Barangaroo
Lend Lease (Millers Point) Pty Ltd
23 November 2012
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Tree Root Mass Investigation

Hickson Road, Millers Point, NSW

Tree Root Mass Investigation

Hickson Road, Millers Point, NSW

Prepared for

Lend Lease (Millers Point) Pty Ltd

Prepared by

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This document was prepared for the specific purpose described in our proposal and as agreed to by Lend Lease (Millers Point) Pty Ltd. From a technical perspective, the subsurface environment at any site may present substantial uncertainty. It is a heterogeneous, complex environment, in which small subsurface features or changes in geologic conditions can have substantial impacts on water and chemical movement. Uncertainties may also affect source characterisation assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and remedial action performance.

AECOM's professional opinions are based upon its professional judgement, experience, and training. These opinions are also based upon data derived from the testing and analysis described in this document. It is possible that additional testing and analysis might produce different results and/or different opinions. AECOM has limited its investigation to the scope agreed upon with its client. AECOM believes that its opinions are reasonably supported by the testing and analysis that have been done, and that those opinions have been developed according to the professional standard of care for the environmental consulting profession in this area at the date of this document. That standard of care may change and new methods and practices of exploration, testing, analysis and remediation may develop in the future, which might produce different results.

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Glossary of Terms

Term	Description
AHD	Australian Height Datum
ALS	ALS Environmental
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
As	Arsenic
BaP	Benzo-α-pyrene
BDA	Barangaroo Delivery Authority
BH	Borehole Location
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
Cd	Cadmium
Cr	Chromium
CoPC	Chemicals of Potential Concern
CPAH	Carcinogenic Polycyclic Aromatic Hydrocarbons
Cr 6+/ Cr VI	Hexavalent Chromium
Cu	Copper
DEC	Department of Environment and Conservation NSW (superseded)
DECC	Department of Environment and Climate Change NSW (superseded)
DECCW	Department of Environment, Climate Change and Water NSW
DGI	Data Gap Investigation
DP	Deposited Plan
DQO	Data Quality Objectives
DQI	Data Quality Indicators
EC	Electrical Conductivity
EIL	Ecological Investigation Level
EMP	Environment Management Plan
EPA	Environmental Protection Authority
ESA	Environmental Site Assessment
GPS	Global Positioning System
Hg	Mercury
HHERA	Human Health and Ecological Risk Assessment
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
m bgs	Metres below ground surface
m bTOC	Metres below top of casing
MW	Monitoring Well Location
LOR	Limit of Reporting

NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection (Assessment of Site Contamination) Measure
Ni	Nickel
NHMRC	National Health and Medical Research Council
OHS/OH&S	Occupational Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PDA	Project Development Agreement
Pb	Lead
PSI	Preliminary Site Assessment
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan
RWP	Remediation Work Plan
SAQP	Sampling Analysis and Quality Plan
SAC	Soil Acceptance Criteria
SEPR™	Surfactant Enhanced Product Recovery
SIL	Soil Investigation Level
S-ISCO®	Surfactant Enhanced *In situ* Chemical Oxidation
SROH	Significant Risk of Harm
SSESC	Site-specific Ecological Screening Criteria
SSTC	Site Specific Target Criteria
SWL	Standing Water Level
SVOC	Semi Volatile Organic Compound
TPH	Total Petroleum Hydrocarbons
VMP	Voluntary Management Proposal
VOC	Volatile Organic Compound
USEPA	United States Environmental Protection Agency
Zn	Zinc

Units of Measurement

°C	degrees Celsius	m	Metres
cm	centimetre	mS	milli-Siemens
ha	hectare	mV	Millivolts
kg	kilogram	ppm	parts per million
km	kilometre	µg	Microgram
%	percent		

Executive Summary

AECOM Australia Pty Ltd (AECOM) was engaged by Lend Lease (Millers Point) Pty Ltd (Lend Lease) to investigate potential contamination associated within selected tree roots located within the area of EPA Remediation Site declaration 21122, in Hickson Road, Millers Point, NSW (the Site).

The purpose of the investigation was to assess soil contamination conditions and potential for remediation requirements related to the protection of human health in the root mass zone.

The main components of the scope of work undertaken included the following:

- Drilling of nine boreholes (designated TBH01 to TBH09) within the root mass of selected trees using a small track mounted drill rig to a maximum of 2 m below ground surface (bgs);
- Laboratory analysis of sixteen soil and fill samples plus quality assurance and quality control samples for the heavy metals, total petroleum hydrocarbons, BTEX and PAHs;
- Excavation of three inspection pits within the tree root mass to a maximum depth of 0.5 m bgs, using non-destructive vacuum excavation techniques; and
- Desktop investigation of potential phytotoxic effects associated with the use of S-ISCO® chemicals (Sodium persulphate, Peroxide, Fe-TAML® and VeruSOL®).

Based on the results of this investigation AECOM makes the following conclusions regarding the assessment of contamination within the tree root mass zones:

- Tar Containing Material (TCM) was not identified in any of the boreholes completed within the root mass zone of the investigated trees.
- Based on the shallow test pit excavations and boreholes completed, observed tree roots appear largely laterally confined to the footpath side of the kerb line (i.e. to the east of the kerb on the eastern side and to the west of the kerb on the western side of Hickson Road) and generally do not appear to extend further into Hickson Road.
- With respect to addressing the Remediation Site declaration, the material assessed within the root mass zone of the trees investigated is considered suitable, from a human health risk perspective, to remain *in-situ* or for re-use within Hickson Road, based on the comparison of the individual concentrations and the 95% UCL concentrations to the SSTCs.
- Based on the reported results, remediation of the tree root mass is not required. Accordingly, future S-ISCO® injections in this area are not required.
- As the S-ISCO® chemicals are injected into the groundwater table, which based on visual observations is generally 1 to 1.5 m below the bulk of the observed tree root mass, it is not anticipated that the tree root mass will be significantly exposed to S-ISCO chemicals, reducing the likelihood of any adverse effects on the health of the trees.

1.0 Introduction

1.1 Background

AECOM Australia Pty Ltd (AECOM) was engaged by Lend Lease (Millers Point) Pty Ltd (Lend Lease) to investigate potential contamination associated within selected tree roots located within the area of EPA Remediation Site declaration 21122, in Hickson Road, Millers Point, NSW (the Site). The Site location is shown on Figure F1 and the Site Layout is shown on Figured F2a, F2b and F2c in **Appendix A**.

The Site is located within the area of land subject to NSW Department of Environment, Climate Change and Water (DECCW) Declaration of Remediation Site (Declaration Number 21122; Area Number 3221) and approved Voluntary Remediation Proposal (VMP) (Declaration Number 20101719), hereafter referred to as the Declaration Area.

1.2 Purpose and Objectives

The purpose of the investigation was to assess soil contamination conditions and potential for remediation requirements related to the protection of human health in the root mass zone.

The objectives of the investigation were to:

- Evaluate whether tar containing material (TCM) is present in the root mass of selected trees located within the Declaration Area;
- Complete shallow test pit excavations suitable for Lend Lease's contracted arborist (Tree Wise Men Pty Ltd) to inspect the distribution of shallow sub-surface tree roots and associated ground conditions at selected trees located within the base of the Hickson Road footpath (behind the kerb);
- Evaluate the extent (if any) of remediation required in the area of the root zones of trees within Hickson Road in the event S-ISCO is selected as the remedial approach;
- Evaluate possible phytotoxic effects associated with the use of S-ISCO® chemicals, including sodium persulfate, hydrogen peroxide, Fe-TAML® and VeruSOL® on trees through a desktop evaluation.

1.3 Scope of Work

AECOM undertook the following scope of works to achieve the project objectives:

- Obtained City of Sydney Footpath Opening Permit and RTA Road Occupancy Licence;
- Installation of temporary fencing and barricades at each location;
- Service location in all areas subject to intrusive investigations;
- Non destructive digging in the first 1 m of each borehole and testpit;
- Drilling of nine boreholes (designated TBH01 to TBH09) within the root mass of selected trees using a small track mounted drill rig to a maximum of 2 m below ground surface (bgs);
- Laboratory analysis of sixteen soil and fill samples plus quality assurance and quality control samples for the following analytes:
    - Heavy Metals (arsenic, cadmium, copper, chromium, nickel, lead, mercury and zinc);
    - Total petroleum hydrocarbons (TPH);
    - Benzene, toluene, ethylbenzene and xylenes (BTEX); and
    - Polycyclic aromatic hydrocarbons (PAHs).
- Excavation of three inspection pits within the tree root mass to a maximum depth of 0.5 m bgs, using non destructive vacuum excavation techniques;
- Survey of nine borehole locations using a registered surveyor (Rygate Surveyors); and

- Desktop evaluation of potential phytotoxic effects associated with the use of S-ISCO® chemicals (Sodium persulfate, Peroxide, Fe-TAML® and VeruSOL®).

2.0 Site Identification

The following table provides Site identification details.

Table 1 Site Identification

Item	Description
Site Owner	Owner: City of Sydney Road Authority: Barangaroo Delivery Authority (BDA)
Client	Lend Lease (Millers Point) Pty Ltd (Lend Lease)
Site Address	Hickson Road (Sussex Street), Barangaroo, NSW 2000
Legal Description (Lot and DP)	Section of Hickson Road in State Plan 118 and 162 (refer to **Appendix A**)
County and Parish	County of Cumberland, Parish of Saint Phillip
Local Government Authority	City of Sydney
Current Zoning	Maritime and Transport Zone [a]
Current Land Use	Roadway and pedestrian
Proposed Land Use	Roadway and pedestrian
Approximate Average Elevation	2 - 3 m AHD
Site Location	**Figure F1 (Appendix A)**
Site Layout	**Figure F2a, 2b, 2c (Appendix A)**

Notes * Derived from CAD plans provided by Lend Lease.
AHD – Australian Height Datum
[a] City of Sydney 2005. *Sydney Local Environmental Plan 2005*, Gazetted 9 December 2005, as amended.

3.0 Previous Investigations

Contamination investigations and assessments have been previously undertaken for the declaration area in which the Site is located and also of the remainder of land within the Barangaroo Stage 1 Development Area. The investigations assessed the presence of soil and groundwater contamination which originated primarily from the former Miller's Point gas works. Relevant previous contamination investigations and assessment reports are listed below:

- NA&A .1996. Initial Environmental Assessment, Sydney Ports Corporation, Darling Harbour Berths 3-8 Hickson Road, Darling Harbour. June.
- Jeffery and Katauskas (J&K). 2006. Geotechnical Report development of Wharves 3-8 at East Darling Harbour. August.
- ERM. 2007. Environmental Site Assessment, East Darling Harbour, Sydney, NSW, Final Report. 21 June.
- Coffey Environments. 2008. Preliminary Environmental Investigation, 30-38 Hickson Road, Millers Point, NSW 2000. 12 May.
- ERM. 2008a. Additional Investigation Works at Barangaroo, Hickson Road, Millers Point, NSW. July.
- ERM. 2008b. Preliminary Sediment Screening Works at East Darling Harbour, Adjacent to Barangaroo, NSW, Draft, Rev 03. August.
- ARUP. 2008. Barangaroo Development, East Darling Harbour Geotechnical Desk Top Study. 28 October.
- AECOM Australia Pty Ltd, 2009. Revised Draft Remediation Work Plan, Stage 1 Development, Barangaroo, 30 November.
- ERM. 2010. Overarching Remedial Action Plan for the Barangaroo Project Site, Sydney. June.
- AECOM Australia Pty Ltd 2010. Data Gap Investigation, EPA Declaration Area (Parts of Barangaroo Site and Hickson Road), Millers Point, NSW. 23 September.
- AECOM Australia Pty Ltd 2012. Human Health and Ecological Risk Assessment, VMP Remediation Works Area – Barangaroo. 25 October.

The recent Human Health and Ecological Risk Assessment (HHERA) (AECOM 2012) for the VMP Area, developed human health based Site-specific target criteria (SSTC) and Site-specific ecological screening criteria (SSESC) (soil and groundwater concentrations) that remediation would need to achieve to allow redevelopment for the land uses described in the declaration area. The human health SSTC criteria for the declaration area are applicable to this investigation and are discussed in **Section 8.0**.

4.0 Site Condition and Surrounding Environment

4.1 Current Land Use

The Site is currently a public roadway, consisting of one south and one north bound traffic and bike lanes, parking spaces and pedestrian pathways on either side of the road. Trees are located behind the kerb along both sides of the Road.

With the exception of the immediate area around the base of tree trunks which are covered with crushed granite encompassing area of approximately 1 m^2 to 6 m^2, the entire Site is sealed with a mixture of asphalt and concrete.

4.2 Proposed Land Use

Based on the current Lend Lease development plans, it is understood that the proposed land use across the Development Area (South) will comprise mixed commercial and high density residential (with minimal access to soil) with associated open space areas.

The Site, which comprises a portion of land adjacent to Hickson Road, will remain a public footpath.

4.3 Surrounding Land Use

The Site is surrounded by the following land use:

- **North:** Hickson Road continues to the north, with residential properties on High Street to the northeast above a high rock cutting and the temporary cruise passenger terminal to the northwest.
- **South:** Hickson Road continues to the south into Sussex Street, with commercial/residential properties to the southwest followed by Napoleon Street and part of the Barangaroo Stage 1 development area to the southwest;
- **East:** Commercial and high density residential buildings with Jenkins Street beyond; and
- **West:** The remainder of the declaration area and the Barangaroo stage 1 development area, followed by Darling Harbour.

4.4 Topography and Drainage

The topography of the Site is relatively flat having undergone significant historical cut and fill works. Darling Harbour is located approximately 150 m to the west of the Site. The entire Site is sealed with asphalt and concrete, with the exception of the area immediately around the base of the trees running along either side of Hickson Road.

The majority of stormwater runoff would be captured by the stormwater guttering running along either side of the road, which drain to the west into Darling Harbour.

4.5 Geology

The AECOM (2010b) DGI described the following geology beneath the Site:

- Reference to the *1:100, 000 Geological Survey of NSW (Sydney) Sheet 9130 (Ed 1) (*Herbert 1983*)* indicates that the stratigraphy of the Site comprises man-made fill material, marine clays and Hawkesbury Sandstone.
- Information from previous investigations indicates that during the early 1800s the shoreline ran approximately along the western edge of Hickson Road (i.e. along the eastern edge of the proposed Stage 1 Development).
- The area to the west of Hickson Road is understood to have been progressively reclaimed.
- Aerial photographs from the 1950s indicate that the area between Hickson Road and the current shoreline was occupied by a number of finger wharves, extending from Hickson Road, which were filled in several stages between the 1960s and 1980s with various types of material.

Based on the AECOM (2010b) DGI and Coffey (2008) investigation, the following sequence of lithology has been identified:

- Surface slabs of asphalt and concrete vary to depths between 0.3 to 0.8 m bgs.
- Fill consisting predominantly of sand and gravel with minor anthropogenic inclusions such as brick, coal, charcoal and slag extending to depth ranging between 0.57 and 9.2 m bgs, with the fill layer generally deeper towards the west side of Hickson Road and within former gasworks subsurface structures such as the tar tank beneath Hickson Road.
- Thin layer of residual clayey sand identified at some locations, mainly in the northern portion of the Site ranging between 1.0 and 3.5 m bgs.
- Sandstone bedrock identified at depths ranging between 0.57 m bgs and 9.2 m bgs, generally increasing in depth to the west.

4.6 Hydrogeology

The AECOM (2010b) DGI indicated the following about hydrogeology within the Site:

- Groundwater beneath the Site is present as an unconfined, shallow aquifer within the fill materials and the underlying natural sediments.
- Groundwater is also likely to occur as a deeper bedrock aquifer within the underlying sandstone bedrock.
- Groundwater within the bedrock would occur as a fractured bedrock aquifer, potentially confined by an overlying clay unit in some areas of the Site.
- Due to the proximity of the Site to Darling Harbour, the depth to groundwater is shallow (less than 3 m bgs) and the overall direction of groundwater flow is expected to be towards Darling Harbour.
- Groundwater at the Site may be tidally influenced, resulting in the fluctuation of groundwater levels within the fill materials and natural sediments.
- The results of the AECOM (2010b) DGI investigation indicate that the variable nature and distribution of fill materials at the Site cause localised variations in groundwater flow, which is further complicated by tidal movements.

A search of the NSW Department of Natural Resources (DNR) groundwater bore data base as reported in ERM (2007) indicated that there were 32 registered groundwater bores within a 4 km radius of the Site, which were registered for either recreation, irrigation or monitoring purposes

4.7 Potentially Sensitive Receptors

In the context of this investigation, the selected trees located within the Declaration Area which form the subject of this report are the nearest potentially sensitive receptor. The closest potential aquatic sensitive receptor is Darling Harbour and the adjacent Sydney Harbour which are highly urbanised estuaries. Sydney Harbour is used for a mixture of purposes including recreational purposes such as boating, swimming and fishing and for commercial purposes including cargo and passenger transport. The area of Darling Harbour adjacent to the Site currently serves as a passenger terminal for cruise vessels.

The Site is situated in a mixed commercial and residential area, with a child care centre located on the east side of the Site. No other environmentally sensitive receptors have been identified.

Potential human exposure to contaminants of potential concern in impacted soil/fill materials and/or groundwater may occur via the following potential exposure pathways:

- Direct dermal contact with impacted materials;
- Incidental ingestion of impacted materials;
- Inhalation of volatile potential contaminants of concern; and
- Inhalation of potential contaminants of concern sorbed to air-borne particulates.

The following potential human receptors were identified:

- Workers engaged in Site operational activities;

- Workers engaged in future redevelopment of the Site;
- Workers on the Site entering confined spaces or exposed to subsurface materials during maintenance work;
- Future residents inhabiting the Site;
- Off-site workers conducting construction, road or other sub-surface works in the vicinity of the Site;
- Residents in neighbouring properties and;
- Occupants within the day care facility located on Hickson Road.

5.0 Potentially Contaminating Activities and Contaminants of Concern

5.1 Existing Identified Contamination

Based on the historical review of the Site as presented in the ERM (2007, 2008a) reports and the results of the environmental and geotechnical investigations conducted on the Site, the potentially contaminating activities and associated chemicals of potential concern (CoPC) have been identified and are summarised in the table below.

Description of Potentially Contaminating Activity	CoPC	Comments
Former gasworks	Metals, TPH, BTEX, PAHs, phenols, sulphate, cyanide, ammonia	Associated with gasworks waste. Gasworks contamination is likely to be concentrated in the vicinity gasworks infrastructure across the Declaration Area but may have also been relocated.
Importation of fill materials for reclamation activities	Metals, TPH, BTEX, PAHs, PCBs, OCPs, VOCs, SVOCs	Fill materials of unknown origin have been used for land reclamation beneath Hickson Road.
Demolition of former buildings potentially containing hazardous materials	Metals	Hazardous materials including lead based paints, may have been used in the construction of historical warehouses, buildings and/or industrial infrastructure on the Site and may have been introduced to the sub-surface during demolition works or as a result of leaching or weathering while the building structures were still in place.

Notes: Metals – Arsenic (As), Copper (Cu), Chromium (Cr), Cadmium (Cd), Mercury (Hg), Lead (Pb), Nickel (Ni), Zinc (Zn)
PAHs – Polycyclic aromatic hydrocarbons
TPH – Total petroleum hydrocarbons
BTEX – Benzene, toluene, ethylbenzene and xylenes
OCPs – Organochlorine pesticides
OPPs – Organophosphorus pesticides
PCBs – Polychlorinated biphenyls
SVOCs – Semi volatile organic compounds
VOCs – Volatile organic compounds

5.2 Chemicals Potentially used for S-ISCO® Remediation

S-ISCO® and SEPR™ may be used to remediate gas works contamination in the Declaration Area. The chemicals specifically used are hydrogen peroxide, sodium persulfate, sodium hydroxide, VeruSOL® and Fe-TAML®. The volumes, concentrations and injection rates of the chemicals will vary throughout the S-ISCO® and SEPR™ process.

6.0 Investigation Methodology

6.1 Soil Field Investigation

6.1.1 Services Location and Clearance

All borehole locations were cleared for subsurface utilities as follows:

- Plans of underground utilities were requested from the Dial-Before-You-Dig service and relevant utility representatives were contacted to confirm proposed sample points were clear of subsurface utilities. CAD plans relating to the presence of subsurface utilities were also supplied by BDA and Lend Lease. All plans were reviewed by AECOM prior to the commencement of service location clearance.
- All sample locations were marked on the ground with spray paint and were measured from nearby reference points.
- Each sampling location was cleared using a Telstra accredited, underground services location contractor (Australian Locating Services).
- After coring through the asphalt and/or concrete surface, each location was potholed by air-knifing (non-destructive drilling) by a competent subcontractor (Terratest) to at least 1 m bgs or to the depth of refusal.

6.1.2 Intrusive Work

Terratest were engaged to carry out the drilling operations. The surface at each location was cored using a track mounted concrete corer and the drilling technique consisted of direct push tube sampling with a track mounted Geoprobe™ drill rig. The push-tube samplers were hammered into undisturbed soil in one continuous uniform motion without rotating. Samples were collected based on their location, distribution within the soil/fill profile and suitability for sampling.

Boreholes were drilled to a maximum of 2 m bgs or refusal (whichever was shallower).

Borehole locations were reinstated with grout or soil cuttings that had been drilled out from that location. In many instances, no grout or soil cuttings could be placed down the hole due to the collapse of fill materials following completion of drilling. All boreholes were reinstated to original surface level and condition. Any excess soil generated from the drilling process was placed in drums and stored on-site for future disposal.

6.1.3 Soil Sampling

All boreholes were cored then air-knifed to a minimum depth of one metre (where possible) to expose underground services. Soil samples were then collected from beneath the concrete or asphalt surface and then every 0.5 m or where a significant change in physical characteristics was identified to the maximum target depth of 2 m bgs. Where possible, soil samples were collected from the natural material, at the interface with any overlying fill and underlying bedrock.

The soil was collected in disposable plastic liners and representative soil samples were transferred from liners into laboratory supplied sampling containers by nitrile-gloved hand.

All soil samples were placed in laboratory prepared glass sampling containers using single use disposable nitrile gloves. Field duplicates (intra-laboratory) and triplicates (inter-laboratory) were prepared in the field by splitting soil samples. In order to minimise the loss of volatiles, samples were not mixed or homogenised during collection or splitting and jars were filled so as to minimise the amount of headspace where sample recovery allowed.

6.1.4 Soil Sample Labelling, Preservation, Storage and Transport

All samples were clearly labelled with unique sample identification numbers consisting of the date, sample location, depth of sample and samplers initials. In the case of field duplicates and triplicates, sample containers were labelled so as to not reveal their purpose or sample location to the laboratory. All samples were kept chilled in an ice-filled esky prior to dispatch to the NATA registered laboratory under chain of custody (COC) procedures.

All samples collected are stored at the laboratory (3 months for metals [28 days for mercury], or 14 days for organics).

6.1.5 Soil Sampling Equipment Decontamination

The decontamination procedures were performed before initial use of re-useable equipment and after each subsequent use.

All re-usable sampling equipment (split tube sampler and spatula) were decontaminated between each sample by scrubbing with a solution of Decon 90 (a phosphate-free detergent) followed by a rinse in potable water. For each day of sampling, following decontamination procedures, a rinsate blank was completed by running laboratory prepared deionised water over the re-usable sampling equipment for collection directly into laboratory prepared sampling containers for analysis.

At each sample location a new set of disposable nitrile gloves were used to directly collect soil samples from the re-useable sampling equipment for placement into the laboratory prepared glass sampling containers.

6.1.6 Field Screening

For each sample depth, additional soil was placed in a sealed plastic bag and screened for head space vapours and the presence of VOCs, using a calibrated photo-ionisation detector (PID). The headspace reading was taken at ambient temperature and was recorded on the borehole logs (**Appendix D**). The PID readings were considered when selecting soil samples for laboratory analysis.

The PID was calibrated with isobutylene gas at 100 ppm at the commencement of each day of sampling and, if necessary, during the day in accordance with the procedure provided by the supplier. Calibration records are provided in (**Appendix E**).

6.1.7 Field Logging

Recording of logs for boreholes and in the field was conducted in accordance with AS1726-1993 and soils were classified in accordance with the Unified Soil Classification System (USCS), including observation of any anthropogenic material (i.e. odours, asbestos cement [AC] sheeting etc). Descriptions were recorded on AECOM's standard borehole and monitoring bore field log sheets for uniformity in descriptions, presentation and to aid in future interpretations.

The American Society for Testing and Materials (ASTM) system and the USCS are the general standards used by AECOM in classifying soil by visual and manual examination. The reference for the USCS system is *Procedure for Determining Unified Soil Classification (Visual Method)*, United States Department of the Interior, Bureau of Reclamation (USBR) 5005-86. The reference for the ASTM system is *Description and Identification of Soils (Visual-Manual Procedure)*, ASTM Standard Practice D 2488-90.

6.1.8 Survey of Boreholes

The borehole location and ground level were surveyed by a registered surveyor from Rygate & Company Pty Ltd. (Rygate) with reference to the Australian Height Datum (AHD) and Australia Map Grid (AMG).

The elevation and position of the boreholes are recorded on the borelogs provided in (**Appendix D**).

6.2 Tree Root Inspection Test Pits

Three tree root inspection test pits were selected in consultation with Tree Wise Men Pty Ltd arborist Peter Castor. The test pits were located at the base of trees T11, T15 and T18 (refer to Figure F2 in **Appendix A**).

Test pits were excavated using air knifing (non destructive digging) to refusal depths of 0.3 m bgs (T11 and T15) and 0.4 m bgs (T18). Refusal occurred on concrete sub surfaces underlying the tree roots. Photos of tree root inspection test pits are provided in **Appendix F**.

6.3 Phytotoxicity Desktop Evaluation

A search of available and relevant phytotoxicity information sources and ecological risk information sources was undertaken in order to provide advice on potential effects of SISCO® constituents (other than the elements and compounds for which specific terrestrial soil use criteria are derived in the VMP HHERA [AECOM, 2011]) on adjacent tree roots at Barangaroo. The information is summarised in **Section 10.0** below.

7.0 Quality Assurance and Quality Control

7.1 Field Quality Control

The field Quality Assurance/Quality Control (QA/QC) procedures, Data Quality Objectives (DQOs) and acceptance limits established for the project are summarised below:

- Use of standard procedures for soil and groundwater sampling;
- Use of a new pair of disposable nitrile gloves for each soil and groundwater sample collection event;
- Use of appropriate equipment decontamination procedures;
- Use of laboratory prepared and supplied sampling containers appropriate for each CoPC investigated;
- Use of appropriate sample Chain of Custody (COC) documentation. Copies of the COCs are included in the laboratory reports (**Appendix G**);
- Collection and analysis of field duplicate (intra-laboratory duplicate) sample at a rate of approximately one per 10 primary samples;
- Collection and analysis of a field inter-laboratory triplicate sample at a rate of approximately one per 20 primary samples;
- The relative percentage differences (RPDs) of the primary and duplicate sample results are to be less than 50% for all CoPC;

Field sampling QC analytical results are presented on Table T4 in **Appendix B** and summarised below:

- Two field duplicate soil sample (DUP01 and DUP02) were analysed, meeting the project limit of one per 10 primary samples;
- One field intra-laboratory triplicate soil sample (TRIP01) was analysed, meeting the project limit of one per 20 primary samples;
- The relative percentage differences (RPDs) of the primary and duplicated samples met the within the acceptable limit of 50% for all analytes, with the exception of the following:
    - RPDs for fluoranthrene (126%) and pyrene (124%) in duplicate DUP01 and primary sample TBH01_0.43-0.5;
    - RPDs for copper (95%), benz(a)anthracene (81%), benzo(a)pyrene (52%), chrysene (67%), fluroanthene (82%), pyrene (73%) in triplicate TRIP01 and primary sample TBH01_0.43-0.5.
- The elevated RPD is likely to be associated with variation in contaminant concentration within the fill, rather than laboratory inaccuracies. Therefore, AECOM considers that the elevated RPD is not significant.

7.2 Laboratory Quality Control

The DQOs and acceptable limits defined for the assessment of the laboratory analytical data are listed below:

- Maximum acceptable sample holding time is 14 days for organic analyses and six months for lead analyses.
- Samples to be appropriately preserved and handled.
- Laboratory LORs to be less than the adopted assessment criteria.
- Laboratory method blank analyses to be less than the laboratory LOR.
- Laboratory duplicate samples to be analysed at a rate of one in 20 samples, when the batch size exceeds five samples. The RPD of results to be less than 50 %.
- Matrix spike recoveries to be conducted by the laboratory at a rate of one in 20 samples.
- Analysis of Laboratory Control Samples (LCS) at a rate of one in 20 samples.
- Matrix, LCS and Surrogate recoveries to be within the acceptable range of 70-130%.

A review of laboratory QA/QC is summarised below:

- Samples were received by the laboratory chilled and intact, as indicated on the sample receipt notification forms (refer **Appendix G**).
- Soil and groundwater samples were extracted and analysed within acceptable holding times;
- Laboratory LORs were less than the adopted soil/groundwater assessment criteria;
- Matrix spike recoveries, laboratory control sample recoveries and method blanks were tested for PAH, TPH, BTEX and metals at the required rates.
- Surrogate sample recoveries were tested for all primary samples for TPH, BTEX and PAHs.
- Two laboratory duplicate samples were analysed for each primary sample batch. This was equivalent to one lab duplicate for four soil samples analysed, thereby fulfilling the QA/QC requirements. RPDs for duplicate laboratory samples were generally within the acceptable limit of 50%, with the exception of the following:
    - ALS Report ES1102539: RPD of 133%for zinc in Lab ID ES1102438-002 and 73.8% for zinc in ES1102363-013.
- Method blank sample results were less than laboratory LORs.
- All matrix spike recoveries, matrix spike duplicate, surrogate spike recoveries and laboratory control sample recoveries were within acceptable range (including laboratory's historical statistical range and/or USEPA-SW846 limits), exception of a matrix spike recovery of 138% for pyrene in Lab ID ES1102540-001 in ALS report ES1102539

7.3 Data Useability

The data validation procedure employed in the assessment of the field and laboratory QA/QC data indicated that the reported analytical results are representative of soil and groundwater conditions at the sample locations and that the overall quality of the analytical data produced is acceptably reliable for the purpose of this investigation

8.0 Basis for Soil Assessment Criteria

8.1 Site Specific Soil Criteria

Site specific soil assessment criteria (SAC) were developed and presented in the VMP HHERA (AECOM, 2012) as discussed below. The VMP HHERA included the derivation of health and odour based site-specific target criteria (SSTC) for the protection of human health.

8.1.1 Site Specific Target Criteria

The SSTCs applied to the Site in the VMP Area HHERA (AECOM, 2012) were developed to provide human health risk-based concentrations that can be used:

- As assessment criteria applicable to areas of the Site based on the proposed land uses: if all CoPCs in samples are below the applicable SSTCs, then further assessment of the health risks would not be warranted; and
- As assessment criteria applicable for the beneficial reuse of excavated material (either treated or untreated) within the Barangaroo Stage 1 Development: if all CoPCs in samples are below the SSTCs, then further assessment of the health risks would not be warranted.

Details on how the SSTCs have been derived are provided in the draft VMP HHERA (AECOM, 2012). This assessment is focused on the protection of human health only.

8.1.2 Risks to the Environment

The remediation goals for the protection of the environment, recommended by the VMP HHERA (AECOM, 2012) are:

- As a primary goal, removal / remediation of Separate Phase Gasworks Waste and Tar (which includes, but is not limited to TCM) to the extent practicable; and
- As a secondary goal, remediation of soil to the extent practicable, such that groundwater quality leaving the Site (measured at the down hydraulic gradient Site boundary) approaches the Marine Water Quality Criteria (MWQC).

The VMP Remediation Extent document describes the extent of remediation that can be practicably achieved with a view to ultimately improving groundwater quality at the Site. The VMP Remediation Extent document concludes that:

- The extent of remediation that can be practicably accomplished for the protection of the environment is consistent with that required for protection of human health (i.e. based on comparison of the SSTCs against the reported soil and groundwater concentrations); and
- The standard of remediation required should equal the higher or:
  - Removal of separate phase gas works waste and tar (SPGWT) to the extent practicable; and
  - Remediation of contaminated soils such that the contaminant mass is reduced, on average, by 90% (calculated based on the estimated mass of naphthalene and TPH C10—C14).

This document does not specifically consider the requirement for remediation within the tree root mass for the protection of the environment because:

- The extent of remediation required will be consistent with an assessment of the risk to human health (ie. comparison of reported soil concentrations with the VMP SSTC); and
- The requirement to remove SPGWT to the extent practicable is consistent with the requirements of remediation for the protection of human health; and
- It is not appropriate that the requirement for reduction of the contaminant mass by, on average, 90% be assessed solely based on the limited soil volume contained within the tree root mass. It is considered more appropriate that this assessment be made as part of the Block 4 / VMP RAP (which will include consideration of the data presented in this document).

8.2 Adopted Soil Assessment Criteria

The adopted assessment criteria are the SSTC for the unsaturated zone as all soil results relevant to this assessment are less than 2 m bgs.

The adopted SSTC are presented in Table T1 in **Appendix B**.

9.0 Results

9.1 Field Observations

9.1.1 Boreholes

Field observations of fill, natural soil, bedrock and PID readings for each borehole location (TBH01 to TBH09) are summarised in Table 2 below. Borelogs and PID readings are provided in Appendix D.

Table 2 Summary of Field Observations

Location	Surface	Encountered Fill/Tree Roots	Natural Soil or Bedrock	Final Depth (m bgs)	PID readings (ppm)
TBH01	Asphalt and concrete to 0.22 m bgs	Gravel and sandy gravel with inclusions of brick and coke gravel Fine (<5 mm) tree rootlets observed	Sandstone bedrock at 0.59 m	0.59	2.4
TBH02	Borehole cancelled due to underground services (no alternative location due to the presence of nearby surrounding services)				
TBH03	Asphalt and concrete to 0.7 m bgs	Sandy gravel, sandy clay and clayey sand with inclusions of brick	Sandstone bedrock at 1.66 m bgs	1.66	0.2 - 2.2
TBH04	Asphalt to 0.1 m bgs Subsurface concrete slab between 0.25 and 0.6 m bgs.	Sandy gravel, silty sand, gravelly clayey sand with inclusions of charcoal and timber	Not encountered	2.0	0.2 - 0.6
TBH05	Asphalt to 0.1 m bgs Subsurface asphalt/concrete slab between 0.21 and 0.47 m bgs	Sandy Gravel with bituminous gravel layers and weathered sandstone boulders One 5 mm tree root encountered at 0.2 m bgs 20 mm tree root encountered at 1.4 m bgs	Not encountered	2.0	0 - 0.3
TBH06	Asphalt to 0.1 m bgs Subsurface concrete slab from 0.2 to 0.37 m bgs	Sandy gravel with concrete at 0.9 to 1 m bgs overlaying sandy clay One 50 mm tree root encountered at 0.47 m	Not encountered	2.0	0 - 0.1
TBH07	Asphalt to 0.1 Subsurface asphalt and concrete slab from 0.15 to 0.77 m bgs	Layer of gravelly sand between 0.1 and 0.15 m bgs	Not encountered	0.77	0.7
TBH08	Asphalt to 0.13 m bgs Subsurface slab from 0.29 m bgs to 0.77 m bgs	Layer of sandy gravel 0.13 to 0.29 m bgs One 50 mm tree root encountered at 0.24 m bgs	Not encountered	0.77	0.5
TBH09	Asphalt to 0.05 m bgs Subsurface asphalt slab from 0.05 to 0.77 m bgs	Gravel between 0.05 m and 0.24 m bgs	Not encountered	0.64	-

Notes: ppm – parts per million
m bgs – metres below ground surface

Additionally the following observations were made:

- Dark grey staining and mild tar odours were noted between 1.2 and 1.66 m bgs in TBH03. No odours or staining were noted in any other borehole.
- No TCM was observed in any of the boreholes.
- Groundwater was encountered in at 1.9 m bgs in borehole TBH05. Groundwater was not encountered in any other borehole.

9.1.2 Test Pits

Photographs of the three test pits for tree root observations are shown in Appendix E. Test pits were limited to a maximum depth of 0.4 m bgs as a confining layer of concrete was encountered below the main mass of roots at each test pit location.

9.2 Soil Analytical Results

Soil analytical results for samples collected from TBH01 to TBH09 are presented in Table T2 in Appendix B**.** Historical results for boreholes potentially located within the root mass zones of trees within the Site are presented in Table T3 in Appendix B. All results were less than the VMP SSTC. A summary of the results are provided in Table 3 below.

Table 3 Summary of analytical results

Chemical Name	EQL (mg/kg)	VMP SSTC	Number		Concentration (mg/kg)				
			Results	Detects	Min	Max	Average	Median	SD
Arsenic	2	-	29	2	<5	8	3.1	2.5	1.5
Cadmium	2	-	29	0	<1	ND	0.5	0.5	0
Chromium			29	15	2	110	17	8	26
Copper	5	-	29	14	<5	76	23	23	21
Lead	5	-	29	14	<5	1420	99	25	359
Mercury	0.1	-	29	1	<0.1	0.7	0.11	0.05	0.039
Nickel	2	-	29	12	<2	98	12	7	16
Zinc	5	-	29	14	<5	531	68	40	145
CPAH		67	23	17	0.06	56.15	9.1	1.256	15
PAH (Total)		-	23	17	1.7	668.3	91	10.6	169
Phenol	0.5	-	13	3	<0.5	1.2	0.39	0.25	0.29
TPH C_6 - C_9	10	-	24	0	<10	ND	5	5	0
TPH C_{10} - C_{14}	50	54000	24	1	<50	1010	66	25	201
TPH C_{15}-C_{28}	100	72000	24	9	<100	2510	401	50	667
TPH C_{29}-C_{36}	100	7300	24	9	<100	1330	272	50	360
Benzene	0.2	380	24	2	<0.2	2	0.19	0.1	0.39
Toluene	0.5	-	24	1	<0.5	0.7	0.27	0.25	0.092
Ethylbenzene	0.5	-	24	0	<0.5	ND	0.25	0.25	0
Total Xylene	0.15	-	24	1	0.8	0.8	0.51	0.5	0.061

10.0 S-ISCO® Chemicals - Phytotoxicity

A review of available information on the possible phytotoxic effects associated with the use of key S-ISCO® chemicals, including sodium persulphate, peroxide, Fe-TAML® and VeruSOL® on trees was undertaken. The following table provides a summary of the available relevant information.

Table 4 Summary of information relating to possible phytotoxic effects associated with the use of S-ISCO® chemicals

S-ISCO Chemical	Summary of phytotoxicity information
Sodium Persulphate	MSDS (Price Chemicals Pty Ltd, 2007) derived ecological information section states there is currently no data on ecotoxicity, environmental persistence, mobility or bioaccumulation.
Sodium Hydroxide	MSDS (Science Lab.com Inc, 2005) derived ecological section provides the following information: - Sodium Hydroxide degrades readily by reacting with natural carbon dioxide in air and does not bio accumulate. - Possible hazardous short term degradation products are not likely, however long term degradation products may arise. - The degradation products are not toxic. - There is no information on ecotoxicity.
Hydrogen Peroxide	- Hydrogen peroxide has many essential roles in plant metabolism but at the same time, accumulation related to virtually any environmental stress is potentially damaging (Cheeseman, 2007). - All biotic and abiotic stresses induce or involve oxidative stress to some degree, and the ability of plants to control oxidant levels is highly correlated to stress tolerance (Cheeseman, 2007). - It is well established that oxidative metabolism, and particularly hydrogen peroxide (H_2O_2), is involved in a wide variety of reactions and signalling cascades necessary for all aspects of plant growth and the integration of activity (Cheeseman, 2007). - Oxidative stress, arising from an imbalance in the regeneration and removal of reactive oxygen species (ROS) such as the superoxide radical (O_2^-), hydrogen peroxide, singlet oxygen and hydroxyl radicals (OH), is a challenge faced by all aerobic organisms. ROS are highly reactive and in the absence of protective mechanisms, can produce damage to cell structure and function. (Cho and Seo, 2004). - It is possible that inefficient removal of hydrogen peroxide and subsequent hydrogen peroxide accumulation can induce phytotoxicity. (Cho and Seo, 2004). - Radical reactions are exothermic and the decomposition of hydrogen peroxide at the surface yields oxygen. The reaction of Fe^{2+} and hydrogen peroxide is extremely exothermic and could evaporate water from soil and is toxic to microbes (Sahl and Munakata-Marr, 2006). - The MSDS for hydrogen peroxide (Sigma-Aldrich, 2006) derived ecological information describes the following: • Hydrogen peroxide in the aquatic environment is subject to various reduction or oxidation processes and decomposes in water and oxygen. Hydrogen peroxide half-life in freshwater ranged from 8 hours to 20 days, in air from 10-20 hours and in soils from minutes to hours depending upon microbiological activity and metal contaminants. In addition, hydrogen peroxide breaks down in sunlight. • There is currently no phytotoxicity information on the Hydrogen Peroxide MSDS, with the exception of acute toxicity for Algae LC50, 48hours > 1.7 mg/L.
Fe-TAML®	- The MSDS for Fe-TAML® catalyst (GreenOx Catalysts, Inc, 2006) provided the following ecological information: • Fe-TAML is soluble in water but not likely to mobilise in soil. • Is not expected to be persistent or bio-accumulating in the environment. • Acute algal toxicity (LC50 Scenedesmus subspicatus > 0.2 mg/L [72 h] [Isopropanol]).

S-ISCO Chemical	Summary of phytotoxicity information
VeruSOL®	- VeruSOL® comprises a clear formula made with citrus extracts and plant-derived surfactants (VeruTEK®, 2011b). - In particular, VeruSOL-3 is a mixture of D-limonene and plant-based surfactants (Nadagouda *et al*, 2009). - Some of the benefits and features of VeruSOL® include: • An ecofriendly surfactant – VeruSOL® is made from plant materials and biodegrades. • Controlled solubilisation - VeruSOL® forms stable Windsor Type I emulsions with contaminants and contaminant non- aqueous phase liquids (NAPLs) for targeted destruction by coeluted oxidants such as hydrogen peroxide. • VeruSOL® is easily manipulated due to its nontoxic and non-irritant properties. - MSDS (VeruTEK, 2006) derived Ecological Information determines the following: • There is no eco or phytotoxicity information available at this time for this product. However, a spill may produce significant toxicity to aquatic organisms and ecosystems. Some studies have shown that certain bacteria and fungi have the ability to degrade terpenes, decreasing their toxicity to fish. When spilled this product may act as oil, causing a film, sheen, emulsion or sludge at or beneath the surface of a water body. • Product is expected to be readily biodegradable. • No appreciable bioconcentration is expected in the environment. • Product is expected to volatalise rapidly.

In summary, the following has been identified:

- It is known that VeruSOL® is a surfactant derived from plant materials, is non-toxic and biodegrades in the environment. When used with oxidants, including hydrogen peroxide (which decomposes exothermically into water and oxygen) and sodium persulfate, VeruSOL® can produce Fenton's reagent; producing a mix of ferrous iron salts as a catalyst and hydrogen peroxide and at low pH hydroxyl radicals ($OH^{\cdot}$) that oxidise contaminants such as chlorinated solvents, fuel oils and BTEX (Amarante, 2000).
- The effects of in situ chemical oxidation (ISCO) on biological processes have been researched to determine if ISCO coupling with in situ bioremediation could be achieved in field and laboratory experiments. Literature has been compiled to determine the effect of ISCO on microbial communities following addition of a chemical oxidant as a range of concentrations to treat a variety of subsurface contaminants. Results indicate that although microbial communities may potentially be adversely affected by chemical oxidation (in particular Fenton's Reagent if not used carefully) in the short-term, a rebound of microbial biomass and/or bioremediation activity can be expected (Sahl and Munakata-Marr, 2006).
- In addition, it is noted that chemicals involved in the ISCO process require health and safety precautions during installation when handled separately (Mueller and Brown, 2011). However, when individual chemicals discussed herein are used as oxidants, they break down into harmless by-products (comprising water, oxygen and carbon dioxide) and are considered to present a minimal phytotoxic risk (VeruTEK® 2010).
- While there is a general lack of literature assessing the specific phytotoxicity of S-ISCO® chemicals, case studies in which S-ISCO® has been successfully implemented indicate there were no adverse effects to the surrounding environment, including plants (VeruTEK® 2011b).

11.0 Site Characterisation

To assess the material contained within the root mass of trees, AECOM results have been combined with previous investigation data (Coffey) to characterise the tree root zone.

11.1 Fill Materials and Natural Soils

- Observed fill materials at depths between 0 and 2 m bgs generally comprised unconsolidated gravels, sand, bricks, sandstone, slag and charcoal in variable gravelly sand to clayey sand matrix.
- Shallow sandstone bedrock was identified at depths of less than 1 m bgs, on the eastern side of Hickson Road near trees T49 and T44.
- Small tree roots (<50 mm) and fine rootlets were observed between the surface and 2 m bgs, however the bulk of the root mass appeared to be confined above sub-surface slabs which were encountered between 0.2 and 0.4 m bgs in tree root pits and some boreholes.
- All results were less than the adopted SAC with the exception of the concentrations of CPAH in two soil samples.
- The observed root mass was identified in unsaturated soils.
- No observations of TCM were identified in any of the boreholes investigated as part of this assessment

11.2 Hydrogeological Conditions

Results of the previous DGI investigation (AECOM 2010b) indicated that groundwater beneath the Site is present as an unconfined, shallow aquifer within the fill materials and the underlying natural sediments. Groundwater is also likely to occur as a deeper bedrock aquifer within the underlying sandstone bedrock. Groundwater within the bedrock would occur as a fractured bedrock aquifer, potentially confined by an overlying clay unit in some areas of the Site.

Due to the proximity of the Site to Darling Harbour, the depth to groundwater is shallow (average of 2 m bgs) and the overall direction of groundwater flow is expected to be towards Darling Harbour. Groundwater at the Site is slightly tidally influenced, resulting in the fluctuation of groundwater levels within the fill materials and natural sediments. Groundwater chemistry at the Site is dominated by sodium and chloride ions, indicative of a saline environment.

11.3 Conceptual Site Model Update

Based on the dataset and site information, the following points provide a conceptual site model for the root mass of selected trees in Hickson Road with respect to the contaminants identified in the Remediation Site declaration:

- The bulk of the root mass was observed to be shallow (less than 0.5 m bgs) and mainly confined to the near surface due to subsurface slabs providing a preferential pathway along the back of the kerb;
- Based on the salinity and depth of groundwater it is not anticipated that the root mass would extend past 2 m bgs due to the intolerance of the fig trees (*Ficus hilli* and *Platanus hybridia*) to saline conditions, as such if S-ISCO® chemicals were used, it is unlikely tree roots would come into contact with S-ISCO® chemicals;
- TCM was not identified in any of the tree root mass locations investigated; and
- Given that soil concentrations are all less than the VMP HHERA SSTC's, contamination requiring remediation for the protection of human health was not identified within the tree root mass investigation locations (refer Section . That is, no exceedances of the VMP HHERA SSTC were reported

Given that concentrations of gas works residue exceeding the adopted criteria were not reported at the locations sampled and the tree roots are located in the unsaturated zone, AECOM considers that S-ISCO® chemicals would not likely adversely impact tree health because remediation using S-ISCO® chemicals would not be required in the root mass zone.

12.0 Conclusions and Recommendations

Based on the results of this investigation AECOM makes the following conclusions regarding the assessment of contamination within the tree root mass zones:

- Tar Containing Material (TCM) was not identified in any of the boreholes completed within the root mass zone of the investigated trees.
- Based on the shallow test pit excavations and boreholes completed, observed tree roots appear largely laterally confined to the footpath side of the kerb line (i.e. to the east of the kerb on the eastern side and to the west of the kerb on the western side of Hickson Road) and generally do not appear to extend further into Hickson Road.
- With respect to addressing the Remediation Site declaration, the material assessed within the root mass zone of the trees investigated is considered suitable to remain *in-situ* or for re-use within Hickson Road, based on the comparison of the individual concentrations and the 95% UCL concentrations to the SSTCs.
- Based on the reported results, remediation of the tree root mass is not required. Accordingly, potential future S-ISCO injections in this area are not required.
- Additionally as the S-ISCO® chemicals are injected into the groundwater table which based on visual observations is generally 1 to 1.5 m below the bulk of the observed tree root mass, it is not anticipated that the tree root mass will be significantly exposed to S-ISCO chemicals, reducing the likelihood of any adverse effects on the health of the trees.

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Appendix A

Figures

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information

PROJECT ID:	60153531		
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Site Location

Lend Lease (Millers Point) Pty Ltd
Tree Root Mass Investigation
Barangaroo
Hickson Road, Millers Point NSW

Figure F1

Last modified: 24 May 11 - 17:28

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STREET

HIGH STREET

HICKSON ROAD

No.3
2 STOREY BRICK
TERRACE

ROCK FACE

FOOTPATH

KERB

PARKING METER

STONE

TOP OLD STONE KERB 0.22 HIGH

PRIVATE SIN LOW STONE WALL

BITUMEN

GRASS

OLD CHIMNEY

ROLLER DOOR
6.29 TOP
2.10 F.L.

LOUVRES
6.12 U/S
9.07 TOP

CONC FOOTPATH

CONC DRIVEWAY

VEHICLE CROSSING

LANE MARKING

CONCRETE DRIVEWAY

TOP

SIGN

CONC.

TOP OF CONC. KERB

LIGHT POLE

FENCE

METAL

T1 TREE 0.5D 8H 10S

T2 TREE 0.4D 10H 10S T34

T3 TREE 0.4D 10H 10S T34

T4 TREE 0.4D 10H 10S

T5 TREE 0.4D 10H 10S

T6 TREE 0.4D 10H 10S

T7 TREE 0.4D 10H 10S

T8 TREE 0.4D 10H 10S

T9 TREE 0.4D 10H 10S

T10 TREE 0.45D 10H 10S

T11 TREE 0.55D 10H 10S

T12 TREE 0.4D 10H

T51 TREE 0.5D 4S 6H

T52 TREE 0.5D 4S 6H

T53 TREE 0.5D 4S 6H

GARDEN

TREE 0.3D 8S 8H

TREE 0.25D 6S 8H

BH1

BH140

BH044

BH042

BH179

BH024

BH025

BH69/MW69

BH136

BH023

BH056

BH078

BH400

BH180

FOR CONTINUATION REFER TO DRG 60153531-10-F2b

LEGEND:

- COFFEY BOREHOLE LOCATION
- COFFEY GROUNDWATER WELL LOCATION
- ERM BOREHOLE LOCATION
- ERM GROUNDWATER MONITORING WELL LOCATION
- AECOM BOREHOLE LOCATION
- AECOM GROUNDWATER MONITORING WELL LOCATION
- AECOM SOIL VAPOUR LOCATION
- AECOM (2011) TREE BOREHOLE LOCATION
- AECOM (2011) TREE ROOT OBSERVATION TEST PITS
- TREE TRANSPLANTABILITY RATING A
- TREE TRANSPLANTABILITY RATING B
- TREE TRANSPLANTABILITY RATING C
- DEVELOPMENT BLOCK BOUNDARY
- VMP AND PDA REMEDIATION WORKS AREA BOUNDARY
- OTHER REMEDIATION WORKS (NORTH) AREA BOUNDARY

REVISIONS

No.	BY	DATE	DESCRIPTION	APPD
01	SS	14.02.2011		DFM

SCALES:

2 0 2 4 6 8m

1 : 200 FULL SIZE A1

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001-2000

DESIGNED	AR/DFM	CHECKED	AR/DFM
DRAWN	SS	CHECKED	JA
APPROVED	DFM	DATE	14.02.2011

DESIGNER:

AECOM

AECOM Australia Pty Ltd A.B.N. 20 093 846 925

BARANGAROO

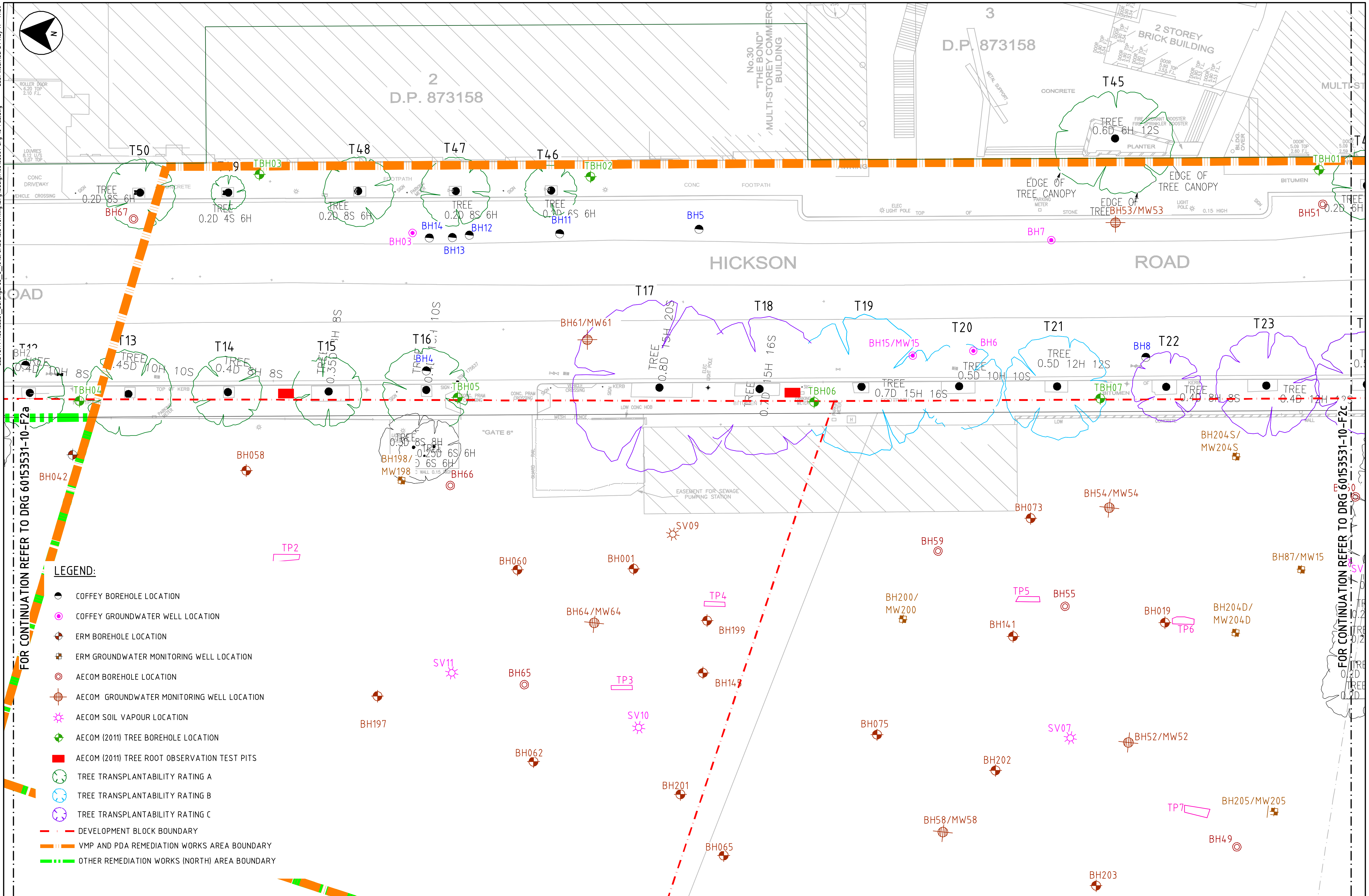
FIGURE 2a
TREE ROOT MASS INVESTIGATION
SITE PLAN AND SAMPLING LOCATIONS

SHT 1 OF 3

STATUS: DRAFT

DRAWING NO: 60153531-DRG-10-F2a

REV: 01



2
D.P. 873158
3
D.P. 873158
No.30 "THE BOND" MULTI-STOREY COMMERCIAL BUILDING
2 STOREY BRICK BUILDING
HICKSON
ROAD
T50
T48
T47
T46
T45
T13
T14
T15
T16
T17
T18
T19
T20
T21
T22
T23
TBH01
TBH02
TBH03
TBH04
TBH05
TBH06
TBH07
BH03
BH5
BH7
BH11
BH12
BH13
BH14
BH51
BH53/MW53
BH61/MW61
BH67
BH15/MW15
BH6
BH8
BH4
BH058
BH042
BH198/MW198
BH66
BH073
BH54/MW54
BH204S/MW204S
SV09
TP2
BH060
BH001
BH59
BH87/MW15
BH64/MW64
TP4
BH199
BH200/MW200
TP5
BH55
BH141
BH019
TP6
BH204D/MW204D
SV11
BH65
TP3
BH149
BH197
SV10
BH075
SV07
BH52/MW52
BH062
BH202
BH201
BH58/MW58
TP7
BH205/MW205
BH065
BH49
BH203
"GATE 6"
EASEMENT FOR SEWAGE PUMPING STATION
EDGE OF TREE CANOPY
FOR CONTINUATION REFER TO DRG 60153531-10-F2a
FOR CONTINUATION REFER TO DRG 60153531-10-F2c
LEGEND:
COFFEY BOREHOLE LOCATION
COFFEY GROUNDWATER WELL LOCATION
ERM BOREHOLE LOCATION
ERM GROUNDWATER MONITORING WELL LOCATION
AECOM BOREHOLE LOCATION
AECOM GROUNDWATER MONITORING WELL LOCATION
AECOM SOIL VAPOUR LOCATION
AECOM (2011) TREE BOREHOLE LOCATION
AECOM (2011) TREE ROOT OBSERVATION TEST PITS
TREE TRANSPLANTABILITY RATING A
TREE TRANSPLANTABILITY RATING B
TREE TRANSPLANTABILITY RATING C
DEVELOPMENT BLOCK BOUNDARY
VMP AND PDA REMEDIATION WORKS AREA BOUNDARY
OTHER REMEDIATION WORKS (NORTH) AREA BOUNDARY

This drawing is confidential and shall only be used for the purposes of this project.

No.	BY	DATE	DESCRIPTION	APPD
01	SS	14.02.2011		DFM

SCALES: 1:500 FULL SIZE A1

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001-2000

DESIGNED	AR/DFM	CHECKED	AR/DFM
DRAWN	SS	CHECKED	JA
APPROVED	DFM	DATE	14.02.2011

DESIGNER: AECOM

AECOM Australia Pty Ltd A.B.N. 20 093 846 925

BARANGAROO

FIGURE 2b
TREE ROOT MASS INVESTIGATION
SITE PLAN AND SAMPLING LOCATIONS

SHT 2 OF 3

STATUS: DRAFT | DRAWING NO: 60153531-DRG-10-F2b | REV: 01

Last modified: 24 May 11 - 17:31

Cad ref: P:\60153531_Barangaroo_S_ICLS_CADD\S3 Working\Drg\Design\60153531-drg-10-F2c.dwg

FOR CONTINUATION REFER TO DRG 60153531-10-F2b

"THE GRAFTON BOND"
5 STOREY BRICK
& SANDSTONE BUILDING

No.36
"THE BOND"
MULTI-STOREY RESIDENTIAL
BUILDING

STONE PAVING

D.P. 813557

HICKSON ROAD

T24 T25 T26 T27 T28 T29 T30 T31 T32 T33 T34 T35 T36 T37 T38 T39 T40 T41 T42 T43 T44

BH51 BH9 BH10 BH43 BH160 BH133 BH50 BH42 BH146 BH409 BH44 BH132 BH135 BH408 BH161 BH206/MW206 BH208 BH35 BH113 BH159 BH207 BH45/MW45 BH114 BH11 BH134 BH07 BH08 / MW08 BH117/MW23 BH09 / MW09 BH112 BH10

TBH01 TBH08 TBH09

SV06 SV05 SV03

EASEMENT FOR DRAINAGE 1.22 WIDE

LOT 3
D.P. 876514

LEGEND:

- COFFEY BOREHOLE LOCATION
- COFFEY GROUNDWATER WELL LOCATION
- ERM BOREHOLE LOCATION
- ERM GROUNDWATER MONITORING WELL LOCATION
- AECOM BOREHOLE LOCATION
- AECOM GROUNDWATER MONITORING WELL LOCATION
- AECOM SOIL VAPOUR LOCATION
- AECOM (2011) TREE BOREHOLE LOCATION
- AECOM (2011) TREE ROOT OBSERVATION TEST PITS
- TREE TRANSPLANTABILITY RATING A
- TREE TRANSPLANTABILITY RATING B
- TREE TRANSPLANTABILITY RATING C
- DEVELOPMENT BLOCK BOUNDARY
- OTHER REMEDIATION WORKS (SOUTH) BOUNDARY

REVISIONS

No.	BY	DATE	DESCRIPTION	APPD
01	SS	14.02.2011		DFM

SCALES: 1:500 FULL SIZE A1 (5 0 5 10 15m)

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001-2000

DESIGNED	AR/DFM	CHECKED	AR/DFM
DRAWN	SS	CHECKED	JA
APPROVED	DFM	DATE	14.02.2011

DESIGNER: AECOM

AECOM Australia Pty Ltd A.B.N. 20 093 846 925

BARANGAROO

FIGURE 2c
TREE ROOT MASS INVESTIGATION
SITE PLAN AND SAMPLING LOCATIONS

SHT 3 OF 3

STATUS:	DRAWING NO:	REV:
DRAFT	60153531-DRG-10-F2c	01

Appendix B

Tables

				Location	TBH01	TBH03	TBH03	TBH05	TBH05	TBH05	TBH06	TBH06	TBH07	TBH08
				Field ID	TBH01_0.43-0.5	TBH03_1.2-1.3	TBH03_1.5-1.6	TBH05_0.6-0.7	TBH05_1.3-1.7	TBH05_1.8-2.0	TBH06_0.55-0.6	TBH06_1.5-2.0	TBH07_0.1-0.15	TBH08_0.13-0.25
				Sample Date	5/02/2011	5/02/2011	5/02/2011	12/02/2011	12/02/2011	12/02/2011	5/02/2011	12/02/2011	4/02/2011	4/02/2011
				Consultant	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM
				Matrix	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill
				Area	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road
Chemical Group	**Chemical Name**	**output unit**	**EQL**	**VMP SSTC**										
PAHs	CPAH (Total)	mg/kg			8.7	<4	<4	<4	2.2	113.2	3.1	<4	39.4	6.4
	CPAH (TEF)	mg/kg		67	2.22	<1.21	<1.21	<1.21	0.85	28.753	0.967	<1.21	10.663	1.828
	PAH (Total)	mg/kg			16.5	<8	<8	<8	4.1	161.8	7.3	<8	58.6	12.3
	Acenaphthene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5
	Acenaphthylene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	1.4	<0.5
	Anthracene	mg/kg	0.5		0.5	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	1.4	<0.5
	Benz(a)anthracene	mg/kg	0.5		1.9	<0.5	<0.5	<0.5	0.7	15.6	0.9	<0.5	4.7	1.3
	Benzo(a) pyrene	mg/kg	0.5		1.7	<0.5	<0.5	<0.5	0.7	18.8	0.8	<0.5	7.8	1.5
	Benzo(b)&(k)fluoranthene	mg/kg	1											
	Benzo(b)fluoranthene	mg/kg	0.5		1.8	<0.5	<0.5	<0.5	0.8	23.8	0.7	<0.5	8	1.3
	Benzo(g,h,i)perylene	mg/kg	0.5		0.6	<0.5	<0.5	<0.5	<0.5	15.1	<0.5	<0.5	6.5	0.7
	Benzo(k)fluoranthene	mg/kg	0.5		0.7	<0.5	<0.5	<0.5	<0.5	9.3	<0.5	<0.5	2.7	0.5
	Chrysene	mg/kg	0.5		1.4	<0.5	<0.5	<0.5	<0.5	13.2	0.7	<0.5	4.8	1.1
	Dibenz(a,h)anthracene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	3.4	<0.5	<0.5	0.8	<0.5
	Fluoranthene	mg/kg	0.5		3.1	<0.5	<0.5	<0.5	1	19.1	1.7	<0.5	6.4	2.8
	Fluorene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5		0.6	<0.5	<0.5	<0.5	<0.5	14	<0.5	<0.5	4.1	<0.5
	Naphthalene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5
	Phenanthrene	mg/kg	0.5		1.2	<0.5	<0.5	<0.5	<0.5	8.3	0.6	<0.5	1.4	<0.5
	Pyrene	mg/kg	0.5		3	<0.5	<0.5	<0.5	0.9	16	1.9	<0.5	8.6	3.1
TPH	TPH C15-C36	mg/kg			<200	<200	<200	<200	<200	1210	<200	<200	700	370
	TPH C10 - C14	mg/kg	50	54000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
	TPH C15-C28	mg/kg	100	72000	<100	<100	<100	<100	<100	600	<100	<100	280	110
	TPH C29-C36	mg/kg	100	21,000	<100	<100	<100	<100	<100	610	<100	<100	420	260
	TPH C6 - C9	mg/kg	10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH+C10 - C36 (Sum of total)	mg/kg	50		<50	<50	<50	<50	<50	1210	<50	<50	700	370
BTEX	Total Xylene (ESDAT)	mg/kg	0.15		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Benzene	mg/kg	0.2	380	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (m & p)	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	mg/kg	2		<5	<5	<5	<5	<5	<5	<5	<5	5	<5
	Cadmium	mg/kg	0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium	mg/kg	2		12	6	13	103	4	4	8	7	46	11
	Copper	mg/kg	5		11	23	47	39	9	51	28	<5	51	76
	Lead	mg/kg	5		103	11	20	10	26	115	20	<5	25	26
	Mercury	mg/kg	0.1		0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	mg/kg	2		4	8	10	52	<2	18	5	<2	49	10
	Zinc	mg/kg	5		30	98	106	15	29	344	29	<5	43	38

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
VMP SSTC - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated

				Location	BH4	BH5	BH5	BH8	BH8	BH9	MW3	MW3	MW6	AECOM_BH51	AECOM_BH53	AECOM_BH61	AECOM_BH67
				Field ID	BH4 0.4-0.5	BH5 0.4-0.5	BH5 1.2-1.3	BH8 0.26-0.4	BH8 0.6-0.7	BH9 0.4-0.5	MW3 0.4-0.5	MW3 0.9-1.0	MW6 0.8-0.9	BH51_0.4-0.5	BH53_1.1-1.5	BH61_0.3-0.4	BH67_0.4-0.43
				Sample Date	21/02/2008	23/02/2008	23/02/2008	19/02/2008	19/02/2008	21/02/2008	23/02/2008	23/02/2008	20/02/2008	6/03/2010	6/03/2010	6/03/2010	6/03/2010
				Consultant	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	AECOM	AECOM	AECOM	AECOM
				Matrix	Fill	Fill	Natural Clayey Sand	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill
				Area	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road
Chemical Group	**Chemical Name**	**output unit**	**EQL**	**VMP SSTC**													
PAHs	CPAH (Total)	mg/kg			<3	29.2	0.6	61.9	91.6	0.6	2.5	95.2	<3	5.9	226.6		81.5
	CPAH (TEF)	mg/kg		67	<1.11	8.491	0.06	21.841	37.753	0.06	0.16	19.996	<1.11	1.256	56.149		12.389
	PAH (Total)	mg/kg			<7	82.9	4.6	136.7	274.5	1.7	5.1	468.5	<7	10.6	668.3		131.2
	2-chloronaphthalene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				
	2-methylnaphthalene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5
	3-methylcholanthrene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5				
	Acenaphthene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	5.4		<0.5
	Acenaphthylene	mg/kg	0.5		<0.5	6.4	<0.5	7.4	17.1	<0.5	0.6	42.5	<0.5	<0.5	13		3.2
	Anthracene	mg/kg	0.5		<0.5	4.4	<0.5	5.9	11.5	<0.5	<0.5	13.8	<0.5	<0.5	25.7		3.4
	Benz(a)anthracene	mg/kg	0.5		<0.5	11.8	0.6	24	33.5	0.6	0.8	44.6	<0.5	1.3	52.3		16.2
	Benzo(a) pyrene	mg/kg	0.5		<0.5	6.9	<0.5	16.1	31.3	<0.5	<0.5	11.7	<0.5	0.9	38.1		5.5
	Benzo(b)&(k)fluoranthene	mg/kg	1		<1	20	<1	34	57	<1	1	62	<1				
	Benzo(b)fluoranthene	mg/kg	0.5											1.4	50.4		20.3
	Benzo(g,h,i)perylene	mg/kg	0.5		<0.5	2.2	<0.5	4.5	4.8	<0.5	1	4.2	<0.5	0.5	16.8		6.3
	Benzo(k)fluoranthene	mg/kg	0.5											0.7	13.8		8.7
	Chrysene	mg/kg	0.5		<0.5	4.9	<0.5	7.6	10.5	<0.5	<0.5	23.4	<0.5	1.1	36.1		17.6
	Dibenz(a,h)anthracene	mg/kg	0.5		<0.5	<0.5	<0.5	2.5	2	<0.5	<0.5	2.7	<0.5	<0.5	4.4		1.6
	Fluoranthene	mg/kg	0.5		<0.5	15.9	0.8	23	62	0.5	0.7	91.1	<0.5	1.9	142		17.7
	Fluorene	mg/kg	0.5		<0.5	<0.5	<0.5	0.8	1.9	<0.5	<0.5	8.5	<0.5	<0.5	15.6		<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5		<0.5	3.4	<0.5	7.2	9.5	<0.5	0.7	8.6	<0.5	<0.5	14.7		5.3
	Naphthalene	mg/kg	0.5		<0.5	0.7	1.6	0.9	2.3	<0.5	<0.5	2.5	<0.5	<0.5	20.8		0.9
	PAHs (Sum of total)	mg/kg	0.5											10.6	668		131
	Phenanthrene	mg/kg	0.5		<0.5	11.6	0.7	12.6	24.8	<0.5	0.5	120	<0.5	0.8	91.2		7.9
	Pyrene	mg/kg	0.5		<0.5	14.7	0.9	24.2	63.3	0.6	0.8	93.2	<0.5	2	128		16.6
TPH	TPH C15-C36	mg/kg			<200	1700	<200	510	2370	<200	<200	3270	<200	<200	3250	<200	1270
	TPH C10 - C14	mg/kg	50	54000	<50	<50	<50	<50	<50	<50	<50	1010	<50	<50	<50	<50	<50
	TPH C15-C28	mg/kg	100	72000	<100	1060	<100	310	1380	<100	<100	2510	<100	<100	1920	<100	700
	TPH C29-C36	mg/kg	100	21,000	<100	640	<100	200	990	<100	<100	760	<100	<100	1330	<100	570
	TPH C6 - C9	mg/kg	10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
	TPH+C10 - C36 (Sum of total)	mg/kg	50		<250	1700	<250	510	2370	<250	<250	4280	<250	<50	3250	<50	1270
BTEX	Total Xylene (ESDAT)	mg/kg	0.15		<1	<1	0.8	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Benzene	mg/kg	0.2	380	<0.2	<0.2	2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5		<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (m & p)	mg/kg	0.5		<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Aluminium	mg/kg	50				2160										
	Antimony	mg/kg	5				<5										
	Arsenic	mg/kg	2		<5	<5	6	<5	<5	<5	<5	<5	7	<5	8	<5	<5
	Barium	mg/kg	10		60	30	100										20
	Beryllium	mg/kg	1		<1	1	<1										<1
	Cadmium	mg/kg	0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium	mg/kg	2		7	7	110	13	23	9	10	<2	8	12	7	8	3
	Chromium (hexavalent)	mg/kg	0.5				0.9										
	Cobalt	mg/kg	2		2	12	10										2
	Copper	mg/kg	5		17	<5	75	6	13	31	15	<5	18	27	12	6	10
	Lead	mg/kg	5		95	26	203	21	37	24	21	<5	211	50	1420	13	46
	Manganese	mg/kg	5		172	202	172										24
	Mercury	mg/kg	0.1		0.1	<0.1	<0.1	0.7	0.2	<0.1	0.5	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
	Nickel	mg/kg	2		4	9	98	10	6	6	6	<2	3	7	6	5	<2
	Selenium	mg/kg	5				<5										
	Silver	mg/kg	2				<2										
	Tin	mg/kg	5				<5										
	Vanadium	mg/kg	5		12	13	37										8
	Zinc	mg/kg	5		75	38	86	22	30	44	28	23	57	67	531	44	36

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
VMP SSTC - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
note TPH in table not speciated

AECOM

Table T4
Field Soil Duplicate
Analytical Results

		Field_ID	TBH01 0.43-0.5	DUP 01	RPD	TRIP01	RPD	TBH05 1.8-2.0	DUP02	RPD
		Sampled_Date	5/02/2011	5/02/2011	%	5/02/2011	%	12/02/2011	12/02/2011	%
		SampleCode	ES1102539004	ES1102539007		A11-FE30616		ES1103303002	ES1103303007	
ChemName	**output unit**	**LOR**	Primary Sample	Field Duplicate of TBH01_0.43-0.5		Field Inter- Laboratory Duplicate of TBH01 0.43-0.5		Primary Sample	Field Duplicate of TBH05_1.8-2	
BTEX										
Benzene	mg/kg	0.2	<0.2	<0.2	nc	<0.5	nc	<0.2	<0.2	nc
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	nc	<0.5	nc	<0.5	<0.5	nc
Toluene	mg/kg	0.5	<0.5	<0.5	nc	<0.5	nc	<0.5	<0.5	nc
Xylene (m & p)	mg/kg	0.5	<0.5	<0.5	nc	<1	nc	<0.5	<0.5	nc
Xylene (o)	mg/kg	0.5	<0.5	<0.5	nc	<0.5	nc	<0.5	<0.5	nc
Total Xylene (ESDAT)	mg/kg	0.15	<1	<1	nc	<0.15	nc	<1	<1	nc
Metals										
Arsenic	mg/kg	2	<5	<5	nc	2.4	nc	<5	<5	nc
Cadmium	mg/kg	0.5	<1	<1	nc	<0.5	nc	<1	<1	nc
Chromium	mg/kg	2	12	16	29	10	18	4	6	40
Copper	mg/kg	5	11	12	9	31	**95**	51	54	6
Lead	mg/kg	5	103	71	37	120	15	115	113	2
Mercury	mg/kg	0.1	0.2	<0.1	nc	<0.1	nc	<0.1	<0.1	nc
Nickel	mg/kg	2	4	4	0	<5	nc	18	18	0
Zinc	mg/kg	5	30	24	22	25	18	344	362	5
Polycyclic Aromatic Hydrocarbons (PAHs)										
Acenaphthene	mg/kg	0.5	<0.5	<0.5	nc	<0.5	nc	0.6	0.6	0
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	nc	<0.5	nc	0.9	0.7	25
Anthracene	mg/kg	0.5	0.5	<0.5	nc	<0.5	nc	3.1	3.6	15
Benz(a)anthracene	mg/kg	0.5	1.9	<0.5	nc	0.8	**81**	15.6	14.6	7
Benzo(a) pyrene	mg/kg	0.5	1.7	<0.5	nc	1	**52**	18.8	16.1	15
Benzo(b)&(k)fluoranthene	mg/kg	1				1.7				
Benzo(b)fluoranthene	mg/kg	0.5	1.8	<0.5	nc			23.8	18.1	27
Benzo(g,h,i)perylene	mg/kg	0.5	0.6	<0.5	nc	0.7	15	15.1	11.5	27
Benzo(k)fluoranthene	mg/kg	0.5	0.7	<0.5	nc			9.3	10.9	16
Chrysene	mg/kg	0.5	1.4	<0.5	nc	0.7	**67**	13.2	11.8	11
Dibenz(a,h)anthracene	mg/kg	0.5	<0.5	<0.5	nc	<0.5	nc	3.4	2.5	31
Fluoranthene	mg/kg	0.5	3.1	0.7	**126**	1.3	**82**	19.1	17.8	7
Fluorene	mg/kg	0.5	<0.5	<0.5	nc	<0.5	nc	<0.5	0.6	nc
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	0.6	<0.5	nc	0.6	0	14	10.6	28
Naphthalene	mg/kg	0.5	<0.5	<0.5	nc	<0.5	nc	0.6	0.8	29
PAHs (Sum of total)	mg/kg	1				7.9				
Phenanthrene	mg/kg	0.5	1.2	<0.5	nc	<0.5	nc	8.3	9.5	13
Pyrene	mg/kg	0.5	3	0.7	**124**	1.1	**93**	16	14.9	7
CPAH (ESDAT)	mg/kg		9.2	<4	nc	4.3	**73**	113.2	96.1	16
PAH (ESDAT TOTAL)	mg/kg		19	8.4	**77**	9.7	**65**	162.3	144.6	12
Total Petroleum Hydrocarbons (TPH)										
TPH C6 - C9	mg/kg	10	<10	<10	nc	<10	nc	<10	<10	nc
TPH C10 - C14	mg/kg	50	<50	<50	nc	<50	nc	<50	<50	nc
TPH C15-C28	mg/kg	100	<100	<100	nc	<100	nc	600	530	12
TPH C29-C36	mg/kg	100	<100	<100	nc	<100	nc	610	470	26
TPH+C10 - C36 (Sum of total)	mg/kg	50	<50	<50	nc	<100	nc	1210	1000	19

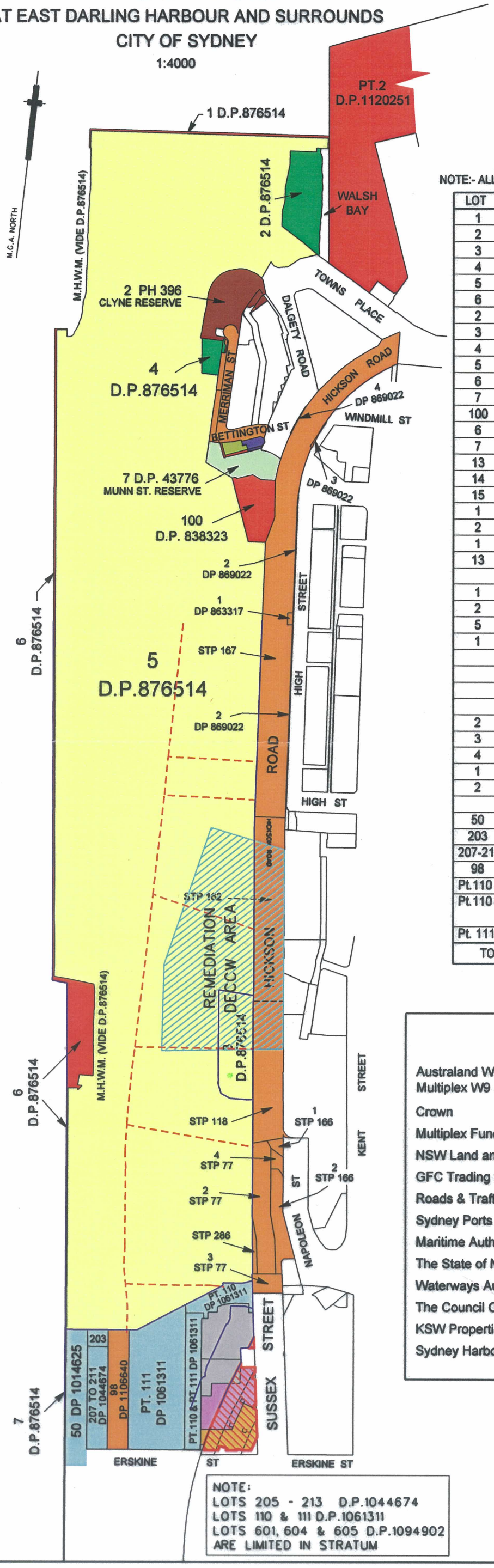
Notes
mg/kg - milligrams per kilogram
LOR - Laboratory Limit of Reporting
< denotes concentration less than laboratory LOR
nc - denotes not calcuable as one or more results less than LOR
RPD - Relative Percent Difference
CPAH= Sum of 8 PAH Compounds (Benz(a)anthracene Benzo(a) pyrene;
Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene;

Appendix C

Ownership Plans

PLAN

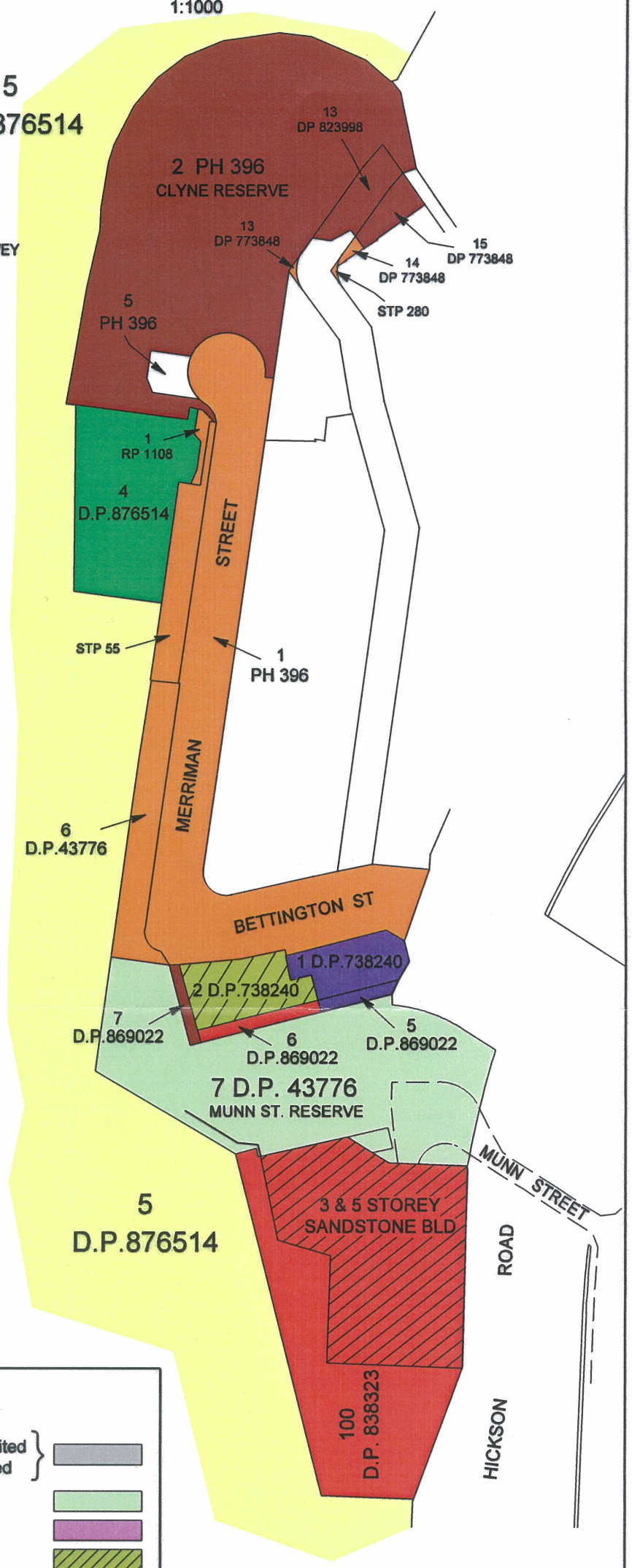
OWNERSHIP OF LAND
AT EAST DARLING HARBOUR AND SURROUNDS
CITY OF SYDNEY
1:4000



NOTE:- ALL AREAS SUBJECT TO SURVEY

LOT	PLAN	AREA (m²)
1	DP 876514	424.1
2	DP 876514	3035
3	DP 876514	3402
4	DP 876514	637.3
5	DP 876514	200300
6	DP 876514	3885
2	DP 869022	175.8
3	DP 869022	32.2
4	DP 869022	21.0
5	DP 869022	32.0
6	DP 869022	50.4
7	DP 869022	26.7
100	DP 838323	1968
6	DP 43776	284.6
7	DP 43776	1631
13	DP 773848	3.5
14	DP 773848	9.2
15	DP 773848	67.8
1	DP 738240	173.1
2	DP 738240	225.7
1	DP 863317	57.7
13	DP 823998	107.8
	STP 280	2.5
1	PH 396	1570
2	PH 396	2474
5	PH 396	56.0
1	RP 1108	21.3
	STP 55	199.0
	STP 162	5240
	STP 118	3968
	STP 286	181.0
2	STP 77	2250
3	STP 77	532.9
4	STP 77	204.2
1	STP 166	173.1
2	STP 166	1233
	STP 167	13320
50	DP 1014625	2812
203	DP 1044674	328.9
207-211	DP 1044674	2000
98	DP 1106640	2329
Pt.110	DP 1061311	1206
Pt.110 & Pt. 111	DP 1061311	2054
Pt. 111	DP 1061311	6947
TOTAL AREA 26.57 ha		

DIAGRAM
1:1000



LEGEND

- Australand W9 & 10 Stage 3A Pty Limited / Multiplex W9 & 10 Stage 3A Pty Limited
- Crown
- Multiplex Funds Management Limited
- NSW Land and Housing Corporation
- GFC Trading Pty Limited
- Roads & Traffic Authority of NSW
- Sydney Ports Corporation
- Maritime Authority of NSW
- The State of New South Wales
- Waterways Authority
- The Council Of The City Of Sydney
- KSW Properties Pty Limited
- Sydney Harbour Foreshore Authority

- SITE BOUNDARIES
- PLANNING BOUNDARIES
- REMEDIATION - DECCW

NOTE:
LOTS 205 - 213 D.P.1044674
LOTS 110 & 111 D.P.1061311
LOTS 601, 604 & 605 D.P.1094902
ARE LIMITED IN STRATUM

RYGATE & COMPANY PTY. LIMITED
SURVEYORS, TOWN PLANNERS
ROAD & DRAINAGE ENGINEERS
81 YORK STREET, SYDNEY 2000
PHONE 9262 6800
ACN 001 204897
ABN 61 001 204897
FAX 9262 6843

REF: 72085-Ownership-G DATE: 3/3/2010
DECCW ZONE ADDED BASED ON PLAN LLD_ASK_0109-B

Appendix D

Borelogs

AECOM Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2072

BOREHOLE LOG TBH01

PROJECT NUMBER 60153531/5.7 **DATE** 05 Feb 11
PROJECT NAME Tree Root Mass Investigation
LOCATION Hickson Road, Millers Point NSW
DRILLING METHOD Coring
SAMPLING METHOD Grab

LOGGED BY Kate O'Brien
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Asphalt Footpath	0.10
						CONCRETE	Concrete Slab	0.18
				0.2		CONCRETE	Concrete Slab	0.22
						FILL	Gravel (FILL), medium sized road base gravels, loose, dry, greyish brown. No odour, staining or potential asbestos containing materials observed (ACM).	0.30
						CONCRETE	Concrete Slab	0.43
2.4		TBH01_0.43-0.5	✳	0.4		FILL	Sandy Gravel (FILL), fine to medium grained sand (40%), medium to cobble sized sandstone gravel with minor brick and fine sized coke gravel, fine (<5 mm) rootlets.	0.55
						Sandstone	Sandstone Bedrock Borehole terminated at 0.59 m bgs in sandstone bedrock. Total Depth: 0.59 m	

AECOM Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2072

BOREHOLE LOG TBH03

PROJECT NUMBER 60153531/5.7 **DATE** 05 Feb 11
PROJECT NAME Tree Root Mass Investigation
LOCATION Hickson Road, Millers Point NSW
DRILLING METHOD Hand Auger
SAMPLING METHOD Hand Auger

LOGGED BY Kate O'Brien
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Asphalt Footpath	0.09
						CONCRETE	Concrete Slab	0.18
				0.2		CONCRETE	Concrete Slab	0.30
						FILL	Gravel with sand (FILL), medium dense, saturated from coring, brown/grey, medium sized concrete gravel. No odour, staining or asbestos containing material (ACM).	0.32
				0.4		CONCRETE	Concrete Slab	0.50
						CONCRETE	Cemented Concrete, Brick and Sandstone.	0.70
2.2		TBH03_0.7-0.9		0.8		FILL	Silty Sandy Gravel (Fill), medium dense, brown with black, fine to coarse sand with minor silt, fine sub angular and angular brick gravel, moist (from coring). No odour, staining or potential ACM observed.	1.00
				1.0		FILL	Red Clay and Sandstone Bricks (Broken).	1.20
0.2		TBH03_1.2-1.3	✳	1.2		FILL	Sandy Clay and Clayey Sand (FILL), medium dense, brown and dark grey, fine to medium grained sand, minor inclusion of fine sandstone gravel. Minor dark grey staining and mild tar odour observed. No ACM observed.	1.50
0.2		TBH03_1.5-1.6	✳	1.4		FILL	Clayey Sand (FILL), medium stiff to stiff, low to medium plasticity, moist, fine to medium grained sand, orange and dark grey. Minor dark grey staining and mild tar odour observed. No ACM observed.	1.66
				1.6			Borehole terminated on Sandstone (likely bedrock) Total Depth: 1.66 m	

AECOM Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2072

BOREHOLE LOG TBH04

PROJECT NUMBER 60153531/5.7 **DATE** 12 Feb 11
PROJECT NAME Tree Root Mass Investigation
LOCATION Hickson Road, Millers Point NSW
DRILLING METHOD Push Tube
SAMPLING METHOD Grab/Push tube

LOGGED BY Kate O'Brien
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Asphalt Footpath	0.10
				0.2		FILL	Gravel with sand (FILL), fine to medium sized road base gravels, greyish brown, saturated from coring. No odour, staining or ACM observed.	0.24
				0.4		CONCRETE	Concrete Slab	0.60
0.6		TBH04_0.6-0.65	✳	0.6		FILL	Sandy Gravel (FILL), weathered and crushed sandstone cobbles, dense, moist to dry, dark yellow and brown. No odour, staining or ACM observed.	
0.2		TBH04_0.7-0.8	✳	0.8		FILL	Sandstone Boulder (FILL), dense, white, dry. No odour or staining observed.	0.80
						FILL	Silty Sand (FILL), medium dense, dark brown, dry, fine grained sand with silt. No odour, staining or ACM observed.	0.90
0.2		TBH04_0.9-1.4		1.0				
				1.2				
				1.4		FILL	Gravelly Clayey Sand (FILL), medium dense, dark brown and black, slightly moist, minor fine surrounded charcoal gravel, rootlets and timber. No odour, staining or ACM observed.	1.40
				1.6				
0.2		TBH04_1.7-2.0	✳	1.8				
				2.0			Borehole terminated at 2 m bgs, target depth reached. Total Depth: 2.00 m	2.00

60153531_5.7_BORELOGS_21FEB2011.GPJ 06/06/11

AECOM Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2072

BOREHOLE LOG TBH05

PROJECT NUMBER 60153531/5.7 **DATE** 12 Feb 11
PROJECT NAME Tree Root Mass Investigation
LOCATION Hickson Road, Millers Point NSW
DRILLING METHOD Push Tube
SAMPLING METHOD Grab/Push tube

LOGGED BY Kate O'Brien
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Asphalt Footpath	
						FILL	Gravel (FILL), coarse concrete and brick gravel, medium dense, dry, pale brown and grey. No odour, staining or ACM observed.	0.10
0.3				0.2		FILL	Sandy Gravel (FILL), fine grained sand with minor silt, fine to medium concrete, brick and sandstone gravel, medium dense, dry, 5 mm tree root. No odour, staining or ACM observed.	0.20
						ASPHALT	Asphalt Slab.	0.21
						CONCRETE	Concrete Slab	0.24
				0.4				
						FILL	Clayey Sandy Gravel (FILL), coarse to cobble sized sandstone gravel with clayey sand, dense, saturated, yellow brown. No odour, staining or ACM observed.	0.47
0.2				0.6				
						FILL	Sandstone Boulder	0.70
				0.8				
				1.0		FILL	Bitumen Slab (FILL), very dense, dry, black. No odour, staining or ACM observed.	1.00
0.2		TBH05_1.0-1.3		1.2				
						FILL	Sandy Gravel (FILL), weathered sandstone cobbles/boulders, very dense, moist, dark yellow. No odour or staining observed.	1.30
				1.4			20 mm Tree Root at 1.4 m	
0		TBH05_1.3-1.7	✳					
				1.6				
				1.8		FILL	Gravel (FILL), bituminous gravel , very dense, saturated, black. No odour or staining observed.	1.80
0.1		TBH05_1.8-2.0	✳					
		DUP02	✳	2.0			Borehole terminated at 2 m bgs, target depth reached. Total Depth: 2.00 m	2.00

60153531_5.7_BORELOGS_21FEB2011.GPJ 06/06/11

AECOM Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2072

BOREHOLE LOG TBH06

PROJECT NUMBER 60153531/5.7
PROJECT NAME Tree Root Mass Investigation
LOCATION Hickson Road, Millers Point NSW
DRILLING METHOD Push Tube
SAMPLING METHOD Grab/Push tube

DATE 5 Feb 2011/ 12 Feb 2011

LOGGED BY Kate O'Brien
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Asphalt Footpath	0.10
0		TBH06_0.1-0.2		0.2		FILL	Clayey Sandy GRAVEL (FILL), fine to coarse sandstone gravel with minor concrete and road base gravels, loose to medium dense, dry, brown, inclusion of	0.20
						CONCRETE	Concrete Slab	0.37
				0.4		FILL	Sandy Gravel (FILL), medium sized sandstone gravel and sandstone cobbles, medium grained sand, medium dense, slightly moist, yellow and brown. No odour staining or ACM observed. 50mm tree root at 0.47 m bgs	
0.1		TBH06_0.55-0.6	✳	0.6		FILL	Sandy Gravel (FILL), sandstone and concrete cobbles, coarse sandstone gravel and minor fine to medium grained sand, medium dense, dry, yellow/brown. No odour staining or ACM observed.	0.60
				0.8				
						CONCRETE	Concrete Slab	0.90
				1.0		FILL	Sandy Clay (FILL), medium stiff, low plasticity, fine grained sand, slightly moist. No odour staining or ACM observed.	1.00
				1.2				
				1.4				
				1.6				
0		TBH06_1.5-2.0	✳	1.8				
				2.0			Borehole terminated at 2 m bgs, target depth reached. Total Depth: 2.00 m	2.00

AECOM Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2072

BOREHOLE LOG TBH07

PROJECT NUMBER 60153531/5.7
PROJECT NAME Tree Root Mass Investigation
LOCATION Hickson Road, Millers Point NSW
DRILLING METHOD Coring
SAMPLING METHOD Grab

DATE 04 Feb 11

LOGGED BY Kate O'Brien
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Asphalt Footpath	0.10
0.7		TBH07_0.1-0.15	✳			FILL	Gravelly Sand (FILL), fine to medium grained sand with minor clay and silt, fine to coarse sub angular sandstone and road base, medium dense, slightly moist, dark brown and grey. No odour staining or ACM observed.	0.15
				0.2		ASPHALT	Asphalt Slab.	0.32
				0.4		CONCRETE	Concrete Slab	
				0.6				0.77
							Borehole terminated at 0.77 m bgs in concrete - maximum reach of diatube. Total Depth: 0.77 m	

60153531_5.7_BORELOGS_21FEB2011.GPJ 06/06/11

AECOM Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2072

BOREHOLE LOG TBH08

PROJECT NUMBER 60153531/5.7 **DATE** 04 Feb 11
PROJECT NAME Tree Root Mass Investigation
LOCATION Hickson Road, Millers Point NSW
DRILLING METHOD Coring
SAMPLING METHOD Grab

LOGGED BY Kate O'Brien
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Asphalt Footpath	0.13
0.5		TBH08_0.13-0.25		0.2		FILL	Sandy Gravel (FILL), fine to medium sized sand, fine to cobble sized gravel (sandstone, concrete and road base gravels), loose, dry to slightly moist, pale brown and grey. No odour staining or ACM observed. 50 mm tree root above asphalt subsurface slab.	0.29
				0.4		ASPHALT	Asphalt Slab.	
				0.6				0.77
							Borehole terminated at 0.77 m bgs in asphalt - maximum reach of diatube. Total Depth: 0.77 m	

AECOM Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2072

BOREHOLE LOG TBH09

PROJECT NUMBER 60153531/5.7 **DATE** 04 Feb 11
PROJECT NAME Tree Root Mass Investigation
LOCATION Hickson Road, Millers Point NSW
DRILLING METHOD Coring
SAMPLING METHOD

LOGGED BY Kate O'Brien
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						ASPHALT	Asphalt Footpath	0.05
						FILL	Gravel (FILL), fine angular road base gravels, loose, dry, greyish brown. No odour, staining or ACM observed.	0.11
				0.2		FILL	Gravel (FILL), concrete gravel, dense, dry, pale grey. No odour, staining or ACM observed.	0.24
				0.4		ASPHALT	Asphalt Slab	
				0.6				0.64
							Borehole terminated at 0.64 m bgs in asphalt - maximum reach of diatube. Total Depth: 0.64 m	

Appendix E

Calibration Certificates

Photoionization Detector (Hire Unit)

AECOM

Job Number/Name: 60153531/5.7 Hickson Road Tree Investigation

Frequency: Daily on Use or Twice Daily

PID Serial Number	Date/Time	Fresh Air Cal.	Span Gas concentration (e.g.101 ppm Isobutylene)	Span Gas Cal.	Name (print)	Signature
T-105429	4-2-11 / 11 am	0.0	101.1 ppm ± 3	100 ppm ± 3	Kate O'Brien	
"	5-2-11 / 8am	0.0	100.7 ppm ± 3	"	Kate O'Brien	
"	12-2-11 / 8 am	0.0	100 ppm ± 3	102.9 ppm	Kate O'Brien	

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-105429

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6 eV			
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm		
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		103ppm Isobutylene	NATA	828SY		100ppm

Calibrated by: Carly Hanrahan

Calibration date: 18/01/2011

Next calibration due: 17/02/2011

Appendix F

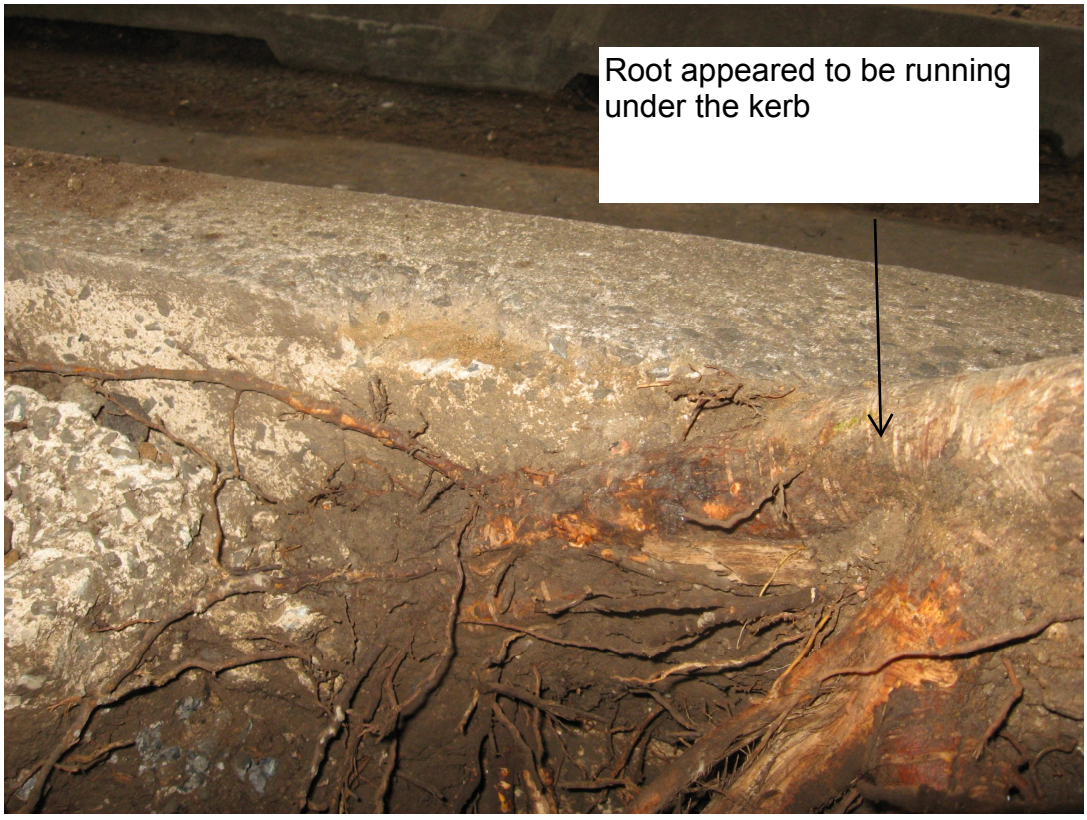
Site Photographs

Tree Pit – Tree T11

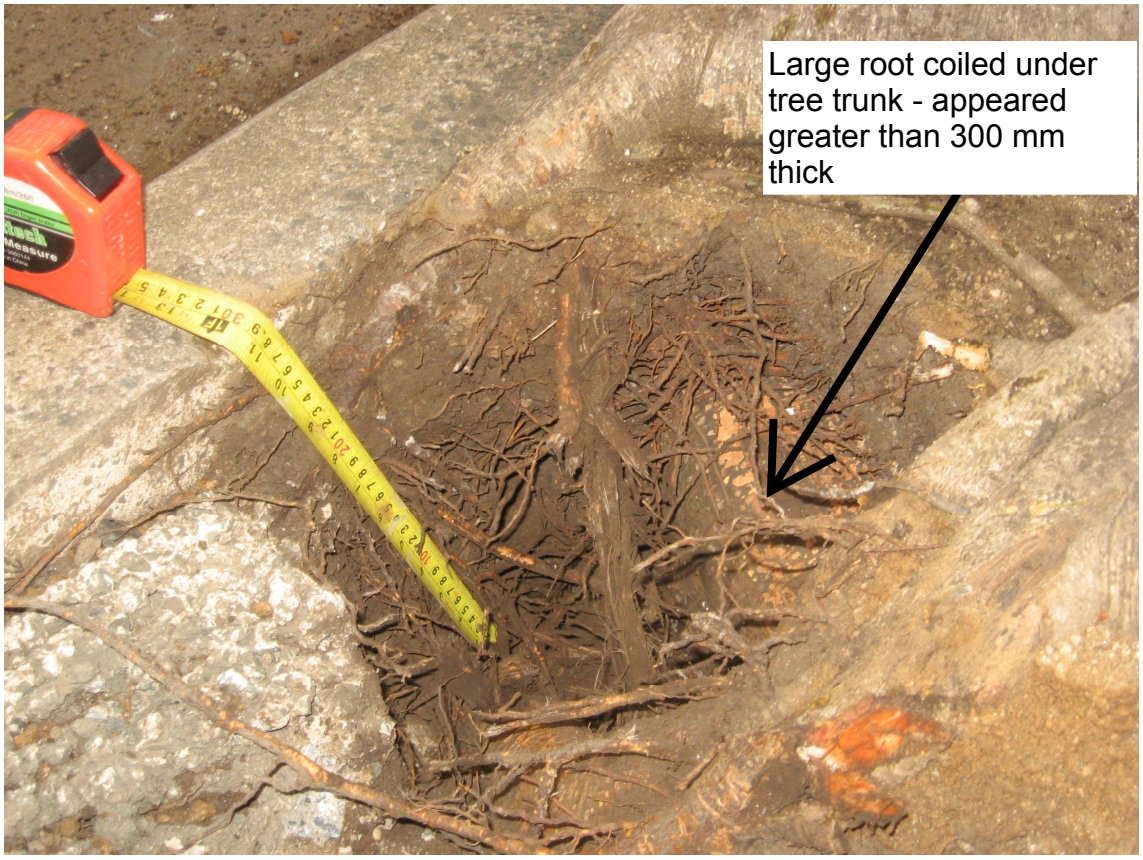
Test Pit - Tree T15

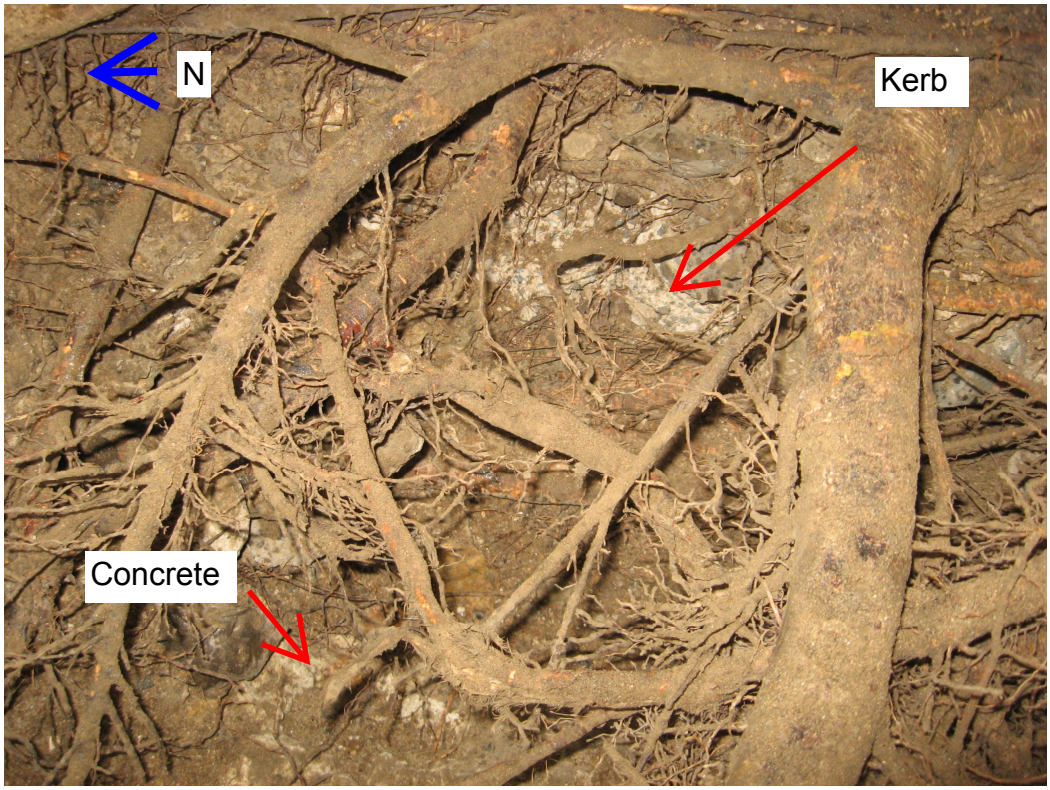
Test pit limited in extent due to concrete subsurface

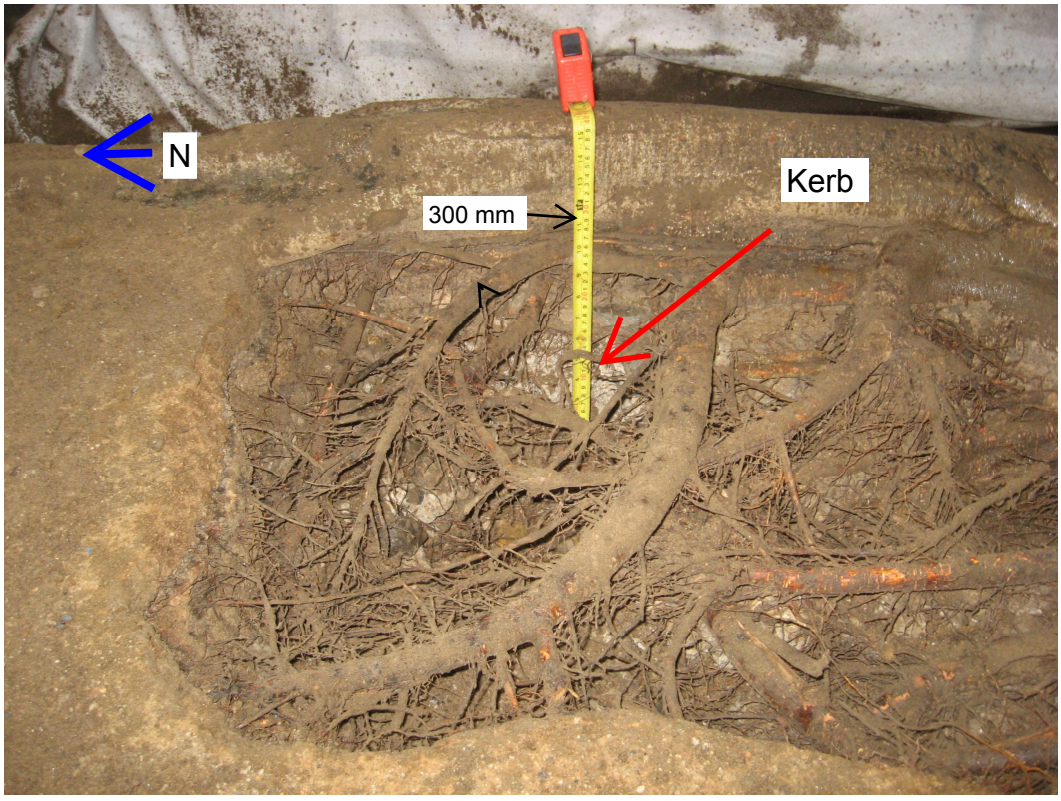
Concrete layer

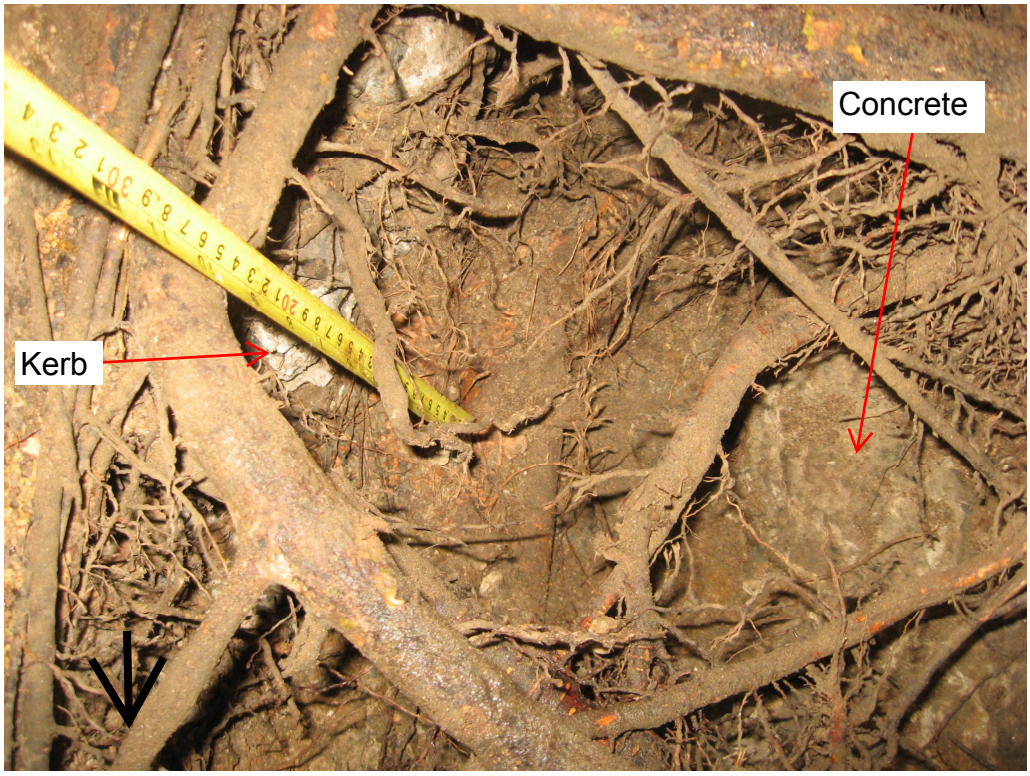

Root appeared to be running under the kerb

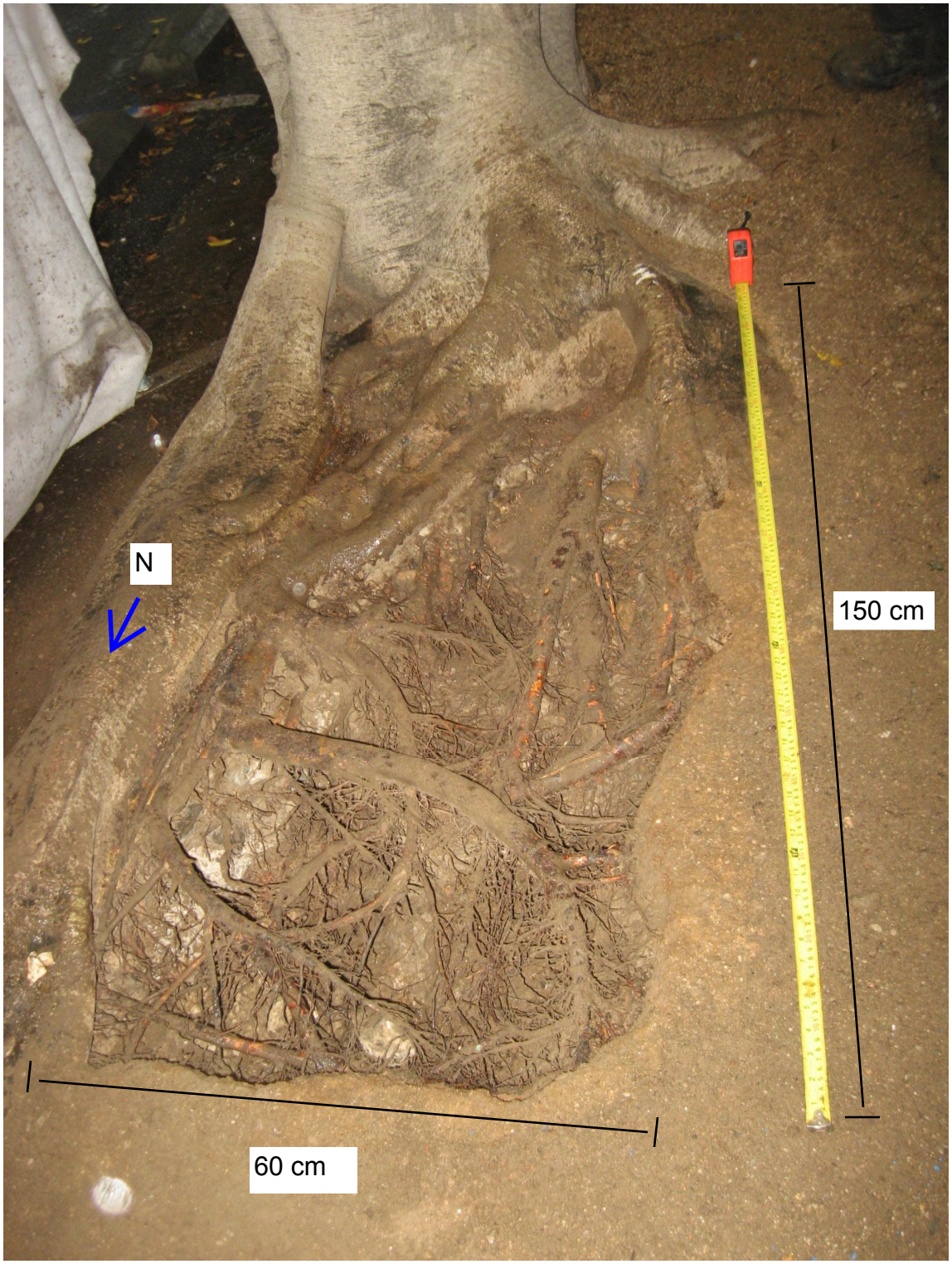

Concrete layer


Large root coiled under tree trunk - appeared greater than 300 mm thick

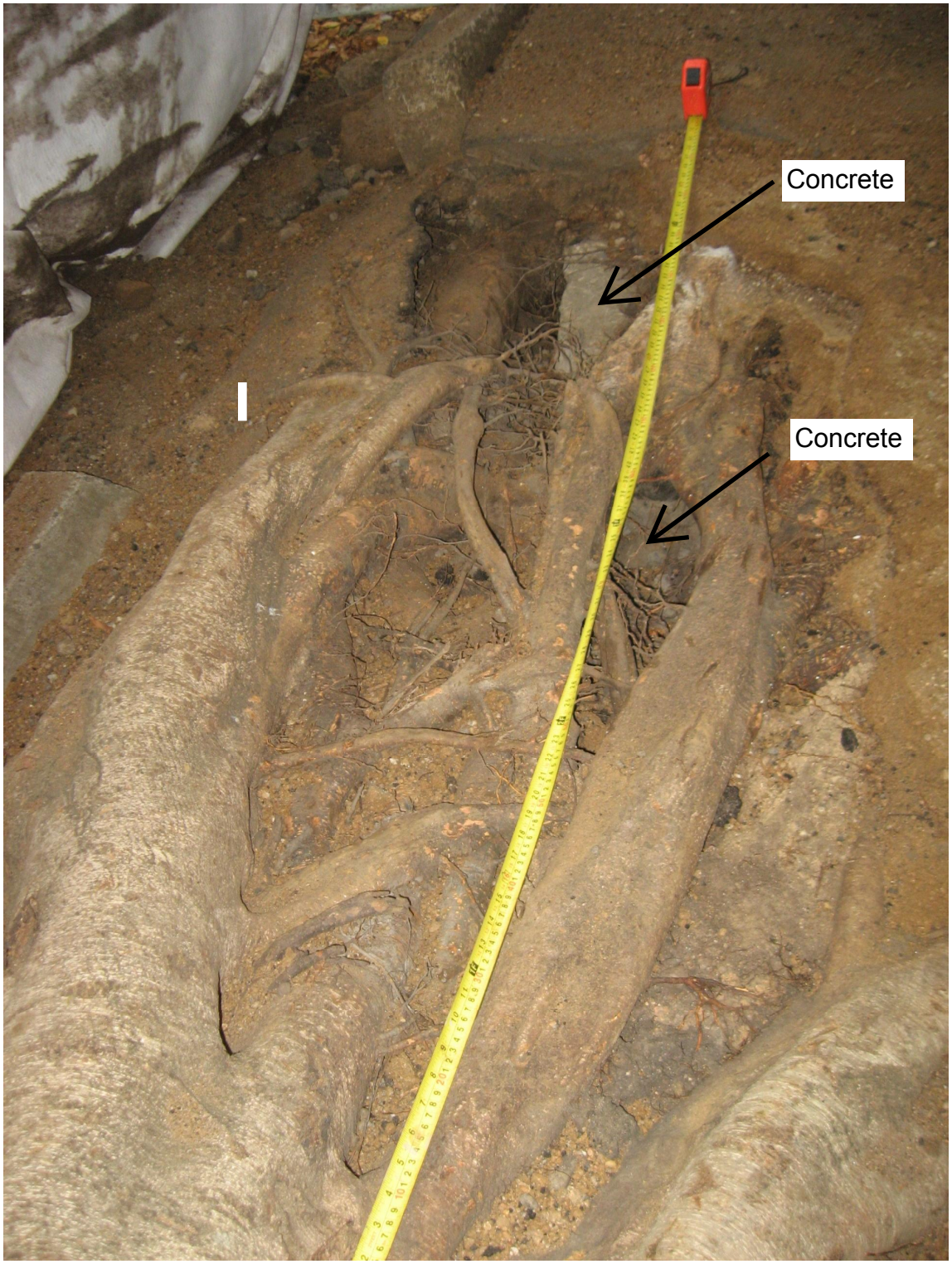

N
Kerb
Concrete

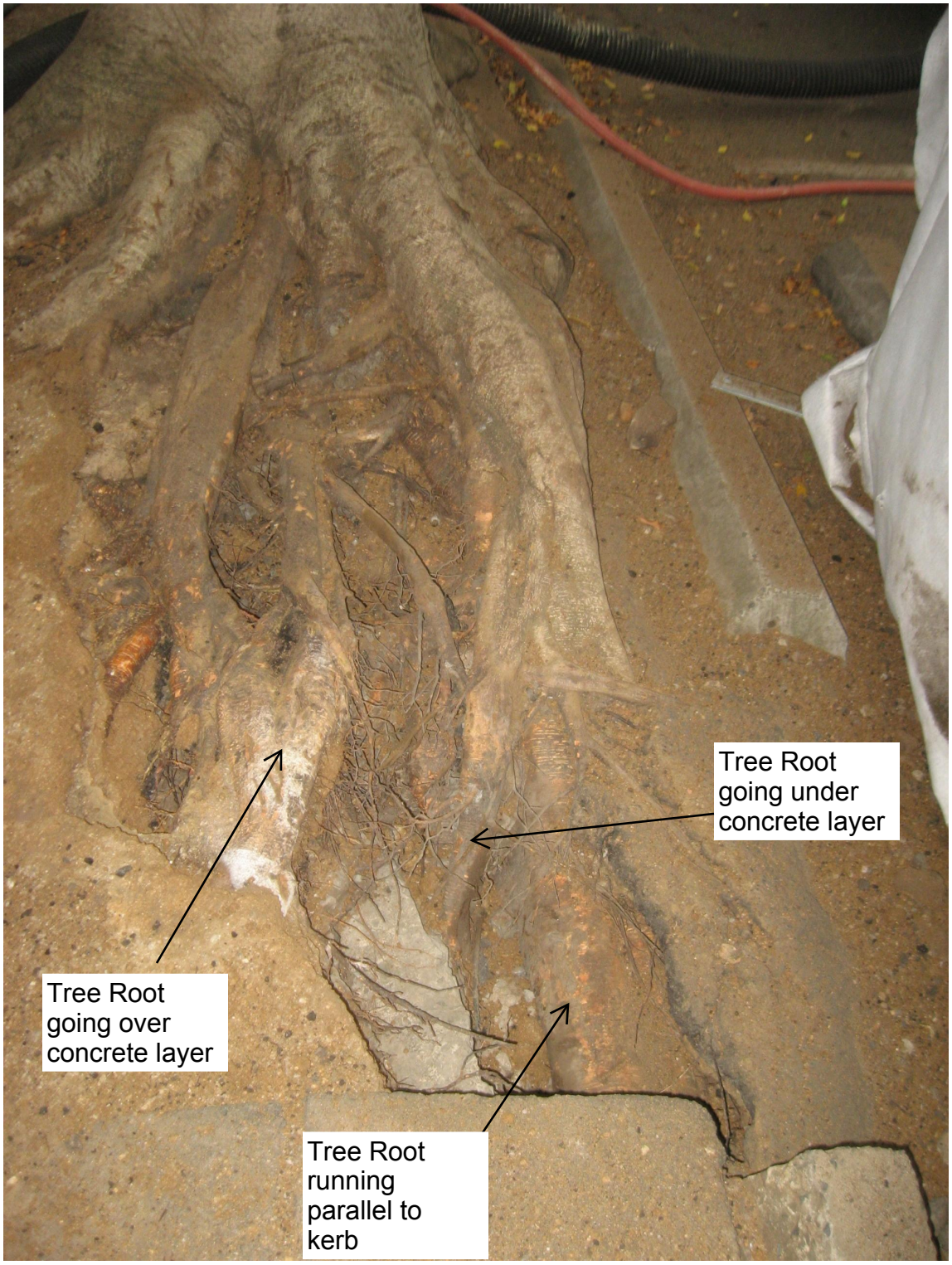

N
300 mm
Kerb


Concrete
Kerb


N
150 cm
60 cm

Test Pit – Tree T18


Concrete
Concrete


Tree Root going under concrete layer
Tree Root going over concrete layer
Tree Root running parallel to kerb


W

Appendix G

Laboratory Reports

CERTIFICATE OF ANALYSIS

Work Order	: **ES1102539**	Page	: 1 of 7
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MS KATE O BRIEN	Contact	: Jennifer Cullen
Address	: LEVEL 5, 828 PACIFIC HIGHWAY GORDON NSW, AUSTRALIA 2072	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kate.obrien@aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 8484 8999	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 8484 8989	Facsimile	: +61 2 8784 8500
Project	: 60153531 5 7 HICKSON ROAD	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: 38962AUS		
C-O-C number	: ----	Date Samples Received	: 07-FEB-2011
Sampler	: KO	Issue Date	: 15-FEB-2011
Site	: ----		
		No. of samples received	: 9
Quote number	: EN/004/10	No. of samples analysed	: 7

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics

General Comments

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

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

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

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

When 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.

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

- **EG005T: Sample ES1102363013 shows poor duplicate precision for zinc due to sample heterogeneity. Confirmed by re-extraction and re-analysis.**
- **EG005T: Sample ES1102438002 shows poor duplicate precision for zinc due to sample heterogeneity. Confirmed by re-extraction and re-analysis.**
- **EP075(SIM): Poor matrix spike recovery due to sample matrix interferences.**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: TBH07_0.1-0.15	TBH03_1.2-1.3	TBH03_1.5-1.6	TBH01_0.43-0.5	TBH06_0.55-0.6
				Client sampling date / time: 04-FEB-2011 15:00	05-FEB-2011 15:00	05-FEB-2011 15:00	05-FEB-2011 15:00	05-FEB-2011 15:00
				ES1102539-001	ES1102539-002	ES1102539-003	ES1102539-004	ES1102539-005
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	**7.3**	**14.3**	**16.4**	**12.4**	**10.8**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**5**	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**46**	**6**	**13**	**12**	**8**
Copper	7440-50-8	5	mg/kg	**51**	**23**	**47**	**11**	**28**
Lead	7439-92-1	5	mg/kg	**25**	**11**	**20**	**103**	**20**
Nickel	7440-02-0	2	mg/kg	**49**	**8**	**10**	**4**	**5**
Zinc	7440-66-6	5	mg/kg	**43**	**98**	**106**	**30**	**29**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	**0.2**	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	**1.4**	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	**1.4**	<0.5	<0.5	**1.2**	**0.6**
Anthracene	120-12-7	0.5	mg/kg	**1.4**	<0.5	<0.5	**0.5**	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	**6.4**	<0.5	<0.5	**3.1**	**1.7**
Pyrene	129-00-0	0.5	mg/kg	**8.6**	<0.5	<0.5	**3.0**	**1.9**
Benz(a)anthracene	56-55-3	0.5	mg/kg	**4.7**	<0.5	<0.5	**1.9**	**0.9**
Chrysene	218-01-9	0.5	mg/kg	**4.8**	<0.5	<0.5	**1.4**	**0.7**
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	**8.0**	<0.5	<0.5	**1.8**	**0.7**
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	**2.7**	<0.5	<0.5	**0.7**	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	**7.8**	<0.5	<0.5	**1.7**	**0.8**
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	**4.1**	<0.5	<0.5	**0.6**	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	**0.8**	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	**6.5**	<0.5	<0.5	**0.6**	<0.5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**280**	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	**420**	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	**700**	<50	<50	<50	<50
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: TBH07_0.1-0.15	TBH03_1.2-1.3	TBH03_1.5-1.6	TBH01_0.43-0.5	TBH06_0.55-0.6
				Client sampling date / time: 04-FEB-2011 15:00	05-FEB-2011 15:00	05-FEB-2011 15:00	05-FEB-2011 15:00	05-FEB-2011 15:00
				ES1102539-001	ES1102539-002	ES1102539-003	ES1102539-004	ES1102539-005
EP080: BTEX - Continued								
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**126**	**121**	**118**	**118**	**120**
2-Chlorophenol-D4	93951-73-6	0.1	%	**120**	**116**	**110**	**109**	**109**
2.4.6-Tribromophenol	118-79-6	0.1	%	**93.2**	**108**	**97.5**	**80.8**	**72.1**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**117**	**114**	**110**	**111**	**112**
Anthracene-d10	1719-06-8	0.1	%	**118**	**110**	**105**	**112**	**111**
4-Terphenyl-d14	1718-51-0	0.1	%	**120**	**119**	**115**	**117**	**116**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**95.4**	**93.2**	**118**	**89.9**	**89.0**
Toluene-D8	2037-26-5	0.1	%	**90.2**	**88.1**	**116**	**81.2**	**85.5**
4-Bromofluorobenzene	460-00-4	0.1	%	**118**	**118**	**103**	**107**	**110**

Analytical Results

Sub-Matrix: SOIL				Client sample ID	TBH08_0.13-0.25	DUP 01	----	----	----
				Client sampling date / time	04-FEB-2011 15:00	05-FEB-2011 15:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1102539-006	ES1102539-007	----	----	----
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		6.8	13.4	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg		11	16	----	----	----
Copper	7440-50-8	5	mg/kg		76	12	----	----	----
Lead	7439-92-1	5	mg/kg		26	71	----	----	----
Nickel	7440-02-0	2	mg/kg		10	4	----	----	----
Zinc	7440-66-6	5	mg/kg		38	24	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		2.8	0.7	----	----	----
Pyrene	129-00-0	0.5	mg/kg		3.1	0.7	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		1.3	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg		1.1	<0.5	----	----	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		1.3	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		1.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		0.7	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg		110	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg		260	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		370	<50	----	----	----
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL				Client sample ID	TBH08_0.13-0.25	DUP 01	----	----	----
				Client sampling date / time	04-FEB-2011 15:00	05-FEB-2011 15:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1102539-006	ES1102539-007	----	----	----
EP080: BTEX - Continued									
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.1	%		122	122	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%		115	115	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%		92.6	86.7	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		116	118	----	----	----
Anthracene-d10	1719-06-8	0.1	%		112	114	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%		118	119	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		100	91.3	----	----	----
Toluene-D8	2037-26-5	0.1	%		119	87.7	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%		107	115	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	56.3	133.3
2-Chlorophenol-D4	93951-73-6	53.8	133.8
2.4.6-Tribromophenol	118-79-6	23.1	134.9
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	58.9	132.7
Anthracene-d10	1719-06-8	55.0	137.6
4-Terphenyl-d14	1718-51-0	54.0	147.8
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

CPFO419 (ENV) Chain of Custody Analysis Request Form

15-2-11

AECOM

AECOM - Sydney (Gordon) PO Box 726 Pymble NSW 2073 Australia	Tel: 61 2 8484 8999 Fax: 61 2 8484 8989 Email: Kate.O'Brien@aecom.com
Laboratory Details Lab. Name: ALS Lab. Address: 277 Woodpark Rd Smithfield Contact Name: Lab. Ref:	Tel: 8784 8555 Fax: Preliminary Report by: Final Report by: Lab Quote No: SY/418/10 V2

1/2

Project Name: Hickson Road **Project Number:** 60153531/5.7 **Purchase Order Number:** 38962AUS

Sample collected by: Kate O'Brien **Sample Results to be returned to:** Kate O'Brien

Specifications: Esdat

	(Tick)		
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	☐ Yes	☐ No	☐ N/A
2. Fast TAT Guarantee Required?	☐ Yes	☐ No	☐ N/A
3. Is any sediment layer present in waters to be excluded from extractions?	☐ Yes	☐ No	☐ N/A
4. Special storage requirements?	☐ Yes	☐ No	☐ N/A
5. Preservation requirements?	☐ Yes	☐ No	☐ N/A
6. Other requirements?	☐ Yes	☐ No	☐ N/A

7. Report Format: ☐ Fax ☐ Hard copy ☑ Email 8. Project Manager: Anthony Davis tel: 8484 8939

Lab. ID	Sample ID	Sampling Date & time	Matrix: soil	Matrix: water	Matrix: other	Preservation: filtrd	Preservation: acid	Preservation: ice	Preservation: other	Container (No. & type)	Heavy Metals (8)	TPH (C6-C36)	BTEX	PAHs	HOLD
1	TBH07_0.1-0.15	4.2.11	X					X		150ml	X	X	X	X	
(8)	TBH03_0.7-0.9	5.2.11	X					X		250ml					X
2	TBH03_1.2-1.3	5.2.11	X					X		250ml	X	X	X	X	
3	TBH03_1.5-1.6	5.2.11	X					X		250ml	X	X	X	X	
4	TBH01_0.43-0.5	5.2.11	X					X		250ml	X	X	X	X	
(9)	TBH06_0.1-0.2	5.2.11	X					X		250ml					X
5	TBH06_0.55-0.6	5.2.11	X					X		250ml	X	X	X	X	
6	TBH08_0.13-0.25	4.2.11	X					X		250ml	X	X	X	X	
7	DUP01	5.2.11	X					X		150ml	X	X	X	X	

Remarks & comments

Environmental Division Sydney
Work Order
ES1102539

Telephone : +61-2-8784 8555

Relinquished By:	Received by:		
Name: Kate O'Brien Date: 7.2.11	Name: Sonya Yoo Date: 07/2/11	Received in good condition?	Yes/No/NA — Method of Shipment
of: AECOM Time: 9am	of: ALS Sydney Time: 1550	Samples received chilled? 6.6	Yes/No/NA — Consignment Note No.
			Yes/No/NA — Transport Co: ☐ Courier ☐ Postal ☐ By Hand
Relinquished By:	**Received by:**	Received in good condition?	Yes/No/NA — Method of Shipment
Name: Date:	Name: Date:	Samples received chilled?	Yes/No/NA — Consignment Note No.
of: Time:	of: Time:		Yes/No/NA — Transport Co: ☐ Courier ☐ Postal ☐ By Hand

CPFO419 (ENV) Chain of Custody Analysis Request Form

AECOM

AECOM - Sydney (Gordon)
PO Box 726
Pymble NSW 2073 Australia
Tel: 61 2 8484 8999
Fax: 61 2 8484 8989
Email: Kate.O'Brien@aecom.com

Laboratory Details
Lab. Name: ALS
Lab. Address: 277 Woodpark Rd Smithfield
Contact Name:
Lab. Ref:
Tel: 8784 8555
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No: SY/418/10 V2

Project Name: Hickson Road **Project Number:** 60153531/5.7 **Purchase Order Number:** 38962AUS

Sample collected by: Kate O'Brien **Sample Results to be returned to:** Kate.O'Brien@aecom.com / Anthony.Davis@aecom.com

Specifications: Esdat

	(Tick)		
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	☐ Yes	☐ No	☐ N/A
2. Fast TAT Guarantee Required?	☐ Yes	☐ No	☐ N/A
3. Is any sediment layer present in waters to be excluded from extractions?	☐ Yes	☐ No	☐ N/A
4. Special storage requirements?	☐ Yes	☐ No	☐ N/A
5. Preservation requirements?	☐ Yes	☐ No	☐ N/A
6. Other requirements?	☐ Yes	☐ No	☐ N/A

7. Report Format: ☐ Fax ☐ Hard copy ☑ Email 8. Project Manager: Anthony Davis tel: 8484 8939

Analysis Request

Lab. ID	Sample ID	Sampling Date & time	Matrix: soil	water	other	Preservation: fil'ed	acid	ice	other	Container (No. & type)	Heavy Metals (8)	TPH (C6-C36)	BTEX	PAHs	Remarks & comments
1	TBH07_0·1-0·15	4·2·11	X							150ml					
8	TBH03_0·7-0·9	5·2·11	X							250ml					
2	TBH03_1·2-1·3	5·2·11	X							250ml					
3	TBH03_1·5-1·6	5·2·11	X							250ml					
4	TBH01_0·43-0·5	5·2·11	X							250ml					
9	TBH06_0·1-0·2	5·2·11	X							250ml					
5	TBH06_0·55-0·6	5·2·11	X							250ml					
6	TBH08_0·13-0·25	4·2·11	X							250ml					
7	DUP01	5·2·11	X							150ml					

Environmental Division Sydney
Work Order
ES1102539
Telephone : +61-2-8784 8555

Relinquished By:	Received by:			
Name: Kate O'Brien	Date: 7·2·11	Name: Scott Stephens	Date: 07/2/11	Received in good condition? Yes/No/NA — Method of Shipment:
of: AECOM	Time: 9am	of: ALS Sydney	Time: 15:50	Samples received chilled? Yes/No/NA (6.6) — Consignment Note No.: — Transport Co: ☐ Courier ☐ Postal ☐ By Hand
Relinquished By:		**Received by:**		Received in good condition? Yes/No/NA — Method of Shipment:
Name:	Date:	Name:	Date:	Samples received chilled? Yes/No/NA — Consignment Note No.:
of:	Time:	of:	Time:	Transport Co: ☐ Courier ☐ Postal ☐ By Hand

CPFO419 (ENV) Chain of Custody Analysis Request Form

AECOM

AECOM - Sydney (Gordon) PO Box 726 Pymble NSW 2073 Australia	Tel: 61 2 8484 8999 Fax: 61 2 8484 8989 Email: Kate.O'Brien@aecom.com

Laboratory Details

Lab. Name:	ALS	Tel:	8784 8555
		Fax:	
Lab. Address:	277 Woodpark Rd Smithfield	Preliminary Report by:	
Contact Name:		Final Report by:	
Lab. Ref:		Lab Quote No:	SY/418/10 V2

Project Name: Hickson Road **Project Number:** 60153531/5.7 **Purchase Order Number:** 38962AUS

Sample collected by: Kate O'Brien **Sample Results to be returned to:** Kate.O'Brien@aecom.com / Anthony.Davis@aecom.com

Specifications: **Esdat**

	(Tick)		
1. Urgent TAT required? (please circle: 24hr 48hr ______days)	☐ Yes	☐ No	☐ N/A
2. Fast TAT Guarantee Required?	☐ Yes	☐ No	☐ N/A
3. Is any sediment layer present in waters to be excluded from extractions?	☐ Yes	☐ No	☐ N/A
4. Special storage requirements?	☐ Yes	☐ No	☐ N/A
5. Preservation requirements?	☐ Yes	☐ No	☐ N/A
6. Other requirements?	☐ Yes	☐ No	☐ N/A

7. Report Format: ☐ Fax ☐ Hard copy ☑ Email 8. Project Manager: Anthony Davis tel: 8484 8939

Analysis Request: Heavy Metals (8), TPH (C6-C36), BTEX, PAHs

Remarks & comments: Copy only.

Lab. ID	Sample ID	Sampling Date & time	Matrix: soil	Matrix: water	Matrix: other	Preservation: filt'ed	Preservation: acid	Preservation: ice	Preservation: other	Container (No. & type)
	TRIP01	5.2.11	X							
	Please send TRIP01 to Labmark									

Subcon / Forward Lab / Split WO
Lab / Analysis: Labmark
Organised By / Date:
Relinquished By / Date:
Connote / Courier:
WO No:
Attach By PO / Internal Sheet:

Relinquished By:		Received by:				
Name: Kate O'Brien	Date: 7.2.11	Name: Scott Stephens 6.6°C	Date: 07/2/11	Received in good condition?	Yes/No/NA	Method of Shipment
of: AECOM	Time: 9am	of: ALS Sydney	Time: 15:50	Samples received chilled?	Yes/No/NA	Consignment Note No.
				6.6°C	Yes/No/NA	Transport Co: ☐ Courier ☐ Postal ☐ By Hand

Relinquished By:		Received by:				
Name:	Date:	Name:	Date:	Received in good condition?	Yes/No/NA	Method of Shipment
of:	Time:	of:	Time:	Samples received chilled?	Yes/No/NA	Consignment Note No.
					Yes/No/NA	Transport Co: ☐ Courier ☐ Postal ☐ By Hand

QUALITY CONTROL REPORT

Work Order	: **ES1102539**	Page	: 1 of 7
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MS KATE O BRIEN	Contact	: Jennifer Cullen
Address	: LEVEL 5, 828 PACIFIC HIGHWAY GORDON NSW, AUSTRALIA 2072	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kate.obrien@aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 8484 8999	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 8484 8989	Facsimile	: +61 2 8784 8500
Project	: 60153531 5 7 HICKSON ROAD	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 07-FEB-2011
Sampler	: KO	Issue Date	: 15-FEB-2011
Order number	: 38962AUS		
		No. of samples received	: 9
Quote number	: EN/004/10	No. of samples analysed	: 7

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics

General Comments

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

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 1661549)									
ES1102399-032	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	2.5	2.6	6.7	No Limit
ES1102422-016	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	17.2	16.4	5.4	0% - 50%
EA055: Moisture Content (QC Lot: 1661550)									
ES1102539-003	TBH03_1.5-1.6	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	16.4	16.9	2.8	0% - 50%
ES1102632-003	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	29.1	29.0	0.0	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1661285)									
ES1102363-013	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	6	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	4	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	6	6	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	95	69	32.3	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	34	73	# 73.8	0% - 50%
ES1102438-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	16	13	20.6	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	21	19	12.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	306	296	3.6	0% - 20%
		EG005T: Copper	7440-50-8	5	mg/kg	55	54	1.9	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	103	115	10.8	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	222	1110	# 133	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1661286)									
ES1102363-013	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1102438-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.3	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1661974)									
ES1102539-001	TBH07_0.1-0.15	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	1.4	1.6	12.8	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.4	2.0	37.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	1.4	2.0	33.6	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	6.4	8.8	30.6	0% - 50%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	8.6	11.0	# 24.8	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	4.7	6.0	23.3	0% - 50%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	4.8	5.8	18.8	0% - 50%
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	8.0	8.3	3.6	0% - 50%

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: 1661974) - continued									
ES1102539-001	TBH07_0.1-0.15	EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	2.7	2.5	7.7	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	7.8	8.1	3.7	0% - 50%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	4.1	3.6	10.7	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.8	0.7	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	6.5	5.5	16.2	0% - 50%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1661127)									
ES1102399-045	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES1102540-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1661973)									
ES1102539-001	TBH07_0.1-0.15	EP071: C15 - C28 Fraction	----	100	mg/kg	280	340	18.6	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	420	420	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEX (QC Lot: 1661127)									
ES1102399-045	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1102540-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1661285)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.11 mg/kg	121	70	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.76 mg/kg	99.0	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	60.93 mg/kg	105	89.2	117
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.68 mg/kg	103	90.1	114
EG005T: Lead	7439-92-1	5	mg/kg	<5	54.76 mg/kg	100	85.2	111
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.23 mg/kg	108	88.3	116
EG005T: Zinc	7440-66-6	5	mg/kg	<5	103.88 mg/kg	100	88.9	112
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1661286)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	1.4 mg/kg	68.8	67	118
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1661974)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	101	81.9	113
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	99.6	79.6	113
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	97.1	81.5	112
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	97.2	79.9	112
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	106	79.4	114
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	110	81.1	112
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	102	78.8	113
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	103	78.9	113
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	81.7	77.2	112
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	105	79.8	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	83.9	71.8	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	103	74.2	117
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	87.0	76.4	113
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	79.1	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	75.9	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	79.1	72.4	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1661127)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	90.2	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1661973)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	97.0	75.2	116
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	200 mg/kg	99.0	75.3	113
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	90.0	72.6	117
EP080: BTEX (QCLot: 1661127)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	81.2	63	121

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEX (QCLot: 1661127) - continued								
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	106	69	122
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	85.6	61	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	85.0	62	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	90.0	63	117

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1661285)							
ES1102363-013	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	112	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	104	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	106	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	118	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	94.8	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	105	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	100	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1661286)							
ES1102363-013	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	90.8	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1661974)							
ES1102539-001	TBH07_0.1-0.15	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	127	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	# 138	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1661127)							
ES1102399-045	Anonymous	EP080: C6 - C9 Fraction	----	26 mg/kg	79.3	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1661973)							
ES1102539-001	TBH07_0.1-0.15	EP071: C10 - C14 Fraction	----	640 mg/kg	111	70	130
		EP071: C15 - C28 Fraction	----	3140 mg/kg	99.4	70	130
		EP071: C29 - C36 Fraction	----	2860 mg/kg	100	70	130
EP080: BTEX (QCLot: 1661127)							
ES1102399-045	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	71.0	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	74.2	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	71.4	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	71.6	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	75.3	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1102539**	Page	: 1 of 6
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: MS KATE O BRIEN	Contact	: Jennifer Cullen
Address	: LEVEL 5, 828 PACIFIC HIGHWAY GORDON NSW, AUSTRALIA 2072	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kate.obrien@aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 8484 8999	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 8484 8989	Facsimile	: +61 2 8784 8500
Project	: 60153531 5 7 HICKSON ROAD	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 07-FEB-2011
Sampler	: KO	Issue Date	: 15-FEB-2011
Order number	: 38962AUS		
		No. of samples received	: 9
Quote number	: EN/004/10	No. of samples analysed	: 7

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

This Interpretive Quality Control Report contains the following information:

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

Analysis Holding Time Compliance

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

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

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil Glass Jar - Unpreserved TBH07_0.1-0.15, TBH08_0.13-0.25	**04-FEB-2011**	**----**	----	----	**08-FEB-2011**	18-FEB-2011	✓
Soil Glass Jar - Unpreserved TBH03_1.2-1.3, TBH03_1.5-1.6, TBH01_0.43-0.5, TBH06_0.55-0.6, DUP 01	**05-FEB-2011**	**----**	----	----	**08-FEB-2011**	19-FEB-2011	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved TBH07_0.1-0.15, TBH08_0.13-0.25	**04-FEB-2011**	**08-FEB-2011**	03-AUG-2011	✓	**09-FEB-2011**	03-AUG-2011	✓
Soil Glass Jar - Unpreserved TBH03_1.2-1.3, TBH03_1.5-1.6, TBH01_0.43-0.5, TBH06_0.55-0.6, DUP 01	**05-FEB-2011**	**08-FEB-2011**	04-AUG-2011	✓	**09-FEB-2011**	04-AUG-2011	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved TBH07_0.1-0.15, TBH08_0.13-0.25	**04-FEB-2011**	**08-FEB-2011**	04-MAR-2011	✓	**10-FEB-2011**	04-MAR-2011	✓
Soil Glass Jar - Unpreserved TBH03_1.2-1.3, TBH03_1.5-1.6, TBH01_0.43-0.5, TBH06_0.55-0.6, DUP 01	**05-FEB-2011**	**08-FEB-2011**	05-MAR-2011	✓	**10-FEB-2011**	05-MAR-2011	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved TBH07_0.1-0.15, TBH08_0.13-0.25	**04-FEB-2011**	**09-FEB-2011**	18-FEB-2011	✓	**10-FEB-2011**	21-MAR-2011	✓
Soil Glass Jar - Unpreserved TBH03_1.2-1.3, TBH03_1.5-1.6, TBH01_0.43-0.5, TBH06_0.55-0.6, DUP 01	**05-FEB-2011**	**09-FEB-2011**	19-FEB-2011	✓	**10-FEB-2011**	21-MAR-2011	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved TBH07_0.1-0.15, TBH08_0.13-0.25	**04-FEB-2011**	**08-FEB-2011**	18-FEB-2011	✓	**08-FEB-2011**	18-FEB-2011	✓
Soil Glass Jar - Unpreserved TBH07_0.1-0.15, TBH08_0.13-0.25	**04-FEB-2011**	**09-FEB-2011**	18-FEB-2011	✓	**10-FEB-2011**	21-MAR-2011	✓
Soil Glass Jar - Unpreserved TBH03_1.2-1.3, TBH03_1.5-1.6, TBH01_0.43-0.5, TBH06_0.55-0.6, DUP 01	**05-FEB-2011**	**08-FEB-2011**	19-FEB-2011	✓	**08-FEB-2011**	19-FEB-2011	✓
Soil Glass Jar - Unpreserved TBH03_1.2-1.3, TBH03_1.5-1.6, TBH01_0.43-0.5, TBH06_0.55-0.6, DUP 01	**05-FEB-2011**	**09-FEB-2011**	19-FEB-2011	✓	**10-FEB-2011**	21-MAR-2011	✓
EP080: BTEX							
Soil Glass Jar - Unpreserved TBH07_0.1-0.15, TBH08_0.13-0.25	**04-FEB-2011**	**08-FEB-2011**	18-FEB-2011	✓	**08-FEB-2011**	18-FEB-2011	✓
Soil Glass Jar - Unpreserved TBH03_1.2-1.3, TBH03_1.5-1.6, TBH01_0.43-0.5, TBH06_0.55-0.6, DUP 01	**05-FEB-2011**	**08-FEB-2011**	19-FEB-2011	✓	**08-FEB-2011**	19-FEB-2011	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	4	32	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	11	**9.1**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2010 Draft) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3)
TPH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (1999) Schedule B(3) (Method 506.1)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) 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 (1999) Schedule B(3) (Method 502 and 507)
TPH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005T: Total Metals by ICP-AES	ES1102438-002	Anonymous	**Zinc**	7440-66-6	133 %	0-20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	ES1102363-013	Anonymous	**Zinc**	7440-66-6	73.8 %	0-50%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	ES1102539-001	TBH07_0.1-0.15	**Pyrene**	129-00-0	24.8 %	0-20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	ES1102539-001	TBH07_0.1-0.15	**Pyrene**	129-00-0	138 %	70-130%	**Recovery greater than upper data quality objective**

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

Regular Sample Surrogates

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

Outliers : Analysis Holding Time Compliance

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

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

Outliers : Frequency of Quality Control Samples

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

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

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES1103303**	Page	: 1 of 7
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MS KATE O BRIEN	Contact	: Jennifer Cullen
Address	: LEVEL 5, 828 PACIFIC HIGHWAY GORDON NSW, AUSTRALIA 2072	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kate.obrien@aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 8484 8999	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 8484 8989	Facsimile	: +61 2 8784 8500
Project	: HICKSON ROAD 60153531 5 7	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: 38962AUS		
C-O-C number	: ----	Date Samples Received	: 14-FEB-2011
Sampler	: K'O	Issue Date	: 24-FEB-2011
Site	: ----		
		No. of samples received	: 12
Quote number	: SY/418/10 V2	No. of samples analysed	: 8

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Luke Witham	Senior Inorganic Chemist	Inorganics
Pabi Subba	Senior Organic Chemist	Organics

General Comments

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

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

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

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

When 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.

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

- **EG005T: LCS recovery for Nickel falls outside ALS Dynamic Control Limit. However, they are within the acceptance criteria based on ALS DQO. No further action is required.**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: TBH06_1.5-2.0	TBH05_1.8-2.0	TBH05_0.6-0.7	TBH04_0.6-0.65	TBH04_1.7-2.0
				Client sampling date / time: 12-FEB-2011 15:00	12-FEB-2011 15:00	12-FEB-2011 15:00	12-FEB-2011 15:00	12-FEB-2011 15:00
				ES1103303-001	ES1103303-002	ES1103303-003	ES1103303-004	ES1103303-006
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1.0	%	14.5	24.4	25.6	11.1	27.1
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	3
Chromium	7440-47-3	2	mg/kg	7	4	103	10	10
Copper	7440-50-8	5	mg/kg	<5	51	39	43	454
Lead	7439-92-1	5	mg/kg	<5	115	10	16	508
Nickel	7440-02-0	2	mg/kg	<2	18	52	7	17
Zinc	7440-66-6	5	mg/kg	<5	344	15	18	1420
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	0.1	1.8
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	0.6	<0.5	<0.5	0.7
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	0.9	<0.5	<0.5	5.0
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	0.6	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	1.0
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	8.3	<0.5	<0.5	1.6
Anthracene	120-12-7	0.5	mg/kg	<0.5	3.1	<0.5	<0.5	1.9
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	19.1	<0.5	<0.5	4.3
Pyrene	129-00-0	0.5	mg/kg	<0.5	16.0	<0.5	<0.5	4.2
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	15.6	<0.5	<0.5	3.9
Chrysene	218-01-9	0.5	mg/kg	<0.5	13.2	<0.5	<0.5	3.4
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	23.8	<0.5	<0.5	5.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	9.3	<0.5	<0.5	2.8
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	18.8	<0.5	<0.5	6.4
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	14.0	<0.5	<0.5	5.4
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3.4	<0.5	<0.5	1.2
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	15.1	<0.5	<0.5	7.0
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	600	<100	<100	1340
C29 - C36 Fraction	----	100	mg/kg	<100	610	<100	<100	700
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	1210	<50	<50	2040
EP080: BTEX								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: TBH06_1.5-2.0	TBH05_1.8-2.0	TBH05_0.6-0.7	TBH04_0.6-0.65	TBH04_1.7-2.0
				Client sampling date / time: 12-FEB-2011 15:00	12-FEB-2011 15:00	12-FEB-2011 15:00	12-FEB-2011 15:00	12-FEB-2011 15:00
				ES1103303-001	ES1103303-002	ES1103303-003	ES1103303-004	ES1103303-006
EP080: BTEX - Continued								
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**110**	**108**	**113**	**110**	**110**
2-Chlorophenol-D4	93951-73-6	0.1	%	**102**	**94.3**	**94.2**	**96.5**	**94.0**
2.4.6-Tribromophenol	118-79-6	0.1	%	**59.9**	**69.2**	**58.5**	**55.1**	**73.5**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**105**	**99.2**	**100**	**102**	**99.0**
Anthracene-d10	1719-06-8	0.1	%	**112**	**107**	**108**	**108**	**109**
4-Terphenyl-d14	1718-51-0	0.1	%	**104**	**97.6**	**101**	**105**	**110**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**116**	**109**	**106**	**113**	**114**
Toluene-D8	2037-26-5	0.1	%	**123**	**110**	**110**	**114**	**119**
4-Bromofluorobenzene	460-00-4	0.1	%	**108**	**101**	**101**	**108**	**112**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	DUP02	TBH04_0.7-0.8	TBH05_1.3-1.7	----	----
				Client sampling date / time	12-FEB-2011 15:00	12-FEB-2011 15:00	12-FEB-2011 15:00	----	----
					ES1103303-007	ES1103303-008	ES1103303-011	----	----
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1.0	%		26.4	10.8	21.2	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	11	<5	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg		6	10	4	----	----
Copper	7440-50-8	5	mg/kg		54	1730	9	----	----
Lead	7439-92-1	5	mg/kg		113	279	26	----	----
Nickel	7440-02-0	2	mg/kg		18	9	<2	----	----
Zinc	7440-66-6	5	mg/kg		362	649	29	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	0.3	<0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		0.8	0.9	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		0.7	3.1	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg		0.6	<0.5	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg		0.6	0.6	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg		9.5	6.4	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg		3.6	2.9	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg		17.8	14.1	1.0	----	----
Pyrene	129-00-0	0.5	mg/kg		14.9	14.4	0.9	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		14.6	8.0	0.7	----	----
Chrysene	218-01-9	0.5	mg/kg		11.8	6.3	<0.5	----	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		18.1	8.0	0.8	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		10.9	3.2	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		16.1	7.6	0.7	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		10.6	2.7	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		2.5	0.7	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		11.5	2.8	<0.5	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		530	520	<100	----	----
C29 - C36 Fraction	----	100	mg/kg		470	340	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		1000	860	<50	----	----
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: DUP02	TBH04_0.7-0.8	TBH05_1.3-1.7	----	----
				Client sampling date / time: 12-FEB-2011 15:00	12-FEB-2011 15:00	12-FEB-2011 15:00	----	----
				ES1103303-007	ES1103303-008	ES1103303-011	----	----
EP080: BTEX - Continued								
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**111**	**84.9**	**74.1**	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**96.4**	**102**	**89.9**	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**74.3**	**64.0**	**50.7**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**104**	**99.8**	**88.2**	----	----
Anthracene-d10	1719-06-8	0.1	%	**111**	**96.2**	**90.4**	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**105**	**84.1**	**101**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**123**	**105**	**104**	----	----
Toluene-D8	2037-26-5	0.1	%	**102**	**113**	**102**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**89.3**	**98.6**	**99.3**	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	56.3	133.3
2-Chlorophenol-D4	93951-73-6	53.8	133.8
2.4.6-Tribromophenol	118-79-6	23.1	134.9
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	58.9	132.7
Anthracene-d10	1719-06-8	55.0	137.6
4-Terphenyl-d14	1718-51-0	54.0	147.8
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	72.8	133.2
Toluene-D8	2037-26-5	73.9	132.1
4-Bromofluorobenzene	460-00-4	71.6	130.0

CPFO419 (ENV) Chain of Custody Analysis Request Form

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AECOM

AECOM - Sydney (Gordon) PO Box 726 Pymble NSW 2073 Australia	Tel: 61 2 8484 8999 Fax: 61 2 8484 8989 Email: Kate.O'Brien@aecom.com	**Laboratory Details** Lab. Name: ALS Lab. Address: 277 Woodpark Rd Smithfield Contact Name: Lab. Ref:	Tel: 8784 8555 Fax: Preliminary Report by: Final Report by: Lab Quote No: SY/418/10 V2

Project Name: Hickson Road **Project Number:** 60153531/5.7 **Purchase Order Number:** 38962AUS

Sample collected by: Kate O'Brien **Sample Results to be returned to:** Kate.O'Brien@aecom.com / Anthony.Davis@aecom.com

Specifications: Esdat

	(Tick)		
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	☐ Yes	☐ No	☐ N/A
2. Fast TAT Guarantee Required?	☐ Yes	☐ No	☐ N/A
3. Is any sediment layer present in waters to be excluded from extractions?	☐ Yes	☐ No	☐ N/A
4. Special storage requirements?	☐ Yes	☐ No	☐ N/A
5. Preservation requirements?	☐ Yes	☐ No	☐ N/A
6. Other requirements?	☐ Yes	☐ No	☐ N/A

7. Report Format: ☐ Fax ☐ Hard copy ☑ Email 8. Project Manager: Anthony Davis tel: 8484 8939

Analysis Request

Lab. ID	Sample ID	Sampling Date & time	Matrix: soil	water	other	Preservation: filt'ed	acid	ice	other	Container (No. & type)	Heavy Metals (8)	TPH (C6-C36)	BTEX	PAHs	Remarks & comments
4	TBH04_0.6-0.65	12.2.11	X					X		250ml					
8	TBH04_0.7-0.8	"	X					X		150ml					
5	TBH04_0.9-1.4	"	X					X		250ml					
6	TBH04_1.7-2.0	"	X					X		250ml					
9	TBH05_0.2-0.21	"	X					X		250ml					
3	TBH05_0.6-0.7	"	X					X		150ml					
10	TBH05_1-1.3	"	X					X		250ml					
11	TBH05_1.3-1.7	"	X					X		250ml					
2	TBH05_1.8-2.0	"	X					X		150ml					
1	TBH06_1.5-2.0	"	X					X		250ml					

Environmental Division Sydney
Work Order
ES1103303
Telephone : +61-2-8784 8555

Relinquished By:	Received by:			
Name: Kate O'Brien Date: 14/2/11	Name:	Date:	Received in good condition?	Yes/No/NA Method of Shipment
of: Time: 3pm	of:	Time:	Samples received chilled?	Yes/No/NA Consignment Note No.
				Yes/No/NA Transport Co: ☐ Courier ☐ Postal ☐ By Hand
Relinquished By:	**Received by:**			
Name: Date:	Name: Wanda	Date: 14/02/11	Received in good condition?	Yes/No/NA Method of Shipment
of: Time:	of: ALS	Time: 16:30	Samples received chilled?	Yes/No/NA Consignment Note No.
				Yes/No/NA Transport Co: ☐ Courier ☐ Postal ☐ By Hand

CPFO419 (ENV) Chain of Custody Analysis Request Form

COC #2 Page 2/2

AECOM

AECOM - Sydney (Gordon) PO Box 726 Pymble NSW 2073 Australia	Tel: 61 2 8484 8999 Fax: 61 2 8484 8989 Email: Kate.O'Brien@aecom.com	**Laboratory Details** Lab. Name: ALS Lab. Address: 277 Woodpark Rd Smithfield Contact Name: Lab. Ref:	Tel: 8784 8555 Fax: Preliminary Report by: Final Report by: Lab Quote No: SY/418/10 V2

Project Name: Hickson Road **Project Number:** 60153531/5.7 **Purchase Order Number:** 38962AUS

Sample collected by: Kate O'Brien **Sample Results to be returned to:** Kate.O'Brien@aecom.com / Anthony.Davis@aecom.com

Specifications: Esdat

	(Tick)		
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	☐ Yes	☐ No	☐ N/A
2. Fast TAT Guarantee Required?	☐ Yes	☐ No	☐ N/A
3. Is any sediment layer present in waters to be excluded from extractions?	☐ Yes	☐ No	☐ N/A
4. Special storage requirements?	☐ Yes	☐ No	☐ N/A
5. Preservation requirements?	☐ Yes	☐ No	☐ N/A
6. Other requirements?	☐ Yes	☐ No	☐ N/A

7. Report Format: ☐ Fax ☐ Hard copy ☑ Email 8. Project Manager: Anthony Davis tel: 8484 8939

Lab. ID	Sample ID	Sampling Date & time	Matrix: soil	water	other	Preservation: filt'ed	acid	ice	other	Container (No. & type)	Analysis Request: Heavy Metals (8)	TPH (C6-C36)	BTEX	PAHs	Remarks & comments
7	DUP02	12.2.11	X					X		150ml					
	Extra sample														
(12)	TPH05_09-1.4	12021													

Relinquished By:	**Received by:**	Received in good condition?	Yes/No/NA	Method of Shipment	
Name: Kate O'Brien Date: 14/2/11	Name: Date:	Samples received chilled?	Yes/No/NA	Consignment Note No.	
of: Time: 3pm	of: Time:		Yes/No/NA	Transport Co: ☐ Courier ☐ Postal ☐ By Hand	
Relinquished By:	**Received by:**	Received in good condition?	Yes/No/NA	Method of Shipment	
Name: Date:	Name: Date: 14/02/11	Samples received chilled?	Yes/No/NA	Consignment Note No.	
of: Time:	of: Time: 1030		Yes/No/NA	Transport Co: ☐ Courier ☐ Postal ☐ By Hand	

Fadi Soro

From: Jennifer Cullen
Sent: Wednesday, 16 February 2011 12:10 PM
To: Fadi Soro; Samples Sydney
Cc: Wael Saleh
Subject: FW: Barangaroo - Hickson Road - 60153531/5.7
Importance: High

Hi Fadi,

Could you also arrange for the below samples be logged in for analysis.

These ones would have been delivered on Monday for the Barangaroo project.

Thanks

How was your customer experience? Please send us your feedback

Kind Regards

Jennifer Cullen
SENIOR PROJECT MANAGER

ALS | Environmental Division

Address
277-289 Woodpark Road, Smithfield, NSW, 2164

PHONE +61 2 8784 8555
DIRECT +61 2 8784 8509
FAX +61 2 8784 8500

www.alsglobal.com

From: O'Brien, Kate [mailto:Kate.O'Brien@aecom.com]
Sent: Wednesday, 16 February 2011 12:01 PM
To: Jennifer Cullen
Subject: Barangaroo - Hickson Road - 60153531/5.7

Hi Jenny

Could I also please get the following samples analysed which were delivered to the lab on Monday

1. TBH06_1.5-2.0 – Metals (8), TPH, BTEX, PAH
2. TBH05_1.8-2.0 – Metals (8), TPH, BTEX, PAH
3. TBH05_0.6-0.7 – Metals (8), TPH, BTEX, PAH
4. TBH04_0.6-0.65 - Metals (8), TPH, BTEX, PAH
5. TBH04_0.9-1.4 - Metals (8), TPH, BTEX, PAH
6. TBH04_1.7-2.0 – Metals (8), TPH, BTEX, PAH
7. DUP02 - Metals (8), TPH, BTEX, PAH

Regards

Kate O'Brien
Professional Scientist
D +61 2 8484 8939
Kate.O'Brien@aecom.com

AECOM
Level 5, 828 Pacific Highway, Gordon, NSW 2072
PO Box 726 Pymble NSW 2073
T +61 2 8484 8999 F +61 2 8484 8989
www.aecom.com

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SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES1103303**

Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MS KATE O BRIEN	Contact	: Jennifer Cullen
Address	: LEVEL 5, 828 PACIFIC HIGHWAY GORDON NSW, AUSTRALIA 2072	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kate.obrien@aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 8484 8999	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 8484 8989	Facsimile	: +61 2 8784 8500
Project	: HICKSON ROAD 60153531 5 7	Page	: 1 of 3
Order number	: 38962AUS		
C-O-C number	: ----	Quote number	: ES2010HLAENV0391 (SY/418/10 V2)
Site	: ----		
Sampler	: K'O	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 14-FEB-2011	Issue Date	: 17-FEB-2011 13:33
Client Requested Due Date	: 24-FEB-2011	Scheduled Reporting Date	: **24-FEB-2011**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 7.8'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 12
Security Seal	: Intact.	No. of samples analysed	: 7

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Sample id TPH05_0.9-1.4 received extra and placed on hold , please confrim.**
- 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 (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When 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.

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	(On Hold) SOIL No analysis requested	SOIL - S-26 8 metals/TPH/BTEX/PAH
ES1103303-001	12-FEB-2011 15:00	TBH06_1.5-2.0		✓
ES1103303-002	12-FEB-2011 15:00	TBH05_1.8-2.0		✓
ES1103303-003	12-FEB-2011 15:00	TBH05_0.6-0.7		✓
ES1103303-004	12-FEB-2011 15:00	TBH04_0.6-0.65		✓
ES1103303-005	12-FEB-2011 15:00	TBH04_0.9-1.4		✓
ES1103303-006	12-FEB-2011 15:00	TBH04_1.7-2.0		✓
ES1103303-007	12-FEB-2011 15:00	DUP02		✓
ES1103303-008	12-FEB-2011 15:00	TBH04_0.7-0.8	✓	
ES1103303-009	12-FEB-2011 15:00	TBH05_0.2-0.21	✓	
ES1103303-010	12-FEB-2011 15:00	TBH05_1-1.3	✓	
ES1103303-011	12-FEB-2011 15:00	TBH05_1.3-1.7	✓	
ES1103303-012	12-FEB-2011 15:00	TPH05_0.9-1.4	✓	

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	accountsenv@aecom.com
MR ANTHONY DAVIS		
- *AU Certificate of Analysis - NATA (COA)	Email	anthony.davis@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	anthony.davis@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	anthony.davis@aecom.com
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	anthony.davis@aecom.com
- A4 - AU Tax Invoice (INV)	Email	anthony.davis@aecom.com
- Chain of Custody (CoC) (COC)	Email	anthony.davis@aecom.com
- EDI Format - ENMRG (ENMRG)	Email	anthony.davis@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	anthony.davis@aecom.com
- EDI Format - HLAPro (HLAPro)	Email	anthony.davis@aecom.com
- EDI Format - XTab (XTAB)	Email	anthony.davis@aecom.com
MS JENNIFER CULLEN		
- Chain of Custody (CoC) (COC)	Email	jennifer.cullen@alsenviro.com
MS KATE O BRIEN		
- *AU Certificate of Analysis - NATA (COA)	Email	kate.obrien@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	kate.obrien@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	kate.obrien@aecom.com
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	kate.obrien@aecom.com
- Chain of Custody (CoC) (COC)	Email	kate.obrien@aecom.com
- EDI Format - ENMRG (ENMRG)	Email	kate.obrien@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	kate.obrien@aecom.com
- EDI Format - HLAPro (HLAPro)	Email	kate.obrien@aecom.com
- EDI Format - XTab (XTAB)	Email	kate.obrien@aecom.com
MS KATE PIGRAM		
- *AU Certificate of Analysis - NATA (COA)	Email	kate.pigram@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	kate.pigram@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	kate.pigram@aecom.com
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	kate.pigram@aecom.com
- Chain of Custody (CoC) (COC)	Email	kate.pigram@aecom.com
- EDI Format - ENMRG (ENMRG)	Email	kate.pigram@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	kate.pigram@aecom.com
- EDI Format - HLAPro (HLAPro)	Email	kate.pigram@aecom.com
- EDI Format - XTab (XTAB)	Email	kate.pigram@aecom.com

CPFO419 (ENV) Chain of Custody Analysis Request Form

COC #2 Page 1/2

AECOM

AECOM - Sydney (Gordon) PO Box 726 Pymble NSW 2073 Australia	Tel: 61 2 8484 8999 Fax: 61 2 8484 8989 Email: Kate.O'Brien@aecom.com	**Laboratory Details** Lab. Name: ALS Lab. Address: 277 Woodpark Rd Smithfield Contact Name: Lab. Ref:	Tel: 8784 8555 Fax: Preliminary Report by: Final Report by: Lab Quote No: SY/418/10 V2

Project Name: Hickson Road **Project Number:** 60153531/5.7 **Purchase Order Number:** 38962AUS

Sample collected by: Kate O'Brien **Sample Results to be returned to:** Kate.O'Brien@aecom.com / Anthony.Davis@aecom.com

Specifications: Esdat

	(Tick)		
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	☐ Yes	☐ No	☐ N/A
2. Fast TAT Guarantee Required?	☐ Yes	☐ No	☐ N/A
3. Is any sediment layer present in waters to be excluded from extractions?	☐ Yes	☐ No	☐ N/A
4. Special storage requirements?	☐ Yes	☐ No	☐ N/A
5. Preservation requirements?	☐ Yes	☐ No	☐ N/A
6. Other requirements?	☐ Yes	☐ No	☐ N/A

7. Report Format: ☐ Fax ☐ Hard copy ☑ Email 8. Project Manager: Anthony Davis tel: 8484 8939

Analysis Request

Lab. ID	Sample ID	Sampling Date & time	Matrix: soil	water	other	Preservation: fil'ed	acid	ice	other	Container (No. & type)	Heavy Metals (8)	TPH (C6-C36)	BTEX	PAHs	Remarks & comments
4	TBH04_0.6-0.65	12.2.11	X					X		250ml					
8	TBH04_0.7-0.8	"	X					X		150ml					
5	TBH04_0.9-1.4	"	X					X		250ml					
6	TBH04_1.7-2.0	"	X					X		250ml					
9	TBH05_0.2-0.21	"	X					X		250ml					
3	TBH05_0.6-0.7	"	X					X		150ml					
10	TBH05_1-1.3	"	X					X		250ml					
11	TBH05_1.3-1.7	"	X					X		250ml					
2	TBH05_1.8-2.0	"	X					X		150ml					
1	TBH06_1.5-2.0	"	X					X		250ml					

Environmental Division Sydney
Work Order
ES1103303
Telephone : +61-2-8784 8555

Relinquished By:	**Received by:**		Received in good condition?	Yes/No/NA	Method of Shipment
Name: Kate O'Brien	Name:	Date: 14/2/11	Samples received chilled?	Yes/No/NA	Consignment Note No.
of:	of:	Time: 3pm		Yes/No/NA	Transport Co: ☐ Courier ☐ Postal ☐ By Hand
Relinquished By:	**Received by:**		Received in good condition?	Yes/No/NA	Method of Shipment
Name:	Name: Wanda	Date: 14/02/11	Samples received chilled?	Yes/No/NA	Consignment Note No.
of:	of: ALS	Time: 16:30		Yes/No/NA	Transport Co: ☐ Courier ☐ Postal ☐ By Hand

CPFO419 (ENV) Chain of Custody Analysis Request Form

COC #2 Page 2/2

AECOM

AECOM - Sydney (Gordon) PO Box 726 Pymble NSW 2073 Australia	Tel: 61 2 8484 8999 Fax: 61 2 8484 8989 Email: Kate.O'Brien@aecom.com

Laboratory Details

Lab. Name:	ALS	Tel:	8784 8555
Lab. Address:	277 Woodpark Rd Smithfield	Fax:	
Contact Name:		Preliminary Report by:	
Lab. Ref:		Final Report by:	
		Lab Quote No:	SY/418/10 V2

Project Name: Hickson Road **Project Number:** 60153531/5.7 **Purchase Order Number:** 38962AUS

Sample collected by: Kate O'Brien **Sample Results to be returned to:** Kate.O'Brien@aecom.com / Anthony.Davis@aecom.com

Specifications: Esdat

	(Tick)		
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	☐ Yes	☐ No	☐ N/A
2. Fast TAT Guarantee Required?	☐ Yes	☐ No	☐ N/A
3. Is any sediment layer present in waters to be excluded from extractions?	☐ Yes	☐ No	☐ N/A
4. Special storage requirements?	☐ Yes	☐ No	☐ N/A
5. Preservation requirements?	☐ Yes	☐ No	☐ N/A
6. Other requirements?	☐ Yes	☐ No	☐ N/A

7. Report Format: ☐ Fax ☐ Hard copy ☑ Email 8. Project Manager: Anthony Davis tel: 8484 8939

Lab. ID	Sample ID	Sampling Date & time	Matrix: soil	Matrix: water	Matrix: other	Preservation: filt'ed	Preservation: acid	Preservation: ice	Preservation: other	Container (No. & type)	Heavy Metals (8)	TPH (C6-C36)	BTEX	PAHs	Remarks & comments
7	DUP02	12.2.11	X					X		150ml					
	Extra sample														
(12)	TPH05_0.9-1.4	12021													

Relinquished By:		**Received by:**		Received in good condition?	Yes/No/NA
Name: Kate O'Brien	Date: 14/2/11	Name:	Date:	Samples received chilled?	Yes/No/NA
of:	Time: 3pm	of:	Time:		Yes/No/NA
Relinquished By:		**Received by:**		Received in good condition?	Yes/No/NA
Name:	Date:	Name: Wendy	Date: 14/02/11	Samples received chilled?	Yes/No/NA
of:	Time:	of: ALS	Time: 1050		Yes/No/NA

Method of Shipment: Consignment Note No.: Transport Co: ☐ Courier ☐ Postal ☐ By Hand

QUALITY CONTROL REPORT

Work Order	: **ES1103303**	Page	: 1 of 11
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MS KATE O BRIEN	Contact	: Jennifer Cullen
Address	: LEVEL 5, 828 PACIFIC HIGHWAY GORDON NSW, AUSTRALIA 2072	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kate.obrien@aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 8484 8999	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 8484 8989	Facsimile	: +61 2 8784 8500
Project	: HICKSON ROAD 60153531 5 7	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 14-FEB-2011
Sampler	: K'O	Issue Date	: 24-FEB-2011
Order number	: 38962AUS		
		No. of samples received	: 12
Quote number	: SY/418/10 V2	No. of samples analysed	: 8

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Luke Witham	Senior Inorganic Chemist	Inorganics
Pabi Subba	Senior Organic Chemist	Organics

General Comments

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

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 1674249)									
ES1103277-036	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	15.0	16.5	9.6	0% - 50%
ES1103319-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	52.7	50.5	4.1	0% - 20%
EA055: Moisture Content (QC Lot: 1678501)									
ES1103303-008	TBH04_0.7-0.8	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	10.8	12.0	10.7	0% - 50%
ES1103581-004	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1.0	%	8.1	9.4	15.2	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1674252)									
ES1103231-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	14	13	0.0	No Limit
ES1103232-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	5	5	0.0	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 1677692)									
ES1102875-027	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	11	14	28.7	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	6	8	16.4	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	52	45	15.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	162	168	3.4	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	306	276	10.2	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1674253)									
ES1103231-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES1103232-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1677693)									
ES1102875-027	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.8	0.8	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1674753)									

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: 1674753) - continued									
ES1102875-027	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	1.8	<0.5	113	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	0.7	<0.5	39.4	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	2.2	1.1	68.6	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	2.3	1.1	71.8	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	1.8	0.7	85.8	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	1.5	0.6	86.3	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	1.7	0.7	81.8	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	0.8	<0.5	49.8	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.6	0.6	82.2	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.8	<0.5	44.4	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	1.0	<0.5	66.4	No Limit
ES1103136-042	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1680722)									
ES1103303-008	TBH04_0.7-0.8	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	0.9	0.8	14.7	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	3.1	2.7	11.4	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	0.6	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	6.4	6.0	5.4	0% - 50%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	2.9	2.9	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1680722) - continued									
ES1103303-008	TBH04_0.7-0.8	EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	14.1	14.3	1.7	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	14.4	13.9	3.5	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	8.0	7.8	1.6	0% - 50%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	6.3	7.0	10.9	0% - 50%
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	8.0	7.7	3.5	0% - 50%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	3.2	3.3	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	7.6	7.5	0.0	0% - 50%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	2.7	3.1	15.5	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	0.7	0.7	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	2.8	3.2	13.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1673428)									
ES1103303-001	TBH06_1.5-2.0	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES1103374-004	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1674752)									
ES1102875-027	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES1103136-042	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1678192)									
ES1103303-008	TBH04_0.7-0.8	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1680721)									
ES1103303-008	TBH04_0.7-0.8	EP071: C15 - C28 Fraction	----	100	mg/kg	520	520	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	340	400	17.1	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEX (QC Lot: 1673428)									
ES1103303-001	TBH06_1.5-2.0	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES1103374-004	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEX (QC Lot: 1678192)									
ES1103303-008	TBH04_0.7-0.8	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1674252)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.11 mg/kg	126	70	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.76 mg/kg	99.7	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	60.93 mg/kg	104	89.2	117
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.68 mg/kg	108	90.1	114
EG005T: Lead	7439-92-1	5	mg/kg	<5	54.76 mg/kg	104	85.2	111
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.23 mg/kg	# 117	88.3	116
EG005T: Zinc	7440-66-6	5	mg/kg	<5	103.88 mg/kg	92.0	88.9	112
EG005T: Total Metals by ICP-AES (QCLot: 1677692)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	13.11 mg/kg	108	70	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	2.76 mg/kg	90.9	83.3	111
EG005T: Chromium	7440-47-3	2	mg/kg	<2	60.93 mg/kg	109	89.2	117
EG005T: Copper	7440-50-8	5	mg/kg	<5	54.68 mg/kg	103	90.1	114
EG005T: Lead	7439-92-1	5	mg/kg	<5	54.76 mg/kg	93.8	85.2	111
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55.23 mg/kg	110	88.3	116
EG005T: Zinc	7440-66-6	5	mg/kg	<5	103.88 mg/kg	94.1	88.9	112
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1674253)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	1.4 mg/kg	74.1	67	118
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1677693)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	1.4 mg/kg	68.2	67	118
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1674753)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	105	81.9	113
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	109	79.6	113
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	108	81.5	112
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	# 112	79.9	112
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	113	79.4	114
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	111	81.1	112
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	# 114	78.8	113
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	# 117	78.9	113
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	107	77.2	112
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	113	79.8	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	95.2	71.8	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	102	74.2	117
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	105	76.4	113
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	104	71	113

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1674753) - continued								
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	105	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	102	72.4	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1680722)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	4 mg/kg	97.9	81.9	113
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	4 mg/kg	92.2	79.6	113
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	4 mg/kg	91.8	81.5	112
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	4 mg/kg	92.2	79.9	112
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	4 mg/kg	96.2	79.4	114
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	4 mg/kg	96.1	81.1	112
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	4 mg/kg	96.0	78.8	113
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	4 mg/kg	95.2	78.9	113
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	4 mg/kg	91.1	77.2	112
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	4 mg/kg	93.9	79.8	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	<0.5	4 mg/kg	92.9	71.8	118
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	4 mg/kg	87.4	74.2	117
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	4 mg/kg	101	76.4	113
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	4 mg/kg	80.8	71	113
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	4 mg/kg	84.9	71.7	113
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	4 mg/kg	80.2	72.4	114
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1673428)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	81.3	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1674752)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	110	75.2	116
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	200 mg/kg	98.1	75.3	113
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	98.8	72.6	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1678192)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	93.2	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1680721)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	106	75.2	116
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	200 mg/kg	94.0	75.3	113
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	90.0	72.6	117
EP080: BTEX (QCLot: 1673428)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	90.1	63	121
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	101	69	122
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	91.7	61	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	96.3	62	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	95.0	63	117

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEX (QCLot: 1678192)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	97.0	63	121
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	96.8	69	122
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	93.0	61	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	87.7	62	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	93.6	63	117

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1674252)							
ES1103231-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	109	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	103	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	102	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	115	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	107	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	112	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	104	70	130
EG005T: Total Metals by ICP-AES (QCLot: 1677692)							
ES1102875-027	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	110	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	95.8	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	111	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	113	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	125	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	111	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	87.2	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1674253)							
ES1103231-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	84.0	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1677693)							
ES1102875-027	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	89.9	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1674753)							
ES1102875-027	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	122	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	98.5	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1680722)							
ES1103303-008	TBH04_0.7-0.8	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	95.6	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	80.0	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1673428)							
ES1103303-001	TBH06_1.5-2.0	EP080: C6 - C9 Fraction	----	26 mg/kg	82.5	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1674752)							
ES1102875-027	Anonymous	EP071: C10 - C14 Fraction	----	640 mg/kg	100	70	130
		EP071: C15 - C28 Fraction	----	3140 mg/kg	87.6	70	130
		EP071: C29 - C36 Fraction	----	2860 mg/kg	76.3	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1678192)							
ES1103303-008	TBH04_0.7-0.8	EP080: C6 - C9 Fraction	----	32.5 mg/kg	76.0	70	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1680721)							
ES1103303-008	TBH04_0.7-0.8	EP071: C10 - C14 Fraction	----	640 mg/kg	103	70	130
		EP071: C15 - C28 Fraction	----	3140 mg/kg	77.6	70	130
		EP071: C29 - C36 Fraction	----	2860 mg/kg	71.9	70	130
EP080: BTEX (QCLot: 1673428)							
ES1103303-001	TBH06_1.5-2.0	EP080: Benzene	71-43-2	2.5 mg/kg	75.4	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	78.8	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	78.0	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	79.0	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	78.9	70	130
EP080: BTEX (QCLot: 1678192)							
ES1103303-008	TBH04_0.7-0.8	EP080: Benzene	71-43-2	2.5 mg/kg	98.2	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	96.7	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	93.3	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	89.6	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	90.9	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1103303**	Page	: 1 of 6
Client	: AECOM Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: MS KATE O BRIEN	Contact	: Jennifer Cullen
Address	: LEVEL 5, 828 PACIFIC HIGHWAY GORDON NSW, AUSTRALIA 2072	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kate.obrien@aecom.com	E-mail	: jennifer.cullen@alsglobal.com
Telephone	: +61 02 8484 8999	Telephone	: +61 2 8784 8509
Facsimile	: +61 02 8484 8989	Facsimile	: +61 2 8784 8500
Project	: HICKSON ROAD 60153531 5 7	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 14-FEB-2011
Sampler	: K'O	Issue Date	: 24-FEB-2011
Order number	: 38962AUS		
		No. of samples received	: 12
Quote number	: SY/418/10 V2	No. of samples analysed	: 8

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

This Interpretive Quality Control Report contains the following information:

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

Analysis Holding Time Compliance

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

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

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content								
Soil Glass Jar - Unpreserved								
TBH06_1.5-2.0, TBH05_0.6-0.7, TBH04_1.7-2.0,	TBH05_1.8-2.0, TBH04_0.6-0.65, DUP02	**12-FEB-2011**	**----**	----	----	**18-FEB-2011**	26-FEB-2011	✓
Soil Glass Jar - Unpreserved								
TBH04_0.7-0.8,	TBH05_1.3-1.7	**12-FEB-2011**	**----**	----	----	**22-FEB-2011**	26-FEB-2011	✓
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved								
TBH06_1.5-2.0, TBH05_0.6-0.7, TBH04_1.7-2.0,	TBH05_1.8-2.0, TBH04_0.6-0.65, DUP02	**12-FEB-2011**	**18-FEB-2011**	11-AUG-2011	✓	**18-FEB-2011**	11-AUG-2011	✓
Soil Glass Jar - Unpreserved								
TBH04_0.7-0.8,	TBH05_1.3-1.7	**12-FEB-2011**	**21-FEB-2011**	11-AUG-2011	✓	**22-FEB-2011**	11-AUG-2011	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved								
TBH06_1.5-2.0, TBH05_0.6-0.7, TBH04_1.7-2.0,	TBH05_1.8-2.0, TBH04_0.6-0.65, DUP02	**12-FEB-2011**	**18-FEB-2011**	12-MAR-2011	✓	**18-FEB-2011**	12-MAR-2011	✓
Soil Glass Jar - Unpreserved								
TBH04_0.7-0.8,	TBH05_1.3-1.7	**12-FEB-2011**	**21-FEB-2011**	12-MAR-2011	✓	**22-FEB-2011**	12-MAR-2011	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved								
TBH06_1.5-2.0, TBH05_0.6-0.7, TBH04_1.7-2.0,	TBH05_1.8-2.0, TBH04_0.6-0.65, DUP02	**12-FEB-2011**	**18-FEB-2011**	26-FEB-2011	✓	**18-FEB-2011**	30-MAR-2011	✓
Soil Glass Jar - Unpreserved								
TBH04_0.7-0.8,	TBH05_1.3-1.7	**12-FEB-2011**	**23-FEB-2011**	26-FEB-2011	✓	**23-FEB-2011**	04-APR-2011	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved TBH06_1.5-2.0, TBH05_1.8-2.0, TBH05_0.6-0.7, TBH04_0.6-0.65, TBH04_1.7-2.0, DUP02	**12-FEB-2011**	**17-FEB-2011**	26-FEB-2011	✓	**17-FEB-2011**	26-FEB-2011	✓
Soil Glass Jar - Unpreserved TBH06_1.5-2.0, TBH05_1.8-2.0, TBH05_0.6-0.7, TBH04_0.6-0.65, TBH04_1.7-2.0, DUP02	**12-FEB-2011**	**18-FEB-2011**	26-FEB-2011	✓	**18-FEB-2011**	30-MAR-2011	✓
Soil Glass Jar - Unpreserved TBH04_0.7-0.8, TBH05_1.3-1.7	**12-FEB-2011**	**22-FEB-2011**	26-FEB-2011	✓	**22-FEB-2011**	26-FEB-2011	✓
Soil Glass Jar - Unpreserved TBH04_0.7-0.8, TBH05_1.3-1.7	**12-FEB-2011**	**23-FEB-2011**	26-FEB-2011	✓	**23-FEB-2011**	04-APR-2011	✓
EP080: BTEX							
Soil Glass Jar - Unpreserved TBH06_1.5-2.0, TBH05_1.8-2.0, TBH05_0.6-0.7, TBH04_0.6-0.65, TBH04_1.7-2.0, DUP02	**12-FEB-2011**	**17-FEB-2011**	26-FEB-2011	✓	**17-FEB-2011**	26-FEB-2011	✓
Soil Glass Jar - Unpreserved TBH04_0.7-0.8, TBH05_1.3-1.7	**12-FEB-2011**	**22-FEB-2011**	26-FEB-2011	✓	**22-FEB-2011**	26-FEB-2011	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	4	34	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	3	22	**13.6**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	3	28	**10.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	3	29	**10.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	3	26	**11.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	3	27	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	22	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	28	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	29	**6.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	2	26	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	27	**7.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	22	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	28	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	29	**6.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	2	26	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	27	**7.4**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	22	**9.1**	**5.0**	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	28	**7.1**	**5.0**	✓	ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	29	**6.9**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	2	26	**7.7**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	27	**7.4**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2010 Draft) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	(APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3)
TPH - Semivolatile Fraction	EP071	SOIL	(USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (1999) Schedule B(3) (Method 506.1)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	(USEPA SW 846 - 8270B) 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 (1999) Schedule B(3) (Method 502 and 507)
TPH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids (Option B - Non-concentrating)	ORG17B	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 20mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EG005T: Total Metals by ICP-AES	1967045-002	----	**Nickel**	7440-02-0	117 %	88.3-116%	**Recovery greater than upper control limit**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	1967444-007	----	**Fluorene**	86-73-7	112 %	79.9-112%	**Recovery greater than upper control limit**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	1967444-007	----	**Fluoranthene**	206-44-0	114 %	78.8-113%	**Recovery greater than upper control limit**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	1967444-007	----	**Pyrene**	129-00-0	117 %	78.9-113%	**Recovery greater than upper control limit**

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

Regular Sample Surrogates

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

Outliers : Analysis Holding Time Compliance

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

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

Outliers : Frequency of Quality Control Samples

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

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

mgt LabMark ENVIRONMENTAL LABORATORIES

Certificate of Analysis

AECOM Aust P/L Sydney
Level 5, 828 Pacific Hwy
Gordon
NSW 2072

Attention: Kate O'Brien

NATA Accredited
Laboratory Number 13535

The tests covered by this document have been performed in accordance with NATA and ISO/IES 17025 and are traceable to national standards of measurement.

Report	289864-S
Client Reference	HICKSON ROAD 60153531/5.7
Received Date	Feb 08, 2011

Client Sample ID			**TRIP01**
Sample Matrix			**Soil**
mgt-LabMark Sample No.			**11-FE30616**
Date Sampled			**Feb 05, 2011**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons			
TRH C6-C9 Fraction by GC	10	mg/kg	< 10
TRH C10-C14 Fraction by GC	50	mg/kg	< 50
TRH C15-C28 Fraction by GC	100	mg/kg	< 100
TRH C29-C36 Fraction by GC	100	mg/kg	< 100
TRH C10-36 (Total)	100	mg/kg	< 100
BTEX			
Benzene	0.5	mg/kg	< 0.5
Toluene	0.5	mg/kg	< 0.5
Ethylbenzene	0.5	mg/kg	< 0.5
Total m+p-Xylenes	1	mg/kg	< 1
o-Xylene	0.5	mg/kg	< 0.5
Xylenes(ortho.meta and para)	0.15	mg/kg	< 0.15
Total BTEX	1	mg/kg	< 1
4-Bromofluorobenzene (surr.)	1	%	82
Polyaromatic Hydrocarbons (PAH)			
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	0.8
Benzo(a)pyrene	0.5	mg/kg	1.0
Benzo(b)fluoranthene & Benzo(k)fluoranthene	1	mg/kg	1.7
Benzo(g.h.i)perylene	0.5	mg/kg	0.7
Chrysene	0.5	mg/kg	0.7
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	1.3
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	0.6
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	1.1
Total PAH	1	mg/kg	7.9
Anthracene-d10 (surr.)	1	%	100
2-Fluorobiphenyl (surr.)	1	%	84
p-Terphenyl-d14 (surr.)	1	%	71
% Moisture	0.1	%	17
Heavy Metals			

Client Sample ID			**TRIP01**
Sample Matrix			**Soil**
mgt-LabMark Sample No.			**11-FE30616**
Date Sampled			**Feb 05, 2011**
Test/Reference	LOR	Unit	
Arsenic	2	mg/kg	2.4
Cadmium	0.5	mg/kg	< 0.5
Chromium	5	mg/kg	10
Copper	5	mg/kg	31
Lead	5	mg/kg	120
Nickel	5	mg/kg	< 5
Zinc	5	mg/kg	25
Mercury	0.1	mg/kg	< 0.1

Sample History

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

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - Method: E004 Petroleum Hydrocarbons (TPH)	Asquith	Feb 11, 2011	14 Day
BTEX - Method: E029/E016 BTEX	Asquith	Feb 11, 2011	14 Day
Polyaromatic Hydrocarbons (PAH) - Method: E007 Polyaromatic Hydrocarbons (PAH)	Asquith	Feb 11, 2011	14 Day
% Moisture - Method: E005 Moisture Content	Asquith	Feb 11, 2011	28 Day
Heavy Metals - Method: USEPA 6020 Heavy Metals & USEPA 7470/71 Mercury	Oakleigh	Feb 11, 2011	6 Month

mgt LabMark ENVIRONMENTAL LABORATORIES

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NATA Site # 13535

Clayton
1868 Dandenong Road
Clayton VIC 3168
Phone : +61 3 9265 9300
NATA Site # 1645

Company Name: AECOM Aust P/L Sydney
Address: Level 5, 828 Pacific Hwy
Gordon
NSW 2072

Order No.:
Report #: 289864
Phone: (02) 8484 8999
Fax: (02) 8484 8989

Received: Feb 8, 2011 12:00
Due: Feb 15, 2011 05:00
Priority: 5 Day
Contact name: Kate O'Brien

Client Job No.: HICKSON ROAD 60153531/5.7

mgt-LabMark Client Manager: Leanne Knowles

Sample Detail					% Moisture	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total Recoverable Hydrocarbons	BTEX	Polyaromatic Hydrocarbons (PAH)
Laboratory where analysis is conducted																
Oakleigh Laboratory - NATA Site #1261						X	X	X	X	X	X	X	X			
Thornleigh Laboratory - NATA Site #18217																
Asquith Laboratory - NATA Site #13535					X									X	X	X
Clayton Laboratory - NATA Site #1645																
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**												
TRIP01	Feb 05, 2011		Soil	A11-FE30616	X	X	X	X	X	X	X	X	X	X	X	X

mgt-LabMark Internal Quality Control Review

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 PQLs are matrix dependant. Quoted PQLs 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 Acknowledgment.
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 an RPD

UNITS

mg/kg: milligrams per Kilogram	**mg/L:** milligrams per litre
µg/l: micrograms per litre	**ppm:** Parts per million
ppb: Parts per billion	**%:** Percentage
org/100ml: Organisms per 100 millilitres	**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 client's batch of samples but run within the laboratory batch of analysis.
Batch SPIKE:	Spike recovery reported on a sample from outside of the client's batch of samples but run within the laboratory batch of analysis.
USEPA:	U.S Environmental Protection Agency
APHA:	American Public Health Association
ASLP:	Australian Standard Leaching Procedure (AS4439.3)
TCLP:	Toxicity Characteristic Leaching Procedure
COC:	Chain Of Custody
SRA:	Sample Receipt Advice

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 0-20%
Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 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, Toxophene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxophene 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 Arochlor 1260 in Matrix Spikes and LCS's.
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 RPD's are calculated from raw analytical data thus it is possible to have two sets of data below the LOR with a positive RPD - eg: LOR 0.1, Result A = <0.1 (raw data is 0.02) & Result B = <0.1 (raw data is 0.03) resulting in a RPD of 40% calculated from the raw data.

Quality Control Results

Sample, Test, Result Reference	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Codes
Method Blank							
Total Recoverable Hydrocarbons E004 Petroleum Hydrocarbor							
TRH C6-C9 Fraction by GC	mg/kg	< 10			10	Pass	
TRH C10-C14 Fraction by GC	mg/kg	< 50			50	Pass	
TRH C15-C28 Fraction by GC	mg/kg	< 100			100	Pass	
TRH C29-C36 Fraction by GC	mg/kg	< 100			100	Pass	
Method Blank							
BTEX E029/E016 BTEX							
Benzene	mg/kg	< 0.5			0.5	Pass	
Toluene	mg/kg	< 0.5			0.5	Pass	
Ethylbenzene	mg/kg	< 0.5			0.5	Pass	
Total m+p-Xylenes	mg/kg	< 1			1	Pass	
o-Xylene	mg/kg	< 0.5			0.5	Pass	
Xylenes(ortho.meta and para)	mg/kg	< 0.15			0.15	Pass	
Total BTEX	mg/kg	< 1			1	Pass	
Method Blank							
Polyaromatic Hydrocarbons (PAH) E007 Polyaromatic Hydroca							
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)fluoranthene & Benzo(k)fluorar	mg/kg	< 1			1	Pass	
Benzo(g.h.i)perylene	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							
Heavy Metals USEPA 6020 Heavy Metals & USEPA 7470/71 Mer							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.5			0.5	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons E004 Petroleum Hydrocarbor		Result 1					
TRH C6-C9 Fraction by GC	%	101			70-130	Pass	
TRH C15-C28 Fraction by GC	%	93			70-130	Pass	
LCS - % Recovery							
BTEX E029/E016 BTEX		Result 1					
Benzene	%	100			70-130	Pass	
Toluene	%	98			70-130	Pass	
Ethylbenzene	%	95			70-130	Pass	
Total m+p-Xylenes	%	91			70-130	Pass	
o-Xylene	%	92			70-130	Pass	
Xylenes(ortho.meta and para)	%	91			70-130	Pass	
LCS - % Recovery							
Polyaromatic Hydrocarbons (PAH) E007 Polyaromatic Hydroca		Result 1					
Acenaphthene	%	106			70-130	Pass	
Acenaphthylene	%	105			70-130	Pass	
Anthracene	%	112			70-130	Pass	
Benz(a)anthracene	%	109			70-130	Pass	
Benzo(a)pyrene	%	120			70-130	Pass	
Benzo(b)fluoranthene & Benzo(k)fluorar	%	117			70-130	Pass	
Benzo(g.h.i)perylene	%	120			70-130	Pass	
Chrysene	%	118			70-130	Pass	

Sample, Test, Result Reference	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Codes
Dibenz(a.h)anthracene	%	110			70-130	Pass	
Fluoranthene	%	125			70-130	Pass	
Fluorene	%	106			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	112			70-130	Pass	
Naphthalene	%	106			70-130	Pass	
Phenanthrene	%	109			70-130	Pass	
Pyrene	%	106			70-130	Pass	
LCS - % Recovery							
Heavy Metals USEPA 6020 Heavy Metals & USEPA 7470/71 Mer		Result 1					
Arsenic	%	96			80-120	Pass	
Cadmium	%	96			80-120	Pass	
Chromium	%	100			80-120	Pass	
Copper	%	99			80-120	Pass	
Lead	%	94			80-120	Pass	
Nickel	%	99			80-120	Pass	
Zinc	%	82			80-120	Pass	
Mercury	%	111			75-125	Pass	
[Duplicate of 11-FE30730 - BATCH]							
Total Recoverable Hydrocarbons		Result 1	Result 2	RPD			
TRH C6-C9 Fraction by GC	mg/kg	< 10	< 10	<1	30%	Pass	
TRH C10-C14 Fraction by GC	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C15-C28 Fraction by GC	mg/kg	< 100	< 100	<1	30%	Pass	
TRH C29-C36 Fraction by GC	mg/kg	< 100	< 100	<1	30%	Pass	
[Duplicate of 11-FE30730 - BATCH]							
BTEX		Result 1	Result 2	RPD			
Benzene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Toluene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Ethylbenzene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Total m+p-Xylenes	mg/kg	< 1	< 1	<1	30%	Pass	
o-Xylene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Xylenes(ortho.meta and para)	mg/kg	< 0.15	< 0.15	<1	30%	Pass	
[Duplicate of 11-FE30617 - BATCH]							
Polyaromatic Hydrocarbons (PAH)		Result 1	Result 2	RPD			
Acenaphthene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b)fluoranthene & Benzo(k)fluoran	mg/kg	< 1	< 1	<1	30%	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
[Duplicate of 11-FE05093 - BATCH]							
Heavy Metals		Result 1	Result 2	RPD			
Arsenic	mg/kg	22	19	13	30%	Pass	
Chromium	mg/kg	12	11	4	30%	Pass	
Copper	mg/kg	< 5	< 5	<1	30%	Pass	
Lead	mg/kg	12	11	11	30%	Pass	
Nickel	mg/kg	6.5	6.1	7	30%	Pass	
Zinc	mg/kg	< 5	< 5	<1	30%	Pass	
Mercury	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
[Spike of 11-FE30730 - BATCH] - % Recovery							
BTEX		Result 1					
Benzene	%	92			70 - 130	Pass	
Toluene	%	93			70 - 130	Pass	
Ethylbenzene	%	88			70 - 130	Pass	
Total m+p-Xylenes	%	85			70 - 130	Pass	
o-Xylene	%	84			70 - 130	Pass	
Xylenes(ortho.meta and para)	%	85			70 - 130	Pass	
[Spike of 11-FE05093 - BATCH] - % Recovery							

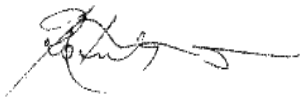
Sample, Test, Result Reference	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Codes
Heavy Metals		Result 1					
Arsenic	%	91			75 - 125	Pass	
Cadmium	%	95			75 - 125	Pass	
Chromium	%	96			75 - 125	Pass	
Copper	%	99			75 - 125	Pass	
Lead	%	87			75 - 125	Pass	
Nickel	%	94			75 - 125	Pass	
Zinc	%	81			75 - 125	Pass	
Mercury	%	123			70 - 130	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Organic samples had Teflon liners	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	Yes

Authorised By



Dr. Bob Symons
NATA Signatory

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

CPFO419 (ENV) Chain of Custody Analysis Request Form

AECOM

2/2

AECOM - Sydney (Gordon)		**Laboratory Details**	Tel: 8784 8555
PO Box 726	Tel: 61 2 8484 8999	Lab. Name: ALS	Fax:
Pymble NSW 2073 Australia	Fax: 61 2 8484 8989	Lab. Address: 277 Woodpark Rd Smithfield	Preliminary Report by:
	Email: Kate.O'Brien@aecom.com	Contact Name:	Final Report by:
		Lab. Ref:	Lab Quote No: SY/418/10 V2

Project Name: Hickson Road **Project Number:** 60153531/5.7 **Purchase Order Number:** 38962AUS

Sample collected by: Kate O'Brien **Sample Results to be returned to:** Kate O'Brien

Specifications: Esdat

	(Tick)		
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	☐ Yes	☐ No	☐ N/A
2. Fast TAT Guarantee Required?	☐ Yes	☐ No	☐ N/A
3. Is any sediment layer present in waters to be excluded from extractions?	☐ Yes	☐ No	☐ N/A
4. Special storage requirements?	☐ Yes	☐ No	☐ N/A
5. Preservation requirements?	☐ Yes	☐ No	☐ N/A
6. Other requirements?	☐ Yes	☐ No	☐ N/A

7. Report Format: ☐ Fax ☐ Hard copy ☑ Email 8. Project Manager: Anthony Davis tel: 8484 8939

Lab. ID	Sample ID	Sampling Date & time	Matrix: soil	water	other	Preservation: filtred	acid	ice	other	Container (No. & type)	Heavy Metals (8)	TPH (C6-C36)	BTEX	PAHs	Remarks & comments
11-FE30616	TRIP01	5-2-11	X					X			X	X	X	X	
	Please send TRIP01 to Labmark for analysis														

Relinquished By:	**Received by:**	Received in good condition?	Yes/No/NA	Method of Shipment	
Name: Kate O'Brien Date: 7-2-11	Name: [illegible] Date: 07/2/11	Samples received chilled? 6.6	Yes/No/NA	Consignment Note No.	
of: AECOM Time: 9am	of: Ausy Time: 1550		Yes/No/NA	Transport Co: ☐ Courier ☐ Postal ☐ By Hand	
Relinquished By:	**Received by:** BL	Received in good condition?	Yes/No/NA	Method of Shipment	
Name: Date:	Name: Sarah Date: 8/2/11	Samples received chilled?	Yes/No/NA	Consignment Note No.	
of: Time:	of: mgt labmark Time: 3:45		Yes/No/NA	Transport Co: ☐ Courier ☐ Postal ☐ By Hand	

289864

mgt LabMark ENVIRONMENTAL LABORATORIES

ABN – 50 005 085 521 e.mail : mgt@mgtenv.com.au web : www.mgtenv.com.au

Melbourne
3-5 Kingston Town Close
Oakleigh Vic 3166
Phone : +61 3 9564 7055
NATA Acc # 1261

Sydney
Unit F6, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 8215 6222
NATA Acc # 1645

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600

Sample Receipt Advice

Company name: **AECOM Aust P/L Sydney**

Contact name: Kate O'Brien
Client job number: HICKSON ROAD 60153531/5.7
COC number: Not provided
Turn around time: 5 Day
Date received: Feb 8, 2011
MGT lab reference: **289864**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ 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.

☑ Organic samples had Teflon liners.

☑ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Notes

Heavy Metals (8) by mgt Labmark Melbourne - results may be delayed.

Contact notes

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

Leanne Knowles on Phone : +61 2 9476 6533 or by e.mail: leanne.knowles@labmark.com.au

Results will be delivered electronically via e.mail to Kate O'Brien - kate.obrien@aecom.com.

mgt Labmark Sample Receipt

mgt LabMark
ENVIRONMENTAL LABORATORIES

ABN – 50 005 085 521 e.mail : mgt@mgtenv.com.au web : www.mgtlabmark.com.au

Melbourne
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Oakleigh VIC 3166
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NATA Site # 1261

Thornleigh
1a Chilvers Rd
Thornleigh NSW 2120
Phone : +61 2 9484 3300
NATA Site # 18217

Asquith
Unit 1, 8 Leighton Place
Asquith NSW 2077
Phone : +61 2 9476 6533
NATA Site # 13535

Clayton
1868 Dandenong Road
Clayton VIC 3168
Phone : +61 3 9265 9300
NATA Site # 1645

Company Name: AECOM Aust P/L Sydney
Address: Level 5, 828 Pacific Hwy
Gordon
NSW 2072

Order No.:
Report #: 289864
Phone: (02) 8484 8999
Fax: (02) 8484 8989

Received: Feb 8, 2011 12:00
Due: Feb 15, 2011 05:00
Priority: 5 Day
Contact name: Kate O'Brien

Client Job No.: HICKSON ROAD 60153531/5.7

mgt-LabMark Client Manager: Leanne Knowles

Sample Detail					% Moisture	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total Recoverable Hydrocarbons	BTEX	Polyaromatic Hydrocarbons (PAH)
Laboratory where analysis is conducted																
Oakleigh Laboratory - NATA Site #1261						X	X	X	X	X	X	X	X			
Thornleigh Laboratory - NATA Site #18217																
Asquith Laboratory - NATA Site #13535					X									X	X	X
Clayton Laboratory - NATA Site #1645																
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**												
TRIP01	Feb 05, 2011		Soil	A11-FE30616	X	X	X	X	X	X	X	X	X	X	X	X

Appendix H

Calculations

1				General UCL Statistics for Data Sets with Non-Detects								
2		User Selected Options										
3			From File	K:\60153531_Barangaroo\5. Declaration Area DGRs\5.7 Hickson Road Tree Investigation\95% UCL data.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Phenanthrene											
10												
11						General Statistics						
12						Number of Valid Data	21			Number of Detected Data	10	
13						Number of Distinct Detected Data	10			Number of Non-Detect Data	11	
14										Percent Non-Detects	52.38%	
15												
16						Raw Statistics				Log-transformed Statistics		
17						Minimum Detected	0.6			Minimum Detected	-0.511	
18						Maximum Detected	24.8			Maximum Detected	3.211	
19						Mean of Detected	6.72			Mean of Detected	1.222	
20						SD of Detected	7.669			SD of Detected	1.311	
21						Minimum Non-Detect	0.5			Minimum Non-Detect	-0.693	
22						Maximum Non-Detect	0.5			Maximum Non-Detect	-0.693	
23												
24												
25						UCL Statistics						
26						Normal Distribution Test with Detected Values Only				Lognormal Distribution Test with Detected Values Only		
27						Shapiro Wilk Test Statistic	0.801			Shapiro Wilk Test Statistic	0.914	
28						5% Shapiro Wilk Critical Value	0.842			5% Shapiro Wilk Critical Value	0.842	
29						Data not Normal at 5% Significance Level				Data appear Lognormal at 5% Significance Level		
30												
31						Assuming Normal Distribution				Assuming Lognormal Distribution		
32						DL/2 Substitution Method				DL/2 Substitution Method		
33						Mean	3.331			Mean	-0.144	
34						SD	6.118			SD	1.598	
35						95% DL/2 (t) UCL	5.633			95% H-Stat (DL/2) UCL	6.343	
36												
37						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
38						MLE yields a negative mean				Mean in Log Scale	-0.797	
39										SD in Log Scale	2.355	
40										Mean in Original Scale	3.269	
41										SD in Original Scale	6.151	
42										95% Percentile Bootstrap UCL	5.602	
43										95% BCA Bootstrap UCL	6.621	
44												
45						Gamma Distribution Test with Detected Values Only				Data Distribution Test with Detected Values Only		
46						k star (bias corrected)	0.669			Data appear Gamma Distributed at 5% Significance Level		
47						Theta Star	10.04					
48						nu star	13.39					
49												
50						A-D Test Statistic	0.479			Nonparametric Statistics		
51						5% A-D Critical Value	0.753			Kaplan-Meier (KM) Method		
52						K-S Test Statistic	0.753			Mean	3.514	
53						5% K-S Critical Value	0.275			SD	5.878	

54	**Data appear Gamma Distributed at 5% Significance Level**										SE of Mean	1.352
55											95% KM (t) UCL	5.846
56	**Assuming Gamma Distribution**										95% KM (z) UCL	5.738
57	Gamma ROS Statistics using Extrapolated Data										95% KM (jackknife) UCL	5.703
58	Minimum	1E-09									95% KM (bootstrap t) UCL	7.527
59	Maximum	24.8									95% KM (BCA) UCL	6.124
60	Mean	7.585									95% KM (Percentile Bootstrap) UCL	5.976
61	Median	6.4									95% KM (Chebyshev) UCL	9.407
62	SD	7.539									97.5% KM (Chebyshev) UCL	11.96
63	k star	0.264									99% KM (Chebyshev) UCL	16.97
64	Theta star	28.75										
65	Nu star	11.08									**Potential UCLs to Use**	
66	AppChi2	4.629									95% KM (t) UCL	5.846
67	95% Gamma Approximate UCL	18.16										
68	95% Adjusted Gamma UCL	19.49										
69	**Note: DL/2 is not a recommended method.**											
70												
71												
72	**Zinc**											
73												
74	**General Statistics**											
75	Number of Valid Data	21									Number of Detected Data	20
76	Number of Distinct Detected Data	17									Number of Non-Detect Data	1
77											Percent Non-Detects	4.76%
78												
79	**Raw Statistics**										**Log-transformed Statistics**	
80	Minimum Detected	15									Minimum Detected	2.708
81	Maximum Detected	649									Maximum Detected	6.475
82	Mean of Detected	101.3									Mean of Detected	3.902
83	SD of Detected	162.7									SD of Detected	1.064
84	Minimum Non-Detect	5									Minimum Non-Detect	1.609
85	Maximum Non-Detect	5									Maximum Non-Detect	1.609
86												
87												
88	**UCL Statistics**											
89	**Normal Distribution Test with Detected Values Only**										**Lognormal Distribution Test with Detected Values Only**	
90	Shapiro Wilk Test Statistic	0.561									Shapiro Wilk Test Statistic	0.825
91	5% Shapiro Wilk Critical Value	0.905									5% Shapiro Wilk Critical Value	0.905
92	**Data not Normal at 5% Significance Level**										**Data not Lognormal at 5% Significance Level**	
93												
94	**Assuming Normal Distribution**										**Assuming Lognormal Distribution**	
95	DL/2 Substitution Method										DL/2 Substitution Method	
96	Mean	96.6									Mean	3.76
97	SD	160									SD	1.224
98	95% DL/2 (t) UCL	156.8									95% H-Stat (DL/2) UCL	175.6
99												
100	Maximum Likelihood Estimate(MLE) Method										Log ROS Method	
101	Mean	91.86									Mean in Log Scale	3.785
102	SD	161.4									SD in Log Scale	1.167
103	95% MLE (t) UCL	152.6									Mean in Original Scale	96.68
104	95% MLE (Tiku) UCL	147.5									SD in Original Scale	160
105											95% Percentile Bootstrap UCL	156.9
106											95% BCA Bootstrap UCL	185

107												
108	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
109				k star (bias corrected)	0.735		**Data do not follow a Discernable Distribution (0.05)**					
110				Theta Star	137.8							
111				nu star	29.4							
112												
113				A-D Test Statistic	2.384		**Nonparametric Statistics**					
114				5% A-D Critical Value	0.776					Kaplan-Meier (KM) Method		
115				K-S Test Statistic	0.776					Mean		97.19
116				5% K-S Critical Value	0.201					SD		155.8
117	**Data not Gamma Distributed at 5% Significance Level**									SE of Mean		34.89
118										95% KM (t) UCL		157.4
119	**Assuming Gamma Distribution**									95% KM (z) UCL		154.6
120				Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL		157.2
121				Minimum	1E-09					95% KM (bootstrap t) UCL		208.8
122				Maximum	649					95% KM (BCA) UCL		156.9
123				Mean	96.48					95% KM (Percentile Bootstrap) UCL		155.9
124				Median	30					95% KM (Chebyshev) UCL		249.3
125				SD	160.1					97.5% KM (Chebyshev) UCL		315.1
126				k star	0.343					99% KM (Chebyshev) UCL		444.4
127				Theta star	281.2							
128				Nu star	14.41		**Potential UCLs to Use**					
129				AppChi2	6.853					97.5% KM (Chebyshev) UCL		315.1
130				95% Gamma Approximate UCL	202.9							
131				95% Adjusted Gamma UCL	215.4							
132	**Note: DL/2 is not a recommended method.**											
133												
134												
135	**Copper**											
136												
137	**General Statistics**											
138				Number of Valid Data	20					Number of Detected Data		17
139				Number of Distinct Detected Data	16					Number of Non-Detect Data		3
140										Percent Non-Detects		15.00%
141												
142	**Raw Statistics**						**Log-transformed Statistics**					
143				Minimum Detected	6					Minimum Detected		1.792
144				Maximum Detected	76					Maximum Detected		4.331
145				Mean of Detected	31.24					Mean of Detected		3.2
146				SD of Detected	20.22					SD of Detected		0.765
147				Minimum Non-Detect	5					Minimum Non-Detect		1.609
148				Maximum Non-Detect	5					Maximum Non-Detect		1.609
149												
150												
151	**UCL Statistics**											
152	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
153				Shapiro Wilk Test Statistic	0.926					Shapiro Wilk Test Statistic		0.93
154				5% Shapiro Wilk Critical Value	0.892					5% Shapiro Wilk Critical Value		0.892
155	**Data appear Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**					
156												
157	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
158				DL/2 Substitution Method						DL/2 Substitution Method		
159				Mean	26.93					Mean		2.857

160				SD	21.33					SD	1.092
161				95% DL/2 (t) UCL	35.17					95% H-Stat (DL/2) UCL	39.13
162											
163				Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
164				Mean	25.39					Mean in Log Scale	2.937
165				SD	23.2					SD in Log Scale	0.956
166				95% MLE (t) UCL	34.36					Mean in Original Scale	27.21
167				95% MLE (Tiku) UCL	34.39					SD in Original Scale	21.01
168										95% Percentile Bootstrap UCL	35.01
169										95% BCA Bootstrap UCL	35.65
170											
171	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**				
172				k star (bias corrected)	1.867		**Data appear Normal at 5% Significance Level**				
173				Theta Star	16.73						
174				nu star	63.49						
175											
176				A-D Test Statistic	0.465		**Nonparametric Statistics**				
177				5% A-D Critical Value	0.749					Kaplan-Meier (KM) Method	
178				K-S Test Statistic	0.749					Mean	27.45
179				5% K-S Critical Value	0.211					SD	20.21
180	**Data appear Gamma Distributed at 5% Significance Level**									SE of Mean	4.657
181										95% KM (t) UCL	35.5
182	**Assuming Gamma Distribution**									95% KM (z) UCL	35.11
183				Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	35.24
184				Minimum	1E-09					95% KM (bootstrap t) UCL	36.82
185				Maximum	76					95% KM (BCA) UCL	36.35
186				Mean	26.93					95% KM (Percentile Bootstrap) UCL	35.45
187				Median	25					95% KM (Chebyshev) UCL	47.75
188				SD	21.35					97.5% KM (Chebyshev) UCL	56.53
189				k star	0.401					99% KM (Chebyshev) UCL	73.79
190				Theta star	67.18						
191				Nu star	16.04		**Potential UCLs to Use**				
192				AppChi2	7.987					95% KM (t) UCL	35.5
193				95% Gamma Approximate UCL	54.07					95% KM (Percentile Bootstrap) UCL	35.45
194				95% Adjusted Gamma UCL	57.27						
195	**Note: DL/2 is not a recommended method.**										
196											
197											
198	**CPAH**										
199											
200					**General Statistics**						
201				Number of Valid Data	21					Number of Detected Data	13
202				Number of Distinct Detected Data	13					Number of Non-Detect Data	8
203										Percent Non-Detects	38.10%
204											
205	**Raw Statistics**						**Log-transformed Statistics**				
206				Minimum Detected	4.3					Minimum Detected	1.459
207				Maximum Detected	113.2					Maximum Detected	4.729
208				Mean of Detected	39.59					Mean of Detected	3.049
209				SD of Detected	39.28					SD of Detected	1.269
210				Minimum Non-Detect	3					Minimum Non-Detect	1.099
211				Maximum Non-Detect	4					Maximum Non-Detect	1.386
212											

	A	B	C	D	E	F	G	H	I	J	K	L
213	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		8
214	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		13
215	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		38.10%
216												
217	**UCL Statistics**											
218	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
219	Shapiro Wilk Test Statistic					0.833	Shapiro Wilk Test Statistic					0.865
220	5% Shapiro Wilk Critical Value					0.866	5% Shapiro Wilk Critical Value					0.866
221	**Data not Normal at 5% Significance Level**						**Data not Lognormal at 5% Significance Level**					
222												
223	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
224	DL/2 Substitution Method						DL/2 Substitution Method					
225	Mean					25.22	Mean					2.124
226	SD					35.75	SD					1.56
227	95% DL/2 (t) UCL					38.68	95% H-Stat (DL/2) UCL					55.5
228												
229	Maximum Likelihood Estimate(MLE) Method						Log ROS Method					
230	Mean					12.23	Mean in Log Scale					1.844
231	SD					48.97	SD in Log Scale					1.916
232	95% MLE (t) UCL					30.66	Mean in Original Scale					24.94
233	95% MLE (Tiku) UCL					32.63	SD in Original Scale					35.94
234							95% Percentile Bootstrap UCL					38.17
235							95% BCA Bootstrap UCL					40.32
236												
237	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
238	k star (bias corrected)					0.763	**Data appear Gamma Distributed at 5% Significance Level**					
239	Theta Star					51.86						
240	nu star					19.85						
241												
242	A-D Test Statistic					0.718	**Nonparametric Statistics**					
243	5% A-D Critical Value					0.761	Kaplan-Meier (KM) Method					
244	K-S Test Statistic					0.761	Mean					26.15
245	5% K-S Critical Value					0.244	SD					34.28
246	**Data appear Gamma Distributed at 5% Significance Level**						SE of Mean					7.786
247							95% KM (t) UCL					39.58
248	**Assuming Gamma Distribution**						95% KM (z) UCL					38.95
249	Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL					39.26
250	Minimum					1E-09	95% KM (bootstrap t) UCL					44.65
251	Maximum					113.2	95% KM (BCA) UCL					38.95
252	Mean					30.11	95% KM (Percentile Bootstrap) UCL					39.48
253	Median					17.35	95% KM (Chebyshev) UCL					60.09
254	SD					33.96	97.5% KM (Chebyshev) UCL					74.77
255	k star					0.253	99% KM (Chebyshev) UCL					103.6
256	Theta star					119.2						
257	Nu star					10.61	**Potential UCLs to Use**					
258	AppChi2					4.328	95% KM (BCA) UCL					38.95
259	95% Gamma Approximate UCL					73.84						
260	95% Adjusted Gamma UCL					79.43						
261	**Note: DL/2 is not a recommended method.**											
262												