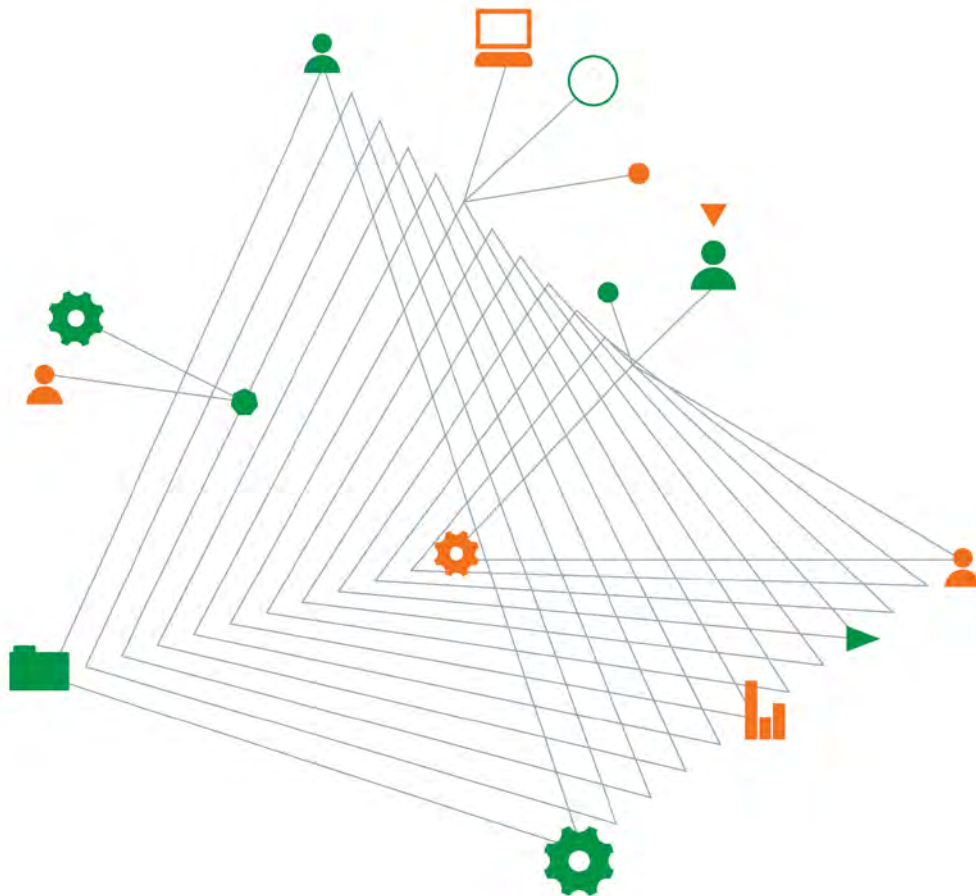


St Leonards Health Organisations Relocation (SHOR) Project - Detailed Site Investigation

St Leonards, NSW

14 November 2017



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St Leonards Health Organisations Relocation (SHOR) Project - Detailed Site Investigation

Prepared for
NSW Health Infrastructure

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Executive Summary

NSW Health Infrastructure (NSW Health) engaged Coffey Environments Australia Pty Ltd (Coffey) to provide geotechnical and environmental services for the proposed Royal North Shore Hospital redevelopment (the hospital site).

It is understood that the proposed development will involve the following parts of the hospital site:

- the present Building 9 and former Building 10
- the present Buildings 51 and 52
- north-eastern portion of the former Building 2
- the present Buildings 37 and 38
- the present Buildings 32, 35 and 36

This detailed site investigation (DSI) has been prepared for the investigation work that was carried out in the vicinity of the existing Buildings 51 and 52 (the site) which is identified in the Concept Plan as Site 4a in Precinct 4.

The site is proposed to be redeveloped as the St Leonards Health Organisations Relocation (SHOR) building for commercial uses. The redevelopment will involve the construction of a 10-storey building above two basement levels for car parking. The proposed Precinct Plan, Precinct 4 boundary and layout of the commercial building development is provided in Appendix A. Based on information provided to us, a childcare centre is intended to be on the ground floor of the proposed commercial building. A review of the plans indicated that the proposed centre will be located within the building footprint and above the basement carpark, and therefore, will not have direct contact with the underlying soils.

The objective of the DSI is to assess the site's suitability for the proposed commercial use, with respect to land contamination, in general accordance with State Environmental Planning Policy (SEPP) 55 – Remediation of Land. The DSI will be used as a supporting document for the development application, currently being prepared by Health Infrastructure.

The investigation was carried out in general accordance with our variation request dated 22 November 2016 (reference: ENAURHOD06452AA-P03).

The objectives of the investigation are to:

- Assess the site's suitability for the proposed commercial use, with respect to land contamination, in general accordance with State Environmental Planning Policy (SEPP) 55 – Remediation of Land; and
- Provide a preliminary waste classification to facilitate off-site disposal to licensed landfill in accordance with NSW EPA (2014) Waste Classification Guidelines.

Based on a review of readily available information, observations made during fieldwork and an assessment of laboratory analytical data, Coffey considers that the site is suitable for the proposed commercial development with respect to contamination, subject to the following:

- The contamination risk on the site must be reviewed if a substantial change to the layout of building is proposed.
- Implementation of an unexpected finds protocol during earthworks and site excavation. If during the excavation work, material is encountered which appears to be potentially contaminated or suspicious, excavation works should cease in the affected area until inspection is carried out by a competent environmental consultant. In the context of the above, potentially contaminated or suspicious material would include fibrous materials, asbestos sheeting, drums, metal or plastic chemical containers or brightly coloured material, stained or odorous soil etc.

Advice from a construction dewatering contractor should be obtained before applying for a permit to discharge accumulated seepage water from the site.

This report should be read in conjunction with the attached ***Important Information About Your Coffey Environmental Report***.

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Figure 2 – Site Layout and Sampling Location Plan

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Appendices

Appendix A – Proposed Development Plan

Appendix B – Borehole Logs

Appendix C – Calibration Certificates

Appendix D – Data Assessment

Appendix E – Field Data Sheet

Appendix F - Laboratory Reports and Chain of Custody Documentation

Appendix G – Risk Assessment

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Abbreviations

ACM	Asbestos Containing Material
AHD	Australian Height Datum
AST	Aboveground Storage Tank
BH	Borehole
bgs	below ground surface
COC	Chain of Custody
COPC	Chemical of potential concern
Eurofins	Eurofins Environment Testing Australia Pty Ltd, trading as Eurofins MGT
LOR	Limit of Reporting
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
µg/L	microgram per litre
NATA	National Association of Testing Authorities
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
OCP	Organochlorine Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PID	Photoionisation Detector
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percent Difference
SOP	Standard Operating Procedures
TRH	Total Recoverable Hydrocarbon
VENM	Virgin Excavated Natural Material

1. St Leonards Health Organisations Relocation (SHOR)

1.1. Project introduction

This report supports a State Significant Development Application (SSDA) submitted to the Department of Planning and Environment pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the St Leonards Health Organisations Relocation (SHOR) Project at the Royal North Shore Hospital (RNSH).

The SSD Application relates to the Concept Plan Approval for the Royal North Shore Hospital, St Leonards which was approved in April 2007 (MP 06_0051). This application is SSD by way of Ministerial declaration pursuant to Section 89(C) of the EP&A Act, the order for which was published on 13 October 2017.

This development proposal relates specifically to the construction of a new building on the south-western edge (identified as site 4A under the Concept Plan) of the RNSH Campus. Uses proposed include health-related commercial uses, retail and a child care centre.

This report has been prepared having regard to the Secretary's Environmental Assessment Requirements issued for the project.

1.2. Background

Site 4a (the site) is located within the hospital grounds of RNSH, within Precinct 4.

The site forms part of a wider Concept Plan approval for the redevelopment and renewal of RNSH (MP 06_0051). On 13 April 2007, approval was granted for a Concept Plan, including proposed building envelopes (height, bulk, scale), associated GFA and land use, site preparatory works, and road networks.

The Concept Plan proposed staged renewal of the entire campus through the nomination of eight precincts and a six-stage construction and delivery strategy. Since concept approval, redevelopment of the following buildings has been completed:

- Kolling Institute Research Building;
- Acute Services Building;
- Clinical Services Building;
- Community Services Building; and
- Multi-Storey Car Park with capacity for 567 spaces.

Under the Concept Plan, Precinct 4 comprises Site 4a and Site 4b.

Approval for demolition of existing buildings currently located on Precinct 4 and adjoining areas of the RNSH Campus was obtained as part of a Review of Environmental Factors (REF) under Part 5 of the EP&A Act 1979, dated August 2016. The Part 5 approval also included regrading of land for landscaping purposes and some landscaping works. Other works that have been carried out on site, and were covered under the REF include refurbishment of the existing buildings (Building 33, 35, 36 and the Douglas Building) and other civil infrastructure upgrades.

The Concept Plan has undergone several modifications, with the most recent modification relating to the subject site. Modification 7 (MP 06_0051 MOD 7 - Modification to Concept Plan building footprint in Precinct 4a) was lodged on December 2016 and approved by the DP&E on 20 July 2017. The modification amended the building footprint originally approved for Site 4a under the Concept Plan and consolidated the commercial floor plate design, allowing a more efficient commercial floor plate and an improved design response for the site.

1.3. Overview of proposed development

This SSD Application seeks approval for works proposed to Precinct 4 (Site 4a and Site 4b) and some adjoining public domain grounds. Specifically, consent is sought for the following:

- Construction of a 10-storey building with a total GFA of 30,977 m² comprising of the following uses:
 - 28,615 m² of health-related employment generating uses;
 - 658m² lobby;
 - 241m² café;
 - 902 m² child care facility;
 - 561m² basement storage and miscellaneous.
- Construction of 2 basement levels with 115 car parking spaces and 1 car wash bay;
- Subdivision of the existing land parcel into the following additional allotments:
 - Proposed Lot 41 (Area 8,049 m²);
 - Proposed Lot 42 (Area 64 m²); and
 - Proposed Lot 40 (Residue Lot comprising the RNS hospital precinct)
- Improved east-west connectivity of the 4A+4B precinct through an at grade pedestrian access way interconnecting Herbert Street (east) to Reserve street (west);
- Creation of an additional easement along the southern alignment of the site for unrestricted vehicular access; and
- Associated public domain and landscaping works.

1.4. Precinct 4

The RNSH Campus is situated approximately 6.5 km north of Sydney CBD and 3 km south west of Chatswood. The RNSH precinct is located within Willoughby City Council LGA, less than 200 metres from St Leonards Station.

Precinct 4 is located at the southern edge of the RNSH Campus with direct frontage to Reserve Road (west of the site).

The land is owned by the Health Administration Corporation. Precinct 4 currently forms a part of the Royal North Shore Hospital campus, legally described as Lot 210 under DP 1172133. Total site area of the existing campus is 11.38 hectares.

2. Context of this report

2.1. Background

NSW Health Infrastructure (NSW Health) engaged Coffey Environments Australia Pty Ltd (Coffey) to provide geotechnical and environmental services for the proposed Royal North Shore Hospital redevelopment (the SHOR project, described in Section 1).

This detailed site investigation (DSI) has been prepared for the investigation work that was carried out in the vicinity of the existing Buildings 51 and 52 (the site) which is identified in the Concept Plan as Site 4a in Precinct 4.

The site is proposed to be redeveloped as the St Leonards Health Organisations Relocation (SHOR) building for commercial uses. The redevelopment will involve the construction of a 10-storey building above two basement levels for car parking. The proposed Precinct Plan, Precinct 4 boundary and layout of the commercial building development is provided in Appendix A. Based on information provided to us, a childcare centre is intended to be on the ground floor of the proposed commercial building. A review of the plans indicated that the proposed centre will be located within the building footprint and above the basement carpark, and therefore, will not have direct contact with the underlying soils.

The hospital location and the layout of the site are shown in Figures 1 and 2, respectively.

The objective of the DSI is to assess the site's suitability for the proposed commercial use, with respect to land contamination, in general accordance with State Environmental Planning Policy (SEPP) 55 – Remediation of Land. The DSI will be used as a supporting document for the development application, currently being prepared by Health Infrastructure.

The investigation was carried out in general accordance with our variation request dated 22 November 2016 (reference: ENAURHOD06452AA-P03).

2.2. Objectives

The objectives of the investigation are to:

- Assess the site's suitability for the proposed commercial use, with respect to land contamination, in general accordance with State Environmental Planning Policy (SEPP) 55 – Remediation of Land; and
- Provide a preliminary waste classification to facilitate off-site disposal of fill materials to licensed landfill in accordance with NSW EPA (2014) Waste Classification Guidelines.

2.3. Proposed development and bulk excavation

The proposed development would involve the construction of a 10-storey commercial building with two basement levels in the north-western portion of the site. At the time of preparing this report, the design floor level for the lower basement was 76.0mAHD, to incorporate floor slab and sub floor drainage the bulk excavation level may require to be taken further down to about 75.5m AHD.

Based on this information, it is estimated that the bulk excavation will extend to approximately 5.5 m below the existing ground level in the north-west corner of the site. Excavation in the south-east corner of the site could be about 1 m depth with the difference due to the slope of the ground surface across the site.

2.4. Scope of works

Coffey addressed the objectives through:

- Review previous Coffey contamination reports prepared for Northern Sydney Health and NSW Health Administration Corporation. This will include extraction, compiling and review of existing bore logs and laboratory results relevant to the site. Reports include:
 - Coffey (2004) Preliminary Contamination Assessment, Royal North Shore hospital Redevelopment. S21855/4-AM/ 13 September 2004.
 - Coffey (2007) Stage 2 Environmental Site Assessment, Royal North Shore hospital Redevelopment, Proposed Divestment Site. ENVILCOV00298AA-AK. 20 March 2007.
 - Coffey (2007) Stage 2 Environmental Site Assessment, Royal North Shore hospital Redevelopment, Proposed Hospital Site. ENVILCOV00298AA-AL. 16 March 2007.
- Collection of soil samples at regular intervals for laboratory analysis from four boreholes that were drilled for the geotechnical investigation (BH202 to BH205) ;
- Drilling of three environmental boreholes (BHC101 to BHC103) using a truck mounted drill rig equipped with solid augers. Boreholes were extended 0.5m into the underlying weathered bedrock, anticipated to be approximately 5m deep. Soil samples were collected at regular intervals for laboratory analysis;
- Logging of materials observed in boreholes according to the Unified Soil Classification System (USCS) and recording soil bore locations by measuring from features on-site;
- Headspace field screening of samples for volatile organic compounds (VOC) using a calibrated photo-ionisation detector (PID);
- Storage of samples in laboratory supplied jars and bottles, placement of samples in insulated containers with ice and transported to the laboratory under chain of custody control;
- Laboratory analysis of selected soil samples for selected chemicals of potential concern (COPC), including Total Petroleum Hydrocarbon (TPH), Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAH), Metals (As, Cd, Cr, Cu, Pb, Ni, Hg, Zn), Organochlorine Pesticides (OCP), Polychlorinated Biphenyls (PCB) and asbestos (presence / absence). Additionally, selected soil samples were also analysed for leachable metals and PAH to optimise waste classification.
- Collection of groundwater samples to assess groundwater quality beneath the site from the three groundwater piezometers (BH202, BH204 and BH205) installed during geotechnical investigation;
- Establishing piezometer locations and ground surface levels using survey plans provided to Coffey to establish groundwater flow direction; and
- Preparation of this Detailed Site Investigation Report in general accordance with relevant sections of NSW OEH (2011), Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.

3. Site information

3.1. Site identification

Site identification details are summarised in Table 3.1.

Table 3.1 Site Identification Details

Site address	Royal North Shore Hospital, Corner of Reserve Road and Forsyth Place, St Leonards NSW
Site area	Approximately 4,800m ² (78mx61m) Building footprint – approximately 3,400m ² (65m x 52m)
Current land use	Buildings 51 and 52 are currently used for hospital administration purposes.
Title identification details	Part Lot 210 DP1172133 within Willoughby City Council
Proposed site uses	Commercial office building with two basement levels for car parking

The site location and site layout are shown in Figures 1 and 2, respectively.

3.2. Surrounding Land Use

During the fieldwork, Coffey observed that the general land uses surrounding the site include:

- **North:** hospital use
- **East:** hospital use and St Leonards railway station with retail premises at ground level and offices above
- **South:** commercial and retail premises
- **West:** Gore Hill Park Oval

3.3. Site topography

The hospital site is located along a natural ridgeline running in a north-south direction (where Reserve Road is now located), at an elevation of approximately 98m Australian Height Datum (mAHD). The site is generally slopping to approximately 90mAHD and 93m to the east and west, respectively.

Within the site, the ground surface slopes gently down to the south-east, from approximately RL 81 m AHD in the north to approximately RL 76 m AHD in the south-east.

There is no surface water bodies located within the site. The nearest water feature is Berry Creek which is approximately 1km south of the centre of the hospital site.

3.4. Regional geology

The Sydney 1:100,000 geological map published by the Geological Survey of NSW (1983) indicated that the site is underlain by Ashfield Shale, described as black to dark grey shale and laminite. The shale was underlain by the Hawkesbury Sandstone which is described as medium to coarse grained quartz sandstone with very minor shale and laminite lenses. An intermediate unit, known as Mittagong

Formation, comprising interbedded shale, laminite and medium grained quartz sandstone, is indicated to be found between the Ashfield Shale and the Hawkesbury Sandstone in some locations.

The shale and sandstone was expected to be overlain by residual soils. Fill was also expected in some locations.

3.5. Acid sulfate soils

The 1:250,000 Acid Sulfate Soil Risk Map (Department of Land and Water Conservation, 1997) for the Parramatta River / Prospect region indicates that there is no known occurrence of acid sulfate soils at the site and the area surrounding the site, which is consistent with the elevation of the site.

3.6. Regional hydrogeology

Regional groundwater was expected to occur mainly within joints, bedding partings and fractures within the bedrock, or perched within the overlying fill and/or natural soils. The flow of regional groundwater is expected to be to the south or southwest, towards Sydney Harbour, however shallow groundwater is likely to follow topography and flow toward the railway tracks to the east which are at lower elevation than the site.

3.7. Local Sensitive Environments

No local sensitive environmental receptors are present within the investigation area. The nearest surface water feature is Berry Creek which is located approximately 1 km south of the site.

4. Previous Investigations

4.1. Coffey (2004) Preliminary Contamination Assessment

A preliminary contamination assessment was undertaken in September 2004 to assist with master planning and initial design for the redevelopment of the southern / south-western portion of the hospital site (including Buildings 9, 10, 37, 38, 51 and 52).

The site history review indicated that the hospital site was established as early as the 1930s. The hospital was initially occupied the investigation area only (i.e. east of Reserve Road), but eventually extended into the land bound by Reserve Road and the present day Gore Hill Park where the main hospital building was previously located (the proposed executive administration building location).

A dangerous goods search was undertaken as part of this assessment. No UST or AST was identified within the proximity of the site.

A preliminary intrusive investigation was also conducted as part of this assessment. Twelve (12) boreholes were drilled across the investigation area, and one borehole (BH3) was located between Buildings 51 and 52.

Borehole log for BH3 (included in Appendix B) shows a layer of fill material 1.2m thick over residual silty clay (also 1.2m thick) above sandstone bedrock. These observations are consistent with regional geology, and no anthropogenic materials were logged within the fill.

Results for analysis of two samples of fill material from BH3, indicated low concentrations of heavy metals, a trace concentration of PAHs in one sample and no asbestos was identified. These results are summarised in Table LR1. Reported contaminant concentrations were well below commercial land use criteria (HIL D, NEPM, 1999).

4.2. Coffey (2004) Stage 2 Environmental Site Assessment, Proposed Divestment Site

A Stage 2 Environmental Site Assessment (ESA) was undertaken across a portion of the hospital site (referred to as the divestment site in the ESA) to assess the suitability of the investigation area for residential and/or commercial uses, with respect to contamination.

The ESA included the drilling of the following boreholes in the vicinity of the site:

- Buildings 51 and 52 – BH109, BH120, HA127, HA129, and HA132

Logs for boreholes BH109 and BH120 (included in Appendix B) indicate that the encountered geology was similar to those observed during the 2004 investigation. Foreign materials, such as brick fragments, concrete fragments and ash were observed in the three hand auger holes (logs included in Appendix B). Topsoil and/fill material (1m thick) was underlain by residual soils (approximately 1m thick) and Hawkesbury Sandstone (BH109 was the only location where drilling continued into bedrock).

Results for analysis of two samples of fill material from each location, indicated low concentrations of heavy metals (except for lead in both samples from HA132), trace to low concentrations of PAHs and no asbestos was identified. These results are summarised in Table LR2. Reported contaminant concentrations were well below commercial land use criteria (HIL D, NEPM, 1999).

4.3. Coffey (2016) Preliminary Contamination Review

This Preliminary Contamination Review for part of the hospital property included Buildings 51 and 52 (the site).

During the site walkover conducted as part of this assessment, storage generator with integral fuel tank was observed adjacent to the main building entrance to the north of Building 51. Site personnel informed Coffey that this generator and tank was relocated from Building 9 during redevelopment of Building 9. The tank contains diesel and has an approximate capacity of 15,000L. Diesel fuel is required for the emergency generator which is located above the tank. The generator is tested on a monthly basis to ensure it is operational. The tank and the generator are located on a concrete slab approximately 50cm thick. No hydrocarbon staining or signs of spillage was noted on the concrete slab or on the ground surface close to the tank at the time of site visit.

Based on information provided during the site visit, the generator has never been used, other than routine checks for operability.

4.4. Areas of environmental concern

To facilitate the field and laboratory program, areas of environmental concern (AEC) were considered and are summarised in Table 4.1.

Table 4.1 Areas of Environmental Concern and Chemicals of Potential Concern

Item	Sources and mechanism	Potential chemicals of concern
Fill across the site during site development	Placement of fill of unknown origin over natural soils during development of the existing buildings, potentially including contaminating materials such as ash	TRH, BTEX, PAH, heavy metals, OCP, PCB, asbestos

5. Sampling, analysis and quality plan

As stated in Appendix B of Schedule B2, Guideline on Site Characterisation, in NEPM (1999), the Data Quality Objectives (DQO) process is used to “define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site”.

The seven-step DQO process adopted for this assessment is provided below:

Step 1: State the Problem

The primary objective is to:

- Assess the suitability of the site for proposed commercial uses.

The main problems are:

- How many sample locations are required?
- Will groundwater monitoring well installation be required?
- At what depth should soil samples be collected?
- What are the CoPCs for both soil and groundwater?

Step 2: Identify the Decision/s

The main decisions include:

- Constraints (if required) which may restrict site’s suitability for the proposed intended use
- Remediation requirements (if required) to make the site suitable for its intended uses.

Step 3: Identify Inputs to the Decisions

The primary inputs to assessing the above include:

- Results from previous and current investigations
- Results of the field investigations with comparison to the adopted investigation levels; and
- Relevant legislation and regulatory guidelines.

Step 4: Define the Study Boundaries

The lateral investigation boundary is the proposed development boundary, as shown in Figure 2.

The vertical investigation boundary is 0.5m below the design basement level.

Step 5: Develop a Decision Rule

Are all quality assurance / quality control (QA / QC) sample results within recommended control limits?

- *If Yes*; then data is considered suitable and reliable for the purpose of the assessment.
- *If No*; then data may not be considered suitable and reliable for the purpose of the assessment. In this case:
 - Assess, if identified, any anomalies are due to heterogeneous nature of the sample, reported contaminant concentrations (i.e. close to the laboratory limit of reporting [LOR]), or poor field

or laboratory techniques and, based on this, assess the suitability of the results for inclusion in the data set, meeting the project objective.

- If an anomaly is considered to be a result of laboratory error, request re-analysis of the sample in question by the project laboratory or a secondary laboratory.

For the purposes of this assessment, do the contaminant concentrations exceed relevant criteria and are further remediation actions or management options required to make the site suitable for their intended use?

- *If Yes*; then further works will be required to assess management and / or remediation requirements.
- *If No*; then it may be concluded that the site is suitable for its proposed intended use.

Step 6: Specify Limits of Decision Errors

There are two types of decision errors:

- Sampling errors, which occur when the samples collected are not representative of the conditions within the investigation area; and
- Measurement errors, which occur during sample collection, handling, preparation, analysis and data reduction.

The null hypothesis for this study is:

- a. Contaminant concentrations within the soil and groundwater, as a whole within the site, are more than or comparable with relevant investigation levels.

These errors may lead the decision maker to make the following errors:

- Deciding that the soil and groundwater contamination is not present within the site, but residual soil and/or groundwater contamination remain present within the site which was resulted from former and current land use activities; and
- Deciding that the soil and groundwater contamination within the site are greater than the actual nature, level and extent of the contamination which was resulted from former and current land use activities.

An assessment will be made as to the likelihood of a decision error being made based on the results of a QA / QC assessment and the closeness of the data to assessment criteria. Additionally, statistics may be used, where applicable, such as 95% Upper Confidence Limit (UCL) of the arithmetic mean concentration.

The adopted investigation levels are summarised in Section 7 of this report.

Step 7: Optimise the Design for Obtaining Data

Based on the previous Steps 1 to 6 of the DQO process, the optimal design for obtaining the required data is presented in the following sections.

6. Field and Laboratory Program

6.1. Sampling Density

For site characterisation, a minimum of 13 systematic sampling points is recommended for an area of 4,800m², as outlined in the NSW EPA (1995) Sampling Design Guideline. The DSI utilises the existing soil contamination data collected by Coffey in 2004 and 2007 (BH3, BH109, BH120, HA127, HA129, and HA132) and soil contamination data collected by Coffey in 2016 and 2017 (BH202 to BH205 and BHC101 to BHC103) to assess the chemical characteristic of the fill material and natural soils at the site. A total of 13 sampling points used for this assessment satisfies the minimum recommended requirement.

6.2. Soil Sampling Methodology

Soil sampling was undertaken by Coffey in general accordance with the Coffey's standard operating procedures (SOP), based on regulator guidance and relevant Australian standards and summarised in Table 6.1.

Table 6.1 Soil Sampling Methodology

Activity	Details
Soil Sampling	Sample collection was undertaken in general accordance with recommended procedures in Schedule B2 of the National Environmental Protection (Assessment of Site Contamination) Measure (amended in 2013 - amended ASC NEPM), and/or the 'Australian Standards AS4482.1-2005 Guide To Investigation and Sampling of Sites with Potentially Contaminated Soil - Part 1: Non-volatile and Semi-volatile Compounds' and 'ASS4482.2-1999 Guide to Sampling and Investigation of Potentially Contaminated Soil - Part 2: Volatile Substances'. Soil sampling was undertaken on 4 June 2004, 27-28 November 2006, 12-26 November 2016 and 14 January 2017. Soil samples were collected from boreholes or hand auger holes within the site ranging from 0.05-2.1m below ground level. Soil samples were collected either directly from the hand auger or split tube sampler. Disposable gloves were used and changed between each soil sample. Sampling equipment was decontaminated before re-use.
Soil Logging	Soil logging was carried out in accordance with the Unified Soil Classification System (USCS) by suitably qualified and experienced environmental scientists.
Soil Screening	Selected soil samples were placed inside a sealed plastic bag for soil headspace screening in the field for Volatile Organic Compounds (VOCs) using a Photoionization Detector (PID) with 10.6eV lamp. The PID was calibrated by equipment supplier using isobutylene calibration gas. The headspace readings, together with other field observations, were used to assess which samples should be analysed for volatile organic compounds.
QA/QC Samples	To assess the accuracy and precision of the data generated by the field and laboratory procedures carried out in this investigation, the following QA/QC samples were analysed: Four intra-laboratory duplicate and three inter-laboratory duplicate samples were collected to assess the reproducibility of sampling and analysis during the three sampling rounds in 2004, 2007 and 2016/17.

Activity	Details
	- One trip spike sample and one trip blank sample were included to assess potential volatile loss or cross-contamination on each sampling round. - One rinsate sample collected off non-disposable sampling equipment to assess the effectiveness of the decontamination process during the 2016/17 investigation. Rinsate samples were also collected as part of the 2004 and 2007 investigations.
Sample Handling and Transportation	Soil samples collected for chemical analysis were immediately placed into laboratory supplied jars, with Teflon seals to limit volatile loss and placed into an ice chilled cooler. Soil samples collected for asbestos analysis were placed into zip lock plastic bags and sealed. Samples were dispatched to NATA accredited laboratories under chain of custody control.

6.3. Groundwater Sampling Methodology

Groundwater and surface water sampling were undertaken by Coffey in general accordance with the Coffey's standard operating procedure (SOP), prepared based on regulator guidance and relevant Australian standards and summarised in Table 6.2.

Table 6.2 Groundwater Sampling Methodology

Activity	Detail / Comments
Groundwater sampling	Fieldwork was undertaken as per the following: - Well installation: 12-26 November 2016 - Groundwater monitoring event (GME): 12 January 2017. Sample collection was conducted in general accordance with Section 8.2 in Schedule B2 of NEPM (NEPC, 2013).
Well Construction and Development	Groundwater samples were collected from the three piezometers that were installed as part of the geotechnical investigation (BH202, BH204 and BH205). A review of the construction details indicated that the piezometers were screened within the Residual Soils and/or Hawkesbury Sandstone, and therefore, is considered to be usable for groundwater assessment purposes. Piezometer locations are shown on Figure 2. Construction details are provided on the logs presented in Appendix B.
Well Gauging	Depth to standing water was gauged using an oil/water interface probe (IP) to assess the presence (and apparent thickness) of PSH, if any. The IP was calibrated prior to use by the equipment supplier. Calibration certificates are presented in Appendix C.
Well Purging and Sampling	The three piezometers were purged using a micropurge kit until groundwater quality readings were stabilised. Depth to water was maintained within 10cm during purging.

Activity	Detail / Comments
	Field groundwater quality parameters were recorded at approximately every 1L interval. The water quality meter was calibrated prior to use. Calibration certificates are presented in Appendix C.
QA/QC Samples	To measure the accuracy and precision of the data generated by the field and laboratory procedures carried out in this investigation, Coffey collected the following QA/QC samples: • One trip spike sample submitted to the primary laboratory • One trip blank sample submitted to the primary laboratory • No rinsate sample was collected as non-disposable equipment was not used during groundwater sampling.
Sample Handling and Transportation	Groundwater samples were immediately placed into laboratory supplied bottles, with Teflon lined seals and placed into an ice chilled cooler. Sample containers for analysis of volatile compounds were filled to eliminate headspace. Samples were dispatched to NATA accredited laboratories under chain of custody control.

6.4. Laboratory Testing

Soil samples were analysed for a suite of chemicals of potential concern (COPC) as summarised in Table 6.3 at NATA accredited primary and secondary laboratories (Eurofins-MGT and ALS Environmental, respectively).

Table 6.3 Sampling and Analytical Schedule

Sample location	Contamination testing – primary samples	
	Fill/Natural Soils	Groundwater
TRH/BTEX	28	3
PAH/Heavy metals	33	3
PCB/OCP	23	-
Asbestos (presence / absence)	14 (fill material or disturbed soil only)	-

Where concentrations of chemicals were reported above the CT1 threshold from the NSW EPA (2014a) Waste Classification Guidelines Part 1: Classifying Waste, additional analysis of leachate from the toxicity characteristic leaching procedure was generally undertaken for the relevant chemical.

6.5. Quality Plan

QA/QC assessment was undertaken to assess the data completeness, comparability, representativeness, precision and accuracy based on field works and laboratory analysis and the processes for assessment of data quality provided in Section 19 (Appendix D) of Schedule B2 Guideline on Site Characterisation of the amended NEPM ASC.

Specific data quality indicators (DQIs) indicators for field and laboratory QC samples are listed in Table 6.4.

Table 6.4 Data Quality Indicators for Analytical Results

Type of Quality Control Sample	Control Limit
Duplicate Samples	Relative Percentage Difference (RPD) within 50% for soil and groundwater
Triplicate Samples	RPD within 50% for soil
Spikes	Recoveries within the following ranges • 70% - 130% for inorganics / metals • 60% - 140% for organics or as specified in laboratory's quality plan
Blanks	Analytes not detected

6.6. Laboratory Details

Analysis was carried out by the following laboratories who hold NATA accredited analytical methods which are consistent with methods recommended in Schedule B3 of the NEPM ASC:

- Primary Laboratory – Amdel (2004), SGS (2007), Eurofins MGT (2016/17)
- Secondary Laboratory - ALS Laboratory, Smithfield NSW (2007 and 2016/17)

7. Quality Assessment

A quality assurance/quality control plan was implemented to achieve data quality objectives (DQOs) and to demonstrate accuracy, precision, comparability, representativeness and completeness of the data generated and the procedures for assessing the DQOs are met. A data quality assurance is presented within Appendix D.

Field duplicate soil sample results are provided in Table LR6. Overall the data validation assessment results indicated that the data are considered suitable for use in this DSI. Copies of the 2004 and 2007 data validation assessment are also included in Appendix D.

The results of the data validation assessment conclude that the combined data from relevant Coffey investigations between 2004 and the present are usable for the purposes of this assessment.

8. Assessment Criteria

8.1. Health-based Investigation and Screening Levels

8.1.1. General

Assessment criteria were selected with consideration of the proposed commercial land use. The criteria presented below are intended to apply to a Tier 1 risk assessment based on certain generic characteristics. Where concentrations of a COPC exceed the generic assessment criteria, then further consideration of the specific exposure pathway is required which may warrant further investigation, assessment or the development of a strategy to mitigate the potential risks identified.

8.1.2. Health Investigation and Screening Levels

The assessment criteria proposed for this project were sourced from:

- NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure (1999, amended 2013) (NEPM ASC).
- Friebel and Nadebaum (2011); CRC Care Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater.

Schedule B1 of the NEPM ASC also states that 'the selection and use of investigation levels should be considered in the context of the iterative development of a Conceptual Site Model'. Based on information describing the proposed development, Coffey considers the proposed use of the site is represented by the generic commercial setting (HIL D) defined in Schedule B7 of NEPM ASC given that the most sensitive human receptor as a future site user will be site workers.

Schedule B1 of NEPM ASC also provides health screening levels (HSLs) for volatile hydrocarbons for several soil types, which account for assessment of potential inhalation risk of these contaminants under the exposure setting considered relevant for the land use. The HSL-D value for sandy soil (1 to <2m depth) is considered to be suitable for the fill type at the site and conservative for the residual soil at the site.

Schedule B1 of NEPM ASC also provides guidance on the assessment of soils impacted by asbestos, including health screening levels for asbestos in soil for a range of land uses. The soil sampling in this contamination testing is intended for screening of potential asbestos presence only and does not follow the quantitative assessment of asbestos described in NEPM ASC. For this reason, a preliminary assessment criterion of 'no asbestos detected' for all forms of asbestos was adopted.

A summary of the adopted health-based soil investigation levels is provided in Table 8.1.

Table 8.1 Soil Investigation Levels - Health Investigation and Screening Levels

Analyte	HIL D ¹ & HSL D ² (mg/kg)
Arsenic (total)	3,000 ¹
Cadmium	900 ¹
Chromium (VI) ¹	3,600 ^{1,6}
Copper	240,000 ¹
Lead	1,500 ¹
Mercury (inorganic)	730 ¹
Nickel	6,000 ¹
Zinc	400,000 ¹
F1 (TRH C ₆ -C ₁₀ excluding BTEX)	260 ²
F2 (TRH C ₁₀ -C ₁₆ excluding Naphthalene)	1,000 ⁴
F3 TRH C ₁₆ -C ₃₄	3,500 ⁴
F4 TRH C ₃₄ -C ₄₀	10,000 ⁴
Benzene	3 ²
Toluene	630 ³
Ethylbenzene	68 ³
Total Xylene	230 ²
Naphthalene	10 ³
Total PAHs	4,000 ¹
Carcinogenic PAH (as BaP TEQ) ¹⁵	40 ¹
Aldrin + Dieldrin	45 ¹
Chlordane	530 ¹
DDT+DDD+DDE	3,600 ¹
Endosulfan	2,000 ¹
Endrin	100 ¹
Heptachlor	50 ¹
HCB	80 ¹
Methoxychlor	2,500 ¹
Chlorpyrifos	2,000 ¹
PCBs	7 ¹
Asbestos (as bonded ACM, Asbestos fines and fibres)	ND ⁷

Notes:

1. Table 1A(1) - Schedule B1, Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999) amended NEPM

- (NEPC, 2013)
2. Table 1A(3) - Schedule B1, Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999)
 3. Table 1A(3) – Soil saturation concentration, Schedule B1, Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999)
 4. Table 1B(5) – Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 1999)
 5. TEQ = Toxicity Equivalent Quotient
 6. Soils were tested for Total Chromium, which comprises both Chromium (III) and Chromium (VI) valence states. The HIL for Chromium (VI) has been adopted as a conservative assessment threshold
 7. ND= not detected

8.1.3. Ecological Investigation Levels and Ecological Screening Levels

Coffey understands that the large majority of the site area will be excavated for the basement construction, as shown in development plans (Appendix A). Although the proposed building footprint does not cover the site area, shallow soils outside the excavation are likely to be disturbed during construction activities, and is likely to be restored as footpath or landscaped area.

For this reason, ecological investigation and screening levels are considered not applicable for the site.

8.2. Waste Classification Criteria

A preliminary waste classification of the fill material was conducted in accordance with the procedures for classifying waste as described in NSW EPA (2014) Waste Classification Guidelines, Part 1: Classifying Waste.

8.3. Groundwater investigation levels

To assess groundwater quality, reference needs to be made to environmental and/or human health threshold levels or acceptance criteria. Groundwater investigation levels (GILs) are selected based on published criteria for beneficial use of groundwater and potential environmental impact.

8.3.1. Assessment of environmental values

The DEC (now EPA) *Guidelines for the Assessment and Management of Contaminated Groundwater* (2007) describes the process involved in identifying the likely environmental values that must be considered during groundwater investigations at potentially contaminated sites. Based on this, assessment of relevant environmental values follows the steps below:

- Determine whether the aquifer beneath the site is included in the NSW Office of Water list of major aquifers of drinking water quality;
- Assess the identified uses of groundwater from the aquifer; and
- Use groundwater indicators to assess whether the aquifer is suitable for use as a drinking water source (i.e. based on measured concentrations of total dissolved solids (TDS) within the groundwater).

Based on these steps, Coffey identified the following:

- The groundwater underlying the site is considered not to be part of the NSW Office of Water list of major aquifers of drinking water quality; and

- Potential receptors may include Berry Creek which is a marine environment. However, given Berry Creek is approximately 1km from the site, groundwater seepage is likely to be into a freshwater habitat; and
- A review of the NSW Natural Resources Atlas found no registered bore within a 500m radius.

Based on the above, Coffey considers that potential beneficial uses of groundwater include:

- Protecting freshwater ecosystems.

pH was noted to be between 3 to 5 which is typical of Hawkesbury sandstone in the Sydney region. Given the groundwater is acidic it is considered not suitable for beneficial uses. Therefore, potable use was not included when selecting GILs for comparison against the groundwater analytical results.

8.3.2. Protection of aquatic ecosystems

Chemical concentrations in groundwater are assessed against criteria from the following guidelines:

- ANZECC & ARMCANZ (2000). *National Water Quality Management Strategy. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

Assuming slightly to moderately disturbed ecosystems, freshwater criteria for protection of 95% of species were applied, except where contaminants are potentially bioaccumulative in which case the trigger values for protection of 99% of species have been used.

A summary of the adopted GILs is provided in Table 8.2.

Table 8.2 Summary of Groundwater Investigation Levels

Analyte	ANZECC 2000 ⁽¹⁾ (µg/L)
Arsenic	13 ^(a)
Cadmium	0.2
Chromium (Total)	3.3 ^(b)
Copper	1.4
Lead	3.4
Mercury	0.06
Nickel	11
Zinc	8
TRH C ₆ -C ₁₀	20 ^(c)
TRH C ₁₀ -C ₁₆	50 ^(c)
TRH C ₁₆ -C ₃₄	100 ^(c)
TRH C ₃₄ -C ₄₀	100 ^(c)
Benzene	950
Toluene	180
Ethylbenzene	80
Xylene (m & p)	75 ^(d)
o-Xylene	350

Analyte	ANZECC 2000 ⁽¹⁾ (µg/L)
Benzo(a)pyrene	0.1
Naphthalene	16
Anthracene	0.01
Phenanthrene	0.6
Fluoranthene	1

1. Australian and New Zealand Environment and Conservation (2000) National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Where insufficient data is available to derive a reliable trigger value, low reliability values have been adopted from Section 8.3.7 of ANZECC/ARMCANZ (2000)
 - (a) The guideline value for arsenic V has been adopted.
 - (b) Low Reliability value for Chromium (III) adopted for Chromium (Total).
 - (c) In the absence of a nominated guideline value, the laboratory LOR has been taken as the nominal trigger value for the presence of TRH compounds in groundwater as will be used as the GIL (NSW DEC, 2007).
 - (d) GIL for m&p Xylene is based on the m-Xylene, which is the lower trigger value for the two Xylene isomers.

HSLs are also applied to groundwater for assessing human health risk through the dominant vapour inhalation exposure pathway. Therefore, TRH and BTEX concentrations are assessed against the groundwater HSLs for vapour intrusion from the relevant depth and soil matrix applicable to “Commercial / Industrial” land use (HSL D) from the amended NEPM (NEPC, 2013). However, it is noted that there are limitations with regard to the application of HSLs where the identified contamination has an atypical petroleum composition.

The HSLs for TRH and BTEX in groundwater from the amended NEPM (NEPC, 2013) are summarised in Table 8.3.

Based on the dominant soil texture and the measured standing water levels, for conservative purposes the HSLs for sandy soils with groundwater between 4m to <8m depth have been adopted. The adopted screening levels were selected in consideration of the dominant soil texture – coarse grained sandy soils and the measured standing water level.

Table 8.3 Summary of HSLs in Groundwater

Chemical	HSL D – Commercial / Industrial Land Use (for sandy soils) (mg/L)	
	2m to <4m and 4m to <8m	8m+
Benzene	5	5
Toluene	NL	NL
Ethylbenzene	NL	NL
Xylenes	NL	NL
Naphthalene	NL	NL
C ₆ -C ₁₀	6	7
>C ₁₀ -C ₁₆	NL	NL

NL: non-limiting (i.e. calculated risk level is above the solubility level for this chemical).

Where the depth to groundwater is less than 2m bgs, comparison of the reported TRH and BTEX concentrations against the HSLs in the amended NEPM (NEPC, 2013) is not applicable. Therefore, where elevated concentrations of these contaminants are reported, individual assessment and consideration of the potential risk human health and the environment is required. This also applies to the basement floor where the depth to groundwater will be taken from the start of the basement level.

9. Field Observations

9.1. Encountered Subsurface Condition

The subsurface condition beneath the site generally comprises the following:

- Fill material was encountered from depths ranging from 0.05 m to 1.6m (BH205) which comprised gravelly sand, sandy gravel and silty clay, but were variable at the different borehole locations. Foreign materials including asphalt fragments, ash and glass were encountered in most borehole locations; overlying
- Residual soils to depths ranging from 0.5 m (BHC101) to 4.35 m (BH204), and generally comprised high plasticity silty clays, sandy clay and gravelly clay; overlying
- Hawkesbury Sandstone.

Field observations are provided in the borehole logs in Appendix B. No asbestos was observed during drilling works undertaken in 2004, 2006 and 2016/17.

Groundwater inflows were observed in the following borehole locations during geotechnical drilling conducted in 2016:

- BH203 at 3.8bgl
- BH204 at 3.9m bgl
- BH205 at 4.5m bgl

Groundwater was not encountered during drilling of environmental boreholes in 2017, which terminated at 4m below the surface.

9.2. Field Headspace Screening

Soil samples were screened in the field using a PID for the presence of ionisable VOCs.

Headspace readings ranged from 4.4 to 10.5ppm which indicate there is a low potential for the presence of ionisable VOCs within those soil samples.

No visual or olfactory evidence of VOC contamination was apparent during soil sampling activities.

9.3. Groundwater levels and observations

Standing water levels were measured in each piezometer on 12 January 2017 and recorded on the field data sheets presented in Appendix E.

Groundwater levels and observations are summarised in Table 9.1.

Table 9.1 Groundwater levels and observations

Item	Description
Standing Water Level	Standing water levels were measured between 2.748m below top of casing (btoc) in BH205 and 3.730m btoc in BH202. These observations represent groundwater levels between 74.27mAHD in BH202 and 77.174mAHD in BH204.
Groundwater flow direction	Based on standing water levels measured at the site, the inferred groundwater flow direction was towards the east.
PSH and sheens	PSH was not encountered during groundwater monitoring or sampling. In addition, no hydrocarbon sheen was observed during purging and sampling.
Odours	No hydrocarbon odour was detected during purging and sampling from piezometers.

Groundwater quality parameters measured during purging are recorded on the field data sheets presented in Appendix E.

Site-specific groundwater quality (measured post-purge) is summarised in Table 9.2.

Table 9.2 Field Groundwater Quality Parameters (post purge)

Parameter	Range*	Comment
Dissolved Oxygen (DO)	0.49 mg/L to 1.00 mg/L	Indicative of low oxygen content
Oxidation / Reduction Potential (E_h) referenced to Standard Hydrogen Electrode (SHE)*	200 mV to 251 mV	Indicative of slightly oxidising conditions
Electrical Conductivity (EC)	570 μScm^{-1} to 867 μScm^{-1}	Indicative of freshwater environments
pH	3.75 to 5.15	Indicative of acidic conditions
Temperature	20.1 °C to 21.8 °C	-

*Redox potential reading was referenced to SHE by adding 199mV to the mV reading, as recommended by the equipment manufacturer.

10. Results and Discussion

10.1. Soil

The laboratory results are provided in Tables LR1 to LR3 attached at the rear of the text. Laboratory reports and chain of custody documentation are provided in Appendix F. The results indicate that:

- COPCs were reported below the adopted health investigation and screening levels for proposed commercial land uses in the fill and natural soil samples submitted for analysis.
- Asbestos was not observed during drilling and was not detected in the fill material samples submitted for asbestos identification, including trace analysis.

10.2. Groundwater

The laboratory results are provided in Table LR4. Laboratory reports and chain of custody records are provided in Appendix F.

- Concentrations of the COPC below the adopted groundwater investigation levels except for:
 - Lead in BH202 (0.004mg/L)
 - Copper in BH204 (0.01mg/L)
 - Nickel in BH202 and BH205 (0.028mg/L and 0.024mg/L, respectively)
 - Zinc in BH202, BH204 and BH205 (0.17mg/L, 0.12mg/L and 0.15mg/L, respectively)

In addition to the heavy metal exceedance, minor concentration of TRH C₁₆-C₃₄ (F3 fraction) were also recorded in the groundwater samples collected during this assessment:

- BH202 and BH203 – 0.1mg/L
- BH205 – 0.3mg/L

Based on water level monitoring conducted as part of the geotechnical investigation (GEOTLCOV25684AB-AK, dated 25 January 2017), basement excavation is likely to penetrate the groundwater and seepage into the excavation is likely. The following exposure pathway scenarios may be plausible:

- Human health - Direct contact with groundwater by excavation workers during construction and future maintenance workers during maintenance activities

The recorded copper, lead, nickel and zinc concentrations were below their drinking water criteria (for incidental contact of 20mg/L, 0.2mg/L, 0.1mg/L and 30mg/L, respectively, Australian Drinking Water Guideline 2011, version 3.3, dated November 2016).

Given TRH C₁₆-C₃₄ hydrocarbons are considered to be non-volatile, the potential for vapour intrusion risk to excavation and maintenance workers and future site users are considered not plausible, therefore direct contact is the only plausible pathway with respect to human risk. To assess this risk, a simple risk assessment was carried out and results are included in Appendix G.

The risk assessment showed that the estimated hazard quotient (HQ) for the possible exposure scenarios was below 1 indicating the concentrations of TRH reported in groundwater at the site are not considered to pose an unacceptable health risk to future construction workers or basement maintenance workers.

Whilst groundwater HSL may not be applicable in this scenario (basement design level is just above the groundwater inflow), given the volatile hydrocarbons (BTEX, TRH C₆-C₁₀ and TRH C₁₀-C₁₆) were not detected in the groundwater samples collected from the site it is considered that the potential for vapour intrusion is unlikely.

- Environment – discharge of groundwater during construction and; possibly post-construction, depending upon the type of basement structure to be constructed at the site (for example, drained basement)

With respect to heavy metals, these concentrations are considered likely to represent regional levels typical for historical suburban areas, rather than a result of site specific contamination. There are no guideline values for petroleum hydrocarbons in Australia other than the Commonwealth Airports (Environment Protection) Regulations 1997. The recorded TRH C₁₆-C₃₄ concentrations were below the threshold value of 0.6mg/L.

Based on the reported groundwater results, it is considered that the risk to the environment is low should discharge of accumulated seepage be required. We note that groundwater discharge to stormwater drains will require authority approval. Groundwater was acidic (between pH 3 to 5), which is typical in the sandstone environment. pH adjustment to neutralise acidity, and possible compliance with other Council requirements, would be required prior to discharge.

11. Conceptual Site Model

A conceptual site model (CSM) is a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors.

11.1. Human Receptors

Table 11.1 below summarises the plausible exposure pathways for human receptors.

Table 11.1 Summary of plausible exposure pathways for human receptors

Receptor	Contaminated Media	Plausible Exposure Pathway (No migration)				Comments
		Inhalation indoor	Inhalation outdoor	Ingestion	Dermal contact	
Construction workers during development	Soil	n	n	n	n	The identified impacts do not represent unacceptable risks to future construction workers.
Construction workers (future maintenance work)	Soil	n	n	n	n	The identified impacts do not represent unacceptable risks to future site users and maintenance workers.
Future site users and visitors	Soil	n	n	n	n	
Construction workers during development	Water	n	n	n	n	The identified impacts do not represent unacceptable risks to future construction workers.
Construction workers (future maintenance work)	Water	n	n	n	n	The identified impacts do not represent unacceptable risks to future construction workers.

Legend; n = pathway not complete, P = pathway potentially complete

11.2. Ecological Receptors

While copper, nickel and zinc were recorded at concentrations exceeding the adopted GIL, these concentrations are related to regional groundwater quality, and therefore, is not considered to have significant impacts to the receiving environments.

12. Preliminary Waste Classification

The following preliminary waste classification applies should there be fill material requiring off-site disposal from the investigation area.

Coffey followed the six step process detailed in Part 1 of the NSW EPA (2014) Waste Classification Guidelines for assessing the classification of the soil to be excavated. The waste classification results are presented in Table LR5. Laboratory reports and chain of custody records are provided in Appendix F.

According to the waste classification procedure:

- Step 1: The material assessed is not a 'special waste'.
- Step 2: The material assessed is not a 'liquid waste'.
- Step 3: The material assessed is not 'pre-classified'.
- Step 4: The material assessed does not appear to possess hazardous characteristics.
- Step 5: The material has been assessed by chemical analyses, as presented in Table LR5.
- Step 5: The next step for classifying the materials is to compare analytical results against relevant chemical threshold values listed in Tables 1 and 2 NSW EPA (2014) Waste Classification Guidelines.
 - Results for chemicals analysed were below the threshold concentrations (CT1) for General Solid Waste (GSW), with the exception of lead in soil samples HA132_0.0-0.1 and HA132_0.2-0.3 (analysed in the Coffey (2007) investigation), nickel in soil samples BHC101_0.05-0.1, BH202_0.1-0.2, BH203_0.1-0.2 and BH204_0.1-0.2 as well as BH109_0.1-0.2, BH109_0.5-0.6, BH120_0.5-0.6, HA127_0.5-0.6, HA132_0.2-0.3 (analysed in the Coffey (2007) investigation), BHC101_0.05-0.1, BHC101_0.4-0.5, BHC103_0.3-0.4, BHC103_0.8-1.0, BH203_0.9-1.0, BH204_0.7-0.8 and BH204_0.9-1.0;
 - Leachate analysis using the Toxicity Characteristic Leaching Procedure (TCLP) was undertaken on the above soil samples for nickel or B(a)P and the results were reported well below the leachable threshold (TCLP1) or LOR. Leaching procedure was not conducted for the soil samples where elevated lead concentrations were recorded in 2007 as the recorded concentrations were below the adopted criteria at the time (NSW DECC 2009); and
 - Analytical results for chemicals were below the Specific Contaminant Concentration (SCC1) threshold for GSW.
- Step 6: The material is composed predominantly of soil and rock materials. NSW EPA (2014) notes that materials that are non-putrescible (for the purpose of waste classification) include soils, timber, garden trimmings, agricultural, forestry and crop materials, and natural fibrous organic and vegetative materials. Based on observations by Coffey, the material is considered to be non-putrescible.

Coffey also note the following:

- Although leaching procedure was not conducted for the soil samples where elevated lead concentrations were recorded above the current criteria (NSW EPA 2014), the recorded concentrations were marginally above the criteria (120mg/kg and 160mg/kg against 100mg/kg). The 95% upper confidence limit (UCL) was calculated for lead using the analytical data for samples collected from the fill layer. The calculation reported a 95% UCL of 56.6mg/kg, below the lead threshold concentrations for General Solid Waste (GSW). UCL calculation is included in Appendix H;

- Asphalt was identified within the topsoil and ash was also identified in some parts of the fill material. Based on results of these investigations we consider that the B(a)P results reported are attributed to the presence of ash and/or asphalt in the samples; and
- No asbestos was identified in samples from this site.

On the above basis of the above steps, fill material from the site is preliminary classified as **General Solid Waste (non-putrescible)**.

Based on the available results and site observations, the underlying residual clay and sandstone at the site would satisfy the definition of **Virgin Excavated Natural Material (VENM)**. Materials classifying as VENM should not be mixed with any other materials on the site, if mixing were to occur it would affect this classification.

Should unexpected contamination be encountered during excavation, further assessment will be required to confirm the actual waste classification of affected materials.

13. Conclusions and Recommendations

Based on a review of readily available information, observations made during fieldwork and an assessment of laboratory analytical data, Coffey considers that the site is suitable for the proposed commercial development with respect to contamination, subject to the following:

- The contamination risk on the site must be reviewed if a substantial change to the layout of building is proposed.
- Implementation of an unexpected finds protocol during earthworks and site excavation. If during the excavation work, material is encountered which appears to be potentially contaminated or suspicious, excavation works should cease in the affected area until inspection is carried out by a competent environmental consultant. In the context of the above, potentially contaminated or suspicious material would include fibrous materials, asbestos sheeting, drums, metal or plastic chemical containers or brightly coloured material, stained or odorous soil etc.

Advice from a construction dewatering contractor should be obtained before applying for a permit to discharge accumulated seepage water from the site.

This report should be read in conjunction with the attached ***Important Information About Your Coffey Environmental Report***.

14. Limitations

The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the sampling points at the time the investigations were carried out. It is the nature of contaminated land investigations that the degree of variability in site conditions cannot be known completely and no sampling and analysis program can eliminate all uncertainty concerning the condition of the site. Professional judgement must be exercised in the collection and interpretation of the data. The possibility that other, as yet unidentified, contamination is present at the site cannot be precluded.

15. References

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WA Department of Health (2008) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

Figures

Tables

Appendix A – Proposed Development Plan

Appendix B – Borehole Logs

Appendix C – Calibration Certificates

Appendix D – Data Assessment

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Appendix E – Field Data Sheet

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Appendix F - Laboratory Reports and Chain of Custody Documentation

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Appendix G – Risk Assessment

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Appendix H – UCL Calculation

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Important information about your Coffey Environmental Report

Introduction

This report has been prepared by Coffey for you, as Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice,

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Coffey should be kept apprised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statutes and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but

steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Coffey would be pleased to assist with any investigation or advice in such circumstances.

Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Coffey prepared the report and has familiarity with the site, Coffey is well placed to provide such

assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Coffey disowns any responsibility for such misinterpretation.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

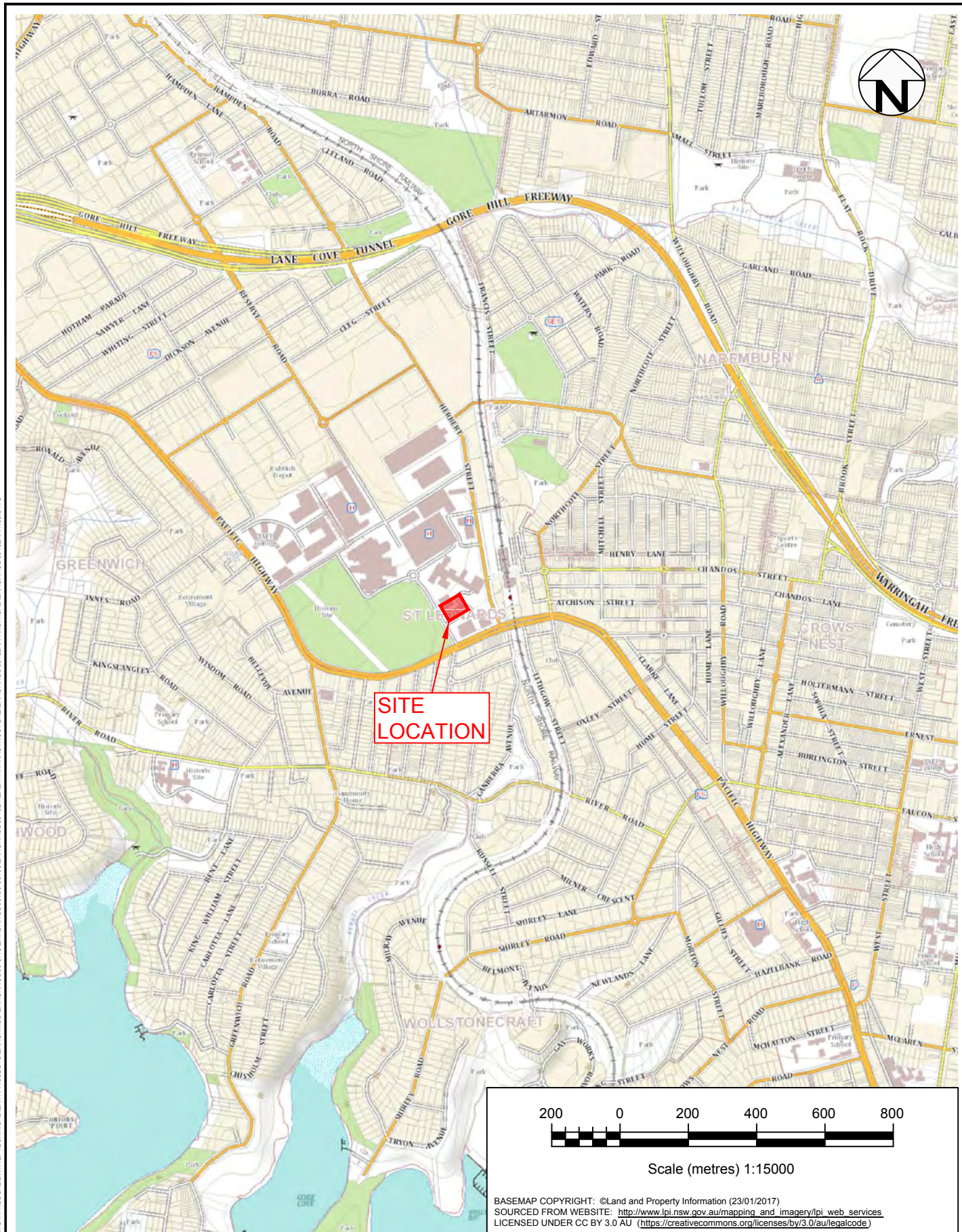
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Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

Figures

PLOT DATE: 28/03/2017 4:03:34 PM DWG FILE: V:\7579\51 TT.LOCAL\DATA2 TECHNICAL\EN\PROJECTS\EN\NAURHOD06452AA-R05.DWG



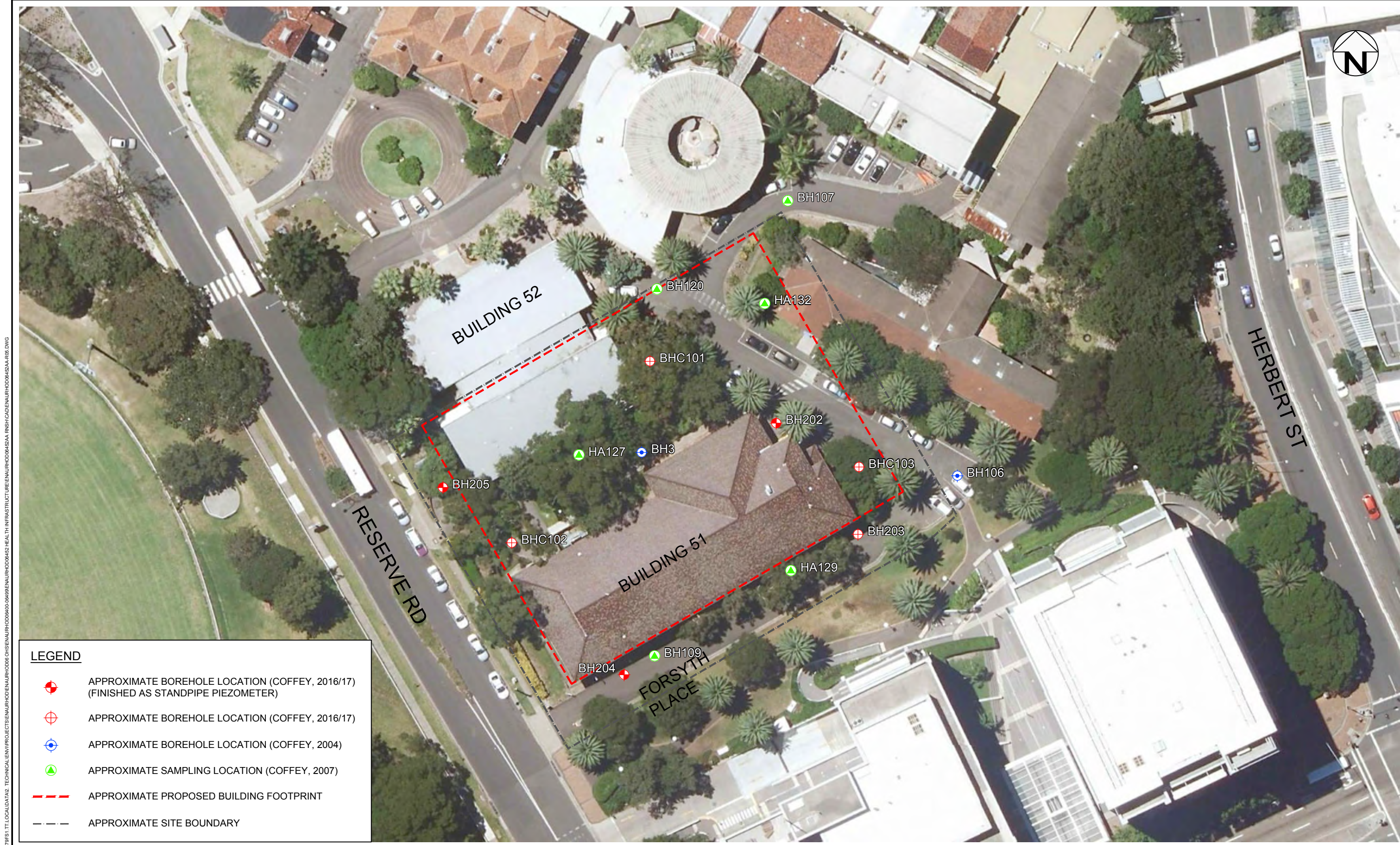
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approved	---
date	28 / 03 / 17
scale	AS SHOWN
original size	A4



coffey

A TETRA TECH COMPANY

client:	HEALTH INFRASTRUCTURE C/O SAVILLS PROJECT MANAGEMENT		
project:	DETAILED SITE INVESTIGATION ST LEONARDS HEALTH ORGANISATION RELOCATION PROJECT ROYAL NORTH SHORE HOSPITAL ST LEONARDS NSW		
title:	SITE LOCALITY		
project no:	ENAUHOD06452AA-R05	figure no:	FIGURE 1
		rev:	A



LEGEND

APPROXIMATE BOREHOLE LOCATION (COFFEY, 2016/17)
(FINISHED AS STANDPIPE PIEZOMETER)

APPROXIMATE BOREHOLE LOCATION (COFFEY, 2016/17)

APPROXIMATE BOREHOLE LOCATION (COFFEY, 2004)

APPROXIMATE SAMPLING LOCATION (COFFEY, 2007)

APPROXIMATE PROPOSED BUILDING FOOTPRINT

APPROXIMATE SITE BOUNDARY

revision

no.	description	drawn	approved	date
A	ORIGINAL ISSUE			

505101520

Scale (metres) 1:600

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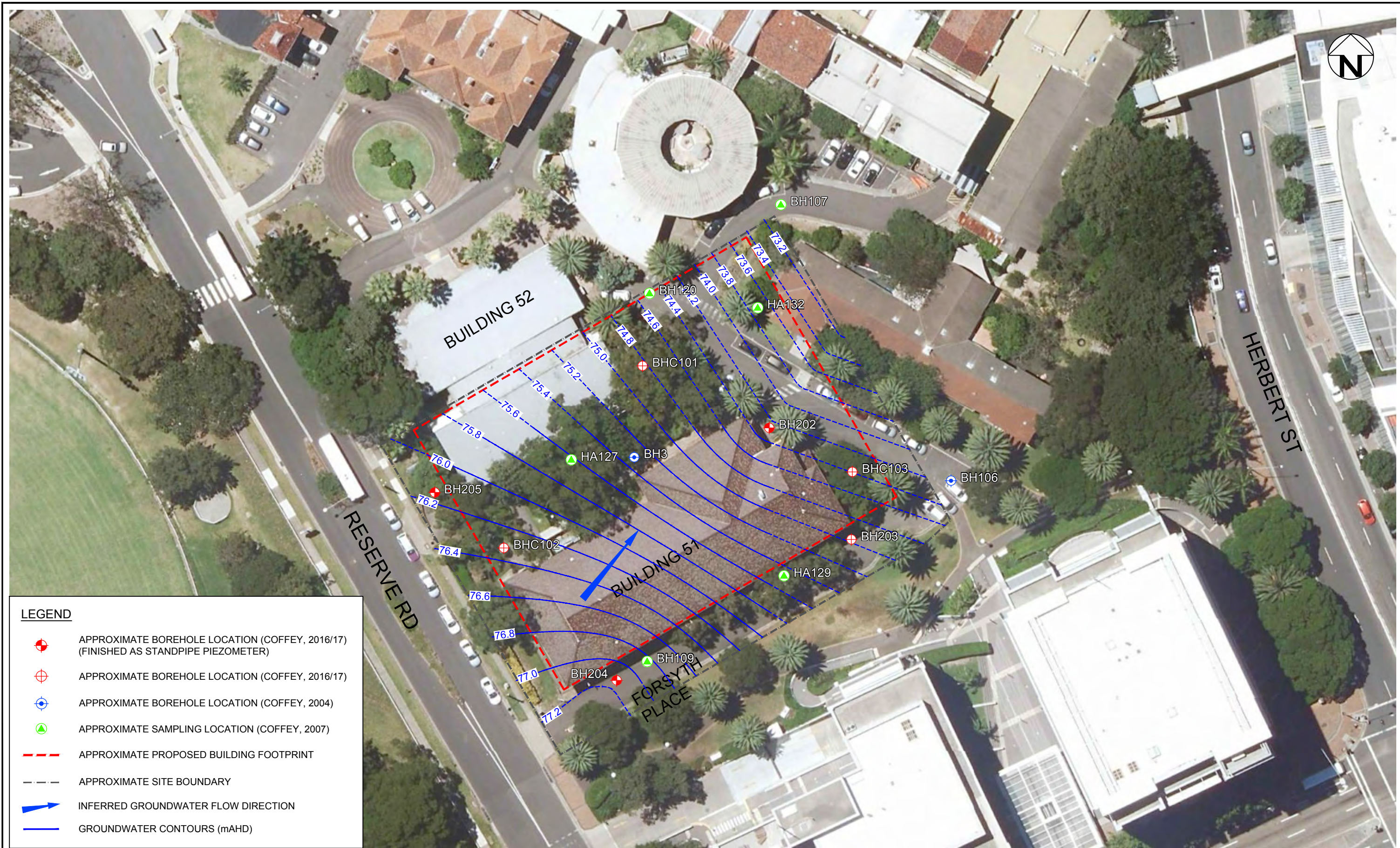
drawn	FA / FW
approved	---
date	28 / 03 / 17
scale	AS SHOWN
original size	A3

coffey

A TETRA TECH COMPANY

client: HEALTH INFRASTRUCTURE C/O SAVILLS PROJECT MANAGEMENT		
project: DETAILED SITE INVESTIGATION ST LEONARDS HEALTH ORGANISATION RELOCATION PROJECT ROYAL NORTH SHORE HOSPITAL ST LEONARDS NSW		
title: SITE LAYOUT AND SAMPLING LOCATION PLAN		
project no: ENAURHOD06452AA-R05	figure no: FIGURE 2	rev: A

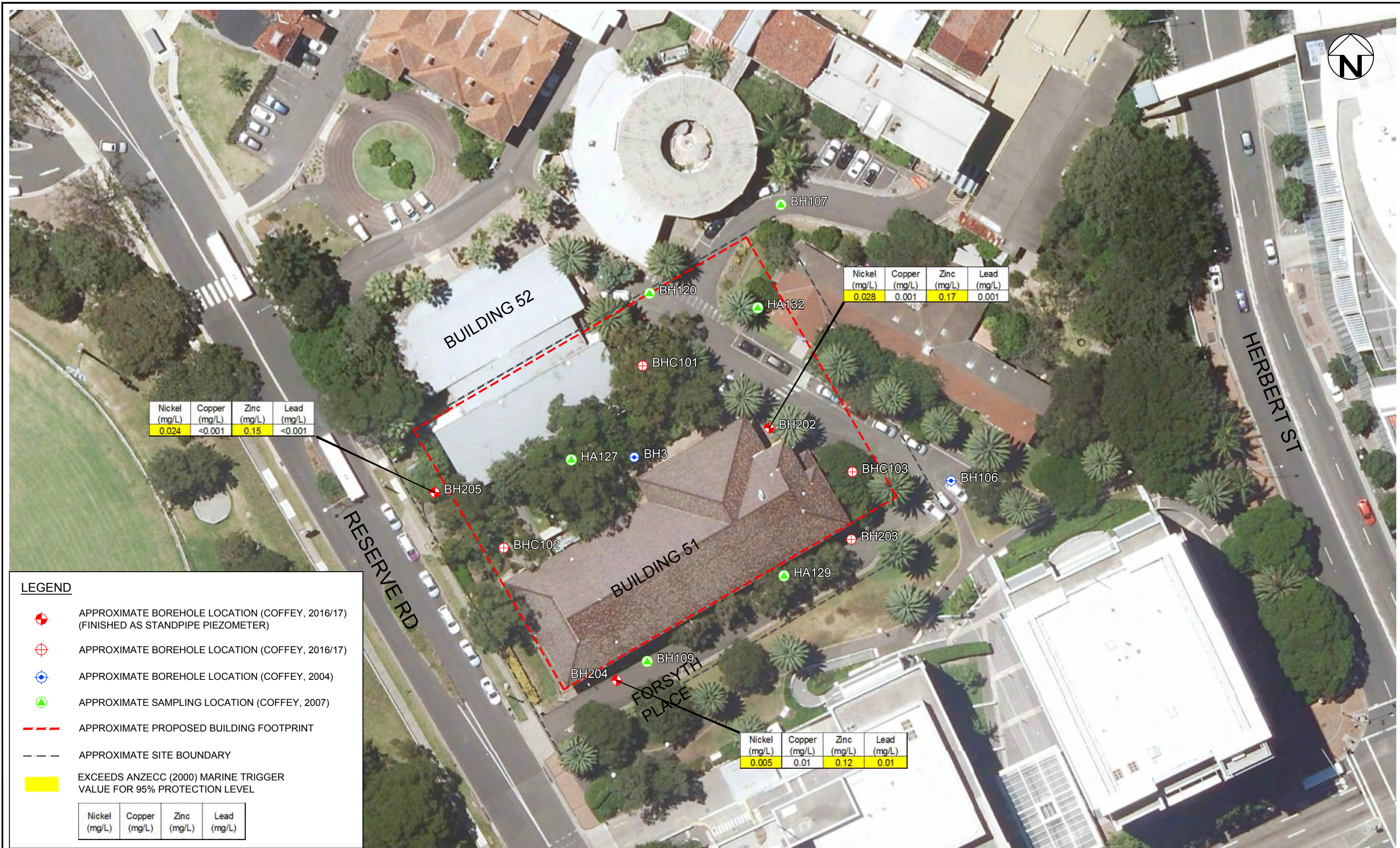
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revision	no.	description			drawn	approved	date	505101520 Scale (metres) 1:600		drawn	FA / FW	coffey A TETRA TECH COMPANY	client: HEALTH INFRASTRUCTURE C/O SAVILLS PROJECT MANAGEMENT		
	A	ORIGINAL ISSUE								approved	---		project: DETAILED SITE INVESTIGATION ST LEONARDS HEALTH ORGANISATION RELOCATION PROJECT ROYAL NORTH SHORE HOSPITAL ST LEONARDS NSW		
										date	28 / 03 / 17		title: INFERRED GROUNDWATER DIRECTION		
										scale	AS SHOWN				
										original size	A3		project no: ENAUHOD06452AA-R05	figure no: FIGURE 3	rev: A

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PLOT DATE: 28/03/2017 4:03:41 PM DWG FILE: WTS7579FS1.TT.LOCALDATA2 TECHNICAL/ENVIRONMENTAL/PROJECT/ST/ENAU/RHOD06452AA RNSH/CA/ENAU/RHOD06452AA R05.DWG



revision	no.	description	drawn	approved	date	505101520 Scale (metres) 1:600 AERIAL IMAGERY COPYRIGHT: ©Land and Property Information (2015) SOURCED FROM WEBSITE: http://www.lpi.nsw.gov.au/mapping_and_imagery/lpi_web_services LICENSED UNDER CC BY 3.0 AU (https://creativecommons.org/licenses/by/3.0/au/legalcode)	drawn	FA / FW	coffey A TETRA TECH COMPANY	client: HEALTH INFRASTRUCTURE C/O SAVILLS PROJECT MANAGEMENT		
	A	ORIGINAL ISSUE					approved	---		project: DETAILED SITE INVESTIGATION ST LEONARDS HEALTH ORGANISATION RELOCATION PROJECT ROYAL NORTH SHORE HOSPITAL ST LEONARDS NSW		
							date	28 / 03 / 17		title: GROUNDWATER EXCEEDANCES		
							scale	AS SHOWN		project no: ENAU/RHOD06452AA-R05	figure no: FIGURE 4	rev: A
							original size	A3				

Tables

						Sample ID	BH3	BH3
						Matrix	Fill	Fill
						Date	4-Jun-04	4-Jun-04
						Depth (m)	0-0.3	0.5-0.95
		NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 0 to <1m, Sand	NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 1m to <2m, Sand	NEPM 2013 HILs Commercial/ industrial D Soil	NEPM 2013 Mgmt Limits Commercial and industrial, Coarse Soil			
Asbestos (presence/absence)	ND			ND		ND	-	
Benzene	mg/kg	3	3			<0.2	<0.2	
Ethylbenzene	mg/kg					<0.2	<0.2	
Toluene	mg/kg					<0.2	<0.2	
Xylene Total	mg/kg	230				<0.4	<0.4	
Arsenic	mg/kg			3000		5	6	
Cadmium	mg/kg			900		<1	<1	
Chromium	mg/kg			3600		14	28	
Copper	mg/kg			240000		22	26	
Lead	mg/kg			1500		21	34	
Mercury	mg/kg			730		<0.1	<0.1	
Nickel	mg/kg			6000		24	37	
Zinc	mg/kg			400000		36	37	
DDD	mg/kg			3600		-	-	
DDT	mg/kg					-	-	
Other OCP Analysis	mg/kg					-	-	
Acenaphthene	mg/kg					<0.5	<0.5	
Acenaphthylene	mg/kg					<0.5	<0.5	
Anthracene	mg/kg					<0.5	<0.5	
Benz(a)anthracene	mg/kg					<0.5	<0.5	
Benzo(a)pyrene	mg/kg					<0.5	<0.5	
Benzo(bk)fluoranthene	mg/kg					<0.5	<0.5	
Benzo(g,h,i)perylene	mg/kg					0.7	<0.5	
Chrysene	mg/kg					0.7	<0.5	
Dibenz(a,h)anthracene	mg/kg					<0.5	<0.5	
Fluoranthene	mg/kg					<0.5	<0.5	
Fluorene	mg/kg					<0.5	<0.5	
Indeno(1,2,3-cd)pyrene	mg/kg					<0.5	<0.5	
Naphthalene	mg/kg					<0.5	<0.5	
Phenanthrene	mg/kg					<0.5	<0.5	
Pyrene	mg/kg					<0.5	<0.5	
Total PAHs	mg/kg			4000		1.4	ND	
PCBs (Sum of total)	mg/kg			7		-	-	
C6 - C9	mg/kg				700	<2	<2	
C10 - C14	mg/kg				1000	<50	<50	
C15 - C28	mg/kg				3500	<100	<100	
C29 - C36	mg/kg				10,000	<100	<100	
C10 - C36 (Sum of total)	mg/kg					ND	ND	

Notes:

1. TPH results were compared to the corresponding TRH criteria for ESL and Management Limits as TRH compounds were not required to be analysed at the time of assessment.

		Sample ID	BH109	BH109	BH120	BH120	HA127	HA127	HA129	HA129	HA132	HA132
		Matrix	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL
		Date	27/11/2006	27/11/2006	27/11/2006	27/11/2006	28/11/2006	28/11/2006	28/11/2006	28/11/2006	28/11/2006	28/11/2006
		Depth (m)	0.1 - 0.2	0.5 - 0.6	0.5-0.6	0.7-0.8	0.0 - 0.1	0.5 - 0.6	0.0 - 0.1	0.2 - 0.3	0.0 - 0.1	0.2 - 0.3
		NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 0 to <1m, Sand	NEPM 2013 Commercial/Industrial D Soil HSL for Vapour Intrusion, 1m to <2m, Sand	NEPM 2013 HILs Commercial/ Industrial D Soil	NEPM 2013 Mgmt Limits Commercial and Industrial, Coarse Soil							
Asbestos (presence/absence)	ND			ND		ND	ND	ND	ND	ND	ND	ND
Benzene	mg/kg	3	3			-	<0.5	<0.5	-	<0.5	<0.5	-
Ethylbenzene	mg/kg					-	<0.5	<0.5	-	<0.5	<0.5	-
Toluene	mg/kg					-	<0.5	<0.5	-	<0.5	<0.5	-
Xylene Total	mg/kg	230				-	<1.5	<1.5	-	<1.5	<1.5	-
Arsenic	mg/kg			3000		10	4	9	10	<3	4	<3
Cadmium	mg/kg			900		0.2	0.1	1	1	0.1	0.1	0.3
Chromium	mg/kg			3600		11	8.6	29	29	7.9	16	7
Copper	mg/kg			240000		17	18	31	8	8.8	10	7.8
Lead	mg/kg			1500		38	25	54	20	12	17	11
Mercury	mg/kg			730		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg			6000		11	10	13	4	6.1	14	5.5
Zinc	mg/kg			400000		48	27	260	56	24	21	22
OCP (Sum of total)	mg/kg					-	ND	ND	-	-	-	-
Acenaphthene	mg/kg					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg					0.1	<0.1	0.2	<0.1	<0.1	0.2	<0.1
Anthracene	mg/kg					0.4	0.2	0.2	<0.1	<0.1	0.2	<0.1
Benzo(a)anthracene	mg/kg					1.2	0.5	0.6	0.3	<0.1	0.6	<0.1
Benzo(a)pyrene	mg/kg					1.1	0.63	0.8	0.3	0.07	0.83	0.1
Benzo(bk)fluoranthene	mg/kg					1.5	0.9	1.1	0.4	<0.2	1.1	<0.2
Benzo(g,h,i)perylene	mg/kg					0.7	0.4	0.5	0.2	<0.1	0.7	<0.1
Chrysene	mg/kg					1	0.4	0.5	0.2	<0.1	0.5	<0.1
Dibenz(a,h)anthracene	mg/kg					0.2	0.1	0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg					2.2	1.1	1.7	0.8	0.1	1.9	0.2
Fluorene	mg/kg					0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg					0.6	0.4	0.5	0.2	<0.1	0.6	<0.1
Naphthalene	mg/kg					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg					1.3	0.6	0.7	0.4	<0.1	0.9	0.1
Pyrene	mg/kg					2.4	1.1	1.8	0.7	0.1	1.8	0.2
Total PAHs	mg/kg			4000		12.8	6.3	8.7	3.6	0.3	9.3	0.6
PCBs (Sum of total)	mg/kg			7		-	ND	ND	-	-	-	-
C6 - C9	mg/kg				700	-	<20	<20	-	-	<20	<20
C10 - C14	mg/kg				1000	-	<20	<20	-	-	<20	<20
C15 - C28	mg/kg				3500	-	<50	<50	-	-	<50	<50
C29 - C36	mg/kg				10,000	-	<50	<50	-	-	<50	<50
C10 - C36 (Sum of total)	mg/kg					-	ND	ND	-	-	ND	100

Notes:

1. TPH results were compared to the corresponding TRH criteria for ESL and Management Limits as TRH compounds were not required to be analysed at the time of assessment.

								Field_ID	BH202	BH204	BH205
								LocCode	BH202	BH204	BH205
								Sampled_Date-Time	12/01/2017	12/01/2017	12/01/2017
				NEPM 2013 Commercial/ industrial GW HSL D Vapour Intrusion, 2m to <4m, Sand	NEPM 2013 Commercial/ industrial GW HSL D Vapour Intrusion, 4m to <8m, Sand	NEPM 2013 Commercial/ industrial GW HSL D Vapour Intrusion, 8m+, Sand	NEPM 2013 GILs, Fresh Waters(A)				
Method_Type	ChemName	Units	EQL								
Heavy Metal	Arsenic (Filtered)	mg/L	0.001				0.013	<0.001	<0.001	<0.001	
	Cadmium (Filtered)	mg/L	0.0002				0.0002	<0.0002	<0.0002	<0.0002	
	Chromium (Filtered)	mg/L	0.001				0.001	<0.001	<0.001	<0.001	
	Copper (Filtered)	mg/L	0.001				0.0014	0.001	0.01	<0.001	
	Lead (Filtered)	mg/L	0.001				0.0034	0.004	0.001	<0.001	
	Mercury (Filtered)	mg/L	0.0001				0.00006	<0.0001	<0.0001	<0.0001	
	Nickel (Filtered)	mg/L	0.001				0.011	0.028	0.005	0.024	
	Zinc (Filtered)	mg/L	0.005				0.008	0.17	0.12	0.15	
Organic	Naphthalene	µg/L	10				16	<10	<10	<10	
	F2-NAPHTHALENE	mg/L	0.05					<0.05	<0.05	<0.05	
	C6 - C9	µg/L	20					<20	<20	<20	
	C6-C10 less BTEX (F1)	mg/L	0.02	6	6	7		<0.02	<0.02	<0.02	
	C10-C16	mg/L	0.05					<0.05	<0.05	<0.05	
	C16-C34	mg/L	0.1					0.1	0.1	0.3	
	C34-C40	mg/L	0.1					<0.1	<0.1	<0.1	
	C6 - C10	mg/L	0.02					<0.02	<0.02	<0.02	
PAH	Acenaphthene	µg/L	1					<1	<1	<1	
	Acenaphthylene	µg/L	1					<1	<1	<1	
	Anthracene	µg/L	1				0.01	<1	<1	<1	
	Benzo(a)anthracene	µg/L	1					<1	<1	<1	
	Benzo(a)pyrene	µg/L	1				0.1	<1	<1	<1	
	Benzo(g,h,i)perylene	µg/L	1					<1	<1	<1	
	Benzo(k)fluoranthene	µg/L	1					<1	<1	<1	
	Chrysene	µg/L	1					<1	<1	<1	
	Benzo[b+j]fluoranthene	mg/L	0.001					<0.001	<0.001	<0.001	
	Dibenz(a,h)anthracene	µg/L	1					<1	<1	<1	
	Fluoranthene	µg/L	1					<1	<1	<1	
	Fluorene	µg/L	1					<1	<1	<1	
	Indeno(1,2,3-c,d)pyrene	µg/L	1					<1	<1	<1	
	Naphthalene	µg/L	1				16	<1	<1	<1	
	Phenanthrene	µg/L	1				0.6	<1	<1	<1	
	Pyrene	µg/L	1					<1	<1	<1	
	Total PAHs	µg/L	1					<1	<1	<1	
TPH	C10 - C14	µg/L	50					<50	<50	<50	
	C15 - C28	µg/L	100					<100	<100	200	
	C29 - C36	µg/L	100					<100	<100	<100	
	C10 - C36 (Sum of total)	µg/L	100					<100	<100	200	
Volatile	Benzene	µg/L	1	5000	5000	5000	950	<1	<1	<1	
	Ethylbenzene	µg/L	1				80	<1	<1	<1	
	Toluene	µg/L	1				180	<1	<1	<1	
	Xylene (m & p)	µg/L	2				75	<2	<2	<2	
	Xylene (o)	µg/L	1				350	<1	<1	<1	
	Xylene Total	µg/L	3				425	<3	<3	<3	

						Sample ID	BH3	BH3
						Matrix	Fill	Fill
						Date	4-Jun-04	4-Jun-04
						Depth (m)	0-0.3	0.5-0.95
		CT1 NSW 2014 General Solid Waste (No Leaching)	CT2 NSW 2014 Restricted Solid Waste (No Leaching)	SCC1 NSW 2014 General Solid Waste (leached)	SCC2 NSW 2014 Restricted Solid Waste (leached)			
Asbestos (presence/absence)	ND	ND		ND		ND	-	
Benzene	mg/kg	10	40	18	70	<0.2	<0.2	
Ethylbenzene	mg/kg	600	2400	1080	4320	<0.2	<0.2	
Toluene	mg/kg	288	1152	518	2073	<0.2	<0.2	
Xylene Total	mg/kg	1000	4000	1800	7200	<0.4	<0.4	
Arsenic	mg/kg	100	400	500	20,000	5	6	
Cadmium	mg/kg	20	80	100	400	<1	<1	
Chromium	mg/kg	100	400	1900	7600	14	28	
Copper	mg/kg					22	26	
Lead	mg/kg	100	400	1500	6000	21	34	
Mercury	mg/kg	4	16	50	200	<0.1	<0.1	
Nickel	mg/kg	40	160	1050	4200	24	37	
Zinc	mg/kg					36	37	
DDD	mg/kg					-	-	
DDT	mg/kg					-	-	
Other OCP Analysis	mg/kg					-	-	
Acenaphthene	mg/kg					<0.5	<0.5	
Acenaphthylene	mg/kg					<0.5	<0.5	
Anthracene	mg/kg					<0.5	<0.5	
Benzo(a)anthracene	mg/kg					<0.5	<0.5	
Benzo(a)pyrene	mg/kg	0.8	3.2	10	23	<0.5	<0.5	
Benzo(bk)fluoranthene	mg/kg					<0.5	<0.5	
Benzo(g,h,i)perylene	mg/kg					0.7	<0.5	
Chrysene	mg/kg					0.7	<0.5	
Dibenz(a,h)anthracene	mg/kg					<0.5	<0.5	
Fluoranthene	mg/kg					<0.5	<0.5	
Fluorene	mg/kg					<0.5	<0.5	
Indeno(1.2.3-cd)pyrene	mg/kg					<0.5	<0.5	
Naphthalene	mg/kg					<0.5	<0.5	
Phenanthrene	mg/kg					<0.5	<0.5	
Pyrene	mg/kg					<0.5	<0.5	
Total PAHs	mg/kg	200	800	200	800	1.4	ND	
PCBs (Sum of total)	mg/kg	50	50	50	50	-	-	
C6 - C9	mg/kg	650	2600	650	2600	<2	<2	
C10 - C14	mg/kg					<50	<50	
C15 - C28	mg/kg					<100	<100	
C29 - C36	mg/kg	10,000	40,000	10,000	40,000	<100	<100	
C10 - C36 (Sum of total)	mg/kg					ND	ND	

Notes:

1. TPH results were compared to the corresponding TRH criteria for ESL and Management Limits as TRH compounds were not required to be analysed at the time of assessment.

		Sample ID	BH109	BH109	BH120	BH120	HA127	HA127	HA129	HA129	HA132	HA132
		Matrix	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL	FILL
		Date	27/11/2006	27/11/2006	27/11/2006	27/11/2006	28/11/2006	28/11/2006	28/11/2006	28/11/2006	28/11/2006	28/11/2006
		Depth (m)	0.1 - 0.2	0.5 - 0.6	0.5-0.6	0.7-0.8	0.0 - 0.1	0.5 - 0.6	0.0 - 0.1	0.2 - 0.3	0.0 - 0.1	0.2 - 0.3
		CT1 NSW 2014 General Solid Waste (No Leaching)	CT2 NSW 2014 Restricted Solid Waste (No Leaching)	SCC1 NSW 2014 General Solid Waste (leached)	SCC2 NSW 2014 Restricted Solid Waste (leached)							
Asbestos (presence/absence)	ND	ND		ND		ND	ND	ND	ND	ND	ND	ND
Benzene	mg/kg	10	40	18	70	-	<0.5	<0.5	-	<0.5	<0.5	-
Ethylbenzene	mg/kg	600	2400	1080	4320	-	<0.5	<0.5	-	<0.5	<0.5	-
Toluene	mg/kg	288	1152	518	2073	-	<0.5	<0.5	-	<0.5	<0.5	-
Xylene Total	mg/kg	1000	4000	1800	7200	-	<1.5	<1.5	-	<1.5	<1.5	-
Arsenic	mg/kg	100	400	500	20,000	10	4	9	10	<3	4	7
Cadmium	mg/kg	20	80	100	400	0.2	0.1	1	0.1	0.1	0.3	0.4
Chromium	mg/kg	100	400	1900	7600	11	8.6	29	29	7.9	16	14
Copper	mg/kg					17	18	31	8	8.8	10	7.8
Lead	mg/kg	100	400	1500	6000	38	25	54	20	12	17	11
Mercury	mg/kg	4	16	50	200	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	40	160	1050	4200	11	10	13	4	6.1	14	5.5
Zinc	mg/kg					48	27	260	56	24	21	22
OCP (Sum of total)	mg/kg	250	1000	250	1000	-	ND	ND	-	-	-	ND
Acenaphthene	mg/kg					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg					0.1	<0.1	0.2	<0.1	<0.1	0.2	<0.1
Anthracene	mg/kg					0.4	0.2	0.2	<0.1	<0.1	0.2	<0.1
Benzo(a)anthracene	mg/kg					1.2	0.5	0.6	0.3	<0.1	0.6	<0.1
Benzo(a)pyrene	mg/kg	0.8	3.2	10	23	1.1	0.63	0.8	0.3	0.07	0.83	0.1
Benzo(b)fluoranthene	mg/kg					1.5	0.9	1.1	0.4	<0.2	1.1	<0.2
Benzo(g,h,i)perylene	mg/kg					0.7	0.4	0.5	0.2	<0.1	0.7	<0.1
Chrysene	mg/kg					1	0.4	0.5	0.2	<0.1	0.5	<0.1
Dibenz(a,h)anthracene	mg/kg					0.2	0.1	0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg					2.2	1.1	1.7	0.8	0.1	1.9	0.2
Fluorene	mg/kg					0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg					0.6	0.4	0.5	0.2	<0.1	0.6	<0.1
Naphthalene	mg/kg					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg					1.3	0.6	0.7	0.4	<0.1	0.9	0.1
Pyrene	mg/kg					2.4	1.1	1.8	0.7	0.1	1.8	0.2
Total PAHs	mg/kg	200	800	200	800	12.8	6.3	8.7	3.6	0.3	9.3	0.6
PCBs (Sum of total)	mg/kg	50	50	50	50	-	ND	ND	-	-	-	ND
C6 - C9	mg/kg	650	2600	650	2600	-	<20	<20	-	-	<20	<20
C10 - C14	mg/kg					-	<20	<20	-	-	<20	<20
C15 - C28	mg/kg					-	<50	<50	-	-	<50	<50
C29 - C36	mg/kg	10,000	40,000	10,000	40,000	-	<50	<50	-	-	<50	100
C10 - C36 (Sum of total)	mg/kg					-	ND	ND	-	-	ND	100

Notes:

1. TPH results were compared to the corresponding TRH criteria for ESL and Management Limits as TRH compounds were not required to be analysed at the time of assessment.

9/02/2017

			Field ID	BH202	QD-01		BH202	QT-01	
			LocCode	BH202	QD-01	RPD	BH202	QT-01	RPD
			Sampled Date-Time	12/01/2017	12/01/2017		12/01/2017	12/01/2017	
Method_Type	ChemName	Units	EQL						
Heavy Metal	Arsenic (Filtered)	mg/L	0.001	<0.001	<0.001	NA	<0.001	<0.001	NA
	Cadmium (Filtered)	mg/L	0.0002	<0.0002	<0.0002	NA	<0.0002	<0.001	NA
	Chromium (Filtered)	mg/L	0.001	<0.001	<0.001	NA	<0.001	<0.001	NA
	Copper (Filtered)	mg/L	0.001	0.001	0.08	195	0.001	0.003	100
	Lead (Filtered)	mg/L	0.001	0.004	0.004	0	0.004	0.003	29
	Mercury (Filtered)	mg/L	0.0001	<0.0001	<0.0001	NA	<0.0001	<0.0001	NA
	Nickel (Filtered)	mg/L	0.001	0.028	0.029	4	0.028	0.028	0
	Zinc (Filtered)	mg/L	0.005	0.17	0.17	0	0.17	0.176	3
Organic	Naphthalene	µg/L	10	<10	<10	NA	<10	<10	NA
	F2-NAPHTHALENE	mg/L	0.05	<0.05	<0.05	NA	<0.05	<0.05	NA
	C6 - C9	µg/L	20	<20	<20	NA	<20	<20	NA
	C6-C10 less BTEX (F1)	mg/L	0.02	<0.02	<0.02	NA	<0.02	<0.02	NA
	C10-C16	mg/L	0.05	<0.05	<0.05	NA	<0.05	<0.05	NA
	C16-C34	mg/L	0.1	0.1	0.1	0	0.1	<0.1	0
	C34-C40	mg/L	0.1	<0.1	<0.1	NA	<0.1	<0.1	NA
	C6 - C10	mg/L	0.02	<0.02	<0.02	NA	<0.02	<0.02	NA
PAH	Acenaphthene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Acenaphthylene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Anthracene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Benzo(a)anthracene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Benzo(a)pyrene	µg/L	1	<1	<1	NA	<1	<0.05	NA
	Benzo(g,h,i)perylene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Benzo(k)fluoranthene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Chrysene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Benzo[b+j]fluoranthene	mg/L	0.001	<0.001	<0.001	NA	<0.001	<0.1	NA
	Dibenz(a,h)anthracene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Fluoranthene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Fluorene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Indeno(1,2,3-c,d)pyrene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Naphthalene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Phenanthrene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Pyrene	µg/L	1	<1	<1	NA	<1	<0.1	NA
	Total PAHs	µg/L	1	<1	<1	NA	<1	<0.1	NA
TPH	C10 - C14	µg/L	50	<50	<50	NA	<50	<50	NA
	C15 - C28	µg/L	100	<100	<100	NA	<100	200	NA
	C29 - C36	µg/L	100	<100	<100	NA	<100	<100	NA
	C10 - C36 (Sum of total)	µg/L	100	<100	<100	NA	<100	200	NA
Volatile	Benzene	µg/L	1	<1	<1	NA	<1	<1	NA
	Ethylbenzene	µg/L	1	<1	<1	NA	<1	<1	NA
	Toluene	µg/L	1	<1	<1	NA	<1	<1	NA
	Xylene (m & p)	µg/L	2	<2	<2	NA	<2	<2	NA
	Xylene (o)	µg/L	1	<1	<1	NA	<1	<1	NA
	Xylene Total	µg/L	3	<3	<3	NA	<3	<3	NA

Royal North Shore Hospital
Site 4A Detailed Site Investigation
Table LR8 - Equipment Rinsate Results (Soil Sampling) (2016/17)

ENAU RHOD06452AA-R05

				Field_ID	QR-01
				LocCode	QR-01
				Sampled_Date-Time	12/01/2017
Method_Type	ChemName	Units	EQL		
Heavy Metal	Arsenic (Filtered)	mg/L	0.001	<0.001	
	Cadmium (Filtered)	mg/L	0.0002	<0.0002	
	Chromium (Filtered)	mg/L	0.001	<0.001	
	Copper (Filtered)	mg/L	0.001	<0.001	
	Lead (Filtered)	mg/L	0.001	<0.001	
	Mercury (Filtered)	mg/L	0.0001	<0.0001	
	Nickel (Filtered)	mg/L	0.001	<0.001	
	Zinc (Filtered)	mg/L	0.005	<0.005	
Organic	Naphthalene	µg/L	10	<10	
	F2-NAPHTHALENE	mg/L	0.05	<0.05	
	C6 - C9	µg/L	20	<20	
	C6-C10 less BTEX (F1)	mg/L	0.02	<0.02	
	C10-C16	mg/L	0.05	<0.05	
	C16-C34	mg/L	0.1	0.1	
	C34-C40	mg/L	0.1	<0.1	
	C6 - C10	mg/L	0.02	<0.02	
PAH	Acenaphthene	µg/L	1	<1	
	Acenaphthylene	µg/L	1	<1	
	Anthracene	µg/L	1	<1	
	Benzo(a)anthracene	µg/L	1	<1	
	Benzo(a)pyrene	µg/L	1	<1	
	Benzo(g,h,i)perylene	µg/L	1	<1	
	Benzo(k)fluoranthene	µg/L	1	<1	
	Chrysene	µg/L	1	<1	
	Benzo[b+j]fluoranthene	mg/L	0.001	<0.001	
	Dibenz(a,h)anthracene	µg/L	1	<1	
	Fluoranthene	µg/L	1	<1	
	Fluorene	µg/L	1	<1	
	Indeno(1,2,3-c,d)pyrene	µg/L	1	<1	
	Naphthalene	µg/L	1	<1	
	Phenanthrene	µg/L	1	<1	
	Pyrene	µg/L	1	<1	
	Total PAHs	µg/L	1	<1	
TPH	C10 - C14	µg/L	50	<50	
	C15 - C28	µg/L	100	<100	
	C29 - C36	µg/L	100	<100	
	C10 - C36 (Sum of total)	µg/L	100	<100	
Volatile	Benzene	µg/L	1	<1	
	Ethylbenzene	µg/L	1	<1	
	Toluene	µg/L	1	<1	
	Xylene (m & p)	µg/L	2	<2	
	Xylene (o)	µg/L	1	<1	
	Xylene Total	µg/L	3	<3	

SDG	12-Jan-17	12-Jan-17	14-Jan-17	14-Jan-17
Field ID	TRIP BLANK	TRIP SPIKE	TRIP BLANK	TRIP SPIKE
Sampled_Date/Time	12/01/2017	12/01/2017	12/01/2017	12/01/2017
Sample Type	Trip_B	TRIP_S	Trip_B	TRIP_S

ChemName	Units	EQL				
Benzene	µg/l	1	<1	121%	<1	115%
Ethylbenzene	µg/l	1	<1	115%	<1	112%
Toluene	µg/l	1	<1	121%	<1	114%
Xylene (m & p)	µg/l	2	<2	107%	<2	109%
Xylene (o)	µg/l	1	<1	119%	<1	118%
Xylene Total	µg/l	3	<3	111%	<3	112%

Appendix A – Proposed Development Plan

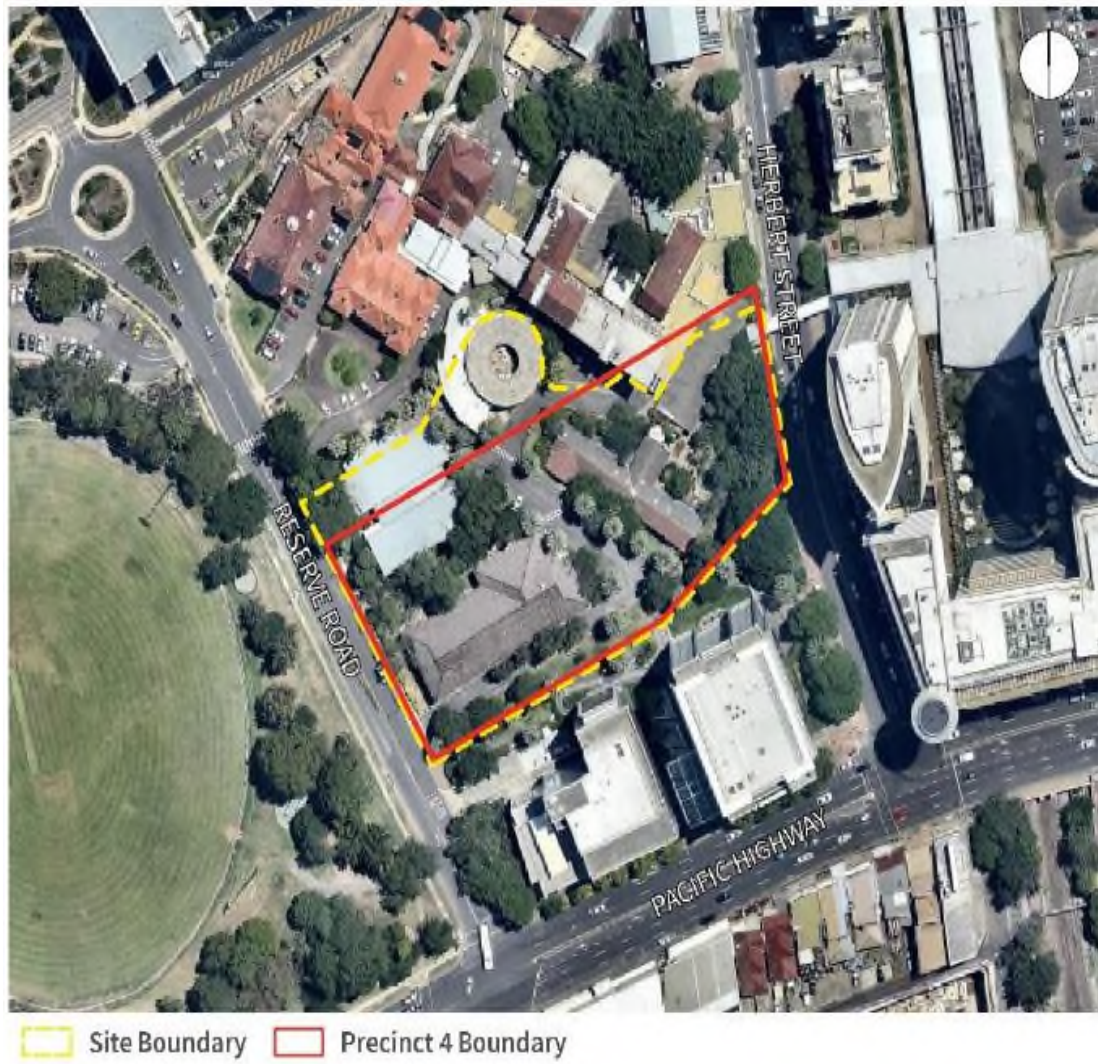


Figure A1 – Project Aerial Plan
Source: Ethos Urban



Figure A2 — Proposed Precinct Plan
Source: BVN

ST LEONARDS HEALTH ORGANISATIONS RELOCATION (SHOR) PROJECT

RNSH - ST LEONARDS, SYDNEY



SHEET LIST	
DRAWING NUMBER	SHEET NAME
A-00-00	COVER SHEET & DRAWING INDEX
A-00-01	LEGEND SHEET
A-00-02	PRECINCT PLAN - EXISTING
A-00-03	SITE PLAN - EXISTING
A-00-04	SITE PLAN - EXISTING UNDERGROUND SERVICES
A-00-05	DEMOLITION PLAN - SITE
A-00-10	PRECINCT PLAN - PROPOSED
A-00-11	SITE PLAN - PROPOSED
A-00-13	SITE SECTION - A & B
A-00-14	SITE SECTION - C & D
A-00-15	BRIDGE SECTIONS
A-00-16	BRIDGE PLAN
B-00-01	GA PLAN - GROUND LEVEL
B-01-01	GA PLAN - LEVEL 1
B-02-01	GA PLAN - TYPICAL LEVEL (LEVELS 2-5, 7-9)
B-02-02	ACCESS FLOOR PLAN - TYPICAL LEVEL (LEVELS 2-5, 7-9)
B-06-01	GA PLAN - LEVEL 6 (WARM SHELL)
B-10-01	GA PLAN - PLANT LEVEL 10
B-10-02	GA PLAN - PLANT WITH SKYLIGHT LEVEL 10
B-11-01	ROOF PLAN
B-11-02	ROOF PLAN - PLANT WITH SKYLIGHT
B-B1-01	GA PLAN - BASEMENT LEVEL 1
B-B2-01	GA PLAN - BASEMENT LEVEL 2
C-XX-01	ELEVATION - NORTH WEST
C-XX-02	ELEVATION - NORTH EAST
C-XX-03	ELEVATION - SOUTH WEST
C-XX-04	ELEVATION - SOUTH EAST
D-XX-01	SECTION A-A
D-XX-02	SECTION B-B
E-00-01	RCP - GROUND LEVEL
E-01-01	RCP - LEVEL 1
E-02-01	RCP - TYPICAL (LEVELS 2-5, 7-9)
E-06-01	RCP - LEVEL 6 (WARM SHELL)
E-10-01	RCP - PLANT LEVEL 10
E-B1-01	RCP - BASEMENT LEVEL 1
E-B2-01	RCP - BASEMENT LEVEL 2
G-00-01	CORE RCP - GROUND LEVEL
G-01-01	CORE RCP - LEVEL 1
G-02-01	CORE RCP - TYPICAL (LEVELS 2-5, 7-9)
G-06-01	CORE RCP - LEVEL 6 (WARM SHELL)
H-00-01	CORE PLAN - GROUND LEVEL
H-01-01	CORE PLAN - LEVEL 01
H-02-01	CORE PLAN - TYPICAL (LEVELS 02-09)
H-B1-01	CORE PLAN - BASEMENT 01
H-B2-01	CORE PLAN - BASEMENT 02
H-XX-40	TYPICAL LIFT CAR FINISHES PLAN, RCP & ELEVATIONS
H-XX-41	TYPICAL LIFT CAR FINISHES DETAILS
K-XX-01	TOWER FACADE WALL SECTIONS
K-XX-02	INTERFACE DETAILS - RECESS
K-XX-04	BASEMENT WALL SECTIONS
K-XX-05	BASEMENT WALL SECTIONS
Q-B1-01	WET AREA PLAN - END OF TRIP FACILITY
R-XX-01	AREA PLANS - LEVELS B2 - 05 - GFA
R-XX-02	AREA PLANS - LEVELS 06 - 10 - GFA
R-XX-03	AREA PLANS - LEVELS B2 - 05 - NLA
R-XX-04	AREA PLANS - LEVELS 06 - 10 - NLA
R-XX-05	AREA PLANS - LEVELS B2 - 05 - GBA
R-XX-06	AREA PLANS - LEVELS 06 - 10 - GBA
R-XX-07	AREA PLANS - SCHEDULES
R-XX-08	AREA PLANS - LEVELS B2 - 05 - WILLOUGHBY GFA
R-XX-09	AREA PLANS - LEVELS 06 - 10 - WILLOUGHBY GFA
Y-XX-01	3D VIEW 01 - RENDERING
Y-XX-02	3D VIEW 02 - RENDERING



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ISSUE	DATE	FOR
1	07.02.17	PRELIMINARY TENDER ISSUE
2	17.02.17	PRE TENDER UPDATE
A	24.02.17	TENDER ISSUE

STRUCTURAL & CIVIL

ENSTRUCT

MECHANICAL, ELECTRICAL, DRY FIRE & ESD
WOOD & GRIEVE ENGINEERS

HYDRAULIC & WET FIRE
MEDLAND ENGINEERING

FACADE
SURFACE DESIGN

TRAFFIC
ASON GROUP

QUANTITY SURVEYOR
RIDER LEVETT BUCKNALL

VERTICAL TRANSPORTATION
NORMAN DISNEY & YOUNG

PROJECT MANAGER
SAVILLS PROJECT MANAGEMENT

CLIENT

HEALTH INFRASTRUCTURE NSW
PROJECT

ST LEONARDS HEALTH
ORGANISATIONS RELOCATION
(SHOR)
RNSH - ST LEONARDS, SYDNEY

BVM PROJECT NUMBER

1609521.000

DRAWING KEY



GRAPHIC SCALE

SCALE @ A1

SCALE @ A3

DO NOT SCALE

STATUS

FOR TENDER

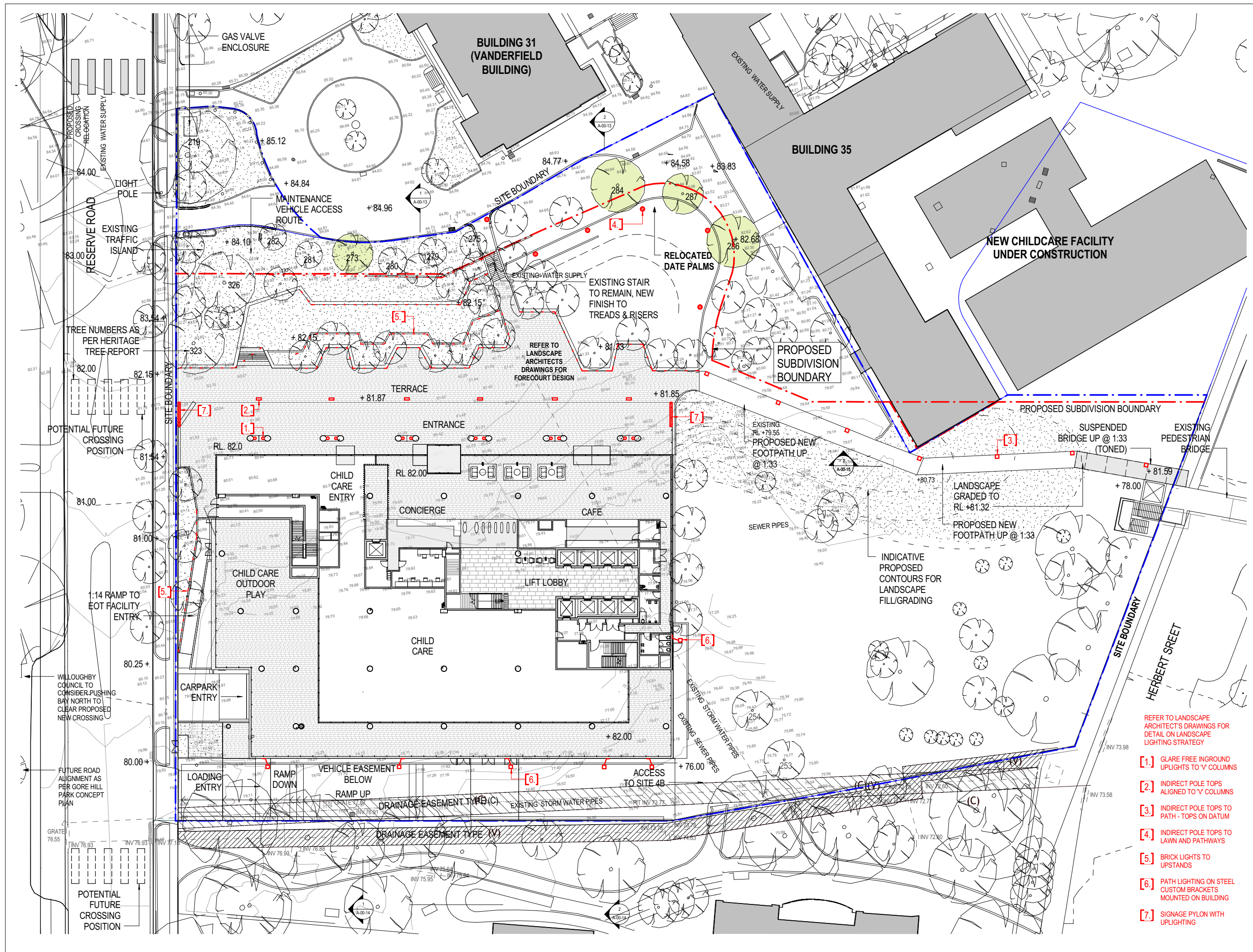
DRAWING

COVER SHEET & DRAWING
INDEX

AR-A-00-00

ISSUE

A



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A	01.06.17	TENDER ISSUE

STRUCTURAL & CIVIL

ENSTRUCT

MECHANICAL, ELECTRICAL, DRY FIRE & ESD

WOOD & GRIEVE ENGINEERS

HYDRAULIC & WET FIRE

MEDLAND ENGINEERING

FAÇADE

SURFACE DESIGN

TRAFFIC

ASON GROUP

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PROJECT MANAGER

SAVILLS PROJECT MANAGEMENT

CLIENT

HEALTH INFRASTRUCTURE NSW

PROJECT

ST LEONARDS HEALTH

ORGANISATIONS RELOCATION

(SHOR)

RNSH - ST LEONARDS, SYDNEY

BVM PROJECT NUMBER

1609521.000

DRAWING KEY

TRUE NORTH

PROJECT NORTH

GRAPHIC SCALE

SCALE @ A1

SCALE @ A3

1:500

DO NOT SCALE

STATUS

FOR TENDER

DRAWING

SITE PLAN - PROPOSED

ISSUE

AR-A-00-11

A

REFER TO LANDSCAPE ARCHITECT'S DRAWINGS FOR DETAIL ON LANDSCAPE LIGHTING STRATEGY

- [1] GLARE FREE INGROUND UPLIGHTS TO 'V' COLUMNS
- [2] INDIRECT POLE TOPS ALIGNED TO 'V' COLUMNS
- [3] INDIRECT POLE TOPS TO PATH - TOPS ON DATUM
- [4] INDIRECT POLE TOPS TO LAWN AND PATHWAYS
- [5] BRICK LIGHTS TO UPSTANDS
- [6] PATH LIGHTING ON STEEL CUSTOM BRACKETS MOUNTED ON BUILDING
- [7] SIGNAGE PYLON WITH UPLIGHTING



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NORMAN DISNEY & YOUNG

PROJECT MANAGER
SAVILLS PROJECT MANAGEMENT

CLIENT

HEALTH INFRASTRUCTURE NSW
PROJECT

ST LEONARDS HEALTH
ORGANISATION RELOCATION (SHOR)
RNSH - ST LEONARDS, SYDNEY

BVM PROJECT NUMBER

1609521.001

DRAWING KEY

TRUE NORTH PROJECT NORTH
GRAPHIC SCALE

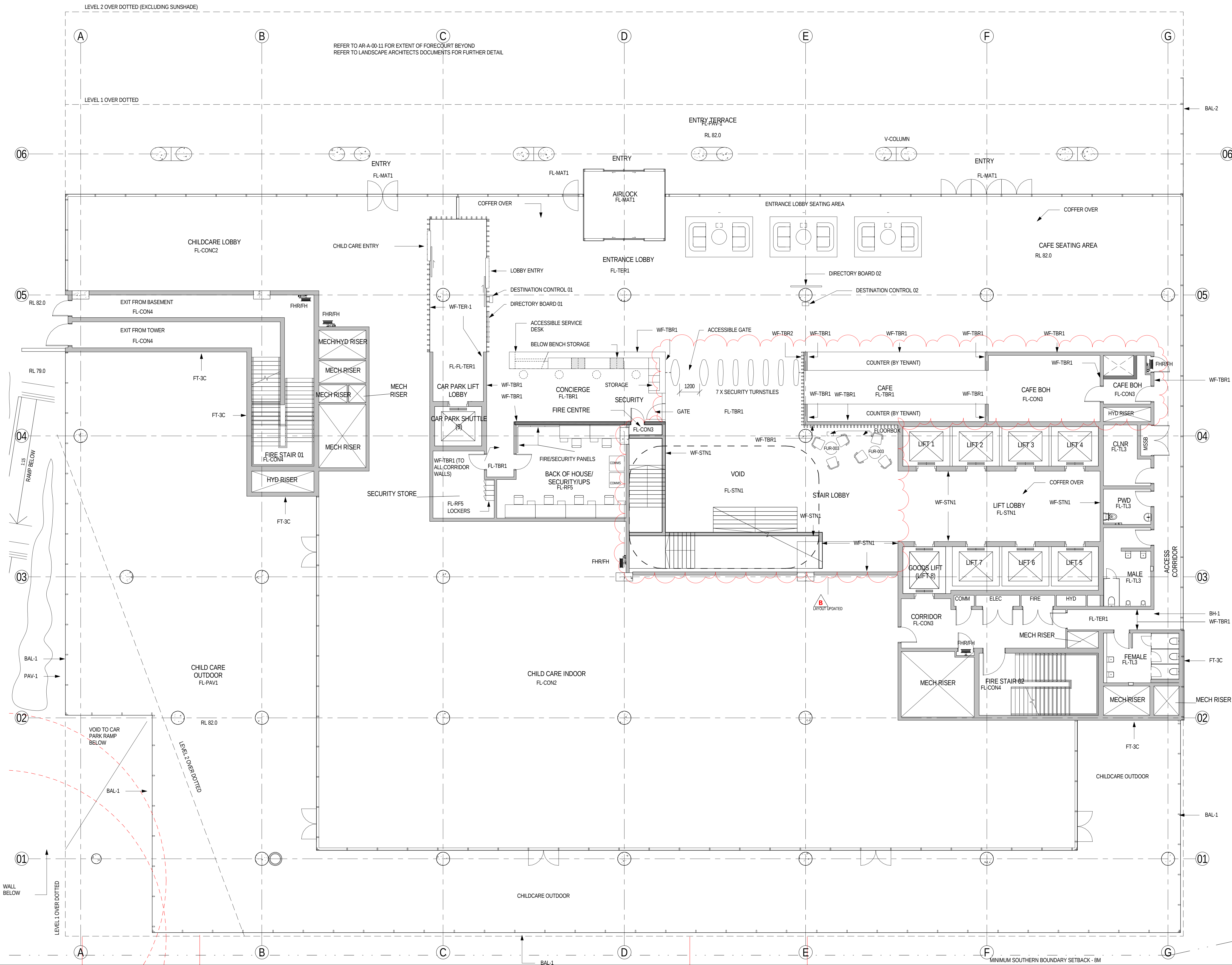
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STATUS

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DRAWING

GA PLAN - GROUND LEVEL

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3	19.01.17	ISSUE FOR COORDINATION
4	30.01.17	ISSUE FOR COORDINATION
5	07.02.17	PRELIMINARY TENDER ISSUE
6	17.02.17	PRE TENDER UPDATE
A	24.02.17	TENDER ISSUE

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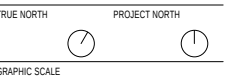
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HEALTH INFRASTRUCTURE NSW

PROJECT
ST LEONARDS HEALTH
ORGANISATIONS RELOCATION
(SHOR)

RNSH - ST LEONARDS, SYDNEY

BVN PROJECT NUMBER
1609521.000

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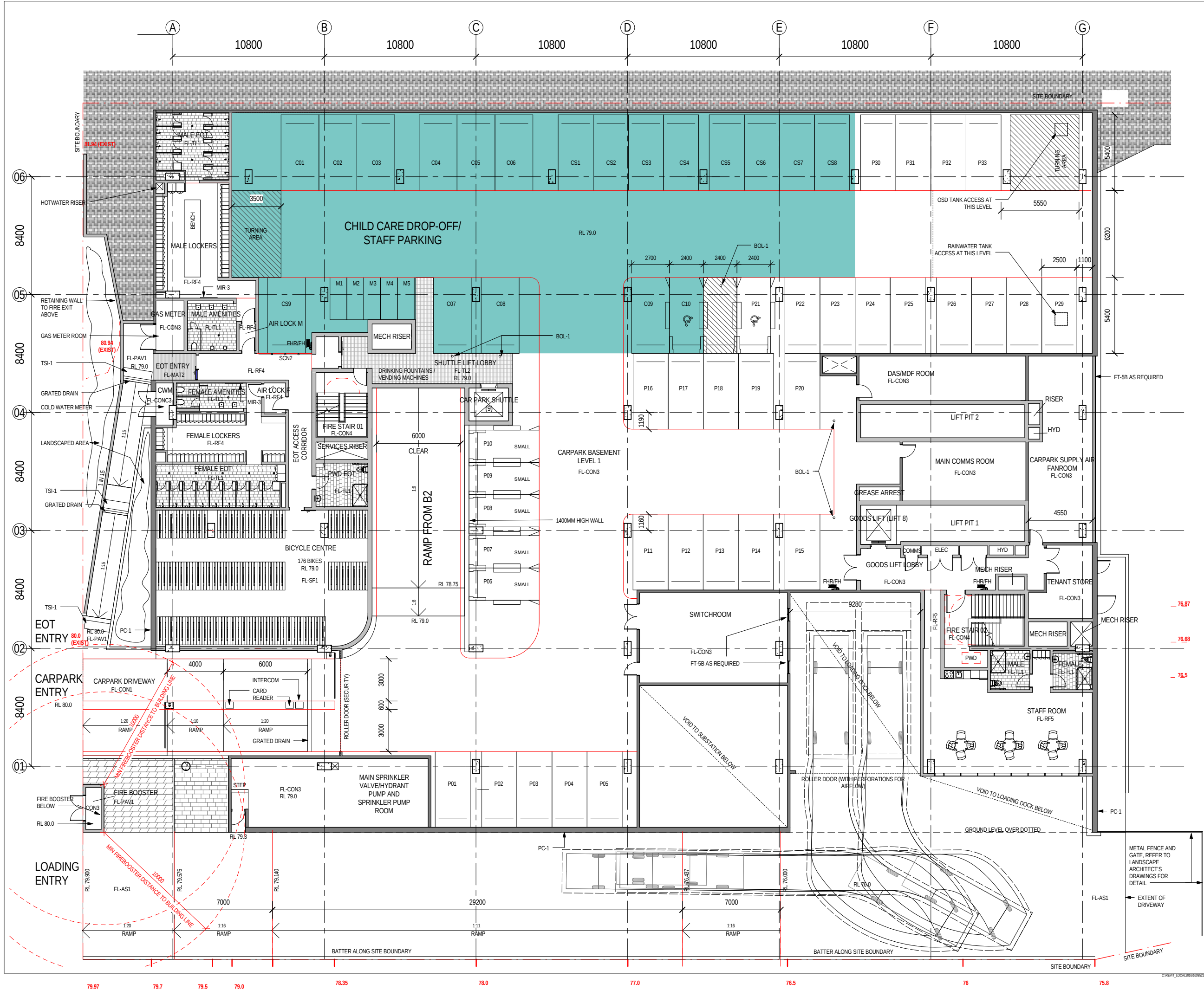
SCALE @ A1
1: 250 @ A3
SCALE @ A3
1: 250
STATUS
DO NOT SCALE

FOR TENDER
DRAWING

GA PLAN - BASEMENT LEVEL
1

AR-B-B1-01

ISSUE
A





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6	17.02.17	PRE TENDER UPDATE
7	24.02.17	TENDER ISSUE

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PROJECT MANAGER
SAVILLS PROJECT MANAGEMENT

CLIENT

HEALTH INFRASTRUCTURE NSW
PROJECT

ST LEONARDS HEALTH
ORGANISATIONS RELOCATION
(SHOR)
RNSH - ST LEONARDS, SYDNEY

OWN PROJECT NUMBER

609521.000

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SCALE @ A3	
: 250	DO NOT SCALE
STATUS	

FOR TENDER
DRAWING

GA PLAN - BASEMENT LEVEL
2

AR-B-B2-01

UE

Appendix B – Borehole Logs

Borehole No. **BH3****Engineering Log - Borehole**Sheet 1 of 3
Office Job No.: **S21855/4**Client: **NORTHERN SYDNEY HEALTH**Date started: **4.6.2004**

Principal:

Date completed: **4.6.2004**Project: **ROYAL NORTH SHORE HOSPITAL REDEVELOPMENT**Logged by: **EW/DMH**Borehole Location: **ST LEONARDS (SEE SITE PLAN)**Checked by: **BW**

drill model and mounting:		B80 TRUCK		Easting: 332717.5		slope: -90°		R.L. Surface: 78.67					
hole diameter:		100 mm		Northing 6256003.6		bearing: -		datum: AHD					
drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer	structure and additional observations
1	2	3							soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400 kPa	
ADT		N	None Observed	E					FILL: SILTY SAND: Fine to coarse grained, brown, some clay.	M			FILL/TOPSOIL
				SPT 6,14,8 N*=22 E	78	1			FILL: SANDY CLAY: Low to medium plasticity, brown, fine to coarse grained sand.	M			FILL
				SPT 2,2,3 N*=5 E	77	2		CL/CH	SILTY CLAY: Medium plasticity, yellow brown mottled red, some sand, trace of decomposed wood.	VS		X	RESIDUAL
									Some ironstone from 2m.	H		X	EXTREMELY WEATHERED SANDSTONE
					76	3			Borehole BH3 continued as cored hole				
					75	4							
					74	5							
					73	6							
					72	7							
					71	8							

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. AOT	support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressurameter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture O dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VS _t very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
---	--	--	---	---

Borehole No. **BH3****Engineering Log - Cored Borehole**Sheet 3 of 3
Office Job No.: **S21855/4**Client: **NORTHERN SYDNEY HEALTH**Date started: **4.6.2004**

Principal:

Date completed: **4.6.2004**Project: **ROYAL NORTH SHORE HOSPITAL REDEVELOPMENT**Logged by: **EW/DMH**Borehole Location: **ST LEONARDS (SEE SITE PLAN)**Checked by: **RW**

drilling information				material substance				rock mass defects			
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength	la ₅₀ MPa D- diam- etral A- axial	defect spacing mm	defect description type, inclination, planarity, roughness, coating, thickness
NMLC			70	9		indistinctly laminated at 7.60m. Carbonaceous laminations from 7.48m to 7.55m. SANDSTONE: Medium to coarse grained, pale grey, indistinctly laminated at 10°.	MW	0.3 0.28		30 100 300 1000 3000	SM, 10mm sandy clay, pp= 280kPa. SM, 10mm sandy clay, pp= 130kPa.
			69	10				0.61 0.38		90	SM, 5mm sandy clay. SM, 10mm clay and rock fragments. XW SM, 40mm sandy clay, pp= 160kPa. JT, 30°, PL, RO, CO. SM, 3mm sandy clay.
								0.6 1.03			SM, 2mm sandy clay. SM, 100mm clay.
			68	11		BH3 terminated at 10.2m					
			67	12							
			66	13							
			65	14							
			64	15							
			63	16							

method	core-lift	water	weathering	defect type	roughness
DT diatuba	□ casing used	10/1/98 water level on date shown	FR fresh	JT joint	VR very rough
AS auger screwing	□ barrel withdrawn	▲ water inflow	SW slightly weathered	PT parting	RO rough
AD auger drilling	□ graphic log/core recovery	▲ partial drill fluid loss	MW moderately weathered	SM seam	SO smooth
RR roller/tricone	□ core recovered	▲ complete drill fluid loss	HW highly weathered	SZ sheared zone	SL slickensided
CB claw or blade bit	□ - graphic symbols indicate material		XW extremely weathered	SS sheared surface	
NMLC NMLC core	□ no core recovered		DW distinctly weathered (covers MW and HW)	CS crushed seam	
NQ, HQ, PQ wireline core					

strength	planarity	coating
VL very low	PL planar	CN clean
L low	CU curved	SN stained
M medium	UN undulating	VN veneer
H high	ST stepped	CO coating
VH very high	IR irregular	
EH extremely high		

CORED BOREHOLE S21855.3.GPJ COFFEY.GDT 13.09.04

Form GEO 5.5 Issue 3 Rev. 3

Borehole No. **BH109**

Engineering Log - Borehole

Client: **NSW Health**

Principal:

Project: **Royal North Shore Hospital**

Borehole Location:

Sheet 1 of 1

Office Job No.: **ENVILCOV00298AA**Date started: **27.11.2006**Date completed: **27.11.2006**

Logged by: **NF**

Checked by: **SD**

[illegible]

Borehole No. **BH120**

Sheet 1 of 1

Office Job No.: **ENVILCOV00298AA**

Date started: **27.11.2006**

Date completed: **27.11.2006**

Logged by: **NF**

Checked by: **SD**

Engineering Log - Borehole

Client: **NSW Health**

Principal:

Project: **Royal North Shore Hospital**

Borehole Location:

drill model and mounting:				Easting:		slope: -90°		R.L. Surface:					
hole diameter: mm				Northing		bearing:		datum: AHD					
drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
1	2	3											
HA									BITUMEN	D			FILL
									FILL: GRAVEL (Roadbase)				
						0.5			FILL: CLAYEY GRAVEL: 60% ironstone, gravel up to 25mm diameter				
				E									
				E									
						1.0			CLAY: low to medium plasticity, grey to yellow, mottled orange, traces of ironstone	M	F		RESIDUAL SOIL
									CLAY: low to medium plasticity, grey to yellow, mottled orange, traces of ironstone				
				E					Becoming grey with depth				
						1.5							
									Borehole BH120 terminated at 1.5m				
						2.0							
method				support		notes, samples, tests				classification symbols and soil description		consistency/density index	
AS auger screwing*				M mud N nil		U ₅₀ undisturbed sample 50mm diameter				based on unified classification system		VS very soft	
AD auger drilling*				C casing		U ₆₃ undisturbed sample 63mm diameter						S soft	
RR roller/tricone				penetration		D disturbed sample						F firm	
W washbore				1 2 3 4		N standard penetration test (SPT)						St stiff	
CT cable tool				no resistance ranging to refusal		N* SPT - sample recovered						VSt very stiff	
HA hand auger						Nc SPT with solid cone						H hard	
DT diatube						V vane shear (kPa)						Fb friable	
B blank bit						P pressuremeter						VL very loose	
V V bit						Bs bulk sample						L loose	
T TC bit						E environmental sample						MD medium dense	
*bit shown by suffix e.g. ADT						R refusal						D dense	
												VD very dense	

Borehole No. **HA127**

Engineering Log - Borehole

Client: **NSW Health**

Principal:

Project: **Royal North Shore Hospital**

Borehole Location:

Sheet 1 of 1

Office Job No.: **ENVILCOV00298AA**

Date started: **28.11.2006**

Date completed: **28.11.2006**

Logged by: **AD**

Checked by: **SD**

drill model and mounting:						Easting:		slope: -90°		R.L. Surface:									
hole diameter: mm						Northing		bearing:		datum: AHD									
drilling information							material substance												
method	penetration 1 2 3			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa 100 200 300 400				structure and additional observations	
HA				None observed		E					FILL: SANDY SILT: Low liquid limit, dark brown, fine to medium grained sand, with grass ond rootlets on surface	D					FILL		
						E					FILL: SILTY SAND: fine to medium grained, dark brown, low liquid limit silt, woth traces of terracotta fragments up to 50mm	M							
						E		0.5			FILL: SAND: fine to medium grained, grey brown, with traces of sandstone fragments up to 80mm diameter								
							1.0			Borehole HA127 terminated at 0.7m						Refusal on sandstone in fill			
method						support		N nil		notes, samples, tests				classification symbols and soil description				consistency/density index	
AS auger screwing*						M mud				U ₅₀ undisturbed sample 50mm diameter				based on unified classification system				VS very soft	
AD auger drilling*						C casing				U ₆₃ undisturbed sample 63mm diameter								S soft	
RR roller/tricone										D disturbed sample								F firm	
W washbore										N standard penetration test (SPT)								St stiff	
CT cable tool										N* SPT - sample recovered								VSt very stiff	
HA hand auger										Nc SPT with solid cone								H hard	
DT diatube										V vane shear (kPa)								Fb friable	
B blank bit										P pressuremeter								VL very loose	
V V bit										Bs bulk sample				moisture				L loose	
T TC bit										E environmental sample				D dry				MD medium dense	
*bit shown by suffix e.g. ADT										R refusal				M moist				D dense	
														Wp plastic limit				VD very dense	
														WL liquid limit					

Borehole No. **HA129**

Sheet 1 of 1

Office Job No.: **ENVILCOV00298AA**

Date started: **28.11.2006**

Date completed: **28.11.2006**

Logged by: **AD**

Checked by: **SD**

Engineering Log - Borehole

Client: **NSW Health**

Principal:

Project: **Royal North Shore Hospital**

Borehole Location:

drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations
1	2	3											
HA				E					FILL: SANDY SILT: low liquid limit, dark brown, fine to medium grained sand, grass and rootlets at surface	D			FILL
									FILL: SILTY SAND: fine to medium grained, dark brown, low liquid limit silt, with traces of sandstone fragments up to 35mm diameter (<5%)	M			
				E									
				E									
						0.5			FILL: SAND: fine to medium grained, grey brown, with traces of sandstone fragments up to 65mm diameter(<5%)				
									Borehole HA129 terminated at 0.6m				Refusal on sandstone in fill
						1.0							

method		support		notes, samples, tests		classification symbols and soil description		consistency/density index	
AS	auger screwing*	M	mud	U ₅₀	undisturbed sample 50mm diameter	based on unified classification system		VS	very soft
AD	auger drilling*	C	casing	U ₆₃	undisturbed sample 63mm diameter			S	soft
RR	roller/tricone			D	disturbed sample			F	firm
W	washbore			N	standard penetration test (SPT)			St	stiff
CT	cable tool			N*	SPT - sample recovered			VSt	very stiff
HA	hand auger			Nc	SPT with solid cone			H	hard
DT	diatube			V	vane shear (kPa)			Fb	friable
B	blank bit			P	pressuremeter			VL	very loose
V	V bit			Bs	bulk sample			L	loose
T	TC bit			E	environmental sample			MD	medium dense
*bit shown by suffix e.g. ADT				R	refusal			D	dense
								VD	very dense

Borehole No. **HA132**

Sheet 1 of 1
Office Job No.: **ENVILCOV00298AA**

Engineering Log - Borehole

Client: **NSW Health**

Date started: **28.11.2006**

Principal:

Date completed: **28.11.2006**

Project: **Royal North Shore Hospital**

Logged by: **AD**

Borehole Location:

Checked by: **SD**

drill model and mounting:		Easting:		slope: -90°		R.L. Surface:							
hole diameter: mm		Northing		bearing:		datum: AHD							
drilling information				material substance									
method	penetration 1 2 3	support water	notes samples, tests, etc	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa 100 200 300 400	structure and additional observations		
HA			E HADUP1A				FILL: SANDY SILT: low liquid limit, dark brown, fine to medium grained sand, grass and rootlets at surface	D			FILL		
		None Observed	E HADUP2A				FILL: SILTY SAND: fine to medium grained, dark brown, with traces of sandstone fragments up to 80mm diameter (<5%)	M					
				0.5			Borehole HA132 terminated at 0.4m				Refusal on sandstone in fill		
				1.0									
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT			support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow			notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal			classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit			consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	

Engineering Log - Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Base of Building 51 Access Ramp**

Borehole ID. **BH202**

sheet: 1 of 4

project no. **GEOTLCOV25684AB**

date started: **12 Nov 2016**

date completed: **12 Nov 2016**

logged by: **PH**

checked by: **BW**

position: E: 332,740.0; N: 6,256,008.0 (MGA56) surface elevation: 78.0 m (AHD)

surface elevation: 78.0 m (AHD)

angle from horizontal: 90°

drill model: Comacchio MCT200, Light Vehicle mounted

drilling fluid: Water

casing diameter : HQ

drilling information						material substance														
method & support	1 penetration	2 water	3 samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations								
DT HA AD/T			E	78	1.0		CH	FILL: ASPHALTIC CONCRETE: aggregate in asphalt.	M	VSt		ASPHALT FILL								
			E																	
			E																	
			SPT 4, 3, 5 N*=8																	
			E																	
				77				Gravelly Silty CLAY: medium plasticity, red brown and orange brown, gravel is subrounded to subangular, fine to coarse siltstone, trace of rootlets.	~Wp			RESIDUAL SOIL								
				76	2.0		CH	Sandy CLAY: high plasticity, pale grey mottled red and orange, sand is fine to medium grained.												
				75	3.0			SANDSTONE: fine to medium grained, pale grey, extremely weathered, estimated very low strength.				WEATHERED ROCK								
			SPT 22, 10/40mm N*=R					From 3.0 m: fine grained												
			E																	
				74	4.0			Borehole BH202 continued as cored hole												
				73	5.0															
				72	6.0															
				71	7.0															
method AD auger drilling* AS auger screwing* HA hand auger WA washbore DT diatube HA hand auger * bit shown by suffix e.g. AD/T B blank bit T TC bit V V hit						support M mud C casing N nil penetration no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow		samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing		classification symbol & soil description based on Unified Classification System moisture D dry M moist Wp wet Wp plastic limit WI liquid limit		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense								

Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Base of Building 51 Access Ramp**

Borehole ID. **BH202**

sheet: 3 of 4

project no. **GEOTLCOV25684AB**

date started: **12 Nov 2016**

date completed: **12 Nov 2016**

logged by: **PH**

checked by: **BW**

position: E: 332,740.0; N: 6,256,008.0 (MGA56) surface elevation: 78.0 m (AHD) angle from horizontal: 90°
drill model: Comacchio MCT200, Light Vehicle mounted drilling fluid: Water casing diameter: HQ vane id.:

drilling information				material substance				rock mass defects				
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)	
						VL L M H VH EH				30 100 300 1000 3000	particular	general
					SANDSTONE: medium grained, pale grey, distinctly to indistinctly cross bedded at 0-15°. (continued)	SW - FR	X	a=0.67 d=0.88	97%		JT, 20°, PL, RO, Fe CO	
			69	9.0			O	a=0.68 d=0.66				
			68	10.0	10.20 to 10.82 m: massive bedding		O	a=0.79 d=0.73	91%			
			67	11.0	11.30 to 11.40 m: interlaminated sandstone and siltstone 11.60 to 11.70 m: silty laminae		X	a=1.17 d=0.83			SM, 75°, PL, Clay SM, 15°, PL, Clay SM, 0°, PL, Clay	
			66	12.0			X	a=0.31 d=0.58			SM, 20°, PL, Clay JT, 90°, PL, RO, CN JT, 90°, PL, RO, CN JT, 90°, PL, RO, CN XW material with soil properties	
			65	13.0	NO CORE: 0.40 m						JT, 70°, PL, RO, CN XW material with soil properties JT, 80°, PL, RO, CN JT, 75°, PL, RO, CN JT, 90°, PL, RO, CN JT, 15°, PL, RO, CN SM, 20°, IR, sand, 20mm JT, 30°, PL, RO, CN JT, 20°, PL, RO, CN JT, 20°, PL, RO, CN JT, 20°, PL, RO, CN SM, 20°, PL, RO, Clay, 10mm SM, 45°, IR, clayey sand, 90mm XW material with soil properties	
			64	14.0		FR	O	a=0.12 d=0.40	36%			
					NO CORE: 0.51 m			a=0.07 d=0.04				
			63	15.0	SANDSTONE: fine grained, pale grey and grey, distinctly laminated at 5°. SANDSTONE: medium grained, pale grey, indistinctly cross bedded at 0-15° to massive.	FR			98%		JT, 20°, PL, RO, CN SM, 10°, PL, XW, 50mm	
method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test DT diatube HA hand auger				water 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown 25uL		graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)		weathering & alteration* RS residual soil XW extremely weathered HW highly weathered DW distinctly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high		defect type PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating		

Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Base of Building 51 Access Ramp**

Borehole ID. **BH202**

sheet: 4 of 4

project no. **GEOTLCOV25684AB**

date started: **12 Nov 2016**

date completed: **12 Nov 2016**

logged by: **PH**

checked by: **BW**

position: E: 332,740.0; N: 6,256,008.0 (MGA56)				surface elevation: 78.0 m (AHD)				angle from horizontal: 90°																							
drill model: Comacchio MCT200, Light Vehicle mounted				drilling fluid: Water				casing diameter : HQ				vane id.:																			
drilling information				material substance						rock mass defects																					
method & support		water		RL (m)		depth (m)		graphic log		material description				weathering & alteration		estimated strength & Is50		samples, field tests & Is(50) (MPa)		core run & RQD		defect spacing (mm)		additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)							
										ROCK TYPE: grain characteristics, colour, structure, minor components						X = axial; O = diametral a = axial; d = diametral		a = axial; d = diametral						particular				general			
NMLC				61		17.0				SANDSTONE: medium grained, pale grey, indistinctly cross bedded at 0-15° to massive. (continued)				FR				a=0.87 d=0.95 a=1.39 d=1.25		98%											
				60		18.0				Borehole BH202 terminated at 17.90 m																					
				59		19.0																									
				58		20.0																									
				57		21.0																									
				56		22.0																									
				55		23.0																									
method & support				water				graphic log / core recovery				weathering & alteration*				defect type				planarity											
AS auger screwing				10/10/12, water level on date shown				core recovered (graphic symbols indicate material)				RS residual soil				PT parting				PL planar											
AD auger drilling				water inflow				no core recovered				XW extremely weathered				JT joint				CU curved											
CB claw or blade bit				complete drilling fluid loss				core run & RQD				HW highly weathered				SZ shear zone				UN undulating											
W washbore				partial drilling fluid loss				barrel withdrawn				DW distinctly weathered				SS shear surface				ST stepped											
NMLC NMLC core (51.9 mm)								RQD = Rock Quality Designation (%)				MW moderately weathered				CO contact				IR Irregular											
NQ wireline core (47.6mm)												SW slightly weathered				CS crushed seam															
HQ wireline core (63.5mm)												FR fresh				SM seam															
PQ wireline core (85.0mm)												*W replaced with A for alteration																			
SPT standard penetration test												strength				roughness				coating											
DT diatube												VL very low				SL slickensided				CN clean											
HA hand auger												L low				POL polished				SN stain											
												M medium				SO smooth				VN veneer											
												H high				RO rough				CO coating											
												VH very high				VR very rough															
												FH extremely high																			

Piezometer Installation Log

principal:

location: **Site 4a - Base of Building 51 Access Ramp**

sheet: 1 of 1

date started: **12 Nov 2016**

date completed: **12 Nov 2016**

logged by: **PH**

checked by: **BW**

surface elevation: 78.0 m (AHD)

angle from horizontal: 90°

equipment type: Comacchio MCT200, Light Vehicle mounted drilling fluid: Water

casing diameter : HQ

drilling information				material substance		piezometer construction details				
method & support	water	RL (m)	depth (m)	graphic log	material name					
H/A ADT NMLC					ASPHALT	BH202 </				

Engineering Log - Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Forsyth Place - Building 51**

Borehole ID. **BH203**

sheet: 1 of 4

project no. **GEOTLCOV25684AB**

date started: **19 Nov 2016**

date completed: **19 Nov 2016**

logged by: **BW**

checked by: **RT**

position: E: 332,754.0; N: 6,255,989.0 (MGA56)

surface elevation: 76.3 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 205, Track mounted

drilling fluid: Water

casing diameter: HQ

drilling information						material substance							
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
ADV CASING	1 2 3							FILL: ASPHALT: black, angular gravel. FILL: Sandy Silty CLAY: low plasticity, brown, grey red, orange, sand is fine to medium grained, trace of fine to medium gravel, rootlets and ash.	D			ASPHALT FILL	
			E	-76									
			E										
			E		1.0							Duplicate sample	
			SPT 2, 2, 4 N*=6	-75									
			E										
					2.0		CH	Silty CLAY: high plasticity, light brown with yellow and grey mottling, trace of fine grained sand. Black fibrous wood throughout.	>Wp	St		RESIDUAL SOIL	
			SPT 2, 2, 5 N*=7	-74				CH	Silty CLAY: high plasticity, red-brown and brown, trace of fine grained sand and fine to medium grained, angular ironstone gravel.				
					3.0								
					-73								
			E	-72				SANDSTONE: fine to medium grained, pale grey and red-brown, extremely weathered, estimated very low to low strength.				WEATHERED ROCK	
			SPT 25/60mm N*=R					Borehole BH203 continued as cored hole					
</													

Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Forsyth Place - Building 51**

Borehole ID. **BH203**

sheet: 2 of 4

project no. **GEOTLCOV25684AB**

date started: **19 Nov 2016**

date completed: **19 Nov 2016**

logged by: **BW**

checked by: **RT**

position: E: 332,754.0; N: 6,255,989.0 (MGA56) surface elevation: 76.3 m (AHD) angle from horizontal: 90°
drill model: Comacchio 205, Track mounted drilling fluid: Water casing diameter: HQ vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
		-76									
			1.0								
		-75									
			2.0								
		-74									
			3.0								
		-73									
			4.0		started coring at 4.10m						
		-72			SANDSTONE: fine to medium grained, pale red and pale grey, indistinctly bedded at 0-10°, with red and dark red ferruginous bands.	XW MW		a=0.35 d=0.31			XW, soil properties
			5.0								JT, 40°, PL, RO, CN
		-71									SM, XW, 30mm
			6.0					a=0.73 d=0.70	75%		SM, XW, 10mm
		-70									JT, 40°, PL, RO, CN
			7.0		SANDSTONE: fine to medium grained, grey, massive to indistinctly bedded.	FR		a=0.46 d=0.68			PT, 20°, PL, RO, trace Fe SN
		-69									PT, 5°, PL, RO, trace Fe SN
								a=0.72 d=0.43	99%		SM, 30°, XW, 70mm
											SM, 20°, PL, XW, 80mm
											JT, 5 - 10°, UN, Fe healed

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test DT diatube HA hand auger	water 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown	graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil XW extremely weathered HW highly weathered DW distinctly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high	defect type PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Forsyth Place - Building 51**

Borehole ID. **BH203**

sheet: 3 of 4

project no. **GEOTLCOV25684AB**

date started: **19 Nov 2016**

date completed: **19 Nov 2016**

logged by: **BW**

checked by: **RT**

position: E: 332,754.0; N: 6,255,989.0 (MGA56) surface elevation: 76.3 m (AHD) angle from horizontal: 90°
drill model: Comacchio 205, Track mounted drilling fluid: Water casing diameter: HQ vane id.:

drilling information			material substance			rock mass defects		
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa) a = axial d = diametral
		-68			SANDSTONE: fine to medium grained, grey, distinctly bedded at 10°, trace silty laminae.	FR		
			9.0		SANDSTONE: medium to coarse grained, grey, distinctly bedded at 10-20°, trace silty laminae and siltstone clasts.			a=0.65 d=0.33 99%
		-67						
			10.0					a=1.75 d=1.54
		-66						
			11.0			SW - MW		a=1.35 d=0.99
		-65				FR		
			12.0					a=0.94 d=0.60
		-64						
			13.0			SW - MW		a=0.79 d=0.73
		-63			SANDSTONE: medium grained, grey, massive to indistinctly bedded.	FR		
			14.0					a=0.27 d=0.43
		-62			SANDSTONE: fine grained, grey, distinctly bedded at 0-10°, trace silty laminae.			
			15.0					a=0.84 d=0.80
		-61			SANDSTONE: medium to coarse grained, distinctly bedded at 0-20°.			a=1.54 d=1.31

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test DT diatube HA hand auger	water 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown	graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil XW extremely weathered HW highly weathered DW distinctly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high	defect type PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Forsyth Place - Building 51**

Borehole ID. **BH203**

sheet: 4 of 4

project no. **GEOTLCOV25684AB**

date started: **19 Nov 2016**

date completed: **19 Nov 2016**

logged by: **BW**

checked by: **RT**

position: E: 332,754.0; N: 6,255,989.0 (MGA56)

surface elevation: 76.3 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 205, Track mounted

drilling fluid: Water

casing diameter : HQ

vane id.:

drilling information				material substance		rock mass defects													
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50)				samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)				additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)		
							VL	L	M	H			FH	30	100	300	1000	3000	particular
NMLC		-60			SANDSTONE: medium to coarse grained, distinctly bedded at 0-20°. (continued)	FR	VL	L	M	H	FH	96%	30	100	300	1000	3000	JT, 30°, PL, RO, CN	
		-59	17.0																
		-58	18.0																
		-57	19.0		Borehole BH203 terminated at 19.00 m														
		-56	20.0																
		-55	21.0																
		-54	22.0																
		-53	23.0																
method & support				water		graphic log / core recovery				weathering & alteration*				defect type		planarity			
AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test DT diatube HA hand auger				10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss 25uL water pressure test result (lugeons) for depth interval shown		core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)				RS residual soil XW extremely weathered HW highly weathered DW distinctly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high FH extremely high				PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam		PL planar CU curved UN undulating ST stepped IR Irregular			
														roughness		coating			
														SL slickensided POL polished SO smooth RO rough VR very rough		CN clean SN stain VN veneer CO coating			

Engineering Log - Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Corner of Forsyth Place and Reserve Road - Building 51**

Borehole ID. **BH204**

sheet: 1 of 4

project no. **GEOTLCOV25684AB**

date started: **26 Nov 2016**

date completed: **26 Nov 2016**

logged by: **PH**

checked by: **BW**

position: E: 332,714.0; N: 6,255,965.0 (MGA56)

surface elevation: 78.9 m (AHD)

angle from horizontal: 90°

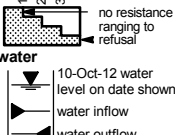
drill model: Comacchio 205, Track mounted

drilling fluid: Water

casing diameter: HW

drilling information					material substance									
method & support	1 penetration	2 penetration	3 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
AD/T HW casing					E					ASPHALT: dark grey.	M			PAVEMENT
					E					FILL: Sandy GRAVEL: fine to medium grained, sub-angular to angular, dark grey, sand is fine to coarse grained, with some fines.				FILL
					E					FILL: Gravelly SAND: fine to coarse grained, yellow-grey, sub-rounded to sub-angular, fine to coarse grained gravel with some sandstone cobbles.	<Wp	VSt		RESIDUAL SOIL
					E	78	1.0		CH	FILL: Silty Sandy GRAVEL: fine to medium grained, angular, dark grey, fine to coarse grained sand.				
					SPT 2, 1, 4 N*=5					Gravelly Silty CLAY: high plasticity, mottled red, orange and pale grey, sub-angular to angular, fine to medium grained ironstone gravel.	>Wp	F / St		
						77	2.0							
					SPT 1, 2, 1 N*=3									
						76	3.0							
					E									
					SPT 10, 20/50mm N*=R	75	4.0			SANDSTONE: medium grained, pale grey, red and orange, extremely weathered, estimated very low strength.				WEATHERED ROCK
										Borehole BH204 continued as cored hole				
						74	5.0							
						73	6.0							
						72	7.0							
						71								

method AD auger drilling* AS auger screwing* HA hand auger W washbore DT diatube HA hand auger	support M mud C casing	penetration water 10-Oct-12 water level on date shown water inflow water outflow	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet Wp plastic limit WI liquid limit					

method AD auger drilling* AS auger screwing* HA hand auger W washbore DT diatube HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
penetration 	water 10-Oct-12 water level on date shown water inflow water outflow	moisture D dry M moist W wet Wp plastic limit WI liquid limit		

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Corner of Forsyth Place and Reserve Road - Building 51**

Borehole ID. **BH204**

sheet: 2 of 4

project no. **GEOTLCOV25684AB**

date started: **26 Nov 2016**

date completed: **26 Nov 2016**

logged by: **PH**

checked by: **BW**

position: E: 332,714.0; N: 6,255,965.0 (MGA56)

surface elevation: 78.9 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 205, Track mounted

drilling fluid: Water

casing diameter : HW

vane id.:

drilling information				material substance				rock mass defects									
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50)				samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)			
							VL	L	M	H				FH	particular	general	
		-78	1.0														
		-77	2.0														
		-76	3.0														
		-75	4.0														
					started coring at 4.35m												
		-74	5.0		SANDSTONE: medium grained, pale grey, red and orange.	XW / HW				a=0.03				XW material with soil properties			
					NO CORE: 1.35 m									XW material with soil properties			
		-73	6.0							54%							
					SANDSTONE: medium grained, pale grey, red and orange.	HW				a=0.23 d=0.10							
		-72	7.0														
						XW				a=0.05 d=0.08				XW material with soil properties			
		-71								57%							
method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test DT diatube HA hand auger				water 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown		graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)				weathering & alteration* RS residual soil XW extremely weathered HW highly weathered DW distinctly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high FH extremely high				defect type PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating			
															Defects are: PT, 0 - 20°, PL, RO, CN, unless otherwise described		

Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Corner of Forsyth Place and Reserve Road - Building 51**

Borehole ID. **BH204**

sheet: 3 of 4

project no. **GEOTLCOV25684AB**

date started: **26 Nov 2016**

date completed: **26 Nov 2016**

logged by: **PH**

checked by: **BW**

position: E: 332.714.0: N: 6.255.965.0 (MGA56)

surface elevation: 78.9 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 205. Track mounted

drilling fluid: Water

casing diameter : HW

vane id.:

drilling information				material substance		rock mass defects					
method & support	water	RL (m)	depth (m)	graphic log	ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) X = axial; O = diametral a = axial; d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
		-70	9.0		SANDSTONE: medium to coarse grained, pale grey, indistinctly bedded at 5° to massive. <i>(continued)</i>	MW		a=0.17 d=0.26	57%		SM, 5°, XW, 50mm
					8.80 to 9.40 m: with distint silty laminae at 5°			a=0.31 d=0.19			
		-69	10.0			SW		a=0.68 d=0.94			SM, 5°, PL, Clay, 20 mm
									98%		SM, 5°, PL, Clay, 20 mm
		-68	11.0					a=0.62 d=0.48			
					SANDSTONE: fine grained, pale grey, distinct dark grey silty laminae at 0-10°.			a=0.25 d=0.34			JT, 60°, PL, RO, CN
		-67	12.0		SANDSTONE: coarse grained, pale grey mottled red-brown.	MW		a=0.89 d=0.67			SM, 5°, PL, XW, 70mm
					SANDSTONE: fine to medium grained, pale grey, distinct dark grey silty laminae at 0-5°.	SW / FR					
		-66	13.0		SANDSTONE: medium to coarse grained, pale grey, indistinctly cross-bedded at 5-20°.			a=0.47 d=0.42			SM, 5°, PL, XW, 20mm
									52%		
		-65	14.0					a=1.46 d=1.24			Highly fractured / XW material
											Highly fractured / XW material
		-64	15.0					a=0.34 d=0.64			JT, 20 - 30°, PL, Clay
					15.00 to 15.70 m: with some shale laminae and thin interbeds						Highly fractured / XW material
											SM, 5°, PL, Clay, 10 mm
											SM, 5°, XW, 40 mm
		-63						a=0.10 d=0.11 a=0.29 d=0.56	93%		JT, 80 - 90°, CU, RO, CN
method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test DT diatube HA hand auger				water 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown 25UL		graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)		weathering & alteration* RS residual soil XW extremely weathered HW highly weathered DW distinctly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high FH extremely high		defect type PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough planarity PL planar CU curved UN undulating ST stepped IR Irregular coating CN clean SN stain VN veneer CO coating	
Defects are: PT, 0 - 20° PL, RO, CN, unless otherwise described											

Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Corner of Forsyth Place and Reserve Road - Building 51**

Borehole ID. **BH204**

sheet: 4 of 4

project no. **GEOTLCOV25684AB**

date started: **26 Nov 2016**

date completed: **26 Nov 2016**

logged by: **PH**

checked by: **BW**

position: E: 332,714.0; N: 6,255,965.0 (MGA56)

surface elevation: 78.9 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 205, Track mounted

drilling fluid: Water

casing diameter : HW

vane id.:

drilling information				material substance		rock mass defects					
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) X = axial; O = diametral a = axial; d = diametral	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
NMILC		-62	17.0		SANDSTONE: medium to coarse grained, pale grey, indistinctly cross-bedded at 5-20°. (continued) 16.50 m: medium grained rounded quartz gravel inclusions	SW / FR	X O	a=0.82 d=0.90 a=2.07 d=2.87	93%	30 100 300 1000 3000	particular
		-61	18.0		Borehole BH204 terminated at 18.00 m						general
		-60	19.0								
		-59	20.0								
		-58	21.0								
		-57	22.0								
		-56	23.0								
		-55									
method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMILC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test DT diatube HA hand auger		water 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss 25uL water pressure test result (lugeons) for depth interval shown		graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)		weathering & alteration* RS residual soil XW extremely weathered HW highly weathered DW distinctly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high FH extremely high		defect type PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough		planarity PL planar CU curved UN undulating ST stepped IR Irregular coating CN clean SN stain VN veneer CO coating	

Piezometer Installation Log

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Corner of Forsyth Place and Reserve Road - Building 51**

Hole ID. **BH204**

sheet: 1 of 1

project no. **GEOTLCOV25684AB**

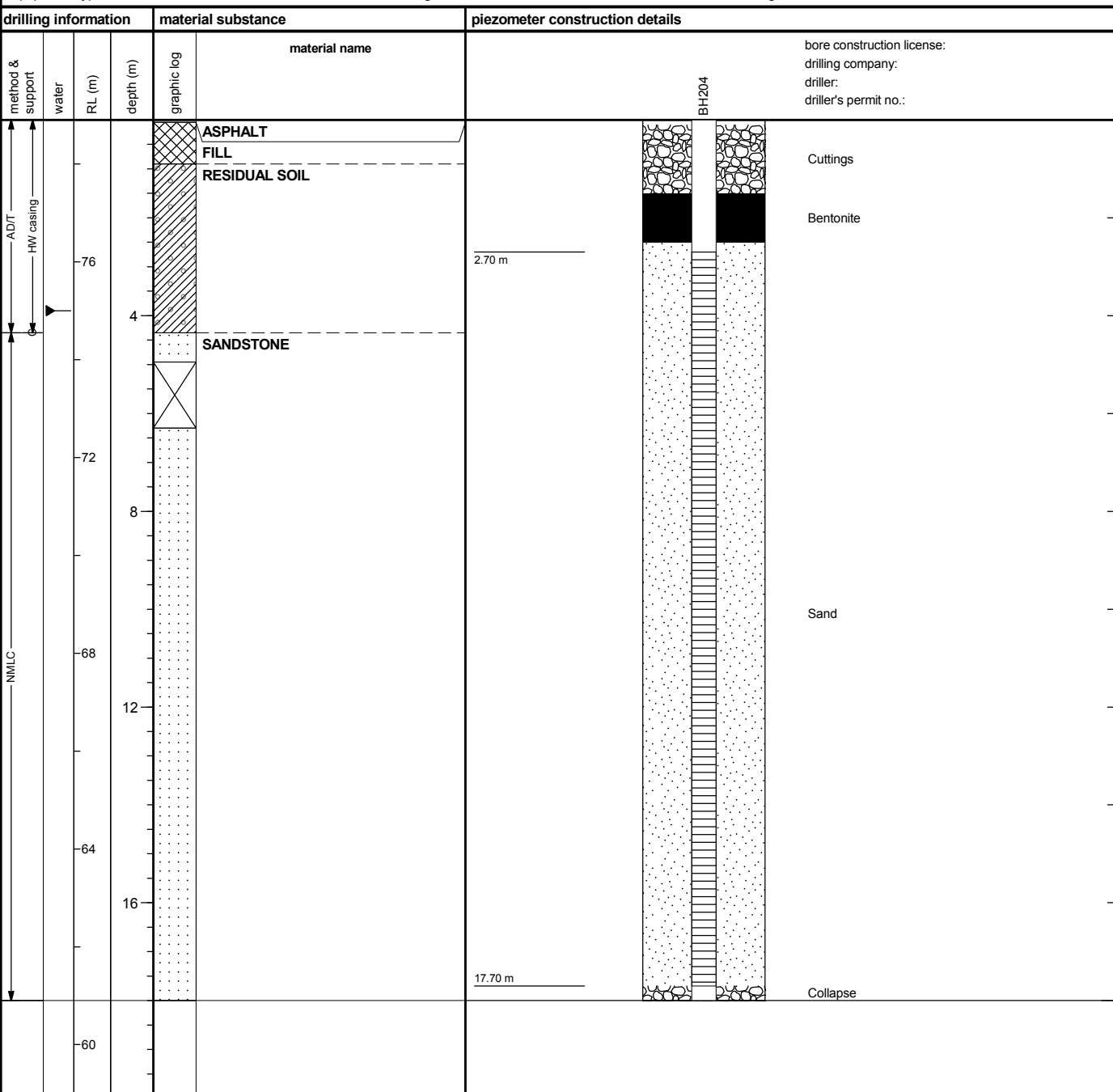
date started: **26 Nov 2016**

date completed: **26 Nov 2016**

logged by: **PH**

checked by: **BW**

position: E: 332,714.0; N: 6,255,965.0 (MGA56) surface elevation: 78.9 m (AHD) angle from horizontal: 90°
equipment type: Comacchio 205, Track mounted drilling fluid: Water casing diameter: HW



method & support	graphic log / core recovery	ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD)
see engineering log for details								stickup tip water level
10-Oct-12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown	core recovered (graphic symbols indicate material) no core recovered	BH204	standpipe piezo.			18.00 m		60.90

Engineering Log - Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Adjacent to Building 52 Undercroft**

Borehole ID. **BH205**

sheet: 1 of 4

project no. **GEOTLCOV25684AB**

date started: **16 Nov 2016**

date completed: **16 Nov 2016**

logged by: **RT**

checked by: **BW**

position: E: 332,683.0; N: 6,255,997.0 (MGA56)

surface elevation: 80.5 m (AHD)

angle from horizontal: 90°

drill model: Comacchio 205, Track mounted

drilling fluid: Water

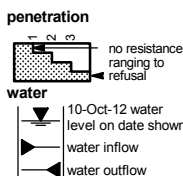
casing diameter : HWT

drilling information					material substance							
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
DT ADV	1 2 3		E	80	1.0		CH	CONCRETE: grey, with aggregate up to 20 mm.	M	VSt - H	100 200 300 400	CONCRETE
								FILL: Gravelly SAND: fine to medium grained, grey, brown, fine to coarse sub-rounded to sub-angular gravel, with some clay and trace of rootlets.				FILL
								Gravelly CLAY: high plasticity, orange, brown, fine to coarse sub-rounded to sub-angular gravel.				RESIDUAL SOIL
								Silty CLAY: medium plasticity, pale grey.				
								SANDSTONE: fine grained, pale grey and orange, with clay bands, extremely weathered, estimated very low strength.				
			SPT 4, 5, 8 N*=13	79	2.0		CH					EXTREMELY WEATHERED ROCK
			SPT 9, 9, 17 N*=26	78	3.0		CH					
			SPT 7, 9, 11 N*=20	77	4.0							
				76	5.0							
				75	6.0							
				74	7.0							
				73								

method AD auger drilling* AS auger screwing* HA hand auger WA washbore DT diatube HA hand auger	support M mud C casing penetration no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System moisture D dry M moist W wet Wp plastic limit WI liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
--	---	--	--	--

method	support	samples & field tests	classification symbol & soil description	consistency / relative density
AD auger drilling*	M mud	B bulk disturbed sample	based on Unified Classification System	VS very soft
AS auger screwing*	C casing	D disturbed sample		S soft
HA hand auger		E environmental sample		F firm
W washbore		SS split spoon sample		St stiff
DT diatube		U## undisturbed sample ##mm diameter		VSt very stiff
HA hand auger		HP hand penetrometer (kPa)		H hard
		N standard penetration test (SPT)		Fb friable
		N* SPT - sample recovered		VL very loose
		Nc SPT with solid cone		L loose
		VS vane shear; peak/remoulded (kPa)		MD medium dense
		R refusal		D dense
		HB hammer bouncing		VD very dense

* bit shown by suffix
e.g. AD/T
B blank bit
T TC bit
V V bit



Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Adjacent to Building 52 Undercroft**

Borehole ID. **BH205**

sheet: 2 of 4

project no. **GEOTLCOV25684AB**

date started: **16 Nov 2016**

date completed: **16 Nov 2016**

logged by: **RT**

checked by: **BW**

position: E: 332,683.0; N: 6,255,997.0 (MGA56) surface elevation: 80.5 m (AHD) angle from horizontal: 90°
drill model: Comacchio 205, Track mounted drilling fluid: Water casing diameter: HWT vane id.:

drilling information				material substance		rock mass defects										
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50					samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)	
							VL	L	M	H	VH				EH	a = axial; O = diametral
			80													
			1.0													
			79													
			2.0													
			78													
			3.0													
			77													
			4.0													
			76													
			5.0													
			75													
			6.0		started coring at 5.85m											
			74		NO CORE: 0.11 m	HW										PT, 0°, CU, RO, CN
			7.0		SANDSTONE: medium grained, red, pale grey, distinctly bedded at 0-10°, 1-5mm, trace of siltstone laminae.					a=0.60 d=0.52	77%					PT, 0°, CU, RO, CN
			73		SANDSTONE: fine to medium grained, pale grey, distinctly bedded at 0-10°, 10-30mm, trace of cross bedding with some siltstone laiminae.	SW - FR				a=0.39 d=0.55	93%					PT, 0°, CU, RO, X CO
method & support				water		graphic log / core recovery		weathering & alteration*				defect type		planarity		
AS auger screwing				10/10/12, water level on date shown		core recovered (graphic symbols indicate material)		RS residual soil				PT parting		PL planar		
AD auger drilling				water inflow		no core recovered		XW extremely weathered				JT joint		CU curved		
CB claw or blade bit				complete drilling fluid loss				HW highly weathered				SZ shear zone		UN undulating		
W washbore				partial drilling fluid loss				DW distinctly weathered				SS shear surface		ST stepped		
NMLC NMLC core (51.9 mm)								MW moderately weathered				CO contact		IR Irregular		
NQ wireline core (47.6mm)								SW slightly weathered				CS crushed seam				
HQ wireline core (63.5mm)								FR fresh				SM seam				
PQ wireline core (85.0mm)								*W replaced with A for alteration								
SPT standard penetration test								strength								
DT diatube								VL very low								
HA hand auger				water pressure test result (lugeons) for depth interval shown		core run & RQD		L low				roughness		coating		
				25uL		barrel withdrawn		M medium				SL slickensided		CN clean		
						RQD = Rock Quality Designation (%)		H high				POL polished		SN stain		
								VH very high				SO smooth		VN veneer		
								EH extremely high				RO rough		CO coating		
												VR very rough				

Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Adjacent to Building 52 Undercroft**

Borehole ID. **BH205**

sheet: 3 of 4

project no. **GEOTLCOV25684AB**

date started: **16 Nov 2016**

date completed: **16 Nov 2016**

logged by: **RT**

checked by: **BW**

position: E: 332,683.0; N: 6,255,997.0 (MGA56) surface elevation: 80.5 m (AHD) angle from horizontal: 90°
drill model: Comacchio 205, Track mounted drilling fluid: Water casing diameter: HWT vane id.:

drilling information				material substance				rock mass defects					
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) X = axial O = diametral a = axial, d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)		
							VL L M H VH EH				particular	general	
			-72		SANDSTONE: fine to medium grained, pale grey, distinctly bedded at 0-10°, 10 -30mm, trace of cross bedding with some siltstone laminae. (continued)	SW - FR		a=0.54 d=0.56	93%				
			-71						a=0.89 d=0.88				100%
			-70						a=0.95 d=1.05				
			-69						a=1.15 d=1.14				100%
			-68						a=1.07 d=1.18				100%
			-67		SANDSTONE: coarse grained, pale grey, distinctly bedded at 0-5°, 1-5mm.			a=1.07 d=0.83			CS, PL, 20 mm		
			-66		SANDSTONE: fine to medium grained, pale grey, distinctly bedded at 0-10°, 10 -30mm, trace of cross bedding with some siltstone laminae.				99%		CS, 20 mm		
					SILTSTONE: grey, laminated, with trace of sandstone bands.			a=0.55 d=0.98					
					SANDSTONE: fine to medium grained, pale grey, distinctly bedded at 0-10°, 10-20mm.								
					SILTSTONE: grey, laminated, with trace of sandstone bands.								
			-65		SANDSTONE: fine to medium grained, pale grey, distinctly bedded at 0-10°, 10-20mm, with some siltstone laminae.			a=0.83 d=0.97	100%				
method & support				water		graphic log / core recovery		weathering & alteration*		defect type		planarity	
AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test DT diatube HA hand auger				10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown		core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)		RS residual soil XW extremely weathered HW highly weathered DW distinctly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high		PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam		PL planar CU curved UN undulating ST stepped IR irregular	
								strength VL very low L low M medium H high VH very high EH extremely high		roughness SL slickensided POL polished SO smooth RO rough VR very rough		coating CN clean SN stain VN veneer CO coating	

Defects are: PT, 0 - 10°, PL, RO, CN, unless otherwise described

method & support

AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube
HA hand auger

water

10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
water pressure test result (lugeons) for depth interval shown

graphic log / core recovery

core recovered (graphic symbols indicate material)
no core recovered
core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*

RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration
strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type

PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

roughness

SL slickensided
POL polished
SO smooth
RO rough
VR very rough

planarity

PL planar
CU curved
UN undulating
ST stepped
IR irregular

coating

CN clean
SN stain
VN veneer
CO coating

Engineering Log - Cored Borehole

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Adjacent to Building 52 Undercroft**

Borehole ID. **BH205**

sheet: 4 of 4

project no. **GEOTLCOV25684AB**

date started: **16 Nov 2016**

date completed: **16 Nov 2016**

logged by: **RT**

checked by: **BW**

position: E: 332,683.0; N: 6,255,997.0 (MGA56)				surface elevation: 80.5 m (AHD)				angle from horizontal: 90°																			
drill model: Comacchio 205, Track mounted				drilling fluid: Water				casing diameter : HWT				vane id.:															
drilling information				material substance								rock mass defects															
method & support		water		RL (m)		depth (m)		graphic log		material description ROCK TYPE: grain characteristics, colour, structure, minor components				weathering & alteration		estimated strength & Is50 X = axial; O = diametral a = axial; d = diametral		samples, field tests & Is(50) (MPa) a = axial; d = diametral		core run & RQD		defect spacing (mm) 30 100 300 1000 3000		additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)			
NMLC				-64		17.0				SANDSTONE: fine to medium grained, pale grey, distinctly bedded at 0-10°, 10-20mm, with some siltstone laminae. (continued)				SW - FR				a=2.38 d=1.51		100%							
				-63		18.0				Borehole BH205 terminated at 18.06 m								a=1.48 d=1.23		99%							
				-62		19.0																					
				-61		20.0																					
				-60		21.0																					
				-59		22.0																					
				-58		23.0																					
				-57																							
method & support				water				graphic log / core recovery				weathering & alteration*				defect type				planarity							
AS auger screwing				10/10/12, water level on date shown				core recovered (graphic symbols indicate material)				RS residual soil				PT parting				PL planar							
AD auger drilling				water inflow				no core recovered				XW extremely weathered				JT joint				CU curved							
CB claw or blade bit				complete drilling fluid loss								HW highly weathered				SZ shear zone				UN undulating							
W washbore				partial drilling fluid loss								DW distinctly weathered				SS shear surface				ST stepped							
NMLCNMLC core (51.9 mm)												MW moderately weathered				CO contact				CS crushed seam							
NQ wireline core (47.6mm)												SW slightly weathered				SM seam											
HQ wireline core (63.5mm)												FR fresh															
PQ wireline core (85.0mm)												*W replaced with A for alteration															
SPT standard penetration test												strength															
DT diatube				25uL water pressure test result (lugeons) for depth interval shown				barrel withdrawn				VL very low				roughness				coating							
HA hand auger								RQD = Rock Quality Designation (%)				L low				SL slickensided				CN clean							
												M medium				POL polished				SN stain							
												H high				SO smooth				VN veneer							
												VH very high				RO rough				CO coating							
												FH extremely high				VR very rough											

Piezometer Installation Log

client: **Health Infrastructure c/o Savills Project Management Pty Ltd**

principal:

project: **Royal North Shore Hospital**

location: **Site 4a - Adjacent to Building 52 Undercroft**

Hole ID. **BH205**

sheet: 1 of 1

project no. **GEOTLCOV25684AB**

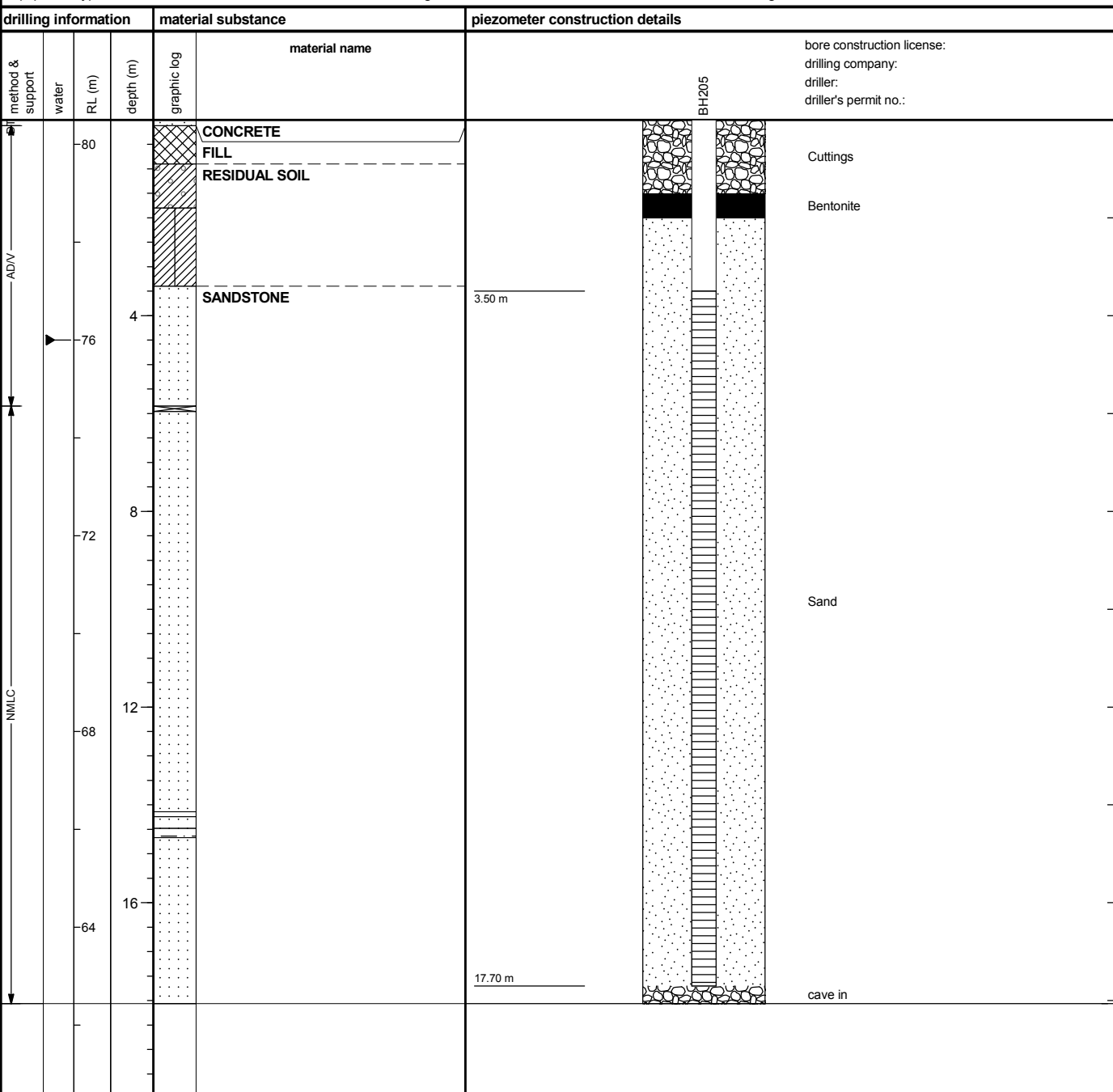
date started: **16 Nov 2016**

date completed: **16 Nov 2016**

logged by: **RT**

checked by: **BW**

position: E: 332,683.0; N: 6,255,997.0 (MGA56) surface elevation: 80.5 m (AHD) angle from horizontal: 90°
equipment type: Comacchio 205, Track mounted drilling fluid: Water casing diameter: HWT



method & support see engineering log for details	graphic log / core recovery	ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup tip water level
water 10-Oct-12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown	core recovered (graphic symbols indicate material) no core recovered	BH205	standpipe piezo.			17.70 m		62.80

Engineering Log - Environmental

Client: **Health Infrastructure c/o Savills Project Management**

Date started: **14.1.2017**

Principal:

Date completed: **14.1.2017**

Project: **Site 4A DSI - Royal North Shore Hospital**

Logged by: **JS**

Borehole Location: **Buildings 51 and 52**

Checked by: **FW**

drill model and mounting:	Geoprobe	Easting:	332718	slope:	-90°	R.L. Surface:
hole diameter:	125mm	Northing	6256019	bearing:		datum:

drilling information						material substance													
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter				structure and additional observations	
	1	2	3											100 kPa	200 kPa	300 kPa	400 kPa		
H&S						E (PID=7.1)		0.1			ASPHALT	D						No asbestos, odour or staining observed, common tree roots.	
						E (PID = 10.1) QD-02/QT-02		0.2			FILL: Sand, fine to medium grained, some medium to coarse grained, sub-angular gravels, dark brown-black, trace of clay and asphalt fragments, ash and glass.								Residual soils, no odour or staining observed.
SS								0.3		CL	Silty CLAY: medium-low plasticity, grey-white.							Weathered sandstone bedrock, no odour or staining observed.	
								0.4											
								0.5											
								0.6											
								0.7											
								0.8		SC	Clayey SAND: fine grained, dark brown-grey, trace of sub-angular gravels.								
								0.9											
								1.0											
								1.1											
								1.2											
								1.3											
								1.4											
								1.5											
								1.6		CL	Silty CLAY: low plasticity, grey-red, trace of fine grained sand.								
								1.7											
								1.8											
								1.9											
							E (PID=8.5)		2.0										
									2.1										
									2.2										
								2.3											
								2.4											
								2.5											
								2.6											
								2.7		ML	Clayey SILT: low plasticity, grey-white.								
								2.8											
								2.9											
						E (PID=5.5)		3.0											
								3.1											
								3.2											
								3.3			SANDSTONE: fine to medium grained, grey, trace of low plasticity clay.	M					Weathered sandstone bedrock, no odour or staining observed.		
								3.4											
								3.5											
								3.6											
								3.7											
								3.8											
								3.9											
						E (PID=4.4)		4.0											
								4.1			Borehole BHC101 terminated at 4m								
								4.2											
								4.3											
								4.4											
								4.5											
								4.6											
								4.7											
								4.8											
								4.9											
								5.0											
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow			notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal				classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit			consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense			

Engineering Log - Environmental

Client: **Health Infrastructure c/o Savills Project Management**

Date started: **14.1.2017**

Principal:

Date completed: **14.1.2017**

Project: **Site 4A DSI - Royal North Shore Hospital**

Logged by: **JS**

Borehole Location: **Buildings 51 and 52**

Checked by: **FW**

drill model and mounting:	Geoprobe	Easting:	332695	slope:	-90°	R.L. Surface:
hole diameter:	125mm	Northing	6255988	bearing:		datum:

drilling information						material substance													
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter				structure and additional observations	
	1	2	3											100 kPa	200 kPa	300 kPa	400 kPa		
HA					E (PID=7.0)		0.1			TOPSOIL: Sand, fine grained, dark brown-grey, trace of low plasticity clay and small to medium grained, sub-angular gravels. FILL: Gravelly SAND, fine to medium grained, dark brown-grey, with some sub-angular gravels and crushed sandstone cobbles. FILL: Gravelly SAND, fine to medium grained, dark brown-grey, with some sub-angular gravels, trace of asphalt/ash and large sandstone boulders.	D						No asbestos, odour or staining observed. Rootlets, grass and bark.		
						0.2													
						0.3													
						0.4													
					E (PID=10.5)	0.5													
						0.6													
						0.7													
						0.8													
					E (PID=8.7)	0.9													
						1.0													
						1.1													
						1.2													
						1.3													
						1.4													
						1.5													
SS						1.6			CL	Silty CLAY: low to medium plasticity, grey-red, iron-staining.						Residual soils, no asbestos, odour or staining observed.			
						1.7													
						1.8													
						1.9													
						E (PID=7.4)	2.0												
							2.1												
							2.2												
							2.3												
							2.4												
							2.5												
							2.6												
							2.7												
							2.8												
						E (PID=8.3)	2.9												
							3.0												
						3.1													
						3.2													
						3.3			SANDSTONE: fine to medium grained, grey-red, ironstone bands observed						Weathered sandstone bedrock, no odour or staining observed.				
						3.4													
						3.5													
						3.6													
						3.7													
						3.8													
					E (PID=4.5)	3.9													
						4.0													
						4.1													
						4.2													
						4.3													
						4.4													
						4.5													
						4.6													
						4.7													
						4.8													
						4.9													
						5.0													
method						support		notes, samples, tests				classification symbols and soil description				consistency/density index			
AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT						M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow		U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal				based on unified classification system moisture D dry M moist W wet Wp plastic limit WL liquid limit				VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense			

Borehole No. **BHC103**

Engineering Log - Environmental

Sheet 1 of 1
Office Job No.: **ENAU RHOD06452AA**

Client: **Health Infrastructure c/o Savills Project Management**

Date started: **14.1.2017**

Principal:

Date completed: **14.1.2017**

Project: **Site 4A DSI - Royal North Shore Hospital**

Logged by: **JS**

Borehole Location: **Buildings 51 and 52**

Checked by: **FW**

drill model and mounting:		Geoprobe		Easting: 332754		slope: -90°		R.L. Surface:					
hole diameter:		125mm		Northing 6256001		bearing:		datum:					
drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations
1	2	3							soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
AS				E (PID=8.4)		0.1			ASPHALT	D			Slight hydrocarbon odour, no staining or asbestos observed, tree roots.
				E (PID=8.9)		0.2			FILL: Sand, dark brown-black, fine to medium grained, some medium to coarse grained, sub-angular gravels, trace of low plasticity clay, asphalt fragments, ash and glass.				
				QD-01/QT-01		0.3							
						0.4			FILL: Silty CLAY, low plasticity, brown-red/white, trace of ironstone gravels. Possibly reworked natural material.				No odour or staining, possibly reworked natural soils
						0.5							
						0.6							
						0.7							
				E (PID=9.1)		0.8			FILL: Silty CLAY, low plasticity, orange-brown/grey, trace ironstone gravels. Possibly reworked natural material.				
						0.9							
						1.0							
						1.1							
SS						1.2		CL	Sandy CLAY: low plasticity, orange-brown, fine grained sand.				Residual soil, no odour or staining.
						1.3							
						1.4							
						1.5							
						1.6							
						1.7							
						1.8							
				E (PID=10.5)		1.9							
						2.0							
						2.1		CL	grading to dark red with ironstone and sandstone fragments.				
						2.2							
						2.3							
						2.4							
						2.5							
						2.6							
						2.7		SC	Clayey SAND: fine to medium grained, light grey, low plasticity clay.	M			
						2.8							
				E (PID=2.6)		2.9							
						3.0							
						3.1							
						3.2							
						3.3			SANDSTONE: fine to medium grained, yellow-brown.				Highly weathered sandstone bedrock
						3.4							
						3.5							
						3.6							
						3.7			SANDSTONE: fine to medium grained, red-brown.				Grading to weathered sandstone bedrock
						3.8							
				E (PID=5.8)		3.9							
						4.0							
						4.1			Borehole BHC103 terminated at 4m				
						4.2							
						4.3							
						4.4							
						4.5							
						4.6							
						4.7							
						4.8							
						4.9							
						5.0							

method		support		notes, samples, tests		classification symbols and soil description		consistency/density index	
AS	auger screwing*	M	mud	U ₅₀	undisturbed sample 50mm diameter			VS	very soft
AD	auger drilling*	C	casing	U ₆₃	undisturbed sample 63mm diameter			S	soft
RR	roller/tricone			D	disturbed sample			F	firm
W	washbore			N	standard penetration test (SPT)			St	stiff
CT	cable tool			N*	SPT - sample recovered			VSt	very stiff
HA	hand auger			Nc	SPT with solid cone			H	hard
DT	diatube			V	vane shear (kPa)			Fb	friable
B	blank bit			P	pressuremeter			VL	very loose
V	V bit			Bs	bulk sample			L	loose
T	TC bit			E	environmental sample			MD	medium dense
*bit shown by suffix e.g. ADT				R	refusal			D	dense
								VD	very dense

Appendix C – Calibration Certificates

RENTALS

Equipment Certification Report – Isobutylene

Isobutylene for Minirae PID 2000/3000/Lite:

Bottle Size: 34 L

Current Capacity: 400 PSI

Capacity on return: _____ PSI

Lot #: 168524 C170

Exp Date: DEC 2018

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum \$30 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Return	Item
☒	☐	Isobutylene bottle
☒	☐	Regulator (ID: <u>71356</u>)
☒	☐	Tubing
☒	☐	Carry Case

Date: 12/01/2017

Signed: *[Signature]*

TFS Reference	<u>C5006116</u>	Return Date:	<u>1 / 1</u>
Customer Reference		Return Time:	
Equipment ID	<u>REG71356</u>	Condition on return:	
Equipment Serial No.			

"We do more than give you great equipment... We give you great solutions!"

Phone: (Free Call) 1300 735 295		Fax: (Free Call) 1800 675 123		Email: RentalsAU@Thermofisher.com	
Melbourne Branch 5 Caribbean Drive, Scoresby 3179	Sydney Branch Level 1, 4 Talavera Road, North Ryde 2113	Adelaide Branch 33 King Street, South Australia 5067	Brisbane Branch Unit 2/5 Ross St Newstead 4006	Perth Branch 121 Beringarra Ave Malaga WA 6090	

RENTALS

Equipment Report - MiniRAE 3000 PID

This Gas Meter has been performance checked and calibrated as follows:

Lamp	Compound	Concentration	Zero	Span	Traceability Lot #	Pass?
10.6 eV	Isobutylene	100 ppm	0.0 ppm	100.0 ppm	Lot 389261 Cyl 3	☒

Alarm Limits

High	100 ppm
Low	50 ppm

Bump Test

Date	Target Gas	Reading	Pass?
12/01/2017	100 ppm	100.0 ppm	☒

- ☒ Battery Status
- ☒ 10 minutes test complete
- ☒ Spare battery status (Min 5.5 volts)
- ☒ Electrical Safety Tag attached (AS/NZS 3760)

- ☒ Performance check (pump, lamp, sensor)
- ☒ Data cleared
- ☒ Filters checked

Tag No: 000990

Valid to: 02/03/2017

Date: 12/01/2017

Signed: *[Signature]*

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum \$30 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
☒	☐	MiniRAE 2000 PID / Operational Check / Battery Status <u>100%</u>
☒	☐	Lamp 10.6 eV, Compound Set to: Isobutylene C/factor: 1
☒	☐	Protective yellow rubber boot
☒	☐	Inlet probe (attached to PID)
☒	☐	Spare water trap filter(s) Qty <u>1</u>
☒	☐	Charger 240V to 12V1250mA
☒	☐	Cradle and Travel Charger
☒	☐	Instruction Manual behind foam on the lid of case "
☒	☐	Quick Guide Sheet behind foam on the lid of case "
☒	☐	Spare Alkaline Battery Compartment with batteries
☒	☐	Inline Moisture trap Filter Guide Laminated
☒	☐	Calibration regulator & tubing (optional)
☒	☐	Data cable and Software CD (optional)
☒	☐	Carry Case
☒	☐	Check to confirm electrical safety (tag must be valid)

Date: 12/01/2017

Signed: *[Signature]*

TFS Reference	C5006116	Return Date:	/ /
Customer Reference		Return Time:	
Equipment ID	PID3000-54	Condition on return:	
Equipment Serial No.	592916965		

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Phone: (Free Call) 1300 735 295		Fax: (Free Call) 1800 675 123		Email: RentalsAU@Thermofisher.com	
Melbourne Branch 5 Caribbean Drive, Scoresby 3179	Sydney Branch Level 1, 4 Talavera Road, North Ryde 2113	Adelaide Branch 27 Beulah Road, Norwood, South Australia 5067	Brisbane Branch Unit 2/5 Ross St Newstead 4006	Perth Branch 121 Beringarra Ave Malaga WA 6090	

RENTALS

Equipment Report – Solinst Model 122 Interface Meter

This Meter has been performance checked / calibrated* as follows:

Cleaned/Tested

Pass? ☐ Yes

☐ No

☐ Probe

☐ Tape/Reel

☒ Performance Test & Battery Voltage Check (8.8 v) 8.0v minimum

Date: 22.12.16 Checked by: JWA Gavin

Signed: [Signature]

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum \$20 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Received	Returned	Item
☒	☐	☐	Operations check OK
☒	☐	☐	Plastic Box / Bag
☒	☐	☐	Spare 9V Battery Qty <u>1</u>
☒	☐	☐	Probe Cleaning Brush
☒	☐	☐	Decon
☒	☐	☐	Instruction leaflet
☒	☐	☐	Tape Guide
☐	☐	☐	
Processors Signature/ Initials			<u>MS</u>

Quote Reference	<u>C5006090</u>	Condition on return
Customer Ref		
Equipment ID	<u>80 Meter SOL122-11</u>	
Equipment serial no.	<u>236 572</u>	
Return Date	<u>/ /</u>	
Return Time		

"We do more than give you great equipment... We give you great solutions!"

Phone: (Free Call) 1300 735 295		Fax: (Free Call) 1800 675 123		Email: RentalsAU@ThermoFisher.com	
Melbourne Branch 5 Caribbean Drive, Scoresby 3179	Sydney Branch Level 1, 4 Talavera Road, North Ryde 2113	Adelaide Branch 27 Beulah Road, Norwood, South Australia 5067	Brisbane Branch Unit 2/5 Ross St Newstead 4006	Perth Branch 121 Beringarra Ave Malga WA 6090	

RENTALS

Equipment Certification Report – TPS 90FLMV Water Quality Meter

This Water Quality Meter has been performance checked and calibrated as follows:

Sensor	Concentration	Span 1	Span 2	Traceability Lot #	Pass?
pH	pH 7.00 / pH 4.00	7.00 pH	4.00 pH	289006/289752	☒
Conductivity	12.88mS/cm	0.00 mS/cm	12.88 mS/cm	QA1331	☒
TDS	36 ppk	0 ppk	36.0 ppk	NG1857	☒
Dissolved Oxygen	Sodium Sulphite / Air	0.00 ppm in Sodium Sulphite	8.58 ppm Saturation in Air	1603215673 NJ1314	☒

Check only

Redox (ORP) *	Electrode operability test	240mV +/- 10%	248 mV	9674	☒
---------------	----------------------------	---------------	--------	------	-------------------------------------

* This meter uses an Ag/AgCl ORP electrode. To convert readings to SHE (Standard Hydrogen Electrode), add 199mV to the mV reading.

- ☒ Battery Status 7.3 (min 7.2V)
☒ Electrical Safety Tag attached (AS/NZS 3760)

- ☒ Temperature 22.4 °C
☒ Electrodes Cleaned and checked

Tag No: 000632

Valid to: 11/01/2017

Date: 11/01/2017

Signed: [Signature]

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum \$30 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
☒	☐	90FLMV Unit. Ops check/Battery status: <u>8.0</u>
☒	☐	pH sensor with wetting cap, 5m
☒	☐	Conductivity/TDS/Temperature K=10 sensor, 5m
☒	☐	Dissolved oxygen YSI5739 sensor with wetting cap, 5m
☒	☐	Redox (ORP) sensor with wetting cap, 5m
☒	☐	Power supply 240V to 12V DC 200mA
☒	☐	Instruction Manual
☒	☐	Quick Guide
☒	☐	Syringe with storage solution for pH and ORP sensors
☒	☐	Carry Case
☒	☐	Check to confirm electrical safety (tag must be valid)

Date: 11/01/2017

Signed: [Signature]

TFS Reference		Return Date: / /
Customer Reference		Return Time:
Equipment ID	90FLMVSK	Condition on return:
Equipment Serial No.	T0798	

"We do more than give you great equipment... We give you great solutions!"

Phone: (Free Call) 1300 735 295		Fax: (Free Call) 1800 675 123		Email: RentalsAU@Thermofisher.com	
Melbourne Branch 5 Caribbean Drive, Scoresby 3179	Sydney Branch Level 1, 4 Talavera Road, North Ryde 2113	Adelaide Branch 27 Beulah Road, Norwood, South Australia 5067	Brisbane Branch Unit 2/5 Roes St Newstead 4006	Perth Branch 121 Beringarra Ave Malaga WA 6060	

Equipment Report – Micropurge Kit (MP15)

This system has been performance checked as follows:

Sample Pro Pump		
☒ Components Cleaned / checked	☒ Ops check	
☒ MP15 Controller	☒ Included in kit	☐ Not included in kit
☒ Components Cleaned / checked	☒ Ops check	
☒ Battery check – On/Off	☒ Flow response	

Date: 11/01/2017 Checked by: MILENKO

Signed: [Signature]

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum \$20 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Received	Returned	Item
☒	☐	☐	MP15 Control & Power Pack
☒	☐	☐	CO2 cylinder (installed in MP15 backpack)
☒	☐	☐	2 Stage gas regulator
☒	☐	☐	Spanner or shifter
☒	☐	☐	Quick Start Guide
☒	☐	☐	MP15 Users Guide + Pump operating instructions
☒	☐	☐	Sample Pro Stainless Steel Pump ID: <u>QSP6 P-11</u>
☒	☐	☐	2X Bladder
☒	☐	☐	Flow cell ID: <u>EFC500-15</u>
☒	☐	☐	Stainless Steel Hanger Cable <u>4.5</u> m
☒	☐	☐	Spare CO2 Cylinders, quantity: <u>1</u>
☒	☐	☐	Gas Cylinder CO2 - D Size ID: <u>cylinder 21 & 35</u>
☒	☐	☐	Maintenance kit (O rings, fittings, SS check ball, collett & screen if applicable)

Processors Signature/ Initials

MS

EE Quote Reference	<u>CS 006090</u>	Condition on return
Customer Ref		
Equipment ID	<u>QMP15-6</u>	
Equipment serial no.	<u>1655</u>	
Return Date	<u>/ /</u>	
Return Time		

Appendix D – Data Assessment

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QAI/QC DATA VALIDATION REPORT

Job No: S21855/4 Batches: ALS ES48084, ES48186, ES48409 & Amdel 4E1118



I. SAMPLE HANDLING

1. Were the sample **holding times** met?
2. Were the samples in **proper custody** between the field and reaching the laboratory?
3. Were the samples **properly and adequately** preserved?
This includes keeping the samples chilled, where applicable.
4. Were the samples received by the laboratory in good condition?

Yes	No (Comment below)
✓	☐
✓	☐
✓	☐
☐	✓

COMMENTS:

A total of three primary soil jars (plus one duplicate jar) were broken and an additional three jar lids (plus one duplicate's jar lid) were broken during transportation to the laboratory. These samples were not selected for laboratory analysis with the exception of sample BH1 / 0.5-0.95 for which the lid was broken. As a result, potential hydrocarbon volatiles could have been lost. The results for BTEX and TPH C6-C9 should be considered approximate only. Given that the PID results and olfactory evidence did not suggest the presence of significant hydrocarbon volatile contamination at BH1, the breakage of the lid is not considered to significantly change the volatile results of the analysis.

In addition, an additional surface soil sample identified as BH2A / 0-0.2 was collected to replace BH2 / 0-0.3 which the soil jar was broken. BH2A was located immediately adjacent to BH2.

Sample handling was:

☐

Satisfactory

☐

Unsatisfactory



Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QAI/QC DATA VALIDATION REPORT

Job No: S21855/4 Batches: ALS ES48084, ES48186, ES48409 & Amdel 4E1118



II PRECISION/ACCURACY ASSESSMENT

1. Was a NATA registered laboratory used?
2. Did the laboratory perform the requested tests?
3. Were the laboratory methods adopted NATA endorsed?
4. Were the appropriate test procedures followed?
5. Were the reporting limits satisfactory?
6. Was the NATA Seal on the reports?
7. Were the reports signed by an authorised person?

Yes	No (Comment below)
✓	☐
✓	☐
✓	☐
✓	☐
✓	☐
✓	☐
✓	☐

COMMENTS:

N/A

Precision/Accuracy of the Laboratory Report:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No: S21855/4 Batches: ALS ES48084, ES48186, ES48409 & Amdel 4E1118



III. FIELD QA/QC

1. Number of Samples analysed Soil: 19
Leachate: 4 TCLP
2. Number of Days of Sampling: Soil: 13 (3-15 July)
Leachate: 5 (11-15 July)

3. Number and Type of QA/QC Samples Analysed:

	SOIL	LEACHATE
Field Duplicates	1 Intra Metal/TPH/BTEX/PAH 1 Inter Metal/TPH/BTEX/PAH/OCP/PCB	0
Trip Blanks	1	Not Required
Wash Blanks	1	Same Blank as per Soil
Trip Spikes	1	Not Required

4. FIELD DUPLICATES

- A. Were an Adequate Number of field duplicates collected?
- B. Were RPDs within Control Limits?
- a. Organics ($\pm$ 50%)
 - b. Metals/Inorganics ($\pm$ 50%)
 - c. Nutrients ($\pm$ 50%)

Yes	No (Comment below)
✓	☐
✓ ☐ N/A	☐ ✓ N/A

COMMENTS:

The RPDs of Cr, Cu and Ni concentrations for the duplicate pair BH3 / 0-0.3 and DUP1 / 0-0.3 were calculated to be 60%, 51% and 74%, exceeding the control limit of 50%. The RPD exceedances are considered likely to be the result of the uneven distribution of these metals in the soil samples. Given the concentrations are well below the threshold soil investigation levels, it is considered that such exceedances are acceptable and will not change the conclusion of the overall site assessment. The RPDs for the other duplicate pair were calculated to be within the control limit of 50% for heavy metals.

It is noted that duplicate samples were not tested for leachability (TCLP) samples as results were used for screening purposes.

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No: S21855/4 Batches: ALS ES48084, ES48186, ES48409 & Amdel 4E1118



III. FIELD QA/QC (Continued)

5. TRIP BLANKS / SPIKES

A. Were an Adequate Number of trip blanks / spikes collected?

B. Were the Trip Blanks free of contaminants?

(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
✓	☐
✓	☐

COMMENTS:

N/A

6. WASH BLANKS

A. Were an adequate number of Wash Blanks collected?

B. Were the Wash Blanks free of contaminants?

(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
✓	☐
✓	☐

COMMENTS:

N/A

The field QA/QC was:

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No: S21855/4 Batches: ALS ES48084, ES48186, ES48409 & Amdel 4E1118



IV LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Type and Number of QA/QC Samples

	Soil/Water (including leachate)					
	Metals	TPH	BTEX	PAH	OCP	PCB
Laboratory Blanks / Reagent Blanks	3/2	3/1	3/1	3/2	3/1	3/1
Matrix Spikes / Matrix Spike Duplicates	2/2	2/1	2/1	2/2	2/1	2/1
Laboratory Control Samples	3/2	3/1	3/1	3/2	3/1	3/1
Laboratory Duplicates	-	4/-	4/-	4/-	-	-
Surrogates	-	-	3/3	3/3	2/1	1/1
Other	-	-	-	-	-	-

2. Were the laboratory blanks/reagents blanks free of contamination?

3. Were the control sample / spike recoveries within control limits?

a. Organics (70% to 130%[#])

b. Metals/Inorganic (70% to 130%[#])

4. Were the RPDs of the laboratory duplicates within control limits?

5. Were the surrogate recoveries within control limits[#]?

Yes	No (Comment below)
☒	☐
☒ ☒	☐ ☐
☒	☐
☐	☒

COMMENTS:

The recoveries of OCP surrogates in soil sample BH1 / 0-0.3 and leachate sample BH2A / 0-0.2 were recorded at 59% and 58% respectively, marginally below the control limit. The exceedances are only marginal. Given that OCP compounds in the primary samples were either non-detect or detected well below the threshold investigation levels, such marginal exceedances in surrogate are not considered to change the useability of the data or the conclusion of the overall site assessment.

The laboratory internal QA/QC was:



Satisfactory



Unsatisfactory



Partially Satisfactory

[#] Generally 70%-130% in soil or 80%-120% for inorganics in water, 50%-130% for phenols, 60%-130% for SVOCs, 60%-140% for phenoxy acid herbicides

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No: S21855/4 Batches: ALS ES48084, ES48186, ES48409 & Amdel 4E1118



V. DATA USABILITY

- | | |
|--|-------------------------------------|
| 1. Data Directly Usable | ☐ |
| 2. Data Usable with the following qualifications (see comment below) | ☒ |
| 3. Data Not Usable. | ☐ |

COMMENTS:

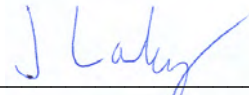
The data useability assessment indicates that the laboratory data was generally useable and reasonably represented the conditions at the sampling locations at the time of sampling, with the following exceptions:

- Volatiles results for sample BH1 / 0.5-0.95 should be considered approximate only as the jar lid was broken and volatiles could have been lost.
- Leachability (TCLP) results should be considered approximate only as duplicate samples were not tested.

QA/QC Report Prepared by:

Edward Wu

QA/QC Report Reviewed by:


(Reviewer)

DATA COMPLETENESS

Field Considerations

	Yes / No	Comment
Were all critical locations sampled?	Yes	Sampling undertaken as per proposal. It is noted that no sampling was undertaken beneath the buildings during this assessment. It has been recommended that sampling beneath buildings be undertaken following demolition.
Were all critical depths sampled?	Yes	
Were the SOPs appropriate and complied with?	Yes	Based on Coffey Geosciences Environmental Field Manual
Was the sampler adequately experienced?	Yes	Refer to Section 6
Was the field documentation complete?	Yes	
Is a copy of the signed chain of custody form for each batch of samples included?	Yes	

Laboratory Considerations

	Yes / No	Comment
Were all critical samples analysed according to sampling plan?	Yes	
Were analytes analysed as per sampling plan?	Yes	
Were the laboratory methods appropriate?	Yes	See Table H1
Were the laboratory methods adopted NATA endorsed?	Yes	
Was the NATA Seal on the	Yes	

laboratory reports?		
Were the laboratory reports signed by an authorised person?	Yes	
Were the laboratory PQLs below the criteria?	No	For soil, the laboratory PQLs were below the criteria. For groundwater, the majority of PQLs were below the groundwater. PQLs for some PAH compounds and some metals were marginally above the criteria however this is not considered to affect the conclusions of the report.
Was sample documentation complete?	Yes	
Were sample holding times complied with?	Yes	See Table H2

COMPLETENESS CONCLUSION

	Yes / No	Comment
Was data adequately complete?	Yes	

DATA COMPARABILITY

Field considerations

	Yes / No	Comment
Was there more than one sampling round?	Yes	
Were the same sampling methodology and SOPs used for all sampling?	Yes	
Was all sampling undertaken by the same sampler?	No	
Were sample containers, preservation, filtering the same?	Yes	
Could climatic conditions (temperature, rainfall, wind) have influenced data comparability?	No	It is not considered that climatic conditions would have affected the soil nor groundwater sampling.

Were the same types of samples collected (filtered, size fractions etc) for each media?	Yes	
---	-----	--

Laboratory Considerations

	Yes / No	Comment
Were the same analytical methods used (including clean up)?	Yes	Methodologies generally the same.
Were the PQLs the same?	No	
Were the same laboratories used?	No	SGS was the primary laboratory for this round while Amdel were the primary laboratory for the previous round. It is noted that results for both soil and groundwater are generally comparable between rounds.
Were the units reported the same?	Yes	

COMPARABILITY CONCLUSION

	Yes / No	Comment
Was data adequately comparable?	Yes	

DATA REPRESENTATIVENESS

Field Considerations

	Yes / No	Comment
Was appropriate media sampled?	Yes	The only media identified that required sampling was soil and groundwater.
Was all media identified sampled?	Yes	
Were the samples properly and adequately preserved? This includes keeping the samples	Yes	

chilled, where applicable.		
Were the samples in proper custody between the field and reaching the laboratory?	Yes	A small number of samples were dispatched to the laboratory however did not appear on the CoC form. The batch of samples was in proper custody between the field and laboratory.
Were the samples received by the laboratory in good condition?	Yes	

Laboratory Considerations

	Yes / No	Comment
Were all samples analysed according to SAQP?	Yes	Analysis was as per proposal

REPRESENTATIVENESS CONCLUSION

	Yes / No	Comment
Was data adequately representative?	Yes	

DATA PRECISION AND ACCURACY

Field considerations

	Yes / No	Comment
Were the SOPs appropriate and complied with?	Yes	Based on Coffey Geosciences' Environmental Field Manual

QA/QC									
Intralab Dup	1, 33%	1, 33%							
Interlab Dup	0	0							
Trip Spikes	N/A	N/A							
Trip Blanks	N/A	N/A							
Wash Blanks	N/A	N/A							
LAB QA/QC									
Lab Blanks	1	1							
Lab Dups	0	0							
Matrix Spikes / Dups	0	0							
Lab Control	1	1							
Surrogate	N/A	3							

INSERT SECTION ON OTHER MEDIA AS REQUIRED

	Yes / No	Comment
Field QA/QC		
Were an adequate number of field duplicates analysed?	Yes	No inter-laboratory duplicate pair was analysed for groundwater. However, given results between sampling rounds were comparable (with different labs used for each sampling round), it is considered that an inter-laboratory duplicate sample was not necessary. The duplicate rates for some soil analytes were slightly below that specified in the DQO. Again this is not considered to affect the usability of the data given data across samples and between rounds was generally comparable.
Were the RPDs of the field	No	RPDs exceeded the control limit for a number of metal, PAH

duplicates within control limits?		and TPH compounds in a number of duplicate samples. In most cases, this is considered to be attributable to the low concentrations of the analytes (generally with 10 times of the LOR). In all cases both the primary and duplicate sample were below the investigation levels. Therefore this is not considered to affect the usability of the data.
Were an adequate number of trip blanks analysed?	Yes	
Were the trip blanks free of contaminants	Yes	
Were an adequate number of trip spikes analysed?	Yes	
Were the trip spikes recoveries within control limits?	Yes	
Were an adequate number of wash blanks analysed?	Yes	
Were the wash blanks free of contaminants?	Yes	
Lab QA/QC		
Were an adequate number of laboratory blank samples analysed?	Yes	
Were the blanks free of contaminants?	Yes	
Were an adequate number of laboratory matrix spikes and laboratory control samples analysed?	Yes	
Were an adequate number of surrogate spike samples analysed?	Yes	
Were the spikes recoveries within control limits?	No	In Batch 49369 the spike recovery for TPH C15-C28 was 62%, marginally below the control limit of 70%. As the total TPH concentrations in the primary samples were generally below the investigation criteria, the marginal deficiency in

		spike recovery is not considered to change the usability of the data or the conclusion of the site assessment. In Batch 49252 the laboratory control recoveries for Naphthalene and Acenaphthylene were 62% and 67%, respectively, marginally below the control limit. Given the concentrations of Naphthalene and Acenaphthylene in the primary samples were either below the detection limit or very low, the deficiency in laboratory control recovery is not considered to change the usability of the data or the overall conclusion of the site assessment.
Were an adequate number of laboratory duplicates analysed?	Yes	
Were the laboratory duplicate RPDs within control limits?	Yes	In Batch 49369 the RPD for arsenic was 53%, marginally above the control limit of 50%. This is not considered to affect the usability of the data.

PRECISION AND ACCURACY CONCLUSION

	Yes / No	Comment
Was soil data adequately precise?	Yes	
Was soil data adequately accurate?	Yes	
Was groundwater data adequately precise?	Yes	
Was groundwater data adequately accurate?	Yes	
Insert other media as required.		

TABLE H1: LABORATORY METHODOLOGIES (SGS)

Analysis	Method Based On	NATA Registered
TPH C6-C9/BTEX	Based on USEPA 8260	Yes
TPH C10-C36	Based on USEPA 8015B	Yes

PAH	Based on USEPA 8270	Yes
Metals	Based on USEPA 200.7 (soil) / USEPA 6020A (water)	Yes
OCP	Based on USEPA 8080/8140	Yes
PCB	Based on USEPA 8080	Yes
SVOC	Based on USEPA 8270 (subcontracted to MGT Victoria)	Yes
VOC	Based on USEPA 8260	Yes
Asbestos	Based on AS 4964-2004	Yes
Dioxin	ISO17025 005	Yes

TABLE H2a: HOLDING TIMES (SGS soil)

Analysis	Holding Time	Maximum Time Between Sampling and Extraction	Holding Times Met
TPH C6-C9/BTEX	14 days	11 days	Yes
TPH C10-C36	14 days	11 days	Yes
PAH	14 days	11 days	Yes
Metals	6 months	11 days	Yes
OCP	14 days	9 days	Yes
PCB	14 days	9 days	Yes
SVOC	14 days	7 days	Yes
VOC	14 days	7 days	Yes
Asbestos	-	11 days	Yes
Dioxin	1 year	9 days	Yes

Coffey Environments Australia Pty Ltd

ABN: 65 140 765 902

DATA VALIDATION ENAURHDO06452AA-R05 Site 4A DSI

Lab Batch References: 524674, 526653, 526829, 528153, 530212, 530449, 531482, ES1626831, ES1700879, ES1701134

I. SAMPLE HANDLING

	Yes	No (Comment below)
1. Were the sample holding times met?	☐	☒
2. Were the samples in proper custody between the field and reaching the laboratory?	☒	☐
3. Were the samples properly and adequately preserved? <i>This includes keeping the samples chilled, where applicable.</i>	☒	☐
4. Were the samples received by the laboratory in good condition?	☒	☐

COMMENTS:

TCLP for PAH was conducted marginally outside holding time for batch 526653. The tests were scheduled in to assist for waste classification purposes. PAHs, and in particular benzo(a)pyrene in the case for waste classification assessment, is not a volatile compound, and therefore it is considered that this discrepancy does not materially affect the outcome of the assessment.

Other analyses were carried out within recommended holding times.

Sample Handling was:

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Environments Australia Pty Ltd

ABN: 65 140 765 902

DATA VALIDATION ENAURHDO06452AA-R05 Site 4A DSI

Lab Batch References: 524674, 526653, 526829, 528153, 530212, 530449, 531482,
ES1626831, ES1700879, ES1701134

II PRECISION/ACCURACY ASSESSMENT

1. Was a NATA registered laboratory used?
2. Did the laboratory perform the requested tests?
3. Were the laboratory methods adopted NATA endorsed?
4. Were the appropriate test procedures followed?
5. Were the reporting limits satisfactory?
6. Was the NATA Seal on the reports?
7. Were the reports signed by an authorised person?

Yes	No (Comment below)
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐

COMMENTS:

Precision/Accuracy of the Laboratory Report	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

Coffey Environments Australia Pty Ltd

ABN: 65 140 765 902

DATA VALIDATION ENAURHDO06452AA-R05 Site 4A DSI

Lab Batch References: 524674, 526653, 526829, 528153, 530212, 530449, 531482, ES1626831, ES1700879, ES1701134

III. FIELD QA/QC

1.	Number of Samples Analysed	Soil	33
		Groundwater	3
2.	Number of Days of Sampling:	Soil	5
		Groundwater	1

3. Number and Type of QA/QC Samples Collected:

Quality Control Sample Type	No.	% Total No. Samples
Intra-lab Duplicates (Soil/Water)	4/1	12%/33%
Inter-lab Duplicates (Soil/Water)	4/1	12%/33%
Trip Blanks (Soil / Water)	1/1	-
Trip Spike (Soil / Water)	1/1	-
Equipment Rinsate (Soil only)	1	-

4. FIELD DUPLICATES

- A. Were an Adequate Number of field duplicates analysed for each chemical?
- B. Were RPDs within Control Limits?
- a. Organics (No limit (<10 x LOR); 50% (10-20 x LOR); 30% (>20 x LOR))
 - b. Metals/Inorganics (No limit (<10 x LOR); 50% (10-20 x LOR); 30% (>20 x LOR))
 - c. Volatile & semi volatile organics (No limit (<10 x LOR); 50% (10-20 x LOR); 30% (>20 x LOR))

Yes	No (Comment below)
☒	☐
☒	☐
☒	☒
☐	☒

COMMENTS:

Calculated RPDs are presented in Tables LR5 and LR6. In general the comparison of primary and duplicate samples demonstrated good reproducibility, when the LOR was considered. The observed variability reported between the primary and duplicate or triplicate soil samples is assessed to be attributable to the heterogeneity of the fill material within the site. The observed variability reported between the primary and duplicate / triplicate groundwater samples is assessed to be attributable to the distribution of chemicals with water column.

Coffey Environments Australia Pty Ltd

ABN: 65 140 765 902

DATA VALIDATION ENAURHDO06452AA-R05 Site 4A DSI

Lab Batch References: 524674, 526653, 526829, 528153, 530212, 530449, 531482, ES1626831, ES1700879, ES1701134

IV. TRIP BLANKS (TB) AND TRIP SPIKES (TS)

- A. Were an Adequate Number of trip blanks and spikes analysed?
- B. Were the trip blanks free of contaminants and trip spike were within acceptance limit?
- C. Were the trip spikes reported within acceptable recoveries?

Yes	No (Comment below)
☐	☒
☒	☐
☒	☐

COMMENTS:

Trip blank and trip spike results are presented in Table LR9. Although a trip blank and trip spike were not accompanied in each sample dispatch, given volatile compounds were not reported in the soil samples analysed for this assessment it is considered the loss of volatile, if present, would be negligible.

6. EQUIPMENT RINSATE SAMPLES

- A. Were an adequate number of Equipment Rinsate Samples collected?
- B. Were the Equipment Rinsate Samples free of contaminants?

Yes	No (Comment below)
☐	☒
☒	☐

COMMENTS:

Equipment rinsate was not carried out on each of the sampling day during geotechnical program. However given the reported concentrations are significantly lower than the adopted soil investigation levels, it is considered that this discrepancy would not have a material impact to the outcome of the assessment.

TRH C16-C34 was reported in the equipment rinsate sample. However given that the reported concentration is significantly less than concentrations reported in soil samples, therefore, that this discrepancy would not have a material impact to the outcome of the assessment.

Field QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

Coffey Environments Australia Pty Ltd

ABN: 65 140 765 902

DATA VALIDATION ENAURHDO06452AA-R05 Site 4A DSI

Lab Batch References: 524674, 526653, 526829, 528153, 530212, 530449, 531482, ES1626831, ES1700879, ES1701134

V LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Type of QA/QC Samples

	Yes	No
Laboratory Blanks/Reagent Blanks	☒	☐
Laboratory Duplicates	☒	☐
Matrix Spikes/Matrix Spike Duplicates	☒	☐
Laboratory Control Spike	☒	☐
Surrogate (where appropriate)*	☒	☐

2. Were the laboratory blanks/reagents blanks free of contamination?

3. Were the spike recoveries within control limits?

a. Organics (70% to 130%)

b. Metals/Inorganic (70% to 130%)

4. Were the RPDs of the laboratory duplicates within control limits?

5. Were the surrogate recoveries within control limits?

Yes	No (Comment below)
☒	☐
☐ ☒	☒ ☐
☒	☐
☒	☐

COMMENTS:

Spike recoveries were recovered outside control limits in sample S16-De11427 for OCPs as a result of matrix interference. Given that OCP was not detected in the soil samples analysed for this assessment, it is considered that this discrepancy would not have a material impact to the outcome of the assessment.

The laboratory internal QA/QC was:

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

ABN: 65 140 765 902

Lab Batch References: 524674, 526653, 526829, 528153, 530212, 530449, 531482, ES1626831, ES1700879, ES1701134

1. Data Directly Usable
2. Data Usable with the following considerations
3. Data Not Usable.

COMMENTS:

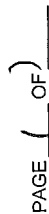
Appendix E – Field Data Sheet



Well Gauging Form

PAGE _____ OF _____

[illegible]



Groundwater Sampling Form (B) – Micro Purge

WELL ID: BH202
DIAMETER: 50 mm
WELL DEPTH: 14.420 m
SCREEN INTERVAL: 8.9 to 17.9 m below TOC
STICK-UP: 50.1 mm

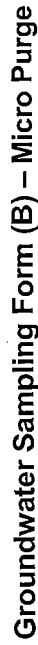
[illegible]

DUPLICATE COLLECTED: Y ☒ N ☐
 DUPLICATE ID: GWQD-01
 TRIPPLICATE COLLECTED: Y ☒ N ☐
 TRIPPLICATE ID: GWQD-01

WERE METALS FIELD FILTERED? Y ☒ N ☐
 Unfiltered samples must not be put into a preserved container (i.e. 'metals' bottle)
 HAS THIS FORM BEEN COMPLETED IN FULL? Y ☒ N ☐

Notes:

- 1 Ensure minimum 3 'equipment' volumes including volume of pump bladder, flow cell and tubing
- 2 Drawdown during pumping to be limited to <100 mm where possible



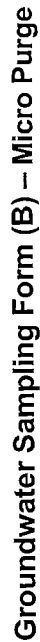
Groundwater Sampling Form (B) – Micro Purge

[illegible]

Coffey Environments - Groundwater Sampling Form (B) - Micro Purge
Issue Date: 17/10/2013
UNCONTROLLED WHEN PRINTED - SEE ELECTRONIC COPY FOR LATEST VERSION

Notes:

- 1 Ensure minimum 3 'equipment' volumes including volume of pump bladder, flow cell and tubing
- 2 Drawdown during pumping to be limited to <100 mm where possible



Groundwater Sampling Form (B) – Micro Purge

PROJECT NAME:						PROJECT NUMBER:												
FIELD PERSONNEL:						DATE:												
PROJECT MANAGER:																		
WELL ID:		DIAMETER:		mm	WELL DEPTH:	m	SCREEN INTERVAL:		to	m below TOC	STICK-UP:	mm						
BH204		50			17.12		2.70		to	17.70								
FIELD EQUIPMENT			FIELD EQUIPMENT			WELL HEADSPACE PID READING												
Equipment ID: AS cnl			Depth to Water - Before Pump Installation: 3.326 m below TOC			Pump Intake Depth: 10M			PID READING									
WQ Meter ID: fms			After Pump Installation: 3.310 m below TOC			Equipment Volume: —			PPM: —									
ORP Ref Electrode: (circle) SHE / Calomel Saturated KCl / Ag/AgCl 1M KCl / Ag/AgCl 4M KCl / Ag/AgCl Saturated KCl																		
TIME OF DAY	CYCLE/ PUMP RATE (ml/min)	VOLUME (L) note 1	DEPTH TO WATER (m) note 2	DISSOLVED OXYGEN (mg/l)		ELECTRICAL CONDUCTIVITY (mS or µS/cm)		pH (pH units)		REDOX POTENTIAL (mV)		TEMPERATURE (°C)		CLARITY – tick one				COMMENTS ODOUR, COLOUR, SEDIMENTS, PSH COLLECTED, etc
				READING	CHANGE*	READING	CHANGE*	READING	CHANGE*	READING	CHANGE*	READING	CHANGE*	Clear	Slightly Cloudy	Cloudy	Very Cloudy	
12.00	CPM2	0.5	3.370	1.05		580		5.43		109		22.5		X				IDS PPM NO odour/sh
↓	↓	1.0	3.380	0.75		517		5.35		107		22.4						163 green No
	↓	1.5		0.65		571		5.22		106		22.2						320 sediment
	↓	2.0	↓	0.49		570		5.17		102		21.9						317
↑	↑	2.5	↑	0.47		570		5.15		101		21.8		↓				315
																		317
STABILISATION CRITERIA (3 readings within following ranges)				± 10%		± 3%		± 0.1 unit		± 10mV		± 0.2°C						
Duplicate Collected:				☐ Y ☒ N		Duplicate ID:				Triplicate Collected:		☐ Y ☒ N		Triplicate ID:				
Were Metals Field Filtered?				☐ Y ☒ N		Unfiltered samples must not be put into a preserved container (i.e. 'metals' bottle)				HAS THIS FORM BEEN COMPLETED IN FULL?		☐ Y ☒ N						

Coffey Environments - Groundwater Sampling Form (B) – Micro Purge
Issue Date: 17/10/2013
UNCONTROLLED WHEN PRINTED – SEE ELECTRONIC COPY FOR LATEST VERSION

Notes:

- 1 Ensure minimum 3 "equipment" volumes including volume of pump bladder, flow cell and tubing
- 2 Drawdown during pumping to be limited to <100 mm where possible

Appendix F - Laboratory Reports and Chain of Custody Documentation

Certificate of Analysis

Coffey Geotechnics Pty Ltd Chatswood
Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 524674-S
Project name RNSH-SITE 4A
Project ID GEOTLCOV25684AB
Received Date Nov 22, 2016

Client Sample ID			BH202_0.5-0.6	BH202_0.1-0.2	BH202_0.8-1.0	BH203_0.1-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-No19970	S16-No19971	S16-No19972	S16-No19973
Date Sampled			Nov 12, 2016	Nov 12, 2016	Nov 12, 2016	Nov 19, 2016
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	57
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	570
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	627
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	64	67	69	69
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	0.6	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			BH202_0.5-0.6	BH202_0.1-0.2	BH202_0.8-1.0	BH203_0.1-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-No19970	S16-No19971	S16-No19972	S16-No19973
Date Sampled			Nov 12, 2016	Nov 12, 2016	Nov 12, 2016	Nov 19, 2016
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	1.1	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	1.7	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	69	92	99	104
p-Terphenyl-d14 (surr.)	1	%	63	90	100	103
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4,4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4,4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4,4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Dibutylchlorendate (surr.)	1	%	116	115	115	78
Tetrachloro-m-xylene (surr.)	1	%	88	103	106	120
Polychlorinated Biphenyls (PCB)						
Aroclor-1016	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1232	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1242	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1248	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1254	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1260	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PCB*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibutylchlorendate (surr.)	1	%	116	115	115	78
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	420
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	800
Heavy Metals						
Arsenic	2	mg/kg	< 2	6.3	6.5	3.2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	< 5	12	18	17
Copper	5	mg/kg	6.9	47	15	49
Lead	5	mg/kg	6.2	6.3	45	< 5

Client Sample ID			BH202_0.5-0.6	BH202_0.1-0.2	BH202_0.8-1.0	BH203_0.1-0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-No19970	S16-No19971	S16-No19972	S16-No19973
Date Sampled			Nov 12, 2016	Nov 12, 2016	Nov 12, 2016	Nov 19, 2016
Test/Reference	LOR	Unit				
Heavy Metals						
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	58	< 5	70
Zinc	5	mg/kg	18	46	71	54
% Moisture	1	%	14	10.0	21	4.7

Client Sample ID			BH203_0.9-1.0	BH203_1.6-1.7	BH205_0.0-0.1	BH205_0.5-0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-No19974	S16-No19975	S16-No19976	S16-No19977
Date Sampled			Nov 19, 2016	Nov 19, 2016	Nov 16, 2016	Nov 16, 2016
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	290	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	320	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	610	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	67	69	69	69
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	2.4	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	2.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	2.9	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	1.3	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	1.8	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	2.1	< 0.5	< 0.5	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	1.2	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	1.1	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	1.4	< 0.5	< 0.5	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	2.1	< 0.5	0.8	0.8
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	1.1	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			BH203_0.9-1.0	BH203_1.6-1.7	BH205_0.0-0.1	BH205_0.5-0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-No19974	S16-No19975	S16-No19976	S16-No19977
Date Sampled			Nov 19, 2016	Nov 19, 2016	Nov 16, 2016	Nov 16, 2016
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Phenanthrene	0.5	mg/kg	0.6	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	2.3	< 0.5	0.9	0.8
Total PAH*	0.5	mg/kg	15	< 0.5	1.7	1.6
2-Fluorobiphenyl (surr.)	1	%	127	99	102	99
p-Terphenyl-d14 (surr.)	1	%	120	96	96	87
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4,4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4,4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4,4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
α-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
β-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
δ-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
γ-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Dibutylchloredate (surr.)	1	%	128	110	Q09INT	91
Tetrachloro-m-xylene (surr.)	1	%	76	86	89	90
Polychlorinated Biphenyls (PCB)						
Aroclor-1016	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1232	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1242	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1248	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1254	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1260	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PCB*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibutylchloredate (surr.)	1	%	128	110	INT	91
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	610	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	120	< 100	< 100	< 100
Heavy Metals						
Arsenic	2	mg/kg	15	7.5	23	27
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	53	27	27	19
Copper	5	mg/kg	17	5.5	22	46
Lead	5	mg/kg	39	24	41	71
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1

Client Sample ID			BH203_0.9-1.0	BH203_1.6-1.7	BH205_0.0-0.1	BH205_0.5-0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-No19974	S16-No19975	S16-No19976	S16-No19977
Date Sampled			Nov 19, 2016	Nov 19, 2016	Nov 16, 2016	Nov 16, 2016
Test/Reference	LOR	Unit				
Heavy Metals						
Nickel	5	mg/kg	8.0	< 5	11	19
Zinc	5	mg/kg	26	24	68	67
% Moisture	1	%	16	30	17	15

Client Sample ID			BH205_2.0-2.1	DUPE1
Sample Matrix			Soil	Soil
Eurofins mgt Sample No.			S16-No19978	S16-No19979
Date Sampled			Nov 16, 2016	Nov 19, 2016
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				
TRH C6-C9	20	mg/kg	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	190
TRH C29-C36	50	mg/kg	< 50	220
TRH C10-36 (Total)	50	mg/kg	< 50	410
BTEX				
Benzene	0.1	mg/kg	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	66	70
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20
Polycyclic Aromatic Hydrocarbons				
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	2.0
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	2.2
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	2.5
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	1.1
Benzo(a)pyrene	0.5	mg/kg	< 0.5	1.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	1.4
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	1.2
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	1.0
Chrysene	0.5	mg/kg	< 0.5	1.1
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	1.8
Fluorene	0.5	mg/kg	< 0.5	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	< 0.5	0.9
Naphthalene	0.5	mg/kg	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	0.6

Client Sample ID			BH205_2.0-2.1	DUPE1
Sample Matrix			Soil	Soil
Eurofins mgt Sample No.			S16-No19978	S16-No19979
Date Sampled			Nov 16, 2016	Nov 19, 2016
Test/Reference	LOR	Unit		
Polycyclic Aromatic Hydrocarbons				
Pyrene	0.5	mg/kg	< 0.5	2.2
Total PAH*	0.5	mg/kg	< 0.5	12.8
2-Fluorobiphenyl (surr.)	1	%	100	101
p-Terphenyl-d14 (surr.)	1	%	92	90
Organochlorine Pesticides				
Chlordanes - Total	0.1	mg/kg	< 0.1	-
4,4'-DDD	0.05	mg/kg	< 0.05	-
4,4'-DDE	0.05	mg/kg	< 0.05	-
4,4'-DDT	0.05	mg/kg	< 0.05	-
a-BHC	0.05	mg/kg	< 0.05	-
Aldrin	0.05	mg/kg	< 0.05	-
b-BHC	0.05	mg/kg	< 0.05	-
d-BHC	0.05	mg/kg	< 0.05	-
Dieldrin	0.05	mg/kg	< 0.05	-
Endosulfan I	0.05	mg/kg	< 0.05	-
Endosulfan II	0.05	mg/kg	< 0.05	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	-
Endrin	0.05	mg/kg	< 0.05	-
Endrin aldehyde	0.05	mg/kg	< 0.05	-
Endrin ketone	0.05	mg/kg	< 0.05	-
g-BHC (Lindane)	0.05	mg/kg	< 0.05	-
Heptachlor	0.05	mg/kg	< 0.05	-
Heptachlor epoxide	0.05	mg/kg	< 0.05	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	-
Methoxychlor	0.2	mg/kg	< 0.2	-
Toxaphene	1	mg/kg	< 1	-
Dibutylchloroendate (surr.)	1	%	Q09INT	-
Tetrachloro-m-xylene (surr.)	1	%	107	-
Polychlorinated Biphenyls (PCB)				
Aroclor-1016	0.5	mg/kg	< 0.5	-
Aroclor-1232	0.5	mg/kg	< 0.5	-
Aroclor-1242	0.5	mg/kg	< 0.5	-
Aroclor-1248	0.5	mg/kg	< 0.5	-
Aroclor-1254	0.5	mg/kg	< 0.5	-
Aroclor-1260	0.5	mg/kg	< 0.5	-
Total PCB*	0.5	mg/kg	< 0.5	-
Dibutylchloroendate (surr.)	1	%	Q09INT	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
TRH >C10-C16	50	mg/kg	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	410
TRH >C34-C40	100	mg/kg	< 100	< 100
Heavy Metals				
Arsenic	2	mg/kg	20	12
Cadmium	0.4	mg/kg	< 0.4	< 0.4
Chromium	5	mg/kg	31	25
Copper	5	mg/kg	< 5	24
Lead	5	mg/kg	12	43
Mercury	0.1	mg/kg	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	15
Zinc	5	mg/kg	< 5	38

Client Sample ID			BH205_2.0-2.1	DUPE1
Sample Matrix			Soil	Soil
Eurofins mgt Sample No.			S16-No19978	S16-No19979
Date Sampled			Nov 16, 2016	Nov 19, 2016
Test/Reference	LOR	Unit		
% Moisture	1	%	22	17

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Nov 28, 2016	14 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
BTEX	Sydney	Nov 24, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Nov 24, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Polycyclic Aromatic Hydrocarbons	Sydney	Nov 28, 2016	14 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Nov 28, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Metals M8	Sydney	Nov 24, 2016	28 Day
- Method: LTM-MET-3040_R0 TOTAL AND DISSOLVED METALS AND MERCURY IN WATERS BY ICP-MS			
Eurofins mgt Suite B13			
Organochlorine Pesticides	Sydney	Nov 28, 2016	14 Day
- Method: E013 Organochlorine Pesticides (OC)			
Polychlorinated Biphenyls (PCB)	Sydney	Nov 28, 2016	28 Day
- Method: E013 Polychlorinated Biphenyls (PCB)			
% Moisture	Sydney	Nov 22, 2016	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name: Coffey Geotechnics Pty Ltd Chatswood
Address: Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SITE 4A
Project ID: GEOTLCOV25684AB

Order No.:
Report #: 524674
Phone: +61 2 9406 1000
Fax: +61 2 9406 1002

Received: Nov 22, 2016 5:10 PM
Due: Nov 29, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence /Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BH202_0.5-0.6	Nov 12, 2016		Soil	S16-No19970	X			X	X	X
2	BH202_0.1-0.2	Nov 12, 2016		Soil	S16-No19971	X			X	X	X
3	BH202_0.8-1.0	Nov 12, 2016		Soil	S16-No19972				X	X	X
4	BH203_0.1-0.2	Nov 19, 2016		Soil	S16-No19973	X			X	X	X
5	BH203_0.9-1.0	Nov 19, 2016		Soil	S16-No19974	X			X	X	X
6	BH203_1.6-1.7	Nov 19, 2016		Soil	S16-No19975				X	X	X
7	BH205_0.0-0.1	Nov 16, 2016		Soil	S16-No19976	X			X	X	X
8	BH205_0.5-0.6	Nov 16, 2016		Soil	S16-No19977	X			X	X	X
9	BH205_2.0-2.1	Nov 16, 2016		Soil	S16-No19978				X	X	X

Company Name: Coffey Geotechnics Pty Ltd Chatswood
Address: Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SITE 4A
Project ID: GEOTLCOV25684AB

Order No.:
Report #: 524674
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Received: Nov 22, 2016 5:10 PM
Due: Nov 29, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence /Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
10	DUPE1	Nov 19, 2016		Soil	S16-No19979					X	X
11	BH202_0.1-0.2	Nov 12, 2016		US Leachate	S16-No19980			X			
12	BH203_0.1-0.2	Nov 19, 2016		US Leachate	S16-No19981			X			
13	BH205_0.5-0.6	Nov 16, 2016		US Leachate	S16-No19982			X			
14	BH202_3.0-3.6	Nov 12, 2016		US Leachate	S16-No19983		X				
15	BH202_2.1-2.4	Nov 12, 2016		US Leachate	S16-No19984		X				
16	BH203_0.5-0.6	Nov 19, 2016		US Leachate	S16-No19985		X				
17	BH203_3.8-3.9	Nov 19, 2016		US Leachate	S16-No19986		X				
18	BH205_0.9-1.0	Nov 19, 2016		US Leachate	S16-No19987		X				
19	BH205_3.0-3.1	Nov 19, 2016		US Leachate	S16-No20013		X				
Test Counts						6	6	3	9	10	10

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4,4'-DDD	mg/kg	< 0.05			0.05	Pass	
4,4'-DDE	mg/kg	< 0.05			0.05	Pass	
4,4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.2			0.2	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Polychlorinated Biphenyls (PCB)							
Aroclor-1016	mg/kg	< 0.5			0.5	Pass	
Aroclor-1232	mg/kg	< 0.5			0.5	Pass	
Aroclor-1242	mg/kg	< 0.5			0.5	Pass	
Aroclor-1248	mg/kg	< 0.5			0.5	Pass	
Aroclor-1254	mg/kg	< 0.5			0.5	Pass	
Aroclor-1260	mg/kg	< 0.5			0.5	Pass	
Total PCB*	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	98			70-130	Pass	
TRH C10-C14	%	104			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	100			70-130	Pass	
Toluene	%	98			70-130	Pass	
Ethylbenzene	%	95			70-130	Pass	
m&p-Xylenes	%	93			70-130	Pass	
o-Xylene	%	93			70-130	Pass	
Xylenes - Total	%	93			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	105			70-130	Pass	
TRH C6-C10	%	88			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	102			70-130	Pass	
Acenaphthylene	%	94			70-130	Pass	
Anthracene	%	91			70-130	Pass	
Benz(a)anthracene	%	86			70-130	Pass	
Benzo(a)pyrene	%	99			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(b&j)fluoranthene	%	93			70-130	Pass	
Benzo(g,h,i)perylene	%	92			70-130	Pass	
Benzo(k)fluoranthene	%	105			70-130	Pass	
Chrysene	%	107			70-130	Pass	
Dibenz(a,h)anthracene	%	89			70-130	Pass	
Fluoranthene	%	87			70-130	Pass	
Fluorene	%	96			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	90			70-130	Pass	
Naphthalene	%	98			70-130	Pass	
Phenanthrene	%	85			70-130	Pass	
Pyrene	%	88			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	106			70-130	Pass	
4,4'-DDD	%	111			70-130	Pass	
4,4'-DDE	%	108			70-130	Pass	
4,4'-DDT	%	104			70-130	Pass	
a-BHC	%	101			70-130	Pass	
Aldrin	%	104			70-130	Pass	
b-BHC	%	107			70-130	Pass	
d-BHC	%	100			70-130	Pass	
Dieldrin	%	108			70-130	Pass	
Endosulfan I	%	108			70-130	Pass	
Endosulfan II	%	112			70-130	Pass	
Endosulfan sulphate	%	115			70-130	Pass	
Endrin	%	105			70-130	Pass	
Endrin aldehyde	%	112			70-130	Pass	
Endrin ketone	%	109			70-130	Pass	
g-BHC (Lindane)	%	101			70-130	Pass	
Heptachlor	%	128			70-130	Pass	
Heptachlor epoxide	%	109			70-130	Pass	
Hexachlorobenzene	%	118			70-130	Pass	
Methoxychlor	%	110			70-130	Pass	
Toxaphene	%	128			70-130	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls (PCB)							
Aroclor-1260	%	73			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	107			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	123			70-130	Pass	
Cadmium	%	128			70-130	Pass	
Chromium	%	125			70-130	Pass	
Copper	%	124			70-130	Pass	
Lead	%	129			70-130	Pass	
Mercury	%	125			70-130	Pass	
Nickel	%	125			70-130	Pass	
Zinc	%	124			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	S16-No20118	NCP	%	83			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S16-No23555	NCP	%	92			70-130	Pass	
Acenaphthylene	S16-No23555	NCP	%	88			70-130	Pass	
Anthracene	S16-No23555	NCP	%	86			70-130	Pass	
Benz(a)anthracene	S16-No23555	NCP	%	91			70-130	Pass	
Benzo(a)pyrene	S16-No23555	NCP	%	93			70-130	Pass	
Benzo(b&j)fluoranthene	S16-No23555	NCP	%	93			70-130	Pass	
Benzo(g,h,i)perylene	S16-No23555	NCP	%	87			70-130	Pass	
Benzo(k)fluoranthene	S16-No23555	NCP	%	96			70-130	Pass	
Chrysene	S16-No23555	NCP	%	94			70-130	Pass	
Dibenz(a,h)anthracene	S16-No23555	NCP	%	88			70-130	Pass	
Fluoranthene	S16-No23555	NCP	%	88			70-130	Pass	
Fluorene	S16-No23555	NCP	%	88			70-130	Pass	
Indeno(1,2,3-cd)pyrene	S16-No23555	NCP	%	88			70-130	Pass	
Naphthalene	S16-No23555	NCP	%	89			70-130	Pass	
Phenanthrene	S16-No23555	NCP	%	82			70-130	Pass	
Pyrene	S16-No23555	NCP	%	89			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S16-No20118	NCP	%	82			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S16-No23845	NCP	%	96			70-130	Pass	
Cadmium	S16-No23845	NCP	%	94			70-130	Pass	
Chromium	S16-No23845	NCP	%	110			70-130	Pass	
Copper	S16-No24429	NCP	%	90			70-130	Pass	
Lead	S16-No23845	NCP	%	84			70-130	Pass	
Mercury	S16-No22986	NCP	%	109			70-130	Pass	
Nickel	S16-No22986	NCP	%	95			70-130	Pass	
Zinc	S16-No22986	NCP	%	91			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	S16-No19973	CP	%	85			70-130	Pass	
4,4'-DDD	S16-No19973	CP	%	97			70-130	Pass	
4,4'-DDE	S16-No19973	CP	%	89			70-130	Pass	
4,4'-DDT	S16-No19973	CP	%	114			70-130	Pass	
α-BHC	S16-No19973	CP	%	76			70-130	Pass	
Aldrin	S16-No19973	CP	%	81			70-130	Pass	
β-BHC	S16-No19973	CP	%	90			70-130	Pass	
δ-BHC	S16-No19973	CP	%	82			70-130	Pass	
Dieldrin	S16-No19973	CP	%	91			70-130	Pass	
Endosulfan I	S16-No19973	CP	%	87			70-130	Pass	
Endosulfan II	S16-No19973	CP	%	111			70-130	Pass	
Endosulfan sulphate	S16-No19973	CP	%	117			70-130	Pass	
Endrin	S16-No19973	CP	%	94			70-130	Pass	
Endrin aldehyde	S16-No19973	CP	%	113			70-130	Pass	
Endrin ketone	S16-No19973	CP	%	126			70-130	Pass	
γ-BHC (Lindane)	S16-No19973	CP	%	80			70-130	Pass	
Heptachlor	S16-No19973	CP	%	114			70-130	Pass	
Heptachlor epoxide	S16-No19973	CP	%	90			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Methoxychlor	S16-No19973	CP	%	127			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls (PCB)				Result 1					
Aroclor-1260	S16-No19973	CP	%	80			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S16-No19974	CP	%	88			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S16-No19974	CP	%	92			70-130	Pass	
Toluene	S16-No19974	CP	%	90			70-130	Pass	
Ethylbenzene	S16-No19974	CP	%	87			70-130	Pass	
m&p-Xylenes	S16-No19974	CP	%	83			70-130	Pass	
o-Xylene	S16-No19974	CP	%	84			70-130	Pass	
Xylenes - Total	S16-No19974	CP	%	84			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S16-No19974	CP	%	85			70-130	Pass	
TRH C6-C10	S16-No19974	CP	%	102			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	B16-No18202	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	B16-No18202	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	B16-No18202	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	B16-No18202	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	B16-No18202	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	B16-No18202	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S16-No22985	NCP	mg/kg	8.0	7.7	5.0	30%	Pass	
Cadmium	S16-No22985	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S16-No23844	NCP	mg/kg	17	19	10	30%	Pass	
Copper	S16-No22985	NCP	mg/kg	56	55	2.0	30%	Pass	
Lead	S16-No22985	NCP	mg/kg	47	52	10	30%	Pass	
Mercury	S16-No22985	NCP	mg/kg	0.1	0.2	11	30%	Pass	
Nickel	S16-No23844	NCP	mg/kg	12	14	14	30%	Pass	
Zinc	S16-No22985	NCP	mg/kg	150	140	13	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S16-No19972	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4,4'-DDD	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4,4'-DDE	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4,4'-DDT	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	

Duplicate								
Organochlorine Pesticides				Result 1	Result 2	RPD		
Endrin	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin aldehyde	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin ketone	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
g-BHC (Lindane)	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor epoxide	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Hexachlorobenzene	S16-No19972	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Methoxychlor	S16-No19972	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Toxaphene	S16-No19972	CP	mg/kg	< 1	< 1	<1	30%	Pass
Duplicate								
Polychlorinated Biphenyls (PCB)				Result 1	Result 2	RPD		
Aroclor-1016	S16-No19972	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1232	S16-No19972	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1242	S16-No19972	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1248	S16-No19972	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1254	S16-No19972	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1260	S16-No19972	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD		
TRH C6-C9	S16-No19973	CP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
BTX				Result 1	Result 2	RPD		
Benzene	S16-No19973	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Toluene	S16-No19973	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Ethylbenzene	S16-No19973	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
m&p-Xylenes	S16-No19973	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
o-Xylene	S16-No19973	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Xylenes - Total	S16-No19973	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
Naphthalene	S16-No19973	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
TRH C6-C10	S16-No19973	CP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Acenaphthene	S16-No19979	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Acenaphthylene	S16-No19979	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Anthracene	S16-No19979	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benz(a)anthracene	S16-No19979	CP	mg/kg	1.1	1.1	3.0	30%	Pass
Benzo(a)pyrene	S16-No19979	CP	mg/kg	1.5	1.4	7.0	30%	Pass
Benzo(b&j)fluoranthene	S16-No19979	CP	mg/kg	1.4	1.6	17	30%	Pass
Benzo(g,h,i)perylene	S16-No19979	CP	mg/kg	1.2	1.1	9.0	30%	Pass
Benzo(k)fluoranthene	S16-No19979	CP	mg/kg	1.0	0.9	15	30%	Pass
Chrysene	S16-No19979	CP	mg/kg	1.1	1.1	<1	30%	Pass
Dibenz(a,h)anthracene	S16-No19979	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluoranthene	S16-No19979	CP	mg/kg	1.8	1.9	6.0	30%	Pass
Fluorene	S16-No19979	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Indeno(1,2,3-cd)pyrene	S16-No19979	CP	mg/kg	0.9	0.9	2.0	30%	Pass
Naphthalene	S16-No19979	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phenanthrene	S16-No19979	CP	mg/kg	0.6	0.8	23	30%	Pass
Pyrene	S16-No19979	CP	mg/kg	2.2	2.3	8.0	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	S16-No19979	CP	%	17	17	1.0	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q09	The Surrogate recovery is outside of the recommended acceptance criteria due to matrix interference. Acceptance criteria were met for all other QC

Authorised By

Nibha Vaidya	Analytical Services Manager
Nibha Vaidya	Senior Analyst-Asbestos (NSW)
Ryan Hamilton	Senior Analyst-Inorganic (NSW)
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Certificate of Analysis

Coffey Geotechnics Pty Ltd Chatswood
Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 524674-L
Project name RNSH-SITE 4A
Project ID GEOTLCOV25684AB
Received Date Nov 22, 2016

Client Sample ID			BH202_0.1-0.2	BH203_0.1-0.2	BH205_0.5-0.6
Sample Matrix			US Leachate	US Leachate	US Leachate
Eurofins mgt Sample No.			S16-No19980	S16-No19981	S16-No19982
Date Sampled			Nov 12, 2016	Nov 19, 2016	Nov 16, 2016
Test/Reference	LOR	Unit			
USA Leaching Procedure					
Leachate Fluid ^{C01}		comment	1.0	1.0	1.0
pH (initial)	0.1	pH Units	8.8	9.1	8.1
pH (off)	0.1	pH Units	5.3	5.5	5.2
pH (USA HCl addition)	0.1	pH Units	1.7	1.7	1.7

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description

USA Leaching Procedure

- Method: LTM-GEN-7010

- Method: Leaching Procedure for Soils & Solid Wastes

Testing Site

Sydney

Extracted

Nov 24, 2016

Holding Time

14 Day

Company Name: Coffey Geotechnics Pty Ltd Chatswood
Address: Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SITE 4A
Project ID: GEOTLCOV25684AB

Order No.:
Report #: 524674
Phone: +61 2 9406 1000
Fax: +61 2 9406 1002

Received: Nov 22, 2016 5:10 PM
Due: Nov 29, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence /Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BH202_0.5-0.6	Nov 12, 2016		Soil	S16-No19970	X			X	X	X
2	BH202_0.1-0.2	Nov 12, 2016		Soil	S16-No19971	X			X	X	X
3	BH202_0.8-1.0	Nov 12, 2016		Soil	S16-No19972				X	X	X
4	BH203_0.1-0.2	Nov 19, 2016		Soil	S16-No19973	X			X	X	X
5	BH203_0.9-1.0	Nov 19, 2016		Soil	S16-No19974	X			X	X	X
6	BH203_1.6-1.7	Nov 19, 2016		Soil	S16-No19975				X	X	X
7	BH205_0.0-0.1	Nov 16, 2016		Soil	S16-No19976	X			X	X	X
8	BH205_0.5-0.6	Nov 16, 2016		Soil	S16-No19977	X			X	X	X
9	BH205_2.0-2.1	Nov 16, 2016		Soil	S16-No19978				X	X	X

Company Name: Coffey Geotechnics Pty Ltd Chatswood
Address: Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SITE 4A
Project ID: GEOTLCOV25684AB

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Received: Nov 22, 2016 5:10 PM
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Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence /Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
10	DUPE1	Nov 19, 2016		Soil	S16-No19979					X	X
11	BH202_0.1-0.2	Nov 12, 2016		US Leachate	S16-No19980			X			
12	BH203_0.1-0.2	Nov 19, 2016		US Leachate	S16-No19981			X			
13	BH205_0.5-0.6	Nov 16, 2016		US Leachate	S16-No19982			X			
14	BH202_3.0-3.6	Nov 12, 2016		US Leachate	S16-No19983		X				
15	BH202_2.1-2.4	Nov 12, 2016		US Leachate	S16-No19984		X				
16	BH203_0.5-0.6	Nov 19, 2016		US Leachate	S16-No19985		X				
17	BH203_3.8-3.9	Nov 19, 2016		US Leachate	S16-No19986		X				
18	BH205_0.9-1.0	Nov 19, 2016		US Leachate	S16-No19987		X				
19	BH205_3.0-3.1	Nov 19, 2016		US Leachate	S16-No20013		X				
Test Counts						6	6	3	9	10	10

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other

Authorised By

Nibha Vaidya Analytical Services Manager



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Certificate of Analysis



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025—Testing
 The results of the tests, calibrations and/or
 measurements included in this document are traceable
 to Australian/national standards.

Coffey Geotechnics Pty Ltd Chatswood
Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067

Attention: Fiona Wong
Report 524674-AID
Project Name RNSH-SITE 4A
Project ID GEOTLCOV25684AB
Received Date Nov 22, 2016
Date Reported Nov 29, 2016

Methodology:

Asbestos ID Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. Bulk samples include building materials, soils and ores.

Subsampling Soil Samples The whole sample submitted is first dried and then sieved through a 10mm sieve followed by a 2mm sieve. All fibrous matter viz greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) Iron ores - Sampling and Sample preparation procedures is employed. Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis in accordance with AS 4964-2004.

Bonded asbestos-containing material (ACM) The material is first examined and any fibres isolated and where required interfering organic fibres or matter may be removed by treating the sample for several hours at a temperature not exceeding $400 \pm 30^{\circ}\text{C}$. The resultant material is then ground and examined in accordance with AS 4964-2004.

Limit of Reporting The nominal detection limit of the AS4964 method is around 0.01%. The examination of large sample sizes (at least 500 ml is recommended) may improve the likelihood of identifying asbestos material in the greater than 2 mm fraction. The NEPM screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. NOTE: NATA News, September 2011 – page 34, states, “Weighing of fibres is problematic and can lead to loss of fibres and potential exposure for laboratory analysts. To request laboratories to report information which is outside the scope of AS 4964-2004 and the scope of their accreditation is misleading and is most unwise” therefore such values reported are outside the scope of Eurofins | mgt NATA accreditation as designated by an asterisk.

Project Name RNSH-SITE 4A
Project ID GEOTLCOV25684AB
Date Sampled Nov 12, 2016 to Nov 19, 2016
Report 524674-AID

Client Sample ID	Eurofins mgt Sample No.	Date Sampled	Sample Description	Result
BH202_0.5-0.6	16-No19970	Nov 12, 2016	Approximate Sample 306g Sample consisted of: Brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BH202_0.1-0.2	16-No19971	Nov 12, 2016	Approximate Sample 565g Sample consisted of: Brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BH203_0.1-0.2	16-No19973	Nov 19, 2016	Approximate Sample 423g Sample consisted of: Brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BH203_0.9-1.0	16-No19974	Nov 19, 2016	Approximate Sample 399g Sample consisted of: Brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BH205_0.0-0.1	16-No19976	Nov 16, 2016	Approximate Sample 211g Sample consisted of: Brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BH205_0.5-0.6	16-No19977	Nov 16, 2016	Approximate Sample 327g Sample consisted of: Brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Nov 22, 2016	Indefinite

Company Name: Coffey Geotechnics Pty Ltd Chatswood
Address: Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SITE 4A
Project ID: GEOTLCOV25684AB

Order No.:
Report #: 524674
Phone: +61 2 9406 1000
Fax: +61 2 9406 1002

Received: Nov 22, 2016 5:10 PM
Due: Nov 29, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence / Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BH202_0.5-0.6	Nov 12, 2016		Soil	S16-No19970	X			X	X	X
2	BH202_0.1-0.2	Nov 12, 2016		Soil	S16-No19971	X			X	X	X
3	BH202_0.8-1.0	Nov 12, 2016		Soil	S16-No19972				X	X	X
4	BH203_0.1-0.2	Nov 19, 2016		Soil	S16-No19973	X			X	X	X
5	BH203_0.9-1.0	Nov 19, 2016		Soil	S16-No19974	X			X	X	X
6	BH203_1.6-1.7	Nov 19, 2016		Soil	S16-No19975				X	X	X
7	BH205_0.0-0.1	Nov 16, 2016		Soil	S16-No19976	X			X	X	X
8	BH205_0.5-0.6	Nov 16, 2016		Soil	S16-No19977	X			X	X	X
9	BH205_2.0-2.1	Nov 16, 2016		Soil	S16-No19978				X	X	X

Company Name: Coffey Geotechnics Pty Ltd Chatswood
Address: Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SITE 4A
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Sample Detail						Asbestos Absence / Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
10	DUPE1	Nov 19, 2016		Soil	S16-No19979					X	X
11	BH202_0.1-0.2	Nov 12, 2016		US Leachate	S16-No19980			X			
12	BH203_0.1-0.2	Nov 19, 2016		US Leachate	S16-No19981			X			
13	BH205_0.5-0.6	Nov 16, 2016		US Leachate	S16-No19982			X			
14	BH202_3.0-3.6	Nov 12, 2016		US Leachate	S16-No19983		X				
15	BH202_2.1-2.4	Nov 12, 2016		US Leachate	S16-No19984		X				
16	BH203_0.5-0.6	Nov 19, 2016		US Leachate	S16-No19985		X				
17	BH203_3.8-3.9	Nov 19, 2016		US Leachate	S16-No19986		X				
18	BH205_0.9-1.0	Nov 19, 2016		US Leachate	S16-No19987		X				
19	BH205_3.0-3.1	Nov 19, 2016		US Leachate	S16-No20013		X				
Test Counts						6	6	3	9	10	10

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
COC	Chain of custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Western Australia Department of Health
NOHSC	National Occupational Health and Safety Commission
ACM	Bonded asbestos-containing material means any material containing more than 1% asbestos and comprises asbestos-containing-material which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin. Common examples of ACM include but are not limited to: pipe and boiler insulation, sprayed-on fireproofing, troweled-on acoustical plaster, floor tile and mastic, floor linoleum, transite shingles, roofing materials, wall and ceiling plaster, ceiling tiles, and gasket materials. This term is restricted to material that cannot pass a 7 mm x 7 mm sieve. This sieve size is selected because it approximates the thickness of common asbestos cement sheeting and for fragments to be smaller than this would imply a high degree of damage and hence potential for fibre release.
FA	FA comprises friable asbestos material and includes severely weathered cement sheet, insulation products and woven asbestos material. This type of friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. This material is typically unbonded or was previously bonded and is now significantly degraded (crumbling).
PACM	Presumed Asbestos-Containing Material means thermal system insulation and surfacing material found in buildings, vessels, and vessel sections constructed no later than 1980 that are assumed to contain greater than one percent asbestos but have not been sampled or analyzed to verify or negate the presence of asbestos.
AF	Asbestos fines (AF) are defined as free fibres, or fibre bundles, smaller than 7mm. It is the free fibres which present the greatest risk to human health, although very small fibres (< 5 microns in length) are not considered to be such a risk. AF also includes small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve. (Note that for bonded ACM fragments to pass through a 7 mm x 7 mm sieve implies a substantial degree of damage which increases the potential for fibre release.)
AC	Asbestos cement means a mixture of cement and asbestos fibres (typically 90:10 ratios).

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Authorised by:

Nibha Vaidya

Senior Analyst-Asbestos (NSW)



Glenn Jackson

National Operations Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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Sample Receipt Advice

Company name: **Coffey Geotechnics Pty Ltd Chatswood**
Contact name: **Fiona Wong**
Project name: **RNSH-SITE 4A**
Project ID: **GEOTLCOV25684AB**
COC number: **Not provided**
Turn around time: **5 Day**
Date/Time received: **Nov 22, 2016 5:10 PM**
Eurofins | mgt reference: **524674**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 9.4 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

DUP1 forwarded to ALS. Extra sample jar BH205_3.0-3.1 received, logged on HOLD.

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Fiona Wong - fiona_wong@coffey.com.

Note: A copy of these results will also be delivered to the general Coffey Geotechnics Pty Ltd Chatswood email address.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 1 of 1

9187



Consigning Office: Chatswood
 Report Results to: Fiona Wong
 Invoices to: Chat - General admin

Mobile: _____ Email: Jessie.Sixsmith @coffey.com
 Phone: _____ Email: _____ @coffey.com

Project No: GEOTICOU2S684AB Task No: Drilling
 Project Name: RNSH-SHE 4a Laboratory: Eurofins
 Sampler's Name: PH/BW/RWJ Project Manager: Fiona Wong
 Special Instructions: *see NOTES*
 Relevant agreements: Eurofins COF_ENAUABTF00952AA_MSA1 ; ALS COF_ENAUABTF00952AA_MSA2 and SGS COF_ENAUABTF00952AA_MSA3

Analysis Request Section

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil...etc)	Container Type & Preservative*	T-A-T (specify)	NOTES									
	BH202 (0.5-0.6)	12/11	Am/b	Soil	J, Z	STD*	* Please extract organics only, and preplumble TCP AS per Fiona Wong's Request. FIONA WONG will CONFIRM when ANALYSIS is to commence. * * Forward to ALS									
	↓ (0.1-0.2)				↓											
	↓ (0.8-1.0)				J											
	↓ (3.0-3.6)				J, Z											
	↓ (2.1-2.4)				J, Z											
	BH203 (0.1-0.2)	11/11			↓											
	↓ (0.5-0.6)				↓											
	↓ (0.9-1.0)				J											
	↓ (1.6-1.7)				J											
	↓ (3.8-3.9)				J, Z											
	BH205 (0.0-0.1)	16/11			↓											
	↓ (0.5-0.6)				↓											
	↓ (0.9-1.0)				J											
	↓ (1.6-1.7)				J											
	↓ (2.0-2.1)				J, Z											
	Dupe 1	19/11			J											
	Dupe 1	19/11			J, Z											

RELINQUISHED BY

Name: Jessie Sixsmith Date: 22-11-16
 Time: _____
 Date: _____
 Time: _____

RECEIVED BY

Name: Fiona Wong Date: 22/11
 Company: Eurofins Time: 17:10
 Name: _____ Date: _____
 Company: _____ Time: _____

Sample Receipt Advice: (Lab Use Only)

All Samples Received in Good Condition ☒
 All Documentation is in Proper Order ☒
 Samples Received Properly Chilled ☒
 Lab. Ref/Batch No. S24674

Preservation Codes: P - Plastic, G - Glass Bottle, J - Glass Jar, V - Vial, Z - Ziplock Bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved, served, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative, OP - Other Preservative

Certificate of Analysis

Coffey Geotechnics Pty Ltd Chatswood
Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 526653-L
Project name ADDITIONAL: RNSH-SITE 4A
Project ID GEOTLCOV25684AB
Received Date Dec 07, 2016

Client Sample ID			BH202_0.1-0.2	BH203_0.1-0.2	BH203_0.9-1.0	DUPE1
Sample Matrix			US Leachate	US Leachate	US Leachate	US Leachate
Eurofins mgt Sample No.			S16-De06538	S16-De06539	S16-De06540	S16-De06541
Date Sampled			Nov 12, 2016	Nov 12, 2016	Nov 19, 2016	Nov 19, 2016
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	0.001	mg/L	-	-	< 0.001	< 0.001
Acenaphthylene	0.001	mg/L	-	-	< 0.001	< 0.001
Anthracene	0.001	mg/L	-	-	< 0.001	< 0.001
Benz(a)anthracene	0.001	mg/L	-	-	< 0.001	< 0.001
Benzo(a)pyrene	0.001	mg/L	-	-	< 0.001	< 0.001
Benzo(b&j)fluoranthene ^{N07}	0.001	mg/L	-	-	< 0.001	< 0.001
Benzo(g,h,i)perylene	0.001	mg/L	-	-	< 0.001	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	-	-	< 0.001	< 0.001
Chrysene	0.001	mg/L	-	-	< 0.001	< 0.001
Dibenz(a,h)anthracene	0.001	mg/L	-	-	< 0.001	< 0.001
Fluoranthene	0.001	mg/L	-	-	< 0.001	< 0.001
Fluorene	0.001	mg/L	-	-	< 0.001	< 0.001
Indeno(1,2,3-cd)pyrene	0.001	mg/L	-	-	< 0.001	< 0.001
Naphthalene	0.001	mg/L	-	-	< 0.001	< 0.001
Phenanthrene	0.001	mg/L	-	-	< 0.001	< 0.001
Pyrene	0.001	mg/L	-	-	< 0.001	< 0.001
Total PAH*	0.002	mg/L	-	-	< 0.001	< 0.001
2-Fluorobiphenyl (surr.)	1	%	-	-	84	76
p-Terphenyl-d14 (surr.)	1	%	-	-	99	92
Heavy Metals						
Nickel	0.05	mg/L	< 0.05	0.07	-	-
USA Leaching Procedure						
Leachate Fluid ^{C01}		comment	1.0	1.0	1.0	1.0
pH (initial)	0.1	pH Units	8.8	9.1	8.8	8.8
pH (off)	0.1	pH Units	5.3	5.5	5.2	5.3
pH (USA HCl addition)	0.1	pH Units	1.7	1.7	2.2	2.2

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons	Sydney	Dec 12, 2016	7 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Heavy Metals	Sydney	Dec 09, 2016	180 Day
- Method: LTM-MET-3030 by ICP-OES (hydride ICP-OES for Mercury)			
USA Leaching Procedure	Sydney	Dec 09, 2016	14 Day
- Method: LTM-GEN-7010			
- Method: Leaching Procedure for Soils & Solid Wastes			

Company Name: Coffey Geotechnics Pty Ltd Chatswood
Address: Level 18, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: ADDITIONAL: RNSH-SITE 4A
Project ID: GEOTLCOV25684AB

Order No.:
Report #: 526653
Phone: +61 2 9406 1000
Fax: +61 2 9406 1002

Received: Dec 7, 2016 9:37 AM
Due: Dec 14, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Nickel	Polyyclic Aromatic Hydrocarbons	USA Leaching Procedure
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 18217								
External Laboratory								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID			
1	BH202_0.1-0.2	Nov 12, 2016		US Leachate	S16-De06538	X		X
2	BH203_0.1-0.2	Nov 12, 2016		US Leachate	S16-De06539	X		X
3	BH203_0.9-1.0	Nov 19, 2016		US Leachate	S16-De06540		X	X
4	DUPE1	Nov 19, 2016		US Leachate	S16-De06541		X	X
Test Counts						2	2	4

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank										
Polycyclic Aromatic Hydrocarbons										
Acenaphthene				mg/L	< 0.001			0.001	Pass	
Acenaphthylene				mg/L	< 0.001			0.001	Pass	
Anthracene				mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene				mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene				mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene				mg/L	< 0.001			0.001	Pass	
Benzo(g,h,i)perylene				mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene				mg/L	< 0.001			0.001	Pass	
Chrysene				mg/L	< 0.001			0.001	Pass	
Dibenz(a,h)anthracene				mg/L	< 0.001			0.001	Pass	
Fluoranthene				mg/L	< 0.001			0.001	Pass	
Fluorene				mg/L	< 0.001			0.001	Pass	
Indeno(1,2,3-cd)pyrene				mg/L	< 0.001			0.001	Pass	
Naphthalene				mg/L	< 0.001			0.001	Pass	
Phenanthrene				mg/L	< 0.001			0.001	Pass	
Pyrene				mg/L	< 0.001			0.001	Pass	
Method Blank										
Heavy Metals										
Nickel				mg/L	< 0.05			0.05	Pass	
Test	Lab Sample ID	QA Source		Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery										
Heavy Metals					Result 1					
Nickel	S16-De13546	NCP	%		90			70-130	Pass	
Test	Lab Sample ID	QA Source		Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
Heavy Metals					Result 1	Result 2	RPD			
Nickel	S16-De13545	NCP	mg/L		< 0.05	< 0.05	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	No
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

Nibha Vaidya	Analytical Services Manager
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Metal (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Sample Receipt Advice

Company name: **Coffey Geotechnics Pty Ltd Chatswood**
Contact name: **Fiona Wong**
Project name: **ADDITIONAL: RNSH-SITE 4A**
Project ID: **GEOTLCOV25684AB**
COC number: **Not provided**
Turn around time: **5 Day**
Date/Time received: **Dec 7, 2016 9:37 AM**
Eurofins | mgt reference: **526653**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 9.4 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☐ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☐ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Additional from 524674 | PAH analysis conducted outside of holding time

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Fiona Wong - fiona_wong@coffey.com.

Note: A copy of these results will also be delivered to the general Coffey Geotechnics Pty Ltd Chatswood email address.

Siamak Sobhanei

From: Andrew Black
Sent: Wednesday, 7 December 2016 9:43 AM
To: !AU04_CAU001_EnviroSampleNSW
Subject: Report 524674 : Site RNSH-SITE 4A (GEOTLCOV25684AB)- ADDITIONAL LEACHATE ANALYSIS (5DAY TAT)

Additional leachate analysis on 5 day TAT.

Andrew Black
Phone: +61 410 220 750
Email: AndrewBlack@eurofins.com

From: Wong, Fiona [<mailto:Fiona.Wong@coffey.com>]
Sent: Wednesday, 7 December 2016 9:37 AM
To: Andrew Black
Subject: RE: Eurofins | mgt Test Results - Report 524674 : Site RNSH-SITE 4A (GEOTLCOV25684AB)

Hi Andrew

Further to our earlier telephone conversation can you please organise the following additional tests to be carried out:

- BH202_0.1-0.2 and BH203_0.1-0.2 – TCLP for nickel, leach samples have been prepared
- BH203_0.9-1.0 and DUPE1 for TCLP PAH, leach samples have not been prepared, and I note this will be outside of holding time.

Thanks and regards

Fiona Wong
Associate Environmental Engineer

t: +61 2 9406 1213
m: +61 409 367 752
w: coffey.com

Season's greetings
from Coffey

Our office will be closed
from close of business
Friday 23 December 2016
and will re-open on
Monday 9 January 2017.



From: AndrewBlack@eurofins.com [<mailto:AndrewBlack@eurofins.com>]
Sent: Tuesday, 29 November 2016 5:49 PM
To: Wong, Fiona <Fiona.Wong@coffey.com>
Subject: Eurofins | mgt Test Results - Report 524674 : Site RNSH-SITE 4A (GEOTLCOV25684AB)

Certificate of Analysis

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 526829-S
Project name RNHS SITE 4A
Project ID ENAURHOD06452AA
Received Date Dec 07, 2016

Client Sample ID			BH204_0.1-0.2	BH204_0.5-0.6	BH204_0.7-0.8	BH204_0.9-1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-De07803	S16-De07804	S16-De07805	S16-De07806
Date Sampled			Nov 26, 2016	Nov 26, 2016	Nov 26, 2016	Nov 26, 2016
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	1700
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	680
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	2380
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	71	65	60	64
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	1.8	2.8
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	2.0	3.1
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	2.3	3.3
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	0.5	0.8
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	1.5	2.2
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	1.3	2.1
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	< 0.5	1.6	2.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	< 0.5	0.7	1.3
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	0.8	1.0
Chrysene	0.5	mg/kg	< 0.5	< 0.5	1.3	1.7
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	3.2	4.9
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	0.6	1.0

Client Sample ID			BH204_0.1-0.2	BH204_0.5-0.6	BH204_0.7-0.8	BH204_0.9-1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-De07803	S16-De07804	S16-De07805	S16-De07806
Date Sampled			Nov 26, 2016	Nov 26, 2016	Nov 26, 2016	Nov 26, 2016
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	1.3	2.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	3.0	5.0
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	15.8	25
2-Fluorobiphenyl (surr.)	1	%	85	83	83	84
p-Terphenyl-d14 (surr.)	1	%	96	98	99	105
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
4,4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
4,4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
4,4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
α-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
β-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
δ-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
γ-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	< 0.2	-
Toxaphene	1	mg/kg	< 1	< 1	< 1	-
Dibutylchlorendate (surr.)	1	%	90	82	110	-
Tetrachloro-m-xylene (surr.)	1	%	87	80	95	-
Polychlorinated Biphenyls						
Aroclor-1016	0.5	mg/kg	< 0.5	< 0.5	< 0.5	-
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
Aroclor-1232	0.5	mg/kg	< 0.5	< 0.5	< 0.5	-
Aroclor-1242	0.5	mg/kg	< 0.5	< 0.5	< 0.5	-
Aroclor-1248	0.5	mg/kg	< 0.5	< 0.5	< 0.5	-
Aroclor-1254	0.5	mg/kg	< 0.5	< 0.5	< 0.5	-
Aroclor-1260	0.5	mg/kg	< 0.5	< 0.5	< 0.5	-
Total PCB*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	-
Dibutylchlorendate (surr.)	1	%	90	82	110	-
Tetrachloro-m-xylene (surr.)	1	%	87	80	95	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	2300
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	270

Client Sample ID			BH204_0.1-0.2	BH204_0.5-0.6	BH204_0.7-0.8	BH204_0.9-1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S16-De07803	S16-De07804	S16-De07805	S16-De07806
Date Sampled			Nov 26, 2016	Nov 26, 2016	Nov 26, 2016	Nov 26, 2016
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	9.1
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	20	7.6	< 5	23
Copper	5	mg/kg	46	9.7	8.1	8.3
Lead	5	mg/kg	< 5	19	26	27
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	85	9.3	< 5	5.6
Zinc	5	mg/kg	52	23	16	13
% Moisture	1	%	5.5	10	23	17

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Dec 09, 2016	14 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
BTEX	Sydney	Dec 09, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Dec 09, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Polycyclic Aromatic Hydrocarbons	Sydney	Dec 09, 2016	14 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Dec 09, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Metals M8	Sydney	Dec 09, 2016	28 Day
- Method: LTM-MET-3040_R0 TOTAL AND DISSOLVED METALS AND MERCURY IN WATERS BY ICP-MS			
Organochlorine Pesticides	Sydney	Dec 09, 2016	14 Day
- Method: E013 Organochlorine Pesticides (OC)			
Polychlorinated Biphenyls	Sydney	Dec 09, 2016	28 Day
- Method: E013 Polychlorinated Biphenyls (PCB)			
% Moisture	Sydney	Dec 08, 2016	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067

Project Name: RNHS SITE 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 526829
Phone: +61 2 9406 1000
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Received: Dec 7, 2016 12:04 PM
Due: Dec 14, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence /Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217							X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217						X					
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BH204 0.1-0.2	Nov 26, 2016		Soil	S16-De07803	X			X	X	X
2	BH204 0.5-0.6	Nov 26, 2016		Soil	S16-De07804	X			X	X	X
3	BH204 0.7-0.8	Nov 26, 2016		Soil	S16-De07805	X			X	X	X
4	BH204 0.9-1.0	Nov 26, 2016		Soil	S16-De07806					X	X
5	BH204 3.5-4.0	Nov 26, 2016		Soil	S16-De07807		X				
6	BH204 0.1-0.2	Nov 26, 2016		US Leachate	S16-De07808			X			
7	BH204 0.5-0.6	Nov 26, 2016		US Leachate	S16-De07809			X			
8	BH204 0.7-0.8	Nov 26, 2016		US Leachate	S16-De07810			X			
Test Counts						3	1	3	3	4	4

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4,4'-DDD	mg/kg	< 0.05			0.05	Pass	
4,4'-DDE	mg/kg	< 0.05			0.05	Pass	
4,4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.2			0.2	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/kg	< 0.5			0.5	Pass	
Aroclor-1221	mg/kg	< 0.1			0.1	Pass	
Aroclor-1232	mg/kg	< 0.5			0.5	Pass	
Aroclor-1242	mg/kg	< 0.5			0.5	Pass	
Aroclor-1248	mg/kg	< 0.5			0.5	Pass	
Aroclor-1254	mg/kg	< 0.5			0.5	Pass	
Aroclor-1260	mg/kg	< 0.5			0.5	Pass	
Total PCB*	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	73			70-130	Pass	
TRH C10-C14	%	81			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	96			70-130	Pass	
Toluene	%	93			70-130	Pass	
Ethylbenzene	%	89			70-130	Pass	
m&p-Xylenes	%	89			70-130	Pass	
o-Xylene	%	89			70-130	Pass	
Xylenes - Total	%	89			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	118			70-130	Pass	
TRH C6-C10	%	79			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	86			70-130	Pass	
Acenaphthylene	%	80			70-130	Pass	
Anthracene	%	91			70-130	Pass	
Benz(a)anthracene	%	88			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(a)pyrene	%	85			70-130	Pass	
Benzo(b&j)fluoranthene	%	86			70-130	Pass	
Benzo(g,h,i)perylene	%	84			70-130	Pass	
Benzo(k)fluoranthene	%	88			70-130	Pass	
Chrysene	%	93			70-130	Pass	
Dibenz(a,h)anthracene	%	82			70-130	Pass	
Fluoranthene	%	87			70-130	Pass	
Fluorene	%	81			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	84			70-130	Pass	
Naphthalene	%	93			70-130	Pass	
Phenanthrene	%	84			70-130	Pass	
Pyrene	%	86			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	96			70-130	Pass	
4,4'-DDD	%	75			70-130	Pass	
4,4'-DDE	%	93			70-130	Pass	
4,4'-DDT	%	126			70-130	Pass	
a-BHC	%	94			70-130	Pass	
Aldrin	%	99			70-130	Pass	
b-BHC	%	102			70-130	Pass	
d-BHC	%	105			70-130	Pass	
Dieldrin	%	94			70-130	Pass	
Endosulfan I	%	103			70-130	Pass	
Endosulfan II	%	92			70-130	Pass	
Endosulfan sulphate	%	110			70-130	Pass	
Endrin	%	100			70-130	Pass	
Endrin aldehyde	%	92			70-130	Pass	
Endrin ketone	%	100			70-130	Pass	
g-BHC (Lindane)	%	98			70-130	Pass	
Heptachlor	%	104			70-130	Pass	
Heptachlor epoxide	%	103			70-130	Pass	
Methoxychlor	%	119			70-130	Pass	
Toxaphene	%	129			70-130	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls							
Aroclor-1260	%	93			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	80			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	95			70-130	Pass	
Cadmium	%	99			70-130	Pass	
Chromium	%	95			70-130	Pass	
Copper	%	95			70-130	Pass	
Lead	%	102			70-130	Pass	
Mercury	%	104			70-130	Pass	
Nickel	%	94			70-130	Pass	
Zinc	%	97			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1				
TRH C6-C9	S16-De11355	NCP	%	84		70-130	Pass	
TRH C10-C14	S16-De09370	NCP	%	99		70-130	Pass	
Spike - % Recovery								
BTEX				Result 1				
Benzene	S16-De11355	NCP	%	105		70-130	Pass	
Toluene	S16-De11355	NCP	%	101		70-130	Pass	
Ethylbenzene	S16-De11355	NCP	%	99		70-130	Pass	
m&p-Xylenes	S16-De11355	NCP	%	99		70-130	Pass	
o-Xylene	S16-De11355	NCP	%	100		70-130	Pass	
Xylenes - Total	S16-De11355	NCP	%	99		70-130	Pass	
Spike - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1				
Naphthalene	S16-De11355	NCP	%	111		70-130	Pass	
TRH C6-C10	S16-De11355	NCP	%	85		70-130	Pass	
Spike - % Recovery								
Polycyclic Aromatic Hydrocarbons				Result 1				
Acenaphthene	S16-De08456	NCP	%	96		70-130	Pass	
Acenaphthylene	S16-De08456	NCP	%	88		70-130	Pass	
Anthracene	S16-De08456	NCP	%	100		70-130	Pass	
Benz(a)anthracene	S16-De08456	NCP	%	94		70-130	Pass	
Benzo(a)pyrene	S16-De08456	NCP	%	88		70-130	Pass	
Benzo(b&j)fluoranthene	S16-De08456	NCP	%	87		70-130	Pass	
Benzo(g,h,i)perylene	S16-De08456	NCP	%	90		70-130	Pass	
Benzo(k)fluoranthene	S16-De08456	NCP	%	96		70-130	Pass	
Chrysene	S16-De08456	NCP	%	101		70-130	Pass	
Dibenz(a,h)anthracene	S16-De08456	NCP	%	87		70-130	Pass	
Fluoranthene	S16-De08456	NCP	%	94		70-130	Pass	
Fluorene	S16-De08456	NCP	%	91		70-130	Pass	
Indeno(1,2,3-cd)pyrene	S16-De08456	NCP	%	88		70-130	Pass	
Naphthalene	S16-De08456	NCP	%	103		70-130	Pass	
Phenanthrene	S16-De08456	NCP	%	95		70-130	Pass	
Pyrene	S16-De08456	NCP	%	95		70-130	Pass	
Spike - % Recovery								
Organochlorine Pesticides				Result 1				
Chlordanes - Total	S16-De11445	NCP	%	104		70-130	Pass	
4,4'-DDD	S16-De11445	NCP	%	87		70-130	Pass	
4,4'-DDE	S16-De11445	NCP	%	104		70-130	Pass	
4,4'-DDT	S16-De11427	NCP	%	59		70-130	Fail	Q08
a-BHC	S16-De11445	NCP	%	96		70-130	Pass	
Aldrin	S16-De11445	NCP	%	108		70-130	Pass	
b-BHC	S16-De11445	NCP	%	109		70-130	Pass	
d-BHC	S16-De11445	NCP	%	119		70-130	Pass	
Dieldrin	S16-De11445	NCP	%	102		70-130	Pass	
Endosulfan I	S16-De11445	NCP	%	109		70-130	Pass	
Endosulfan II	S16-De11445	NCP	%	125		70-130	Pass	
Endosulfan sulphate	S16-De11445	NCP	%	114		70-130	Pass	
Endrin	S16-De11445	NCP	%	106		70-130	Pass	
Endrin aldehyde	S16-De11445	NCP	%	102		70-130	Pass	
Endrin ketone	S16-De11445	NCP	%	118		70-130	Pass	
g-BHC (Lindane)	S16-De11445	NCP	%	100		70-130	Pass	
Heptachlor	S16-De11445	NCP	%	116		70-130	Pass	
Heptachlor epoxide	S16-De11445	NCP	%	113		70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Methoxychlor	S16-De11427	NCP	%	57			70-130	Fail	Q08
Toxaphene	S16-De11427	NCP	%	57			70-130	Fail	Q08
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1260	S16-De11445	NCP	%	98			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S16-De09370	NCP	%	100			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S16-De06133	NCP	%	89			70-130	Pass	
Cadmium	S16-De06133	NCP	%	93			70-130	Pass	
Chromium	S16-De06133	NCP	%	90			70-130	Pass	
Copper	S16-De06133	NCP	%	85			70-130	Pass	
Lead	S16-De06133	NCP	%	89			70-130	Pass	
Mercury	S16-De06133	NCP	%	102			70-130	Pass	
Nickel	S16-De06133	NCP	%	89			70-130	Pass	
Zinc	S16-De06133	NCP	%	90			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	S16-De09369	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S16-De09369	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S16-De09369	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S16-De11443	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4,4'-DDD	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4,4'-DDE	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4,4'-DDT	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S16-De11443	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S16-De11443	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Toxaphene	S16-De11443	NCP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
Polychlorinated Biphenyls				Result 1	Result 2	RPD			
Aroclor-1016	S16-De11443	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1221	S16-De11443	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1232	S16-De11443	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1242	S16-De11443	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1248	S16-De11443	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate								
Polychlorinated Biphenyls				Result 1	Result 2	RPD		
Aroclor-1254	S16-De11443	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1260	S16-De11443	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
TRH >C10-C16	S16-De09369	NCP	mg/kg	< 50	< 50	<1	30%	Pass
TRH >C16-C34	S16-De09369	NCP	mg/kg	< 100	< 100	<1	30%	Pass
TRH >C34-C40	S16-De09369	NCP	mg/kg	< 100	< 100	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S16-De04013	NCP	mg/kg	14	17	14	30%	Pass
Cadmium	S16-De03977	NCP	mg/kg	0.4	0.4	2.0	30%	Pass
Chromium	S16-De06132	NCP	mg/kg	7.2		12	30%	Pass
Copper	S16-De06132	NCP	mg/kg	17		8.0	30%	Pass
Lead	S16-De06132	NCP	mg/kg	8.5		11	30%	Pass
Mercury	S16-De04013	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Nickel	S16-De06132	NCP	mg/kg	< 5	5.6	11	30%	Pass
Zinc	S16-De06132	NCP	mg/kg	32	38	15	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	S16-De03319	NCP	%	7.5	6.6	13	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD		
TRH C6-C9	S16-De07806	CP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
BTEX				Result 1	Result 2	RPD		
Benzene	S16-De07806	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Toluene	S16-De07806	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Ethylbenzene	S16-De07806	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
m&p-Xylenes	S16-De07806	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
o-Xylene	S16-De07806	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Xylenes - Total	S16-De07806	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
Naphthalene	S16-De07806	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
TRH C6-C10	S16-De07806	CP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Acenaphthene	S16-De07806	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Acenaphthylene	S16-De07806	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Anthracene	S16-De07806	CP	mg/kg	0.8	0.9	10	30%	Pass
Benz(a)anthracene	S16-De07806	CP	mg/kg	2.2	2.5	13	30%	Pass
Benzo(a)pyrene	S16-De07806	CP	mg/kg	2.1	2.3	10	30%	Pass
Benzo(b&j)fluoranthene	S16-De07806	CP	mg/kg	2.5	2.6	4.0	30%	Pass
Benzo(g,h,i)perylene	S16-De07806	CP	mg/kg	1.3	1.4	8.0	30%	Pass
Benzo(k)fluoranthene	S16-De07806	CP	mg/kg	1.0	1.2	11	30%	Pass
Chrysene	S16-De07806	CP	mg/kg	1.7	1.9	12	30%	Pass
Dibenz(a,h)anthracene	S16-De07806	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluoranthene	S16-De07806	CP	mg/kg	4.9	5.5	13	30%	Pass
Fluorene	S16-De07806	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Indeno(1,2,3-cd)pyrene	S16-De07806	CP	mg/kg	1.0	1.1	9.0	30%	Pass
Naphthalene	S16-De07806	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phenanthrene	S16-De07806	CP	mg/kg	2.5	2.5	<1	30%	Pass
Pyrene	S16-De07806	CP	mg/kg	5.0	5.7	12	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference

Authorised By

Nibha Vaidya	Analytical Services Manager
Ryan Hamilton	Senior Analyst-Organic (NSW)
Rhys Thomas	Senior Analyst-Asbestos (WA)
Ryan Hamilton	Senior Analyst-Volatile (NSW)
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Inorganic (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Certificate of Analysis

Coffey Environments Pty Ltd NSW
 Level 20, Tower B, Citadel Tower 799 Pacific Highway
 Chatswood
 NSW 2067



NATA Accredited
 Accreditation Number 1261
 Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
 The results of the tests, calibrations and/or
 measurements included in this document are traceable
 to Australian/national standards.

Attention: **Fiona Wong**

Report **526829-L**
 Project name RNHS SITE 4A
 Project ID ENAURHOD06452AA
 Received Date Dec 07, 2016

Client Sample ID			BH204_0.1-0.2	BH204_0.5-0.6	BH204_0.7-0.8
Sample Matrix			US Leachate	US Leachate	US Leachate
Eurofins mgt Sample No.			S16-De07808	S16-De07809	S16-De07810
Date Sampled			Nov 26, 2016	Nov 26, 2016	Nov 26, 2016
Test/Reference	LOR	Unit			
USA Leaching Procedure					
Leachate Fluid ^{C01}		comment	1.0	1.0	1.0
pH (initial)	0.1	pH Units	10	9.9	8.8
pH (off)	0.1	pH Units	5.8	5.3	5.2
pH (USA HCl addition)	0.1	pH Units	2.2	2.2	2.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description

USA Leaching Procedure

- Method: LTM-GEN-7010

- Method: Leaching Procedure for Soils & Solid Wastes

Testing Site

Sydney

Extracted

Dec 09, 2016

Holding Time

14 Day

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNHS SITE 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 526829
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Dec 7, 2016 12:04 PM
Due: Dec 14, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence /Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217							X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217						X					
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BH204 0.1-0.2	Nov 26, 2016		Soil	S16-De07803	X			X	X	X
2	BH204 0.5-0.6	Nov 26, 2016		Soil	S16-De07804	X			X	X	X
3	BH204 0.7-0.8	Nov 26, 2016		Soil	S16-De07805	X			X	X	X
4	BH204 0.9-1.0	Nov 26, 2016		Soil	S16-De07806					X	X
5	BH204 3.5-4.0	Nov 26, 2016		Soil	S16-De07807		X				
6	BH204 0.1-0.2	Nov 26, 2016		US Leachate	S16-De07808			X			
7	BH204 0.5-0.6	Nov 26, 2016		US Leachate	S16-De07809			X			
8	BH204 0.7-0.8	Nov 26, 2016		US Leachate	S16-De07810			X			
Test Counts						3	1	3	3	4	4

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other

Authorised By

Nibha Vaidya Analytical Services Manager



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Certificate of Analysis



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025—Testing
 The results of the tests, calibrations and/or
 measurements included in this document are traceable
 to Australian/national standards.

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067

Attention: Fiona Wong
Report 526829-AID
Project Name RNHS SITE 4A
Project ID ENAURHOD06452AA
Received Date Dec 07, 2016
Date Reported Dec 14, 2016

Methodology:

Asbestos ID Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. Bulk samples include building materials, soils and ores.

Subsampling Soil Samples The whole sample submitted is first dried and then sieved through a 10mm sieve followed by a 2mm sieve. All fibrous matter viz greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) Iron ores - Sampling and Sample preparation procedures is employed. Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis in accordance with AS 4964-2004.

Bonded asbestos-containing material (ACM) The material is first examined and any fibres isolated and where required interfering organic fibres or matter may be removed by treating the sample for several hours at a temperature not exceeding $400 \pm 30^{\circ}\text{C}$. The resultant material is then ground and examined in accordance with AS 4964-2004.

Limit of Reporting The nominal detection limit of the AS4964 method is around 0.01%. The examination of large sample sizes (at least 500 ml is recommended) may improve the likelihood of identifying asbestos material in the greater than 2 mm fraction. The NEPM screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. NOTE: NATA News, September 2011 – page 34, states, “Weighing of fibres is problematic and can lead to loss of fibres and potential exposure for laboratory analysts. To request laboratories to report information which is outside the scope of AS 4964-2004 and the scope of their accreditation is misleading and is most unwise” therefore such values reported are outside the scope of Eurofins | mgt NATA accreditation as designated by an asterisk.

Project Name RNHS SITE 4A
Project ID ENAURHOD06452AA
Date Sampled Nov 26, 2016
Report 526829-AID

Client Sample ID	Eurofins mgt Sample No.	Date Sampled	Sample Description	Result
BH204_0.1-0.2	16-De07803	Nov 26, 2016	Approximate Sample 811g Sample consisted of: Grey-brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BH204_0.5-0.6	16-De07804	Nov 26, 2016	Approximate Sample 292g Sample consisted of: Grey-brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BH204_0.7-0.8	16-De07805	Nov 26, 2016	Approximate Sample 501g Sample consisted of: Grey-brown coarse grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Perth	Dec 08, 2016	Indefinite

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067

Project Name: RNHS SITE 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 526829
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Dec 7, 2016 12:04 PM
Due: Dec 14, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence / Presence	HOLD	USA Leaching Procedure	Eurofins mgt Suite B13	Moisture Set	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217							X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217						X					
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BH204 0.1-0.2	Nov 26, 2016		Soil	S16-De07803	X			X	X	X
2	BH204 0.5-0.6	Nov 26, 2016		Soil	S16-De07804	X			X	X	X
3	BH204 0.7-0.8	Nov 26, 2016		Soil	S16-De07805	X			X	X	X
4	BH204 0.9-1.0	Nov 26, 2016		Soil	S16-De07806					X	X
5	BH204 3.5-4.0	Nov 26, 2016		Soil	S16-De07807		X				
6	BH204 0.1-0.2	Nov 26, 2016		US Leachate	S16-De07808			X			
7	BH204 0.5-0.6	Nov 26, 2016		US Leachate	S16-De07809			X			
8	BH204 0.7-0.8	Nov 26, 2016		US Leachate	S16-De07810			X			
Test Counts						3	1	3	3	4	4

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
COC	Chain of custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Western Australia Department of Health
NOHSC	National Occupational Health and Safety Commission
ACM	Bonded asbestos-containing material means any material containing more than 1% asbestos and comprises asbestos-containing-material which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin. Common examples of ACM include but are not limited to: pipe and boiler insulation, sprayed-on fireproofing, troweled-on acoustical plaster, floor tile and mastic, floor linoleum, transite shingles, roofing materials, wall and ceiling plaster, ceiling tiles, and gasket materials. This term is restricted to material that cannot pass a 7 mm x 7 mm sieve. This sieve size is selected because it approximates the thickness of common asbestos cement sheeting and for fragments to be smaller than this would imply a high degree of damage and hence potential for fibre release.
FA	FA comprises friable asbestos material and includes severely weathered cement sheet, insulation products and woven asbestos material. This type of friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. This material is typically unbonded or was previously bonded and is now significantly degraded (crumbling).
PACM	Presumed Asbestos-Containing Material means thermal system insulation and surfacing material found in buildings, vessels, and vessel sections constructed no later than 1980 that are assumed to contain greater than one percent asbestos but have not been sampled or analyzed to verify or negate the presence of asbestos.
AF	Asbestos fines (AF) are defined as free fibres, or fibre bundles, smaller than 7mm. It is the free fibres which present the greatest risk to human health, although very small fibres (< 5 microns in length) are not considered to be such a risk. AF also includes small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve. (Note that for bonded ACM fragments to pass through a 7 mm x 7 mm sieve implies a substantial degree of damage which increases the potential for fibre release.)
AC	Asbestos cement means a mixture of cement and asbestos fibres (typically 90:10 ratios).

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Authorised by:

Rhys Thomas	Senior Analyst-Asbestos (WA)
Nibha Vaidya	Senior Analyst-Asbestos (NSW)



Glenn Jackson
National Operations Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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Sample Receipt Advice

Company name: **Coffey Environments Pty Ltd NSW**

Contact name: **Fiona Wong**

Project name: **RNHS SITE 4A**

Project ID: **ENAU RHOD06452AA**

COC number: **Not provided**

Turn around time: **5 Day**

Date/Time received: **Dec 7, 2016 12:04 PM**

Eurofins | mgt reference: **526829**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt
Sample Receipt : 11.3 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Fiona Wong - fiona_wong@coffey.com.

Note: A copy of these results will also be delivered to the general Coffey Environments Pty Ltd NSW email address.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 1 of 1

0811

Consigning Office: ChatswoodReport Results to: Fiona WongMobile: 0409367752 Email: fiona.wong

@coffey.com

Invoices to: "Phone: " Email: "

@coffey.com

Project No: ENAUABTF006452AA Task No: SAR VARProject Name: EUROFINS-SITE 4A EUROFINS-NGTSampler's Name: PH Project Manager: TW

Special Instructions:

Relevant agreements: Eurofins COF_ENAUABTF00952AA_MSA1 ; ALS COF_ENAUABTF00952AA_MSA2 and SGS COF_ENAUABTF00952AA_MSA3

Analysis Request Section

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil...etc)	Container Type & Preservative*	T-A-T (specify)	NOTES									
	BH204-0.1-0.2	26/11	-	SOIL	JAR 2 STD		B7 B12 K2S2O8 (P/A) TCLP PATH prepow TCLP HQ (prepoly)									
	BH204-0.5-0.6	↓	↓	↓	↓, 2											
	BH204-0.7-0.8	↓	↓	↓	↓, 2											
	BH204-0.9-1.0	↓	↓	↓	↓, 2											
	BH204-3.5-4.0	↓	↓	↓	↓, 2											

B7 only
Houn

RELINQUISHED BY

Name: FIONA WONG Date: 7/12/16 →

Coffey Environments Time:

Name: _____ Date: _____ →

Company: _____ Time: _____

RECEIVED BY

Name: Sean EF Date: 7/12Company: _____ Time: 12:04

Name: _____ Date: _____

Company: _____ Time: _____

Sample Receipt Advice: (Lab Use Only)

All Samples Received in Good Condition ☐All Documentation is in Proper Order ☐Samples Received Properly Chilled ☐

Lab. Ref/Batch No.

526829

*Container Type & Preservation Codes: P - Plastic, G - Glass Bottle, J - Glass Jar, V - Vial, Z - Ziplock Bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved, S - Sulphuric Acid Preserved, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative, OP - Other Preservative

Certificate of Analysis

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 528153-L
Project name ADDITIONAL: RNHS SITE 4A
Project ID ENAURHOD06452AA
Received Date Dec 15, 2016

Client Sample ID			BH204 0.1-0.2 US Leachate S16-De17625 Nov 26, 2016	BH204 0.7-0.8 US Leachate S16-De17626 Nov 26, 2016	BH204 0.9-1.0 US Leachate S16-De17627 Nov 26, 2016
Sample Matrix					
Eurofins mgt Sample No.					
Date Sampled					
Test/Reference	LOR	Unit			
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.001	mg/L	-	< 0.001	< 0.001
Acenaphthylene	0.001	mg/L	-	< 0.001	< 0.001
Anthracene	0.001	mg/L	-	< 0.001	< 0.001
Benz(a)anthracene	0.001	mg/L	-	< 0.001	< 0.001
Benzo(a)pyrene	0.001	mg/L	-	< 0.001	< 0.001
Benzo(b&j)fluoranthene ^{N07}	0.001	mg/L	-	< 0.001	< 0.001
Benzo(g,h,i)perylene	0.001	mg/L	-	< 0.001	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	-	< 0.001	< 0.001
Chrysene	0.001	mg/L	-	< 0.001	< 0.001
Dibenz(a,h)anthracene	0.001	mg/L	-	< 0.001	< 0.001
Fluoranthene	0.001	mg/L	-	< 0.001	< 0.001
Fluorene	0.001	mg/L	-	< 0.001	< 0.001
Indeno(1,2,3-cd)pyrene	0.001	mg/L	-	< 0.001	< 0.001
Naphthalene	0.001	mg/L	-	< 0.001	< 0.001
Phenanthrene	0.001	mg/L	-	< 0.001	< 0.001
Pyrene	0.001	mg/L	-	< 0.001	< 0.001
Total PAH*	0.002	mg/L	-	< 0.001	< 0.001
2-Fluorobiphenyl (surr.)	1	%	-	79	80
p-Terphenyl-d14 (surr.)	1	%	-	99	109
Heavy Metals					
Nickel	0.05	mg/L	0.08	-	-
USA Leaching Procedure					
Leachate Fluid ^{C01}		comment	1.0	1.0	1.0
pH (initial)	0.1	pH Units	9.4	8.3	8.1
pH (off)	0.1	pH Units	5.4	5.1	5.1
pH (USA HCl addition)	0.1	pH Units	1.6	1.6	1.6

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons	Sydney	Dec 21, 2016	7 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Heavy Metals	Sydney	Dec 20, 2016	180 Day
- Method: LTM-MET-3030 by ICP-OES (hydride ICP-OES for Mercury)			
USA Leaching Procedure	Sydney	Dec 20, 2016	14 Day
- Method: LTM-GEN-7010 Leaching Procedure for Soils & Solid Wastes			

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: ADDITIONAL: RNHS SITE 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 528153
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Dec 15, 2016 7:24 AM
Due: Dec 22, 2016
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Nickel	Polycyclic Aromatic Hydrocarbons	USA Leaching Procedure
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 18217								
External Laboratory								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID			
1	BH204 0.1-0.2	Nov 26, 2016		US Leachate	S16-De17625	X		X
2	BH204 0.7-0.8	Nov 26, 2016		US Leachate	S16-De17626		X	X
3	BH204 0.9-1.0	Nov 26, 2016		US Leachate	S16-De17627		X	X
Test Counts						1	2	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank										
Polycyclic Aromatic Hydrocarbons										
Acenaphthene				mg/L	< 0.001			0.001	Pass	
Acenaphthylene				mg/L	< 0.001			0.001	Pass	
Anthracene				mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene				mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene				mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene				mg/L	< 0.001			0.001	Pass	
Benzo(g,h,i)perylene				mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene				mg/L	< 0.001			0.001	Pass	
Chrysene				mg/L	< 0.001			0.001	Pass	
Dibenz(a,h)anthracene				mg/L	< 0.001			0.001	Pass	
Fluoranthene				mg/L	< 0.001			0.001	Pass	
Fluorene				mg/L	< 0.001			0.001	Pass	
Indeno(1,2,3-cd)pyrene				mg/L	< 0.001			0.001	Pass	
Naphthalene				mg/L	< 0.001			0.001	Pass	
Phenanthrene				mg/L	< 0.001			0.001	Pass	
Pyrene				mg/L	< 0.001			0.001	Pass	
Method Blank										
Heavy Metals										
Nickel				mg/L	< 0.05			0.05	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery										
Heavy Metals					Result 1					
Nickel	S16-De22766	NCP	%	93				70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
Heavy Metals					Result 1	Result 2	RPD			
Nickel	S16-De22765	NCP	mg/L	< 0.05	< 0.05	<1		30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

Nibha Vaidya	Analytical Services Manager
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins | mgt shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins | mgt be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Sample Receipt Advice

Company name: **Coffey Environments Pty Ltd NSW**
Contact name: **Fiona Wong**
Project name: **ADDITIONAL: RNHS SITE 4A**
Project ID: **ENAU RHOD06452AA**
COC number: **Not provided**
Turn around time: **5 Day**
Date/Time received: **Dec 15, 2016 7:24 AM**
Eurofins | mgt reference: **528153**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt
Sample Receipt : 11.3 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Additional from 526829

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Fiona Wong - fiona_wong@coffey.com.

Note: A copy of these results will also be delivered to the general Coffey Environments Pty Ltd NSW email address.

Sean 15/12 7:24

S28183

From: Wong, Fiona [mailto:Fiona.Wong@coffey.com]

Sent: Thursday, 15 December 2016 7:24 AM

To: Andrew Black

Subject: RE: Eurofins | mgt Test Results - Report 526829 : Site RNHS SITE 4A (ENAU RHOD06452AA)

Hi Andrew

Can you please schedule in the following TCLP tests?

- BH204 0.1-0.2 – TCLP Nickel
- BH204 0.7-0.8 and BH204 0.9-1.0 – TCLP PAH

Standard TAT will be fine.

Regards

Fiona Wong

Associate Environmental Engineer

t: +61 2 9406 1213

m: +61 409 367 752

w: coffey.

Certificate of Analysis

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067

Attention: Fiona Wong

Report 530449-S
Project name RNSH-SIR 4A
Project ID ENAURHOD06452AA
Received Date Jan 16, 2017

Client Sample ID			BHC101_0.05-0.1	BHC101_0.4-0.5	BHC101_0.8-1.0	BHC102_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S17-Ja06102	S17-Ja06103	S17-Ja06104	S17-Ja06105
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	64	69	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	56
TRH C10-36 (Total)	50	mg/kg	64	69	< 50	56
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	0.4	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	0.7	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	0.3	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	1.0	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	61	62	59	61
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	2.2	2.7	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	2.4	2.9	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	2.7	3.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	0.7	0.6	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	1.9	1.8	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	1.6	2.0	< 0.5	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	1.9	2.2	< 0.5	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	0.9	1.7	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	0.9	1.1	< 0.5	< 0.5
Chrysene	0.5	mg/kg	1.4	1.4	< 0.5	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	4.3	5.3	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	0.7	1.2	< 0.5	< 0.5

Client Sample ID			BHC101_0.05-0.1	BHC101_0.4-0.5	BHC101_0.8-1.0	BHC102_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S17-Ja06102	S17-Ja06103	S17-Ja06104	S17-Ja06105
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	2.1	2.2	< 0.5	< 0.5
Pyrene	0.5	mg/kg	4.3	5.2	< 0.5	0.5
Total PAH*	0.5	mg/kg	20.7	25.2	< 0.5	0.5
2-Fluorobiphenyl (surr.)	1	%	77	80	78	72
p-Terphenyl-d14 (surr.)	1	%	93	99	102	88
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	-	< 0.1
4,4'-DDD	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
4,4'-DDE	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
4,4'-DDT	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	-	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Toxaphene	1	mg/kg	< 1	< 1	-	< 1
Dibutylchloredate (surr.)	1	%	76	65	-	120
Tetrachloro-m-xylene (surr.)	1	%	76	86	-	97
Organophosphorus Pesticides (OP)						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	-	< 2
Demeton (total)	1	mg/kg	< 1	< 1	-	< 1
Diazinon	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	-	< 2
Parathion	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Phorate	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2

Client Sample ID			BHC101_0.05-0.1	BHC101_0.4-0.5	BHC101_0.8-1.0	BHC102_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S17-Ja06102	S17-Ja06103	S17-Ja06104	S17-Ja06105
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit				
Organophosphorus Pesticides (OP)						
Profenofos	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Prothiofos	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Ronnel	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Stirophos	0.5	mg/kg	< 0.5	< 0.5	-	< 0.5
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	-	< 0.2
Triphenylphosphate (surr.)	1	%	96	97	-	88
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	11	8.1	12	8.0
Copper	5	mg/kg	59	16	< 5	27
Lead	5	mg/kg	15	31	20	26
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	47	11	< 5	13
Zinc	5	mg/kg	36	29	12	43
% Moisture	1	%	7.1	12	19	4.9

Client Sample ID			BHC102_0.8-1.0	BHC103_0.3-0.4	BHC103_0.8-1.0	QD-01
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S17-Ja06106	S17-Ja06108	S17-Ja06109	S17-Ja06110
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	130	120	220
TRH C29-C36	50	mg/kg	210	81	< 50	130
TRH C10-36 (Total)	50	mg/kg	210	211	120	350
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	63	62	60	60
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20

Client Sample ID			BHC102_0.8-1.0	BHC103_0.3-0.4	BHC103_0.8-1.0	QD-01
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S17-Ja06106	S17-Ja06108	S17-Ja06109	S17-Ja06110
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	5.9	4.8	6.2
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	6.1	5.0	6.5
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	6.4	5.3	6.7
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	1.0	< 0.5	1.0
Anthracene	0.5	mg/kg	< 0.5	1.3	1.9	1.4
Benz(a)anthracene	0.5	mg/kg	< 0.5	3.9	3.7	4.0
Benzo(a)pyrene	0.5	mg/kg	< 0.5	4.4	3.6	4.7
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	5.3	3.8	5.6
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	3.3	2.4	3.4
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	2.3	1.7	2.4
Chrysene	0.5	mg/kg	< 0.5	3.0	2.8	3.1
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	11	12	10
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	2.4	1.8	2.4
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	4.7	8.7	4.7
Pyrene	0.5	mg/kg	< 0.5	10	11	10
Total PAH*	0.5	mg/kg	< 0.5	52.6	53.4	52.7
2-Fluorobiphenyl (surr.)	1	%	76	78	73	78
p-Terphenyl-d14 (surr.)	1	%	94	93	88	95
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	< 0.1	-	-
4,4'-DDD	0.05	mg/kg	-	< 0.05	-	-
4,4'-DDE	0.05	mg/kg	-	< 0.05	-	-
4,4'-DDT	0.05	mg/kg	-	< 0.05	-	-
a-BHC	0.05	mg/kg	-	< 0.05	-	-
Aldrin	0.05	mg/kg	-	< 0.05	-	-
b-BHC	0.05	mg/kg	-	< 0.05	-	-
d-BHC	0.05	mg/kg	-	< 0.05	-	-
Dieldrin	0.05	mg/kg	-	< 0.05	-	-
Endosulfan I	0.05	mg/kg	-	< 0.05	-	-
Endosulfan II	0.05	mg/kg	-	< 0.05	-	-
Endosulfan sulphate	0.05	mg/kg	-	< 0.05	-	-
Endrin	0.05	mg/kg	-	< 0.05	-	-
Endrin aldehyde	0.05	mg/kg	-	< 0.05	-	-
Endrin ketone	0.05	mg/kg	-	< 0.05	-	-
g-BHC (Lindane)	0.05	mg/kg	-	< 0.05	-	-
Heptachlor	0.05	mg/kg	-	< 0.05	-	-
Heptachlor epoxide	0.05	mg/kg	-	< 0.05	-	-
Hexachlorobenzene	0.05	mg/kg	-	< 0.05	-	-
Methoxychlor	0.2	mg/kg	-	< 0.2	-	-
Toxaphene	1	mg/kg	-	< 1	-	-
Dibutylchloroendate (surr.)	1	%	-	96	-	-
Tetrachloro-m-xylene (surr.)	1	%	-	80	-	-

Client Sample ID			BHC102_0.8-1.0	BHC103_0.3-0.4	BHC103_0.8-1.0	QD-01
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S17-Ja06106	S17-Ja06108	S17-Ja06109	S17-Ja06110
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit				
Organophosphorus Pesticides (OP)						
Azinphos-methyl	0.2	mg/kg	-	< 0.2	-	-
Chlorpyrifos	0.2	mg/kg	-	< 0.2	-	-
Coumaphos	2	mg/kg	-	< 2	-	-
Demeton (total)	1	mg/kg	-	< 1	-	-
Diazinon	0.2	mg/kg	-	< 0.2	-	-
Dichlorvos	0.2	mg/kg	-	< 0.2	-	-
Dimethoate	0.2	mg/kg	-	< 0.2	-	-
Disulfoton	0.2	mg/kg	-	< 0.2	-	-
Ethoprop	0.2	mg/kg	-	< 0.2	-	-
Fenitrothion	0.2	mg/kg	-	< 0.2	-	-
Fensulfothion	0.2	mg/kg	-	< 0.2	-	-
Fenthion	0.2	mg/kg	-	< 0.2	-	-
Malathion	0.2	mg/kg	-	< 0.2	-	-
Methyl parathion	0.2	mg/kg	-	< 0.2	-	-
Mevinphos	0.2	mg/kg	-	< 0.2	-	-
Monocrotophos	2	mg/kg	-	< 2	-	-
Parathion	0.5	mg/kg	-	< 0.5	-	-
Phorate	0.2	mg/kg	-	< 0.2	-	-
Profenofos	0.2	mg/kg	-	< 0.2	-	-
Prothiofos	0.5	mg/kg	-	< 0.5	-	-
Ronnel	0.2	mg/kg	-	< 0.2	-	-
Stirophos	0.5	mg/kg	-	< 0.5	-	-
Trichloronate	0.2	mg/kg	-	< 0.2	-	-
Triphenylphosphate (surr.)	1	%	-	98	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	210	230	170	380
TRH >C34-C40	100	mg/kg	520	< 100	< 100	110
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	< 5	9.2	10.0	8.4
Copper	5	mg/kg	150	82	< 5	52
Lead	5	mg/kg	16	29	18	33
Mercury	0.1	mg/kg	< 0.1	0.6	0.2	1.0
Nickel	5	mg/kg	14	37	< 5	24
Zinc	5	mg/kg	58	53	< 5	57
% Moisture	1	%	2.9	17	15	18

Client Sample ID			QD-02
Sample Matrix			Soil
Eurofins mgt Sample No.			S17-Ja06111
Date Sampled			Jan 14, 2017
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	150
TRH C29-C36	50	mg/kg	< 50
TRH C10-36 (Total)	50	mg/kg	150
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	61
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.5	mg/kg	< 0.5
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50
TRH C6-C10	20	mg/kg	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	4.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	4.7
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	5.0
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	0.9
Anthracene	0.5	mg/kg	1.1
Benz(a)anthracene	0.5	mg/kg	3.1
Benzo(a)pyrene	0.5	mg/kg	3.4
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	3.7
Benzo(g,h,i)perylene	0.5	mg/kg	2.5
Benzo(k)fluoranthene	0.5	mg/kg	1.6
Chrysene	0.5	mg/kg	2.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	9.3
Fluorene	0.5	mg/kg	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	1.8
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	4.9
Pyrene	0.5	mg/kg	9.1
Total PAH*	0.5	mg/kg	43.9
2-Fluorobiphenyl (surr.)	1	%	75
p-Terphenyl-d14 (surr.)	1	%	91
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
TRH >C10-C16	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	200
TRH >C34-C40	100	mg/kg	< 100

Client Sample ID			QD-02
Sample Matrix			Soil
Eurofins mgt Sample No.			S17-Ja06111
Date Sampled			Jan 14, 2017
Test/Reference	LOR	Unit	
Heavy Metals			
Arsenic	2	mg/kg	< 2
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	8.8
Copper	5	mg/kg	28
Lead	5	mg/kg	23
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	17
Zinc	5	mg/kg	31
% Moisture	1	%	9.0

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Jan 18, 2017	14 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
BTEX	Sydney	Jan 18, 2017	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Jan 18, 2017	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Polycyclic Aromatic Hydrocarbons	Sydney	Jan 18, 2017	14 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Jan 18, 2017	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Metals M8	Sydney	Jan 18, 2017	28 Day
- Method: LTM-MET-3040_R0 TOTAL AND DISSOLVED METALS AND MERCURY IN WATERS BY ICP-MS			
Eurofins mgt Suite B10			
Organochlorine Pesticides	Sydney	Jan 18, 2017	14 Day
- Method: E013 Organochlorine Pesticides (OC)			
Organophosphorus Pesticides (OP)	Sydney	Jan 18, 2017	14 Day
- Method: E014 Organophosphorus Pesticides (OP)			
% Moisture	Sydney	Jan 16, 2017	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 530449
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Jan 16, 2017 11:59 AM
Due: Jan 23, 2017
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence /Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BHC101_0.05-0.1	Jan 14, 2017	10:00AM	Soil	S17-Ja06102	X			X	X	
2	BHC101_0.4-0.5	Jan 14, 2017	10:00AM	Soil	S17-Ja06103				X	X	
3	BHC101_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06104				X		X
4	BHC102_0.0-0.1	Jan 14, 2017	10:00AM	Soil	S17-Ja06105	X			X	X	
5	BHC102_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06106	X			X	X	
6	BHC103_0.05-	Jan 14, 2017	10:00AM	Soil	S17-Ja06107	X					

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Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	0.1										
7	BHC103_0.3-0.4	Jan 14, 2017	10:00AM	Soil	S17-Ja06108				X	X	
8	BHC103_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06109				X		X
9	QD-01	Jan 14, 2017	10:00AM	Soil	S17-Ja06110				X		X
10	QD-02	Jan 14, 2017	10:00AM	Soil	S17-Ja06111				X		X
11	QR-01	Jan 14, 2017	10:00AM	Water	S17-Ja06112						X
12	TRIP SPIKE	Jan 14, 2017	10:00AM	Water	S17-Ja06113			X			
13	TRIP BLANK	Jan 14, 2017	10:00AM	Water	S17-Ja06114			X			
14	BHC101_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06121		X				
15	BHC101_3.8-	Jan 14, 2017	10:00AM	Soil	S17-Ja06122		X				

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Sample Detail						Asbestos Absence / Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	4.0										
16	BHC102_0.4-0.5	Jan 14, 2017	10:00AM	Soil	S17-Ja06123		X				
17	BHC102_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06124		X				
18	BHC102_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06125		X				
19	BHC102_3.8-4.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06126		X				
20	BHC103_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06127		X				
21	BHC103_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06128		X				
22	BHC103_3.8-	Jan 14, 2017	10:00AM	Soil	S17-Ja06129		X				

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Sample Detail						Asbestos Absence /Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	4.0										
23	QT-02	Jan 14, 2017	10:00AM	Soil	S17-Ja06130		X				
24	BHC101_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06228		X				
Test Counts						4	11	2	9	5	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4,4'-DDD	mg/kg	< 0.05			0.05	Pass	
4,4'-DDE	mg/kg	< 0.05			0.05	Pass	
4,4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.2			0.2	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Organophosphorus Pesticides (OP)							
Azinphos-methyl	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos	mg/kg	< 0.2			0.2	Pass	
Coumaphos	mg/kg	< 2			2	Pass	
Demeton (total)	mg/kg	< 1			1	Pass	
Diazinon	mg/kg	< 0.2			0.2	Pass	
Dichlorvos	mg/kg	< 0.2			0.2	Pass	
Dimethoate	mg/kg	< 0.2			0.2	Pass	
Disulfoton	mg/kg	< 0.2			0.2	Pass	
Ethoprop	mg/kg	< 0.2			0.2	Pass	
Fenitrothion	mg/kg	< 0.2			0.2	Pass	
Fensulfothion	mg/kg	< 0.2			0.2	Pass	
Fenthion	mg/kg	< 0.2			0.2	Pass	
Malathion	mg/kg	< 0.2			0.2	Pass	
Methyl parathion	mg/kg	< 0.2			0.2	Pass	
Mevinphos	mg/kg	< 0.2			0.2	Pass	
Monocrotophos	mg/kg	< 2			2	Pass	
Parathion	mg/kg	< 0.5			0.5	Pass	
Phorate	mg/kg	< 0.2			0.2	Pass	
Profenofos	mg/kg	< 0.2			0.2	Pass	
Prothiofos	mg/kg	< 0.5			0.5	Pass	
Ronnel	mg/kg	< 0.2			0.2	Pass	
Stirophos	mg/kg	< 0.5			0.5	Pass	
Trichloronate	mg/kg	< 0.2			0.2	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	77			70-130	Pass	
TRH C10-C14	%	97			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	83			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Toluene	%	80			70-130	Pass	
Ethylbenzene	%	79			70-130	Pass	
m&p-Xylenes	%	81			70-130	Pass	
o-Xylene	%	81			70-130	Pass	
Xylenes - Total	%	81			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	76			70-130	Pass	
TRH C6-C10	%	80			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	77			70-130	Pass	
Acenaphthylene	%	75			70-130	Pass	
Anthracene	%	79			70-130	Pass	
Benz(a)anthracene	%	76			70-130	Pass	
Benzo(a)pyrene	%	81			70-130	Pass	
Benzo(b&j)fluoranthene	%	80			70-130	Pass	
Benzo(g,h,i)perylene	%	74			70-130	Pass	
Benzo(k)fluoranthene	%	80			70-130	Pass	
Chrysene	%	81			70-130	Pass	
Dibenz(a,h)anthracene	%	72			70-130	Pass	
Fluoranthene	%	79			70-130	Pass	
Fluorene	%	73			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	74			70-130	Pass	
Naphthalene	%	78			70-130	Pass	
Phenanthrene	%	72			70-130	Pass	
Pyrene	%	80			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	99			70-130	Pass	
4,4'-DDD	%	95			70-130	Pass	
4,4'-DDE	%	98			70-130	Pass	
4,4'-DDT	%	82			70-130	Pass	
a-BHC	%	96			70-130	Pass	
Aldrin	%	99			70-130	Pass	
b-BHC	%	92			70-130	Pass	
d-BHC	%	107			70-130	Pass	
Dieldrin	%	97			70-130	Pass	
Endosulfan I	%	98			70-130	Pass	
Endosulfan II	%	93			70-130	Pass	
Endosulfan sulphate	%	77			70-130	Pass	
Endrin	%	86			70-130	Pass	
Endrin aldehyde	%	94			70-130	Pass	
Endrin ketone	%	89			70-130	Pass	
g-BHC (Lindane)	%	90			70-130	Pass	
Heptachlor	%	102			70-130	Pass	
Heptachlor epoxide	%	99			70-130	Pass	
Hexachlorobenzene	%	118			70-130	Pass	
Methoxychlor	%	102			70-130	Pass	
Toxaphene	%	107			70-130	Pass	
LCS - % Recovery							
Organophosphorus Pesticides (OP)							
Demeton (total)	%	122			70-130	Pass	
Diazinon	%	125			70-130	Pass	

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dimethoate				%	107			70-130	Pass	
Fenitrothion				%	94			70-130	Pass	
Methyl parathion				%	86			70-130	Pass	
Mevinphos				%	114			70-130	Pass	
Stirophos				%	113			70-130	Pass	
LCS - % Recovery										
Total Recoverable Hydrocarbons - 2013 NEPM Fractions										
TRH >C10-C16				%	99			70-130	Pass	
LCS - % Recovery										
Heavy Metals										
Arsenic				%	82			70-130	Pass	
Cadmium				%	82			70-130	Pass	
Chromium				%	81			70-130	Pass	
Copper				%	91			70-130	Pass	
Lead				%	73			70-130	Pass	
Mercury				%	100			70-130	Pass	
Nickel				%	82			70-130	Pass	
Zinc				%	89			70-130	Pass	
Test	Lab Sample ID	QA Source		Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery										
Polycyclic Aromatic Hydrocarbons					Result 1					
Benz(a)anthracene	S17-Ja07902	NCP	%	108				70-130	Pass	
Benzo(a)pyrene	S17-Ja07902	NCP	%	95				70-130	Pass	
Benzo(b&i)fluoranthene	S17-Ja07902	NCP	%	107				70-130	Pass	
Benzo(g,h,i)perylene	S17-Ja07902	NCP	%	85				70-130	Pass	
Chrysene	S17-Ja07902	NCP	%	96				70-130	Pass	
Fluoranthene	S17-Ja07902	NCP	%	109				70-130	Pass	
Indeno(1,2,3-cd)pyrene	S17-Ja07902	NCP	%	86				70-130	Pass	
Phenanthrene	S17-Ja07902	NCP	%	93				70-130	Pass	
Pyrene	S17-Ja07902	NCP	%	110				70-130	Pass	
Spike - % Recovery										
Heavy Metals					Result 1					
Chromium	S17-Ja07901	NCP	%	83				70-130	Pass	
Copper	S17-Ja07901	NCP	%	105				70-130	Pass	
Lead	S17-Ja07901	NCP	%	78				70-130	Pass	
Mercury	S17-Ja08528	NCP	%	130				70-130	Pass	
Nickel	S17-Ja08528	NCP	%	76				70-130	Pass	
Zinc	S17-Ja07901	NCP	%	85				70-130	Pass	
Spike - % Recovery										
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					Result 1					
TRH C6-C9	S17-Ja06103	CP	%	94				70-130	Pass	
TRH C10-C14	S17-Ja06103	CP	%	100				70-130	Pass	
Spike - % Recovery										
BTEX					Result 1					
Benzene	S17-Ja06103	CP	%	101				70-130	Pass	
Toluene	S17-Ja06103	CP	%	97				70-130	Pass	
Ethylbenzene	S17-Ja06103	CP	%	95				70-130	Pass	
m&p-Xylenes	S17-Ja06103	CP	%	97				70-130	Pass	
o-Xylene	S17-Ja06103	CP	%	96				70-130	Pass	
Xylenes - Total	S17-Ja06103	CP	%	97				70-130	Pass	
Spike - % Recovery										
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					Result 1					
Naphthalene	S17-Ja06103	CP	%	75				70-130	Pass	
TRH C6-C10	S17-Ja06103	CP	%	102				70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
Polycyclic Aromatic Hydrocarbons				Result 1				
Acenaphthene	S17-Ja06103	CP	%	92		70-130	Pass	
Acenaphthylene	S17-Ja06103	CP	%	110		70-130	Pass	
Anthracene	S17-Ja06103	CP	%	118		70-130	Pass	
Benzo(k)fluoranthene	S17-Ja06103	CP	%	112		70-130	Pass	
Dibenz(a,h)anthracene	S17-Ja06103	CP	%	101		70-130	Pass	
Fluorene	S17-Ja06103	CP	%	102		70-130	Pass	
Naphthalene	S17-Ja06103	CP	%	100		70-130	Pass	
Spike - % Recovery								
Organochlorine Pesticides				Result 1				
Chlordanes - Total	S17-Ja06103	CP	%	85		70-130	Pass	
4,4'-DDE	S17-Ja06103	CP	%	98		70-130	Pass	
a-BHC	S17-Ja06103	CP	%	78		70-130	Pass	
Aldrin	S17-Ja06103	CP	%	83		70-130	Pass	
b-BHC	S17-Ja06103	CP	%	102		70-130	Pass	
d-BHC	S17-Ja06103	CP	%	87		70-130	Pass	
Dieldrin	S17-Ja06103	CP	%	91		70-130	Pass	
Endosulfan I	S17-Ja06103	CP	%	85		70-130	Pass	
Endosulfan II	S17-Ja06103	CP	%	85		70-130	Pass	
Endrin	S17-Ja06103	CP	%	85		70-130	Pass	
Endrin aldehyde	S17-Ja06103	CP	%	86		70-130	Pass	
Endrin ketone	S17-Ja06103	CP	%	71		70-130	Pass	
Heptachlor	S17-Ja06103	CP	%	75		70-130	Pass	
Heptachlor epoxide	S17-Ja06103	CP	%	85		70-130	Pass	
Methoxychlor	S17-Ja06103	CP	%	100		70-130	Pass	
Spike - % Recovery								
Organophosphorus Pesticides (OP)				Result 1				
Diazinon	S17-Ja06103	CP	%	117		70-130	Pass	
Dimethoate	S17-Ja06103	CP	%	97		70-130	Pass	
Fenitrothion	S17-Ja06103	CP	%	91		70-130	Pass	
Methyl parathion	S17-Ja06103	CP	%	83		70-130	Pass	
Mevinphos	S17-Ja06103	CP	%	111		70-130	Pass	
Spike - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1				
TRH >C10-C16	S17-Ja06103	CP	%	103		70-130	Pass	
Spike - % Recovery								
Organochlorine Pesticides				Result 1				
Chlordanes - Total	S17-Ja08825	NCP	%	93		70-130	Pass	
4,4'-DDD	S17-Ja08825	NCP	%	110		70-130	Pass	
4,4'-DDE	S17-Ja08825	NCP	%	95		70-130	Pass	
4,4'-DDT	S17-Ja08825	NCP	%	95		70-130	Pass	
a-BHC	S17-Ja08825	NCP	%	90		70-130	Pass	
Aldrin	S17-Ja08825	NCP	%	90		70-130	Pass	
b-BHC	S17-Ja08825	NCP	%	90		70-130	Pass	
d-BHC	S17-Ja08825	NCP	%	100		70-130	Pass	
Dieldrin	S17-Ja08825	NCP	%	95		70-130	Pass	
Endosulfan I	S17-Ja08825	NCP	%	95		70-130	Pass	
Endosulfan II	S17-Ja08825	NCP	%	90		70-130	Pass	
Endosulfan sulphate	S17-Ja08825	NCP	%	80		70-130	Pass	
Endrin	S17-Ja08825	NCP	%	95		70-130	Pass	
Endrin aldehyde	S17-Ja08825	NCP	%	80		70-130	Pass	
Endrin ketone	S17-Ja08825	NCP	%	80		70-130	Pass	
g-BHC (Lindane)	S17-Ja08825	NCP	%	85		70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heptachlor	S17-Ja08825	NCP	%	105			70-130	Pass	
Heptachlor epoxide	S17-Ja08825	NCP	%	90			70-130	Pass	
Hexachlorobenzene	S17-Ja08825	NCP	%	90			70-130	Pass	
Methoxychlor	S17-Ja08825	NCP	%	90			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S17-Ja06102	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S17-Ja06102	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S17-Ja06102	CP	mg/kg	64	77	18	30%	Pass	
TRH C29-C36	S17-Ja06102	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S17-Ja06102	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S17-Ja06102	CP	mg/kg	0.4	0.2	68	30%	Fail	
Ethylbenzene	S17-Ja06102	CP	mg/kg	0.1	< 0.1	200	30%	Fail	
m&p-Xylenes	S17-Ja06102	CP	mg/kg	0.7	0.3	73	30%	Fail	
o-Xylene	S17-Ja06102	CP	mg/kg	0.3	0.1	82	30%	Fail	
Xylenes - Total	S17-Ja06102	CP	mg/kg	1.0	0.4	76	30%	Fail	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S17-Ja06102	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S17-Ja06102	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g,h,i)perylene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a,h)anthracene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1,2,3-cd)pyrene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S17-Ja04281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S17-Ja06102	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4,4'-DDD	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4,4'-DDE	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4,4'-DDT	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	

Duplicate								
Organochlorine Pesticides				Result 1	Result 2	RPD		
Endosulfan sulphate	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin aldehyde	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin ketone	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
g-BHC (Lindane)	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor epoxide	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Hexachlorobenzene	S17-Ja06102	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Methoxychlor	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Toxaphene	S17-Ja06102	CP	mg/kg	< 1	< 1	<1	30%	Pass
Duplicate								
Organophosphorus Pesticides (OP)				Result 1	Result 2	RPD		
Azinphos-methyl	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Chlorpyrifos	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Coumaphos	S17-Ja04257	NCP	mg/kg	< 2	< 2	<1	30%	Pass
Demeton (total)	S17-Ja04257	NCP	mg/kg	< 1	< 1	<1	30%	Pass
Diazinon	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Dichlorvos	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Dimethoate	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Disulfoton	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ethoprop	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fenitrothion	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fensulfthion	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fenthion	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Malathion	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Methyl parathion	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Mevinphos	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Monocrotophos	S17-Ja06102	CP	mg/kg	< 2	< 2	<1	30%	Pass
Parathion	S17-Ja04257	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phorate	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Profenofos	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Prothiofos	S17-Ja04257	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Ronnel	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Stirophos	S17-Ja04257	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Trichloronate	S17-Ja06102	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
TRH >C10-C16	S17-Ja06102	CP	mg/kg	< 50	< 50	<1	30%	Pass
TRH >C16-C34	S17-Ja06102	CP	mg/kg	< 100	110	8.0	30%	Pass
TRH >C34-C40	S17-Ja06102	CP	mg/kg	< 100	< 100	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S17-Ja07911	NCP	mg/kg	< 2	< 2	<1	30%	Pass
Cadmium	S17-Ja07911	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass
Chromium	S17-Ja07911	NCP	mg/kg	8.4	7.0	19	30%	Pass
Copper	S17-Ja07911	NCP	mg/kg	10	11	11	30%	Pass
Lead	S17-Ja07911	NCP	mg/kg	13	13	<1	30%	Pass
Mercury	S17-Ja08496	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Nickel	S17-Ja07900	NCP	mg/kg	11	12	8.0	30%	Pass
Zinc	S17-Ja07911	NCP	mg/kg	18	16	14	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	S17-Ja06102	CP	%	7.1	7.7	9.0	30%	Pass

Duplicate								
Organochlorine Pesticides				Result 1	Result 2	RPD		
Chlordanes - Total	S17-Ja08824	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
4,4'-DDD	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
4,4'-DDE	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
4,4'-DDT	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
a-BHC	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Aldrin	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
b-BHC	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
d-BHC	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Dieldrin	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan I	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan II	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan sulphate	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin aldehyde	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin ketone	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
g-BHC (Lindane)	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor epoxide	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Hexachlorobenzene	S17-Ja08824	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Methoxychlor	S17-Ja08824	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Toxaphene	S17-Ja08824	NCP	mg/kg	< 1	< 1	<1	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

Nibha Vaidya	Analytical Services Manager
Nibha Vaidya	Senior Analyst-Asbestos (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Inorganic (NSW)

Glenn Jackson

National Operations Manager

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Certificate of Analysis

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 530449-W
Project name RNSH-SIR 4A
Project ID ENAURHOD06452AA
Received Date Jan 16, 2017

Client Sample ID			QR-01	TRIP SPIKE	TRIP BLANK
Sample Matrix			Water	Water	Water
Eurofins mgt Sample No.			S17-Ja06112	S17-Ja06113	S17-Ja06114
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					
TRH C6-C9	0.02	mg/L	< 0.02	-	-
TRH C10-C14	0.05	mg/L	< 0.05	-	-
TRH C15-C28	0.1	mg/L	< 0.1	-	-
TRH C29-C36	0.1	mg/L	< 0.1	-	-
TRH C10-36 (Total)	0.1	mg/L	< 0.1	-	-
BTEX					
Benzene	0.001	mg/L	< 0.001	115%	< 0.001
Toluene	0.001	mg/L	< 0.001	114%	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	112%	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	109%	< 0.002
o-Xylene	0.001	mg/L	< 0.001	118%	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	112%	< 0.003
4-Bromofluorobenzene (surr.)	1	%	93	114	97
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene ^{N02}	0.01	mg/L	< 0.01	-	-
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05	-	-
TRH C6-C10	0.02	mg/L	< 0.02	-	-
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02	-	-
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.001	mg/L	< 0.001	-	-
Acenaphthylene	0.001	mg/L	< 0.001	-	-
Anthracene	0.001	mg/L	< 0.001	-	-
Benz(a)anthracene	0.001	mg/L	< 0.001	-	-
Benzo(a)pyrene	0.001	mg/L	< 0.001	-	-
Benzo(b&j)fluoranthene ^{N07}	0.001	mg/L	< 0.001	-	-
Benzo(g,h,i)perylene	0.001	mg/L	< 0.001	-	-
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	-	-
Chrysene	0.001	mg/L	< 0.001	-	-
Dibenz(a,h)anthracene	0.001	mg/L	< 0.001	-	-
Fluoranthene	0.001	mg/L	< 0.001	-	-
Fluorene	0.001	mg/L	< 0.001	-	-
Indeno(1,2,3-cd)pyrene	0.001	mg/L	< 0.001	-	-
Naphthalene	0.001	mg/L	< 0.001	-	-
Phenanthrene	0.001	mg/L	< 0.001	-	-
Pyrene	0.001	mg/L	< 0.001	-	-

Client Sample ID			QR-01	TRIP SPIKE	TRIP BLANK
Sample Matrix			Water	Water	Water
Eurofins mgt Sample No.			S17-Ja06112	S17-Ja06113	S17-Ja06114
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit			
Polycyclic Aromatic Hydrocarbons					
Total PAH*	0.001	mg/L	< 0.001	-	-
2-Fluorobiphenyl (surr.)	1	%	80	-	-
p-Terphenyl-d14 (surr.)	1	%	118	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
TRH >C10-C16	0.05	mg/L	< 0.05	-	-
TRH >C16-C34	0.1	mg/L	0.1	-	-
TRH >C34-C40	0.1	mg/L	< 0.1	-	-
Heavy Metals					
Arsenic	0.001	mg/L	< 0.001	-	-
Cadmium	0.0002	mg/L	< 0.0002	-	-
Chromium	0.001	mg/L	< 0.001	-	-
Copper	0.001	mg/L	< 0.001	-	-
Lead	0.001	mg/L	< 0.001	-	-
Mercury	0.0001	mg/L	< 0.0001	-	-
Nickel	0.001	mg/L	< 0.001	-	-
Zinc	0.005	mg/L	< 0.005	-	-

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: TRH C6-C36 - LTM-ORG-2010	Sydney	Jan 16, 2017	7 Day
BTEX - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Jan 16, 2017	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Jan 16, 2017	7 Day
Polycyclic Aromatic Hydrocarbons - Method: E007 Polyaromatic Hydrocarbons (PAH)	Sydney	Jan 16, 2017	7 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Jan 16, 2017	7 Day
Metals M8 - Method: LTM-MET-3040 Metals in Waters by ICP-MS	Sydney	Jan 16, 2017	28 Day

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 530449
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Jan 16, 2017 11:59 AM
Due: Jan 23, 2017
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence / Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BHC101_0.05-0.1	Jan 14, 2017	10:00AM	Soil	S17-Ja06102	X			X	X	
2	BHC101_0.4-0.5	Jan 14, 2017	10:00AM	Soil	S17-Ja06103				X	X	
3	BHC101_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06104				X		X
4	BHC102_0.0-0.1	Jan 14, 2017	10:00AM	Soil	S17-Ja06105	X			X	X	
5	BHC102_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06106	X			X	X	
6	BHC103_0.05-	Jan 14, 2017	10:00AM	Soil	S17-Ja06107	X					

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Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	0.1										
7	BHC103_0.3-0.4	Jan 14, 2017	10:00AM	Soil	S17-Ja06108				X	X	
8	BHC103_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06109				X		X
9	QD-01	Jan 14, 2017	10:00AM	Soil	S17-Ja06110				X		X
10	QD-02	Jan 14, 2017	10:00AM	Soil	S17-Ja06111				X		X
11	QR-01	Jan 14, 2017	10:00AM	Water	S17-Ja06112						X
12	TRIP SPIKE	Jan 14, 2017	10:00AM	Water	S17-Ja06113			X			
13	TRIP BLANK	Jan 14, 2017	10:00AM	Water	S17-Ja06114			X			
14	BHC101_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06121		X				
15	BHC101_3.8-	Jan 14, 2017	10:00AM	Soil	S17-Ja06122		X				

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Sample Detail						Asbestos Absence /Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	4.0										
16	BHC102_0.4-0.5	Jan 14, 2017	10:00AM	Soil	S17-Ja06123		X				
17	BHC102_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06124		X				
18	BHC102_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06125		X				
19	BHC102_3.8-4.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06126		X				
20	BHC103_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06127		X				
21	BHC103_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06128		X				
22	BHC103_3.8-	Jan 14, 2017	10:00AM	Soil	S17-Ja06129		X				

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Sample Detail						Asbestos Absence /Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	4.0										
23	QT-02	Jan 14, 2017	10:00AM	Soil	S17-Ja06130		X				
24	BHC101_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06228		X				
Test Counts						4	11	2	9	5	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g,h,i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
Dibenz(a,h)anthracene	mg/L	< 0.001			0.001	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
Indeno(1,2,3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/L	< 0.001			0.001	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Zinc	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Total Recoverable Hydrocarbons - 1999 NEPM Fractions									
TRH C6-C9			%	106			70-130	Pass	
TRH C10-C14			%	114			70-130	Pass	
LCS - % Recovery									
BTEX									
Benzene			%	117			70-130	Pass	
Toluene			%	114			70-130	Pass	
Ethylbenzene			%	114			70-130	Pass	
m&p-Xylenes			%	111			70-130	Pass	
o-Xylene			%	118			70-130	Pass	
Xylenes - Total			%	113			70-130	Pass	
LCS - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions									
Naphthalene			%	95			70-130	Pass	
TRH C6-C10			%	105			70-130	Pass	
LCS - % Recovery									
Polycyclic Aromatic Hydrocarbons									
Acenaphthene			%	76			70-130	Pass	
Acenaphthylene			%	75			70-130	Pass	
Anthracene			%	81			70-130	Pass	
Benz(a)anthracene			%	75			70-130	Pass	
Benzo(a)pyrene			%	78			70-130	Pass	
Benzo(b&j)fluoranthene			%	79			70-130	Pass	
Benzo(g,h,i)perylene			%	79			70-130	Pass	
Benzo(k)fluoranthene			%	76			70-130	Pass	
Chrysene			%	77			70-130	Pass	
Dibenz(a,h)anthracene			%	76			70-130	Pass	
Fluoranthene			%	75			70-130	Pass	
Fluorene			%	75			70-130	Pass	
Indeno(1.2.3-cd)pyrene			%	73			70-130	Pass	
Naphthalene			%	72			70-130	Pass	
Phenanthrene			%	74			70-130	Pass	
Pyrene			%	77			70-130	Pass	
LCS - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions									
TRH >C10-C16			%	122			70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	99			70-130	Pass	
Cadmium			%	97			70-130	Pass	
Chromium			%	93			70-130	Pass	
Copper			%	92			70-130	Pass	
Lead			%	102			70-130	Pass	
Mercury			%	106			70-130	Pass	
Nickel			%	91			70-130	Pass	
Zinc			%	101			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S17-Ja05987	NCP	%	100			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S17-Ja05987	NCP	%	104			70-130	Pass	
Toluene	S17-Ja05987	NCP	%	108			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Ethylbenzene	S17-Ja05987	NCP	%	108			70-130	Pass	
m&p-Xylenes	S17-Ja05987	NCP	%	108			70-130	Pass	
o-Xylene	S17-Ja05987	NCP	%	113			70-130	Pass	
Xylenes - Total	S17-Ja05987	NCP	%	109			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S17-Ja05987	NCP	%	95			70-130	Pass	
TRH C6-C10	S17-Ja05987	NCP	%	98			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S17-Ja05029	NCP	%	97			70-130	Pass	
Cadmium	S17-Ja05029	NCP	%	105			70-130	Pass	
Chromium	S17-Ja05029	NCP	%	90			70-130	Pass	
Copper	S17-Ja05029	NCP	%	85			70-130	Pass	
Lead	S17-Ja05029	NCP	%	104			70-130	Pass	
Mercury	S17-Ja05029	NCP	%	110			70-130	Pass	
Nickel	S17-Ja05029	NCP	%	86			70-130	Pass	
Zinc	S17-Ja03010	NCP	%	90			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S17-Ja07379	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S17-Ja07379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S17-Ja07379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S17-Ja07379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S17-Ja07379	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S17-Ja07379	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total	S17-Ja07379	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S17-Ja07379	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S17-Ja07379	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S17-Ja05038	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	S17-Ja05038	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	S17-Ja05028	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper	S17-Ja05038	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead	S17-Ja05028	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury	S17-Ja05038	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	S17-Ja05038	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc	S17-Ja05038	NCP	mg/L	0.016	0.015	4.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

Nibha Vaidya	Analytical Services Manager
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)
Ryan Hamilton	Senior Analyst-Metal (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins | mgt shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins | mgt be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Certificate of Analysis



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025—Testing
 The results of the tests, calibrations and/or
 measurements included in this document are traceable
 to Australian/national standards.

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067

Attention: Fiona Wong
Report 530449-AID
Project Name RNSH-SIR 4A
Project ID ENAURHOD06452AA
Received Date Jan 16, 2017
Date Reported Jan 23, 2017

Methodology:

Asbestos ID	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. Bulk samples include building materials, soils and ores.
Subsampling Soil Samples	The whole sample submitted is first dried and then sieved through a 10mm sieve followed by a 2mm sieve. All fibrous matter viz greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) Iron ores - Sampling and Sample preparation procedures is employed. Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis in accordance with AS 4964-2004.
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated and where required interfering organic fibres or matter may be removed by treating the sample for several hours at a temperature not exceeding 400 ± 30°C. The resultant material is then ground and examined in accordance with AS 4964-2004.
Limit of Reporting	The nominal detection limit of the AS4964 method is around 0.01%. The examination of large sample sizes (at least 500 ml is recommended) may improve the likelihood of identifying asbestos material in the greater than 2 mm fraction. The NEPM screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. NOTE: NATA News, September 2011 – page 34, states, “Weighing of fibres is problematic and can lead to loss of fibres and potential exposure for laboratory analysts. To request laboratories to report information which is outside the scope of AS 4964-2004 and the scope of their accreditation is misleading and is most unwise” therefore such values reported are outside the scope of Eurofins mgt NATA accreditation as designated by an asterisk.

Project Name RNSH-SIR 4A
Project ID ENAURHOD06452AA
Date Sampled Jan 14, 2017
Report 530449-AID

Client Sample ID	Eurofins mgt Sample No.	Date Sampled	Sample Description	Result
BHC101_0.05-0.1	17-Ja06102	Jan 14, 2017	Approximate Sample 195g Sample consisted of: Brown fine grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BHC102_0.0-0.1	17-Ja06105	Jan 14, 2017	Approximate Sample 158g Sample consisted of: Brown fine grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.
BHC103_0.05-0.1	17-Ja06107	Jan 14, 2017	Approximate Sample 109g Sample consisted of: Brown fine grain soil and rocks	No asbestos detected. Organic fibre detected. No respirable fibres detected.

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Jan 18, 2017	Indefinite

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 530449
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Jan 16, 2017 11:59 AM
Due: Jan 23, 2017
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence / Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BHC101_0.05-0.1	Jan 14, 2017	10:00AM	Soil	S17-Ja06102	X			X	X	
2	BHC101_0.4-0.5	Jan 14, 2017	10:00AM	Soil	S17-Ja06103				X	X	
3	BHC101_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06104				X		X
4	BHC102_0.0-0.1	Jan 14, 2017	10:00AM	Soil	S17-Ja06105	X			X	X	
5	BHC102_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06106				X		X
6	BHC103_0.05-	Jan 14, 2017	10:00AM	Soil	S17-Ja06107	X					

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

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Received: Jan 16, 2017 11:59 AM
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Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence / Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	0.1										
7	BHC103_0.3-0.4	Jan 14, 2017	10:00AM	Soil	S17-Ja06108				X	X	
8	BHC103_0.8-1.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06109				X		X
9	QD-01	Jan 14, 2017	10:00AM	Soil	S17-Ja06110				X		X
10	QD-02	Jan 14, 2017	10:00AM	Soil	S17-Ja06111				X		X
11	QR-01	Jan 14, 2017	10:00AM	Water	S17-Ja06112						X
12	TRIP SPIKE	Jan 14, 2017	10:00AM	Water	S17-Ja06113			X			
13	TRIP BLANK	Jan 14, 2017	10:00AM	Water	S17-Ja06114			X			
14	BHC101_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06121		X				
15	BHC101_3.8-	Jan 14, 2017	10:00AM	Soil	S17-Ja06122		X				

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
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Order No.:
Report #: 530449
Phone: +61 2 9406 1000
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Received: Jan 16, 2017 11:59 AM
Due: Jan 23, 2017
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence / Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	4.0										
16	BHC102_0.4-0.5	Jan 14, 2017	10:00AM	Soil	S17-Ja06123		X				
17	BHC102_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06124		X				
18	BHC102_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06125		X				
19	BHC102_3.8-4.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06126		X				
20	BHC103_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06127		X				
21	BHC103_2.8-3.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06128		X				
22	BHC103_3.8-	Jan 14, 2017	10:00AM	Soil	S17-Ja06129		X				

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 530449
Phone: +61 2 9406 1000
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Received: Jan 16, 2017 11:59 AM
Due: Jan 23, 2017
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos Absence / Presence	HOLD	BTEX	Moisture Set	Eurofins mgt Suite B10	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271											
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 18217											
	4.0										
23	QT-02	Jan 14, 2017	10:00AM	Soil	S17-Ja06130		X				
24	BHC101_1.8-2.0	Jan 14, 2017	10:00AM	Soil	S17-Ja06228		X				
Test Counts						3	11	2	9	4	6

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
COC	Chain of custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Western Australia Department of Health
NOHSC	National Occupational Health and Safety Commission
ACM	Bonded asbestos-containing material means any material containing more than 1% asbestos and comprises asbestos-containing-material which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin. Common examples of ACM include but are not limited to: pipe and boiler insulation, sprayed-on fireproofing, troweled-on acoustical plaster, floor tile and mastic, floor linoleum, transite shingles, roofing materials, wall and ceiling plaster, ceiling tiles, and gasket materials. This term is restricted to material that cannot pass a 7 mm x 7 mm sieve. This sieve size is selected because it approximates the thickness of common asbestos cement sheeting and for fragments to be smaller than this would imply a high degree of damage and hence potential for fibre release.
FA	FA comprises friable asbestos material and includes severely weathered cement sheet, insulation products and woven asbestos material. This type of friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. This material is typically unbonded or was previously bonded and is now significantly degraded (crumbling).
PACM	Presumed Asbestos-Containing Material means thermal system insulation and surfacing material found in buildings, vessels, and vessel sections constructed no later than 1980 that are assumed to contain greater than one percent asbestos but have not been sampled or analyzed to verify or negate the presence of asbestos.
AF	Asbestos fines (AF) are defined as free fibres, or fibre bundles, smaller than 7mm. It is the free fibres which present the greatest risk to human health, although very small fibres (< 5 microns in length) are not considered to be such a risk. AF also includes small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve. (Note that for bonded ACM fragments to pass through a 7 mm x 7 mm sieve implies a substantial degree of damage which increases the potential for fibre release.)
AC	Asbestos cement means a mixture of cement and asbestos fibres (typically 90:10 ratios).

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Authorised by:

Nibha Vaidya

Senior Analyst - Asbestos(NSW)



Glenn Jackson

National Operations Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

Eurofins | mgt shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins | mgt be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Sample Receipt Advice

Company name: **Coffey Environments Pty Ltd NSW**

Contact name: **Fiona Wong**

Project name: **RNSH-SIR 4A**

Project ID: **ENAU RHOD06452AA**

COC number: **Not provided**

Turn around time: **5 Day**

Date/Time received: **Jan 16, 2017 11:59 AM**

Eurofins | mgt reference: **530449**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt
Sample Receipt : 14.4 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Sample containers for volatile analysis received with zero headspace.
- ☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Fiona Wong - fiona_wong@coffey.com.

Note: A copy of these results will also be delivered to the general Coffey Environments Pty Ltd NSW email address.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 1 of 2 9192
 Consigning Office: Chetwood
 Report Results to: ford.wen@coffey.com
 Invoices to: Chad-Generat Admin

 Mobile: _____
 Email: Jessie.Sixsmith@coffey.com
 Phone: _____
 Email: @coffey.com

 Project No: ENAUABT009522A Task No: Site 44 - SAR Variation

 Project Name: RNSH Site 44 Laboratory: Eurofins

 Sample's Name: Jessie Sixsmith Project Manager: FW

Special Instructions:

Relevant agreements: Eurofins COF-ENAUABT009522A, MSA1; ALS COF-ENAUABT009522A, MSA2 and SGS COF-ENAUABT009522A, MSA3

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil..etc)	Container Type & Preservative*	T-A-T (specify)	Analysis Request Section	NOTES
BHC101-0.05-0.1		11/1	AM	Soil	J1218		Asbestos PLA	
BHC101-0.4-0.5					J1218		B10-TRI-BTEX-PAH-HM	
BHC101-0.8-1.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC101-1.8-2.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC101-2.8-3.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC101-3.8-4.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC102-0.0-0.1					J1218		B17-TRI-BTEX-PAH-HM	
BHC102-0.4-0.5					J1218		B17-TRI-BTEX-PAH-HM	
BHC102-0.8-1.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC102-1.8-2.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC102-2.8-3.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC102-3.8-4.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC103-0.05-0.1					J1218		B17-TRI-BTEX-PAH-HM	
BHC103-0.3-0.4					J1218		B17-TRI-BTEX-PAH-HM	
BHC103-0.8-1.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC103-1.8-2.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC103-2.8-3.0					J1218		B17-TRI-BTEX-PAH-HM	
BHC103-3.8-4.0					J1218		B17-TRI-BTEX-PAH-HM	

RELINQUISHED BY

RECEIVED BY

 Name: Jessie Sixsmith Date: 16-1-17
 Coffey Environments Time: 10.00

 Name: AB
 Company: eurofins

 Date: 16/1
 Time: 11:57 AM

 Name: _____ Date: _____
 Company: _____ Time: _____

 Name: _____
 Company: _____

 Date: _____
 Time: _____

*Container Type & Preservation Codes: P - Plastic, G - Glass Bottle, J - Glass Jar, V - Vial, Z - Ziplock Bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved, S - Sulphuric Acid Preserved, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative, OP - Other Preservative

Sample Receipt Advice: (Lab Use Only)

All Samples Received in Good Condition

All Documentation is in Proper Order

Samples Received Properly Chilled

Lab. Ref/Batch No.

Certificate of Analysis

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 531482-S
Project name RNSH-SIR 4A
Project ID ENAURHOD06452AA
Received Date Jan 24, 2017

Client Sample ID			BHC102_0.0-0.1	BHC101_0.05-0.1	BHC103_0.3-0.4
Sample Matrix			Soil	Soil	Soil
Eurofins mgt Sample No.			S17-Ja13284	S17-Ja13285	S17-Ja13286
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit			
Polychlorinated Biphenyls					
Aroclor-1016	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aroclor-1232	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aroclor-1242	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aroclor-1248	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aroclor-1254	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aroclor-1260	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Total PCB*	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Dibutylchloroendate (surr.)	1	%	89	74	69
% Moisture	1	%	8.2	6.1	16

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description

Polychlorinated Biphenyls

- Method: E013 Polychlorinated Biphenyls (PCB)

% Moisture

- Method: LTM-GEN-7080 Moisture

Testing Site

Sydney

Sydney

Extracted

Jan 25, 2017

Jan 24, 2017

Holding Time

28 Day

14 Day

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 531482
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Jan 24, 2017 2:08 AM
Due: Jan 30, 2017
Priority: 3 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Nickel	Polyyclic Aromatic Hydrocarbons	Polychlorinated Biphenyls	USA Leaching Procedure	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794										
Perth Laboratory - NATA Site # 18217										
External Laboratory										
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID					
1	BHC101_0.4-0.5	Jan 14, 2017		US Leachate	S17-Ja13280		X		X	
2	BHC101_0.05-0.1	Jan 14, 2017		US Leachate	S17-Ja13281	X			X	
3	BHC103_0.3-0.4	Jan 14, 2017		US Leachate	S17-Ja13282		X		X	
4	BHC103_0.8-1.0	Jan 14, 2017		US Leachate	S17-Ja13283		X		X	
5	BHC102_0.0-0.1	Jan 14, 2017		Soil	S17-Ja13284			X		X
6	BHC101_0.05-	Jan 14, 2017		Soil	S17-Ja13285			X		X

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 531482
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Jan 24, 2017 2:08 AM
Due: Jan 30, 2017
Priority: 3 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Nickel	Polycyclic Aromatic Hydrocarbons	Polychlorinated Biphenyls	USA Leaching Procedure	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794										
Perth Laboratory - NATA Site # 18217										
	0.1									
7	BHC103_0.3-0.4	Jan 14, 2017		Soil	S17-Ja13286			X		X
Test Counts						1	3	3	4	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank										
Polychlorinated Biphenyls										
Aroclor-1016				mg/kg	< 0.5			0.5	Pass	
Aroclor-1221				mg/kg	< 0.1			0.1	Pass	
Aroclor-1232				mg/kg	< 0.5			0.5	Pass	
Aroclor-1242				mg/kg	< 0.5			0.5	Pass	
Aroclor-1248				mg/kg	< 0.5			0.5	Pass	
Aroclor-1254				mg/kg	< 0.5			0.5	Pass	
Aroclor-1260				mg/kg	< 0.5			0.5	Pass	
Total PCB*				mg/kg	< 0.5			0.5	Pass	
LCS - % Recovery										
Polychlorinated Biphenyls										
Aroclor-1260				%	88			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery										
Polychlorinated Biphenyls										
Aroclor-1260				%	109			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
Polychlorinated Biphenyls										
Aroclor-1016				mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1221				mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1232				mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1242				mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1248				mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1254				mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1260				mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate										
					Result 1	Result 2	RPD			
% Moisture				%	16	13	17	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised By

Nibha Vaidya	Analytical Services Manager
Ryan Hamilton	Senior Analyst-Inorganic (NSW)
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins | mgt shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins | mgt be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Certificate of Analysis

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 531482-L
Project name RNSH-SIR 4A
Project ID ENAURHOD06452AA
Received Date Jan 24, 2017

Client Sample ID			BHC101_0.4-0.5	BHC101_0.05-0.1	BHC103_0.3-0.4	BHC103_0.8-1.0
Sample Matrix			US Leachate	US Leachate	US Leachate	US Leachate
Eurofins mgt Sample No.			S17-Ja13280	S17-Ja13281	S17-Ja13282	S17-Ja13283
Date Sampled			Jan 14, 2017	Jan 14, 2017	Jan 14, 2017	Jan 14, 2017
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Acenaphthylene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Anthracene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Benz(a)anthracene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Benzo(a)pyrene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Benzo(b&j)fluoranthene ^{N07}	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Benzo(g,h,i)perylene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Chrysene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Dibenz(a,h)anthracene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Fluoranthene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Fluorene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Naphthalene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Phenanthrene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Pyrene	0.001	mg/L	< 0.001	-	< 0.001	< 0.001
Total PAH*	0.002	mg/L	< 0.001	-	< 0.001	< 0.001
2-Fluorobiphenyl (surr.)	1	%	69	-	73	73
p-Terphenyl-d14 (surr.)	1	%	83	-	103	95
Heavy Metals						
Nickel	0.05	mg/L	-	< 0.05	-	-
USA Leaching Procedure						
Leachate Fluid ^{C01}		comment	1.0	1.0	1.0	1.0
pH (initial)	0.1	pH Units	6.0	8.9	8.4	6.2
pH (off)	0.1	pH Units	5.1	5.3	5.1	5.0
pH (USA HCl addition)	0.1	pH Units	1.4	1.4	1.4	1.4

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons	Sydney	Jan 25, 2017	7 Day
- Method: E007 Polyaromatic Hydrocarbons (PAH)			
Heavy Metals	Sydney	Jan 24, 2017	180 Day
- Method: LTM-MET-3030 by ICP-OES (hydride ICP-OES for Mercury)			
USA Leaching Procedure	Sydney	Jan 24, 2017	14 Day
- Method: LTM-GEN-7010 Leaching Procedure for Soils & Solid Wastes			

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 531482
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Jan 24, 2017 2:08 AM
Due: Jan 30, 2017
Priority: 3 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Nickel	Polyyclic Aromatic Hydrocarbons	Polychlorinated Biphenyls	USA Leaching Procedure	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794										
Perth Laboratory - NATA Site # 18217										
External Laboratory										
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID					
1	BHC101_0.4-0.5	Jan 14, 2017		US Leachate	S17-Ja13280		X		X	
2	BHC101_0.05-0.1	Jan 14, 2017		US Leachate	S17-Ja13281	X			X	
3	BHC103_0.3-0.4	Jan 14, 2017		US Leachate	S17-Ja13282		X		X	
4	BHC103_0.8-1.0	Jan 14, 2017		US Leachate	S17-Ja13283		X		X	
5	BHC102_0.0-0.1	Jan 14, 2017		Soil	S17-Ja13284			X		X
6	BHC101_0.05-	Jan 14, 2017		Soil	S17-Ja13285			X		X

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SIR 4A
Project ID: ENAURHOD06452AA

Order No.:
Report #: 531482
Phone: +61 2 9406 1000
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Received: Jan 24, 2017 2:08 AM
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Priority: 3 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Nickel	Polycyclic Aromatic Hydrocarbons	Polychlorinated Biphenyls	USA Leaching Procedure	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271										
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794										
Perth Laboratory - NATA Site # 18217										
	0.1									
7	BHC103_0.3-0.4	Jan 14, 2017		Soil	S17-Ja13286			X		X
Test Counts						1	3	3	4	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank										
Heavy Metals										
Nickel				mg/L	< 0.05			0.05	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery										
Heavy Metals										
Nickel					Result 1					
Nickel				%	88			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Duplicate										
Heavy Metals										
Nickel					Result 1	Result 2	RPD			
Nickel				mg/L	< 0.05	< 0.05	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

Nibha Vaidya	Analytical Services Manager
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Sample Receipt Advice

Company name: **Coffey Environments Pty Ltd NSW**

Contact name: **Fiona Wong**
Project name: **RNSH-SIR 4A**
Project ID: **ENAU RHOD06452AA**
COC number: **Not provided**
Turn around time: **3 Day**
Date/Time received: **Jan 24, 2017 2:08 AM**
Eurofins | mgt reference: **531482**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt
Sample Receipt : 14.4 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Fiona Wong - fiona_wong@coffey.com.

Note: A copy of these results will also be delivered to the general Coffey Environments Pty Ltd NSW email address.

Alena Bounkeua

From: Wong, Fiona <Fiona.Wong@coffey.com>
Sent: Tuesday, 24 January 2017 9:27 AM
To: Nibha Vaidya
Subject: RE: Eurofins | mgt Test Results, Invoice - Report 530449 : Site RNSH-SIR 4A (ENAU RHOD06452AA)

Yes TCLP (PAH).

Thanks, Fiona

Sent from my Windows Phone

From: [Nibha Vaidya](#)
Sent: 24/01/2017 9:13
To: [Wong, Fiona](#)
Cc: [Sixsmith, Jessie](#); [Dunbavan, Michael](#)
Subject: RE: Eurofins | mgt Test Results, Invoice - Report 530449 : Site RNSH-SIR 4A (ENAU RHOD06452AA)

Morning Fiona,

I shall arrange this for you. Just to confirm "BHC103_0.3-0.4 and BHC103_0.8-1.0 (PAH)" will be the TCLP analysis as well – is it correct?

Kind Regards,

Nibha Vaidya
Phone : +61 2 9900 8415
Mobile : +61 499 900 805
Email : NibhaVaidya@eurofins.com

From: Wong, Fiona [<mailto:Fiona.Wong@coffey.com>]
Sent: Tuesday, 24 January 2017 2:08 AM
To: Nibha Vaidya
Cc: Sixsmith, Jessie; Dunbavan, Michael
Subject: RE: Eurofins | mgt Test Results, Invoice - Report 530449 : Site RNSH-SIR 4A (ENAU RHOD06452AA)

Hi Nibha

Can you please schedule in the following analyses?

- BHC101_0.4-0.5 – TCLP (PAH)
- BHC101_0.05-0.1 – TCLP (Nickel)
- BHC103_0.3-0.4 and BHC103_0.8-1.0 (PAH)

In addition, please analyse the following samples for PCB?

- BHC101_0.05-0.1
- BHC102_0.0-0.1
- BHC103_0.3-0.4

3 day TAT please.

I won't be in the office for the rest of this week. Please drop me an email if you have any questions. I will reply you ASAP.

Thanks and regards

Fiona Wong
Associate Environmental Engineer

t: +61 2 9406 1213
m: +61 409 367 752
w: coffey.com

From: NibhaVaidya@eurofins.com [<mailto:NibhaVaidya@eurofins.com>]
Sent: Monday, 23 January 2017 3:31 PM
To: Wong, Fiona <Fiona.Wong@coffey.com>
Cc: Sixsmith, Jessie <Jessie.Sixsmith@coffey.com>
Subject: Eurofins | mgt Test Results, Invoice - Report 530449 : Site RNSH-SIR 4A (ENAHOD06452AA)

Dear Fiona,

Please find attached final results and invoice for your project in the subject header.

Kind Regards,

Nibha Vaidya
Analytical Services Manager

Eurofins | mgt
Unit F3, Parkview Building
16 Mars Road
LANE COVE WEST NSW 2066
AUSTRALIA
Phone: +61 299 008 400
Mobile:
Email: NibhaVaidya@eurofins.com
Website: environment.eurofins.com.au
[EnviroNote 1068 - Eurofins Perth Laboratory](#)
[EnviroNote 1069 - Eurofins Overnight TAT](#)

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Certificate of Analysis

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: Fiona Wong

Report 530212-W
Project name RNSH-SITE 4A (SITE 4A-SAR VARIATION)
Project ID ENAURHOD06452AA
Received Date Jan 12, 2017

Client Sample ID			BH202 Water	BH204 Water	BH205 Water	GWQD_01 Water
Sample Matrix			S17-Ja04337	S17-Ja04338	S17-Ja04339	S17-Ja04340
Eurofins mgt Sample No.			Jan 12, 2017	Jan 12, 2017	Jan 12, 2017	Jan 12, 2017
Date Sampled						
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	0.2	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1	< 0.1	0.2	< 0.1
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	119	119	119	116
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Acenaphthylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benz(a)anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(a)pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(b&j)fluoranthene ^{N07}	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(g,h,i)perylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Chrysene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Dibenz(a,h)anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Fluorene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Indeno(1,2,3-cd)pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Naphthalene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Phenanthrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001

Client Sample ID			BH202	BH204	BH205	GWQD_01
Sample Matrix			Water	Water	Water	Water
Eurofins mgt Sample No.			S17-Ja04337	S17-Ja04338	S17-Ja04339	S17-Ja04340
Date Sampled			Jan 12, 2017	Jan 12, 2017	Jan 12, 2017	Jan 12, 2017
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Total PAH*	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
2-Fluorobiphenyl (surr.)	1	%	96	80	80	78
p-Terphenyl-d14 (surr.)	1	%	117	96	99	96
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	0.1	0.1	0.3	0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	0.001	0.010	< 0.001	0.008
Lead (filtered)	0.001	mg/L	0.004	0.001	< 0.001	0.004
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.028	0.005	0.024	0.029
Zinc (filtered)	0.005	mg/L	0.17	0.12	0.15	0.17

Client Sample ID			TRIP SPIKE	TRIP BLANK
Sample Matrix			Water	Water
Eurofins mgt Sample No.			S17-Ja04342	S17-Ja04343
Date Sampled			Jan 12, 2017	Jan 12, 2017
Test/Reference	LOR	Unit		
BTEX				
Benzene	0.001	mg/L	121%	< 0.001
Toluene	0.001	mg/L	121%	< 0.001
Ethylbenzene	0.001	mg/L	115%	< 0.001
m&p-Xylenes	0.002	mg/L	107%	< 0.002
o-Xylene	0.001	mg/L	119%	< 0.001
Xylenes - Total	0.003	mg/L	111%	< 0.003
4-Bromofluorobenzene (surr.)	1	%	121	120

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: TRH C6-C36 - LTM-ORG-2010	Sydney	Jan 17, 2017	7 Day
BTEX - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Jan 12, 2017	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Jan 12, 2017	7 Day
Polycyclic Aromatic Hydrocarbons - Method: E007 Polyaromatic Hydrocarbons (PAH)	Sydney	Jan 17, 2017	7 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Jan 17, 2017	7 Day
Metals M8 filtered - Method: LTM-MET-3040 Metals in Waters by ICP-MS	Sydney	Jan 12, 2017	28 Day

Company Name: Coffey Environments Pty Ltd NSW
Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067
Project Name: RNSH-SITE 4A (SITE 4A-SAR VARIATION)
Project ID: ENAURHOD06452AA

Order No.:
Report #: 530212
Phone: +61 2 9406 1000
Fax: +61 2 9406 1004

Received: Jan 12, 2017 3:46 PM
Due: Jan 19, 2017
Priority: 5 Day
Contact Name: Fiona Wong

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						HOLD	BTEX	Eurofins mgt Suite B7 (filtered metals)
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 18217								
External Laboratory								
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID			
1	BH202	Jan 12, 2017		Water	S17-Ja04337			X
2	BH204	Jan 12, 2017		Water	S17-Ja04338			X
3	BH205	Jan 12, 2017		Water	S17-Ja04339			X
4	GWQD_01	Jan 12, 2017		Water	S17-Ja04340			X
5	GWQR_01	Jan 12, 2017		Soil	S17-Ja04341	X		
6	TRIP SPIKE	Jan 12, 2017		Water	S17-Ja04342		X	
7	TRIP BLANK	Jan 12, 2017		Water	S17-Ja04343		X	
Test Counts						1	2	4

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g,h,i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
Dibenz(a,h)anthracene	mg/L	< 0.001			0.001	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
Indeno(1,2,3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							

Test		Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Total Recoverable Hydrocarbons - 1999 NEPM Fractions								
TRH C6-C9		%	115			70-130	Pass	
TRH C10-C14		%	114			70-130	Pass	
LCS - % Recovery								
BTEX								
Benzene		%	119			70-130	Pass	
Toluene		%	122			70-130	Pass	
Ethylbenzene		%	117			70-130	Pass	
m&p-Xylenes		%	109			70-130	Pass	
o-Xylene		%	122			70-130	Pass	
Xylenes - Total		%	113			70-130	Pass	
LCS - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions								
Naphthalene		%	97			70-130	Pass	
TRH C6-C10		%	102			70-130	Pass	
LCS - % Recovery								
Polycyclic Aromatic Hydrocarbons								
Acenaphthene		%	76			70-130	Pass	
Acenaphthylene		%	75			70-130	Pass	
Anthracene		%	81			70-130	Pass	
Benz(a)anthracene		%	75			70-130	Pass	
Benzo(a)pyrene		%	78			70-130	Pass	
Benzo(b&j)fluoranthene		%	79			70-130	Pass	
Benzo(g,h,i)perylene		%	79			70-130	Pass	
Benzo(k)fluoranthene		%	76			70-130	Pass	
Chrysene		%	77			70-130	Pass	
Dibenz(a,h)anthracene		%	76			70-130	Pass	
Fluoranthene		%	75			70-130	Pass	
Fluorene		%	75			70-130	Pass	
Indeno(1,2,3-cd)pyrene		%	73			70-130	Pass	
Naphthalene		%	72			70-130	Pass	
Phenanthrene		%	74			70-130	Pass	
Pyrene		%	77			70-130	Pass	
LCS - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions								
TRH >C10-C16		%	122			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1				
TRH C6-C9	S17-Ja04338	CP	%	118		70-130	Pass	
Spike - % Recovery								
BTEX				Result 1				
Benzene	S17-Ja04338	CP	%	125		70-130	Pass	
Toluene	S17-Ja04338	CP	%	120		70-130	Pass	
Ethylbenzene	S17-Ja04338	CP	%	118		70-130	Pass	
m&p-Xylenes	S17-Ja04338	CP	%	123		70-130	Pass	
o-Xylene	S17-Ja04338	CP	%	127		70-130	Pass	
Xylenes - Total	S17-Ja04338	CP	%	124		70-130	Pass	
Spike - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1				
Naphthalene	S17-Ja04338	CP	%	108		70-130	Pass	
TRH C6-C10	S17-Ja04338	CP	%	118		70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S17-Ja04337	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S17-Ja04337	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S17-Ja04337	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S17-Ja04337	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S17-Ja04337	CP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S17-Ja04337	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total	S17-Ja04337	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S17-Ja04337	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S17-Ja04337	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

Nibha Vaidya	Analytical Services Manager
Ryan Hamilton	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Sample Receipt Advice

Company name: **Coffey Environments Pty Ltd NSW**
Contact name: **Fiona Wong**
Project name: **RNSH-SITE 4A (SITE 4A-SAR VARIATION)**
Project ID: **ENAU RHOD06452AA**
COC number: **Not provided**
Turn around time: **5 Day**
Date/Time received: **Jan 12, 2017 3:46 PM**
Eurofins | mgt reference: **530212**

Sample information

- ☒ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ☒ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt
Sample Receipt : 19 degrees Celsius.
- ☒ All samples have been received as described on the above COC.
- ☒ COC has been completed correctly.
- ☒ Attempt to chill was evident.
- ☒ Appropriately preserved sample containers have been used.
- ☒ All samples were received in good condition.
- ☒ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ☒ Appropriate sample containers have been used.
- ☒ Sample containers for volatile analysis received with zero headspace.
- ☒ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

GWQT_01 forwarded to ALS|

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Fiona Wong - fiona_wong@coffey.com.

Note: A copy of these results will also be delivered to the general Coffey Environments Pty Ltd NSW email address.

9191

CERTIFICATE OF ANALYSIS

Work Order : **ES1626831**
Client : **COFFEY ENVIRONMENTS PTY LTD**
Contact : MS FIONA WONG
Address : LEVEL 19, 799 PACIFIC HIGHWAY Tower B - Citadel Tower
 CHATSWOOD NSW, AUSTRALIA 2067
Telephone : +61 02 9406 1000
Project : GEOTLCOV25684AB Drilling RNSH-SHe 4a
Order number : ----
C-O-C number : 9187
Sampler : PH/BW/RWJ
Site : ----
Quote number : ----
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 6
Laboratory : Environmental Division Sydney
Contact : Bronwyn Sheen
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-3-8549 9636
Date Samples Received : 23-Nov-2016 14:30
Date Analysis Commenced : 24-Nov-2016
Issue Date : 29-Nov-2016 15:13



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR.

Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Dup 1	----	----	----	----
Client sampling date / time				[19-Nov-2016]	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1626831-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	16.4	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	9	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	13	----	----	----	----
Copper	7440-50-8	5	mg/kg	37	----	----	----	----
Lead	7439-92-1	5	mg/kg	36	----	----	----	----
Nickel	7440-02-0	2	mg/kg	29	----	----	----	----
Zinc	7440-66-6	5	mg/kg	75	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	1.1	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	1.2	----	----	----	----
Benzo(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.6	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	2.9	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	Dup 1	----	----	----	----
Client sampling date / time					[19-Nov-2016]	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1626831-001	-----	-----	-----	-----
				Result	----	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons - Continued									
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		86.4	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		86.5	----	----	----	----
2,4,6-Tribromophenol	118-79-6	0.5	%		101	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		96.2	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		103	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		84.7	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		88.3	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		82.4	----	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	Dup 1	----	----	----	----
				Client sampling date / time	[19-Nov-2016]	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1626831-001	-----	-----	-----	-----
					Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	0.2	%		85.7	----	----	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2,4,6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1626831	Page	: 1 of 4
Client	: COFFEY ENVIRONMENTS PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS FIONA WONG	Telephone	: +61-3-8549 9636
Project	: GEOTLCOV25684AB Drilling RNSH-SHe 4a	Date Samples Received	: 23-Nov-2016
Site	: ----	Issue Date	: 29-Nov-2016
Sampler	: PH/BW/RWJ	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103) Dup 1	19-Nov-2016	----	----	----	25-Nov-2016	03-Dec-2016	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) Dup 1	19-Nov-2016	25-Nov-2016	18-May-2017	✓	28-Nov-2016	18-May-2017	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) Dup 1	19-Nov-2016	25-Nov-2016	17-Dec-2016	✓	28-Nov-2016	17-Dec-2016	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) Dup 1	19-Nov-2016	24-Nov-2016	03-Dec-2016	✓	24-Nov-2016	03-Jan-2017	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071) Dup 1	19-Nov-2016	24-Nov-2016	03-Dec-2016	✓	25-Nov-2016	03-Jan-2017	✓
Soil Glass Jar - Unpreserved (EP080) Dup 1	19-Nov-2016	25-Nov-2016	03-Dec-2016	✓	28-Nov-2016	03-Dec-2016	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP071) Dup 1	19-Nov-2016	24-Nov-2016	03-Dec-2016	✓	25-Nov-2016	03-Jan-2017	✓
Soil Glass Jar - Unpreserved (EP080) Dup 1	19-Nov-2016	25-Nov-2016	03-Dec-2016	✓	28-Nov-2016	03-Dec-2016	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) Dup 1	19-Nov-2016	25-Nov-2016	03-Dec-2016	✓	28-Nov-2016	03-Dec-2016	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICP-AES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

QUALITY CONTROL REPORT

Work Order	: ES1626831	Page	: 1 of 6
Client	: COFFEY ENVIRONMENTS PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS FIONA WONG	Contact	: Bronwyn Sheen
Address	: LEVEL 19, 799 PACIFIC HIGHWAY Tower B - Citadel Tower CHATSWOOD NSW, AUSTRALIA 2067	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9406 1000	Telephone	: +61-3-8549 9636
Project	: GEOTLCOV25684AB Drilling RNSH-SHe 4a	Date Samples Received	: 23-Nov-2016
Order number	: ----	Date Analysis Commenced	: 24-Nov-2016
C-O-C number	: 9187	Issue Date	: 29-Nov-2016
Sampler	: PH/BW/RWJ		
Site	: ----		
Quote number	: ----		
No. of samples received	: 1		
No. of samples analysed	: 1		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (QC Lot: 668642)									
ES1626783-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	2.7	2.5	8.51	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 668965)									
ES1626795-006	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	64	73	12.3	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	4	4	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	9	9	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	18	19	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	49	53	8.73	0% - 50%
ES1627041-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	11	10	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	<2	41.1	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	25	47.5	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	20	22	10.6	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	322	335	3.99	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 668964)									
ES1626245-004	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1626788-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 667107)									
ES1626913-010	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 667107) - continued									
ES1626913-010	Anonymous	EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			205-82-3						
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenzo(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit		
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 667108)									
ES1626913-010	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 667748)									
ES1626823-002	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 667108)									
ES1626913-010	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 667748)									
ES1626823-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 667748)									
ES1626823-002	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

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

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)		
		LCS	Low	High	
Result					
<5	21.7 mg/kg	106	86	126	
<1	4.64 mg/kg	103	83	113	
<2	43.9 mg/kg	101	76	128	
<5	32 mg/kg	109	86	120	
<5	40 mg/kg	102	80	114	
<2	55 mg/kg	105	87	123	
<5	60.8 mg/kg	121	80	122	
<0.1	2.57 mg/kg	83.1	70	105	
<0.5	6 mg/kg	91.8	77	125	
<0.5	6 mg/kg	96.3	72	124	
<0.5	6 mg/kg	90.9	73	127	
<0.5	6 mg/kg	96.0	72	126	
<0.5	6 mg/kg	94.4	75	127	
<0.5	6 mg/kg	94.7	77	127	
<0.5	6 mg/kg	94.7	73	127	
<0.5	6 mg/kg	94.6	74	128	
<0.5	6 mg/kg	91.7	69	123	
<0.5	6 mg/kg	94.3	75	127	
<0.5	6 mg/kg	94.6	68	116	
<0.5	6 mg/kg	92.9	74	126	
<0.5	6 mg/kg	92.7	70	126	
<0.5	6 mg/kg	94.4	61	121	
<0.5	6 mg/kg	92.8	62	118	
<0.5	6 mg/kg	94.3	63	121	
<50	200 mg/kg	104	75	129	
<100	300 mg/kg	101	77	131	
<100	200 mg/kg	107	71	129	
<10	26 mg/kg	86.4	68	128	



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 667108) - continued								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	102	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	110	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	150 mg/kg	92.1	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 667748)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	85.5	68	128
EP080: BTEXN (QCLot: 667748)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	83.8	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	84.7	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	86.2	65	117
EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	2 mg/kg	86.7	66	118
	106-42-3							
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	86.2	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	87.7	63	119

Matrix Spike (MS) Report

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

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 668965)							
ES1626795-006	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	110	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	104	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	97.5	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	111	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	105	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	103	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	105	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 668964)							
ES1626245-004	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	98.1	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 667107)							
ES1626913-010	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	90.4	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	87.7	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 667108)							
ES1626913-010	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	92.6	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	105	53	131

Page : 6 of 6
 Work Order : ES1626831
 Client : COFFEY ENVIRONMENTS PTY LTD
 Project : GEOTLCOV25684AB Drilling RNSH-SHe 4a



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 667108) - continued							
ES1626913-010	Anonymous	EP071: C29 - C36 Fraction	----	1714 mg/kg	106	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 667748)							
ES1626823-002	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	80.5	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 667108)							
ES1626913-010	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	96.2	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	108	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	98.3	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 667748)							
ES1626823-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	80.0	70	130
EP080: BTEXN (QCLot: 667748)							
ES1626823-002	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	77.2	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	75.5	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	78.4	70	130
		EP080: meta- & para-Xylene	108-38-3	2.5 mg/kg	78.0	70	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	78.8	70	130
		EP080: Napthalene	91-20-3	2.5 mg/kg	81.9	70	130

CERTIFICATE OF ANALYSIS

Work Order : **ES1701134**
Client : **COFFEY ENVIRONMENTS PTY LTD**
Contact : MS JESSIE SIXSMITH
Address : 118 AUBURN STREET
 WOLLONGONG NSW, AUSTRALIA 2500
Telephone : +61 02 9406 1000
Project : ENAURHOD06452AA RNSH SITE 401
Order number : ----
C-O-C number : 9193
Sampler : JESSIE SIXSMITH
Site : ----
Quote number : EN/077/14
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 6
Laboratory : Environmental Division Sydney
Contact : Angelene Kumar
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61 2 8784 8555
Date Samples Received : 17-Jan-2017 13:20
Date Analysis Commenced : 19-Jan-2017
Issue Date : 24-Jan-2017 16:51



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenzo(a,h)anthracene (1.0),

Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR.

Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		QT01	----	----	----	----
Client sampling date / time		14-Jan-2017 00:00		----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1701134-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	15.4	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	17	----	----	----	----
Copper	7440-50-8	5	mg/kg	44	----	----	----	----
Lead	7439-92-1	5	mg/kg	42	----	----	----	----
Nickel	7440-02-0	2	mg/kg	26	----	----	----	----
Zinc	7440-66-6	5	mg/kg	65	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	1.2	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	1.4	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	6.8	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	1.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	12.4	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	12.0	----	----	----	----
Benzo(a)anthracene	56-55-3	0.5	mg/kg	4.2	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	4.2	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	5.6	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	2.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	5.2	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	2.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	3.5	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	61.8	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	6.8	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	7.0	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	7.2	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	QT01	----	----	----	----
Client sampling date / time					14-Jan-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1701134-001	-----	-----	-----	-----
				Result	----	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons - Continued									
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg		130	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg		110	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		240	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		200	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		200	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		89.0	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		88.1	----	----	----	----
2,4,6-Tribromophenol	118-79-6	0.5	%		93.8	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		104	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		99.2	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		96.1	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		91.3	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		106	----	----	----	----

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 Work Order : ES1701134
 Client : COFFEY ENVIRONMENTS PTY LTD
 Project : ENAURHOD06452AA RNSH SITE 401



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	QT01	----	----	----	----
				Client sampling date / time	14-Jan-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1701134-001	-----	-----	-----	-----
				Result		----	----	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	0.2	%		104	----	----	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2,4,6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1701134	Page	: 1 of 4
Client	: COFFEY ENVIRONMENTS PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS JESSIE SIXSMITH	Telephone	: +61 2 8784 8555
Project	: ENAURHOD06452AA RNSH SITE 401	Date Samples Received	: 17-Jan-2017
Site	: ----	Issue Date	: 24-Jan-2017
Sampler	: JESSIE SIXSMITH	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Moisture Content	1	11	9.09	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103) QT01	14-Jan-2017	----	----	----	19-Jan-2017	28-Jan-2017	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) QT01	14-Jan-2017	20-Jan-2017	13-Jul-2017	✓	20-Jan-2017	13-Jul-2017	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) QT01	14-Jan-2017	20-Jan-2017	11-Feb-2017	✓	20-Jan-2017	11-Feb-2017	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) QT01	14-Jan-2017	19-Jan-2017	28-Jan-2017	✓	20-Jan-2017	28-Feb-2017	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) QT01	14-Jan-2017	19-Jan-2017	28-Jan-2017	✓	19-Jan-2017	28-Jan-2017	✓
Soil Glass Jar - Unpreserved (EP071) QT01	14-Jan-2017	19-Jan-2017	28-Jan-2017	✓	20-Jan-2017	28-Feb-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) QT01	14-Jan-2017	19-Jan-2017	28-Jan-2017	✓	19-Jan-2017	28-Jan-2017	✓
Soil Glass Jar - Unpreserved (EP071) QT01	14-Jan-2017	19-Jan-2017	28-Jan-2017	✓	20-Jan-2017	28-Feb-2017	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) QT01	14-Jan-2017	19-Jan-2017	28-Jan-2017	✓	19-Jan-2017	28-Jan-2017	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	1	11	9.09	10.00	✖	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICP-AES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

QUALITY CONTROL REPORT

Work Order	: ES1701134	Page	: 1 of 7
Client	: COFFEY ENVIRONMENTS PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS JESSIE SIXSMITH	Contact	: Angelene Kumar
Address	: 118 AUBURN STREET WOLLONGONG NSW, AUSTRALIA 2500	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9406 1000	Telephone	: +61 2 8784 8555
Project	: ENAURHOD06452AA RNSH SITE 401	Date Samples Received	: 17-Jan-2017
Order number	: ----	Date Analysis Commenced	: 19-Jan-2017
C-O-C number	: 9193	Issue Date	: 24-Jan-2017
Sampler	: JESSIE SIXSMITH		
Site	: ----		
Quote number	: EN/077/14		
No. of samples received	: 1		
No. of samples analysed	: 1		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA055: Moisture Content (QC Lot: 726094)									
ES1701134-001	QT01	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	15.4	13.9	10.5	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 727651)									
EB1700881-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	22	18	18.1	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	13	12	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	25	29	15.2	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	41	39	4.03	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	254	254	0.00	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	533	443	18.4	0% - 20%
ES1701115-006	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	3	2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	9	12.2	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	22	19	12.4	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 727650)									
EB1700881-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	1.8	1.5	12.9	0% - 50%
ES1701115-006	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 725531)									
ES1701101-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 725531) - continued									
ES1701101-001	Anonymous	EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.0	0.9	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	1.8	1.6	8.75	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	1.8	1.7	7.65	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	0.9	0.9	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	0.9	0.8	12.3	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	1.1	1.0	0.00	No Limit
			205-82-3						
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	0.9	1.0	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.8	0.7	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	9.7	8.6	12.0	0% - 50%
EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.2	1.2	0.00	No Limit		
ES1701101-011	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.8	1.6	9.10	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	0.7	0.7	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	3.6	3.6	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	3.6	3.8	4.10	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	1.6	1.6	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	1.6	1.6	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	1.9	1.9	0.00	No Limit
			205-82-3						
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.9	0.8	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.8	1.7	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.7	0.8	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	1.0	1.0	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	19.2	19.1	0.522	0% - 20%
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	2.3	2.2	4.37	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 725532)									
ES1701101-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	110	150	32.6	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	130	120	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit

Page : 4 of 7
 Work Order : ES1701134
 Client : COFFEY ENVIRONMENTS PTY LTD
 Project : ENAURHOD06452AA RNSH SITE 401



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 725532) - continued									
ES1701101-011	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 725556)									
ES1701131-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 725532)									
ES1701101-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	210	240	14.2	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1701101-011	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	120	140	18.7	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 725556)									
ES1701131-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 725556)									
ES1701131-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

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

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike	Spike Recovery (%)	Recovery Limits (%)	
Result	Concentration	LCS	Low	High
<5	21.7 mg/kg	96.7	86	126
<1	4.64 mg/kg	92.6	83	113
<2	43.9 mg/kg	94.0	76	128
<5	32 mg/kg	94.1	86	120
<5	40 mg/kg	95.2	80	114
<2	55 mg/kg	98.7	87	123
<5	60.8 mg/kg	99.2	80	122
<0.1	2.57 mg/kg	83.8	70	105
<0.5	6 mg/kg	92.9	77	125
<0.5	6 mg/kg	95.6	72	124
<0.5	6 mg/kg	98.2	73	127
<0.5	6 mg/kg	98.7	72	126
<0.5	6 mg/kg	96.1	75	127
<0.5	6 mg/kg	95.4	77	127
<0.5	6 mg/kg	96.3	73	127
<0.5	6 mg/kg	93.2	74	128
<0.5	6 mg/kg	93.6	69	123
<0.5	6 mg/kg	94.5	75	127
<0.5	6 mg/kg	97.1	68	116
<0.5	6 mg/kg	95.6	74	126
<0.5	6 mg/kg	94.8	70	126
<0.5	6 mg/kg	89.5	61	121
<0.5	6 mg/kg	89.6	62	118
<0.5	6 mg/kg	94.5	63	121
<50	200 mg/kg	102	75	129
<100	300 mg/kg	104	77	131
<100	200 mg/kg	89.8	71	129
<10	26 mg/kg	86.8	68	128



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 725532) - continued								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	104	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	101	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	150 mg/kg	85.0	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 725556)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	85.4	68	128
EP080: BTEXN (QCLot: 725556)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	88.3	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	90.5	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	89.9	65	117
EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	2 mg/kg	93.3	66	118
	106-42-3							
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	94.1	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	83.4	63	119

Matrix Spike (MS) Report

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

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 727651)							
EB1700881-002	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	91.1	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	96.5	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	96.7	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	98.0	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	76.7	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	93.5	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	83.3	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 727650)							
EB1700881-002	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	87.6	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 725531)							
ES1701101-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	94.0	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	93.2	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 725532)							
ES1701101-001	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	81.1	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	85.9	53	131



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 725532) - continued							
ES1701101-001	Anonymous	EP071: C29 - C36 Fraction	----	1714 mg/kg	95.1	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 725556)							
ES1701131-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	103	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 725532)							
ES1701101-001	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	98.7	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	91.9	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	95.8	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 725556)							
ES1701131-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	102	70	130
EP080: BTEXN (QCLot: 725556)							
ES1701131-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	95.0	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	105	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	113	70	130
		EP080: meta- & para-Xylene	108-38-3	2.5 mg/kg	115	70	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	116	70	130
		EP080: Napthalene	91-20-3	2.5 mg/kg	101	70	130

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : ES1701134**

Client : COFFEY ENVIRONMENTS PTY LTD
Contact : MS JESSIE SIXSMITH
Address : 118 AUBURN STREET
WOLLONGONG NSW, AUSTRALIA
2500

Laboratory : Environmental Division Sydney
Contact : Angelene Kumar
Address : 277-289 Woodpark Road Smithfield
NSW Australia 2164

E-mail : jessie.sixsmith@coffey.com
Telephone : +61 02 9406 1000
Facsimile : ----

E-mail : angelene.kumar@alsglobal.com
Telephone : +61 2 8784 8555
Facsimile : +61-2-8784 8500

Project : ENAURHOD06452AA RNSH SITE 401
Order number : ----
C-O-C number : 9193
Site : ----
Sampler : JESSIE SIXSMITH

Page : 1 of 2
Quote number : ES2014COFENV0369 (EN/077/14)
QC Level : NEPM 2013 B3 & ALS QC Standard

Dates

Date Samples Received : 17-Jan-2017 13:20
Client Requested Due : 24-Jan-2017
Date :

Issue Date : 18-Jan-2017
Scheduled Reporting Date : **24-Jan-2017**

Delivery Details

Mode of Delivery : Undefined
No. of coolers/boxes : ----
Receipt Detail :

Security Seal : Intact.
Temperature : 28.5'C - Ice Bricks present
No. of samples received / analysed : 1 / 1

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

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

- ### Summary of Sample(s) and Requested Analysis

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - E Moisture	SOIL - S 8 metals
ES1701134-001	14-Jan-2017 00:00	QT01	✓	✓

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

- *AU Certificate of Analysis - NATA (COA)	Email	jessie.sixsmith@coffey.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jessie.sixsmith@coffey.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jessie.sixsmith@coffey.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jessie.sixsmith@coffey.com
- A4 - AU Tax Invoice (INV)	Email	jessie.sixsmith@coffey.com
- Attachment - Report (SUBCO)	Email	jessie.sixsmith@coffey.com
- Chain of Custody (CoC) (COC)	Email	jessie.sixsmith@coffey.com
- EDI Format - ENMRG (ENMRG)	Email	jessie.sixsmith@coffey.com
- EDI Format - ESDAT (ESDAT)	Email	jessie.sixsmith@coffey.com

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 2 of 2 9193

Consigning Office:

Report Results to:

Invoices to:

AS Page 1

Mobile:

Email:

@coffey.com

Phone:

Email:

@coffey.com

Project No:

Task No:

Project Name:

Laboratory:

Sampler's Name:

Project Manager:

Special Instructions:

Relevant agreements: Eurofins COF_ENAUABTF00952AA_MSA1; ALS COF_ENAUABTF00952AA_MSA2 and SGS COF_ENAUABTF00952AA_MSA3

Analysis Request Section

NOTES

* Forwarded to
AS

Sample ID

Sample Date

Time

Matrix (Soil, etc)

Container Type & Preservative*

T-A-I (specify)

Lab No.

GD-01

GT-01*

GD-02

GT-02

QE-01

Trip Spike

Trip blank

14/1

AM

10:11

Soil

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Environmental Division
Sydney
Work Order Reference
ES1701134

Telephone : + 61-2-9704 8655

Sample Receipt Advice: (Lab Use Only)

All Samples Received in Good Condition

All Documentation is in Proper Order

Samples Received Properly Chilled

Lab. Ref/Batch No.

RELINQUISHED BY

RECEIVED BY

Name: JESSIE SIXSMITH

Date: 16-1-17

Coffey Environments

Time: 10:00

Name: AB

Company: EUROFINI

Date: 16/1

Time: 11:59 am

Name: Date:

Company: Time:

Name:

Company:

Date:

Time:

*Container Type & Preservation Codes: P - Plastic, G - Glass Bottle, J - Glass Jar, V - Vial, Z - Ziplock Bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved, S - Sulphuric Acid Preserved, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative, OP - Other Preservative

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 1 of 2

9192



Consigning Office: Chatswood
 Report Results to: fora.weng
 Invoices to: Chat-General Admin

Mobile:
 Phone:

Email:
 Email:

Jessie Sixsmith
 @coffey.com
 @coffey.com

Project No: ENAUABT00952AA Task Site 4A - SAR Variation

Project Name: RNSH-Site 4A Laboratory: Eurofins

Sampler's Name: Jessie Sixsmith Project Manager: FW

Special Instructions:

Relevant agreements: Eurofins COF ENAUABT00952AA_MSA1, ALS COF ENAUABT00952AA_MSA2 and SGS COF ENAUABT00952AA_MSA3

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil, etc)	Container Type & Preservative*	T-A-T (Specify)	Analysis Request Section		NOTES
BHC101-005-0.1		4/1	AM	Soil	J121B		<u>Asbestos P/A</u> <u>BLO - RHINOEX P/A</u> <u>B3 - RHINOEX P/A</u> <u>BEX</u> <u>Hold</u>		
BHC101-04-0.5					J121B				
BHC101-08-1.0					J121B				
BHC101-1.8-2.0					J121B				
BHC101-2.8-3.0					J121B				
BHC101-3.8-4.0					J121B				
BHC102-0.0-0.1					J121B				
BHC102-0.4-0.5					J121B				
BHC102-0.8-1.0					J121B				
BHC102-1.8-2.0					J121B				
BHC102-2.8-3.0					J121B				
BHC102-3.8-4.0					J121B				
BHC103-0.05-0.1					J121B				
BHC103-0.2-0.4					J121B				
BHC103-0.8-1.0					J121B				
BHC103-1.8-2.0					J121B				
BHC103-2.8-3.0					J121B				
BHC103-3.8-4.0					J121B				

RELINQUISHED BY

RECEIVED BY

Name: Jessie Sixsmith Date: 16-1-17
 Coffey Environments Time: 10.00

Name: AB
 Company: eurofins

Date: 16/1
 Time: 11:59am

Name: _____ Date: _____
 Company: _____ Time: _____

Name: Dolly
 Company: ALS

Date: 17/1/17
 Time: 1:20

Sample Receipt Advice: (Lab Use Only)

All Samples Received in Good Condition

All Documentation is in Proper Order

Samples Received Properly Chilled

Lab. Ref/Batch No.

*Container Type & Preservation Codes: P - Plastic, G - Glass Bottle, J - Glass Jar, V - Vial, Z - Ziplock Bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved,
 S - Suphuric Acid Preserved, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative, OP - Other Preservative



Work Order	: ES1700879	Page	: 1 of 5
Client	: COFFEY ENVIRONMENTS PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS FIONA WONG	Contact	: Angelene Kumar
Address	: LEVEL 19, 799 PACIFIC HIGHWAY Tower B - Citadel Tower CHATSWOOD NSW, AUSTRALIA 2067	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9406 1000	Telephone	: +61 2 8784 8555
Project	: ENAURHOD06452AA RNSH-SITE 4A - SAR VARIATION	Date Samples Received	: 13-Jan-2017 14:05
Order number	: ---	Date Analysis Commenced	: 17-Jan-2017
C-O-C number	: ---	Issue Date	: 24-Jan-2017 13:46
Sampler	: JESSIE SIXSMITH		
Site	: ---		
Quote number	: EN/077/14		
No. of samples received	: 1		
No. of samples analysed	: 1		

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ravineel Chand		Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

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

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

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

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

- Total PAH reported as the sum of Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene and Benzo(g,h,i)perylene.



Analytical Results

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

Client sample ID

				GWQT-01	----	----	----	----
Client sampling date / time				12-Jan-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1700879-001	-----	-----	-----	-----
Result				----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.003	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.028	----	----	----	----
Lead	7439-92-1	0.001	mg/L	0.003	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.176	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	1330-20-7	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----



Analytical Results

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

Client sample ID

				GWQT-01	----	----	----	----
Client sampling date / time				12-Jan-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1700879-001	-----	-----	-----	-----
				Result	----	----	----	----

EP132B: Polynuclear Aromatic Hydrocarbons

3-Methylcholanthrene	56-49-5	0.1	µg/L	<0.1	----	----	----	----
2-Methylnaphthalene	91-57-6	0.1	µg/L	<0.1	----	----	----	----
7.12-Dimethylbenz(a)anthracene	57-97-6	0.1	µg/L	<0.1	----	----	----	----
Acenaphthene	83-32-9	0.1	µg/L	<0.1	----	----	----	----
Acenaphthylene	208-96-8	0.1	µg/L	<0.1	----	----	----	----
Anthracene	120-12-7	0.1	µg/L	<0.1	----	----	----	----
Benz(a)anthracene	56-55-3	0.1	µg/L	<0.1	----	----	----	----
Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.1	µg/L	<0.1	----	----	----	----
Benzo(e)pyrene	192-97-2	0.1	µg/L	<0.1	----	----	----	----
Benzo(g,h,i)perylene	191-24-2	0.1	µg/L	<0.1	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.1	µg/L	<0.1	----	----	----	----
Chrysene	218-01-9	0.1	µg/L	<0.1	----	----	----	----
Coronene	191-07-1	0.1	µg/L	<0.1	----	----	----	----
Dibenz(a,h)anthracene	53-70-3	0.1	µg/L	<0.1	----	----	----	----
Fluoranthene	206-44-0	0.1	µg/L	<0.1	----	----	----	----
Fluorene	86-73-7	0.1	µg/L	<0.1	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.1	µg/L	<0.1	----	----	----	----
Naphthalene	91-20-3	0.1	µg/L	<0.1	----	----	----	----
Perylene	198-55-0	0.1	µg/L	<0.1	----	----	----	----
Phenanthrene	85-01-8	0.1	µg/L	<0.1	----	----	----	----
Pyrene	129-00-0	0.1	µg/L	<0.1	----	----	----	----
^ Sum of PAHs	----	0.05	µg/L	<0.00	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.05	µg/L	<0.00	----	----	----	----

EP080S: TPH(V)/BTEX Surrogates

1,2-Dichloroethane-D4	17060-07-0	2	%	104	----	----	----	----
Toluene-D8	2037-26-5	2	%	108	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	95.0	----	----	----	----

EP132T: Base/Neutral Extractable Surrogates

2-Fluorobiphenyl	321-60-8	0.1	%	46.6	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	50.6	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	53.7	----	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	43	135
Anthracene-d10	1719-06-8	48	138
4-Terphenyl-d14	1718-51-0	48	144



Environmental

QUALITY CONTROL REPORT

Work Order	: ES1700879	Page	: 1 of 6
Client	: COFFEY ENVIRONMENTS PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS FIONA WONG	Contact	: Angelene Kumar
Address	: LEVEL 19, 799 PACIFIC HIGHWAY Tower B - Citadel Tower CHATSWOOD NSW, AUSTRALIA 2067	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9406 1000	Telephone	: +61 2 8784 8555
Project	: ENAURHOD06452AA RNSH-SITE 4A - SAR VARIATION	Date Samples Received	: 13-Jan-2017
Order number	: ----	Date Analysis Commenced	: 17-Jan-2017
C-O-C number	: ----	Issue Date	: 24-Jan-2017
Sampler	: JESSIE SIXSMITH		
Site	: ----		
Quote number	: EN/077/14		
No. of samples received	: 1		
No. of samples analysed	: 1		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ravineel Chand		Sydney Organics, Smithfield, NSW
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 723662)									
ES1700824-009	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0001	0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.076	0.079	4.82	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.262	0.272	3.76	0% - 20%
ES1700824-019	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0001	0.0002	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.047	0.048	2.62	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.118	0.116	1.35	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 723664)									
ES1700879-001	GWQT-01	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 722520)									
ES1700763-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES1700814-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 722520)									
ES1700763-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1700814-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 722520)									
ES1700763-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 722520) - continued									
ES1700763-001	Anonymous	EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
ES1700814-004	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 722088)									
ES1700879-001	GWQT-01	EP132: Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP132: 3-Methylcholanthrene	56-49-5	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: 2-Methylnaphthalene	91-57-6	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: 7,12-Dimethylbenz(a)anthracene	57-97-6	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Acenaphthene	83-32-9	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Acenaphthylene	208-96-8	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Anthracene	120-12-7	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benz(a)anthracene	56-55-3	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benzo(b+j)fluoranthene	205-99-2	0.1	µg/L	<0.1	<0.1	0.00	No Limit
			205-82-3						
		EP132: Benzo(e)pyrene	192-97-2	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benzo(g,h,i)perylene	191-24-2	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Benzo(k)fluoranthene	207-08-9	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Chrysene	218-01-9	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Coronene	191-07-1	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Dibenz(a,h)anthracene	53-70-3	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Fluoranthene	206-44-0	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Fluorene	86-73-7	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Indeno(1,2,3.cd)pyrene	193-39-5	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Naphthalene	91-20-3	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Perylene	198-55-0	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Phenanthrene	85-01-8	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP132: Pvrene	129-00-0	0.1	µg/L	<0.1	<0.1	0.00	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 723662)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	89.4	85	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	84.8	84	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	88.9	85	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.1	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.0	83	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	88.8	82	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.6	81	117
EG035F: Dissolved Mercury by FIMS (QCLot: 723664)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.5	83	105
EP080/071: Total Petroleum Hydrocarbons (QCLot: 722052)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	96.4	76	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	98.4	83	109
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	93.1	75	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 722520)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	85.6	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 722052)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	102	76	114
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	93.2	81	111
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	93.6	77	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 722520)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	85.8	75	127
EP080: BTEXN (QCLot: 722520)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	92.7	70	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	91.8	69	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	83.1	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	83.3	69	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	86.1	72	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	95.0	70	120
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 722088)								
EP132: 3-Methylcholanthrene	56-49-5	0.1	µg/L	<0.1	2 µg/L	83.4	60	120
EP132: 2-Methylnaphthalene	91-57-6	0.1	µg/L	<0.1	2 µg/L	76.3	59	123
EP132: 7,12-Dimethylbenz(a)anthracene	57-97-6	0.1	µg/L	<0.1	2 µg/L	73.2	36	144



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 722088) - continued								
EP132: Acenaphthene	83-32-9	0.1	µg/L	<0.1	2 µg/L	75.2	64	122
EP132: Acenaphthylene	208-96-8	0.1	µg/L	<0.1	2 µg/L	77.4	64	126
EP132: Anthracene	120-12-7	0.1	µg/L	<0.1	2 µg/L	76.9	65	127
EP132: Benz(a)anthracene	56-55-3	0.1	µg/L	<0.1	2 µg/L	78.0	64	130
EP132: Benzo(a)pyrene	50-32-8	0.05	µg/L	<0.05	2 µg/L	76.2	64	126
EP132: Benzo(b+j)fluoranthene	205-99-2	0.1	µg/L	<0.1	2 µg/L	74.3	62	126
	205-82-3							
EP132: Benzo(e)pyrene	192-97-2	0.1	µg/L	<0.1	2 µg/L	75.9	62	126
EP132: Benzo(g,h,i)perylene	191-24-2	0.1	µg/L	<0.1	2 µg/L	86.5	56	126
EP132: Benzo(k)fluoranthene	207-08-9	0.1	µg/L	<0.1	2 µg/L	74.6	68	130
EP132: Chrysene	218-01-9	0.1	µg/L	<0.1	2 µg/L	76.7	66	130
EP132: Coronene	191-07-1	0.1	µg/L	<0.1	2 µg/L	91.7	35	133
EP132: Dibenz(a,h)anthracene	53-70-3	0.1	µg/L	<0.1	2 µg/L	88.8	58	128
EP132: Fluoranthene	206-44-0	0.1	µg/L	<0.1	2 µg/L	82.0	65	127
EP132: Fluorene	86-73-7	0.1	µg/L	<0.1	2 µg/L	78.4	64	124
EP132: Indeno(1,2,3-cd)pyrene	193-39-5	0.1	µg/L	<0.1	2 µg/L	87.4	57	127
EP132: Naphthalene	91-20-3	0.1	µg/L	<0.1	2 µg/L	70.8	54	128
EP132: Perylene	198-55-0	0.1	µg/L	<0.1	2 µg/L	77.4	66	130
EP132: Phenanthrene	85-01-8	0.1	µg/L	<0.1	2 µg/L	76.7	65	129
EP132: Pyrene	129-00-0	0.1	µg/L	<0.1	2 µg/L	83.8	66	128

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 723662)							
ES1700824-010	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	103	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	90.0	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	97.4	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	100	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	98.6	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	97.3	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	101	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 723664)							
ES1700839-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	81.1	70	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 722520)							
ES1700763-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	108	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 722520)							
ES1700763-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	107	70	130
EP080: BTEXN (QCLot: 722520)							
ES1700763-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	97.9	70	130
		EP080: Toluene	108-88-3	25 µg/L	104	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	104	70	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	104	70	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	107	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	103	70	130
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 722088)							
ES1700879-001	GWQT-01	EP132: 3-Methylcholanthrene	56-49-5	2 µg/L	107	59	115
		EP132: 2-Methylnaphthalene	91-57-6	2 µg/L	102	46	120
		EP132: 7.12-Dimethylbenz(a)anthracene	57-97-6	2 µg/L	105	21	135
		EP132: Acenaphthene	83-32-9	2 µg/L	109	62	114
		EP132: Acenaphthylene	208-96-8	2 µg/L	112	61	119
		EP132: Anthracene	120-12-7	2 µg/L	109	68	116
		EP132: Benz(a)anthracene	56-55-3	2 µg/L	113	67	122
		EP132: Benzo(a)pyrene	50-32-8	2 µg/L	101	72	114
		EP132: Benzo(b+j)fluoranthene	205-99-2	2 µg/L	97.1	69	119
			205-82-3				
		EP132: Benzo(e)pyrene	192-97-2	2 µg/L	100	71	119
		EP132: Benzo(g,h,i)perylene	191-24-2	2 µg/L	108	49	133
		EP132: Benzo(k)fluoranthene	207-08-9	2 µg/L	93.9	71	124
		EP132: Chrysene	218-01-9	2 µg/L	113	70	118
		EP132: Coronene	191-07-1	2 µg/L	110	29	138
		EP132: Dibenz(a,h)anthracene	53-70-3	2 µg/L	109	60	122
		EP132: Fluoranthene	206-44-0	2 µg/L	117	65	121
		EP132: Fluorene	86-73-7	2 µg/L	114	63	118
		EP132: Indeno(1.2.3.cd)pyrene	193-39-5	2 µg/L	108	57	123
		EP132: Naphthalene	91-20-3	2 µg/L	98.1	53	115
		EP132: Perylene	198-55-0	2 µg/L	104	71	118
		EP132: Phenanthrene	85-01-8	2 µg/L	110	67	120
		EP132: Pyrene	129-00-0	2 µg/L	114	70	117

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1700879	Page	: 1 of 4
Client	: COFFEY ENVIRONMENTS PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MS FIONA WONG	Telephone	: +61 2 8784 8555
Project	: ENAURHOD06452AA RNSH-SITE 4A - SAR VARIATION	Date Samples Received	: 13-Jan-2017
Site	: ----	Issue Date	: 24-Jan-2017
Sampler	: JESSIE SIXSMITH	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	7	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) GWQT-01	12-Jan-2017	----	----	----	19-Jan-2017	11-Jul-2017	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) GWQT-01	12-Jan-2017	----	----	----	18-Jan-2017	09-Feb-2017	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) GWQT-01	12-Jan-2017	18-Jan-2017	19-Jan-2017	✓	18-Jan-2017	27-Feb-2017	✓
Clear glass VOC vial - HCl (EP080) GWQT-01	12-Jan-2017	17-Jan-2017	26-Jan-2017	✓	17-Jan-2017	26-Jan-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) GWQT-01	12-Jan-2017	18-Jan-2017	19-Jan-2017	✓	18-Jan-2017	27-Feb-2017	✓
Clear glass VOC vial - HCl (EP080) GWQT-01	12-Jan-2017	17-Jan-2017	26-Jan-2017	✓	17-Jan-2017	26-Jan-2017	✓
EP080: BTEXN							
Clear glass VOC vial - HCl (EP080) GWQT-01	12-Jan-2017	17-Jan-2017	26-Jan-2017	✓	17-Jan-2017	26-Jan-2017	✓
EP132B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP132) GWQT-01	12-Jan-2017	18-Jan-2017	19-Jan-2017	✓	23-Jan-2017	27-Feb-2017	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	1	3	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	7	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	7	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
Semivolatile Compounds by GCMS(SIM - Ultra-trace)	EP132	WATER	In house: Referenced to USEPA 3640 (GPC Cleanup), 8270D GCMS Capillary column, SIM mode. This method is compliant with NEPM (2013) Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Sep. Funnel Extraction /Acetylation of Phenolic Compounds	ORG14-AC	WATER	In house: Referenced to USEPA 3510 (Extraction) / In-house (Acetylation): A 1L sample is extracted into dichloromethane and concentrated to 1 mL with exchange into cyclohexane. Phenolic compounds are reacted with acetic anhydride to yield phenyl acetates suitable for ultra-trace analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 1 of 1 9191Consigning Office: ChatswoodReport Results to: Hona Wong Mobile: Jessie SixsmithInvoices to: Chat-general admin@coffey.com Phone: Email: @coffey.com
Email: @coffey.comProject No: ENAUABT00952AATask No: SITE 4A - SAE VariationProject Name: RNSH - Site 4aLaboratory: EnviroinsSampler's Name: Jessie SixsmithProject Manager: FW

Special Instructions:

Relevant agreements: Eurofins COF_ENAUABT00952AA_MSA1 : ALS COF_ENAUABT00952AA_MSA2 and SGS COF_ENAUABT00952AA_MSA3

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil, etc)	Container Type & Preservative*	T-A-T (specify)
	BH202	B11	PM	water	P2V, G	STD
	BH204					
	BH205					
	GWQD-01					
1	GWQT-01*					
	GWQD-01					
	Trip Spoke				2V	
	Trip Blank				2V	

Analysis Request Section

NOTES

*Please forward to
ALSEnvironmental Division
Sydney
Work Order Reference
ES1700879

Telephone : + 61-2-8784 8656

RELINQUISHED BY

RECEIVED BY

Name: Jessie Sixsmith Date: 12-01-16Coffey Environments Time: 1:30Name: Date: Company: Time: Name: ETHEL MTC Date: 12/11/17Company: Enviroins Time: 15:46Name: J. Cready Date: 13/01/17Company: ALS Time: 14:05

Sample Receipt Advice: (Lab Use Only)

All Samples Received in Good Condition ☒All Documentation is in Proper Order ☒Samples Received Properly Chilled ☒

Lab. Ref/Batch No.

530212

*Container Type & Preservation Codes: P - Plastic, G- Glass Bottle, J - Glass Jar, V - Vial, Z - Ziplock Bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved, S - Sulphuric Acid Preserved, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative, OP - Other Preservative

Appendix G – Risk Assessment

Memorandum

Recipient name	Fiona Wong	Recipient company	Royal North Shore Hospital, St Leonards NSW
		Memo date	9/02/2017
Author	Karen Teague		
Project number	754-ENAU RHOD06452AA		
Memo Subject	Limited Risk Evaluation - Potential Exposures to F3 TPH Fraction in Groundwater Seeping into Basement/Excavation		

1. Background and Hazard Identification

Coffey is currently undertaking a Detailed Site Investigation at the Royal North Shore Hospital in St Leonards NSW, referred to as 'the site'. Petroleum hydrocarbons have been reported in groundwater at three monitoring wells at the site. The standing water level in groundwater bores at the site is approximately 3 mbgs; however, the monitoring wells were installed to approximately 15-20mbgs into the underlying sandstone as part of the geotechnical investigations and shallow water was not encountered during drilling, it is possible the aquifer is confined and under hydraulic pressure.

The proposed Royal North Shore Hospital redevelopment includes a two level basement structure that will intersect the water table during the construction phase and may intersect the basement foundation upon completion. The detected petroleum hydrocarbons are associated with the total petroleum hydrocarbons (TPH) F3 fraction (>C16-C34) which is generally considered to have limited volatility. The maximum TPH F3 concentration reported was 0.3 mg/L.

2. Exposure Assessment

Based on the available information the potential exposures are likely to be associated with impacted groundwater that may seep into the construction excavation or the basement upon completion. The following exposure scenarios are considered to be potential complete and have been quantitatively evaluated further:

- Direct contact by workers undertaking construction activities within the basement excavation during the basement construction phase; and

- Direct contact with impacted groundwater seeping into the basement by maintenance workers involved in servicing basement drainage equipment or infrastructure.

2.1. Estimated intake

This evaluation assessed the dermal contact exposure associated with direct contact with dissolve phase hydrocarbons using the equations shown in Table 2.1, as defined in the USEPA Risk Assessment Guidance for Superfund sites (RAGS) (USEPA, 2004).

Table 2.1: Equation Used to Estimate Chronic Daily Intake

Direct Contact – Water		
Equation 1 (USEPA, 2004)	Dermal contact	$CDI_{Dermal} = \frac{DA_{Event} \times ED \times EF \times EV \times AR}{BW \times AT}$
Where,		
AR	= Exposure area of exposed skin (cm ²)	DA _{Event} = Absorbed dose per event (mg/cm ² -event)(see Attachment A)
AT	= Averaging time (period over which exposure is averaged) (day)	ED = Exposure duration (year)
BW	= Body weight (kg)	EF = Exposure frequency (days/year)
CDI _{Dermal}	= Chronic daily intake (mg/kg/day) – dermal	EV = Event frequency (events/day)

The calculations and default inputs to estimate the absorbed dose per event are presented in Attachment A. The adopted exposure parameters for maintenance and construction workers are provided in Table 2.2.

Table 2.2: Exposure Parameters

Exposure Parameters		Value	Reference
Sub-surface Maintenance Worker (Adult)			
Exposure duration [years]	Maintenance worker	30	NEPM (NEPC, 2013) based on HIL-D
	Construction worker	1	Professional judgement
Exposure frequency [days/year]	Maintenance worker	10	Based on two five-day weeks
	Construction worker	40	Based on five-days per week for eight weeks
Event frequency [events/day]		1	Professional judgement / model default
Exposed skin area [cm ²]		6,300	NEPM (NEPC, 2013) based on HIL-A
Body Weight [kg]		75	enHealth (2012)
Averaging time [days]	Maintenance worker	10,950 ⁽¹⁾	Based on exposure duration
		25,550 ⁽²⁾	
	Construction worker	365 ⁽¹⁾ 25,550 ⁽²⁾	

1 Averaging time for threshold chemicals with a tolerable concentration.

2 Averaging time for non-threshold chemicals with a unit risk.

Whilst the maximum concentration was selected, the composition of the TPH is not known; however given the very low solubility of aliphatic compounds in the >C16-C34 range and aromatic >C21-C34, it was assumed to comprise only aromatic compounds in the >C16-C21 range which are considered to be more toxic.

3. Toxicity Evaluation

COPCs are assessed differently based on the type of health effect. The two classes based on dose-response characteristics are:

- Carcinogenic (non-threshold) effects; and
- Non-carcinogenic (threshold) effects;

Where a threshold refers to a dose below which deleterious effects are not expected to occur. Based on the toxicity review conducted by WHO (2008) the TPH F3 fraction is considered to present non-carcinogenic effects. The toxicity criteria for the >C16-21 fraction is presented Table 3.1.

Table 3.1: Toxicity Criteria for the Chemicals of Potential Concern – Direct Contact Pathway

Chemical	Non-Threshold	Threshold		Gastro-intestinal absorption factor ⁽²⁾ [%]
	Slope Factor (mg/kg/day) ⁻¹	Tolerable Intake [mg/kg/day]	Intake Allocated to Contaminated Sites [%]	
TPH EC>16-21 Aromatic	NA	0.03 ⁽¹⁾	95	100

¹ WHO (2008)

² Slope factor and tolerable intakes have been derived from the delivered doses, rather than absorbed doses therefore gastro-intestinal (GI) absorption factor for all chemicals is 100%

4. Risk Characterisation

The risk of health effects from threshold chemical exposure is expressed in terms of the Hazard Quotient (HQ). The HQ is the ratio of the estimated exposure concentration (EC) to the tolerable concentration (TC). The HQ is calculated as presented in Table 4.1.

Table 4.1: Equation Used to Calculate the Hazard Quotient

Direct Contact	
Equation 2 (USEPA, 1989)	$HQ = \frac{CDI}{TDI \times TIA}$
Where,	
HQ	= Hazard Quotient for a pathway specific exposure (unitless)
CDI	= Chronic Daily Intake (mg/kg/day)
TDI	= Tolerable Daily Intake (mg/kg/day)
TIA	= Tolerable Intake % Allocated to Contaminated Sites

Where the HQ is less than 1, there is unlikely to be any adverse health effects associated with exposure to the chemical of concern. However, a HQ exceeding 1 does not necessarily indicate an actual risk but rather a potential adverse health outcome requiring additional assessment.

The calculated HQ associated with the on-site exposure to the TPH F3 fraction is summarised in Table 4.2 and presented in Attachment B.

Table 4.2: Estimated Hazard Quotient – Construction and Maintenance Workers

COPC	Construction workers within a basement excavation	Maintenance workers within a Basement structure
TPH EC>12-16 Aromatic	0.11	0.03

Shaded cells indicate a potential health risk has been identified

5. Conclusion

Based on the available information and the limitations of the exposure modelling conducted, the estimated HQ for both exposure scenarios was below 1 indicating the concentrations of TPH reported in groundwater at the site are not considered to pose an unacceptable health risk to future construction workers or basement maintenance workers.

6. Limitations

The risk assessment has been limited to addressing the impacts of selected substances, to a specific assumed receptor population under a defined exposure scenario, based on information available at the time of the assessment. The risk assessment approach presented does not consider a fully probabilistic estimate of risk, but presents conditional estimates based on a number of assumptions regarding exposure and toxicity consistent with the nationally endorsed regulatory approach. Further assessments would be required to assess risk where site uses vary from the assumed site conditions and/or exposure settings used in this risk assessment.

This report must be read in conjunction with the attached 'Important information about your Coffey Environments Report'.

7. References

- NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)*. Canberra: National Environment Protection Council.
- enHealth. (2012). *Australian Exposure Factors Guide*. Department of Health and Ageing and enHealth Council.
- USEPA. (2004). *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*. Washington, DC: U.S. Environmental Protection Agency.

Attachment A

DERMAL CONTACT WITH GROUNDWATER - ABSORBED DOSE PER EVENT EQUATIONS

All equations were based on USEPA 2004, with the exception of equations 7 to 11 which were based on USEPA 1992. For calculation of the acceptable dermal absorbed dose for use in the RBL calculations, the concentration of COPC in groundwater is substituted for the COPC tolerable daily intake.

Table 1: Equation Used to Estimate Dermal Absorbed Dose per Event

Calculation of DA_{event} for organic compounds			
Equation 1	If $t_{event} \leq t^*$, then $DA_{Event} = 2FA \times K_p \times C_w \sqrt{\frac{6T_{Event} \times t_{event}}{\pi}}$		
Equation 2	If $t_{event} > t^*$, then $DA_{Event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2T_{Event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$		
Calculation of DA_{event} for inorganic compounds			
Equation 3	$DA_{Event} = K_p \times C_w \times t_{event}$		
Calculation of K_p , where K_{ow} and MW of the chemical fall within the Effective Prediction Domain (EPD)			
Equation 4	$\log K_p = -2.80 + 0.66 \log K_{ow} - 0.0056MW$		
Boundaries of EPD (Mandel Analysis)			
Equation 5	$-0.06831 \leq 5.103 \times 10^{-4} MW + 0.05616 \log K_{ow} \leq 0.5577$		
Equation 6	$-0.3010 \leq -5.103 \times 10^{-4} MW + 0.05616 \log K_{ow} \leq 0.1758$		
Calculation of K_p , where K_{ow} and MW of the chemical fall outside the EPD			
		Low Molecular Weight Compounds (<150)	High Molecular Weight Compounds (>150)
Equation 7	$\text{Log } K_{ow} < 0.5$	$\text{Log } K_p = -3$	$\text{Log } K_p = -5$
Equation 8	$0.5 \leq \text{Log } K_{ow} \leq 3.0$	$\text{Log } K_p = -3.5 + \log K_{ow}$	
Equation 9	$0.5 \leq \text{Log } K_{ow} \leq 3.5$		$\text{Log } K_p = -5.5 + \log K_{ow}$
Equation 10	$\text{Log } K_{ow} > 3.0$	$\text{Log } K_p = -0.5$	
Equation 11	$\text{Log } K_{ow} > 3.5$		$\text{Log } K_p = -1.5$

Calculation of T_{event}	
Equation 12	$T_{Event} = \frac{l_{sc}^2}{6D_{sc}}$
Equation 13	$\frac{D_{sc}}{l_{sc}} = 10^{(-2.8 - 0.0056MW)}$
Calculation of t^*	
Equation 14	If $B \leq 0.6$, then $t^* = 2.4T_{Event}$
Equation 15	If $B > 0.6$, then $t^* = 6T_{Event}(b - \sqrt{b^2 - c^2})$
Equation 16	$b = \frac{2(1+B)^2}{\pi} - c$
Equation 17	$c = \frac{1 + 3B + 3B^2}{3(1+B)}$
Calculation of B	
Equation 18	$B = \frac{K_p}{K_{p,ve}} \approx K_p \frac{\sqrt{MW}}{2.6} \text{ (as an approximation)}$

Table 2: Dermal Absorbed Dose per Event Parameter Definitions

Parameter	Default Value
DA_{event} = Absorbed dose per event (mg/cm ² /event)	Equation 1
FA = Fraction absorbed water (dimensionless)	1
K_p = Dermal Permeability coefficient of compound in water (cm/hr)	Organics: Equations 4 to 11 Inorganics: Chemical-specific
K_{ow} = Octanol/water partition coefficient	Chemical-specific
C_w = Chemical concentration in water (mg/cm ³)	Site-specific
T_{event} = Lag time per event (hr/event)	Equation 12
t_{event} = Event duration (hr/event)	6
t^* = Time to reach steady-state (hr)	Equations 14 to 17
B = Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (ve) (dimensionless)	Equation 18
$K_{p,ve}$ = Steady-state permeability coefficient through the viable epidermis (ve) (cm/hr)	$K_{p,ve} = K_{ew}D_e/L_e$
MW = Molecular weight (g/mole)	Chemical-specific
K_{ew} = Equilibrium partition coefficient between the epidermis and water for the absorbing chemical (dimensionless)	1 (assuming epidermis behaves essentially as water)
D_e = Effective diffusivity of the absorbing chemical in the epidermis (cm ² /hr)	$7.1 \times 10^{-6}/MW$ cm ² /s (assuming $D_e = 10^{-6}$ cm ² /s when MW = 50)
L_e = Effective thickness of the epidermis (cm)	10^{-2}
D_{sc} = Effective diffusion coefficient for chemical transfer through the stratum corneum (cm ² /hr)	Equation 13
l_{sc} = Apparent thickness of stratum corneum (cm)	10^{-3}
b,c = Correlation coefficients which have been fitted to the Flynn's data to give Equation 4	Equations 16 and 17
π = Pi	3.14159

References

USEPA 1992 Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B, Exposure Assessment Group, Office of Health and Environmental Assessment. U.S. Environmental Protection Agency, Washington DC.

USEPA 2004 Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) EPA/540/R/99/005, Office of Superfund Remediation and Technology Innovation. U.S. Environmental Protection Agency, Washington DC.

Attachment B

RISK CALCULATIONS.



Exposure Model and Risk Characterisation

Estimation of Hazard Index

		Source: Groundwater On-site		Royal North Shore Hospital Redevelopment 0
Receptor		On-Site	Construction Worker	Construction Worker - Direct Contact with Groundwater
Scenario ID	4	GNE(dc) t	Groundwater	Threshold Health Effects

Parameters	Units	Adult	
Exposure Duration	years	1	1
Exposure Frequency	days/year	40	40
Exposure Time	hours/day	6	6
Averaging Time	years	1	1
Event Frequency (dermal)	events/day	1	1
Body Weight	kg	75	75
Exposed Skin Area	cm ²	6300	6300

Forward

Contaminant	Groundwater Concentration mg/L	TDI (mg/kg-day) ⁽¹⁾ Dermal	DAevent Dermal (mg/cm ² -event)	% TDI Allocated to Contaminated Sites	Estimated Intake (mg/kg-day) Dermal	Estimated HQ Dermal
TPH Aromatic C16-21	3.0E-01	3.0E-02	3.3E-04	9.5E-01	3.1.E-03	1.1.E-01

Total HI 0.11



Exposure Model and Risk Characterisation

Estimation of Hazard Index

		Source: Groundwater On-site		Royal North Shore Hospital Redevelopment 0
Receptor		On-Site	Maintenance/Subsurface Worker	Maintenance Worker - Direct Contact with Groundwater
Scenario ID	2	GNT(dc) t	Groundwater	Threshold Health Effects

Parameters	Units	Adult	
Exposure Duration	years	30	30
Exposure Frequency	days/year	10	10
Exposure Time	hours/day	6	6
Averaging Time	years	30	30
Event Frequency (dermal)	events/day	1	1
Body Weight	kg	75	75
Exposed Skin Area	cm ²	6300	6300

Forward

Contaminant	Groundwater Concentration mg/L	TDI (mg/kg-day) ⁽¹⁾ Dermal	DAevent Dermal (mg/cm ² -event)	% TDI Allocated to Contaminated Sites	Estimated Intake (mg/kg-day) Dermal	Estimated HQ Dermal
TPH Aromatic C16-21	3.0E-01	3.0E-02	3.3E-04	9.5E-01	7.6.E-04	2.7.E-02

Total HI 0.03

Appendix H – UCL Calculation

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation			8/02/2017 7:31:36 PM								
5	From File			WorkSheet.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	Lead (mg/kg)											
12												
13	General Statistics											
14	Total Number of Observations				32		Number of Distinct Observations				28	
15							Number of Missing Observations				0	
16	Minimum				5		Mean				38.98	
17	Maximum				170		Median				24.5	
18	SD				43.7		Std. Error of Mean				7.725	
19	Coefficient of Variation				1.121		Skewness				2.08	
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic				0.68		Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value				0.93		Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic				0.294		Lilliefors GOF Test					
25	5% Lilliefors Critical Value				0.157		Data Not Normal at 5% Significance Level					
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL				52.08		95% Adjusted-CLT UCL (Chen-1995)				54.73	
31							95% Modified-t UCL (Johnson-1978)				52.56	
32												
33	Gamma GOF Test											
34	A-D Test Statistic				1.311		Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value				0.77		Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic				0.174		Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value				0.159		Data Not Gamma Distributed at 5% Significance Level					
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)				1.27		k star (bias corrected MLE)				1.172	
42	Theta hat (MLE)				30.69		Theta star (bias corrected MLE)				33.27	
43	nu hat (MLE)				81.29		nu star (bias corrected)				75	
44	MLE Mean (bias corrected)				38.98		MLE Sd (bias corrected)				36.01	
45							Approximate Chi Square Value (0.05)				56.06	
46	Adjusted Level of Significance				0.0416		Adjusted Chi Square Value				55.18	
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))				52.16		95% Adjusted Gamma UCL (use when n<50)				52.99	
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic				0.95		Shapiro Wilk Lognormal GOF Test					
53	5% Shapiro Wilk Critical Value				0.93		Data appear Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic				0.109		Lilliefors Lognormal GOF Test					
55	5% Lilliefors Critical Value				0.157		Data appear Lognormal at 5% Significance Level					

	A	B	C	D	E	F	G	H	I	J	K	L	
56	Data appear Lognormal at 5% Significance Level												
57													
58	Lognormal Statistics												
59	Minimum of Logged Data				1.609						Mean of logged Data		3.22
60	Maximum of Logged Data				5.136						SD of logged Data		0.925
61													
62	Assuming Lognormal Distribution												
63	95% H-UCL				56.66						90% Chebyshev (MVUE) UCL		58.66
64	95% Chebyshev (MVUE) UCL				68.16						97.5% Chebyshev (MVUE) UCL		81.34
65	99% Chebyshev (MVUE) UCL				107.2								
66													
67	Nonparametric Distribution Free UCL Statistics												
68	Data appear to follow a Discernible Distribution at 5% Significance Level												
69													
70	Nonparametric Distribution Free UCLs												
71	95% CLT UCL				51.69						95% Jackknife UCL		52.08
72	95% Standard Bootstrap UCL				51.63						95% Bootstrap-t UCL		58.3
73	95% Hall's Bootstrap UCL				53.16						95% Percentile Bootstrap UCL		52.98
74	95% BCA Bootstrap UCL				55.25								
75	90% Chebyshev(Mean, Sd) UCL				62.16						95% Chebyshev(Mean, Sd) UCL		72.66
76	97.5% Chebyshev(Mean, Sd) UCL				87.23						99% Chebyshev(Mean, Sd) UCL		115.9
77													
78	Suggested UCL to Use												
79	95% H-UCL				56.66								
80													
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.												
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)												
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.												
84	For additional insight the user may want to consult a statistician.												
85													
86	ProUCL computes and outputs H-statistic based UCLs for historical reasons only.												
87	H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.												
88	It is therefore recommended to avoid the use of H-statistic based 95% UCLs.												
89	Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.												
90													

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