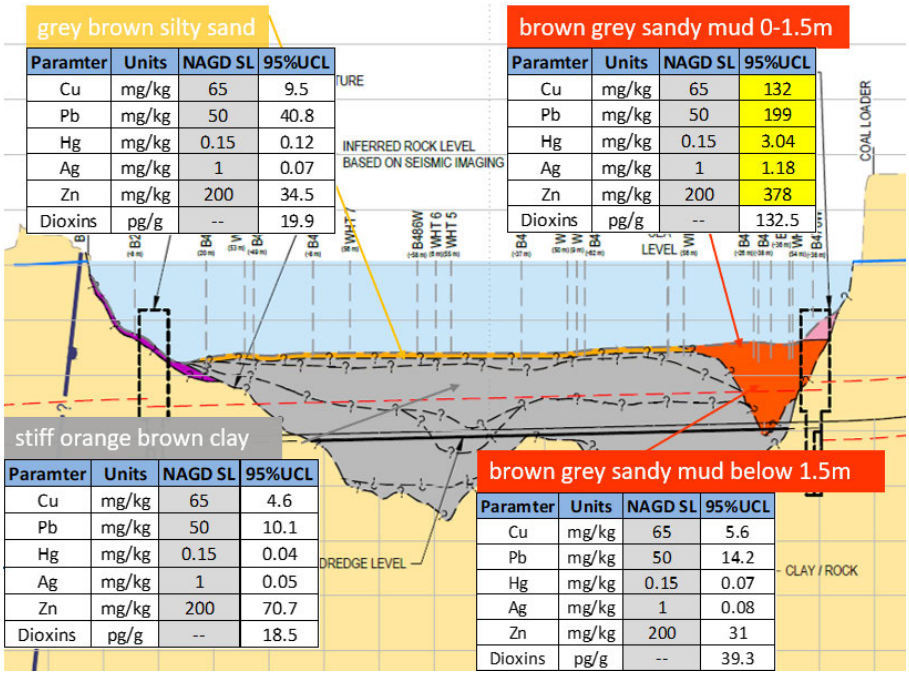

Figure 4 WHT Summary of material types and findings

The data from the Golder-Douglas (2017) investigations for locations that fall within the dredge footprint was combined with the results from this investigation. Statistical analysis of the data has been undertaken for the following material types observed within the dredge footprint:

- layer of grey brown silty sand with shell at the Birchgrove side of the dredge area
- underlying stiff orange brown clay at the Birchgrove side of the dredge area
- brown grey sandy mud 0-1.5 m below the harbour bed at the Waverton side of the dredge area
- brown grey sandy mud greater than 1.5 m below the harbour bed at the Waverton side of the dredge area.

For all material types the 95% UCL of the mean concentrations of TBT, cadmium, chromium, nickel, TPH, OC Pesticides and PAHs were below laboratory detection or below NAGD screening levels.

For the layer of grey brown silty sand at the Birchgrove side of the dredge area the 95% UCL of the mean concentrations of copper, lead, zinc, mercury and silver were also below NAGD screening levels. The arithmetic mean and 95% UCL of the mean concentration of dioxins was 17.0 pg/g and 19.9 pg/g respectively which is below the CCME (2001) probable effects level of 21.5 pg/g.

For the underlying stiff orange brown clay at the Birchgrove side of the dredge area the 95% UCL of the mean concentrations of copper, lead, zinc, mercury and silver were all also below NAGD screening levels. The arithmetic mean and 95% UCL of the mean concentration of dioxins was 13.8 pg/g and 18.5 pg/g respectively which is below the CCME (2001) probable effects level of 21.5 pg/g.

For the brown grey sandy mud greater than 1.5 m below the harbour bed at the Waverton side of the dredge area the 95% UCL of the mean concentrations of copper, lead, zinc, mercury and silver were all also below NAGD screening levels. The arithmetic mean and 95% UCL of the mean concentration of dioxins was 23.9 pg/g and 39.3 pg/g respectively which exceeds the CCME (2001) probable effects level.

For the brown grey sandy mud 0-1.5 m below the harbour bed at the Waverton side of the dredge area the 95% UCL of the mean concentrations of copper, lead, zinc, mercury and silver all exceeded the NAGD screening levels triggering the need for Phase III testing (refer **Section 3.2.2**). The arithmetic mean and 95% UCL of the mean concentration of dioxins was 78.6 pg/g and 132.5 pg/g respectively which exceeds the CCME (2001) probable effects level.

In addition, for the brown grey sandy mud 0-1.5 m below harbour bed, the concentrations of lead and benzo(a)pyrene exceeded the specific contaminant concentration (SCC) for waste classification without toxicity characteristics leaching procedure (TCLP) testing. These exceedances triggered the need for TCLP testing to allow a final waste classification (refer **Section 3.2.3**).

The data from the 2017 investigations for locations that fall within the dredge footprint was combined with the results from this investigation. Statistical analysis of the data has been undertaken for the following material types observed within dredge footprint.

Table 4 Summary of the 95% UCL of the mean concentrations

WHT Sediment						
			grey brown silty sand with shell at the Birchgrove side of the dredge area	stiff orange brown clay at the Birchgrove side of the dredge area	brown grey sandy mud 0-1.5 m below the harbour bed at the Waverton side of the dredge area	brown grey sandy mud greater than 1.5 m below the harbour bed at the Waverton side of the dredge area
Parameter	Units	NAGD SL	95% UCL of MEAN	95% UCL of MEAN	95% UCL of MEAN	95% UCL of MEAN
Tributyltin*	ug/kg	9	5.43	5.00	3.38	1.01
Arsenic	mg/kg	20	10.98	6.60	21.45	16.1
Cadmium	mg/kg	1.5	0.08	13.18	0.23	0.19
Chromium	mg/kg	80	14.49	<0.1	55.69	24.43
Copper	mg/kg	65	9.49	4.57	132.3	5.59
Lead	mg/kg	50	40.82	10.09	199.3	14.22
Mercury	mg/kg	0.15	0.12	0.04	3.04	0.07
Nickel	mg/kg	21	3.49	1.98	15.24	8.96
Silver	mg/kg	1	0.065	<0.1	1.18	0.07
Zinc	mg/kg	200	35	71	378	179.8
TPH*	mg/kg	550	114.9	131.6	216.6	35.6
DDD*	mg/kg	0.002	<0.001	<0.001	<0.001	<0.001
DDE*	mg/kg	0.0022	<0.001	<0.001	<0.001	<0.001
DDT*	mg/kg	0.0016	<0.001	<0.001	<0.001	<0.001
Total PAH*	mg/kg	10	2.63	3.27	6.79	0.25
PCDD/Fs Total TEQ WHO-TEQ2 (0.5 LOR)	pg/g	--	19.9 (arithmetic mean 17.0)	18.5 (arithmetic mean 13.8)	132.5 (arithmetic mean 78.6)	39.3 (arithmetic mean 23.9)

* normalised to 1% TOC

3.2.2 Phase III Testing

Samples representative of the brown grey sandy mud 0-1.5 m below the harbour bed at the Waverton side of the dredge area were selected for the Phase III testing i.e. samples with concentrations of heavy metals

and dioxins as close as possible to the 95% UCL of the mean sediment concentration as determined from the Phase II testing. As noted in **Section 2.4.2**, Phase III testing involved the following:

- DAE of metals
- Mercury speciation
- AVS/SEM testing
- Elutriate testing.

The results of the Phase III testing are shown in **Table 5**, **Table 6** and **Table 7**.

Table 5 DAE and mercury speciation results

	Copper		Lead		Zinc		Silver		Arsenic		Mercury		
	total	DAE	total	DAE	total	DAE	total	DAE	total	DAE	total	DAE	Organic Mercury (as Methyl Hg)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
GUIDELINE	SL 65	SL 65	SL 50	SL 50	SL 200	SL 200	SL 1	SL 1	SL 20	SL 20	SL 0.15	SL 0.15	
WHT 1 0-0.5	140	22	250	250	490	450	1	0.26	19	3.8	3	0.052	-
WHT 1 0.5-1.0	130	99	240	260	490	530	1.1	0.41	22	6.4	3.3	0.064	-
WHT 1 1.1-1.8	130	100	290	310	510	530	1.1	0.25	28	6.1	5.2	0.061	<0.010
WHT 2 0-0.5	130	97	220	250	440	480	0.91	0.34	18	4.6	2.9	0.059	
WHT 2 0.5-1.0	66	33	82	86	160	160	1.8	0.19	26	3.3	1.3	0.056	<0.010
WHT 4 0-0.8	9.7	9.5	23	21	40	37	<0.1	<0.1	7.8	1.9	0.15	0.061	-
WHT 5 0-0.4	24	21	48	48	90	88	0.16	<0.1	7.1	2.2	0.45	0.058	-
WHT 6 0-0.44	18	11	190	140	75	69	<0.1	<0.1	12	3.2	0.35	0.044	<0.010
BIIIPC	120	89	220	220	420	400	1.1	0.3	23	5.9	3.5	0.056	<0.010
B498PC	100	94	230	240	430	430	0.98	0.35	22	5.6	3.7	0.064	-
B478PC	98	67	200	210	340	340	0.89	0.15	21	4.7	3.5	0.056	<0.010

Table 6 AVS and SEM results

	AVS	SEM Cu	SEM Pb	SEM Zn	SEM Ag	SEM Hg	Total SEM	SEM-AVS
	µmole/g dry weight							
GUIDELINE								NAGD <1
WHT 1 0-0.5	-	-	-	-	-	-	-	-
WHT 1 0.5-1.0	-	-	-	-	-	-	-	-
WHT 1 1.1-1.8	20	1.4	1.2	6.3	<0.05	<0.05	8.9	-11.1
WHT 2 0-0.5	-	-					-	-
WHT 2 0.5-1.0	3.2	0.43	0.36	2	<0.05	<0.05	2.8	-0.4
WHT 4 0-0.8	-	-	-	-	-	-	-	-
WHT 5 0-0.4	-	-	-	-	-	-	-	-
WHT 6 0-0.44	4	0.09	1.4	1	<0.05	<0.05	2.5	-1.5
BIIIPC	19	1.5	1.4	6.7	<0.05	<0.05	9.6	-9.4
B498PC	-	-	-	-	-	-	-	-
B478PC	20	0.79	0.95	4.9	<0.05	<0.05	6.7	-13.3

Table 7 Elutriate results

	Copper	Lead	Zinc	Silver	Mercury	Total TCDD
	µg/L	µg/L	µg/L	µg/L	µg/L	pg/L
GUIDELINE	ANZG 95% Species Protection					
	1.3	4.4	15	--	0.4	-
WHT 1 0-0.5	-					-
WHT 1 0.5-1.0	-					-
WHT 1 1.1-1.8	<0.1	2.5	<1	<1	<0.1	26.3
WHT 2 0-0.5	-			-	-	
WHT 2 0.5-1.0	<0.1	0.7	5	<1	<0.1	9.08
WHT 4 0-0.8	-			-	-	-
WHT 5 0-0.4	-			-	-	-
WHT 6 0-0.44	<0.1	3.1	<1	<1	<0.1	4.18
BIIIPC	<0.1	0.6	<1	<1	<0.1	19.6
B498PC	-			-	-	
B478PC	<0.1	<0.1	<1	<1	<0.1	12.6

Bioavailability Testing Results

Dilute acid extraction testing of heavy metals (DAE) for all total recoverable metals (TRM) that exceeded the NAGD SL (copper, lead, silver, arsenic, mercury, zinc) was undertaken. Although not equivalent to the bioavailable fraction, DAE gives a closer approximation to it than total metal sediment data and provides a guide to bioavailability.

The results (**Table 5**) show that the silver, arsenic and mercury DAE concentrations are all below SL. Silver, arsenic and mercury are therefore unlikely to be bioavailable. However, DAE concentrations of copper, lead and zinc exceeded the SL indicating they may be bioavailable.

Mercury is one of only a few elements that may bioaccumulate. Analysis for inorganic and organic Hg was undertaken with determination of methylmercury (MeHg). As shown in **Table 5,** all MeHg concentrations were below laboratory detection.

When AVS is in excess of SEM, on a molar basis, then metals are unlikely to be bioavailable. The results of the AVS and SEM testing showed that AVS was in excess of SEM, on a molar basis, for all samples tested (refer **Table 6**).

Overall, the results of the bioavailability testing indicate that the heavy metals copper, lead and zinc may be bioavailable and Phase IV testing would be required to determine the suitability of the brown grey sandy mud 0-1.5 m below the harbour bed for unconfined sea disposal.

Elutriate Testing Results

Elutriate testing assesses impacts to water quality. The elutriate test is designed to simulate release of contaminants from sediment during dredged material disposal and as a guide to the potential for water quality impacts during dredging. Test results are compared to the relevant ANZG (2018) marine water quality trigger values for 95% species protection. If all contaminants are below the relevant guideline values after initial dilution (i.e. after four hours), effects on organisms in the water column would not be expected during disposal of dredge material. Where it is not possible to obtain sufficient pore water for analysis, elutriate testing can be also be used as an estimate of the pore water concentrations.

The results of the elutriate testing are shown in **Table 7**. The results indicate that all metals released during the elutriate test were at concentrations below laboratory detection and/or below the ANZG (2018)

water quality trigger values for marine water (95% species protection level) without applying any further dilution.

There is no ANZG (2018) water quality trigger values for dioxins. ANZG (2018) notes that the toxicity data, reviewed by USEPA (1984a), were not in a suitable form to derive guideline values for aquatic life. USEPA (1984a) did not derive a guideline figure but considered that water concentrations > 10 pg/L TCDD could lead to excessive levels of dioxin in fish and shellfish for human consumption, assuming a bioconcentration factor (BF) >5000. Measurable elutriate dioxin concentrations were observed at concentrations above the USEPA (1984a) value. Initial dilution at the disposal site would be more than a factor of 100. As the observed TCDD exceedance is less than 2 times the USEPA value, the concentrations of TCDD in the water column at the dredge and disposal ground allowing for initial dilution are expected to be well below the USEPA value.

Having regard to the above, effects on organisms in the water column would therefore not be expected during sea disposal of dredged material (or during the dredging process) due to copper, lead, zinc, mercury, silver and dioxins.

3.2.3 TCLP Testing

Classification of waste for land disposal is undertaken in accordance with the NSW EPA *Waste Classification Guidelines* (2014). Lead and benzo(a)pyrene concentrations exceeding the SCC for waste classification without toxicity characteristics leaching procedure (TCLP) testing were observed for the brown grey sandy mud 0-1.5 m below harbour bed. These exceedances triggered the need for TCLP testing to allow a final waste classification. The results of the TCLP testing are shown in **Table 8**.

Table 8 TCLP results

	Lead		Benzo(a)pyrene	
	TCLP 1	SCC1	TCLP 1	SCC1
	mg/L	mg/kg	mg/L	mg/kg
GUIDELINE	5	1500	0.04	10
B498PC	0.024	200	<0.001	2.7
WHT 1 0-0.5	0.025	220	<0.001	1.9
WHT 1 0.5-1.0	0.007	230	<0.001	2.5
WHT 2 0-0.5	0.006	210	<0.001	1.9

The results show that the brown grey sandy mud 0-1.5 m below harbour bed, has lead and benzo(a)pyrene concentrations below TCLP1 and SCC1. The final waste classification of the material is therefore general solid waste. However, as TBT was detected in the material, on land disposal of the material will need to be in accordance with the NSW EPA chemical control order (CCO) for organotin waste materials. Although dioxins were also detected in the material, the dioxins were at concentrations below the criteria triggering the CCO for dioxin-contaminated waste materials.

3.2.4 Comparison to Previous Testing

Prior to this investigation, Golder-Douglas (2017) undertook a coring investigation within the dredge footprint for the tunnel alignment at that time. A summary of the results is included in the SAP (Appendix A). The Golder-Douglas (2017) results were similar in the types and concentrations of contaminants observed in the 2018 coring exercise. Specifically elevated concentrations of copper, lead, zinc, mercury and silver were observed in the brown grey sandy mud 0-1.5 m below harbour bed on the Waverton side of the alignment for both investigations. For both the Golder-Douglas (2017) investigations and the 2018 investigations, detectable concentrations of dioxins were observed for all material types.

3.3 Data Validation

Field and analytical data quality objectives covering precision, accuracy, representativeness, comparability and completeness are outlined in **Table 9** below. Tabulated results for field blanks, replicates and duplicates are provided in **Appendix D**.

The NAGD recommends that field triplicates should agree within a RSD of +/- 50% although the guidelines note “they may not always do so where the sediments are very heterogeneous or greatly differing in grain size”. The recommended RSD limits were not exceeded.

Split duplicates were collected at one location to determine the precision (repeatability) of the analyses. The recommended RPD limits were exceeded for copper, nickel and total PAHs only. As the remaining analytes were within the RPD range, these results indicate that there is a variable presence of some metals and organics in the sediments.

Additional laboratory quality assurance consisted of the analysis of laboratory duplicates, method blanks, laboratory controls samples and matrix spikes. The results of this quality assurance can be found within the laboratory reports in **Appendix C**.

The NAGD recommends that laboratory duplicates not exceed a RPD of +/- 35%. This range was met for all contaminants for all samples with the exception of pyrene (constituent of total PAH) for laboratory duplicates of one sample.

Matrix spikes for two PAHs constituents only (coronene and dibenz(a,h)anthracene) exceeded the laboratory requirements.

There were no method blank outliers. All samples were tested within recommended holding times and the required frequency of laboratory control sample testing was met.

Overall, field and laboratory QA/QC and data validation indicated that the quality of the data was acceptable for environmental interpretive purposes.

Table 9 Compliance with Data Quality Objectives

Parameter	Data Quality Objective	Compliance
Field		
Blank samples	At or near the Limit of Reporting (LOR)	yes
Rinsate sample	At or near the Limit of Reporting (LOR)	yes
Sample condition	Samples received intact and cold	yes
Field triplicates	RSD <50%	yes (83% results)
Field split triplicate	RPD <50%	yes (100% results)
Sampling methodology	Compliance with SAP	yes
Sample locations	As per SAP, all samples collected	Adjustment to one sample location was required due to continued refusal on gravel. Coordinates of all adjusted locations were recorded.
Chain of custody forms	With all samples	yes
Analytical		
Holding time	Samples analysis within specified holding time	yes
Lab duplicates	RPD <30%	yes except pyrene (PAH) for one duplicate
Lab Control samples	RPD <35%	yes
Matrix spike	recovery 50-150% or as per lab requirement	yes except two PAH constituents
surrogate	recovery 50-150% or as per lab requirement	yes
completeness	Minimum of 95% of all data on submitted samples validated as suitable for use	yes

4 Suitability of Dredged Material for Sea Disposal

A summary of the suitability of the dredge material for sea disposal is described below and shown in **Figure 5**.

The results of the investigations indicated that the sediment from within the Birchgrove end of the dredge area comprised a thin layer of grey brown silty sand with shell overlying stiff orange brown clay. At the Waverton end of the dredge area the sediment comprised a brown grey sandy mud which became firmer with depth.

The results of the geochemical testing were used to calculate the 95% UCL of the mean concentrations of contaminants for the main material types observed at the WHT crossing. The results indicated that the

95% UCL of the mean concentrations for all contaminants were below NAGD SL for the thin layer of grey brown silty sand and underlying stiff orange brown clay. The arithmetic mean and 95% UCL of the mean concentration of dioxins for the thin layer of grey brown silty sand and underlying stiff orange brown clay was below the CCME guideline. Both these material types are considered suitable for unconfined sea disposal.

For the surface brown grey sandy mud 0-1.5 m below harbour bed tested as part of the 2018 investigation, the 95% UCL of the mean concentrations of copper, lead, zinc, mercury and silver all exceeded the NAGD SL triggering the need for Phase III testing in accordance with the NAGD (bioavailability and elutriate testing) to determine suitability of this material for unconfined sea disposal. The results of the Phase III testing indicated that the heavy metals copper, lead and zinc may be bioavailable. In addition, the arithmetic mean and 95% UCL of the mean exceeded the CCME (2001) probable effects level of 21.5 pg/g. This material is not considered suitable for unconfined sea disposal; land disposal of this material would be required.

The brown grey sandy mud with depth greater than 1.5 below the harbour bed is the subject of further consideration and discussion with DoEE.

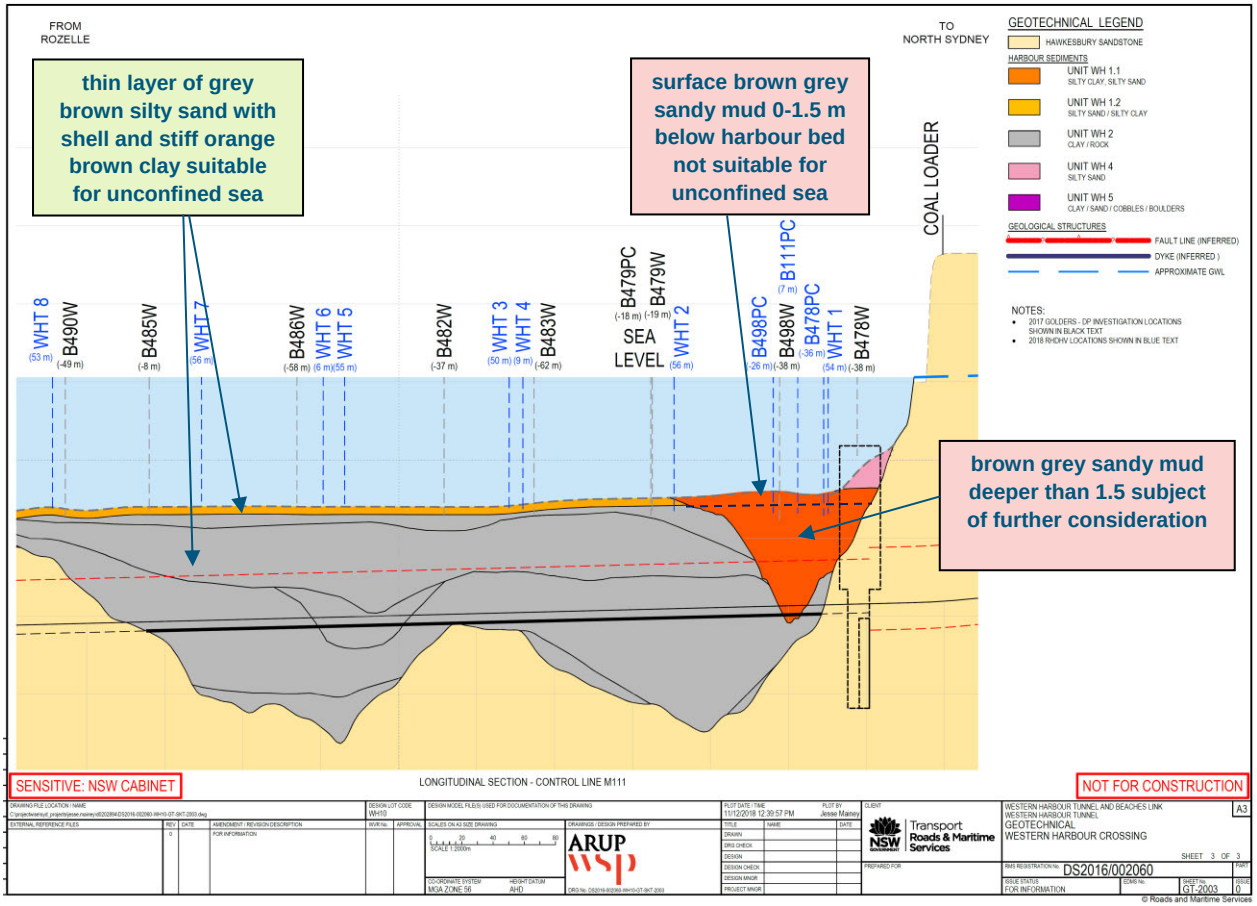

Figure 5 Summary of material suitable for sea disposal

Classification of the sediment for land disposal has been considered. Concentrations of lead and benzo(a)pyrene for the surface brown grey sandy mud, exceeded the specific contaminant concentration (SCC) for waste classification without toxicity characteristics leaching procedure (TCLP) testing. These

exceedances triggered the need for TCLP testing to allow a final waste classification. Following completion of the TCLP testing, the final waste classification of the surface brown grey sandy mud is general solid waste. However, as TBT was detected in the material, land disposal of the material will need to be in accordance with the NSW EPA chemical control order (CCO) for organotin waste materials. Although dioxins were also detected in the material, the dioxins were at concentrations below the criteria triggering the CCO for dioxin-contaminated waste materials.

5 References

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines.

Commonwealth of Australia (2009) National Assessment Guidelines for Dredging (NAGD).

Golder-Douglas 2017, Western Harbour Tunnel and Beaches Link Geotechnical Site Investigation, Marine Sediment Sampling, Analysis and Quality Plan 02/02/17 prepared for Roads and Maritime by Golder – Douglas.

NSW EPA Waste Classification Guidelines (2014).

Appendix A Approved SAP

REPORT

Western Harbour Tunnel

Sampling and Analysis Plan (SAP)

Client: Roads and Maritime Services

Reference: PA1630-SAP
Revision: 02/Final
Date: 28/03/18

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Project name:	Western Harbour Tunnel
Project number:	PA1630
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Date / initials:	28/03/18 GWB
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Classification
Internal use only

Table of Contents

Table of Tables

Table of Figures

Appendices

1 Introduction

The Western Harbour Tunnel and Beaches Link (WHTBL) is a proposed new motorway link. The works are designed to improve journey times and reliability for public transport, freight and private vehicles as well as alleviate pressure on Sydney's most critical transport corridors. The NSW Government through Roads and Maritime Services (Roads and Maritime) has completed the feasibility and business case assessment for the new motorway crossing of Sydney Harbour and Middle Harbour. The assessment has found that the motorway crossing is feasible and as such the project is progressing to the Environmental Impact Statement (EIS) stage. As announced by the Premier in March 2017, the Program comprises two Projects (Western Harbour Tunnel Project and Beaches Link Project), and the Warringah Freeway Upgrade (as a key enabling element of both Projects, to be implemented alongside whichever Project is deployed first).

The Western Harbour Tunnel (WHT) will connect with Westconnex at the proposed Rozelle Interchange, cross beneath Sydney Harbour between Birchgrove and Waverton, and connect with the existing Warringah Freeway in North Sydney. Beaches Link (BL) is a tunnel that will connect to the Warringah Freeway at North Sydney. The tunnel will cross beneath Middle Harbour between Northbridge and Seaforth and connect with the Burnt Bridge Creek Diversion at Balgowlah and the upgraded Wakehurst Parkway in Seaforth. A location plan for the project is provided in Figure 1.

The preferred option for both crossings is an Immersed Tube Tunnel (IMT) which involves capital dredging and management of the dredged material. In accordance with the National Assessment Guidelines for Dredging (NAGD) (2009), development and implementation of a Sampling and Analysis Plan (SAP) is required in order to assess the suitability of the dredge material for sea disposal. This SAP is for the WHT project only.

The WHT SAP has been prepared having regard to recommendations outlined in the relevant guideline documents including:

- Commonwealth of Australia (2009) National Assessment Guidelines for Dredging (the NAGD); and
- ANZECC/ ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

The WHT SAP includes the following elements:

- evaluation of the site history and available data;
- objectives of the SAP;
- plan showing the proposed sampling locations;
- estimates of the number of samples including replicates, triplicates and blanks;
- methods and procedures for sampling;
- details of methods for sample handling, preservation, storage and quality control and quality assurance (QC/QA); and
- list of analyses required, detection limits and laboratory QC/QA procedures.

The WHT SAP has been prepared by Royal HaskoningDHV (RHDHV) on behalf of Roads and Maritime. The SAP will be submitted to the Commonwealth Department of Environment and Energy (DoEE) for approval. The results of the sampling and analysis will be documented in a WHT SAP Implementation Report.

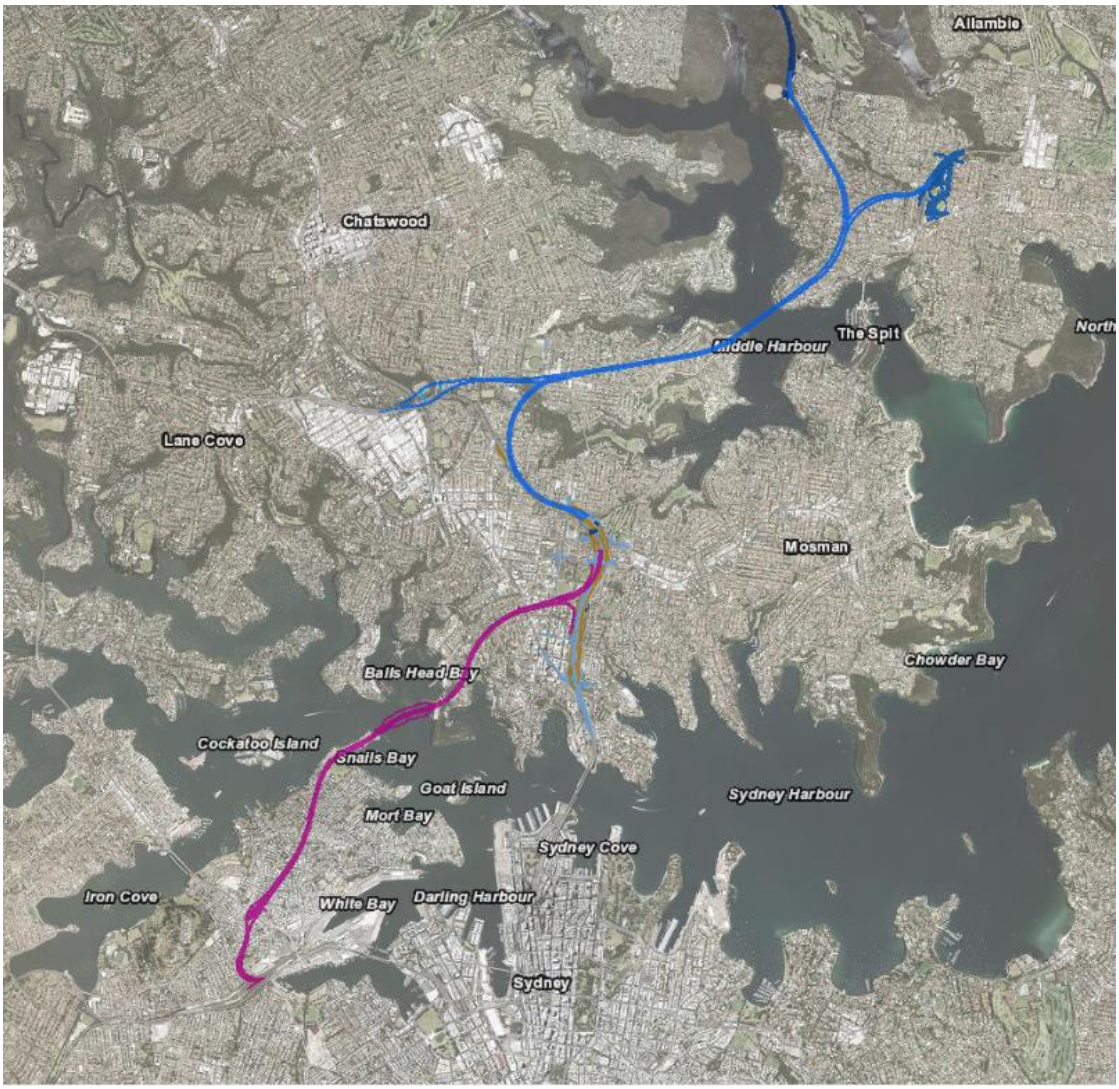


Figure 1 Location Plan

2 Compilation and Review of Existing Data

2.1 Site Description

The WHT site is located within Port Jackson, which is a drowned river valley formed during a period of natural sea level rise approximately 10,000 years ago. The proposed WHT is located in Sydney Harbour, which is the western branch of Port Jackson, approximately 2 km to the north-west of the Sydney Central Business District (CBD). The IMT alignment and dredge footprint is shown on Figure 2. Sediment sampling locations are also shown on Figure 2 and referred to in Section 2.3.

The hydrodynamic conditions at the crossing location are primarily driven by astronomical tides, with other influences from barometric effects, wind influences and freshwater flows from local creeks and rivers being comparatively small. The wave climate is limited to locally generated wind waves and waves from boat wakes, specifically ferries.

The ground conditions comprise sediment (silty clay, silty sand and sandy silt) and rock (Hawkesbury Sandstone). Within the sediment layer at varying depths stiff residual Pleistocene clay has been observed. A geotechnical profile of the crossing is provided in **Appendix A.**

The proposed WHT alignment involves a 630 m long underwater crossing. The sea bed level along the WHT tunnel alignment is approximately 15 m below Australian Height Datum (AHD). The alignment crosses the navigation channel. Vessel traffic in the vicinity of the alignment is dominated by ferries and recreational boats. Birchgrove Wharf is located at the southern end of the crossing with up to 4 ferry movements per hour. In addition there are about 80 oil tanker movements that take place across the site per year.

The Balls Head Reserve and the Balls Head Coal Loader Wharf are located at the northern end of the crossing. The old Coal Loader Site is a former industrial site that operated from the early 1920's to the early 1990's. The main purpose for the site was the transfer of coal (from bulk carriers to smaller coal vessels) and storage of coal.

Figure 2 WHT Alignment and Dredge Footprint

2.2 Site History

The following overview of historical land use in the vicinity of the proposed alignment was provided in WSP Parsons Brinkerhoff, 2016.

> Industrial activities have long contributed to metal (and other contaminants) loading into the estuary (Birch and Taylor, 1999). Sources of contamination in the estuary include current and historical stormwater discharges, as well as discharges from industrial activities (Birch *et al*., 2015a; Birch *et al*., 2015b). Sediment contamination may also have resulted from contaminants leaching from reclaimed areas (an estimated 20% of the harbour area) around the catchment and depositing within embayments (Birch & Taylor, 2004; Birch *et al*., 2009).
>
> Areas of Birchgrove and Balls Head Bay were used as industrial/commercial areas including fuel storage and processing since the mid-1930s but a significant decline in industrial activities has been observed in Birchgrove and upstream areas since the 1980s (Birch *et al*., 2015b).

2.3 Recent Sediment Quality Reports and Data

The following investigations and reports have been prepared either as part of other recent adjacent infrastructure projects, for a previous alignment of the WHT, or for the business case stage of the WHTBL project. A brief description of each is provided below.

.

- **Western Harbour Tunnel, Preliminary Contamination Assessment Report 30/10/15 prepared for Roads and Maritime by Geochemical Assessments Pty Ltd as part of Golder-Douglas team for previous tunnel alignment.**

Sediment samples were collected at nine locations along a previously proposed Western Harbour Tunnel alignment (to the east of the current alignment) and analysed for a wide suite of contaminants (metals, PCDD/Fs, TOC, PCBs, OC pesticides, PAHs, TPHs, TBT). The 95%UCL of the mean concentrations of mercury and lead exceeded their respective NAGD Screening Level (SL). All other metals and organics (TPH, PAHs PCBs and TBT) had their 95% UCL of the mean concentrations below SL. Elevated concentrations of PCDD/Fs were observed.

- **Sediment Quality Assessment: Sydney Metro Harbour Tunnel 29/03/16 prepared for Jacobs by Geochemical Assessments Pty Ltd**

Five samples were tested as part of investigations for the Sydney Metro Harbour Tunnel. Testing for contaminants of concern included metals, PCDD/Fs, TOC, PCBs, OC pesticides, PAHs, TPHs, TBT. Elevated concentrations of Cu, Pb, Hg and Zn were observed above SL. Elevated concentrations of PCDD/Fs were observed. All other metals and organic contaminants were below SL or below the limit of reporting.

- **Review of Contamination Status of Marine Sediments, Sydney and Middle Harbour – Harbourlink Business Case - Environmental Specialist Report 14/09/16 prepared for Roads and Maritime by WSP Parsons Brinkerhoff**

WSP Parsons Brinkerhoff undertook a review of publically available information relevant to the contamination status of sediments likely to be encountered in the proposed harbour crossing alignments (21 publications). The work included the identification of expected contaminants of

potential concern and a detailed description of historical land use. The historical landuse in the vicinity of the alignments was summarised as follows.

The Sydney catchment has been extensively modified since European settlement and land use has evolved over time across the catchment (Birch *et al*., 2015b). Industrial activities and leaching from reclaimed areas have long contributed to metal (and other contaminants) loading into the estuary (Birch and Taylor, 1999).

Disposal of commercial and urban waste into the harbour has mostly ceased, however a legacy of sediment contamination remains in many areas of the harbour (Birch, *et al.,*2015a) Stormwater and urban run-off are currently the largest ongoing source of input to sediment (and water) contamination in the estuary (Beck and Birch, G. F., 2012a, b Birch *et al.,* 2015b).

The review of scientific publications undertaken as part of the sediment contamination review (WSP / Parson Brinckerhoff, 2016a) identified a wide range of contaminants of potential concern (CoPC) for Sydney Harbour and Middle Harbour. The review revealed extensive metal contamination (Birch and Taylor, 1999) has been observed in harbour sediments. Additionally, organochlorine pesticides (OCPs) (Birch and Taylor 2000) and polycyclic aromatic hydrocarbons (PAHs) (McCready *et al*., 2000), polychlorinated dibenzo-para-dioxins (dioxins), dibenzofurans (furans) (Birch *et al*., 2007) and other organic compounds are also reported over extensive areas of the harbour. Other contaminants encountered in the estuary included pharmaceuticals (Birch *et al*., 2015c), tributyltin (Dafforn, 2008), petroleum hydrocarbons (Jones, 2003), polybrominated diphenyl ethers (PBDEs) and hexabromocyclododecane (HBCDs) (Drage *et al*., 2013) phthalate esters, microplastics etc.

The most impacted areas in the estuary were generally found to be in the southern embayments of Homebush, Hen and Chicken, Rozelle and Blackwattle Bays and Iron Cove and generally further west of the Harbour Bridge (Barry *et al*., 1999; Birch & Taylor, 2004).

The contaminants of potential concern identified for the WHT alignment by the WSP Parsons Brinkerhoff study were heavy metals, TPHs, PAHs, OC Pesticides, TBT, PCBs, PCDD/Fs, PBDEs and HBCDs

- **Marine Reference Design Sampling, Analysis and Quality Plan – Marine Contamination Assessments, Harbourlink – Environmental Specialist Report 16/09/16 prepared for Roads and Maritime by WSP Parsons Brinkerhoff**

- **Western Harbour Tunnel and Beaches Link Geotechnical Site Investigation, Marine Sediment Sampling, Analysis and Quality Plan 02/02/17 prepared for Roads and Maritime by Golder – Douglas**

The sampling and analysis requirements for a Phase II assessment of sediment quality were addressed in the two SAQPs listed above.

WSP Parsons Brinkerhoff prepared the 2016 SAQP based on the WHTBL Concept Design (prepared also by WSP Parsons Brinkerhoff as part of the WHTBL Bronze Final Business Case). Following their engagement by Roads and Maritime to undertake geotechnical investigations for the WHTBL project, Golder-Douglas prepared a subsequent SAQP in 2017.

- **Western Harbour Tunnel and Beaches Link Geotechnical Investigation, Draft Contamination Factual Report 12/09/2017 prepared for ROADS AND MARITIME by Golder - Douglas**

This report presents the results of the 2017 contamination investigations. The work comprised the collection of sediment samples from a combined 35 locations from the WHT and BL alignments. Sample locations for WHT are shown on Figure 2. Vibrocores were recovered at each location and sub sampled at 0.5m intervals. Samples were tested for a broad range of parameters comprising:

- Total Organic Carbon
- Organotins
- Heavy Metals
- BTEX Compounds
- Total Petroleum Hydrocarbons
- Total Recoverable Hydrocarbons
- Organochlorine Pesticides
- Organophosphorus Pesticides
- Polycyclic Aromatic Hydrocarbons
- PCDD/Fs
- Phenoxy Herbicides
- Carbamate Pesticides
- Phenolics
- Polychlorinated biphenyls
- Fumigants
- Halogenated Aliphatic Compounds
- Halogenated Aromatic Compounds
- Trihalomethanes
- Nutrients
- ASS Testing
- HBCDs

The following contaminants were not detected above the laboratory limit of reporting (LOR) in any samples and are therefore not considered contaminants of concern.

- BTEX Compounds
- Organophosphorus Pesticides
- Phenoxy Herbicides
- Carbamate Pesticides
- Phenolics
- Fumigants
- Halogenated Aliphatic Compounds
- Halogenated Aromatic Compounds
- Trihalomethanes
- HBCDs

The Golder-Douglas report is a factual report only. Examination of the results by RHDHV indicates that elevated concentrations of contamination are confined primarily to the top 0 – 0.5 m of the sediment profile and comprised heavy metals and OC pesticides above SL. Dioxins were also observed. At the centre of Middle Harbour channel and at the eastern end of the Western Harbour

Tunnel site (near the Balls Head Coal Loader Wharf) contamination extends from 0 - 1.5 m. Concentrations of all contaminants below this upper portion of the sediment are significantly lower. Summary tables of the results are included in **Appendix B.**

For the purpose of this SAP, where elevated concentrations of contamination were observed in more than 6 samples, the 95% upper confidence limit (UCL) of the mean concentration of contamination was calculated for the upper portion of the sediment layer (0-0.5 m and in some areas 0-1.5m) and is presented below in Table 1. The 95% UCL of the mean concentration of contamination was also calculated for the remaining underlying sediment which displayed significantly lower concentrations of contaminants.

Table 1 95% UCL of the Mean Concentration of Contaminants for Golder-Douglas 2017 investigations

			Western Harbour Tunnel Sediment	
			Upper[1]	Lower[2]
Parameter	**Units**	**SL**	**95% UCL of MEAN**	**95% UCL of MEAN**
Tributyltin*	mg/kg	0.009	0.005	<0.0005
Radionuclides	Bq/g	35	1.11	0.87
Antimony	mg/kg	2	<0.5	<0.5
Arsenic	mg/kg	20	16.1	11.2
Cadmium	mg/kg	1.5	0.15	0.12
Chromium	mg/kg	80	39	16
Copper	mg/kg	65	120	4
Lead	mg/kg	50	196	10
Mercury	mg/kg	0.15	2.46	0.035
Nickel	mg/kg	21	11	5
Silver	mg/kg	1	1.19	0.16
Zinc	mg/kg	200	363	37
TPH*	mg/kg	550	246	134
TRH*	mg/kg	550	281	132
DDD*	mg/kg	0.002	0.0008	<0.0005
DDE*	mg/kg	0.0022	0.0004	<0.0005
DDT*	mg/kg	0.0016	0.0009	<0.0005
Total PAH*	mg/kg	10	2.8	0.2
PCDD/Fs Total TEQ WHO-TEQ2 (0.5 LOR)	pg/g	--	18.47 66.37 (near wharf)	18.25
Total PCBs	mg/kg	0.023	<0.005	<0.005

* normalised to 1% TOC

1. primarily the top 0 – 0.5 m of sediment except the eastern end of the Western Harbour Tunnel site (near the Balls Head Coal Loader Wharf) where contamination extends from 0 - 1.5 m.
2. sediment below 0.5 m or in case of the eastern end of the Western Harbour Tunnel site, sediment below 1.5 m

2.4 Contaminants of Potential Concern

Based on the review of the site history and previous sediment investigations, Contaminants of Potential Concern (CoPC) have been identified for the proposed sampling and testing program (refer Table 2).

Testing should include physical analyses and geochemical analysis of the total concentration of contaminants. Samples should be tested for analytes listed in the table below.

Further testing by means of elutriate and bioavailability testing will be undertaken as necessary. Sufficient sediment will be collected to allow for these subsequent tests.

If toxicity testing is required, a subsequent sampling program may need to be undertaken involving recovery of fresh samples but wherever possible sufficient sample volume for toxicity testing will be recovered and stored appropriately.

Table 2 Contaminants of Potential Concern

CoPC
Trace metals (Ag, Cd, Cu, Pb, Zn, Cr, Ni, As and low level Hg)
PAHs (individual species and total PAHs)
Total organic carbon (TOC)
Tributyltin (TBT)
Total petroleum hydrocarbons (TPHs)
OC Pesticides
PCDD/F
Particle size distribution

3 Description of Dredging Proposal

3.1 Overview

The IMT for Western Harbour will require the formation of trenches by capital dredging into the seabed for the sinking, connection and support of submerged tunnel elements between the terminal joints. The selection of methodologies for dredging has been made on the basis of the available geotechnical data, environmental considerations and design requirements. These may be subject to some change depending on the selected contractor's preferred dredging methodology.

The proposed design dredge depth grades up from south to north along the crossing alignment from -34.5 m AHD (Birchgrove) to – 31.4 m AHD (Waverton).

3.2 Dredge method

The expected dredge methods for the IMT for Western Harbour can be summarised as follows:

Western Harbour Tunnel

- Backhoe Dredger (BHD)
- Trailing Suction Hopper Dredger (TSHD)
- Cutter Suction Dredger (CSD)
- Barges

Any sediment identified as unsuitable for unconfined sea disposal will be dredged using a BHD with environmental clamshell.

The reasoning behind the plant selection is set out below.

a) Large to very large Backhoe Dredger (BHD), using closed environmental buckets with silt-screens fixed to the dredge and barge transport of the dredged material to onshore disposal/discharge facilities or offshore (spoil grounds). Suitable/compatible sized hopper barges have been planned to transport the dredged spoil efficiently at BHD compatible production rates. Very large mechanical equipment (BHD) had to be selected, as a consequence of the significant design depth requirements and rock strength.

b) Suitably sized TSHD to perform dredging of other than rock (OTR) to the design levels, where possible, whilst causing minimal turbidity from suspended fines from the drag-head, and without overflow operation.

c) Large CSD capable of achieving the design depths and capable of efficiently crushing weathered to fresh sandstone. In order to reduce the turbidity, this concept work method proposes to leave the crushed rock in the tunnel trench in a layer immediately behind the cutter head (no pumping), for subsequent removal by BHD, before the CSD crushes the next layer.

3.3 Volumes

A geotechnical model of the Western Harbour tunnel alignment has been developed. Preliminary estimated volumes of the identified material type for the capital dredging for the IMT for Western Harbour are shown in Table 3.

Table 3 WHT Estimated Insitu Dredging/Excavation Quantities (cubic metres) with over dredging

Material Type	Estimated Quantity (m^3)
Sediment (elevated concentrations of contaminants)	142,500 m3
Sediment	610,000 m3
Rock	108,000 m3
Cofferdam Rock Excavation	44,000 m3
	904,500

4 Proposed Sediment Sampling and Analysis

4.1 Objectives

Elevated concentrations of Cu, Pb, Hg, Ag, Zn and DDE have been observed in recent sediment quality investigations for the WHTBL project. Concentrations of these contaminants were above the NAGD SL triggering the need for Phase III investigations. PCDD/Fs were also detected but a SL has not been identified in the NAGD.

In addition to the observed contaminants, there has been an adjustment of the IMT alignment for the WHT since completion of the recent sediment quality investigations. The change to the IMT alignment, and corresponding change to the dredge footprint, has resulted in a number of the previous sampling locations now falling outside the dredge footprint. Additional sampling is therefore required to provide sufficient spatial coverage of the footprint and meet the minimum number of sample locations as prescribed by the NAGD. The additional sampling will also allow confirmation of the observed decrease in contamination with depth in those portions of the dredge footprint not yet sampled.

In summary, the objectives of the proposed investigations are to:

- Provide better spatial coverage of the dredge footprint due to the change in IMT alignment and hence change in dredge footprint;
- Meet the minimum number of sample locations as prescribed by the NAGD;
- Confirm the observed decrease in contamination with depth in the portion of the dredge footprint not yet sampled; and
- Recover sufficient volume of sediment representative of the dredge material for use in Phase III testing.

4.2 Sample Locations

The proposed sampling locations have been selected based on a judgemental sampling pattern. A judgemental sampling pattern has been adopted rather than the usual random sampling pattern as an objective of the investigation is to provide better spatial coverage of the dredge footprint by targeting areas not previously sampled. At these locations, sampling is required at 0.5m depth increments to the maximum depth of expected contamination (1.5m), below which a single composite sample will be taken.

Another objective of the investigation is to recover sufficient volume of sample representative of the dredge material for use in Phase III testing. A number of locations previously sampled have therefore been targeted to return to and re-sample as these locations have contamination concentrations close to the 95% UCL of the mean concentrations observed during the recent Golder-Douglas investigations (2017). These locations will potentially provide samples with contamination concentrations representative of the dredge material. At these locations, a single composite sample to the previously observed maximum depth of contamination will be recovered.

Samples will be collected from a total of 8 new locations within the proposed WHT dredge footprint. The number and location of proposed samples has been determined in accordance with the NAGD based on 142,500 m^3 of potentially contaminated material. For a volume of 142,500 m^3 of potentially contaminated material, the NAGD recommends sampling at 20 locations. A total of 12 locations from the recent Golder-Douglas investigations (2017) still fall within the dredge footprint. It is therefore proposed to undertake sampling at 8 new locations. As noted above, these locations will be sampled and tested for the CoPC at

0.5m depth increments to the maximum depth of expected contamination (1.5m), below which a single composite sample will be taken. Multiple cores will be taken at each location to ensure sufficient volume of sample is recovered for testing of the total concentrations of CoPC (Phase II testing) and possible selection for Phase III testing.

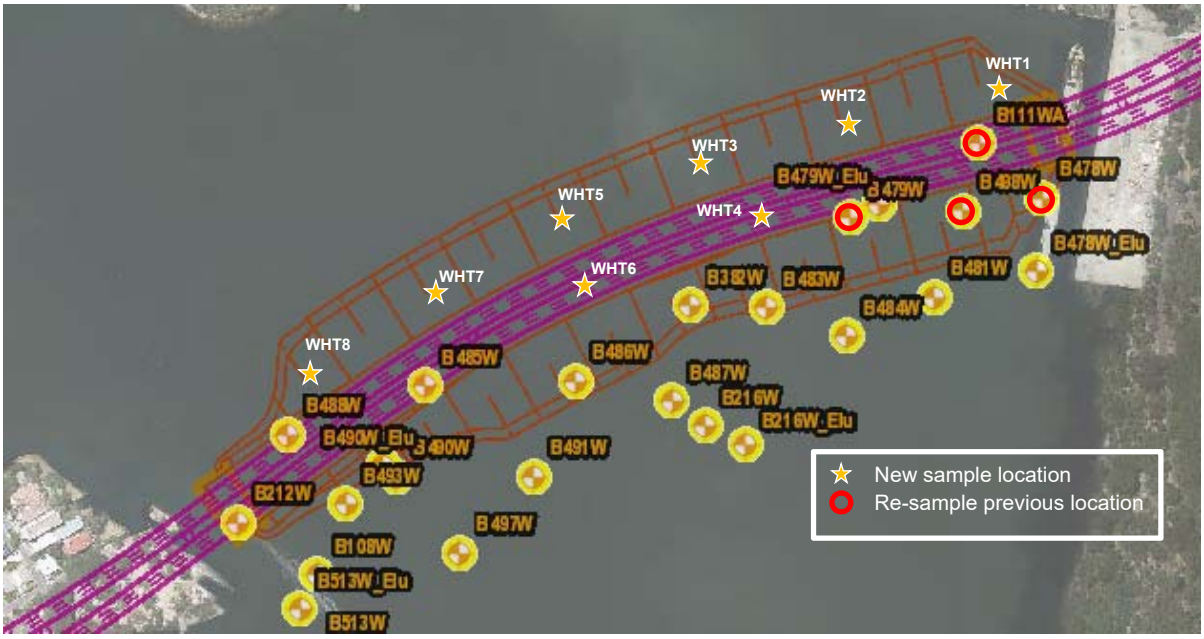
A further 4 locations previously sampled have been targeted to return to as these locations have contamination concentrations close to the 95% UCL of the mean concentrations observed during the recent Golder-Douglas investigations (2017). These locations are likely to have contamination concentrations representative of the dredge material and may be suitable for selection for the proposed Phase III testing. At these locations a single composite sample to the previously observed maximum depth of contamination will be recovered. For a volume of 142,500 m^3 of potentially contaminated sediment, the NAGD recommends a minimum of 5 sampling locations for Phase III testing with a minimum of 1 replicate. Following receipt of the results of the total concentration testing for all the samples, the five samples for the Phase III testing will be selected i.e. from the samples from the 8 new locations and 4 locations being resampled.

All proposed sampling locations within the WHT dredge footprint are shown on Figure 3. The sampling location coordinates are presented in Table 4.

Table 4 WHT Sample Location Coordinates (GDA94 MGA56)

Location ID	Easting	Northing
WHT 1	332778	6253698
WHT 2	332682	6253676
WHT 3	332578	6253639
WHT 4	332600	6253603
WHT 5	332473	6253602
WHT 6	332482	6253551
WHT 7	332387	6253557
WHT 8	332305	6253498
B111WA	332775	6253653
B478W	332818	6253615
B498W	332764	6253607
B479W	332687	6253600

Figure 3 WHT Sample Locations



4.3 Sample Collection

An onboard GPS will be used to position the sampling vessel at the nominated sampling locations. A GPS generally has an accuracy of +/-0.1m. However, following manoeuvring of the vessel into position and recovery of the sample from the harbour bed, the positioning of cores is likely to have an accuracy of +/-5m.

Prior to sampling, all equipment will be thoroughly inspected and washed down. Any evident sources of contamination will be cleaned and surfaces covered in plastic to avoid accidental contamination of any samples.

A combination of vibrocoring, piston and gravity coring will be undertaken depending on water depths and currents. Cores will be driven to a depth of 3m or refusal. Core will be sampled and tested for the CoPC at 0.5m depth increments to the maximum depth of expected contamination (1.5m), below which a single composite sample will be taken. If the cores refuse on stiff residual clay of Pleistocene era, and a plug of this material can be recovered in the cores, this material will also be tested for the CoPC to demonstrate it predates any anthropogenic influence.

Sampling dates, time, water depth and depth of core penetration will be recorded. The cores will be extruded, logged, photographed and subsampled on the vessel following recovery.

All surfaces used for sample handling will be covered in plastic sheeting prior to subsampling. Subsampling will be undertaken using nitrile gloves and decontaminated stainless steel equipment.

A subsample will be collected for each half metre depth increment of the unconsolidated bottom sediments. It is anticipated that 3 cores will need to be recovered at each location to provide sufficient volume of sample. Samples for analysis of volatile compounds will not be mixed and will be recovered at the mid point of each half metre core section in suitable containers with zero headspace.

The following volumes will be retained for each subsample from the cores:

- 250g homogenised sample for particle size analysis transferred to a ziplock plastic bag;
- 2 x 250ml homogenised sample for chemical analysis at all locations. Samples will be transferred to glass jars with teflon lined lids with zero headspace;
- 1 x 150 ml mid point sample for volatile analysis; and
- 3 x 500ml for Phase III testing.

The sediment from the multiple cores at each location from each half metre increment will be homogenised prior to subsampling. Each jar/bag will be filled with zero headspace and tightly sealed to avoid loss of sample. Each container will be labelled with a unique identification number and each sample will be recorded on a log sheet.

Sediment will typically adhere to the outside of the sample containers. To avoid cross contamination, after each container is sealed, the outside of each sample container will be washed.

Three, 20L samples of sea water [1] will also be collected in plastic drums for elutriate testing. Sea water for use in the elutriate testing must be representative of the offshore disposal ground. Clean seawater will be collected at a location outside Sydney Heads (i.e. outside the Harbour) in suitable containers. All sample handling surfaces will be kept clean and covered in sheeting. A discrete open water sampler will be used to eliminate contamination from sample handling.

4.4 Estimated Number of Samples

Table 5 below provides details of the total number of samples, including primary, field triplicate and split triplicates.

Field triplicates will be collected at one location within the WHT dredge footprint. A field triplicate comprises three samples taken at the same location. The triplicate samples will be used to give an indication of the variability in the chemical properties of the sediment at a sample location.

As part of QA/QC procedures, it is also proposed to submit one split triplicate within the WHT dredge footprint, i.e. a single homogenised sample split into three containers with the third sample being sent to a second laboratory to assess variation associated with subsample handling (i.e. two additional samples).

One field blank of certified reference material (CRM) will also be submitted to assess the potential for cross contamination of volatiles between samples.

One rinsate sample per day from each piece of equipment used in homogenising the sediment samples will be submitted to assess if the decontamination of the equipment between samples has been effective.

It is therefore proposed to recover a total of 45 samples comprising subsamples and field QA/QC samples as shown in the table below.

[1] *i.e. to replicate site water at the disposal site.*

Table 5 Number of samples

Sample Type	Description	Number of Samples
WHT		
Primary samples	8 new core locations x 4 samples (0.5 m depth increments and composite below 1.5m) 4 resampled locations x 1 sample (composite sample over previously observed extent of contamination)	36
Field replicates	1 location x 2 additional samples	2
Split Duplicates	1 location x 2 additional samples	2
Field blank	1 sample	1
Rinsate samples	1 per day for up to 4 days of sampling	4
	TOTAL	45

4.5 Sample Preservation

All samples will be packed in ice in an esky immediately after sampling to maintain the temperature below 4°C. Samples will then be submitted to the analytical laboratory on the same day or the following morning.

4.6 Sample Shipment

All sample containers will be clearly labelled with unique sample identification numbers. Samples will be transported in an esky in ice to the relevant analytical laboratory nominated for the analyses required.

All samples will be transported under chain of custody procedures. A copy of a chain of custody form is included in **Appendix C**.

4.7 Analysis Schedule

4.7.1 Physical Analysis

Physical testing will comprise determination of the particle size distribution by sieve analysis and hydrometer, and reporting of percentage gravel, sand, silt and clay.

4.7.2 Chemical Analysis

The primary laboratory selected to undertake the chemical testing is the NATA registered Advanced Analytical. The third spilt triplicate sample will be submitted to a secondary NATA accredited laboratory. Both laboratories will use the methods listed in the table below and are NATA accredited for these methods. PCDD/F analysis will be undertaken by Assure Quality in New Zealand.

The proposed suite of tests is based on our knowledge of the site and its contaminants of potential concern (CoPC). Chemical testing of the sediment sample will include a suite of heavy metals, TOC, TBT, TPHs, PAHs, OC Pesticides and PCDD/F (refer Table 6).

Results will be validated by statistically analysing QA/QC data and would then be compared to the guidelines.

Statistical analysis and tabulation of data will be undertaken following data validation. Data management of the results will be in accordance with the requirements of the NAGD. Validation of data will include consideration of field QA/ QC procedures and evaluating the results from laboratory blanks, standard samples, field triplicate samples and split triplicate samples.

Table 6 Proposed Analysis

Test Parameter	PQL	units	Lab Method
Trace Metals			
Silver (Ag)	0.1	mg/kg	USEPA 6020
Cadmium (Cd)	0.1	mg/kg	USEPA 6020
Copper (Cu)	1	mg/kg	USEPA 6020
Lead (Pb)	1	mg/kg	USEPA 6020
Zinc (Zn)	1	mg/kg	USEPA 6020
Chromium (Cr)	1	mg/kg	USEPA 6020
Nickel (Ni)	1	mg/kg	USEPA 6020
Arsenic (As)	1	mg/kg	USEPA 6020
Mercury (Hg)	0.01	mg/kg	APHA 3112 Hg-B
Organics			
TBT	0.5	µg Sn/kg	In-House GC/MS
PAHs super ultra-trace	4-5	µg/kg	USEPA 3640/8270
TOC	0.02%	-	In house/Leco
TPH (C6-C9)	0.2	mg/kg	USEPA 5030/8260
TPH (C10-C36)	5-10	mg/kg	USEPA 3510/8015
OC Pesticides	0.0005	mg/kg	
PCDD/F	0.0001	µg/kg	

Elutriate and Bioavailability (Phase III)

Concentration of Cu, Pb, Hg, Ag and Zn may exceed the NAGD screening levels. In addition, elevated concentrations of PCDD/Fs have been observed at the WHT site. Elutriate and bioavailability testing is likely to be required to further consider the potential for unconfined sea disposal. Elutriate testing will be undertaken to assess the effect of dissolved contaminants in the water column during dredging and

disposal. Results of elutriate testing will be compared to the relevant ANZECC/ARMCANZ water guidelines.

Bioavailability testing via dilute acid extraction (DAE) testing for metals will be undertaken to give an indication of the in-situ bioavailability of contaminants in the sediment following offshore disposal.

Mercury is one of only a few elements that may bioaccumulate. Analysis for inorganic and organic Hg will be undertaken. Determination of methylmercury (MeHg) is proposed as it is the form of concern (bioaccumulation).

Acid volatile sulphide (AVS) and simultaneously extracted metals (SEM) testing will also be undertaken. This is a further bioavailability test recommended by the NAGD, suitable for metals. If AVS is in excess of SEM, on a molar basis, then it is assumed that the metals are unlikely to be bioavailable. This procedure is only useful for a few metals, principally Ag, Cd, Cu, Ni, Pb and Zn. Analyses of AVS will also be useful to assess bioavailability of Hg, as in sediments with significant AVS much of the Hg would be as HgS, which is insoluble.

In summary, the Phase III testing will involve

- DAE of metals;
- Mercury speciation;
- AVS/SEM testing; and
- Elutriate testing.

Laboratory reporting times for the CoPC's should allow for selection of samples for elutriate testing within holding times if required (2 weeks for some parameters).

4.8 Equipment and Personnel

The equipment required for the sampling program is summarised as follows:

- Work vessel with onboard GPS
- corers
- core pipes, core catcher and core caps
- tarpaulin/ plastic sheeting
- measuring tape
- stainless steel bowl and spoons
- nitrile gloves and PPE
- Decon90 detergent (diluted to 5% with deionised water)
- sample containers and zip-lock bags
- permanent markers and other stationary
- eskies and ice
- camera
- data forms for recording field measurements and logging samples
- chain of custody forms

An experienced environmental scientist will coordinate the sampling program and carry out the subsampling. Experienced personnel will operate the corer and assist in the subsampling.

4.9 Health and Safety Precautions

The sampling program will adhere to the relevant HSE systems.

Safe Work Method Statements (SWMS) will be prepared covering both the coring and subsampling components of the proposed investigation.

4.10 Contingency Plan

Sampling may be delayed where severe weather is forecast, or due to equipment failure. In the event of delay, the sampling will be recommenced following improvement in the weather or fixing of the equipment.

5 QA/QCProceedures

5.1 Field QA/QC Procedures

Field QA/QC procedures will include the following:

- Sample Location: The work vessel's onboard position fixing system will be used to locate the sampling locations.
- Decontamination of Sampling Equipment: Prior to use, the vessel will be thoroughly inspected and washed down. Any evident sources of contamination will be cleaned and covered in plastic to avoid accidental contamination of any samples. All surfaces used for sample handling will also be covered in plastic sheeting prior to subsampling. All sampling equipment that comes into contact with the sediment samples will be decontaminated (using Decon 90) prior to each sampling event.
- Rinsate sample: One rinsate sample per day from each piece of equipment used in homogenising the sediment samples will be submitted to assess if the decontamination of the equipment between samples has been effective.
- Field triplicates: Triplicate samples (comprising three samples taken from one location) will be analysed and used to give an indication of the variability in the chemical properties of the sediment at a sample location.
- Field Documentation: Each sample location will be numbered on a sampling plan in the field logbook. All other observations including weather, time, date of sampling, water depth, and depth of core penetration will be noted in the field logbook. Time, date, core compaction and appearance of the sediments, e.g. texture, colour, odour and the like will also be reported in the field logbook during sub-sampling.
- Cross Contamination: Following sampling, to avoid cross contamination, each sample jar will be washed with water to remove sediment adhering to the outside of the sample containers.
- Split triplicates: At one location, a split triplicate sample will be taken with two of the samples submitted to the primary laboratory and the third sample submitted to the secondary laboratory for geochemical analysis. The split triplicate results will be analysed to assess variability in sub-sampling.
- Sample Control: Each sample will have a unique identification number, which will be recorded in the field log book and chain of custody form. A chain of custody form will accompany the sediment samples at all times and will include the analysis method required of each laboratory.

5.2 Laboratory QA/QC Procedures

Laboratory QA/QC procedures for the chemical analyses will include the following:

- Analysis Blanks: One per analytical run or one in every 20 samples, whichever is the smaller.
- Laboratory Duplicate: One in every 10 samples or client batch, whichever is the smaller.
- Laboratory Control Standard: One per analytical run or one in every 20 samples, whichever is the smaller.
- Laboratory Matrix Spike: One in every 20 samples or client batch, whichever is the smaller.
- Matrix Spike: One in every 20 samples or client batch, whichever is the smaller.

- Surrogate Spike: For determinations that are appropriate, surrogate spikes will be added to all samples for analysis.
- Calibration Blank and Mid Range Calibration Verification: One per analytical run or one in every 20 samples, whichever is the smaller.

5.3 Data Quality Objectives

Field and analytical data quality objectives covering precision, accuracy, representativeness, comparability and completeness are outlined in Table 7 below.

Table 7 Data Quality Objectives

Parameter	Data Quality Objective
Field	
Blank samples	At or near the Limit of Reporting (LOR)
Rinsate sample	At or near the Limit of Reporting (LOR)
Sample condition	Samples received intact and cold
Field duplicates	RPD <50%
Field split triplicate	RPD <50%
Sampling methodology	Compliance with SAP
Sample locations	As per SAP, all samples collected
Chain of custody forms	With all samples
Analytical	
Holding time	Samples analysis within specified holding time
Lab duplicates	RPD <35%
Lab Control samples	RPD <35%
Matrix spike	RPD <35%, recovery 75-125% or as per lab requirement
surrogate	recovery 75-125% or as per lab requirement
completeness	Minimum of 95% of all data on submitted samples validated as suitable for use

6 Reporting

The main findings of the proposed sampling and testing investigation will be documented in a factual report. Reporting will be in accordance with the NAGD guidelines. The report will include:

- a description of the sampling program;

- tabulation of all laboratory results and a copy of the original laboratory sheets;
- results for organic analytes normalised to 1% total organic carbon (within limits of 0.2 to 10% TOC);
- statistical analysis of the results to calculate the mean, and standard deviation and the 95% upper confidence limit of the mean (95% UCL). The USEPA's ProUCL software will be used to calculate the 95% UCL;
- comparison of geochemical results to the NAGD screening levels. Where values are less than the detection limit, a nominal value of one half of the detection limit will be used in the statistical analysis of the results;
- justification for the selection of representative samples for Phase III testing;
- comparison of results of the Phase III testing to relevant guidelines; and
- reporting of all QA/QC.

7 References

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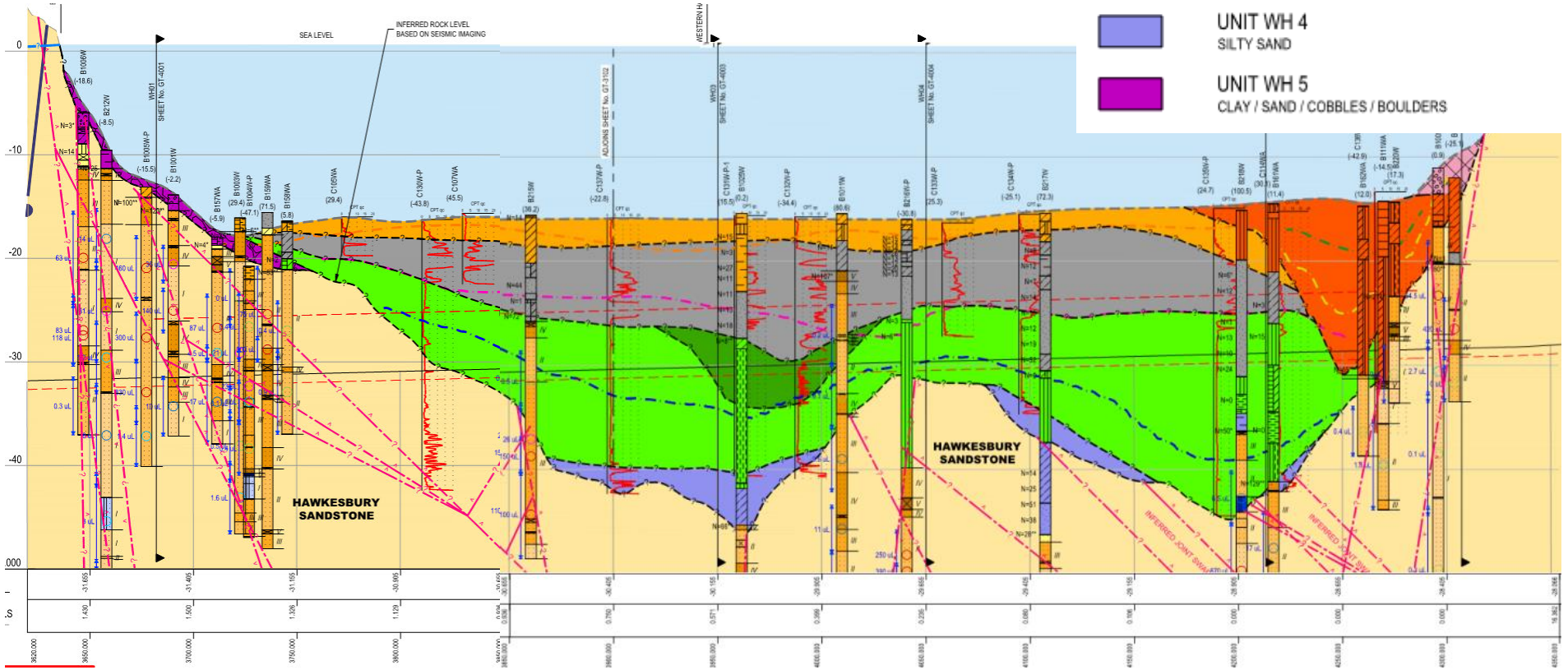
- WSP Parson Brinkerhoff 2016b, Marine Reference Design Sampling, Analysis and Quality Plan – Marine Contamination Assessments, Harbourlink – Environmental Specialist Report 16/09/16 prepared for Roads and Maritime by WSP Parsons Brinkerhoff

Appendix A Geotechnical Profile

Royal HaskoningDHV

Western Harbour Tunnel (section looking upstream)



Appendix B Summary Tables of Golder-Douglas (2017) Results

Royal HaskoningDHV

WESTERN HARBOUR TUNNEL 2017																										
			TOC	Tributyltin	Radionuclides	Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	TPH	TRH	DDD	DDE	DDT	Dieldrin	Endrin	Lindane	Chlordane	Total PAH	Total PCB
				normalised	Sum of gross alpha & beta											normalised	normalised								normalised	
		Units	%	mg/kg	Bq/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		LOR	0.02	0.0005	0.5	0.018	0.02	0.001	0.002	0.002	0.006	0.00004	0.003	0.002	0.005	3.0	3.0	0.0005	0.0005	0.0005	0.0005	0.0005	0.00025	0.00025	0.004	0.005
ISQG-High	Sample	Sample		0.07		25	70	10	370	270	220	1	52	3.7	410			0.02	0.027	0.046	0.008	0.008	0.001	0.006	45	
ISGC-Low (NAGD SL)	Date	Depth		0.005	35	2	20	1.5	80	65	50	0.15	21	1	200	550.0	550.0	0.002	0.0022	0.0016	0.00002 (0.28)	0.00002 (0.01)	0.00032	0.0005	10	0.023
B108WA_VC-A	27/05/17	0-0.5	0.55	0.001	1.41	<0.5	2.6	<0.1	7.4	7.4	25	**0.19**	1.5	<0.1	31.6	212.7	230.9	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	1.1	<0.005
B111WA_VC-A	24/05/17	0-0.5	3.13	0.005	0.78	<0.5	**21.3**	0.1	**81.8**	**152**	**288**	**2.47**	15.6	**2**	**576**	116.0	135.1	0.00102	0.00054	0.00152	<0.0005	<0.0005	<0.00025	<0.0005	0.3	<0.0062
B111WA_VC-B	24/05/17	0.5-1.0	3.59	0.002	1.26	<0.5	**25.7**	0.2	76.6	**122**	**257**	**3**	14.7	**1.6**	**513**	129.0	150.7	0.00127	0.00068	0.00152	<0.0005	<0.0005	<0.00025	<0.0005	0.5	<0.005
B111WA_VC-C	24/05/17	1.0-1.5	4.24	ND	1.43	<0.5	**26.3**	0.3	66.8	**123**	**276**	**5.18**	15.2	**1.9**	**517**	227.4	259.4	0.00154	0.00106	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.4	<0.005
B111WA_VC-D	24/05/17	1.5-2.0	2.22	ND	1.22	<0.5	14.7	<0.1	27.3	6.2	16.2	0.1	9.8	<0.5	33.2	36.0	41.0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.1	<0.005
B111WA_VC-E	28/05/17	2.0-2.5	1.49	ND	<0.5	<0.5	15.5	0.2	21.7	5	11.6	0.03	7.7	<0.1	23.9	8.1	6.0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.0	<0.005
B212WA_VC-A	28/05/17	0-0.5	3.15	0.001	0.92	<0.5	**21.8**	0.2	31.5	**102**	***302***	**6.11**	12	**1.1**	**450**	117.5	127.3	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	6.7	<0.0062
B216W_VC-A	27/05/17	0-0.5	0.34	0.024	<0.5	<0.5	5.02	<0.1	5.9	14.9	28.3	0.13	1.7	<0.1	50.6	417.6	461.8	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	2.5	<0.005
B216W_VC-B	27/05/17	0.5-1.0	0.18	ND	0.63	<0.5	3.59	<0.1	14.9	1.6	6.6	0.02	1.7	<0.1	2.2	61.1	55.6	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B216W_VC-C	27/05/17	1.0-1.5	0.11	ND	0.57	<0.5	2.57	<0.1	10.2	2.2	4.5	<0.01	1.1	0.5	1.8	200.0	190.9	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B216W-VC-D	27/05/17	1.5-2.0	0.12	ND	0.85	<0.5	3.66	<0.1	13.3	3	7.2	0.02	1.1	0.1	3	208.3	233.3	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B478W-A	28/05/17	0-0.5	10.9	0.003	<0.5	<0.5	10.5	<0.1	21.5	43.5	**129**	**1.78**	12.6	0.4	182	34.7	38.9	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	1.4	<0.005
B478W-B	28/05/17	0.5-1.0	2.6	ND	<0.5	<0.5	6.82	<0.1	8.9	11.8	26.7	**0.26**	3.8	0.2	39.1	13.5	13.8	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.3	<0.005
B479W-A	24/05/17	0-0.5	1.22	0.006	<0.5	<0.5	11.1	<0.1	30.4	55	**104**	**1.17**	5.8	0.8	**206**	355.7	423.0	0.0009	0.00059	0.00157	<0.0005	<0.0005	<0.00025	<0.0005	3.4	<0.005
B479W-B	24/05/17	0.5-1.0	0.35	ND	0.51	<0.5	8.02	<0.1	4.5	2	5.2	0.02	1.4	<0.1	7.8	48.6	54.3	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.2	<0.005
B479W-C	24/05/17	1.0-1.5	0.16	ND	0.68	<0.5	5.49	<0.1	12	3	8.2	0.02	<1	<0.1	3.9	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B479W-D	24/05/17	1.5-2.0	0.13	ND	0.82	<0.5	7.82	<0.1	10.8	3.6	12.8	0.02	<1	<0.1	125	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B479W-D	28/05/17	1.5-2.0	0.1	ND	1.05	<0.5	5.31	<0.1	10.2	2.8	7	<0.01	<1	<0.1	2.6	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.9	<0.005
B481W-A	25/05/17	0-0.5	2.26	0.004	0.71	<0.5	**20.5**	0.1	57.8	**101**	**179**	**1.99**	12.2	**1.5**	**368**	309.3	360.2	0.00052	0.00061	0.00122	<0.0005	<0.0005	<0.00025	<0.0005	1.3	<0.0062
B481W-B	25/05/17	0.5-1.0	0.84	ND	0.88	<0.5	16.3	0.2	25.3	6.2	13.6	0.05	8.9	<0.1	30	65.5	75.0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.4	<0.005
B481W-C	25/05/17	1.0-1.5	0.88	ND	1.51	<0.5	15.6	0.2	25.6	5.3	12.4	0.01	9.3	<0.1	23.9	26.1	31.8	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B482W-A	26/05/17	0-0.5	0.67	0.001	0.6	<0.5	17.2	<0.1	18.1	10.2	21.4	0.15	6.3	<0.1	38.9	117.9	129.9	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.4	<0.005
B482W-B	26/05/17	0.5-1.0	0.26	ND	0.76	<0.5	9.12	<0.1	9.3	2.6	6.8	0.01	2.6	<0.1	7.8	123.1	134.6	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B482W-C	26/05/17	1.0-1.5	0.14	ND	1.42	<0.5	8.59	<0.1	16.4	3.9	9.8	0.01	2.2	<0.1	5	107.1	85.7	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B483W-A	28/05/17	0-0.5	0.42	ND	0.78	<0.5	10.5	<0.1	7.5	2.1	6.1	<0.01	2.7	<0.1	7.9	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B483W-B	28/05/17	0.5-1.0	0.42	ND	0.71	<0.5	8.23	<0.1	5.6	2.5	5.2	0.01	1.4	<0.1	3	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B483W-C	28/05/17	1.0-1.5	0.18	ND	0.68	<0.5	3.2	<0.1	9	3.8	5.6	<0.01	1.3	<0.1	4.3	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B484W-A	26/05/17	0-0.5	0.7	0.002	0.98	<0.5	11.7	<0.1	23.5	37.8	**67.5**	**0.73**	5.4	0.3	134	530.0	**627.1**	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	5.2	<0.005
B484W-B	26/05/17	0.5-1.0	0.36	ND	1.51	<0.5	7.41	<0.1	6.1	2.4	5.7	0.01	1.9	<0.1	6.5	63.9	69.4	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B484W-C	27/05/17	1.0-1.5	0.1	ND	0.87	<0.5	1.33	<0.1	7.6	3.8	5.5	<0.01	1.1	<0.1	3.7	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B485W-A	25/05/17	0-0.5	0.2	0.003	0.67	<0.5	15.7	<0.1	20	5.9	17.7	0.12	2.5	<0.1	23.8	155.0	170.0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	1.5	<0.005
B485W-B	25/05/17	0.5-1.0	0.12	ND	0.95	<0.5	**24.6**	<0.1	25	2.6	14	0.05	2.2	<0.1	31.8	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.0	<0.005
B486W-A	26/05/17	0-0.5	0.24	ND	1.91	<0.5	5.75	<0.1	18.4	5.4	38	0.05	2.1	<0.1	10.6	125.0	133.3	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.2	<0.005
B487W-A	27/05/17	0-0.5	0.26	0.004	0.57	<0.5	3.65	<0.1	9.1	6.9	13.7	0.12	1.5	0.1	21.4	307.7	361.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	3.1	<0.005
B487W-B	27/05/17	0.5-1.0	0.1	ND	1.12	<0.5	4.1	<0.1	13	4	19.1	0.03	1.2	<0.1	5	170.0	150.0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B488W-A	25/05/17	0-0.5	0.47	ND	1.09	<0.5	14.3	<0.1	15.7	15.9	27.9	**0.25**	3	<0.1	40	93.6	104.3	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	1.7	<0.005
B490W-A	25/05/17	0-0.5	0.44	0.001	0.61	<0.5	5.29	<0.1	4.4	4.6	8.7	0.07	1.6	<0.1	13.9	81.8	100.0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	1.7	<0.005
B490W-B	25/05/17	0.5-1.0	0.07	ND	<0.5	<0.5	2.31	<0.1	9.2	1.5	5.2	0.01	1.8	<0.1	4.5	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B490W-C	25/05/17	1.0-1.5	0.11	ND	0.85	<0.5	3.71	<0.1	12.7	2.1	6.7	0.02	1.8	<0.1	8.4	ND	ND	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B491W-A	26/05/17	0-0.5	0.12	ND	1.85	<0.5	4.02	<0.1	12	5.4	6.8	0.01	<1	<0.1	6.3	125.0	108.3	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.3	<0.005
B493W-A	25/05/17	0-0.5	0.4	0.004	<0.5	<0.5	7.76	<0.1	10.3	14.4	32	**0.29**	3.1	<0.1	49.8	262.5	310.0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	4.0	<0.005
B497W-A	26/05/17	0-0.5	0.26	0.005	1.33	<0.5	14.7	<0.1	15.2	13.2	22.6	0.06	1.9	<0.1	39.6	273.1	300.0	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	1.4	<0.005
B497W-B	26/05/17	0.5-1.0	0.09	ND	0.85	<0.5	15.8	<0.1	10.9	1.9	2.5	<0.01	1.3	<0.1	6	133.3	111.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	ND	<0.005
B498W-A	24/05/17	0-0.5	3.48	0.005	0.55	<0.5	18.6	0.1	67.8	**129**	**235**	**2.31**	12.9	**1.7**	**506**	117.0	136.8	0.00082	0.00063	0.00097	<0.0005	<0.0005	<0.00025	<0.0005	0.3	<0.0062
B498W-B	24/05/17	0.5-1.0	3.2	0.000	1.4	<0.5	**25**	0.2	59.5	**99.2**	**228**	**4.42**	13.5	1	**418**	318.8	362.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.5	<0.005
B498W-C	24/05/17	1.0-1.5	2.67	ND	1.59	<0.5	**20.2**	0.1	34.1	62.7	**170**	**3.38**	11.4	**1.2**	**273**	134.1	152.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	6.1	<0.005
B498W-D	28/05/17	1.5-2.0	0.7	ND	<0.5	<0.5	14.6	<0.1	19.3	4.9	11.9	0.07	6.8	<0.1	27.5	5.7	8.6	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.1	<0.005
B498W-E	28/05/17	2.0-2.5	1.05	ND	<0.5	<0.5	16.1	0.1	23.2	5.1	11.2	0.02	8.2	0.1	22.5	3.8	6.7	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	0.0	<0.005
B513W-A	27/05/17	0-0.5	0.58	0.002	<0.5	<0.5	13.9	0.2	18	40.7	**114**	**1.31**	4.8	0.4	189	125.9	139.7	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005	1.6	<0.005
B513W-B	27/05/17	0.5-1.0	0.09	ND	0.74	<0.5	10.6	<0.1	15	1.3	6.4	0.04	1.6	0.1	3.9	255.6	244.4	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005
B513W-C	27/05/17		0.12	ND	<0.5	<0.5	10.8	<0.1	10.5	<1	4.9	0.02	1.1	<0.1	3.2	41.7	66.7	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00025	<0.0005		<0.005

Appendix C COC Form

Royal HaskoningDHV

Royal HaskoningDHV
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CHAIN OF CUSTODY

CLIENT: RHDHV			
OFFICE: North Sydney			
PROJECT:			
PROJECT MANAGER: Ali Watters	[redacted]		
SAMPLER: Ali Watters / Pat Lawless	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
[redacted]	DATE/TIME: 14/02/14	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED								Additional Information
	SAMPLES	DATE / TIME	MATRIX	TYPE & PRESERVATIVE	TOTAL CONTAINERS									Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
				TOTAL										

Appendix B Core Logs

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **B479PC**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	23/5/18
PROJECT:	WHTBL	**DATE COMPLETED:**	23/5/18
LOCATION:	Sydney	**LOGGED BY:**	TB
JOB NUMBER:	PA1694	**CHECKED BY:**	AW

Contractor:	Geochemical Assessments	**Core diameter (OD):**		**Easting:**	332686	**Water depth:**	14.1m
Equipment:	Piston Corer		**(ID):**	**Northing:**	6253600	**Datum:**	

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Very soft at surface Brown, grey, muddy sand	muddier at surface becoming more brown with depth
	1			Firmness increasing with depth	
	2			DOT = 2.06	Orange sandy clay at end of core
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **B478**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	23/05/19
PROJECT:	WHTBL	**DATE COMPLETED:**	23/5/19
LOCATION:	Sydney	**LOGGED BY:**	TB
JOB NUMBER:	PA1694	**CHECKED BY:**	AW

Contractor:	Geochemical Assessments	**Core diameter (OD):**		**Easting:**	322798	**Water depth:**	12.9m
Equipment:	Vibrocorer		**(ID):**	**Northing:**	6253610	**Datum:**	

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Very soft layer Brown, grey, silty clay Firmness increasing with depth	relocated due to coal spillage/gravel on bed
	1				
	2			Shell in bottom 30 mm DOT: 2.12	
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **B111PC**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	21/05/18
PROJECT:	WHTBL	**DATE COMPLETED:**	21/05/18
LOCATION:	Sydney	**LOGGED BY:**	TB
JOB NUMBER:	PA1694	**CHECKED BY:**	AW

Contractor:	Geochemical Assessments	**Core diameter (OD):**		**Easting:**	332771	**Water depth:**	13m
Equipment:	Piston Corer		**(ID):**	**Northing:**	6253648	**Datum:**	

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Dark, grey silt clay Firmness increasing with depth	
	1			Trace sand burrows	
				1.65 Darker grey - potentially pre-anthropogenic DOT: 1.83	Octa-dioxin: 1.65 - 1.80
	2				
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **B498PC**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	21/05/18
PROJECT:	WHTBL	**DATE COMPLETED:**	21/05/18
LOCATION:	Sydney	**LOGGED BY:**	AW
JOB NUMBER:	PA1694	**CHECKED BY:**	
Contractor:	Geochemical Assessments	**Core diameter (OD):**	**Easting:** 332764
Equipment:	Piston Corer	**(ID):**	**Northing:** 6253612

Water depth:

Datum:

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Dark grey silty clay Trace sand Firmness increasing with depth	Very firm from 0.8
	1			Piece of slag at 1.65 Shell at end of core DOT: 1.76	
	2				
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **WHT1**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	21/05/18
PROJECT:	WHTBL	**DATE COMPLETED:**	21/05/18
LOCATION:	Sydney	**LOGGED BY:**	TB
JOB NUMBER:	PA1694	**CHECKED BY:**	AW

Contractor:	Geochemical Assessments	**Core diameter (OD):**		**Easting:**	332778	**Water depth:**	12.7m
Equipment:	vibrocore		**(ID):**	**Northing:**	6253698	**Datum:**	

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Very soft hydrous surface layer Brown/grey silty clay Firmness increasing with depth	
	1			Darker grey silty clay - firm	
	2			DOT: 1.9	
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **WHT2**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	22/05/18
PROJECT:	WHTBL	**DATE COMPLETED:**	22/05/18
LOCATION:	Sydney	**LOGGED BY:**	TB
JOB NUMBER:	PA1694	**CHECKED BY:**	AW

Contractor:	Geochemical Assessments	**Core diameter (OD):**		**Easting:**	332682	**Water depth:**	14.1m
Equipment:	Vibrocore		**(ID):**	**Northing:**	6253676	**Datum:**	

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Grey silty mud	
	1			1.45 - 1.46: layers of charcoal-timber DOT: 1.50	
	2				
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **WHT3**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	22/05/18
PROJECT:	WHTBL	**DATE COMPLETED:**	22/05/18
LOCATION:	Sydney	**LOGGED BY:**	TB
JOB NUMBER:	PA1694	**CHECKED BY:**	AW

Contractor:	Geochemical Assessments	**Core diameter (OD):**		**Easting:**	332578	**Water depth:**	
Equipment:		**(ID):**		**Northing:**	6253639	**Datum:**	

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Shell on surface Grey sandy clay	
				0.6 Orange brown sandy clay	
	1			Orange brown clay DOT: 1.12	
	2				
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
Enhancing Society Together

VIBROCORE # **WHT4**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	
PROJECT:	WHTBL	**DATE COMPLETED:**	
LOCATION:	Sydney	**LOGGED BY:**	AW
JOB NUMBER:	PA1694	**CHECKED BY:**	

Contractor:	Geochemical Assessments	**Core diameter (OD):**		**Easting:**	332600	**Water depth:**	15m
Equipment:	Vibrocore		**(ID):**	**Northing:**	6253603	**Datum:**	

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0	0.2	CH	Grey brown silty sand	
				Brown silty sand	
		0.8			
	1			Orange brown stiff clay	
	2				
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
Enhancing Society Together

VIBROCORE # **WHT5**

SHEET 1 of 1

CLIENT:	RMS		**DATE COMMENCED:**	22/05/2018	10.25
PROJECT:	WHTBL		**DATE COMPLETED:**		
LOCATION:	Sydney		**LOGGED BY:**	TB	
JOB NUMBER:	PA1694		**CHECKED BY:**	AW	
Contractor:	Geochemical Assessments	**Core diameter (OD):**	**Easting:**	332473	**Water depth:** 14.6m
Equipment:	vibrocore	**(ID):**	**Northing:**	6253602	**Datum:**

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Shell, rock, gravel in muddy sand Muddy sand, brown, grey	
				0.3	
				0.4 Stiff mud with sandy mud inclusion Stiff orange brown clay	
				DOT: 0.62	
	1				
	2				
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **WHT6**

SHEET 1 of 1

CLIENT:	RMS		**DATE COMMENCED:**	22/05/2018	10
PROJECT:	WHTBL		**DATE COMPLETED:**		
LOCATION:	Sydney		**LOGGED BY:**	TB	
JOB NUMBER:	PA1694		**CHECKED BY:**	AW	
Contractor:	Geochemical Assessments	**Core diameter (OD):**	**Easting:**	332482	**Water depth:** 14.6m
Equipment:		**(ID):**	**Northing:**	6253551	**Datum:**

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Large pieces of rock and shell, ϕ20mm	
		0.44		Grey brown muddy sand with shell	
				Stiff mottled orange/brown clay DOT: 0.55	
	1				
	2				
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
Enhancing Society Together

VIBROCORE # **WHT7**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	22/05/2018
PROJECT:	WHTBL	**DATE COMPLETED:**	
LOCATION:	Sydney	**LOGGED BY:**	AW
JOB NUMBER:	PA1694	**CHECKED BY:**	

Contractor:	Geochemical Assessments	**Core diameter (OD):**		**Easting:**	332387	**Water depth:**	14.4m
Equipment:			**(ID):**	**Northing:**	6253557	**Datum:**	

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0	0.09	CH	Rock, shell, gravel, muddy sandy gravel Stiff brown ornage mottled clay DOT: 0.26	
	1				
	2				
	3				
	4				
	5				
	6				

VIBROCORE LOG

Royal HaskoningDHV
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VIBROCORE # **WHT8**

SHEET 1 of 1

CLIENT:	RMS	**DATE COMMENCED:**	23/05/18
PROJECT:	WHTBL	**DATE COMPLETED:**	23/05/18
LOCATION:	Sydney	**LOGGED BY:**	TB
JOB NUMBER:	PA1694	**CHECKED BY:**	AW

Contractor: Geochemical Assessments **Core diameter (OD):** **Easting:** **Water depth:**

Equipment: **(ID):** **Northing:** **Datum:**

sub sample	Depth below bed level (m)	Graphic Log	USC Symbol	Material Description	Field Observations
	0		CH	Grey brown silty sand with shell - large pieces to 0.3	
		0.4		Orange brown mottled stiff clay	
	1			DOT: 1.18	
	2				
	3				
	4				
	5				
	6				

Appendix C Laboratory Results

CERTIFICATE OF ANALYSIS

Client	**HASKONING AUSTRALIA- ROYAL HASKONING**	**Laboratory :**	Environmental Division Sydney		
Contact	ALI WATTERS	**Contact**	CUSTOMER.SERVICES.ES	**Work Order:**	**ES1990041**
Address:	LEVEL 14 56 Berry Street NORTH SYDNEY 2060	**Address:**	277-289 Woodpark Road Smithfield NSW 2164 Australia		
Project	WHTBL	**Quote #**	----	**Received:**	22 Aug 2019
Order #	- Not provided -			**Issued**	10 Sep 2019
C-O-C #	- Not provided -				
Site					
E-mail	[redacted]	**E-mail**	[redacted]	**Number of Samples**	
Phone	8854 5000	**Phone**	[redacted]	**Received:**	10
Fax	- Not provided -	**Fax**	+61-2-8784 8500	**Analysed:**	10

Notes

LOR = Limit of reporting
I-TEF = International toxic equivalency factor
I-TEQ = International toxic equivalence
WHO-TEF = World Health Organistaion toxic equivalency factor
WHO-TEQ = World Health Organisation toxic equivalence

1 I -TEQ(zero) and WHO-TEQ(zero) calculated treating <LOR as zero concentration
2 I -TEQ(0.5 LOR) and WHO-TEQ(0.5 zero) calculated treating <LOR as 0.5 LoR concentration
3 I-TEQ(LOR) and WHO-TEQ(LOR) calculated treating <LOR as LoR concentration
4 Totals LORs are calculated by multiplying the number of peaks by the individual LOR per compound
5 13C12 Rec(%) = The absolute recovery of Isotopically labelled compound added by the Laboratory to both quantitate and measure extraction efficiency.

T = tetra
Pe = penta
Hx = hexa
Hp =hepta
O = octa
CDD, dioxin = chlorinated dibenzo-p-dioxin
CDF, furan = chlorinated dibenzofuran

Samples analysed 'as received', results reported on 'dry weight' basis.

ALSE - Excellence in Analytical Testing

NATA Accredited Laboratory - 825

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IED 17025

This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Position	Department
[redacted]	HRMS Chemist	GC/HR-MS - NATA 825 (818 - Brisbane)

CERTIFICATE OF ANALYSIS

CERTIFICATE NO.: **S673311-A** **REVISION NO.:** **02** **Page 1 of 38**
ISSUE DATE: 12/06/18 This certificate supersedes any previous revisions

CLIENT DETAILS: Ali Watters
Haskoning Australia Pty Ltd
Level 14, 56 Berry Street
North Sydney NSW 2060

DATE RECEIVED: 23/05/2018
CLIENT JOBREF:
ORDER NO:
TEST DATE: Sample tested between date received and reported.

SAMPLE INFORMATION:

Received Condition (°C): Chilled (0 ~ 5 °C) **Storage Condition:** Refrigerated

Sample No.	Sample Date/Time	Sample Description	Sample Matrix
S673311-A/1		WHT 7A 0-0.1	Sediment
S673311-A/2		WHT 7 0-0.9	Sediment
S673311-A/3		WHT 7 0.1-0.26	Sediment
S673311-A/4		WHT 6 0-0.44	Sediment
S673311-A/5		WHT6 0.45-0.55	Sediment
S673311-A/6		WHT 5 0-0.4	Sediment
S673311-A/7		WHT 5 0.5-0.55	Sediment
S673311-A/8		WHT 5 0.4-0.6	Sediment
S673311-A/9		WHT 4 0-0.8	Sediment
S673311-A/10		WHT 4 0.8-1.2	Sediment
S673311-A/11		BIIIPC	Sediment

Symbio Laboratories Pty Ltd
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▪ Brisbane: 52 Brandl Street, Eight Mile Plains QLD 4113
▪ Melbourne: Unit 36, 640-680 Geelong Rd, Brooklyn VIC 3025
▪ Sydney: 2 Sirius Rd, Lane Cove West NSW 2066
▪ Rockhampton: Unit 3, 191 Berserker St, Berserker QLD 4701
▪ Wagga Wagga: Unit 5, 10-12 Kooringal Rd, Wagga Wagga NSW 2650

Sample No.	Sample Date/Time	Sample Description	Sample Matrix
S673311-A/12		BIIIPC 1.65-1.80	Sediment
S673311-A/13		B498PC	Sediment
S673311-A/14		B498PC 1.60-1.76	Sediment
S673311-A/15		B478PC	Sediment
S673311-A/16		B478PC 1.9-2.0	Sediment
S673311-A/17		B479PC 1.86-1.96	Sediment
S673311-A/18		B479PC	Sediment
S673311-A/19		WHT PCI	Sediment
S673311-A/20		WHT8 0-0.4	Sediment
S673311-A/21		WHT 8 0.4-1.00	Sediment
S673311-A/22		WHT 8 1.00-1.10	Sediment
S673311-A/23		WHT 1 0-0.5	Sediment
S673311-A/24		WHT 1 0.5-1.0	Sediment
S673311-A/25		WHT 1 1.1-1.8	Sediment
S673311-A/26		WHT 4 1.10-1.17	Sediment
S673311-A/27		WHT 3 1.0-1.08	Sediment
S673311-A/28		WHT 2 0-0.5	Sediment
S673311-A/29		WHT 2 0.5-1.0	Sediment
S673311-A/30		WHT 2 1.0-1.5	Sediment
S673311-A/31		WHT B1	Sediment
S673311-A/32		WHT PC5	Sediment
S673311-A/33		WHT PC6	Sediment
S673311-A/34		WHT 3 0-0.6	Sediment

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Sample No.	Sample Date/Time	Sample Description	Sample Matrix
S673311-A/35		WHT3 0.6-1.12	Sediment
S673311-A/36		WHT PC3	Sediment
S673311-A/37		WHT PC4	Sediment
S673311-A/38		WHT D1	Water - General
S673311-A/39		WHT R2	Water - General

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RESULTS OF ANALYSIS:

	Test Method	LOR	Units	S673311-A/1	S673311-A/2	S673311-A/3	S673311-A/4	S673311-A/5
Moisture Content								
Moisture Content	04-004	0.1	%	19	28	-	25	-
Metals - Fresh Water Total								
Silver - Total	04-015	0.1	µg/L	-	-	-	-	-
Arsenic - Total	04-015	0.5	µg/L	-	-	-	-	-
Cadmium - Total	04-015	0.1	µg/L	-	-	-	-	-
Chromium - Total	04-015	1	µg/L	-	-	-	-	-
Copper - Total	04-015	0.5	µg/L	-	-	-	-	-
Nickel - Total	04-015	0.5	µg/L	-	-	-	-	-
Lead - Total	04-015	0.1	µg/L	-	-	-	-	-
Zinc - Total	04-015	0.5	µg/L	-	-	-	-	-
Mercury - Total (µg/L)								
Mercury - Total	04-009	0.1	µg/L	-	-	-	-	-
Trace Elements								
Arsenic	04-001	0.4	mg/kg	7.7	7.9	-	12	-
Cadmium	04-001	0.1	mg/kg	<0.1	<0.1	-	0.11	-
Chromium	04-001	0.1	mg/kg	14	8.6	-	14	-
Copper	04-001	0.1	mg/kg	4.6	7.5	-	18	-
Mercury	04-002	0.01	mg/kg	0.055	0.090	-	0.35	-
Nickel	04-001	0.1	mg/kg	2.2	1.3	-	9.5	-

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	Test Method	LOR	Units	S673311-A/1	S673311-A/2	S673311-A/3	S673311-A/4	S673311-A/5
Lead	04-001	0.5	mg/kg	11	15	-	210	-
Silver	04-001	0.1	mg/kg	<0.1	<0.1	-	<0.1	-
Zinc	04-001	0.5	mg/kg	14	24	-	74	-
Organotin Analysis								
Monobutyltin	04-026	0.5	µgSn/kg	<0.50	<0.50	-	3.4	-
Dibutyltin	04-026	0.5	µgSn/kg	<0.50	<0.50	-	2.9	-
Tributyltin	04-026	0.5	µgSn/kg	<0.50	1.6	-	1.7	-
Surrogate Recovery	04-026		%	107	122	-	68	-
Total Petroleum Hydrocarbons								
TPH C6-C9	04-021	10	mg/kg	<10	<10	-	<10	-
TPH C10-C14	04-020	10	mg/kg	<10	<10	-	<10	-
TPH C15-C28	04-020	50	mg/kg	<50	<50	-	<50	-
TPH C29-C36	04-020	50	mg/kg	<50	<50	-	<50	-
Surrogate Recovery	04-020		%	106	104	-	106	-
Poly Aromatic Hydrocarbons								
Naphthalene	04-022	5	µg/kg	<5	5.4	-	9.5	-
1-Methylnaphthalene	04-022	5	µg/kg	<5	<5	-	<5	-
2-Methylnaphthalene	04-022	5	µg/kg	<5	<5	-	6.0	-
Acenaphthylene	04-022	5	µg/kg	<5	18	-	28	-
Acenaphthene	04-022	5	µg/kg	<5	<5	-	<5	-

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	Test Method	LOR	Units	S673311-A/1	S673311-A/2	S673311-A/3	S673311-A/4	S673311-A/5
Fluorene	04-022	5	µg/kg	<5	<5	-	6.5	-
Phenanthrene	04-022	5	µg/kg	<5	49	-	59	-
Anthracene	04-022	5	µg/kg	<5	12	-	19	-
Fluoranthene	04-022	5	µg/kg	11	120	-	170	-
Pyrene	04-022	5	µg/kg	12	130	-	190	-
Benz(a)anthracene	04-022	5	µg/kg	7.2	54	-	87	-
Chrysene	04-022	5	µg/kg	6.6	62	-	100	-
Benzo(b)&(k)fluoranthene	04-022	10	µg/kg	<10	150	-	250	-
Benzo(a)pyrene	04-022	5	µg/kg	8.0	84	-	170	-
Indeno(1,2,3-cd)pyrene	04-022	5	µg/kg	24	170	-	240	-
Dibenz(a,h)anthracene	04-022	5	µg/kg	<5	28	-	57	-
Benzo(g,h,i)perylene	04-022	5	µg/kg	10	100	-	190	-
Coronene	04-022	10	µg/kg	12	76	-	130	-
Benzo(e)pyrene	04-022	5	µg/kg	5.4	51	-	95	-
Perylene	04-022	5	µg/kg	<5	21	-	30	-
Total PAHs (as above)	04-022	100	µg/kg	<100	1,100	-	1,800	-
Surrogate 1 Recovery	04-022	-	%	102	112	-	111	-
Surrogate 2 Recovery	04-022	-	%	100	120	-	112	-
Surrogate 3 Recovery	04-022	-	%	81	94	-	85	-
Organochlorine Pesticides								
Aldrin	04-024	1	µg/kg	<1	<1	-	<1	-

	Test Method	LOR	Units	S673311-A/1	S673311-A/2	S673311-A/3	S673311-A/4	S673311-A/5
alpha-BHC	04-024	1	µg/kg	<1	<1	-	<1	-
beta-BHC	04-024	1	µg/kg	<1	<1	-	<1	-
gamma-BHC (Lindane)	04-024	1	µg/kg	<1	<1	-	<1	-
delta-BHC	04-024	1	µg/kg	<1	<1	-	<1	-
cis-Chlordane	04-024	1	µg/kg	<1	<1	-	<1	-
trans-Chlordane	04-024	1	µg/kg	<1	<1	-	<1	-
p,p'-DDD	04-024	1	µg/kg	<1	<1	-	<1	-
p,p'-DDE	04-024	1	µg/kg	<1	<1	-	<1	-
p,p'-DDT	04-024	1	µg/kg	<1	<1	-	<1	-
Dieldrin	04-024	1	µg/kg	<1	<1	-	<1	-
alpha-Endosulfan	04-024	1	µg/kg	<1	<1	-	<1	-
beta-Endosulfan	04-024	1	µg/kg	<1	<1	-	<1	-
Endosulfan Sulphate	04-024	1	µg/kg	<1	<1	-	<1	-
Endrin	04-024	1	µg/kg	<1	<1	-	<1	-
Endrin ketone	04-024	1	µg/kg	<1	<1	-	<1	-
Endrin aldehyde	04-024	1	µg/kg	<1	<1	-	<1	-
Heptachlor	04-024	1	µg/kg	<1	<1	-	<1	-
Heptachlor epoxide	04-024	1	µg/kg	<1	<1	-	<1	-
Hexachlorobenzene	04-024	1	µg/kg	<1	<1	-	<1	-
Methoxychlor	04-024	1	µg/kg	<1	<1	-	<1	-
Oxychlordane*	04-024	1	µg/kg	<1	<1	-	<1	-

	Test Method	LOR	Units	S673311-A/1	S673311-A/2	S673311-A/3	S673311-A/4	S673311-A/5
Surrogate Recovery	04-024	-	%	85	92	-	88	-
Subcontract Analysis								
Total Organic Carbon^	S004.01	0.01	%	-	-	0.12	0.68	-

	Test Method	LOR	Units	S673311-A/6	S673311-A/7	S673311-A/8	S673311-A/9	S673311-A/10
Moisture Content								
Moisture Content	04-004	0.1	%	23	-	18	21	19
Metals - Fresh Water Total								
Silver - Total	04-015	0.1	µg/L	-	-	-	-	-
Arsenic - Total	04-015	0.5	µg/L	-	-	-	-	-
Cadmium - Total	04-015	0.1	µg/L	-	-	-	-	-
Chromium - Total	04-015	1	µg/L	-	-	-	-	-
Copper - Total	04-015	0.5	µg/L	-	-	-	-	-
Nickel - Total	04-015	0.5	µg/L	-	-	-	-	-
Lead - Total	04-015	0.1	µg/L	-	-	-	-	-
Zinc - Total	04-015	0.5	µg/L	-	-	-	-	-
Mercury - Total (µg/L)								
Mercury - Total	04-009	0.1	µg/L	-	-	-	-	-
Trace Elements								
Arsenic	04-001	0.4	mg/kg	7.1	-	5.1	7.8	6.2
Cadmium	04-001	0.1	mg/kg	<0.1	-	<0.1	<0.1	<0.1

	Test Method	LOR	Units	S673311-A/6	S673311-A/7	S673311-A/8	S673311-A/9	S673311-A/10
Chromium	04-001	0.1	mg/kg	17	-	17	9.6	13
Copper	04-001	0.1	mg/kg	24	-	5.1	9.7	2.5
Mercury	04-002	0.01	mg/kg	0.45	-	0.017	0.15	0.017
Nickel	04-001	0.1	mg/kg	4.0	-	3.5	3.1	1.6
Lead	04-001	0.5	mg/kg	42	-	7.6	34	7.5
Silver	04-001	0.1	mg/kg	0.16	-	<0.1	<0.1	<0.1
Zinc	04-001	0.5	mg/kg	74	-	5.9	44	3.0
Organotin Analysis								
Monobutyltin	04-026	0.5	µgSn/kg	1.6	-	<0.50	2.7	<0.50
Dibutyltin	04-026	0.5	µgSn/kg	1.5	-	<0.50	3.5	<0.50
Tributyltin	04-026	0.5	µgSn/kg	1.5	-	<0.50	5.7	<0.50
Surrogate Recovery	04-026		%	38	-	42	41	40
Total Petroleum Hydrocarbons								
TPH C6-C9	04-021	10	mg/kg	<10	-	<10	<10	<10
TPH C10-C14	04-020	10	mg/kg	<10	-	<10	<10	<10
TPH C15-C28	04-020	50	mg/kg	50	-	<50	<50	<50
TPH C29-C36	04-020	50	mg/kg	59	-	<50	<50	<50
Surrogate Recovery	04-020		%	96	-	100	104	102
Poly Aromatic Hydrocarbons								
Naphthalene	04-022	5	µg/kg	13	-	<5	7.3	<5

	Test Method	LOR	Units	S673311-A/6	S673311-A/7	S673311-A/8	S673311-A/9	S673311-A/10
1-Methylnaphthalene	04-022	5	µg/kg	<5	-	<5	<5	<5
2-Methylnaphthalene	04-022	5	µg/kg	6.4	-	<5	<5	<5
Acenaphthylene	04-022	5	µg/kg	49	-	<5	15	<5
Acenaphthene	04-022	5	µg/kg	<5	-	<5	<5	<5
Fluorene	04-022	5	µg/kg	9.5	-	<5	<5	<5
Phenanthrene	04-022	5	µg/kg	83	-	<5	33	<5
Anthracene	04-022	5	µg/kg	30	-	<5	10	<5
Fluoranthene	04-022	5	µg/kg	240	-	<5	89	<5
Pyrene	04-022	5	µg/kg	260	-	<5	95	<5
Benz(a)anthracene	04-022	5	µg/kg	130	-	<5	47	<5
Chrysene	04-022	5	µg/kg	150	-	<5	52	<5
Benzo(b)&(k)fluoranthene	04-022	10	µg/kg	480	-	<10	140	<10
Benzo(a)pyrene	04-022	5	µg/kg	320	-	<5	83	<5
Indeno(1,2,3-cd)pyrene	04-022	5	µg/kg	400	-	6.0	180	10
Dibenz(a,h)anthracene	04-022	5	µg/kg	110	-	<5	38	<5
Benzo(g,h,i)perylene	04-022	5	µg/kg	310	-	<5	110	<5
Coronene	04-022	10	µg/kg	200	-	<10	86	<10
Benzo(e)pyrene	04-022	5	µg/kg	170	-	<5	50	<5
Perylene	04-022	5	µg/kg	54	-	<5	17	<5
Total PAHs (as above)	04-022	100	µg/kg	3,000	-	<100	1,100	<100
Surrogate 1 Recovery	04-022	-	%	107	-	115	106	112

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	Test Method	LOR	Units	S673311-A/6	S673311-A/7	S673311-A/8	S673311-A/9	S673311-A/10
Surrogate 2 Recovery	04-022	-	%	105	-	111	98	103
Surrogate 3 Recovery	04-022	-	%	81	-	92	80	84
Organochlorine Pesticides								
Aldrin	04-024	1	µg/kg	<1	-	<1	<1	<1
alpha-BHC	04-024	1	µg/kg	<1	-	<1	<1	<1
beta-BHC	04-024	1	µg/kg	<1	-	<1	<1	<1
gamma-BHC (Lindane)	04-024	1	µg/kg	<1	-	<1	<1	<1
delta-BHC	04-024	1	µg/kg	<1	-	<1	<1	<1
cis-Chlordane	04-024	1	µg/kg	<1	-	<1	<1	<1
trans-Chlordane	04-024	1	µg/kg	<1	-	<1	<1	<1
p,p'-DDD	04-024	1	µg/kg	<1	-	<1	<1	<1
p,p'-DDE	04-024	1	µg/kg	<1	-	<1	<1	<1
p,p'-DDT	04-024	1	µg/kg	<1	-	<1	<1	<1
Dieldrin	04-024	1	µg/kg	<1	-	<1	<1	<1
alpha-Endosulfan	04-024	1	µg/kg	<1	-	<1	<1	<1
beta-Endosulfan	04-024	1	µg/kg	<1	-	<1	<1	<1
Endosulfan Sulphate	04-024	1	µg/kg	<1	-	<1	<1	<1
Endrin	04-024	1	µg/kg	<1	-	<1	<1	<1
Endrin ketone	04-024	1	µg/kg	<1	-	<1	<1	<1
Endrin aldehyde	04-024	1	µg/kg	<1	-	<1	<1	<1
Heptachlor	04-024	1	µg/kg	<1	-	<1	<1	<1

	Test Method	LOR	Units	S673311-A/6	S673311-A/7	S673311-A/8	S673311-A/9	S673311-A/10
Heptachlor epoxide	04-024	1	µg/kg	<1	-	<1	<1	<1
Hexachlorobenzene	04-024	1	µg/kg	<1	-	<1	<1	<1
Methoxychlor	04-024	1	µg/kg	<1	-	<1	<1	<1
Oxychlordane*	04-024	1	µg/kg	<1	-	<1	<1	<1
Surrogate Recovery	04-024	-	%	83	-	96	83	84
Subcontract Analysis								
Total Organic Carbon^	S004.01	0.01	%	0.61	-	0.33	0.41	0.22

	Test Method	LOR	Units	S673311-A/11	S673311-A/12	S673311-A/13	S673311-A/14	S673311-A/15
Moisture Content								
Moisture Content	04-004	0.1	%	54	-	49	-	47
Metals - Fresh Water Total								
Silver - Total	04-015	0.1	µg/L	-	-	-	-	-
Arsenic - Total	04-015	0.5	µg/L	-	-	-	-	-
Cadmium - Total	04-015	0.1	µg/L	-	-	-	-	-
Chromium - Total	04-015	1	µg/L	-	-	-	-	-
Copper - Total	04-015	0.5	µg/L	-	-	-	-	-
Nickel - Total	04-015	0.5	µg/L	-	-	-	-	-
Lead - Total	04-015	0.1	µg/L	-	-	-	-	-
Zinc - Total	04-015	0.5	µg/L	-	-	-	-	-
Mercury - Total (µg/L)								

	Test Method	LOR	Units	S673311-A/11	S673311-A/12	S673311-A/13	S673311-A/14	S673311-A/15
Mercury - Total	04-009	0.1	µg/L	-	-	-	-	-
Trace Elements								
Arsenic	04-001	0.4	mg/kg	23	-	22	-	21
Cadmium	04-001	0.1	mg/kg	0.35	-	0.30	-	0.26
Chromium	04-001	0.1	mg/kg	64	-	53	-	49
Copper	04-001	0.1	mg/kg	120	-	100	-	98
Mercury	04-002	0.01	mg/kg	3.5	-	3.7	-	3.5
Nickel	04-001	0.1	mg/kg	13	-	12	-	17
Lead	04-001	0.5	mg/kg	220	-	200	-	190
Silver	04-001	0.1	mg/kg	1.1	-	0.98	-	0.89
Zinc	04-001	0.5	mg/kg	420	-	350	-	330
Organotin Analysis								
Monobutyltin	04-026	0.5	µgSn/kg	9.7	-	5.3	-	2.1
Dibutyltin	04-026	0.5	µgSn/kg	22	-	11	-	3.8
Tributyltin	04-026	0.5	µgSn/kg	7.2	-	4.2	-	1.8
Surrogate Recovery	04-026		%	40	-	64	-	54
Total Petroleum Hydrocarbons								
TPH C6-C9	04-021	10	mg/kg	<10	-	<10	-	<10
TPH C10-C14	04-020	10	mg/kg	10	-	<10	-	<10
TPH C15-C28	04-020	50	mg/kg	640	-	530	-	450
TPH C29-C36	04-020	50	mg/kg	610	-	500	-	410

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	Test Method	LOR	Units	S673311-A/11	S673311-A/12	S673311-A/13	S673311-A/14	S673311-A/15
Surrogate Recovery	04-020		%	122	-	123	-	119
Poly Aromatic Hydrocarbons								
Naphthalene	04-022	5	µg/kg	280	-	230	-	240
1-Methylnaphthalene	04-022	5	µg/kg	200	-	140	-	110
2-Methylnaphthalene	04-022	5	µg/kg	230	-	170	-	130
Acenaphthylene	04-022	5	µg/kg	460	-	370	-	400
Acenaphthene	04-022	5	µg/kg	58	-	46	-	42
Fluorene	04-022	5	µg/kg	150	-	130	-	120
Phenanthrene	04-022	5	µg/kg	1,300	-	1,100	-	1,000
Anthracene	04-022	5	µg/kg	360	-	350	-	320
Fluoranthene	04-022	5	µg/kg	3,000	-	2,600	-	2,300
Pyrene	04-022	5	µg/kg	3,100	-	2,600	-	2,500
Benz(a)anthracene	04-022	5	µg/kg	1,600	-	1,400	-	1,300
Chrysene	04-022	5	µg/kg	1,700	-	1,400	-	1,400
Benzo(b)&(k)fluoranthene	04-022	10	µg/kg	4,800	-	4,000	-	4,000
Benzo(a)pyrene	04-022	5	µg/kg	3,200	-	2,700	-	2,700
Indeno(1,2,3-cd)pyrene	04-022	5	µg/kg	4,400	-	3,800	-	3,900
Dibenz(a,h)anthracene	04-022	5	µg/kg	1,100	-	1,100	-	990
Benzo(g,h,i)perylene	04-022	5	µg/kg	3,400	-	2,800	-	2,800
Coronene	04-022	10	µg/kg	2,100	-	1,800	-	1,800
Benzo(e)pyrene	04-022	5	µg/kg	1,600	-	1,300	-	1,200

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	Test Method	LOR	Units	S673311-A/11	S673311-A/12	S673311-A/13	S673311-A/14	S673311-A/15
Perylene	04-022	5	µg/kg	520	-	390	-	410
Total PAHs (as above)	04-022	100	µg/kg	34,000	-	28,000	-	28,000
Surrogate 1 Recovery	04-022	-	%	109	-	106	-	124
Surrogate 2 Recovery	04-022	-	%	129	-	120	-	123
Surrogate 3 Recovery	04-022	-	%	104	-	95	-	94
Organochlorine Pesticides								
Aldrin	04-024	1	µg/kg	<1	-	<1	-	<1
alpha-BHC	04-024	1	µg/kg	<1	-	<1	-	<1
beta-BHC	04-024	1	µg/kg	<1	-	<1	-	<1
gamma-BHC (Lindane)	04-024	1	µg/kg	<1	-	<1	-	<1
delta-BHC	04-024	1	µg/kg	<1	-	<1	-	<1
cis-Chlordane	04-024	1	µg/kg	<1	-	<1	-	<1
trans-Chlordane	04-024	1	µg/kg	<1	-	<1	-	<1
p,p'-DDD	04-024	1	µg/kg	<1	-	<1	-	<1
p,p'-DDE	04-024	1	µg/kg	<1	-	<1	-	<1
p,p'-DDT	04-024	1	µg/kg	<1	-	<1	-	<1
Dieldrin	04-024	1	µg/kg	<1	-	<1	-	<1
alpha-Endosulfan	04-024	1	µg/kg	<1	-	<1	-	<1
beta-Endosulfan	04-024	1	µg/kg	<1	-	<1	-	<1
Endosulfan Sulphate	04-024	1	µg/kg	<1	-	<1	-	<1
Endrin	04-024	1	µg/kg	<1	-	<1	-	<1

	Test Method	LOR	Units	S673311-A/11	S673311-A/12	S673311-A/13	S673311-A/14	S673311-A/15
Endrin ketone	04-024	1	µg/kg	<1	-	<1	-	<1
Endrin aldehyde	04-024	1	µg/kg	<1	-	<1	-	<1
Heptachlor	04-024	1	µg/kg	<1	-	<1	-	<1
Heptachlor epoxide	04-024	1	µg/kg	<1	-	<1	-	<1
Hexachlorobenzene	04-024	1	µg/kg	2.2	-	1.3	-	<1
Methoxychlor	04-024	1	µg/kg	<1	-	<1	-	<1
Oxychlordane*	04-024	1	µg/kg	<1	-	<1	-	<1
Surrogate Recovery	04-024	-	%	73	-	73	-	72
Subcontract Analysis								
Total Organic Carbon^	S004.01	0.01	%	4.5	-	3.8	-	4.0

	Test Method	LOR	Units	S673311-A/16	S673311-A/17	S673311-A/18	S673311-A/19	S673311-A/20
Moisture Content								
Moisture Content	04-004	0.1	%	-	-	21	22	23
Metals - Fresh Water Total								
Silver - Total	04-015	0.1	µg/L	-	-	-	-	-
Arsenic - Total	04-015	0.5	µg/L	-	-	-	-	-
Cadmium - Total	04-015	0.1	µg/L	-	-	-	-	-
Chromium - Total	04-015	1	µg/L	-	-	-	-	-
Copper - Total	04-015	0.5	µg/L	-	-	-	-	-
Nickel - Total	04-015	0.5	µg/L	-	-	-	-	-

	Test Method	LOR	Units	S673311-A/16	S673311-A/17	S673311-A/18	S673311-A/19	S673311-A/20
Lead - Total	04-015	0.1	µg/L	-	-	-	-	-
Zinc - Total	04-015	0.5	µg/L	-	-	-	-	-
Mercury - Total (µg/L)								
Mercury - Total	04-009	0.1	µg/L	-	-	-	-	-
Trace Elements								
Arsenic	04-001	0.4	mg/kg	-	-	6.5	6.6	5.1
Cadmium	04-001	0.1	mg/kg	-	-	<0.1	<0.1	<0.1
Chromium	04-001	0.1	mg/kg	-	-	5.6	6.5	6.3
Copper	04-001	0.1	mg/kg	-	-	3.5	5.2	3.3
Mercury	04-002	0.01	mg/kg	-	-	0.052	0.089	0.030
Nickel	04-001	0.1	mg/kg	-	-	2.0	2.0	2.0
Lead	04-001	0.5	mg/kg	-	-	8.0	11	6.1
Silver	04-001	0.1	mg/kg	-	-	<0.1	<0.1	0.16
Zinc	04-001	0.5	mg/kg	-	-	12	18	9.2
Organotin Analysis								
Monobutyltin	04-026	0.5	µgSn/kg	-	-	0.69	-	<0.50
Dibutyltin	04-026	0.5	µgSn/kg	-	-	0.83	-	<0.50
Tributyltin	04-026	0.5	µgSn/kg	-	-	2.3	-	<0.50
Surrogate Recovery	04-026		%	-	-	46	-	100
Total Petroleum Hydrocarbons								
TPH C6-C9	04-021	10	mg/kg	-	-	<10	-	<10

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	Test Method	LOR	Units	S673311-A/16	S673311-A/17	S673311-A/18	S673311-A/19	S673311-A/20
TPH C10-C14	04-020	10	mg/kg	-	-	<10	-	<10
TPH C15-C28	04-020	50	mg/kg	-	-	<50	-	<50
TPH C29-C36	04-020	50	mg/kg	-	-	<50	-	<50
Surrogate Recovery	04-020		%	-	-	108	-	115
Poly Aromatic Hydrocarbons								
Naphthalene	04-022	5	µg/kg	-	-	<5	<5	<5
1-Methylnaphthalene	04-022	5	µg/kg	-	-	<5	<5	<5
2-Methylnaphthalene	04-022	5	µg/kg	-	-	<5	<5	<5
Acenaphthylene	04-022	5	µg/kg	-	-	<5	8.7	<5
Acenaphthene	04-022	5	µg/kg	-	-	<5	<5	<5
Fluorene	04-022	5	µg/kg	-	-	<5	<5	<5
Phenanthrene	04-022	5	µg/kg	-	-	6.0	17	10
Anthracene	04-022	5	µg/kg	-	-	<5	5.7	<5
Fluoranthene	04-022	5	µg/kg	-	-	17	53	22
Pyrene	04-022	5	µg/kg	-	-	19	57	21
Benz(a)anthracene	04-022	5	µg/kg	-	-	9.5	25	9.0
Chrysene	04-022	5	µg/kg	-	-	9.5	28	8.6
Benzo(b)&(k)fluoranthene	04-022	10	µg/kg	-	-	25	79	19
Benzo(a)pyrene	04-022	5	µg/kg	-	-	15	45	11
Indeno(1,2,3-cd)pyrene	04-022	5	µg/kg	-	-	33	91	24
Dibenz(a,h)anthracene	04-022	5	µg/kg	-	-	6.2	16	<5

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	Test Method	LOR	Units	S673311-A/16	S673311-A/17	S673311-A/18	S673311-A/19	S673311-A/20
Benzo(g,h,i)perylene	04-022	5	µg/kg	-	-	18	49	11
Coronene	04-022	10	µg/kg	-	-	17	37	<10
Benzo(e)pyrene	04-022	5	µg/kg	-	-	9.7	26	6.7
Perylene	04-022	5	µg/kg	-	-	<5	9.1	<5
Total PAHs (as above)	04-022	100	µg/kg	-	-	180	550	140
Surrogate 1 Recovery	04-022	-	%	-	-	105	112	109
Surrogate 2 Recovery	04-022	-	%	-	-	100	122	115
Surrogate 3 Recovery	04-022	-	%	-	-	85	91	88
Organochlorine Pesticides								
Aldrin	04-024	1	µg/kg	-	-	<1	<1	<1
alpha-BHC	04-024	1	µg/kg	-	-	<1	<1	<1
beta-BHC	04-024	1	µg/kg	-	-	<1	<1	<1
gamma-BHC (Lindane)	04-024	1	µg/kg	-	-	<1	<1	<1
delta-BHC	04-024	1	µg/kg	-	-	<1	<1	<1
cis-Chlordane	04-024	1	µg/kg	-	-	<1	<1	<1
trans-Chlordane	04-024	1	µg/kg	-	-	<1	<1	<1
p,p'-DDD	04-024	1	µg/kg	-	-	<1	<1	<1
p,p'-DDE	04-024	1	µg/kg	-	-	<1	<1	<1
p,p'-DDT	04-024	1	µg/kg	-	-	<1	<1	<1
Dieldrin	04-024	1	µg/kg	-	-	<1	<1	<1
alpha-Endosulfan	04-024	1	µg/kg	-	-	<1	<1	<1

	Test Method	LOR	Units	S673311-A/16	S673311-A/17	S673311-A/18	S673311-A/19	S673311-A/20
beta-Endosulfan	04-024	1	µg/kg	-	-	<1	<1	<1
Endosulfan Sulphate	04-024	1	µg/kg	-	-	<1	<1	<1
Endrin	04-024	1	µg/kg	-	-	<1	<1	<1
Endrin ketone	04-024	1	µg/kg	-	-	<1	<1	<1
Endrin aldehyde	04-024	1	µg/kg	-	-	<1	<1	<1
Heptachlor	04-024	1	µg/kg	-	-	<1	<1	<1
Heptachlor epoxide	04-024	1	µg/kg	-	-	<1	<1	<1
Hexachlorobenzene	04-024	1	µg/kg	-	-	<1	<1	<1
Methoxychlor	04-024	1	µg/kg	-	-	<1	<1	<1
Oxychlordane*	04-024	1	µg/kg	-	-	<1	<1	<1
Surrogate Recovery	04-024	-	%	-	-	73	82	88
Subcontract Analysis								
Total Organic Carbon^	S004.01	0.01	%	-	-	0.42	-	0.32

	Test Method	LOR	Units	S673311-A/21	S673311-A/22	S673311-A/23	S673311-A/24	S673311-A/25
Moisture Content								
Moisture Content	04-004	0.1	%	18	-	54	51	50
Metals - Fresh Water Total								
Silver - Total	04-015	0.1	µg/L	-	-	-	-	-
Arsenic - Total	04-015	0.5	µg/L	-	-	-	-	-
Cadmium - Total	04-015	0.1	µg/L	-	-	-	-	-

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	Test Method	LOR	Units	S673311-A/21	S673311-A/22	S673311-A/23	S673311-A/24	S673311-A/25
Chromium - Total	04-015	1	µg/L	-	-	-	-	-
Copper - Total	04-015	0.5	µg/L	-	-	-	-	-
Nickel - Total	04-015	0.5	µg/L	-	-	-	-	-
Lead - Total	04-015	0.1	µg/L	-	-	-	-	-
Zinc - Total	04-015	0.5	µg/L	-	-	-	-	-
Mercury - Total (µg/L)								
Mercury - Total	04-009	0.1	µg/L	-	-	-	-	-
Trace Elements								
Arsenic	04-001	0.4	mg/kg	1.8	-	19	22	28
Cadmium	04-001	0.1	mg/kg	<0.1	-	0.22	0.41	0.47
Chromium	04-001	0.1	mg/kg	5.4	-	70	71	60
Copper	04-001	0.1	mg/kg	3.0	-	140	130	130
Mercury	04-002	0.01	mg/kg	<0.01	-	3.0	3.3	5.2
Nickel	04-001	0.1	mg/kg	1.2	-	12	13	14
Lead	04-001	0.5	mg/kg	4.4	-	220	230	270
Silver	04-001	0.1	mg/kg	<0.1	-	1.0	1.1	1.1
Zinc	04-001	0.5	mg/kg	2.7	-	440	470	470
Organotin Analysis								
Monobutyltin	04-026	0.5	µgSn/kg	<0.50	-	31	19	<0.50
Dibutyltin	04-026	0.5	µgSn/kg	<0.50	-	46	41	3.8
Tributyltin	04-026	0.5	µgSn/kg	<0.50	-	18	24	0.63

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	Test Method	LOR	Units	S673311-A/21	S673311-A/22	S673311-A/23	S673311-A/24	S673311-A/25
Surrogate Recovery	04-026		%	126	-	48	51	98
Total Petroleum Hydrocarbons								
TPH C6-C9	04-021	10	mg/kg	<10	-	<10	<10	<10
TPH C10-C14	04-020	10	mg/kg	<10	-	11	13	15
TPH C15-C28	04-020	50	mg/kg	<50	-	500	740	920
TPH C29-C36	04-020	50	mg/kg	<50	-	490	640	760
Surrogate Recovery	04-020		%	88	-	116	128	118
Poly Aromatic Hydrocarbons								
Naphthalene	04-022	5	µg/kg	<5	-	250	270	410
1-Methylnaphthalene	04-022	5	µg/kg	<5	-	210	290	400
2-Methylnaphthalene	04-022	5	µg/kg	<5	-	270	330	440
Acenaphthylene	04-022	5	µg/kg	<5	-	320	360	480
Acenaphthene	04-022	5	µg/kg	<5	-	45	51	74
Fluorene	04-022	5	µg/kg	<5	-	120	150	210
Phenanthrene	04-022	5	µg/kg	<5	-	1,000	1,200	1,700
Anthracene	04-022	5	µg/kg	<5	-	290	370	460
Fluoranthene	04-022	5	µg/kg	<5	-	2,200	2,300	3,300
Pyrene	04-022	5	µg/kg	<5	-	2,300	2,400	3,400
Benz(a)anthracene	04-022	5	µg/kg	<5	-	1,100	1,300	1,900
Chrysene	04-022	5	µg/kg	<5	-	1,200	1,300	1,900

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	Test Method	LOR	Units	S673311-A/21	S673311-A/22	S673311-A/23	S673311-A/24	S673311-A/25
Benzo(b)&(k)fluoranthene	04-022	10	µg/kg	<10	-	3,200	3,700	5,500
Benzo(a)pyrene	04-022	5	µg/kg	<5	-	1,900	2,500	3,600
Indeno(1,2,3-cd)pyrene	04-022	5	µg/kg	<5	-	3,600	4,100	5,400
Dibenz(a,h)anthracene	04-022	5	µg/kg	<5	-	670	880	1,300
Benzo(g,h,i)perylene	04-022	5	µg/kg	<5	-	2,100	2,700	3,700
Coronene	04-022	10	µg/kg	<10	-	1,400	1,700	2,200
Benzo(e)pyrene	04-022	5	µg/kg	<5	-	1,100	1,200	1,700
Perylene	04-022	5	µg/kg	<5	-	380	360	500
Total PAHs (as above)	04-022	100	µg/kg	<100	-	24,000	27,000	39,000
Surrogate 1 Recovery	04-022	-	%	104	-	102	109	100
Surrogate 2 Recovery	04-022	-	%	108	-	119	122	135
Surrogate 3 Recovery	04-022	-	%	83	-	84	87	100
Organochlorine Pesticides								
Aldrin	04-024	1	µg/kg	<1	-	<1	<1	<1
alpha-BHC	04-024	1	µg/kg	<1	-	<1	<1	<1
beta-BHC	04-024	1	µg/kg	<1	-	<1	<1	<1
gamma-BHC (Lindane)	04-024	1	µg/kg	<1	-	<1	<1	<1
delta-BHC	04-024	1	µg/kg	<1	-	<1	<1	<1
cis-Chlordane	04-024	1	µg/kg	<1	-	<1	<1	<1
trans-Chlordane	04-024	1	µg/kg	<1	-	<1	<1	<1
p,p'-DDD	04-024	1	µg/kg	<1	-	<1	<1	<1

	Test Method	LOR	Units	S673311-A/21	S673311-A/22	S673311-A/23	S673311-A/24	S673311-A/25
p,p'-DDE	04-024	1	µg/kg	<1	-	<1	<1	<1
p,p'-DDT	04-024	1	µg/kg	<1	-	<1	<1	<1
Dieldrin	04-024	1	µg/kg	<1	-	<1	<1	<1
alpha-Endosulfan	04-024	1	µg/kg	<1	-	<1	<1	<1
beta-Endosulfan	04-024	1	µg/kg	<1	-	<1	<1	<1
Endosulfan Sulphate	04-024	1	µg/kg	<1	-	<1	<1	<1
Endrin	04-024	1	µg/kg	<1	-	<1	<1	<1
Endrin ketone	04-024	1	µg/kg	<1	-	<1	<1	<1
Endrin aldehyde	04-024	1	µg/kg	<1	-	<1	<1	<1
Heptachlor	04-024	1	µg/kg	<1	-	<1	<1	<1
Heptachlor epoxide	04-024	1	µg/kg	<1	-	<1	<1	<1
Hexachlorobenzene	04-024	1	µg/kg	<1	-	2.5	3.2	1.7
Methoxychlor	04-024	1	µg/kg	<1	-	<1	<1	<1
Oxychlordane*	04-024	1	µg/kg	<1	-	<1	<1	<1
Surrogate Recovery	04-024	-	%	76	-	71	71	72
Subcontract Analysis								
Total Organic Carbon^	S004.01	0.01	%	0.11	-	4.9	5.2	6.5

	Test Method	LOR	Units	S673311-A/26	S673311-A/27	S673311-A/28	S673311-A/29	S673311-A/30
Moisture Content								
Moisture Content	04-004	0.1	%	-	-	54	42	42

	Test Method	LOR	Units	S673311-A/26	S673311-A/27	S673311-A/28	S673311-A/29	S673311-A/30
Metals - Fresh Water Total								
Silver - Total	04-015	0.1	µg/L	-	-	-	-	-
Arsenic - Total	04-015	0.5	µg/L	-	-	-	-	-
Cadmium - Total	04-015	0.1	µg/L	-	-	-	-	-
Chromium - Total	04-015	1	µg/L	-	-	-	-	-
Copper - Total	04-015	0.5	µg/L	-	-	-	-	-
Nickel - Total	04-015	0.5	µg/L	-	-	-	-	-
Lead - Total	04-015	0.1	µg/L	-	-	-	-	-
Zinc - Total	04-015	0.5	µg/L	-	-	-	-	-
Mercury - Total (µg/L)								
Mercury - Total	04-009	0.1	µg/L	-	-	-	-	-
Trace Elements								
Arsenic	04-001	0.4	mg/kg	-	-	18	26	27
Cadmium	04-001	0.1	mg/kg	-	-	0.17	0.25	0.18
Chromium	04-001	0.1	mg/kg	-	-	65	47	19
Copper	04-001	0.1	mg/kg	-	-	130	66	5.9
Mercury	04-002	0.01	mg/kg	-	-	2.9	1.3	0.018
Nickel	04-001	0.1	mg/kg	-	-	12	11	6.6
Lead	04-001	0.5	mg/kg	-	-	210	120	13
Silver	04-001	0.1	mg/kg	-	-	0.91	1.8	<0.1
Zinc	04-001	0.5	mg/kg	-	-	410	220	20

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	Test Method	LOR	Units	S673311-A/26	S673311-A/27	S673311-A/28	S673311-A/29	S673311-A/30
Organotin Analysis								
Monobutyltin	04-026	0.5	µgSn/kg	-	-	22	30	<0.50
Dibutyltin	04-026	0.5	µgSn/kg	-	-	32	35	<0.50
Tributyltin	04-026	0.5	µgSn/kg	-	-	18	9.7	<0.50
Surrogate Recovery	04-026		%	-	-	67	67	58
Total Petroleum Hydrocarbons								
TPH C6-C9	04-021	10	mg/kg	-	-	<10	<10	<10
TPH C10-C14	04-020	10	mg/kg	-	-	<10	<10	<10
TPH C15-C28	04-020	50	mg/kg	-	-	360	280	<50
TPH C29-C36	04-020	50	mg/kg	-	-	360	280	<50
Surrogate Recovery	04-020		%	-	-	104	121	119
Poly Aromatic Hydrocarbons								
Naphthalene	04-022	5	µg/kg	-	-	190	140	<5
1-Methylnaphthalene	04-022	5	µg/kg	-	-	77	67	<5
2-Methylnaphthalene	04-022	5	µg/kg	-	-	100	87	<5
Acenaphthylene	04-022	5	µg/kg	-	-	310	210	<5
Acenaphthene	04-022	5	µg/kg	-	-	38	51	<5
Fluorene	04-022	5	µg/kg	-	-	94	150	<5
Phenanthrene	04-022	5	µg/kg	-	-	830	1,300	<5
Anthracene	04-022	5	µg/kg	-	-	240	270	<5

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	Test Method	LOR	Units	S673311-A/26	S673311-A/27	S673311-A/28	S673311-A/29	S673311-A/30
Fluoranthene	04-022	5	µg/kg	-	-	2,200	2,200	6.1
Pyrene	04-022	5	µg/kg	-	-	2,300	2,100	7.5
Benz(a)anthracene	04-022	5	µg/kg	-	-	1,100	900	<5
Chrysene	04-022	5	µg/kg	-	-	1,200	930	<5
Benzo(b)&(k)fluoranthene	04-022	10	µg/kg	-	-	3,300	2,400	<10
Benzo(a)pyrene	04-022	5	µg/kg	-	-	1,900	1,500	<5
Indeno(1,2,3-cd)pyrene	04-022	5	µg/kg	-	-	3,800	2,900	15
Dibenz(a,h)anthracene	04-022	5	µg/kg	-	-	810	540	<5
Benzo(g,h,i)perylene	04-022	5	µg/kg	-	-	2,400	1,700	7.5
Coronene	04-022	10	µg/kg	-	-	1,600	1,200	<10
Benzo(e)pyrene	04-022	5	µg/kg	-	-	1,100	790	<5
Perylene	04-022	5	µg/kg	-	-	360	300	5
Total PAHs (as above)	04-022	100	µg/kg	-	-	24,000	20,000	<100
Surrogate 1 Recovery	04-022	-	%	-	-	129	100	111
Surrogate 2 Recovery	04-022	-	%	-	-	142	130	110
Surrogate 3 Recovery	04-022	-	%	-	-	100	94	87
Organochlorine Pesticides								
Aldrin	04-024	1	µg/kg	-	-	<1	<1	<1
alpha-BHC	04-024	1	µg/kg	-	-	<1	<1	<1
beta-BHC	04-024	1	µg/kg	-	-	<1	<1	<1
gamma-BHC (Lindane)	04-024	1	µg/kg	-	-	<1	<1	<1

	Test Method	LOR	Units	S673311-A/26	S673311-A/27	S673311-A/28	S673311-A/29	S673311-A/30
delta-BHC	04-024	1	µg/kg	-	-	<1	<1	<1
cis-Chlordane	04-024	1	µg/kg	-	-	<1	<1	<1
trans-Chlordane	04-024	1	µg/kg	-	-	<1	<1	<1
p,p'-DDD	04-024	1	µg/kg	-	-	<1	<1	<1
p,p'-DDE	04-024	1	µg/kg	-	-	<1	<1	<1
p,p'-DDT	04-024	1	µg/kg	-	-	<1	<1	<1
Dieldrin	04-024	1	µg/kg	-	-	<1	<1	<1
alpha-Endosulfan	04-024	1	µg/kg	-	-	<1	<1	<1
beta-Endosulfan	04-024	1	µg/kg	-	-	<1	<1	<1
Endosulfan Sulphate	04-024	1	µg/kg	-	-	<1	<1	<1
Endrin	04-024	1	µg/kg	-	-	<1	<1	<1
Endrin ketone	04-024	1	µg/kg	-	-	<1	<1	<1
Endrin aldehyde	04-024	1	µg/kg	-	-	<1	<1	<1
Heptachlor	04-024	1	µg/kg	-	-	<1	<1	<1
Heptachlor epoxide	04-024	1	µg/kg	-	-	<1	<1	<1
Hexachlorobenzene	04-024	1	µg/kg	-	-	3.3	1.5	<1
Methoxychlor	04-024	1	µg/kg	-	-	<1	<1	<1
Oxychlordane*	04-024	1	µg/kg	-	-	<1	<1	<1
Surrogate Recovery	04-024	-	%	-	-	71	78	80
Subcontract Analysis								
Total Organic Carbon^	S004.01	0.01	%	-	-	2.8	1.8	1.2

	Test Method	LOR	Units	S673311-A/31	S673311-A/32	S673311-A/33	S673311-A/34	S673311-A/35
Moisture Content								
Moisture Content	04-004	0.1	%	0.30	5.8	2.7	24	18
Metals - Fresh Water Total								
Silver - Total	04-015	0.1	µg/L	-	-	-	-	-
Arsenic - Total	04-015	0.5	µg/L	-	-	-	-	-
Cadmium - Total	04-015	0.1	µg/L	-	-	-	-	-
Chromium - Total	04-015	1	µg/L	-	-	-	-	-
Copper - Total	04-015	0.5	µg/L	-	-	-	-	-
Nickel - Total	04-015	0.5	µg/L	-	-	-	-	-
Lead - Total	04-015	0.1	µg/L	-	-	-	-	-
Zinc - Total	04-015	0.5	µg/L	-	-	-	-	-
Mercury - Total (µg/L)								
Mercury - Total	04-009	0.1	µg/L	-	-	-	-	-
Trace Elements								
Arsenic	04-001	0.4	mg/kg	<0.4	31	14	9.6	2.2
Cadmium	04-001	0.1	mg/kg	<0.1	2.5	0.49	<0.1	<0.1
Chromium	04-001	0.1	mg/kg	0.25	79	140	8.3	5.7
Copper	04-001	0.1	mg/kg	1.9	210	85	2.4	1.4
Mercury	04-002	0.01	mg/kg	<0.01	2.3	0.46	0.013	<0.01
Nickel	04-001	0.1	mg/kg	<0.1	17	13	2.8	1.0
Lead	04-001	0.5	mg/kg	<0.5	400	110	5.4	3.8

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	Test Method	LOR	Units	S673311-A/31	S673311-A/32	S673311-A/33	S673311-A/34	S673311-A/35
Silver	04-001	0.1	mg/kg	<0.1	1.2	0.64	<0.1	<0.1
Zinc	04-001	0.5	mg/kg	0.50	870	270	7.7	1.8
Organotin Analysis								
Monobutyltin	04-026	0.5	µgSn/kg	<0.50	-	-	<0.50	<0.50
Dibutyltin	04-026	0.5	µgSn/kg	<0.50	-	-	<0.50	<0.50
Tributyltin	04-026	0.5	µgSn/kg	<0.50	-	-	<0.50	<0.50
Surrogate Recovery	04-026		%	103	-	-	76	107
Total Petroleum Hydrocarbons								
TPH C6-C9	04-021	10	mg/kg	<10	-	-	<10	<10
TPH C10-C14	04-020	10	mg/kg	<10	-	-	<10	<10
TPH C15-C28	04-020	50	mg/kg	<50	-	-	<50	<50
TPH C29-C36	04-020	50	mg/kg	<50	-	-	<50	<50
Surrogate Recovery	04-020		%	122	-	-	123	115
Poly Aromatic Hydrocarbons								
Naphthalene	04-022	5	µg/kg	<5	-	-	<5	<5
1-Methylnaphthalene	04-022	5	µg/kg	<5	-	-	<5	<5
2-Methylnaphthalene	04-022	5	µg/kg	<5	-	-	<5	<5
Acenaphthylene	04-022	5	µg/kg	<5	-	-	<5	<5
Acenaphthene	04-022	5	µg/kg	<5	-	-	<5	<5
Fluorene	04-022	5	µg/kg	<5	-	-	<5	<5

	Test Method	LOR	Units	S673311-A/31	S673311-A/32	S673311-A/33	S673311-A/34	S673311-A/35
Phenanthrene	04-022	5	µg/kg	<5	-	-	<5	<5
Anthracene	04-022	5	µg/kg	<5	-	-	<5	<5
Fluoranthene	04-022	5	µg/kg	<5	-	-	<5	<5
Pyrene	04-022	5	µg/kg	<5	-	-	<5	<5
Benz(a)anthracene	04-022	5	µg/kg	<5	-	-	<5	<5
Chrysene	04-022	5	µg/kg	<5	-	-	<5	<5
Benzo(b)&(k)fluoranthene	04-022	10	µg/kg	<10	-	-	<10	<10
Benzo(a)pyrene	04-022	5	µg/kg	<5	-	-	<5	<5
Indeno(1,2,3-cd)pyrene	04-022	5	µg/kg	<5	-	-	8.1	<5
Dibenz(a,h)anthracene	04-022	5	µg/kg	<5	-	-	<5	<5
Benzo(g,h,i)perylene	04-022	5	µg/kg	<5	-	-	<5	<5
Coronene	04-022	10	µg/kg	<10	-	-	<10	<10
Benzo(e)pyrene	04-022	5	µg/kg	<5	-	-	<5	<5
Perylene	04-022	5	µg/kg	<5	-	-	<5	<5
Total PAHs (as above)	04-022	100	µg/kg	<100	-	-	<100	<100
Surrogate 1 Recovery	04-022	-	%	116	-	-	117	111
Surrogate 2 Recovery	04-022	-	%	122	-	-	119	106
Surrogate 3 Recovery	04-022	-	%	89	-	-	86	86
Organochlorine Pesticides								
Aldrin	04-024	1	µg/kg	<1	-	-	<1	<1
alpha-BHC	04-024	1	µg/kg	<1	-	-	<1	<1

	Test Method	LOR	Units	S673311-A/31	S673311-A/32	S673311-A/33	S673311-A/34	S673311-A/35
beta-BHC	04-024	1	µg/kg	<1	-	-	<1	<1
gamma-BHC (Lindane)	04-024	1	µg/kg	<1	-	-	<1	<1
delta-BHC	04-024	1	µg/kg	<1	-	-	<1	<1
cis-Chlordane	04-024	1	µg/kg	<1	-	-	<1	<1
trans-Chlordane	04-024	1	µg/kg	<1	-	-	<1	<1
p,p'-DDD	04-024	1	µg/kg	<1	-	-	<1	<1
p,p'-DDE	04-024	1	µg/kg	<1	-	-	<1	<1
p,p'-DDT	04-024	1	µg/kg	<1	-	-	<1	<1
Dieldrin	04-024	1	µg/kg	<1	-	-	<1	<1
alpha-Endosulfan	04-024	1	µg/kg	<1	-	-	<1	<1
beta-Endosulfan	04-024	1	µg/kg	<1	-	-	<1	<1
Endosulfan Sulphate	04-024	1	µg/kg	<1	-	-	<1	<1
Endrin	04-024	1	µg/kg	<1	-	-	<1	<1
Endrin ketone	04-024	1	µg/kg	<1	-	-	<1	<1
Endrin aldehyde	04-024	1	µg/kg	<1	-	-	<1	<1
Heptachlor	04-024	1	µg/kg	<1	-	-	<1	<1
Heptachlor epoxide	04-024	1	µg/kg	<1	-	-	<1	<1
Hexachlorobenzene	04-024	1	µg/kg	<1	-	-	<1	<1
Methoxychlor	04-024	1	µg/kg	<1	-	-	<1	<1
Oxychlordane*	04-024	1	µg/kg	<1	-	-	<1	<1
Surrogate Recovery	04-024	-	%	84	-	-	86	75

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	Test Method	LOR	Units	S673311-A/31	S673311-A/32	S673311-A/33	S673311-A/34	S673311-A/35
Subcontract Analysis								
Total Organic Carbon^	S004.01	0.01	%	-	-	-	0.46	0.090

	Test Method	LOR	Units	S673311-A/36	S673311-A/37	S673311-A/38	S673311-A/39
Moisture Content							
Moisture Content	04-004	0.1	%	22	35	-	-
Metals - Fresh Water Total							
Silver - Total	04-015	0.1	µg/L	-	-	<0.10	<0.10
Arsenic - Total	04-015	0.5	µg/L	-	-	<0.50	<0.50
Cadmium - Total	04-015	0.1	µg/L	-	-	<0.10	<0.10
Chromium - Total	04-015	1	µg/L	-	-	<1.0	9.2
Copper - Total	04-015	0.5	µg/L	-	-	0.60	2.5
Nickel - Total	04-015	0.5	µg/L	-	-	<0.50	0.51
Lead - Total	04-015	0.1	µg/L	-	-	<0.10	1.0
Zinc - Total	04-015	0.5	µg/L	-	-	2.9	16
Mercury - Total (µg/L)							
Mercury - Total	04-009	0.1	µg/L	-	-	<0.1	<0.1
Trace Elements							
Arsenic	04-001	0.4	mg/kg	8.7	11	-	-
Cadmium	04-001	0.1	mg/kg	<0.1	0.14	-	-
Chromium	04-001	0.1	mg/kg	6.6	14	-	-

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	Test Method	LOR	Units	S673311-A/36	S673311-A/37	S673311-A/38	S673311-A/39
Copper	04-001	0.1	mg/kg	1.8	3.3	-	-
Mercury	04-002	0.01	mg/kg	<0.01	<0.01	-	-
Nickel	04-001	0.1	mg/kg	2.3	4.8	-	-
Lead	04-001	0.5	mg/kg	4.6	7.2	-	-
Silver	04-001	0.1	mg/kg	<0.1	0.12	-	-
Zinc	04-001	0.5	mg/kg	5.8	12	-	-
Organotin Analysis							
Monobutyltin	04-026	0.5	µgSn/kg	-	-	-	-
Dibutyltin	04-026	0.5	µgSn/kg	-	-	-	-
Tributyltin	04-026	0.5	µgSn/kg	-	-	-	-
Surrogate Recovery	04-026		%	-	-	-	-
Total Petroleum Hydrocarbons							
TPH C6-C9	04-021	10	mg/kg	-	-	-	-
TPH C10-C14	04-020	10	mg/kg	-	-	-	-
TPH C15-C28	04-020	50	mg/kg	-	-	-	-
TPH C29-C36	04-020	50	mg/kg	-	-	-	-
Surrogate Recovery	04-020		%	-	-	-	-
Poly Aromatic Hydrocarbons							
Naphthalene	04-022	5	µg/kg	<5	<5	-	-
1-Methylnaphthalene	04-022	5	µg/kg	<5	<5	-	-

	Test Method	LOR	Units	S673311-A/36	S673311-A/37	S673311-A/38	S673311-A/39
2-Methylnaphthalene	04-022	5	µg/kg	<5	<5	-	-
Acenaphthylene	04-022	5	µg/kg	<5	<5	-	-
Acenaphthene	04-022	5	µg/kg	<5	<5	-	-
Fluorene	04-022	5	µg/kg	<5	<5	-	-
Phenanthrene	04-022	5	µg/kg	<5	<5	-	-
Anthracene	04-022	5	µg/kg	<5	<5	-	-
Fluoranthene	04-022	5	µg/kg	<5	5.5	-	-
Pyrene	04-022	5	µg/kg	<5	6.0	-	-
Benz(a)anthracene	04-022	5	µg/kg	<5	<5	-	-
Chrysene	04-022	5	µg/kg	<5	<5	-	-
Benzo(b)&(k)fluoranthene	04-022	10	µg/kg	<10	<10	-	-
Benzo(a)pyrene	04-022	5	µg/kg	<5	<5	-	-
Indeno(1,2,3-cd)pyrene	04-022	5	µg/kg	5.5	10	-	-
Dibenz(a,h)anthracene	04-022	5	µg/kg	<5	<5	-	-
Benzo(g,h,i)perylene	04-022	5	µg/kg	<5	<5	-	-
Coronene	04-022	10	µg/kg	<10	<10	-	-
Benzo(e)pyrene	04-022	5	µg/kg	<5	<5	-	-
Perylene	04-022	5	µg/kg	<5	<5	-	-
Total PAHs (as above)	04-022	100	µg/kg	<100	<100	-	-
Surrogate 1 Recovery	04-022	-	%	111	110	-	-
Surrogate 2 Recovery	04-022	-	%	108	109	-	-

	Test Method	LOR	Units	S673311-A/36	S673311-A/37	S673311-A/38	S673311-A/39
Surrogate 3 Recovery	04-022	-	%	86	83	-	-
Organochlorine Pesticides							
Aldrin	04-024	1	µg/kg	-	-	-	-
alpha-BHC	04-024	1	µg/kg	-	-	-	-
beta-BHC	04-024	1	µg/kg	-	-	-	-
gamma-BHC (Lindane)	04-024	1	µg/kg	-	-	-	-
delta-BHC	04-024	1	µg/kg	-	-	-	-
cis-Chlordane	04-024	1	µg/kg	-	-	-	-
trans-Chlordane	04-024	1	µg/kg	-	-	-	-
p,p'-DDD	04-024	1	µg/kg	-	-	-	-
p,p'-DDE	04-024	1	µg/kg	-	-	-	-
p,p'-DDT	04-024	1	µg/kg	-	-	-	-
Dieldrin	04-024	1	µg/kg	-	-	-	-
alpha-Endosulfan	04-024	1	µg/kg	-	-	-	-
beta-Endosulfan	04-024	1	µg/kg	-	-	-	-
Endosulfan Sulphate	04-024	1	µg/kg	-	-	-	-
Endrin	04-024	1	µg/kg	-	-	-	-
Endrin ketone	04-024	1	µg/kg	-	-	-	-
Endrin aldehyde	04-024	1	µg/kg	-	-	-	-
Heptachlor	04-024	1	µg/kg	-	-	-	-
Heptachlor epoxide	04-024	1	µg/kg	-	-	-	-

	Test Method	LOR	Units	S673311-A/36	S673311-A/37	S673311-A/38	S673311-A/39
Hexachlorobenzene	04-024	1	µg/kg	-	-	-	-
Methoxychlor	04-024	1	µg/kg	-	-	-	-
Oxychlordane*	04-024	1	µg/kg	-	-	-	-
Surrogate Recovery	04-024	-	%	-	-	-	-
Subcontract Analysis							
Total Organic Carbon^	S004.01	0.01	%	-	-	-	-

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Please note: TOC Testing performed by an external subcontracted NATA certified Laboratory.
Accreditation No.: 1884 Report No: SAL26770B

Client	: HASKONING AUSTRALIA- ROYAL HASK	**Work Order**	: ES1990041
Project	: WHTBL	**ALS Quote Reference**	: ----

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300	**Laboratory Sample ID:**	ES1990041001	**Qc Lot Number:**	4538325	**Date Sampled:** 21-Aug-2019
	Client Sample ID:	WHT 1 1.5-2.0	**Sample Matrix:**	SOIL	**Date Extracted:** 03-Sep-2019
					Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	1.3	0.5	1	1.27	1.27	1.27	1	1.27	1.27	1.27	135.3
12378-PeCDD	10.7	2.4	1	10.70	10.70	10.70	0.5	5.35	5.35	5.35	121.9
123478-HxCDD	14.9	2.4	0.1	1.49	1.49	1.49	0.1	1.49	1.49	1.49	67.0
123678-HxCDD	23.8	2.4	0.1	2.38	2.38	2.38	0.1	2.38	2.38	2.38	92.5
123789-HxCDD	45.9	2.4	0.1	4.59	4.59	4.59	0.1	4.59	4.59	4.59	-
1234678-HpCDD	781.0	2.4	0.01	7.81	7.81	7.81	0.01	7.81	7.81	7.81	80.2
OCDD	33200.0	9.8	0.0003	9.96	9.96	9.96	0.001	33.20	33.20	33.20	77.4
2378-TCDF	2.2	0.5	0.1	0.22	0.22	0.22	0.1	0.22	0.22	0.22	85.0
12378-PeCDF	4.0	2.4	0.03	0.12	0.12	0.12	0.05	0.20	0.20	0.20	91.9
23478-PeCDF	3.6	2.4	0.3	1.08	1.08	1.08	0.5	1.80	1.80	1.80	94.9
123478-HxCDF	7.0	2.4	0.1	0.70	0.70	0.70	0.1	0.70	0.70	0.70	49.7
123678-HxCDF	3.9	2.4	0.1	0.39	0.39	0.39	0.1	0.39	0.39	0.39	57.3
234678-HxCDF	4.7	2.4	0.1	0.47	0.47	0.47	0.1	0.47	0.47	0.47	57.2
123789-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	69.5
1234678-HpCDF	23.3	2.4	0.01	0.23	0.23	0.23	0.01	0.23	0.23	0.23	51.5
1234789-HpCDF	<2.4	2.4	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	70.5
OCDF	29.2	4.9	0.0003	0.01	0.01	0.01	0.001	0.03	0.03	0.03	-
Total TEQ	-	-	-	41.42	41.55	41.69	-	60.13	60.27	60.40	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	130.0	5.9	12
Penta-Dioxins	335.0	22.0	9
Hexa-Dioxins	2080.0	17.1	7
Hepta-Dioxins	3520.0	4.9	2
Octa-Dioxin	33200.0	9.8	1
Tetra-Furans	47.7	9.8	20
Penta-Furans	52.8	29.3	12
Hexa-Furans	48.5	26.9	11
Hepta-Furans	46.0	12.2	5
Octa-Furan	29.2	4.9	1
S **PCDD/Fs**	39489.2		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041002
Client Sample ID: WHT1 2.0-2.5
Qc Lot Number: 4538325
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	1.0	0.5	1	1.00	1.00	1.00	1	1.00	1.00	1.00	125.5
12378-PeCDD	11.4	2.5	1	11.40	11.40	11.40	0.5	5.70	5.70	5.70	125.0
123478-HxCDD	9.7	2.5	0.1	0.97	0.97	0.97	0.1	0.97	0.97	0.97	67.7
123678-HxCDD	15.5	2.5	0.1	1.55	1.55	1.55	0.1	1.55	1.55	1.55	92.8
123789-HxCDD	34.2	2.5	0.1	3.42	3.42	3.42	0.1	3.42	3.42	3.42	-
1234678-HpCDD	425.0	2.5	0.01	4.25	4.25	4.25	0.01	4.25	4.25	4.25	67.0
OCDD	7230.0	10.0	0.0003	2.17	2.17	2.17	0.001	7.23	7.23	7.23	45.1
2378-TCDF	<0.5	0.5	0.1	0.00	0.03	0.05	0.1	0.00	0.03	0.05	85.0
12378-PeCDF	<2.5	2.5	0.03	0.00	0.04	0.08	0.05	0.00	0.06	0.13	96.2
23478-PeCDF	<2.5	2.5	0.3	0.00	0.38	0.75	0.5	0.00	0.63	1.25	103.3
123478-HxCDF	<2.5	2.5	0.1	0.00	0.13	0.25	0.1	0.00	0.13	0.25	48.4
123678-HxCDF	<2.5	2.5	0.1	0.00	0.13	0.25	0.1	0.00	0.13	0.25	60.6
234678-HxCDF	<2.5	2.5	0.1	0.00	0.13	0.25	0.1	0.00	0.13	0.25	56.8
123789-HxCDF	<2.5	2.5	0.1	0.00	0.13	0.25	0.1	0.00	0.13	0.25	63.1
1234678-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.03	0.01	0.00	0.01	0.03	40.2
1234789-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.03	0.01	0.00	0.01	0.03	47.5
OCDF	<5.0	5.0	0.0003	0.00	0.00	0.00	0.001	0.00	0.00	0.01	-
Total TEQ	-	-	-	24.76	25.72	26.69	-	24.12	25.36	26.60	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	112.0	6.5	13
Penta-Dioxins	332.0	17.5	7
Hexa-Dioxins	1780.0	17.5	7
Hepta-Dioxins	2080.0	5.0	2
Octa-Dioxin	7230.0	10.0	1
Tetra-Furans	<9.0	9.0	18
Penta-Furans	<2.5	2.5	1
Hexa-Furans	<2.5	2.5	1
Hepta-Furans	<2.5	2.5	1
Octa-Furan	<5.0	5.0	1
S **PCDD/Fs**	11534.0		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041003
Client Sample ID: WHT9 1.5-2.0
Qc Lot Number: 4538325
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	5.9	0.5	1	5.90	5.90	5.90	1	5.90	5.90	5.90	125.0
12378-PeCDD	11.8	2.4	1	11.80	11.80	11.80	0.5	5.90	5.90	5.90	119.0
123478-HxCDD	14.8	2.4	0.1	1.48	1.48	1.48	0.1	1.48	1.48	1.48	60.1
123678-HxCDD	43.6	2.4	0.1	4.36	4.36	4.36	0.1	4.36	4.36	4.36	95.9
123789-HxCDD	48.2	2.4	0.1	4.82	4.82	4.82	0.1	4.82	4.82	4.82	-
1234678-HpCDD	1260.0	2.4	0.01	12.60	12.60	12.60	0.01	12.60	12.60	12.60	77.1
OCDD	28100.0	9.7	0.0003	8.43	8.43	8.43	0.001	28.10	28.10	28.10	62.8
2378-TCDF	5.7	0.5	0.1	0.57	0.57	0.57	0.1	0.57	0.57	0.57	83.6
12378-PeCDF	4.4	2.4	0.03	0.13	0.13	0.13	0.05	0.22	0.22	0.22	91.1
23478-PeCDF	6.6	2.4	0.3	1.99	1.99	1.99	0.5	3.32	3.32	3.32	97.9
123478-HxCDF	18.3	2.4	0.1	1.83	1.83	1.83	0.1	1.83	1.83	1.83	43.2
123678-HxCDF	7.9	2.4	0.1	0.79	0.79	0.79	0.1	0.79	0.79	0.79	61.2
234678-HxCDF	12.0	2.4	0.1	1.20	1.20	1.20	0.1	1.20	1.20	1.20	53.7
123789-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	60.8
1234678-HpCDF	194.0	2.4	0.01	1.94	1.94	1.94	0.01	1.94	1.94	1.94	43.2
1234789-HpCDF	9.3	2.4	0.01	0.09	0.09	0.09	0.01	0.09	0.09	0.09	61.7
OCDF	431.0	4.8	0.0003	0.13	0.13	0.13	0.001	0.43	0.43	0.43	-
Total TEQ	-	-	-	58.06	58.18	58.30	-	73.54	73.66	73.78	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	171.0	6.3	13
Penta-Dioxins	339.0	21.8	9
Hexa-Dioxins	1930.0	19.4	8
Hepta-Dioxins	3320.0	4.8	2
Octa-Dioxin	28100.0	9.7	1
Tetra-Furans	118.0	8.7	18
Penta-Furans	101.0	31.5	13
Hexa-Furans	264.0	24.2	10
Hepta-Furans	569.0	9.7	4
Octa-Furan	431.0	4.8	1
S **PCDD/Fs**	35343.0		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041004
Client Sample ID: WHT9 2.0-2.5
Qc Lot Number: 4538325
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	0.7	0.5	1	0.67	0.67	0.67	1	0.67	0.67	0.67	122.1
12378-PeCDD	5.8	2.5	1	5.84	5.84	5.84	0.5	2.92	2.92	2.92	131.2
123478-HxCDD	8.1	2.5	0.1	0.81	0.81	0.81	0.1	0.81	0.81	0.81	67.3
123678-HxCDD	13.4	2.5	0.1	1.34	1.34	1.34	0.1	1.34	1.34	1.34	78.0
123789-HxCDD	23.5	2.5	0.1	2.35	2.35	2.35	0.1	2.35	2.35	2.35	-
1234678-HpCDD	443.0	2.5	0.01	4.43	4.43	4.43	0.01	4.43	4.43	4.43	66.8
OCDD	16300.0	9.9	0.0003	4.89	4.89	4.89	0.001	16.30	16.30	16.30	50.5
2378-TCDF	2.6	0.5	0.1	0.26	0.26	0.26	0.1	0.26	0.26	0.26	94.4
12378-PeCDF	3.1	2.5	0.03	0.09	0.09	0.09	0.05	0.15	0.15	0.15	89.1
23478-PeCDF	3.2	2.5	0.3	0.97	0.97	0.97	0.5	1.62	1.62	1.62	95.6
123478-HxCDF	5.1	2.5	0.1	0.51	0.51	0.51	0.1	0.51	0.51	0.51	48.5
123678-HxCDF	3.2	2.5	0.1	0.32	0.32	0.32	0.1	0.32	0.32	0.32	55.4
234678-HxCDF	3.2	2.5	0.1	0.32	0.32	0.32	0.1	0.32	0.32	0.32	54.9
123789-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	65.6
1234678-HpCDF	26.8	2.5	0.01	0.27	0.27	0.27	0.01	0.27	0.27	0.27	40.1
1234789-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	58.8
OCDF	34.5	4.9	0.0003	0.01	0.01	0.01	0.001	0.03	0.03	0.03	-
Total TEQ	-	-	-	23.09	23.22	23.36	-	32.31	32.45	32.58	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	93.6	5.9	12
Penta-Dioxins	204.0	22.3	9
Hexa-Dioxins	1020.0	17.3	7
Hepta-Dioxins	1840.0	4.9	2
Octa-Dioxin	16300.0	9.9	1
Tetra-Furans	44.8	10.4	21
Penta-Furans	46.7	27.2	11
Hexa-Furans	45.0	27.2	11
Hepta-Furans	58.9	9.9	4
Octa-Furan	34.5	4.9	1
S **PCDD/Fs**	19687.5		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041005
Client Sample ID: WHT9 2.5-3.0
Qc Lot Number: 4538325
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	0.5	0.5	1	0.51	0.51	0.51	1	0.51	0.51	0.51	118.3
12378-PeCDD	<2.5	2.5	1	0.00	1.23	2.46	0.5	0.00	0.62	1.23	146.6
123478-HxCDD	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	59.7
123678-HxCDD	3.9	2.5	0.1	0.39	0.39	0.39	0.1	0.39	0.39	0.39	88.0
123789-HxCDD	10.1	2.5	0.1	1.01	1.01	1.01	0.1	1.01	1.01	1.01	-
1234678-HpCDD	172.0	2.5	0.01	1.72	1.72	1.72	0.01	1.72	1.72	1.72	59.2
OCDD	5160.0	9.9	0.0003	1.55	1.55	1.55	0.001	5.16	5.16	5.16	45.2
2378-TCDF	<0.5	0.5	0.1	0.00	0.02	0.05	0.1	0.00	0.02	0.05	101.7
12378-PeCDF	<2.5	2.5	0.03	0.00	0.04	0.07	0.05	0.00	0.06	0.12	111.2
23478-PeCDF	<2.5	2.5	0.3	0.00	0.37	0.74	0.5	0.00	0.62	1.23	120.7
123478-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	40.8
123678-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	55.6
234678-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	52.5
123789-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	56.1
1234678-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	36.5
1234789-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	44.7
OCDF	<4.9	4.9	0.0003	0.00	0.00	0.00	0.001	0.00	0.00	0.00	-
Total TEQ	-	-	-	5.18	7.48	9.79	-	8.79	10.75	12.71	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	36.9	5.9	12
Penta-Dioxins	111.0	19.7	8
Hexa-Dioxins	637.0	17.2	7
Hepta-Dioxins	852.0	4.9	2
Octa-Dioxin	5160.0	9.9	1
Tetra-Furans	<0.5	0.5	1
Penta-Furans	<2.5	2.5	1
Hexa-Furans	<2.5	2.5	1
Hepta-Furans	<4.9	4.9	2
Octa-Furan	<4.9	4.9	1
S **PCDD/Fs**	6796.9		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041006
Client Sample ID: WHT10 1.5-2.0
Qc Lot Number: 4538325
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	<0.5	0.5	1	0.00	0.25	0.50	1	0.00	0.25	0.50	109.2
12378-PeCDD	6.2	2.5	1	6.15	6.15	6.15	0.5	3.08	3.08	3.08	121.3
123478-HxCDD	8.3	2.5	0.1	0.83	0.83	0.83	0.1	0.83	0.83	0.83	59.1
123678-HxCDD	11.7	2.5	0.1	1.17	1.17	1.17	0.1	1.17	1.17	1.17	83.0
123789-HxCDD	38.6	2.5	0.1	3.86	3.86	3.86	0.1	3.86	3.86	3.86	-
1234678-HpCDD	472.0	2.5	0.01	4.72	4.72	4.72	0.01	4.72	4.72	4.72	62.1
OCDD	12600.0	10.0	0.0003	3.78	3.78	3.78	0.001	12.60	12.60	12.60	45.0
2378-TCDF	<0.5	0.5	0.1	0.00	0.02	0.05	0.1	0.00	0.02	0.05	81.1
12378-PeCDF	<2.5	2.5	0.03	0.00	0.04	0.07	0.05	0.00	0.06	0.12	91.5
23478-PeCDF	<2.5	2.5	0.3	0.00	0.37	0.75	0.5	0.00	0.62	1.25	93.8
123478-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	36.6
123678-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	55.4
234678-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	50.2
123789-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	54.6
1234678-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	35.7
1234789-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	48.6
OCDF	<5.0	5.0	0.0003	0.00	0.00	0.00	0.001	0.00	0.00	0.00	-
Total TEQ	-	-	-	20.51	21.72	22.93	-	26.25	27.74	29.23	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	202.0	5.0	10
Penta-Dioxins	456.0	17.5	7
Hexa-Dioxins	2530.0	20.0	8
Hepta-Dioxins	4030.0	5.0	2
Octa-Dioxin	12600.0	10.0	1
Tetra-Furans	<0.5	0.5	1
Penta-Furans	<2.5	2.5	1
Hexa-Furans	<2.5	2.5	1
Hepta-Furans	<2.5	2.5	1
Octa-Furan	<5.0	5.0	1
S **PCDD/Fs**	19818.0		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041007
Client Sample ID: WHT10 2.0-2.5
Qc Lot Number: 4538325
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	1.2	0.5	1	1.23	1.23	1.23	1	1.23	1.23	1.23	113.7
12378-PeCDD	11.9	2.5	1	11.90	11.90	11.90	0.5	5.95	5.95	5.95	134.9
123478-HxCDD	11.0	2.5	0.1	1.10	1.10	1.10	0.1	1.10	1.10	1.10	59.9
123678-HxCDD	15.7	2.5	0.1	1.57	1.57	1.57	0.1	1.57	1.57	1.57	92.9
123789-HxCDD	51.4	2.5	0.1	5.14	5.14	5.14	0.1	5.14	5.14	5.14	-
1234678-HpCDD	732.0	2.5	0.01	7.32	7.32	7.32	0.01	7.32	7.32	7.32	63.2
OCDD	20900.0	9.9	0.0003	6.27	6.27	6.27	0.001	20.90	20.90	20.90	57.0
2378-TCDF	<0.5	0.5	0.1	0.00	0.02	0.05	0.1	0.00	0.02	0.05	89.4
12378-PeCDF	<2.5	2.5	0.03	0.00	0.04	0.07	0.05	0.00	0.06	0.12	87.5
23478-PeCDF	<2.5	2.5	0.3	0.00	0.37	0.74	0.5	0.00	0.62	1.24	95.2
123478-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	43.9
123678-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	58.1
234678-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	55.8
123789-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	60.3
1234678-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	37.1
1234789-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	50.3
OCDF	<5.0	5.0	0.0003	0.00	0.00	0.00	0.001	0.00	0.00	0.00	-
Total TEQ	-	-	-	34.53	35.48	36.44	-	43.21	44.44	45.67	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	315.0	5.4	11
Penta-Dioxins	616.0	19.8	8
Hexa-Dioxins	3820.0	19.8	8
Hepta-Dioxins	6420.0	5.0	2
Octa-Dioxin	20900.0	9.9	1
Tetra-Furans	<0.5	0.5	1
Penta-Furans	<2.5	2.5	1
Hexa-Furans	<2.5	2.5	1
Hepta-Furans	<2.5	2.5	1
Octa-Furan	<5.0	5.0	1
S **PCDD/Fs**	32071.0		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041008
Client Sample ID: WHT10 2.5-3.0
Qc Lot Number: 4538325
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	1.2	0.5	1	1.23	1.23	1.23	1	1.23	1.23	1.23	110.9
12378-PeCDD	11.4	2.4	1	11.40	11.40	11.40	0.5	5.70	5.70	5.70	119.0
123478-HxCDD	10.2	2.4	0.1	1.02	1.02	1.02	0.1	1.02	1.02	1.02	59.1
123678-HxCDD	14.9	2.4	0.1	1.49	1.49	1.49	0.1	1.49	1.49	1.49	93.4
123789-HxCDD	49.3	2.4	0.1	4.93	4.93	4.93	0.1	4.93	4.93	4.93	-
1234678-HpCDD	853.0	2.4	0.01	8.53	8.53	8.53	0.01	8.53	8.53	8.53	70.0
OCDD	24000.0	9.6	0.0003	7.20	7.20	7.20	0.001	24.00	24.00	24.00	64.4
2378-TCDF	<0.5	0.5	0.1	0.00	0.02	0.05	0.1	0.00	0.02	0.05	78.6
12378-PeCDF	<2.4	2.4	0.03	0.00	0.04	0.07	0.05	0.00	0.06	0.12	86.2
23478-PeCDF	<2.4	2.4	0.3	0.00	0.36	0.72	0.5	0.00	0.60	1.20	92.3
123478-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	39.7
123678-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	62.1
234678-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	56.6
123789-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	54.4
1234678-HpCDF	<2.4	2.4	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	37.9
1234789-HpCDF	<2.4	2.4	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	51.6
OCDF	<4.8	4.8	0.0003	0.00	0.00	0.00	0.001	0.00	0.00	0.00	-
Total TEQ	-	-	-	35.80	36.73	37.65	-	46.90	48.09	49.28	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	290.0	5.8	12
Penta-Dioxins	673.0	16.8	7
Hexa-Dioxins	4220.0	19.2	8
Hepta-Dioxins	7100.0	4.8	2
Octa-Dioxin	24000.0	9.6	1
Tetra-Furans	<0.5	0.5	1
Penta-Furans	<2.4	2.4	1
Hexa-Furans	<2.4	2.4	1
Hepta-Furans	<2.4	2.4	1
Octa-Furan	<4.8	4.8	1
S **PCDD/Fs**	36283.0		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041009
Client Sample ID: HT13 1.5-1.66
Qc Lot Number: 4538324
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	<0.5	0.5	1	0.00	0.24	0.49	1	0.00	0.24	0.49	111.7
12378-PeCDD	<2.4	2.4	1	0.00	1.22	2.44	0.5	0.00	0.61	1.22	112.7
123478-HxCDD	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	59.2
123678-HxCDD	2.9	2.4	0.1	0.29	0.29	0.29	0.1	0.29	0.29	0.29	85.7
123789-HxCDD	7.8	2.4	0.1	0.78	0.78	0.78	0.1	0.78	0.78	0.78	-
1234678-HpCDD	170.0	2.4	0.01	1.70	1.70	1.70	0.01	1.70	1.70	1.70	57.5
OCDD	7050.0	9.8	0.0003	2.12	2.12	2.12	0.001	7.05	7.05	7.05	36.8
2378-TCDF	<0.5	0.5	0.1	0.00	0.02	0.05	0.1	0.00	0.02	0.05	77.2
12378-PeCDF	<2.4	2.4	0.03	0.00	0.04	0.07	0.05	0.00	0.06	0.12	77.5
23478-PeCDF	<2.4	2.4	0.3	0.00	0.37	0.73	0.5	0.00	0.61	1.22	85.6
123478-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	42.5
123678-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	53.4
234678-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	50.0
123789-HxCDF	<2.4	2.4	0.1	0.00	0.12	0.24	0.1	0.00	0.12	0.24	55.6
1234678-HpCDF	<2.4	2.4	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	34.6
1234789-HpCDF	<2.4	2.4	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	42.5
OCDF	<4.9	4.9	0.0003	0.00	0.00	0.00	0.001	0.00	0.00	0.00	-
Total TEQ	-	-	-	4.89	7.42	9.95	-	9.82	12.01	14.20	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	146.0	5.9	12
Penta-Dioxins	156.0	17.1	7
Hexa-Dioxins	774.0	17.1	7
Hepta-Dioxins	1080.0	4.9	2
Octa-Dioxin	7050.0	9.8	1
Tetra-Furans	<0.5	0.5	1
Penta-Furans	<2.4	2.4	1
Hexa-Furans	<2.4	2.4	1
Hepta-Furans	<2.4	2.4	1
Octa-Furan	<4.9	4.9	1
S **PCDD/Fs**	9206.0		

ANALYTICAL RESULTS FOR DIOXINS AND FURANS

Method Code EP300

Laboratory Sample ID: ES1990041010
Client Sample ID: WHTQ1
Qc Lot Number: 4538324
Sample Matrix: SOIL
Date Sampled: 21-Aug-2019
Date Extracted: 03-Sep-2019
Date Analysed: 03-Sep-2019

Compound	Conc pg/g	LOR pg/g	WHO-TEF	WHO-TEQ$_1$ (zero)	WHO-TEQ$_2$ (0.5 LOR)	WHO-TEQ$_3$ (LOR)	I-TEF	I-TEQ$_1$ (zero)	I-TEQ$_2$ (0.5 LOR)	I-TEQ$_3$ (LOR)	$^{13}C_{12}$ Rec(%)
2378-TCDD	0.5	0.5	1	0.54	0.54	0.54	1	0.54	0.54	0.54	123.4
12378-PeCDD	11.0	2.5	1	11.00	11.00	11.00	0.5	5.50	5.50	5.50	114.9
123478-HxCDD	10.5	2.5	0.1	1.05	1.05	1.05	0.1	1.05	1.05	1.05	70.5
123678-HxCDD	17.2	2.5	0.1	1.72	1.72	1.72	0.1	1.72	1.72	1.72	97.4
123789-HxCDD	49.3	2.5	0.1	4.93	4.93	4.93	0.1	4.93	4.93	4.93	-
1234678-HpCDD	712.0	2.5	0.01	7.12	7.12	7.12	0.01	7.12	7.12	7.12	62.3
OCDD	23200.0	10.0	0.0003	6.96	6.96	6.96	0.001	23.20	23.20	23.20	40.7
2378-TCDF	<0.5	0.5	0.1	0.00	0.02	0.05	0.1	0.00	0.02	0.05	84.0
12378-PeCDF	<2.5	2.5	0.03	0.00	0.04	0.07	0.05	0.00	0.06	0.12	82.5
23478-PeCDF	<2.5	2.5	0.3	0.00	0.37	0.75	0.5	0.00	0.62	1.25	91.6
123478-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	46.7
123678-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	65.4
234678-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	57.2
123789-HxCDF	<2.5	2.5	0.1	0.00	0.12	0.25	0.1	0.00	0.12	0.25	62.0
1234678-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	40.6
1234789-HpCDF	<2.5	2.5	0.01	0.00	0.01	0.02	0.01	0.00	0.01	0.02	51.0
OCDF	<5.0	5.0	0.0003	0.00	0.00	0.00	0.001	0.00	0.00	0.00	-
Total TEQ	-	-	-	33.32	34.28	35.24	-	44.06	45.29	46.53	-

Group Totals	Conc pg/g	LOR$_4$ pg/g	No. of Peaks
Tetra-Dioxins	299.0	6.0	12
Penta-Dioxins	658.0	17.4	7
Hexa-Dioxins	3610.0	19.9	8
Hepta-Dioxins	5950.0	5.0	2
Octa-Dioxin	23200.0	10.0	1
Tetra-Furans	<0.5	0.5	1
Penta-Furans	<2.5	2.5	1
Hexa-Furans	<2.5	2.5	1
Hepta-Furans	<2.5	2.5	1
Octa-Furan	<5.0	5.0	1
S **PCDD/Fs**	33717.0		

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CERTIFICATE OF ANALYSIS 196474

Client Details

Client	Symbio Alliance
Attention	Results Email
Address	PO Box 4312, Eight Mile Plains, QLD, 4113

Sample Details

Your Reference	**S673311-S674625**
Number of Samples	8 SOIL
Date samples received	18/07/2018
Date completed instructions received	18/07/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	25/07/2018
Date of Issue	27/07/2018
Reissue Details	This report replaces R00 created on 26/07/2018 due to: revised report with additional results.

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Results Approved By

[redacted], Inorganics Supervisor

Authorised By

[redacted]

AVS/SEM						
Our Reference		196474-1	196474-2	196474-3	196474-4	196474-5
Your Reference	UNITS	S673311-F-4	S673311-F-11	S673311-F-15	S673311-F-25	S673311-F-29
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/07/2018	20/07/2018	20/07/2018	20/07/2018	20/07/2018
Date analysed	-	20/07/2018	20/07/2018	20/07/2018	20/07/2018	20/07/2018
Acid Volatile Sulphide	µmole/g dry weight	4.0	19	20	20	3.2
Arsenic	µmole/g dry weight	0.06	0.07	0.06	0.06	<0.05
Copper	µmole/g dry weight	0.09	1.5	0.79	1.4	0.43
Lead	µmole/g dry weight	1.4	1.4	0.95	1.2	0.36
Mercury	µmole/g dry weight	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	µmole/g dry weight	1.0	6.7	4.9	6.3	2.0
Silver*	µmole/g dry weight	<0.05	<0.05	<0.05	<0.05	<0.05
Total SEM	µmole/g dry weight	2.5	9.6	6.7	8.9	2.8
SEM/AVS ratio	-	0.65	0.50	0.30	0.45	0.87

AVS/SEM				
Our Reference		196474-6	196474-7	196474-8
Your Reference	UNITS	S674625-F-7	S674625-F-8	S674625-F-22
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	20/07/2018	20/07/2018	20/07/2018
Date analysed	-	20/07/2018	20/07/2018	20/07/2018
Acid Volatile Sulphide	µmole/g dry weight	4.6	<0.5	2.5
Arsenic	µmole/g dry weight	<0.05	0.07	0.06
Copper	µmole/g dry weight	0.51	0.76	1.2
Lead	µmole/g dry weight	0.37	0.65	0.80
Mercury	µmole/g dry weight	<0.0005	<0.0005	<0.0005
Zinc	µmole/g dry weight	1.9	3.3	3.9
Silver*	µmole/g dry weight	<0.05	<0.05	<0.05
Total SEM	µmole/g dry weight	2.7	4.7	6.0
SEM/AVS ratio	-	0.60	[NT]	2.4

Method ID	Methodology Summary
AVS-SEM	Determination of Acid Volatile Sulfide (AVS) and Simultaneously Extractable Metals (SEM)/Bioavailable Metals in sediment - determined colourimetrically and using ICP-OES/ICP-MS and cold vapour-AAS.

QUALITY CONTROL: AVS/SEM						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	196474-3
Date prepared	-			20/07/2018	1	20/07/2018	20/07/2018		20/07/2018	20/07/2018
Date analysed	-			20/07/2018	1	20/07/2018	20/07/2018		20/07/2018	20/07/2018
Acid Volatile Sulphide	µmole/g dry weight	0.5	AVS-SEM	<0.5	1	4.0	3.9	3	87	#
Arsenic	µmole/g dry weight	0.05	AVS-SEM	<0.05	1	0.06	0.05	18	99	81
Copper	µmole/g dry weight	0.02	AVS-SEM	<0.02	1	0.09	0.10	11	103	115
Lead	µmole/g dry weight	0.005	AVS-SEM	<0.005	1	1.4	1.4	0	106	74
Mercury	µmole/g dry weight	0.0005	AVS-SEM	<0.0005	1	<0.0005	<0.0005	0	120	#
Zinc	µmole/g dry weight	0.02	AVS-SEM	<0.02	1	1.0	0.98	2	105	#
Silver*	µmole/g dry weight	0.05	AVS-SEM	<0.05	1	<0.05	<0.05	0	91	[NT]
Total SEM	µmole/g dry weight	0.13	AVS-SEM	<0.13	1	2.5	2.6	4	[NT]	[NT]
SEM/AVS ratio	-	0	AVS-SEM	<0	1	0.65	0.65	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

Acid Volatile Sulphide
Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Mercury/Zinc
Percent recovery not available due to matrix interference, however an acceptable recovery was achieved for the LCS.

CERTIFICATE OF ANALYSIS

CERTIFICATE NO.: S673311-C **REVISION NO.:** 01
ISSUE DATE: 30/07/2018 This certificate supersedes any previous revisions

CLIENT DETAILS: Ali Watters
Haskoning Australia Pty Ltd
Level 14, 56 Berry Street
North Sydney NSW 2060

CLIENT REF: **Order No:**
JOB DESCRIPTION: Sydney Harbour Sediment Project Phase III
DATE RECEIVED: 23/05/2018
TEST DATE: Sample tested between date received and reported.

CONDITIONS OF SAMPLE: Receipt Temperature: Chilled (0 ~ 5 °C)
Storage Temperature: Refrigerated

RESULTS OF ANALYSIS:

Sample Description Test	Method	Units	S673311-C-13 B498PC	S673311-C-23 WHT 1 0-0.5	S673311-C-24 WHT 1 0.5-1.0	S673311-C-28 WHT 2 0-0.5
TCLP - US EPA1311						
pH_Initial Reading*	ENV004_S		8.70	8.60	8.60	8.80
pH_Acidification Adjust*	ENV004_S		2.70	3.04	2.06	2.04
pH_Post Leaching*	ENV004_S		6.29	6.29	6.29	6.25
Extraction Fluid*	ENV004_S		5	5	5	5
Metals - Fresh Water Total						
Lead - Total	04-015	µg/L	24	25	7.2	6.9
PAH						
Benzo[a]pyrene	ENV103W	µg/L	<1	<1	<1	<1
Surrogate Nitrobenzene-D5	ENV103W	%	83	80	75	79
Surrogate Phenanthrene-D10	ENV103W	%	92	88	90	88

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Melbourne: Unit 36, 640-680 Geelong Rd, Brooklyn VIC 3025
Sydney: 2 Sirius Rd, Lane Cove West NSW 2066
Rockhampton: Unit 3, 191 Berserker St, Berserker QLD 4701
Wagga Wagga: Unit 5, 10-12 Kooringal Rd, Wagga Wagga NSW 2650

CERTIFICATE NO.: S673311-C

Sample Description Test	Method	Units	S673311-C-13 B498PC	S673311-C-23 WHT 1 0-0.5	S673311-C-24 WHT 1 0.5-1.0	S673311-C-28 WHT 2 0-0.5
Surrog 4-Terphenyl-D14	ENV103W	%	104	102	106	105

DEFINITIONS: < : Less than, > : Greater than, - : Not Tested, DWB : Dry Weight Basis, NA: not applicable, RP: Result Pending, - : Not received / requested, ~ : Estimated, TBA - to be advised

* Test not covered by NATA scope of accreditation

: Result derived from calculation.

Results were reported on an "as received" basis unless otherwise indicated.
Sampling was conducted by the customer and results reported pertain only to the samples submitted.
Responsibility for representative sampling rests with the customer.

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Global Experts in Food Assurance

Certificate of Analysis

Final Report

Symbio Reporting
Symbio Laboratories
PO Box 4312
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Brisbane 4113
Australia

PO Number: 60183

Report Issued: 07-Aug-2018 **AsureQuality Reference: 18-190911** **Sample(s) Received:** 24-Jul-2018 13:40

Results

The tests were performed on the samples as received.

Customer Sample Name: S673311-E-4 **AsureQuality ID:** 18-190911-1

Sample Description: WHT 6 0-0.44

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<3.83	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	<3.83	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<2.95	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	4.18	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<2.38	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<2.42	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	<2.42	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<6.65	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	<6.65	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	<4.37	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<4.05	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<4.33	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<5.44	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	<5.44	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<4.88	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	<5.15	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<5.05	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	43.9	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	<3.38	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<3.91	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	<3.91	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	47.9	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	162	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	15.5 (E)	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	2360	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	2590	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	2600	pg/L	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
Sum of PCDD/Fs - Upperbound	2610	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	1.19	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	8.28	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	15.4	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	2.85	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	8.55	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	14.2	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	95	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	69	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	76	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	80	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	86	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	65	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	67	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	65	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	65	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	67	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	67	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	61	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	66	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	68	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	54	%	USEPA Method 1613B (GC-HRMS)

E = Estimated result

Customer Sample Name: S673311-E-11 **AsureQuality ID:** 18-190911-2

Sample Description: BIIIPC

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<2.55	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	4.32	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<5.01	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	19.6	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<1.82	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<4.40	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	24.6	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<4.60	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	65.2	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	<15.6	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<5.97	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<5.99	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<7.92	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	89.8	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<8.23	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	23.4	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<28.9	pg/L	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
Total HxCDD	603	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	155	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<6.64	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	405	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	1140	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	2940	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	620	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	23000	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	27800	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	27800	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	27800	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	22.4	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	31.7	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	40.9	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	38.9	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	47.5	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	56.1	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	83	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	76	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	86	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	88	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	100	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	80	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	85	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	87	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	83	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	88	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	84	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	80	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	91	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	89	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	78	%	USEPA Method 1613B (GC-HRMS)

Customer Sample Name: S673311-E-15 **AsureQuality ID:** 18-190911-3

Sample Description: B478PC

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<5.24	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	<5.24	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<6.42	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	12.6	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<2.43	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<2.31	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	13.1	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<7.92	pg/L	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
Total PeCDD	48.5	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	5.80	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<5.18	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<5.42	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<7.18	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	57.4	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<7.92	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	17.7 (E)	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<29.7	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	554 (E)	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	93.8	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<5.53	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	240	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	909	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	2360	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	407	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	21500	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	25200	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	25200	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	25200	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	19.0	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	29.6	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	40.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	34.3	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	43.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	52.1	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	80	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	80	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	85	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	87	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	93	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	84	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	83	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	81	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	79	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	80	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	82	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	74	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	83	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	70	%	USEPA Method 1613B (GC-HRMS)

E = Estimated result

Customer Sample Name: S673311-E-25 **AsureQuality ID:** 18-190911-4

Sample Description: WHT 1 1.1-1.8

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<6.48	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	7.28	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<2.65	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	26.3	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<2.33	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<2.32	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	9.86	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<5.79	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	60.0	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	11.2	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<3.07	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<2.99	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<3.89	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	88.3	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<6.42	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	21.7	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	16.6	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	543	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	122	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	7.28	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	328	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	1030	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	2670	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	439	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	21700	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	25900	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	25900	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	25900	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	23.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	28.9	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	34.7	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	38.7	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	43.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	47.8	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	78	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	71	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	75	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	83	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	76	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	76	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	77	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	77	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	82	%	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
$^{13}C_{12}$ 123678-HxCDD	81	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	76	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	79	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	71	%	USEPA Method 1613B (GC-HRMS)

Customer Sample Name: S673311-E-29 **AsureQuality ID:** 18-190911-5

Sample Description: WHT 2 0.5-1.0

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<2.87	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	<2.87	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<3.34	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	9.08	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<2.05	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<1.93	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	<2.05	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<5.56	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	23.8	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	<3.39	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<3.06	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<3.10	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<3.97	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	4.46	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<5.22	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	<5.39	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<18.0	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	292	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	22.0	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<4.50	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	55.9	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	283	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	1190	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	75.2	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	8820	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	10500	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	10500	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	10500	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	5.72	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	12.8	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	19.8	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	11.9	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	17.8	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	23.7	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	77	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	70	%	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
$^{13}C_{12}$ 2378-TCDD	82	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	84	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	87	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	92	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	81	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	83	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	83	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	87	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	84	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	72	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	89	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	86	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	71	%	USEPA Method 1613B (GC-HRMS)

Customer Sample Name: S673311-E-40 **AsureQuality ID:** 18-190911-6

Sample Description: Bulk Water Ocean

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<3.33	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	<3.33	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<3.69	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	<3.69	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<2.89	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<2.75	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	<2.89	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<6.02	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	<6.02	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	<4.56	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<4.17	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<4.09	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<5.37	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	<5.37	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<4.72	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	<5.26	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<4.89	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	<5.26	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	<4.30	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<5.11	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	<5.11	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	<6.21	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	<6.21	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	<8.86	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	19.3	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	19.3	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	42.7	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	66.0	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	0.00579	pg/L	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
Total PCDD/F WHO-TEQ - Mediumbound	7.22	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	14.4	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	0.0193	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	6.03	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	12.0	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	75	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	51	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	56	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	55	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	60	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	62	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	48	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	51	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	52	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	51	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	55	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	49	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	48	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	51	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	52	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	42	%	USEPA Method 1613B (GC-HRMS)

Customer Sample Name: S674625-E-7 **AsureQuality ID:** 18-190911-7

Sample Description: B12OWA

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<2.62	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	<2.62	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<3.49	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	9.10	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<4.32	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<4.10	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	<4.32	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<6.34	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	60.6	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	<3.97	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<3.63	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<3.72	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<4.78	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	<4.78	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<10.8	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	<11.4	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<32.3	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	938	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	24.7	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<3.93	pg/L	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
Total HpCDF	56.6	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	769	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	3710	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	85.9	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	51200	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	56100	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	56100	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	56100	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	23.3	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	32.6	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	41.9	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	59.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	67.4	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	75.5	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	85	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	68	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	85	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	77	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	81	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	83	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	73	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	75	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	79	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	76	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	68	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	77	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	71	%	USEPA Method 1613B (GC-HRMS)

Customer Sample Name: S674625-E-8 **AsureQuality ID:** 18-190911-8

Sample Description: BL4 0-0.5

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<2.76	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	<2.76	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<3.48	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	8.00	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<2.89	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<2.67	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	8.88	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<8.55	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	56.1	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	<5.43	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<5.10	pg/L	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
234678-HxCDF	<5.13	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<6.58	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	17.8	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<8.10	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	11.7	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<27.8	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	920	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	33.2	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<5.14	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	73.0	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	837	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	3680	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	118	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	57800	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	62700	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	62700	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	62700	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	27.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	36.8	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	46.3	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	67.8	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	75.5	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	83.2	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	80	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	65	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	75	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	71	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	75	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	67	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	70	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	70	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	68	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	72	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	66	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	64	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	74	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	72	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	67	%	USEPA Method 1613B (GC-HRMS)

Customer Sample Name: S674625-E-22 **AsureQuality ID:** 18-190911-9

Sample Description: BL3 0-0.5

Sample Condition: Acceptable

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<4.34	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	<4.34	pg/L	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
2378-TCDD	<4.75	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	7.04	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<4.30	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<4.18	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	7.24	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<10.7	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	42.7	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	<6.94	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<6.34	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<6.15	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<8.53	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	21.0	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<8.34	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	16.2	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<30.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	710	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	40.9	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<5.45	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	56.6	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	775	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	3110	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	159	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	52300	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	56400	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	56400	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	56400	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	25.5	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	37.5	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	49.5	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	62.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	72.0	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	81.8	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	85	%	USEPA Method 1613B (GC-HRMS)
Internal Standards			
$^{13}C_{12}$ 2378-TCDF	64	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	77	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	73	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	75	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	80	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	67	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	70	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	71	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	69	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	74	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	70	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	63	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	73	%	USEPA Method 1613B (GC-HRMS)

Test	Result	Unit	Method Reference
$^{13}C_{12}$ 1234678-HpCDD	73	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	66	%	USEPA Method 1613B (GC-HRMS)

QC Results

Blank

Relates to sample(s) 18-190911-1, 18-190911-2, 18-190911-3, 18-190911-4, 18-190911-5, 18-190911-6, 18-190911-7, 18-190911-8, 18-190911-9

Test	Result	Unit	Method Reference
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
2378-TCDF	<3.28	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDF	<3.28	pg/L	USEPA Method 1613B (GC-HRMS)
2378-TCDD	<2.90	pg/L	USEPA Method 1613B (GC-HRMS)
Total TCDD	<2.90	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDF	<2.17	pg/L	USEPA Method 1613B (GC-HRMS)
23478-PeCDF	<2.09	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDF	<2.17	pg/L	USEPA Method 1613B (GC-HRMS)
12378-PeCDD	<5.78	pg/L	USEPA Method 1613B (GC-HRMS)
Total PeCDD	<5.78	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDF	<3.22	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDF	<3.03	pg/L	USEPA Method 1613B (GC-HRMS)
234678-HxCDF	<3.12	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDF	<4.09	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDF	<4.09	pg/L	USEPA Method 1613B (GC-HRMS)
123478-HxCDD	<3.32	pg/L	USEPA Method 1613B (GC-HRMS)
123678-HxCDD	<3.70	pg/L	USEPA Method 1613B (GC-HRMS)
123789-HxCDD	<3.44	pg/L	USEPA Method 1613B (GC-HRMS)
Total HxCDD	<3.70	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDF	<4.23	pg/L	USEPA Method 1613B (GC-HRMS)
1234789-HpCDF	<4.97	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDF	<4.97	pg/L	USEPA Method 1613B (GC-HRMS)
1234678-HpCDD	<3.98	pg/L	USEPA Method 1613B (GC-HRMS)
Total HpCDD	<3.98	pg/L	USEPA Method 1613B (GC-HRMS)
OCDF	<4.64	pg/L	USEPA Method 1613B (GC-HRMS)
OCDD	<3.41	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Lowerbound	0.000	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Mediumbound	19.5	pg/L	USEPA Method 1613B (GC-HRMS)
Sum of PCDD/Fs - Upperbound	38.9	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Lowerbound	0.000	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Mediumbound	6.11	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F WHO-TEQ - Upperbound	12.2	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Lowerbound	0.000	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Mediumbound	4.90	pg/L	USEPA Method 1613B (GC-HRMS)
Total PCDD/F I-TEQ - Upperbound	9.80	pg/L	USEPA Method 1613B (GC-HRMS)
Clean-Up Standards			
$^{37}Cl_4$ 2378-TCDD	80	%	USEPA Method 1613B (GC-HRMS)

Internal Standards			
$^{13}C_{12}$ 2378-TCDF	71	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 2378-TCDD	78	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDF	87	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 23478-PeCDF	93	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 12378-PeCDD	102	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDF	88	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDF	88	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 234678-HxCDF	85	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123789-HxCDF	82	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123478-HxCDD	91	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 123678-HxCDD	88	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDF	81	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234789-HpCDF	91	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ 1234678-HpCDD	93	%	USEPA Method 1613B (GC-HRMS)
$^{13}C_{12}$ OCDD	75	%	USEPA Method 1613B (GC-HRMS)

Analysis Summary

Wellington Laboratory

Analysis	Method	Accreditation	Authorised by
Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs)			
DX-DIOX04, 01-DEFAULT	USEPA Method 1613B (GC-HRMS)	IANZ	[redacted]

The total toxic equivalence (TEQ) is calculated for each sample using both WHO toxic equivalency factors (WHO-TEFs; Van den Berg et al., 2005) and international toxic equivalency factors (I-TEFs; Kutz et al., 1990).

Lowerbound concept uses zero for the contribution of each non-quantified analyte. Mediumbound concept uses half of the reporting limit for the contribution of each non-quantified analyte. Upperbound concept uses the reporting limit for the contribution for each non-quantified analyte.

Results that are prefixed with '<' indicate the lowest level at which the analyte can be reported, and that in this case the analyte was not observed above this limit.

[redacted]

Accreditation

Appendix

Analyte Definitions

Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans (PCDD/Fs) - USEPA Method 1613B (GC-HRMS)

Analyte	Full Name
2378-TCDF	2,3,7,8-Tetrachlorodibenzofuran
Total TCDF	Total tetrachlorodibenzofuran
2378-TCDD	2,3,7,8-Tetrachlorodibenzodioxin
Total TCDD	Total tetrachlorodibenzodioxin
12378-PeCDF	1,2,3,7,8-Pentachlorodibenzofuran
23478-PeCDF	2,3,4,7,8-Pentachlorodibenzofuran
Total PeCDF	Total pentachlorodibenzofuran
12378-PeCDD	1,2,3,7,8-Pentachlorodibenzodioxin
Total PeCDD	Total pentachlorodibenzodioxin
123478-HxCDF	1,2,3,4,7,8-Hexachlorodibenzofuran
123678-HxCDF	1,2,3,6,7,8-Hexachlorodibenzofuran
234678-HxCDF	2,3,4,6,7,8-Hexachlorodibenzofuran
123789-HxCDF	1,2,3,7,8,9-Hexachlorodibenzofuran
Total HxCDF	Total hexachlorodibenzofuran
123478-HxCDD	1,2,3,4,7,8-Hexachlorodibenzodioxin
123678-HxCDD	1,2,3,6,7,8-Hexachlorodibenzodioxin
123789-HxCDD	1,2,3,7,8,9-Hexachlorodibenzodioxin
Total HxCDD	Total hexachlorodibenzodioxin
1234678-HpCDF	1,2,3,4,6,7,8-Heptachlorodibenzofuran
1234789-HpCDF	1,2,3,4,7,8,9-Heptachlorodibenzofuran
Total HpCDF	Total heptachlorodibenzofuran
1234678-HpCDD	1,2,3,4,6,7,8-Heptachlorodibenzodioxin
Total HpCDD	Total heptachlorodibenzodioxin
OCDF	Octachlorodibenzofuran
OCDD	Octachlorodibenzodioxin

LOR = Limit of Reporting LOD = Limit of Detection NR = Not Reportable

CERTIFICATE OF ANALYSIS

CERTIFICATE NO.: S673311-E **REVISION NO.:** 00
ISSUE DATE: 7/08/2018 This certificate supersedes any previous revisions

CLIENT DETAILS: Ali Watters
Haskoning Australia Pty Ltd
Level 14, 56 Berry Street
North Sydney NSW 2060

CLIENT REF: **Order No:**
JOB DESCRIPTION: Sydney Harbour Sediment Project Phase III
DATE RECEIVED: 23/05/2018
TEST DATE: Sample tested between date received and reported.

CONDITIONS OF SAMPLE: Receipt Temperature: Chilled (0 ~ 5 °C)
Storage Temperature: Refrigerated

RESULTS OF ANALYSIS:

Sample Description Test	Method	Units	S673311-E-4 WHT 6 0-0.44	S673311-E-11 BIIIPC	S673311-E-15 B478PC	S673311-E-25 WHT 1 1.1-1.8
Mercury - Total (µg/L)						
Mercury - Total	04-009	µg/L	<0.1	<0.1	<0.1	<0.1
Metals - Fresh Water Total						
Silver - Total	04-015	µg/L	<1	<1	<1	<1
Copper - Total	04-015	µg/L	11	8.1	8.7	8.1
Lead - Total	04-015	µg/L	8.1	5.6	4.8	7.5
Zinc - Total	04-015	µg/L	24	21	24	24
Subcontract Analysis						
Dioxins and Furans^	S005.01	-	See attachment	See attachment	See attachment	See attachment

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Melbourne: Unit 36, 640-680 Geelong Rd, Brooklyn VIC 3025
Sydney: 2 Sirius Rd, Lane Cove West NSW 2066
Rockhampton: Unit 3, 191 Berserker St, Berserker QLD 4701
Wagga Wagga: Unit 5, 10-12 Kooringal Rd, Wagga Wagga NSW 2650

CERTIFICATE NO.: S673311-E

Sample Description Test	Method	Units	S673311-E-29 WHT 2 0.5-1.0	S673311-E-40 Bulk Water Ocean
Mercury - Total (µg/L)				
Mercury - Total	04-009	µg/L	<0.1	<0.1
Metals - Fresh Water Total				
Silver - Total	04-015	µg/L	<1	<1
Copper - Total	04-015	µg/L	7.8	12
Lead - Total	04-015	µg/L	5.7	5.0
Zinc - Total	04-015	µg/L	32	27
Subcontract Analysis				
Dioxins and Furans^	S005.01	-	See attachment	See attachment

DEFINITIONS: < : Less than, > : Greater than, - : Not Tested, DWB : Dry Weight Basis, NA: not applicable, RP: Result Pending, - : Not received / requested, ~ : Estimated, TBA - to be advised

* Test not covered by NATA scope of accreditation

: Result derived from calculation.

The metal test was performed after dilution. The LOR was rasied accordingly.

Dioxins and Furans were subcontracted Asurequality. See attached report #60183

Please note: Dioxins and Furans Testing performed by an external subcontracted Laboratory.
Report No: 1198854
Results were reported on an "as received" basis unless otherwise indicated.
Sampling was conducted by the customer and results reported pertain only to the samples submitted.
Responsibility for representative sampling rests with the customer.

[redacted]

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- Rockhampton: Unit 3, 191 Berserker St, Berserker QLD 4701
- Wagga Wagga: Unit 5, 10-12 Kooringal Rd, Wagga Wagga NSW 2650

CERTIFICATE OF ANALYSIS

CERTIFICATE NO.: S673311-G **REVISION NO.:** 00
ISSUE DATE: 27/09/2018 This certificate supersedes any previous revisions

CLIENT DETAILS: Ali Watters
Haskoning Australia Pty Ltd
Level 14, 56 Berry Street
North Sydney NSW 2060

CLIENT REF: **ORDER No:**
DATE RECEIVED: 23/05/2018
TEST DATE: Sample tested between date received and reported.

CONDITIONS OF SAMPLE: Receipt Temperature: Chilled (0 ~ 5 °C)
Storage Temperature: Refrigerated

RESULTS OF ANALYSIS:

Sample Description Test	Method Code	Unit	S673311-G-4 WHT 6 0-0.44	S673311-G-11 BIIIPC	S673311-G-15 B478PC	S673311-G-25 WHT 1 1.1-1.8
Organic Mercury (as Methyl Hg)	ESM-Hg	mg/kg	<0.010	<0.010	<0.010	<0.010

Sample Description Test	Method Code	Unit	S673311-G-29 WHT 2 0.5-1.0
Organic Mercury (as Methyl Hg)	ESM-Hg	mg/kg	<0.010

DEFINITIONS: < = Less than, > = Greater than, - = Not Tested, DWB = Dry Weight Basis.
= The result is derived from calculation.

Results were reported on an "as received" basis unless otherwise indicated.
Sampling was conducted by the customer and results reported pertain only to the samples submitted.
Responsibility for representative sampling rests with the customer.

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CERTIFICATE OF ANALYSIS

CERTIFICATE NO.: **S673311RT-A** **REVISION NO.:** **00** **Page 1 of 7**
ISSUE DATE: 8/11/18 This certificate supersedes any previous revisions

CLIENT DETAILS: Ali Watters
Haskoning Australia Pty Ltd
Level 14, 56 Berry Street
North Sydney NSW 2060

DATE RECEIVED: 23/05/2018
CLIENT JOBREF:
ORDER NO:
TEST DATE: Sample tested between date received and reported.

SAMPLE INFORMATION:

Received Condition (°C): Chilled (0 ~ 5 °C) **Storage Condition:** Refrigerated

Sample No.	Sample Date/Time	Sample Description	Sample Matrix
S673311RT-A/1		WHT 7A 0-0.1	Sediment
S673311RT-A/2		WHT 7 0-0.9	Sediment
S673311RT-A/3		WHT 7 0.1-0.26	Sediment
S673311RT-A/4		WHT 6 0-0.44	Sediment
S673311RT-A/5		WHT6 0.45-0.55	Sediment
S673311RT-A/6		WHT 5 0-0.4	Sediment
S673311RT-A/7		WHT 5 0.5-0.55	Sediment
S673311RT-A/8		WHT 5 0.4-0.6	Sediment
S673311RT-A/9		WHT 4 0-0.8	Sediment
S673311RT-A/10		WHT 4 0.8-1.2	Sediment
S673311RT-A/11		BIIIPC	Sediment

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▪ Wagga Wagga: Unit 5, 10-12 Kooringal Rd, Wagga Wagga NSW 2650
▪ Perth: 2/20 Milford Street, East Victoria Park WA 6101

Sample No.	Sample Date/Time	Sample Description	Sample Matrix
S673311RT-A/12		BIIIPC 1.65-1.80	Sediment
S673311RT-A/13		B498PC	Sediment
S673311RT-A/14		B498PC 1.60-1.76	Sediment
S673311RT-A/15		B478PC	Sediment
S673311RT-A/16		B478PC 1.9-2.0	Sediment
S673311RT-A/17		B479PC 1.86-1.96	Sediment
S673311RT-A/18		B479PC	Sediment
S673311RT-A/19		WHT PCI	Sediment
S673311RT-A/20		WHT8 0-0.4	Sediment
S673311RT-A/21		WHT 8 0.4-1.00	Sediment
S673311RT-A/22		WHT 8 1.00-1.10	Sediment
S673311RT-A/23		WHT 1 0-0.5	Sediment
S673311RT-A/24		WHT 1 0.5-1.0	Sediment
S673311RT-A/25		WHT 1 1.1-1.8	Sediment
S673311RT-A/26		WHT 4 1.10-1.17	Sediment
S673311RT-A/27		WHT 3 1.0-1.08	Sediment
S673311RT-A/28		WHT 2 0-0.5	Sediment
S673311RT-A/29		WHT 2 0.5-1.0	Sediment
S673311RT-A/30		WHT 2 1.0-1.5	Sediment
S673311RT-A/31		WHT B1	Sediment
S673311RT-A/32		WHT PC5	Sediment
S673311RT-A/33		WHT PC6	Sediment
S673311RT-A/34		WHT 3 0-0.6	Sediment

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▪ Perth: 2/20 Milford Street, East Victoria Park WA 6101

Sample No.	Sample Date/Time	Sample Description	Sample Matrix
S673311RT-A/35		WHT3 0.6-1.12	Sediment
S673311RT-A/36		WHT PC3	Sediment
S673311RT-A/37		WHT PC4	Sediment
S673311RT-A/38		WHT D1	Water - General
S673311RT-A/39		WHT R2	Water - General

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▪ Perth: 2/20 Milford Street, East Victoria Park WA 6101

RESULTS OF ANALYSIS:

	Test Method	LOR	Units	S673311RT-A/1	S673311RT-A/2	S673311RT-A/3	S673311RT-A/4	S673311RT-A/5
Trace Elements								
Lead	04-001	0.5	mg/kg	-	-	-	190	-
Zinc	04-001	0.5	mg/kg	-	-	-	75	-

	Test Method	LOR	Units	S673311RT-A/6	S673311RT-A/7	S673311RT-A/8	S673311RT-A/9	S673311RT-A/10
Trace Elements								
Lead	04-001	0.5	mg/kg	48	-	-	23	-
Zinc	04-001	0.5	mg/kg	90	-	-	40	-

	Test Method	LOR	Units	S673311RT-A/11	S673311RT-A/12	S673311RT-A/13	S673311RT-A/14	S673311RT-A/15
Trace Elements								
Lead	04-001	0.5	mg/kg	220	-	230	-	200
Zinc	04-001	0.5	mg/kg	420	-	430	-	340

Symbio Laboratories Pty Ltd

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▪ Melbourne: Unit 36, 640-680 Geelong Rd, Brooklyn VIC 3025
▪ Sydney: 2 Sirius Rd, Lane Cove West NSW 2066
▪ Wagga Wagga: Unit 5, 10-12 Kooringal Rd, Wagga Wagga NSW 2650
▪ Perth: 2/20 Milford Street, East Victoria Park WA 6101

	Test Method	LOR	Units	S673311RT-A/16	S673311RT-A/17	S673311RT-A/18	S673311RT-A/19	S673311RT-A/20
Trace Elements								
Lead	04-001	0.5	mg/kg	-	-	-	-	-
Zinc	04-001	0.5	mg/kg	-	-	-	-	-

	Test Method	LOR	Units	S673311RT-A/21	S673311RT-A/22	S673311RT-A/23	S673311RT-A/24	S673311RT-A/25
Trace Elements								
Lead	04-001	0.5	mg/kg	-	-	250	240	290
Zinc	04-001	0.5	mg/kg	-	-	490	490	510

	Test Method	LOR	Units	S673311RT-A/26	S673311RT-A/27	S673311RT-A/28	S673311RT-A/29	S673311RT-A/30
Trace Elements								
Lead	04-001	0.5	mg/kg	-	-	220	82	-
Zinc	04-001	0.5	mg/kg	-	-	440	160	-

	Test Method	LOR	Units	S673311RT-A/31	S673311RT-A/32	S673311RT-A/33	S673311RT-A/34	S673311RT-A/35
Trace Elements								
Lead	04-001	0.5	mg/kg	-	-	-	-	-
Zinc	04-001	0.5	mg/kg	-	-	-	-	-

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	Test Method	LOR	Units	S673311RT-A/36	S673311RT-A/37	S673311RT-A/38	S673311RT-A/39
Trace Elements							
Lead	04-001	0.5	mg/kg	-	-	-	-
Zinc	04-001	0.5	mg/kg	-	-	-	-

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[redacted]

CERTIFICATE OF ANALYSIS

CERTIFICATE NO.: S673311RT-D **REVISION NO.:** 01
ISSUE DATE: 8/11/2018 This certificate supersedes any previous revisions

CLIENT DETAILS: Ali Watters
Haskoning Australia Pty Ltd
Level 14, 56 Berry Street
North Sydney NSW 2060

CLIENT REF: **Order No:**
JOB DESCRIPTION: Sydney Harbour Sediment Project Phase III
DATE RECEIVED: 23/05/2018
TEST DATE: Sample tested between date received and reported.

CONDITIONS OF SAMPLE: Receipt Temperature: Chilled (0 ~ 5 °C)
Storage Temperature: Refrigerated

RESULTS OF ANALYSIS:

Sample Description Test	Method	Units	S673311RT-D-4 WHT 6 0-0.44	S673311RT-D-6 WHT 5 0-0.4	S673311RT-D-9 WHT 4 0-0.8	S673311RT-D-11 BIIIPC
Dilute Acid Extraction - Metal						
Lead	04-001	mg/kg	140	48	21	220
Zinc	04-001	mg/kg	69	88	37	400

Sample Description Test	Method	Units	S673311RT-D-13 B498PC	S673311RT-D-15 B478PC	S673311RT-D-23 WHT 1 0-0.5	S673311RT-D-24 WHT 1 0.5-1.0
Dilute Acid Extraction - Metal						
Lead	04-001	mg/kg	240	210	250	260
Zinc	04-001	mg/kg	430	340	450	530

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CERTIFICATE NO.: S673311RT-D

Sample Description Test	Method	Units	S673311RT-D-25 WHT 1 1.1-1.8	S673311RT-D-28 WHT 2 0-0.5	S673311RT-D-29 WHT 2 0.5-1.0
Dilute Acid Extraction - Metal					
Lead	04-001	mg/kg	310	250	86
Zinc	04-001	mg/kg	530	480	160

DEFINITIONS: < : Less than, > : Greater than, - : Not Tested, DWB : Dry Weight Basis, NA: not applicable, RP: Result Pending, - : Not received / requested, ~ : Estimated, TBA - to be advised

* Test not covered by NATA scope of accreditation

: Result derived from calculation.

Results were reported on an "as received" basis unless otherwise indicated.
Sampling was conducted by the customer and results reported pertain only to the samples submitted.
Responsibility for representative sampling rests with the customer.

Measurement uncertainty is available on request or via www.symbiolabs.com.au/login

[redacted]

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Perth: 2/20 Milford Street, East Victoria Park WA 6101

CERTIFICATE No:	S673311-A	**REVISION NO;**	00
ISSUE DATE:	15/06/2018	This Certificate supersedes any previous revisions	
CLIENT DETAILS:	Haskoning Australia Pty Ltd		
JOB REF:			
DATE RECEIVED:	23/05/2018	**TEST DATE:**	Sample tested between date received and reported

This Data Quality Report contains information relating to:

Method Blank
Refers to the analytical signal derived from chemical reagents and equipment in the absence of a sample matrix. Method blanks provide an indication of potential method bias for the relevant analytes.
Method Blank analyses are conducted at the minimum rate of one per batch or 5% whichever the greater.

Laboratory Control Sample
The Laboratory Control Sample (LCS) comprises of a certified reference material or control matrix spiked with all analytes representative of the analyte class. The LCS recovery data is used to evaluate method performance.
LCS analyses are conducted at the minimum rate of one per batch or 5% whichever the greater.

Laboratory Duplicate
Involves the analyses of a duplicate sample from within the same analytical batch. The variation between duplicate analyses provides an estimation of method precision and sample heterogeneity.
Duplicate analyses are conducted at the minimum rate of one per batch or 5% which ever the greater
Samples selected for duplicate analysis may not be sourced from this registration.

Methods & Procedures
Analytical methodologies and quality control procedures used for environmental analyses are derived from a variety of reference standards and guidelines including but not limited to APHA, USEPA, AS and NEPM. These methods and procedures are designed to comply with NATA requirements for compliance to ISO/IEC 17025.

S673311-A QC Data
METHOD BLANK AND LABORATORY CONTROL SAMPLE REPORT

Analyte	Method Code	LOR	Units	Blank Result	LCS Result	LCS Expected Value	Recovery %	Acceptable Recovery (%)	
								Low	High
Moisture Content	04-004S-1	0.1	%	N/A	N/A	N/A	N/A	N/A	N/A
Silver - Total	04_015W	0.1	µg/L	<0.1	47.9	50.0	96	50	150
Arsenic - Total	04_015W	0.5	µg/L	<0.5	50.4	50.0	101	50	150
Cadmium - Total	04_015W	0.1	µg/L	<0.1	44.2	50.0	88	50	150
Chromium - Total	04_015W	1	µg/L	<1	49.4	50.0	99	50	150
Copper - Total	04_015W	0.5	µg/L	<0.5	48.9	50.0	98	50	150
Nickel - Total	04_015W	0.5	µg/L	<0.5	47.3	50.0	95	50	150
Lead - Total	04_015W	0.1	µg/L	<0.1	47.8	50.0	96	50	150
Zinc - Total	04_015W	0.5	µg/L	<0.5	53.8	50.0	108	50	150
Mercury - Total	04_009W	0.1	µg/L	<0.1	0.006	0.005	120	50	150
Arsenic	04_001S	0.4	mg/kg	<0.4	4.75	5.00	95	50	150
Cadmium	04_001S	0.1	mg/kg	<0.1	5.08	5.00	102	50	150
Chromium	04_001S	0.1	mg/kg	<0.1	5.22	5.00	104	50	150
Copper	04_001S	0.1	mg/kg	<0.1	5.08	5.00	102	50	150
Mercury	04-002S	0.01	mg/kg	<0.01	0.004	0.005	80	50	150
Nickel	04_001S	0.1	mg/kg	<0.1	5.09	5.00	102	50	150
Lead	04_001S	0.5	mg/kg	<0.5	5.16	5.00	103	50	150
Silver	04_001S	0.1	mg/kg	<0.1	0.661	0.5	132	50	150
Zinc	04_001S	0.5	mg/kg	<0.5	4.95	5.00	99	50	150
Monobutyltin as Sn	04_026	0.5	µg/kg	<0.5	38.2	40.0	96	50	150
Dibutyltin as Sn	04_026	0.5	µg/kg	<0.5	36.7	40.0	92	50	150
Tributlytin as Sn	04_026	0.5	µg/kg	<0.5	38.3	40.0	96	50	150

S673311-A QC Data
METHOD BLANK AND LABORATORY CONTROL SAMPLE REPORT

Analyte	Method Code	LOR	Units	Blank Result	LCS Result	LCS Expected Value	Recovery %	Acceptable Recovery (%)	
								Low	High
TRH C6-C9	04_021	10	mg/kg	<10	276	320	86	50	150
TRH C10-C14	04_020	10	mg/kg	<10	1378	1627	85	50	150
TRH C15-C28	04_020	50	mg/kg	<50	4926	4907	100	50	150
TRH C29-C36	04_020	50	mg/kg	<50	3682	3773	98	50	150
Naphthalene	04-022S	5	µg/kg	<5	62.9	48.0	131	50	150
1-Methylnaphthalene	04-022S	5	µg/kg	<5	60.9	48.0	127	50	150
2-Methylnaphthalene	04-022S	5	µg/kg	<5	60.5	48.0	126	50	150
Acenaphthylene	04-022S	5	µg/kg	<5	62.3	48.0	130	50	150
Acenaphthene	04-022S	5	µg/kg	<5	60.6	48.0	126	50	150
Fluorene	04-022S	5	µg/kg	<5	62.6	48.0	130	50	150
Phenanthrene	04-022S	5	µg/kg	<5	60.5	48.0	126	50	150
Anthracene	04-022S	5	µg/kg	<5	57.2	48.0	119	50	150
Fluoranthene	04-022S	5	µg/kg	<5	62.6	48.0	130	50	150
Pyrene	04-022S	5	µg/kg	<5	62.8	48.0	131	50	150
Benz(a)anthracene	04-022S	5	µg/kg	<5	56.3	48.0	117	50	150
Chrysene	04-022S	5	µg/kg	<5	56.4	48.0	118	50	150
Benzo(b)&(k)fluoranthene	04-022S	10	µg/kg	<10	115.1	96	120	50	150
Benzo(a)pyrene	04-022S	5	µg/kg	<5	49.2	48.0	103	50	150
Indeno(1,2,3-cd)pyrene	04-022S	5	µg/kg	<5	68.4	48.0	143	50	150
Dibenz(a,h)anthracene	04-022S	5	µg/kg	<5	74	48.0	154	50	150
Benzo(g,h,i)perylene	04-022S	5	µg/kg	<5	68.3	48.0	142	50	150

S673311-A QC Data
METHOD BLANK AND LABORATORY CONTROL SAMPLE REPORT

Analyte	Method Code	LOR	Units	Blank Result	LCS Result	LCS Expected Value	Recovery %	Acceptable Recovery (%)	
								Low	High
Coronene	04-022S	10	µg/kg	<10	109.6	48.0	228	50	150
Benzo(e)pyrene	04-022S	5	µg/kg	<5	52.7	48.0	110	50	150
Perylene	04-022S	5	µg/kg	<5	47.4	48.0	99	50	150
Total PAHs (as above)	04-022S	100	µg/kg	N/A	N/A	N/A	N/A	N/A	N/A
Aldrin	04-024S	1	µg/kg	<1	58.1	48.0	121	50	150
alpha-BHC	04-024S	1	µg/kg	<1	58.9	48.0	123	50	150
beta-BHC	04-024S	1	µg/kg	<1	56.9	48.0	119	50	150
gamma-BHC (Lindane)	04-024S	1	µg/kg	<1	59.4	48.0	124	50	150
delta-BHC	04-024S	1	µg/kg	<1	57.1	48.0	119	50	150
cis-Chlordane	04-024S	1	µg/kg	<1	55.7	48.0	116	50	150
trans-Chlordane	04-024S	1	µg/kg	<1	54.7	48.0	114	50	150
p,p'-DDD	04-024S	1	µg/kg	<1	57.0	48.0	119	50	150
p,p'-DDE	04-024S	1	µg/kg	<1	55.8	48.0	116	50	150
p,p'-DDT	04-024S	1	µg/kg	<1	42.1	48.0	88	50	150
Dieldrin	04-024S	1	µg/kg	<1	58.4	48.0	122	50	150
alpha-Endosulfan	04-024S	1	µg/kg	<1	57.2	48.0	119	50	150
beta-Endosulfan	04-024S	1	µg/kg	<1	57.7	48.0	120	50	150
Endosulfan Sulphate	04-024S	1	µg/kg	<1	50.8	48.0	106	50	150
Endrin	04-024S	1	µg/kg	<1	55.6	48.0	116	50	150
Endrin ketone	04-024S	1	µg/kg	<1	54.4	48.0	113	50	150
Endrin aldehyde	04-024S	1	µg/kg	<1	60.3	48.0	126	50	150
Heptachlor	04-024S	1	µg/kg	<1	58.2	48.0	121	50	150

S673311-A QC Data
METHOD BLANK AND LABORATORY CONTROL SAMPLE REPORT

Analyte	Method Code	LOR	Units	Blank Result	LCS Result	LCS Expected Value	Recovery %	Acceptable Recovery (%)	
								Low	High
Heptachlor epoxide	04-024S	1	µg/kg	<1	55.5	48.0	116	50	150
Hexachlorobenzene	04-024S	1	µg/kg	<1	55.7	48.0	116	50	150
Methoxychlor	04-024S	1	µg/kg	<1	43.4	48.0	90	50	150
Oxychlordane*	04-024S	1	µg/kg	<1	56.6	48.0	118	50	150
Total Organic Carbon^	S004_01	0.01	%	N/A	N/A	N/A	N/A	N/A	N/A

Symbio LABORATORIES

S673311-A QC Data
LABORATORY DUPLICATE REPORT

Sample ID	Analyte	Method Code	LOR	Units	Duplicate 1	Duplicate 2	RPD %	Acceptable Criteria %
S673311-A-1	Moisture Content	04-004S-1	0.1	%	19.2	19.3	0.5	30
S6733731-B-1	Silver - Total	04_015W	0.1	µg/L	<0.1	<0.1	0.0	30
S6733731-B-1	Arsenic - Total	04_015W	0.5	µg/L	0.586	0.5	15.8	30
S6733731-B-1	Cadmium - Total	04_015W	0.1	µg/L	<0.1	<0.1	0.0	30
S6733731-B-1	Chromium - Total	04_015W	1	µg/L	<1	<1	0.0	30
S6733731-B-1	Copper - Total	04_015W	0.5	µg/L	69.2	72.7	4.9	30
S6733731-B-1	Nickel - Total	04_015W	0.5	µg/L	1.33	1.38	3.7	30
S6733731-B-1	Lead - Total	04_015W	0.1	µg/L	3.71	3.86	4.0	30
S6733731-B-1	Zinc - Total	04_015W	0.5	µg/L	1671.3	1749	4.5	30
S673311-A-38	Mercury - Total	04_009W	0.1	µg/L	<0.1	<0.1	0.0	30
S673311-A-1	Arsenic	04_001S	0.4	mg/kg	7.69	7.93	3.1	30
S673311-A-1	Cadmium	04_001S	0.1	mg/kg	<0.1	<0.1	0.0	30
S673311-A-1	Chromium	04_001S	0.1	mg/kg	14.5	15.4	6.0	30
S673311-A-1	Copper	04_001S	0.1	mg/kg	4.61	4.91	6.3	30
S673311-A-1	Mercury	04-002S	0.01	mg/kg	0.055	0.058	5.3	30
S673311-A-1	Nickel	04_001S	0.1	mg/kg	2.25	2.45	8.5	30
S673311-A-1	Lead	04_001S	0.5	mg/kg	10.9	11.6	6.2	30
S673311-A-1	Silver	04_001S	0.1	mg/kg	<0.1	<0.1	0	30
S673311-A-1	Zinc	04_001S	0.5	mg/kg	13.6	14.2	4.3	30
S673311-A-4	Monobutyltin as Sn	04_026	0.5	µg/kg	3.4	3.39	0.3	30
S673311-A-4	Dibutyltin as Sn	04_026	0.5	µg/kg	2.92	3.69	23.3	30
S673311-A-4	Tributlytin as Sn	04_026	0.5	µg/kg	1.67	2.15	25.1	30
S673311-A-4	TRH C6-C9	04_021	10	mg/kg	<10	<10	0.0	30

Symbio LABORATORIES

S673311-A QC Data
LABORATORY DUPLICATE REPORT

Sample ID	Analyte	Method Code	LOR	Units	Duplicate 1	Duplicate 2	RPD %	Acceptable Criteria %
S673311-A-4	TRH C10-C14	04_020	10	mg/kg	<10	<10	0.0	30
S673311-A-4	TRH C15-C28	04_020	50	mg/kg	<50	<50	0.0	30
S673311-A-4	TRH C29-C36	04_020	50	mg/kg	<50	<50	0.0	30
S673311-A-30	Naphthalene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	1-Methylnaphthalene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	2-Methylnaphthalene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	Acenaphthylene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	Acenaphthene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	Fluorene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	Phenanthrene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	Anthracene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	Fluoranthene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-18	Pyrene	04-022S	5	µg/kg	19	26.4	32.6	30
S673311-A-30	Benz(a)anthracene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	Chrysene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-30	Benzo(b)&(k)fluoranthene	04-022S	10	µg/kg	<10	<10	0.0	30
S673311-A-30	Benzo(a)pyrene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-4	Indeno(1,2,3-cd)pyrene	04-022S	5	µg/kg	237.6	314.5	27.9	30
S673311-A-30	Dibenz(a,h)anthracene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-18	Benzo(g,h,i)perylene	04-022S	5	µg/kg	17.6	21.4	19.5	30
S673311-A-18	Coronene	04-022S	10	µg/kg	16.7	20.1	18.5	30
S673311-A-30	Benzo(e)pyrene	04-022S	5	µg/kg	<5	<5	0.0	30
S673311-A-18	Perylene	04-022S	5	µg/kg	<5	<5	0.0	30

S673311-A QC Data
LABORATORY DUPLICATE REPORT

Sample ID	Analyte	Method Code	LOR	Units	Duplicate 1	Duplicate 2	RPD %	Acceptable Criteria %
	Total PAHs (as above)	04-022S	100	µg/kg	N/A	N/A	N/A	N/A
S673311-A-4	Aldrin	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	alpha-BHC	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	beta-BHC	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	gamma-BHC (Lindane)	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	delta-BHC	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	cis-Chlordane	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	trans-Chlordane	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	p,p'-DDD	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	p,p'-DDE	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	p,p'-DDT	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Dieldrin	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	alpha-Endosulfan	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	beta-Endosulfan	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Endosulfan Sulphate	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Endrin	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Endrin ketone	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Endrin aldehyde	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Heptachlor	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Heptachlor epoxide	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Hexachlorobenzene	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Methoxychlor	04-024S	1	µg/kg	<1	<1	0.0	30
S673311-A-4	Oxychlordane*	04-024S	1	µg/kg	<1	<1	0.0	30

S673311-A QC Data
LABORATORY DUPLICATE REPORT

Sample ID	Analyte	Method Code	LOR	Units	Duplicate 1	Duplicate 2	RPD %	Acceptable Criteria %
	Total Organic Carbon^	S004_01	0.01	%	N/A	N/A	N/A	N/A

S673311-A QC Data
Surrogate Control Limit Report

Surrogate	Method Code	Acceptable Criteria (%)	
		Lower Limit	Upper Limit
Surrogate 1 Recovery	04-022S	50	150
Surrogate 2 Recovery	04-022S	50	150
Surrogate 3 Recovery	04-022S	50	150
Surrogate Recovery	04-024S	50	150
Surrogate Recovery	04_020	50	150
Surrogate Recovery	04_026	50	150

CERTIFICATE No:	S673311-D	**REVISION NO;**	00
ISSUE DATE:	30/07/2018	This Certificate supersedes any previous revisions	
CLIENT DETAILS:	Haskoning Australia Pty Ltd		
JOB REF:	Sydney Harbour Sediment Project Phase III		
DATE RECEIVED:	23/05/2018	**TEST DATE:**	Sample tested between date received and reported

This Data Quality Report contains information relating to:

Method Blank
Refers to the analytical signal derived from chemical reagents and equipment in the absence of a sample matrix. Method blanks provide an indication of potential method bias for the relevant analytes.
Method Blank analyses are conducted at the minimum rate of one per batch or 5% whichever the greater.

Laboratory Control Sample
The Laboratory Control Sample (LCS) comprises of a certified reference material or control matrix spiked with all analytes representative of the analyte class. The LCS recovery data is used to evaluate method performance.
LCS analyses are conducted at the minimum rate of one per batch or 5% whichever the greater.

Laboratory Duplicate
Involves the analyses of a duplicate sample from within the same analytical batch. The variation between duplicate analyses provides an estimation of method precision and sample heterogeneity.
Duplicate analyses are conducted at the minimum rate of one per batch or 5% which ever the greater
Samples selected for duplicate analysis may not be sourced from this registration.

Methods & Procedures
Analytical methodologies and quality control procedures used for environmental analyses are derived from a variety of reference standards and guidelines including but not limited to APHA, USEPA, AS and NEPM. These methods and procedures are designed to comply with NATA requirements for compliance to ISO/IEC 17025.

S673311-D QC Report
METHOD BLANK AND LABORATORY CONTROL SAMPLE REPORT

Analyte	Method Code	LOR	Units	Blank Result	LCS Result	LCS Expected Value	Recovery %	Acceptable Recovery (%)	
								Low	High
Silver	04_001S	0.1	mg/kg	<0.1	0.473	0.500	95	50	150
Arsenic	04_001S	0.4	mg/kg	<0.4	4.72	5.00	94	50	150
Copper	04_001S	0.1	mg/kg	<0.1	4.76	5.00	95	50	150
Mercury	04_002S	0.01	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A
Lead	04_001S	0.5	mg/kg	<0.5	4.89	5.00	98	50	150
Zinc	04_001S	0.5	mg/kg	<0.5	4.89	5.00	98	50	150

Symbio LABORATORIES

S673311-D QC Report
LABORATORY DUPLICATE REPORT

Sample ID	Analyte	Method Code	LOR	Units	Duplicate 1	Duplicate 2	RPD %	Acceptable Criteria %
S673311-D-4	Silver	04_001S	0.1	mg/kg	<0.1	<0.1	0.0	30
S673311-D-4	Arsenic	04_001S	0.4	mg/kg	3.18	3.33	4.6	30
S673311-D-4	Copper	04_001S	0.1	mg/kg	11.4	11.9	4.3	30
	Mercury	04_002S	0.01	mg/kg	N/A	N/A	N/A	N/A
S673311-D-4	Lead	04_001S	0.5	mg/kg	103	108	4.7	30
S673311-D-4	Zinc	04_001S	0.5	mg/kg	64.9	68.1	4.8	30

CERTIFICATE No:	S673311-E	**REVISION NO;**	00
ISSUE DATE:	08/08/2018	This Certificate supersedes any previous revisions	
CLIENT DETAILS:	Haskoning Australia Pty Ltd		
JOB REF:	Sydney Harbour Sediment Project Phase III		
DATE RECEIVED:	23/05/2018	**TEST DATE:**	Sample tested between date received and reported

This Data Quality Report contains information relating to:

Method Blank
Refers to the analytical signal derived from chemical reagents and equipment in the absence of a sample matrix. Method blanks provide an indication of potential method bias for the relevant analytes.
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Laboratory Duplicate
Involves the analyses of a duplicate sample from within the same analytical batch. The variation between duplicate analyses provides an estimation of method precision and sample heterogeneity.
Duplicate analyses are conducted at the minimum rate of one per batch or 5% which ever the greater
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Methods & Procedures
Analytical methodologies and quality control procedures used for environmental analyses are derived from a variety of reference standards and guidelines including but not limited to APHA, USEPA, AS and NEPM. These methods and procedures are designed to comply with NATA requirements for compliance to ISO/IEC 17025.

S673311-E QC Report
METHOD BLANK AND LABORATORY CONTROL SAMPLE REPORT

Analyte	Method Code	LOR	Units	Blank Result	LCS Result	LCS Expected Value	Recovery %	Acceptable Recovery (%)	
								Low	High
Mercury - Total	04_009W	0.1	µg/L	N/A	N/A	N/A	N/A	N/A	N/A
Silver - Total	04_015W	0.1	µg/L	<0.1	0.473	0.500	95	50	150
Copper - Total	04_015W	0.5	µg/L	<0.5	4.76	5.00	95	50	150
Lead - Total	04_015W	0.1	µg/L	<0.1	4.89	5.00	98	50	150
Zinc - Total	04_015W	0.5	µg/L	<0.5	4.89	5.00	98	50	150

Symbio LABORATORIES

S673311-E QC Report
LABORATORY DUPLICATE REPORT

Sample ID	Analyte	Method Code	LOR	Units	Duplicate 1	Duplicate 2	RPD %	Acceptable Criteria %
	Mercury - Total	04_009W	0.1	µg/L	N/A	N/A	N/A	N/A
S673311-D-4	Silver - Total	04_015W	0.1	µg/L	<0.1	<0.1	0.0	30
S673311-D-4	Copper - Total	04_015W	0.5	µg/L	11.4	11.9	4.3	30
S673311-D-4	Lead - Total	04_015W	0.1	µg/L	103	108	4.7	30
S673311-D-4	Zinc - Total	04_015W	0.5	µg/L	64.9	68.1	4.8	30

CERTIFICATE No:	S673311-F	**REVISION NO;**	00
ISSUE DATE:	30/07/2018	This Certificate supersedes any previous revisions	
CLIENT DETAILS:	Haskoning Australia Pty Ltd		
JOB REF:	Sydney Harbour Sediment Project		
DATE RECEIVED:	23/05/2018	**TEST DATE:**	Sample tested between date received and reported

This Data Quality Report contains information relating to:

Method Blank
Refers to the analytical signal derived from chemical reagents and equipment in the absence of a sample matrix. Method blanks provide an indication of potential method bias for the relevant analytes.
Method Blank analyses are conducted at the minimum rate of one per batch or 5% whichever the greater.

Laboratory Control Sample
The Laboratory Control Sample (LCS) comprises of a certified reference material or control matrix spiked with all analytes representative of the analyte class. The LCS recovery data is used to evaluate method performance.
LCS analyses are conducted at the minimum rate of one per batch or 5% whichever the greater.

Laboratory Duplicate
Involves the analyses of a duplicate sample from within the same analytical batch. The variation between duplicate analyses provides an estimation of method precision and sample heterogeneity.
Duplicate analyses are conducted at the minimum rate of one per batch or 5% which ever the greater
Samples selected for duplicate analysis may not be sourced from this registration.

Methods & Procedures
Analytical methodologies and quality control procedures used for environmental analyses are derived from a variety of reference standards and guidelines including but not limited to APHA, USEPA, AS and NEPM. These methods and procedures are designed to comply with NATA requirements for compliance to ISO/IEC 17025.

Symbio LABORATORIES

S673311-F QC Report
METHOD BLANK AND LABORATORY CONTROL SAMPLE REPORT

Analyte	Method Code	LOR	Units	Blank Result	LCS Result	LCS Expected Value	Recovery %	Acceptable Recovery (%)	
								Low	High
Acid Volatile Sulphide	S008_01	0.5	µmole/g dry weight	<0.5	N/A	N/A	87	70	130
Silver	S008_01	0.05	µmole/g dry weight	<0.05	N/A	N/A	91	70	130
Copper	S008_01	0.02	µmole/g dry weight	<0.02	N/A	N/A	103	70	130
Lead	S008_01	0.005	µmole/g dry weight	<0.005	N/A	N/A	106	70	130
Mercury	S008_01	0.0005	µmole/g dry weight	<0.0005	N/A	N/A	120	70	130
Zinc	S008_01	0.02	µmole/g dry weight	<0.02	N/A	N/A	105	70	130
Total SEM	S008_01	0.13	µmole/g dry weight	<0.13	N/A	N/A	N/A	N/A	N/A
SEM/AVS Ratio	S008_01		-		N/A	N/A	N/A	N/A	N/A

S673311-F QC Report
LABORATORY DUPLICATE REPORT

Sample ID	Analyte	Method Code	LOR	Units	Duplicate 1	Duplicate 2	RPD %	Acceptable Criteria %
196474-1	Acid Volatile Sulphide	S008_01	0.5	µmole/g dry weight	4	3.9	2.5	50
196474-1	Silver	S008_01	0.05	µmole/g dry weight	<0.05	<0.05	0.0	100
196474-1	Copper	S008_01	0.02	µmole/g dry weight	0.09	0.1	10.5	100
196474-1	Lead	S008_01	0.005	µmole/g dry weight	1.4	1.4	0.0	50
196474-1	Mercury	S008_01	0.0005	µmole/g dry weight	<0.0005	<0.0005	0.0	100
196474-1	Zinc	S008_01	0.02	µmole/g dry weight	1	0.98	2.0	50
196474-1	Total SEM	S008_01	0.13	µmole/g dry weight	2.5	2.6	3.9	50
196474-1	SEM/AVS Ratio	S008_01		-	0.65	0.65	0.0	50

QUALITY CONTROL REPORT

Job Reference	S673311-G	**Page**	1 of 4
Client	Haskoning Australia Pty Ltd	**Laboratory**	Brisbane
Contact	Ali Watters	**Address**	52 Brandl Street, Eight Mile Plains, QLD 4113
Address	Level 14, 56 Berry Street	**Contact**	admin@symbiolabs.com.au
	Norty Sydney NSW 2060	**Telephone**	1300 703 166
Telephone			
Order Number		**Date Samples Received**	
Client Job Reference		**Date Analysis Commenced**	
Sampler		**Issue Date**	28/09/2018
Site		**Revision No.**	R00
Quote number			
No of Samples received	5		
No of Samples analysed	5		

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

This Quality Control Report contains the following information:

1. Method Blank (MB) Report; Limit of Reporting and QC Result
2. Method Laboratory Controlled Sample (LCS) Report; QC Result and Acceptance Criteria
3. Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits

General Comments

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

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

Abbreviation:

QC Sample = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CRM = Certified Referenced Material; Used to verify in-house LCS
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference

Client	Haskoning Australia Pty Ltd
Contact	Ali Watters
Job Reference	S673311-G
Page	2 of 4

Method Blank Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination.

Method:Compound / QC Sample ID	Analyte	LOD	Units	QC Result
Lab Method: ESM-Hg				
Method Blank	Organic Mercury (as Methyl Hg)	0.010	mg/kg	<0.010

Client	Haskoning Australia Pty Ltd
Contact	Ali Watters
Job Reference	S673311-G
Page	3 of 4

Method Laboratory Control Sample Report

The quality control term Laboratory Control Sample (LCS) refers to a certified reference material (CRM) or a sample with known parameters that have been verified against a CRM. The quality control term Spike (SPK) refers to a known interference free matrix spiked with target analytes. The purpose of these QC parameters is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method : Compound / QC Sample ID	Analyte	LOD	Units	QC Test Results	Expected Value	QC Recovery (%)	QC Criteria
Lab Method: ESM-Hg							
Laboratory Control Sample	Organic Mercury (as Methyl Hg)	0.010	mg/kg	5.32	5.00	106	80-120%

Client	Haskoning Australia Pty Ltd
Contact	Ali Watters
Job Reference	S673311-G
Page	4 of 4

Laboratory Duplicate Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in the relavant technical method manuals and are dependent on the magnitude of results in comparison to the level of reporting.

Method : Compound / QC Sample ID	Analyte	LOD	Units	Original Result	Dup Result	RPD (%)	RPD Acceptance Criteria (%)
Lab Method: ESM-Hg							
Laboratory Duplicate Sample	Organic Mercury (as Methyl Hg)	0.010	mg/kg	<0.010	<0.010	-	No Limit

Appendix D Field QA/QC

Parameter	Units	PQL	Field Blank	Split Duplicate					Field Triplicate						
			WHT B1	WHT 7 0-0.9	WHT PC1	WHT PC2	average	RPD	WHT 3 0-0.6	WHT PC3	WHT PC4	average	SD	RSD	RPD
	Units	PQL													
Arsenic	mg/kg	0.4	<0.4	7.9	6.6	7.7	7.25	18	9.6	8.7	11	10	1	12	9
Cadmium	mg/kg	0.1	<0.1	*0.05*	*0.05*	*0.05*	0.05	0	*0.1*	*0.1*	0.14	0.11	0.02	20	0
Chromium	mg/kg	0.1	0.25	8.6	6.5	14	7.55	28	8.3	6.6	14	10	4	40	18
Copper	mg/kg	0.1	1.9	7.5	5.2	4.6	6.35	36	2.4	1.8	3.3	3	1	30	24
Lead	mg/kg	0.5	<0.5	15	11	11	13	31	5.4	4.6	7.2	6	1	23	14
Mercury	mg/kg	0.01	<0.01	0.09	0.089	0.055	0.0895	1	0.013	*0.01*	*0.01*	0.0	0.0	16	27
Nickel	mg/kg	0.1	<0.1	1.3	2	2.2	1.65	-42	2.8	2.3	4.8	3	1	40	15
Silver	mg/kg	0.1	<0.1	*0.05*	*0.05*	*0.05*	0.05	0	*0.1*	*0.1*	0.12	0.1	0.0	11	0
Zinc	mg/kg	0.5	0.5	24	18	14	21	29	7.7	5.8	12	9	3	37	22
Tributyltin	µgSn/kg	0.5	<0.5	1.6	--	*0.25*	1.6	--	<0.5	--	--	--	--	--	--
TPH	mg/kg	50	<50	*25*	--	25	25	--	<50	--	--	--	--	--	--
Total PAHs	µg/kg	100	<100	1100	550	50	825	67	*50*	*50*	*50*	50	0	0	0
OC Pesticide	µg/kg	1	<1	*0.5*	*0.5*	*0.5*	0.5	0	<1	--	--	--	--	--	--

Parameter	Units	PQL	Rinsate	
			WHT R1	WHT R2
	Units	PQL	day 1	day 2
Arsenic	µg/L	0.5	<0.5	<0.5
Cadmium	µg/L	0.1	<0.1	<0.1
Chromium	µg/L	1	<1	9.2
Copper	µg/L	0.5	0.6	2.5
Lead	µg/L	0.1	<0.1	1
Mercury	µg/L	0.1	<0.1	<0.1
Nickel	µg/L	0.5	<0.5	0.51
Silver	µg/L	0.1	<0.1	<0.1
Zinc	µg/L	0.5	2.9	16

Notes:

1) > 50% RSD, or > 35% RPD

2) Numbers in italics indicate contaminant concentrations below PQL and are reported as half the PQL for statistical purposes where required

3) Screening Levels as per the National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia, 2009).

4) Field replicates (three samples at the one location, the relative standard deviation, RSD) of ±50%, although they may not always do so where the sediments are very inhomogeneous or greatly differing in grain size

5) Split duplicates (that is, splits of a single mixed sample) should be within a Relative Percent Difference (RPD) of ±35%