JBS ENVIRONMENTAL

Remedial Action Plan

FINAL DRAFT

Barangaroo Delivery Authority

Barangaroo Central, Hickson Road, Sydney, NSW

May 2013
JBS 42021 – 51725 (Rev H)

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List of Abbreviations

A list of the common abbreviations used throughout this report is provided below.

- ACM Asbestos Containing Material
- AHD Australian Height Datum
- As Arsenic
- BDA Barangaroo Development Authority
- BOM Bureau of Meteorology
- BTEX Benzene, Toluene, Ethylbenzene and Xylenes
- B(a)P Benzo(a)pyrene
- bgs Below ground surface
- Cd Cadmium
- CEMP Construction Environmental Management Plan
- COPC Contaminants of Potential Concern
- CQAP Construction Quality Assurance Plan
- Cr Chromium
- Cu Copper
- CQAP Construction Quality Assurance Plan
- DEC Department of Conservation
- DECC Department of Climate Change
- DNAPL Dense Non Aqueous Phase Liquid
- DTIM Deep Tar Impacted Material
- DoPI NSW Department of Planning and Infrastructure
- DP Deposited Plan
- DQI Data Quality Indicators
- DQO Data Quality Objectives
- ENM Excavated Natural Material
- EPA NSW Environment Protection Authority
- EPL Environment Protection Licence
- ERH Electrical Resistance Heating
- DGRs Director General Requirements
- HHERA Human Health and Ecological Risk Assessment
- Hg Mercury
- HIL Health Based Investigation Level
- LOR Limit of Reporting
- LTEMP Long Term Environmental Management Plan
- MAH Monocyclic Aromatic Hydrocarbon
- mAHD metres Australian Height Datum

- MCMS Materials Compliance Management System
- NAPL Non aqueous phase liquid
- NATA National Association of Testing Authorities
- Ni Nickel
- NOW NSW Office of Water
- OCP Organochlorine Pesticide
- OEH NSW Office of the Environment and Heritage
- OHSMP Occupational Health and Safety Management Plan
- PAH Polycyclic Aromatic Hydrocarbons
- Pb Lead
- PIL Phytotoxicity Based Investigation Level
- PCB Polychlorinated Biphenyls
- PQL Practical Quantitation Limit
- QA/QC Quality Assurance/Quality Control
- RAP Remedial Action Plan
- RWP Remedial Works Plan
- SAC Site Acceptance Criteria
- SEPP State Environmental Planning Policy
- SEPR Surfactant Enhanced Product Recovery
- SISCO Surfactant enhanced In-Situ Chemical Oxidation
- SVOC Semi Volatile Organic Compound
- SWA Safe Work Australia
- SWC Sydney Water Corporation
- TCH Thermal (electrical) Conductive Heating
- TEF Toxicity Equivalence Factor
- TIM Tar Impacted Material
- TPH Total Petroleum Hydrocarbons (C_6-C_9 and C_{10}-C_{36})
- UCL Upper Confidence Level
- VENM Virgin Excavated Natural Material
- VOC Volatile Organic Compound
- VSAQP Validation Sampling Analysis and Quality Plan
- Zn Zinc

Definitions

For the purposes of this document, the following definitions apply:

- "Barangaroo Central HHERA" – refers collectively to the Human Health Risk Assessment and Ecological Risk Assessment for the Barangaroo Central Site, prepared by JBS Environmental Pty Ltd.
- "Barangaroo Central Site" – refers to the central portion of the Barangaroo site comprising part Lots 5 and 6 in DP876514. Located adjoining the southern boundary of the Headland Park Site, adjoining the northern boundary of the Stage 1 development and adjoining the northern and part of the western boundary of the Declaration Area.
- "Barangaroo Project Site" – refers to the Barangaroo Site, as defined in this RAP, and adjoining parts of Sussex Street, Hickson Road and Towns Place.
- "Barangaroo Site" – refers to Part Lots 1, 5 & 6 and Lots 3 & 4 of Deposited Plan (DP) 876514.
- "Declaration Area" - refers to the part of the Barangaroo Project Site and the part of Hickson Road which are the subject of the Declaration of Remediation Site by the NSW EPA under the *Contaminated Land Management Act 1997* (Declaration Number 21122, Area Number 3221, dated 6 May 2009. No part of the Declaration Area is within the Barangaroo Central Site.
- "Deep Tar Impacted Material" – refers to material that contains contaminants consistent with a gasworks waste and which contain tar and/or high concentrations of polynuclear aromatic hydrocarbons greater than 10 metres below ground surface and does not require remediation.
- "Headland Park Site" – refers to Part Lots 1, 5 & 6 and Lot 4 of DP 876514 located at the northern portion of the Barangaroo Site and includes adjacent parts of Hickson Road and Towns Place.
- "Imported Materials" – refers to fill/soil/rock materials imported onto the Barangaroo Central Site as part of the remediation works, sourced from land other than the Barangaroo Project Site, as defined in this RAP.
- "Overarching RAP" – refers to the Overarching RAP for the whole Barangaroo Project Site, prepared by ERM Australia Pty Ltd (ERM 2010).
- "Remediation Consultant" – refers to JBS Environmental Pty Ltd.
- "Risk-based Criteria" – refers to the criteria established in the Barangaroo Central HHERA, which form part of the Site Acceptance Criteria, as defined in this RAP.
- "Tar Impacted Material" – refers to material that contains contaminants consistent with a gasworks waste and which contain tar and/or high concentrations of polynuclear aromatic hydrocarbons and is potentially acting as a source of groundwater contamination.
- "Site Acceptance Criteria" – refers to the criteria nominated in this RAP which define the suitability, or otherwise, of materials being accepted onto the Barangaroo Central Site.
- "Site Materials" – refers to fill/soil/rock materials sourced from land within the Barangaroo Project Site, as defined in this RAP.
- "Stage 1 Development" – refers to the southern part of the Barangaroo Project Site, which will be developed for commercial/residential/open space uses. This includes Lot 3 and part Lots 5 and 6 in DP876514.

Executive Summary

Introduction

JBS Environmental Pty Ltd (JBS) was engaged by the Barangaroo Delivery Authority (BDA) as "Remediation Consultant" to prepare a Remedial Action Plan (RAP) for the Barangaroo Central portion of the Barangaroo Site located at Hickson Road, Sydney, NSW, 2000 (**Figure 1**).

This RAP applies only to the Barangaroo Central portion of the Barangaroo Site. In this RAP, Barangaroo Central - comprising Part Lots 5 and 6 of DP876514 - is referred to as the "Barangaroo Central Site". The entire Barangaroo Site is referred to as the "Barangaroo Site", whilst the "Barangaroo Project Site" includes the Barangaroo Site and the adjoining parts of Sussex Street, Hickson Road which were included by the NSW Environment Protection Authority (EPA) as part of the Declaration of Remediation Site.

The footprint of the former gasworks has been declared by the EPA as a Remediation Site and is referred to in this RAP as the "Declaration Area". The Declaration Area refers to the part of the Barangaroo Project Site and Hickson Road which is the subject of the Declaration of Remediation Site by the NSW EPA under the *Contaminated Land Management Act 1997* (Declaration Number 21122, Area Number 3221, dated 6 May 2009 and is inclusive of part Lots 3 and 5 in DP876514.

The soil contamination within the Declaration Area contributing to the groundwater contamination is proposed to be remediated during remediation of the Declaration Area. In the event that remediation of the Declaration Area does not occur, or is unsuccessful, then contingency measures for remediation of the Declaration Area in proximity of the Barangaroo Central Site and associated proposed structures are also included in this RAP.

The southern part of the Barangaroo Project Site, referred to as the "Stage 1 Development", will be developed for a mixture of commercial, residential and open space uses. The boundary of the Barangaroo Central Site which is the subject of this RAP is shown on **Figure 2**.

Summary of Contamination Issues

Previous environmental investigations conducted on the Barangaroo Central Site have identified soil contamination, being Total Petroleum Hydrocarbon (TPH), Polycyclic Aromatic Hydrocarbons (PAH), metal and asbestos-impacted fill material. No significant contamination has been identified on the Barangaroo Central Site, with the exception of shallow tar impacted material and associated groundwater impact on the boundary of the Declaration Area and an area of asbestos containing material impacted fill material. The extent of this contamination, to a depth of 10m below ground surface (bgs), is located within the proposed extent of the southern basement excavation.

Whilst this RAP primarily relates to the remediation and management of contamination within the Barangaroo Central Site, suitable Site Materials from other parts of the Barangaroo Project Site may be relocated onto the Barangaroo Central Site provided they have been demonstrated to be suitable for the proposed use on the Barangaroo Central Site. However, no Site Materials will be accepted for reuse on the Barangaroo Central Site from the Declaration Area.

This RAP therefore gives consideration to the broader contamination issues on the Barangaroo Project Site and outlines the procedures for the acceptance of other Site Materials onto the Barangaroo Central Site.

The contamination issues identified across the broader Barangaroo Project Site are principally associated with fill materials, natural soil and groundwater within the footprint of a former gasworks, which is located on the Stage 1 Development within the Declaration Area, namely:

- TPH, Benzene, Toluene, Ethylbenzene & Xylene (BTEX) and PAH-impacted fill materials, soils and groundwater;
- Cyanide-impacted fill materials, soil and groundwater;
- Phenol- and ammonia-impacted fill materials, soil and groundwater;
- Asbestos-impacted fill materials; and
- Metal-impacted fill materials, soil and groundwater (lead, cadmium, copper & zinc).

Objectives

The objectives of this RAP are to:

- Document the procedures and standards to be followed in order to remove the risks posed by contamination at the Barangaroo Central Site to future site occupants and the surrounding environment (including to human and ecological receptors);
- Document the procedures and standards to be followed in order to ensure the suitability of Site Materials relocated from the broader Barangaroo Project Site onto the Barangaroo Central Site; and
- Enable a Site Audit Report and Site Audit Statement(s) to be prepared by the appointed independent NSW EPA Accredited Site Auditor, confirming that the Barangaroo Central Site can be made suitable for the proposed uses subject to the successful implementation of the proposed remedial/management measures set out in this RAP.

The Overarching RAP (ERM 2010[1]), which has been prepared for the Barangaroo Project Site, makes reference to the preparation of individual RAPs and Remedial Work Plans (RWPs) for various elements of the Barangaroo Project Site.

This RAP for the Barangaroo Central Site is one of the individual RAPs required to be prepared by the Overarching RAP. A RWP for the Barangaroo Central Site has been prepared and is included within this RAP (**Appendix B**).

The Proposed Development/Current Design

The Barangaroo Central Site is proposed to be initially developed as 'Barangaroo Stage 1 Public Domain' to facilitate a recreational use of Barangaroo Central Site prior to anticipated long-term development in accordance with the current Barangaroo concept plan. Characteristics of this development and associated land use are proposed to include:

- Restriction of development to the area of the site referred to as Separable Portions 4 and 5, consisting of the northern and central portions of the Barangaroo Central site, as shown on **Figure 3a**;

[1] *Overarching Remedial Action Plan for The Barangaroo Project Site, Sydney,* ERM, June 2010 (ERM 2010)

- Continuing use of the southern portion of the Barangaroo Central Site as a 'temporary construction staging area', associated with the Barangaroo South development works;
- Use of Barangaroo Central Site for recreational purposes, similar to the open areas of the Headland Park Site;
- Landscaping with grasses and some large plantings over approximately 70 % of the Barangaroo Central Site;
- Retention of existing site paving and use for Car Parking over approximately 30 % of the Barangaroo Central Site as present to the south of the central portion; and

Importation (or relocation from other parts of the Barangaroo Project Site, but not from the Declaration Area) of between 80 000 and 150 000 m^3 of fill materials to raise the site level and create a fall towards Darling Harbour. It is understood that these works are subject of a Project Application that will require a number of environmental studies to support the Project Application, including this RAP.

Barangaroo Central will be ultimately developed for a combined residential / recreational site use. A high density residential building is proposed to be constructed on the eastern portion of the site and be underlain by two basements constructed to a depth of 10 m below the current ground levels. The southern basement is partially located within the Barangaroo Central Site and also extends beyond the Barangaroo Central Site into the Declaration Area. The remainder of the Barangaroo Central Site is proposed to be used for recreational purposes.

Extent of Remediation / Management Required

Metals and PAHs in Growing Media

This RAP has not identified any remedial works (involving excavation and treatment) as being required for the Barangaroo Central Site for the Stage 1 Public Domain development consequent of current site contamination.

Remediation works are required to contain surface soils on the site that have been identified as being unsuitable to be used as growing media. The metals and PAHs in the fill are, however, suitable to be retained as general fill material within the Barangaroo Central Site beneath imported growing media.

Asbestos and Shallow Tar Impacted Material

Asbestos, shallow and deep tar impacted materials requiring remediation have been summarised in **Table E-1**.

Table E-1: Summary of Identified Soil Contamination Requiring Remediation / Management

Contamination	Location	Approx. Dimensions (m)*	Approx. Area (m^2)*	Approx. Volume (m^3)*	Approx. Depth (m bgs)
Surface Soils	Whole Site	N/A	N/A	N/A	N/A
Asbestos Fibre Impacted Fill	BH401	20 m x 20 m	400 m^2	400 m^3	9 – 10 m bgs
Shallow Tar Impacted Materials	BH70 (AECOM) BH74 (AECOM)	10 m x 20 m 10 m x 20 m	200 m^2 200 m^2	200 m^3 1000 m^2	2 – 3 m bgs 1 – 6 m bgs
Deeper Tar Impacted Materials	BH074 (ERM) BH541 BH403	15 m x 20 m 15 m x 20 m 15 m x 20 m	300 m^2 300 m^2 300 m^2	300 m^3 1050 m^3 300 m^3	9 – 10 m bgs 6.5 – 10 m bgs 9 – 10 m bgs

Note:* The actual extent of remediation required will be determined through validation inspection, sampling and analyses. The values presented in this table are indicative estimates only and are based on the limitations of the reports from which the data have been sourced.

Consideration of Deep Residual Tar Impacted Materials

Some additional deep residual tar impacted material is present in the underlying naturally occurring soils/sediments at depths below the proposed basement levels. However, in accordance with EPA guidance provided in DEC 2007, remediation of these deeper materials is not required because:

- Technical difficulties and environmental risks associated with attempting to try and remediate contamination at significant depths immediately adjoining Darling Harbour;
- Extremely high costs and lengthy time implications associated with attempting to complete such remediation works;
- The limited beneficial uses of the deep aquifer and because the primary resource value – that being the discharge of groundwater from the aquifer into Darling Harbour – is already being realised without remediation, with data obtained in the groundwater discharge zone at Darling Harbour indicating that contaminant concentrations are below relevant water quality guidelines;
- The depth of the materials precludes human exposure so there is no risk posed by the materials to human health; and
- The low permeability of the naturally occurring soils/sediments means that the amount of migration of such contamination into the receiving environment is not resulting in relevant water quality guidelines being exceeded.

Given that complete removal or treatment of the deep residual contamination in the naturally occurring soils/sediments is impracticable for the reasons listed above, ongoing monitoring and management of the contamination is required and the adopted strategy for controlling the residual contamination is required to have the following objectives (DEC 2007):

- Ensure the protection of human and ecological health;
- Control further migration of contaminants from sub-surface NAPLs to the surrounding groundwater; and
- Reduce NAPL mass to the extent practicable (source removal or treatment).

The approach outlined in this RAP for the deep residual contamination is consistent with this regulatory guidance given:

- A basement construction method will be adopted for the south of the Barangaroo Central Site that will control the potential human health risk;
- The Barangaroo Central Site has been demonstrated to not pose a potential ecological risk;
- The NAPL that will be left will primarily occur in natural soils / sediments which have negligible migration potential;
- NAPL mass will be reduced by the basement excavation works to a depth of 10m which is considered the extent practicable; and
- Ongoing monitoring / management can be incorporated in the LTEMP which is required for other identified contamination issues at the Barangaroo Central Site.

Seepage Water within Basements

Potential seepage water that may migrate into future deep basements constructed on the Barangaroo Central Site may pose a potential human health risk and a potential aesthetic issue.

Remediation / Management Approach

With consideration to NSW EPA's hierarchy for remediation, and to the site-specific contaminants and environmental setting, the following remediation/management approach has been adopted for the Barangaroo Central Site:

Surface Soils

Soils are required to be imported to the Barangaroo Central Site to be used as growing media in proposed areas of vegetation as the current surface fill is not suitable for growing media. Placement of such materials for growing media will occur once it is demonstrated that the Site Acceptance Criteria established in this RAP have been met.

Shallow Tar Impacted Material (<10 m)

Remediation of shallow tar impacted material (via excavation and off-site disposal) will be undertaken to the extent practicable and necessary. The identified extent of shallow tar impacted materials occurs within the extent of the proposed basement excavation at the south of the Barangaroo Central Site and will be removed with this excavation.

Deep Tar Impacted Material (>10 m)

For the reasons stated in **Section 5.2.4**, remediation of the deep tar-impacted materials in the natural soils/sediments is not practicable and, consistent with the currently regulatory guidance (DEC 2006, 2007), will remain in-situ and be subject to on-going monitoring/management provisions in the LTEMP to be prepared for the Barangaroo Central Site at the completion of the remediation works.

Asbestos

Excavation and off-site removal of the identified asbestos impacted soil at BH401 is the preferred option as this lies within the lateral and vertical extent of the proposed basement.

Seepage Water within Basements

Construction of the southern basement consistent with the methods adopted on the Stage 1 Development within the Declaration Area) incorporating groundwater control walls is the preferred remediation/management option for this identified impact.

Ongoing Management

On-going management through the development and implementation of an appropriate LTEMP, which will be prepared upon completion of the validation report. A validation program has been developed to verify that the remediation works achieve the intended objectives.

Conclusions

Overall, it is considered that the proposed actions outlined in this RAP conform to the requirements of DEC 2006 because they are: technically feasible; environmentally justifiable; and consistent with relevant laws, policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this RAP and subject to the limitations in **Section 12**, it is concluded that the Barangaroo Central Site

can be made suitable for the intended Stage 1 Public Domain use and long term residential use and that the risks posed by contamination arising from the creation of the Barangaroo Central Site can be managed in such a way as to be adequately protective of human health and the environment.

Recommendations

It is recommended that the proposed actions outlined in this RAP be implemented and that the following documentation be developed and implemented to ensure the risks and impacts are controlled in an appropriate manner:

- A CEMP, to document the monitoring and management measures required to control the environmental impacts of the works and ensure the validation protocols are being addressed; and
- An OHSMP to document the procedures to be followed to manage the risks posed to the health of the remediation workforce.

The CEMP and the OHSMP are required to contain a plan addressing plausible contingencies and to be submitted for acceptance by the BDA prior to commencement of remediation works on the Barangaroo Central Site.

Upon completion of the remediation and development works on the Barangaroo Central Site, a validation report and an on-going LTEMP for impacted materials retained beneath the Barangaroo Central Site are required to be submitted by the Remediation Consultant to the BDA and, when acceptable to the BDA, to the Site Auditor for certification that the Barangaroo Central Site is suitable for the proposed uses, subject to implementation of the LTEMP.

1 Introduction

1.1 Introduction and Background

JBS Environmental Pty Ltd (JBS) was engaged by the Barangaroo Delivery Authority (BDA) as "Remediation Consultant" to prepare a Remedial Action Plan (RAP) for the Barangaroo Central portion of the Barangaroo Site located at Hickson Road, Sydney, NSW, 2000 (**Figure 1**).

This RAP applies only to the Barangaroo Central portion of the Barangaroo Site. In this RAP, Barangaroo Central - comprising Part Lots 5 and 6 of DP876514 - is referred to as the "Barangaroo Central Site". The entire Barangaroo Site is referred to as the "Barangaroo Site", whilst the "Barangaroo Project Site" includes the Barangaroo Site and the adjoining parts of Sussex Street, Hickson Road which were included by the NSW Environment Protection Authority (EPA)as part of the Declaration of Remediation Site. The Declaration Area includes the footprint of the former Millers Point Gasworks, except the part situated east of Hickson Road. The southern part of the Barangaroo Project Site, referred to as the "Stage 1 Development", will be developed for a mixture of commercial, residential and open space uses. The boundary of the Barangaroo Central Site, which is the subject of this RAP, is shown on **Figure 2**.

Previous environmental investigations conducted on the Barangaroo Central Site identified soil contamination, being restricted to Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH) and metal-impacted fill materials. No significant contamination has been identified on the Barangaroo Central Site, with the exception of tar-impacted material and associated groundwater impact on the boundary of the Declaration Area. The footprint of the former gasworks has been declared by the EPA as a Remediation Site and is referred to in this RAP as the "Declaration Area".

The soil contamination identified within the Declaration Area which contributes to the groundwater contamination is proposed to be remediated during remediation of the Declaration Area. In the event that remediation of the Declaration Area does not occur, or is unsuccessful, then contingency measures for remediation of the Declaration Area in proximity of the Barangaroo Central Site and associated proposed structures are also included in this RAP.

Whilst this RAP primarily relates to the remediation/management of contamination within the Barangaroo Central Site, suitable Site Materials from other parts of the Barangaroo Project Site are proposed to be relocated onto the Barangaroo Central Site in order to create the Barangaroo Central landform. However, no Site Materials will be accepted for reuse on the Barangaroo Central Site from the Declaration Area.

This RAP therefore gives consideration to the broader contamination issues on the Barangaroo Project Site and outlines the procedures for the acceptance of other Site Materials onto the Barangaroo Central Site.

The contamination issues identified across the broader Barangaroo Project Site are principally associated with fill materials, natural soil and groundwater within the footprint of a former gasworks, which is located on the Stage 1 Development within the Declaration Area, namely:

- TPH, Benzene, Toluene, Ethylbenzene & Xylene (BTEX) and PAH-impacted fill materials, soils and groundwater;
- Cyanide-impacted fill materials, soil and groundwater;

- Phenol- and ammonia-impacted fill materials, soil and groundwater;
- Asbestos-impacted fill materials; and
- Metal-impacted fill materials, soil and groundwater (lead, cadmium, copper & zinc).

1.2 Objectives

The objectives of this RAP are to:

- Document the procedures and standards to be followed in order to remove the risks posed by contamination at the Barangaroo Central Site to future site occupants and the surrounding environment (including to human and ecological receptors);
- Document the procedures and standards to be followed in order to ensure the suitability of Site Materials relocated from the broader Barangaroo Project Site onto the Barangaroo Central Site; and
- Enable a Site Audit Report and Site Audit Statement(s) to be prepared by the appointed independent NSW EPA Accredited Site Auditor, confirming that the Barangaroo Central Site can be made suitable for the proposed uses subject to the successful implementation of the proposed remedial/management measures set out in this RAP.

This RAP has been prepared with consideration to and in compliance with:

- The Director General's Requirements relating to Project Application SSD_5374;
- The requirements of the Overarching RAP prepared for the Barangaroo Project Site (ERM 2010)[2] and the associated Site Audit Statement and Site Audit Report (ENVIRON 2010)[3];
- State Environmental Planning Policy No 55 (SEPP 55) – Remediation of Land and Managing Land Contamination Planning Guidelines (DUAP 1998); and
- Relevant Australian Standards in addition to guidelines made or approved by the NSW EPA.

1.3 Overarching Remedial Action Plan

An Overarching RAP (ERM 2010) was prepared for the Barangaroo Project Site to outline the remediation approach to address the identified contamination across the Barangaroo Project Site as a whole and makes reference to the preparation of specific RAPs and Remedial Work Plans (RWPs) for various staged developments proposed for the Barangaroo Project Site.

This RAP for the Barangaroo Central Site is one of the specific RAPs required to be prepared by the Overarching RAP. A RWP for the Barangaroo Central Site is included within this RAP (**Appendix B**).

[2] *Overarching Remedial Action Plan for The Barangaroo Project Site, Sydney,* ERM, June 2010 (ERM 2010)
[3] *Site Audit Report and Site Audit Statement GN439A, Overarching Remedial Action Plan, Barangaroo,* Graeme Nyland of ENVIRON Australia Pty Ltd, June 2010 (ENVIRON 2010).

1.4 Site Auditor Engagement

As part of the assessment and remediation works, a Site Auditor accredited by NSW EPA has been engaged to review this RAP and to provide a Site Audit Statement certifying that the Barangaroo Central Site can be made suitable for the proposed uses subject to the successful implementation of the proposed remedial/management measures set out in this RAP.

At the completion of the remedial works on the Barangaroo Central Site, and on review of a Validation Report documenting the remediation and the validation process, the Site Auditor will certify that the Barangaroo Central Site is suitable for the proposed uses, subject to implementation of a Long-term Environmental Management Plan (LTEMP).

1.5 Barangaroo Central Human Health and Ecological Risk Assessments

A Human Health and Ecological Risk Assessment (HHERA) has been completed by JBS to determine if concentrations of contaminants in fill materials, natural soil and groundwater on the Barangaroo Central Site (JBS 2012b and 2013) are acceptable for the future uses of the Barangaroo Central Site.

1.6 The Proposed Development / Current Design

The Barangaroo Central Site is proposed to be initially developed as the Barangaroo Stage 1 Public Domain. This development is described in more detail in **Section 1.6.1** and is proposed to be undertaken in the near future. Development is proposed as an interim site use prior to the commencement of the proposed long-term development and is restricted to areas of Barangaroo Central that are referred to as Separable Portions 4 and 5, which comprise the northern and central portions of the Barangaroo Central Site.

The Barangaroo Central Site is proposed ultimately to be developed for combined high-density residential and open-space purposes. This development is described in more detail in **Section 1.6.2**. This development is anticipated to commence in 2015.

This RAP has been required to be prepared to support both the interim landuse, and the proposed long term final landuse.

1.6.1 Barangaroo Central Stage 1 Public Domain

The Barangaroo Central Site is to be initially developed as 'Barangaroo Stage 1 Public Domain' to facilitate a recreational use of Barangaroo Central Site prior to anticipated long-term development in accordance with the current Barangaroo concept plan, which is provided as **Figure 3a**. Characteristics of the development and associated land uses are anticipated to include:

- Restriction of development to the area of the site referred to as Separable Portions 4 and 5, consisting of the northern and central portions of the Barangaroo Central site, as shown on **Figure 3a**;
- Continuing use of the southern portion of the Barangaroo Central Site as a 'temporary construction staging area', associated with the Barangaroo South development works;
- Use of Barangaroo Central Site for recreational purposes, similar to the open areas of the Headland Park Site;
- Landscaping with grasses and some large plantings over approximately 70 % of the Barangaroo Central Site;

- Retention of existing site paving and use for Car Parking over approximately 30 % of the Barangaroo Central Site as present to the south of the central portion; and
- Importation (or relocation from other parts of the Barangaroo Project Site, but not from the Declaration Area) of between 80 000 and 150 000 m^3 of fill materials to raise the site level and create a fall towards Darling Harbour.

It is understood that the works set out above are subject of a Project Application with a range of environmental studies required to support the Project Application, including this RAP.

1.6.2 Barangaroo Central Residential / Open Space Development

The Barangaroo Concept Plan identifies that Barangaroo Central will be developed in the long-term as a mixture of high density residential and open space / recreational land uses. The current design plan for the long-term Barangaroo Central Site development has been provided as **Figure 3b**, which shows the proposed land-uses include:

- High-density residential developments located in the central and northern portion adjoining the eastern site boundary;
- A basement to be constructed in two distinct portions underlying the proposed residential buildings. The southernmost basement is substantially located within the Declaration Area, which is not located in the Barangaroo Central Site. The northern most basement is located wholly within the Barangaroo Central Site; and
- Recreational / open space land-uses located within the western portion, including areas of large tree and garden plantings, grassed areas as used for playing fields or other events, an open amphitheatre and pathways along the foreshore and throughout the site.

The lateral dimensions of the proposed basements can be observed from **Figure 3b**. BDA has advised that the basements shall extend to a depth of 10 m below ground level and will be used for car parking and for minor infrastructure associated with the overlying residential development.

It is understood that the basement construction works are subject of a Project Application in the future with a range of environmental studies required to support the Project Application, including this RAP.

1.7 Remedial Work Plan for Adjoining Declaration Area

The southern basement is proposed to be constructed partially within the Barangaroo Central Site and substantially within the Declaration Area. This, and the known contamination status of the Declaration Area, causes remediation work on Barangaroo Central to be contingent on work completed within the Declaration Area.

Available data have been reviewed for the Declaration Area (AECOM 2012c)[4]. Of relevance to JBS (2012b and 2013), is that the remediation standards proposed for the soil/groundwater within the area of the Declaration Area in proximity of the southern basement proposed on the Barangaroo Central Site exceed the concentrations that JBS (2012b and 2013) have indicated will pose an unacceptable level of human health risk to future users of the basement / overlying residential apartments. On this basis, the RAP for Barangaroo Central documents design requirements for at least the southernmost

[4] *VMP Remediation Extent VMP Remediation Works Area, (Parts of Barangaroo and Hickson Road), Millers Point, NSW*, 12 October 2012, AECOM Australia Pty Ltd (AECOM 2012c)

basement to control potential exposures to infiltrating seepage water. This includes the incorporation of groundwater control walls into the basement structures, as described further in **Section 4.1.8**, and consistent with basement design parameters as adopted with the Stage 1 Development.

2 Summary Site Condition / Surrounding Environment

2.1 Site Identification

The Barangaroo Project Site is located at Hickson Road, Sydney, NSW and is legally referred to as Lots 1, 3, 5 and 6 Deposited Plan (DP) 876514 and includes the adjacent parts of Sussex Street, Hickson Road and Towns Place, as shown in **Figure 1**. The Barangaroo Project Site details are summarised in **Table 2.1** and described in more detail in the following sections.

Table 2.1 Summary Details for the Barangaroo Project Site

Lot/DP	Lots 1, 3, 5 and 6 of Deposited Plan 876514, including adjacent parts of Sussex Street, Hickson Road and Towns Place
Address	Hickson Road Millers Point NSW
Local Government Authority	City of Sydney
Site Zoning	Zone B4 Mixed Use and RE1 Pubic Recreation
Current Use	Vacant/Roadway
Geographical Co-ordinates, Elevation	Easting – 333643m E, Northing – 6251851m S, 2-3m AHD
Site Area	Approximately 22 ha

The Barangaroo Central Site is located within the central portion of the Barangaroo Project Site. Site details are summarised in **Table 2.2** and described in more detail in the following sections. The extent of the site is shown as **Figure 2**.

Table 2.2 Summary Details for the Barangaroo Central Site

Lot/DP	Part Lots 5 and 6 of Deposited Plan 876514
Address	Hickson Rd Millers Point NSW
Local Government Authority	City of Sydney
Site Zoning	Zone B4 Mixed Use and RE1 Pubic Recreation
Current Use	Interim Cruise Passenger Terminal and Water Treatment Plant at south-western portion
Geographical Co-ordinates, Elevation	Easting – 333620m E, Northing – 6251850m, 2-3m AHD
Site Area	Approximately 4.3 ha

The Barangaroo Central Site boundary is defined as:

- North – The northern boundary of the Barangaroo Central Site is defined by the southern boundary of the Barangaroo Headland Park Site, as defined in *Remedial Action Plan Barangaroo Delivery Authority Barangaroo Headland Park revision 3*, JBS Environmental, 8 November 2011;
- East – The eastern extent of Lot 5 DP876514, apart from the portion in the proximity of the Declaration Area. The Barangaroo Central Site eastern boundary in proximity of the Declaration Area is defined by the northern and western extent of the Significantly Contaminated Land as identified by the NSW EPA under the *Contaminated Land Management Act 1997* (Declaration of Remediation Site Number 21122, Area Number 3221, dated 6 May 2009);
- South – The northern boundary of the 'Stage 1' area as shown by the Stage 1 Site plan in the *Part 3A Preliminary Assessment Barangaroo Concept Plan Modification Request for DGRs and PEAR*, prepared by JBA Urban Planning Consultants in February 2010 (JBA 2010), apart from the proximity of the Declaration Area. The Barangaroo Central Site southern boundary in proximity of the Declaration Area is defined by the northern and western extent of the Significantly Contaminated Land as identified by the NSW EPA under the *Contaminated Land Management Act 1997* (Declaration Number 21122, Area Number 3221, dated 6 May 2009); and
- West – The western extent of Lot 6 DP876514.

2.2 Site Condition

The Barangaroo Central Site is characterised as being essentially level and paved. The northern and central portions of the Barangaroo Central Site are currently used as an interim passenger terminal for cruise ships, as per a lease agreement with Sydney Ports Corporation. A large temporary structure is located over the central west portion of the Barangaroo Central Site, which is provided with a raised, temporary floor within the southern and central portions, for use as passenger waiting area and for customs and immigration procedures. The northern portion of the temporary structure is used for luggage handling and does not have temporary flooring. The area to the east of the Interim Terminal is used for car parking and passenger drop off / pick-up associated with the Cruise Passenger Terminal.

A water treatment plant is located within the southern portion of the Barangaroo Central Site and is characterised by a series of large, above-ground storage tanks, filters and associated smaller tanks and shipping containers. The water treatment plant is understood to be used with the current site development works on the Stage 1 Development. Validation of the water treatment plan footprint is included in this RAP (**Section 6**).

A small gate house is located adjoining the eastern boundary of the Barangaroo Central Site. Portions of the foreshore walk are also present within the Barangaroo Central Site, with a walkway extending in an east-west direction through the southern portion, and extending along the eastern boundary. The alignments of the foreshore walk areas are delineated by fencing and signage.

2.3 Surrounding Landuse

The uses of land adjacent to the Barangaroo Central Site have been previously reported as follows (ERM 2008b[5]):

- North: Immediately to the north is the proposed Northern Cove, to be constructed with the development of the Headland Park Site.
- East: Immediately to the east is Hickson Road. Residential and commercial areas of the northern part of Sydney are located further east.
- South: Immediately to the south is the Barangaroo Stage 1 Development. This also comprises the Declaration Area.
- West: Immediately to the west is Darling Harbour.

A former gasworks is known to have operated until the 1920s over part of the Stage 1 Development, located adjoining the south of the Barangaroo Central Site and to have extended to the east beneath Hickson Road and beyond. Contaminated gasworks waste material in this area has been identified to contaminate soils and groundwater on the south-eastern portion of the Barangaroo Project Site. The Declaration Area, which comprises most of the footprint of the former gasworks, forms part of the eastern and southern boundary of the Barangaroo Central Site. It is understood that environmental assessment programs have been undertaken on the Stage 1 Development in preparation for remediation.

[5] *Stage 2 Remedial Action Plan for Barangaroo*, Hickson Road, Sydney, ERM, September 2008 (ERM 2008b)

2.4 Topography

The topography of the Barangaroo Central Site is relatively flat, having been filled for its previous use as a stevedoring facility (ERM 2008b).

The topography of the BCS is proposed to modified by the importation of fill material to create a sloped surface with a fall towards Darling Harbour. It is estimated that 80 000 to 150 000 m^3 of materials will be imported to the Barangaroo Central Site to create the raised site surface for the Barangaroo Stage 1 Public Domain, predominantly over the northern and central portions.

2.5 Hydrology

The closest surface water body to the Barangaroo Central Site is Darling Harbour, located immediately adjacent to the western boundary. At present, surface water from the Barangaroo Central Site is collected via a sub-surface drainage network, which discharges into Darling Harbour.

Hydrology on the proposed Headland Park will be potentially modified with the amended topography and removal of pavements. However, it is proposed at this stage that any future drainage system provided to the Barangaroo Central Site will also discharge into Darling Harbour and the surface water flows will not be in contact with impacted fill, given the growing media requirements in unpaved parts of the site required as part of this RAP.

2.6 Geology

According to the 1:100 000 Geological Survey of NSW (Sydney) Sheet 9130 (Ed 1) 1983, the Barangaroo Central Site is generally underlain by man-made fill materials that have been placed over marine sands over Hawkesbury Sandstone, and which is described as follows (ERM 2008b):

- Man-made fill may consist of "dredged estuarine sand and mud, demolition rubble, industrial and household waste"; and
- Hawkesbury Sandstone is characterised as "medium to coarse-grained quartz sandstone with very minor shale and laminite lenses".

The general geological profile observed at the Barangaroo Central Site, as reported by previous intrusive environmental and geotechnical investigations, is summarised in **Table 2.3**.

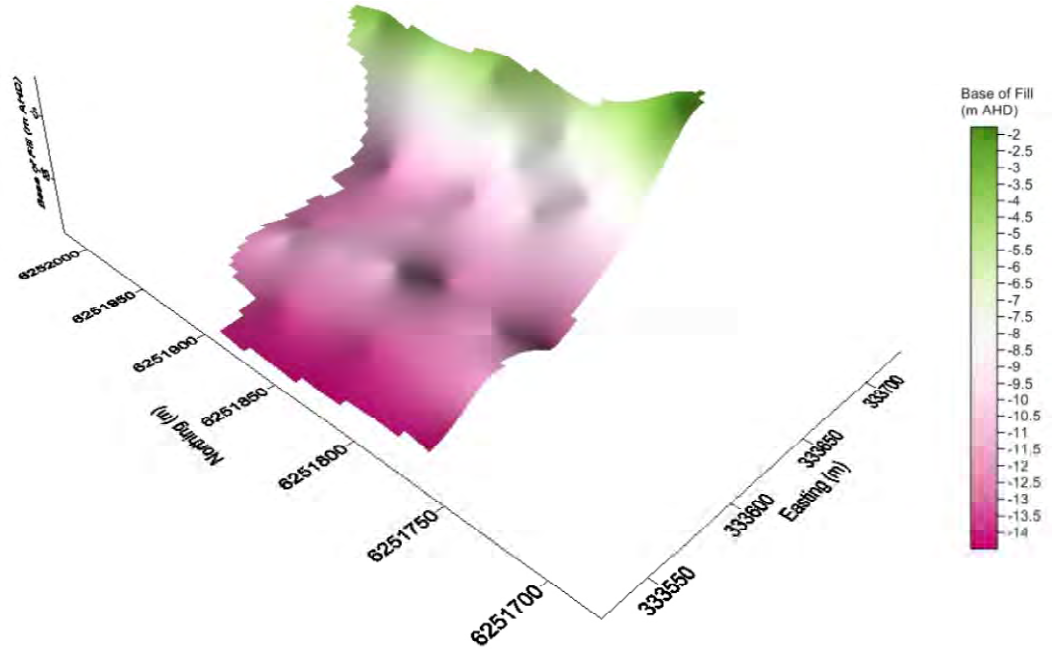
Table 2.3 Summary of Observed Site Geology

Lithological Unit	Description	Depth (m bgs)
Hard standing	Asphalt, bitumen or concrete, generally in good condition with no staining.	0 – 0.46
Road base fill	Very dark grey, dry, loose, medium grained sand to fine gravel, poorly sorted, sub angular, no odours or staining noted.	0 – 0.5
Fill	A range of materials have been reported as being present as fill, including silty clay, clayey sand, sand, sandy gravel, sandy gravelly clay, sandy clay and gravelly sand. Sandstone floaters have also been reported as occurring in fill materials. Anthropogenic materials have also been reported in fill material including building rubble, bricks and concrete.	Surface depth to 4 – 18.3
Marine Clay/Sand	Interbedded clayey sand and sandy clay, dark greyish brown, saturated, some shell fragments and organic matter. Sandy clay – soft, high plasticity. Clayey Sandy – loose to dense, fine to coarse sand, low to no plasticity.	Below 4 – 18.4
Bedrock	Weathered sandstone, white, light yellowish brown, olive brown and reddish brown, wet, fine to coarse grained, some fracturing noted.	Below 9.5 - 38

Volume calculations undertaken on the basis of a contouring computed program using the site surface and depth to fill plot has estimated that 560 000 m^3 of fill materials are present within the Barangaroo Central Site (JBS, 2012a). As can be observed from the output of the site contouring program (shown below) and in consideration of the borelogs

available for the site, the depth of fill on the site increases from less than 2 m at the eastern boundary (Hickson Road) to greater than 14 m at the western boundary (Darling Harbour)in a westerly direction. Minimal thickness of marine clays / sands / sediments have generally been observed during the previous sampling and analysis works underlying the fill and overlying the sandstone.

In reviewing the following image showing the extent of fill on the site, the current site surface is present at an elevation of approximately 3m AHD.



2.7 Hydrogeology

As previously reported (ERM 2008b), information obtained from the Department of Natural Resources (DNR) indicated that 32 registered groundwater bores were situated within a 4 kilometre (km) radius of the Barangaroo Central Site. Review of the groundwater bore information indicated that the bores were used for the following purposes: recreation (8), irrigation (3), and monitoring (22). None of the listed bores were reported to be registered for drinking water purposes. No registered groundwater bores have been reported to be present on or adjacent to the Barangaroo Central Site, apart from monitoring bores. The quality of groundwater in none of the registered bores would be impacted by groundwater on the Barangaroo Site.

The quality of groundwater on the Barangaroo Central Site has been reported to have been assessed from a network of monitoring wells installed across the Site (ERM 2008b). Locations of existing and recently-installed groundwater monitoring wells are shown on **Figures 4** and **6**. Hydrological data indicated that groundwater on the Headland Park Site was strongly influenced by tidal fluctuations and much of the Barangaroo Central Site is likely to be subject to significant seawater flushing, suggesting a hydraulic connection with Darling Harbour. Under typical conditions, there is likely a net groundwater flux towards the Harbour, at a velocity of up to 7.6 m/day (ERM 2008b).

It is not anticipated that the current hydrogeological regime would change substantially as a result of the proposed development. The removal of pavements from the majority of the Barangaroo Central Site has the potential to cause greater levels of surface infiltration to occur which will impact the site hydrology in that current overland flows and surface ponding plans are reduced. However with the highly permeable nature of sub-surface fill

materials and high fluxes of tidal groundwater movement in the fill materials, significant changes to the site hydrogeology are not anticipated, hence there is not considered to be any additional contamination migrating into Darling Harbour as a result of the proposed changes to the hydrogeological regime.

2.8 Meteorology

The Sydney area has a humid to temperate climate with a seasonal rainfall maximum during the summer and autumn months. Annual mean rainfall recorded at Sydney (Observatory Hill) is 1212 mm (BOM 2010)[6].

The Sydney area, in common with other parts of Australia, has a history of droughts, which are broken by periods of heavy rainfall resulting in significant recharges to groundwater resources. The 1940s and 1980s and the current decade are observed to be dry periods, while the early 1970s and 1990s were wet periods.

Summer winds are predominantly northeasterly with southerly thunderstorms common. Winter winds are predominantly westerly.

[6] http://www.bom.gov.au/climate/averages/tables/cw_066062.shtml visited 7th May 2010 (BOM 2010)

3 Summary Site History

3.1 Barangaroo Project Site

The Barangaroo Project Site was a large precinct occupied by shipping and related merchants over the 1900s. A gasworks operated by The Australian Gas Light Company (AGL) over the period of approximately 1840 to 1921 was located on part of the Barangaroo Project Site, within the Stage 1 Development, and extended across part of what is now Hickson Road.

During the use of the Barangaroo Project Site for operation of the gasworks and for shipping purposes, the original shoreline was altered to enable the construction of wharves. From the mid-1920s a number of finger wharves were constructed. Further reclamation and construction of additional wharves took place in the 1950s to 1960s. Over the past 20 years, the Barangaroo Project Site was used principally for stevedoring purposes until the majority of buildings were demolished and the land prepared for redevelopment in the past 5 years.

3.2 Barangaroo Central Site

A summary of the Barangaroo Project Site history has been provided in the previous reports (ERM 2006[7]), and was based on review of historical title deeds, historical aerial photographs, and a previous Contamination Assessment conducted by URS (2001) on the 'Darling Harbour Berths 3 – 8'.

Considerable detail was provided in ERM 2006 relating to the operation of a gasworks on Lot 3 DP 876514, which is currently referred to as the 'Declaration Area' and is located outside the boundaries of the Barangaroo Central Site. With respect to Lot 3, it was reported that the gasworks were operation from 1841 to 1921. Decommissioning was reported to occur between 1922 and 1925, comprising the demolition to the surface of gas holders, purifiers and other facilities and backfilling of holding tanks.

With respect to the Barangaroo Project Site external to Lot 3, ERM 2006 stated that "*The exact history of the remainder of the site is unclear. Originally the remainder of the site consisted of finger wharfs. These wharves were changed over time and then removed, and the site was filled in.*" No evidence has been provided in ERM 2006 or in any other source to suggest that the Barangaroo Central Site was used as part of the gasworks operation, or that operational gasworks waste or rubble generated during decommissioning were placed within the boundaries of the Barangaroo Central Site. Subsequent investigations undertaken on the Barangaroo Central Site have not identified the presence of gasworks structures or of gasworks waste materials.

A chronological summary of the findings of the ERM 2006 historical review pertinent to activities on the Barangaroo Central Site is provided below:

- 1840 to 1910: The Barangaroo Central Site was owned by merchants, compositors, manufacturers and various shipping companies and was also used for ship berthing and associated activities. Ownership was largely transferred to Sydney Harbour Trust Commissioners (SHTC) in approximately 1910.

[7] *East Darling Harbour Geotechnical and Environmental Investigations: Summary of Findings*, ERM, September 2006 (ERM 2006)

- 1910 to 1936: The majority of the Barangaroo Central Site continued to be owned by the SHTC and was used for ship berthing and associated activities such as workshops and stores.
- 1936 to 1998: Ownership transferred to the Maritime Services Board of NSW and subject to various commercial leases. Part of the Barangaroo Central Site initially consisted of finger wharves, which were removed over time with a significant portion of land reclaimed from the Harbour with unclassified fill between 1951 and 1972. The following was noted on the historical aerial photographs viewed from this period:
    - 1951 – Barangaroo Central Site Central used as part of a shipping berthing / dock facility with the site area comprising finger wharves and submerged areas; and
    - 1972 – Significant reclamation earthworks occurring on the Barangaroo Central Site;
- 1998: Sydney Ports Corporation was proprietor of Lot 5. Maritime Ministerial Holding Corporation became proprietor of Lot 6;
- 1996-2007: A number of environmental investigations were conducted on the Barangaroo Central Site; and
- 2007 - 2008: The Barangaroo Central Site was vacated by Patrick Stevedores Operations. The warehouses were demolished and the land predominantly cleared and leveled in preparation for future redevelopment; and
- 2011: The Interim Cruise Ship Passenger Terminal was established on the Barangaroo Central Site and commenced operations.

In order to verify the ERM (2006) assessment, the 1943 historical aerial image of the Barangaroo Central Site was obtained from the NSW Land and Property Management Authority (LPMA 2012[8]) on-line database and reviewed. The 1943 image shows the majority of the Barangaroo Central Site as being part of Darling Harbour, with finger wharves observed to be regularly spaced, extending from the eastern boundary. Shed structures, consistent with the structures on the finger wharves, can also be observed adjoining the eastern boundary, along Hickson Rd.

The historical use of the Barangaroo Central Site observed from the historical aerial photographs is consistent with the historical detail provided in ERM (2006), that between 1936 and 1998 the Barangaroo Central Site was used for various commercial purposes and as finger wharves. Buildings and finger wharves are visible in the Lot 3 area, and no gasworks infrastructure is visible. It is highly unlikely based on the timing of the cessation of gasworks operations and the commencement of site filling on Barangaroo Central that locally sourced gasworks waste / demolition material was used as fill material during reclamation works on the Barangaroo Central Site.

[8] http://imagery.maps.nsw.gov.au/ as viewed on 23 January 2012 (LPMA 2012)

4 Contamination Status

4.1 Previous Site Assessments

A number of previous environmental site investigations have been undertaken which provide relevant environmental data for remediation planning associated with the Barangaroo Central Site development. The works and findings of each of these assessments are summarised in the following sections, as relevant to the Barangaroo Central Site.

4.1.1 Environmental Site Assessment (ERM 2007)

This investigation (ERM 2007[9]) comprised a desktop study of existing and previous land uses at the Barangaroo Site. Soil and groundwater sample locations previously undertaken within the Barangaroo Central Site are shown on **Figure 4**. Twenty-eight soil sample locations were placed within the Barangaroo Central Site and four groundwater monitoring wells. Of these, 19 sample locations and two groundwater monitoring wells are located within the Barangaroo Central Site . Soil and groundwater data are summarised in **Appendix A**.

The investigations were reported to have encountered a layer of silty/gravelly/clayey sand fill in all boreholes, ranging in depth from 4 to 16 m below ground surface (bgs). Underlying natural soils were reported to consist of clayey sands, sandy clays and sands. Variable thicknesses of soils were reported overlying sandstone bedrock.

Soils were reported to have been sampled and analysed for a wide range of contaminants commonly associated with former gasworks, other industrial sites and with substances commonly identified in fill materials, including heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn), cyanides, sulphates, TPH, BTEX, PAHs, PCBs and pesticides.

Elevated levels of copper, lead and zinc were reported in some samples, generally restricted to fill based soils. BTEX constituents have been reported below detection limits in all samples analysed. Some samples of fill materials have reported elevated levels of semi- and non-volatile TPH constituents. Low levels of PAHs have also been reported in some samples of fill based soils. The highest levels of PAHs however were reported in natural soils at a sample location in close proximity of the southern and eastern boundary of the site, in proximity of the Declaration Area (BH074), consistent with potential tar impacted materials. This was consistent with the location where the highest levels of TPH were also been reported.

Elevated levels of PAHs, semi- and non-volatile TPH fractions, heavy metals including cadmium, lead, nickel and zinc, ammonia (as N) and detectable, but low levels of benzene were reported in groundwater hydrogeologically down-gradient of the Declaration Area, within the south-eastern portion of the Barangaroo Central Site. Groundwater in other areas of the Barangaroo Central Site generally reported levels of constituents close to anticipated background levels.

[9] *Environmental Site Assessment, East Darling Harbour, Sydney, NSW*, ERM, June 2007 (ERM 2007)

4.1.2 Additional Investigation Works (ERM 2008a)

The additional investigation at the Barangaroo Project Site (ERM 2008a[10]) consisted of additional soil and groundwater assessment to address perceived data gaps in the initial site assessment (ERM 2007). Sample locations are shown on **Figure 4**. Soils encountered were consistent with that reported in ERM (2007), with the maximum depth of fill being reported to 18 m bgs. Soil and groundwater samples were collected from 11 locations and three additional groundwater monitoring wells were undertaken within the Barangaroo Central Site. Of these, 10 soil sample locations and two groundwater monitoring wells are located within the Barangaroo Central Site. All groundwater monitoring wells (including the four previously existing) were sampled and analysed. Soil and groundwater data are summarised in **Appendix A**.

Soil and groundwater were analysed for the constituents of potential concern (COPCs) identified in the initial site assessment (ERM 2007). The following results were reported for the Barangaroo Central Site (ERM 2008a):

- Localised, elevated levels of heavy metals including copper, lead, mercury and zinc were reported within fill materials;
- Elevated levels of sulphate were reported in several samples of fill materials;
- Levels of BTEX constituents were reported generally below or at detection limits in fill materials;
- Elevated levels of semi- and non-volatile TPH constituents were reported in some samples of fill based soils and natural soils. The highest levels were observed to be at the north-western portion of the Barangaroo Central Site;
- Elevated levels of PAHs were reported in several soil samples. The highest levels, substantially above the adopted recreational land-use investigation criteria were reported in fill based soils at sample location BH183 located in the north-western portion of the Barangaroo Central Site, and naturally occurring clay soils at sample location BH179 adjoining the eastern boundary. No sample locations were undertaken within the Barangaroo Central Site in proximity of the Declaration Area during this assessment; and
- Groundwater was found to be substantially influenced by tidal movements with very high hydraulic conductivities recorded for the fill materials. The greatest impact to groundwater quality was reported by of some heavy metals, PAHs and semi- and non-volatile TPH fractions continued to be recorded at monitoring well MW08, which is located hydrogeologically down-gradient of the Declaration Area. No significant impact by hydrocarbon were reported from monitoring wells installed on the hydrogeological down-gradient boundary of the Barangaroo Central Site. Elevated levels of some heavy metals and PAH constituents were recorded at the hydrogeologically upgradient well as installed on the eastern boundary of the Barangaroo Central Site.

[10] *Additional Investigation Works at Barangaroo, Hickson Road, Millers Point, NSW,* ERM, July 2008 (ERM 2008a)

4.1.3 Remedial Strategy (ERM 2008b)

A remedial strategy for the whole of the Barangaroo Project Site was reported in ERM 2008b, and has been developed into the Overarching RAP. The preferred remedial approach for the Declaration Area, which comprises part of the former gasworks, was determined to be source removal by means of either excavation and off-site treatment and disposal (for the most heavily impacted materials) or excavation and on-site stabilisation / reuse (for less heavily impacted materials). However, the Overarching RAP stated that *in situ* remediation methods may be considered if treatability and pilot trials were shown to be successful. Re-use of suitable materials was proposed to occur in any appropriate parts of the Barangaroo Project Site, potentially including the Barangaroo Central Site, but as explained above, this proposal has not been accepted for the Barangaroo Central Site.

The parts of the Barangaroo Project Site, including the Barangaroo Central Site were proposed to be made suitable by on-site management, involving capping of impacted materials and removal of "hotspots" of materials exceeding risk based clean-up levels and potential implementation of a LTEMP.

4.1.4 Data Gap Investigation (AECOM 2010a)

Soil and groundwater sampling and analysis works were undertaken in 2010 and reported in AECOM 2010a[11] within the Declaration Area and down-gradient of the Declaration Area (including the Barangaroo Central Site) to identify the environmental condition of soil and groundwater underlying the site and to provide additional data from HHERA and RAP for the Declaration Area.

Twenty-four soil bores, conversion of nine to monitoring wells, and seven soil vapour wells were installed in the Declaration Area and a further five groundwater monitoring wells installed down-gradient of the Declaration Area. Two of the down-gradient monitoring wells (referred to as BH69/MW69 and BH74/MW74) were installed at the Barangaroo Central Site and groundwater samples collected as part of the investigation. Additionally, the figures in the report also show AECOM soil bore locations BH63, BH70, BH71, BH73 to be on the Barangaroo Central Site, however these locations were not reported in the text of the report.

Sample locations within the Barangaroo Central Site are shown on **Figures 4, 6, 7** and **8**. The soil and groundwater results for data collected from the Barangaroo Central Site are included in **Appendix A**. AECOM 2010a concluded that the investigation derived sufficient data to identify the general characteristics of the soils, fill, soil vapour and groundwater underlying the Declaration Area and recommended that a HHERA, RAP and RWP be prepared for the Declaration Area. The report made no specific conclusions or recommendations in relation to the data collected from the Barangaroo Central Site.

4.1.5 Draft Contaminant Flux and Discharge Estimations (AECOM 2012a)

A study of the contaminant flux and discharge estimations for groundwater within natural soil and marine sediments for the Declaration Area and surrounding areas including the Barangaroo South Site and Barangaroo Central Site has been reported in AECOM 2012a[12]. The report concluded that the remediation of deep natural soil and marine sediments was

[11] *Data Gap Investigation, EPA Declaration Area (Part of Barangaroo Site and Hickson Road), Millers Point, NSW*, AECOM, 23 September 2010 (AECOM 2010a)

[12] *Draft Contaminant Flux and Discharge Estimations for Natural Residual Soil and Marine Sediments, EPA Declaration Area 21122 and adjacent areas of Barangaroo South and Barangaroo Central*, AECOM Australia Pty Ltd dated 14 March 2012 (AECOM 2012a)

not warranted as there were no significant flux of groundwater within the deep soils or discharge of contaminants from the natural soil and marine sediments underlying the site into Darling Harbour.

4.1.6 Supplementary Data Gap Investigation (AECOM 2012b)

Soil and groundwater sampling and analysis works were reported in AECOM 2012[13] for the Voluntary Management Plan (VMP) Area (which includes areas both within and outside the Declaration Area) to provide data for improved delineation of impacts and to assess whether the impacts require remediation, which would be undertaken to remove the EPA Declaration. Fourteen soil bores and conversion of one to a monitoring well and five to bundled piezometers were installed and groundwater was collected from four existing and six newly-installed monitoring wells. Four of the soil bores (referred to as BH400 to BH403) and one monitoring well (referred to as BH401/MW401) were installed in the Barangaroo Central Site. Groundwater monitoring was undertaken from two existing monitoring wells (referred to as MW69 and MW08) and the newly-installed monitoring well (MW401) within the Barangaroo Central Site. Sample locations within the Barangaroo Central Site are shown on **Figures 4** and **6**. The soil and groundwater data collected from the Barangaroo Central Site are included in **Appendix A**.

The investigation findings in relation to the Barangaroo Central Site were:

- Tar impacted materials were identified at and below the fill and natural soil interface in boreholes BH400 to BH403;
- Concentrations of lead, TPH, BTEX and PAHs exceeded the soil investigation criteria in BH400 to BH403 (NSW EPA 1994 and NEPC 1999);
- Asbestos fibre bundles were identified in fill materials in BH401 at 9.0-9.4m; and
- Concentrations of contaminants in groundwater exceeded the adopted groundwater assessment criteria (ANZECC/ARMCANZ 2000) in each of the groundwater samples.

4.1.7 Data Gap Investigation (JBS 2012a)

Soil and groundwater sampling and analysis were undertaken by JBS in April and May 2012 (JBS 2012a)[14] to identify significant soil and /or groundwater impact that may potentially pose a future human health/ecological risk with regards to the proposed land use. The works comprised the installation of 52 soil bores, 18 shallow and six deep monitoring across the Barangaroo Central Site. Sample locations are shown on **Figures 5** and **6**. A total of 594 soil samples were collected and analysed for TPH, BTEX, PAHs and heavy metals within unsaturated and saturated fill materials and natural soils. VOCs were analysed in 12 soil samples, acid sulphate soils in 10 soil samples and column leachate test were undertaken on 25 samples. Groundwater samples were collected and analysed for TPH, BTEX, metals, PAHs and ammonia from 25 shallow and deep monitoring wells.

The reported soil concentrations were:

- Arsenic ranging between <4 mg/kg and 17 mg/kg;
- Cadmium ranging between <0.5 mg/kg and 1.2 mg/kg;
- Chromium ranging between 2 mg/kg and 84 mg/kg;

[13] *Supplementary Data Gap Investigation, VMP Area, Hickson Road, Millers Point, NSW*, AECOM, 9 March 2012 (AECOM 2012b)
[14] *Data Gap Investigation, Barangaroo Central, Hickson Road, Sydney, NSW,* JBS Environmental Pty Ltd, August 2012 (JBS 2012a)

- Copper ranging between <1 mg/kg and 460 mg/kg;
- Lead ranging between 1 mg/kg and 1,900 mg/kg;
- Mercury ranging between <0.1 mg/kg and 5.2 mg/kg;
- Nickel ranging between 1 mg/kg and 99 mg/kg;
- Zinc ranging between 2 mg/kg and 730 mg/kg;
- Benzo(a)pyrene ranging between <0.05 mg/kg and 84 mg/kg;
- Total PAHs ranging between <15.5 mg/kg and 2,790 mg/kg;
- Benzene ranging between <0.1 mg/kg and 64 mg/kg;
- Toluene ranging between <0.5 mg/kg and 69 mg/kg;
- Ethylbenzene ranging between <1 and 8 mg/kg; and
- Xylenes ranging between <3 mg/kg and 87 mg/kg.

In general, higher concentrations of PAHs were reported in locations on the south-east boundary of the Barangaroo Central Site (adjacent to the western boundary of the Declaration Area) including borehole BH541D from 6.9-7.0 m, 7.9-8.0 m, 8.9-9.0 and 9.9-10 m bgs (PAH reported between 501 mg/kg and 2,790 mg/kg) and BH542 at 13.9-14.0 metres (PAHs reported at 789.5 mg/kg and BTEX reported at 67 mg/kg) within saturated fill materials and BH542 at 14.5 to 14.6 m bgs (PAHs reported at 1802 mg/kg and BTEX reported at 199 mg/kg) in natural soils which was consistent with Tar Impacted Materials.

Potential hotspots of hydrocarbon contamination were reported at sample locations BH547 at depths of 1.5 m and 3 m bgs (total PAHs at 830 mg/kg) and BH530 at a depth of 2m bgs (total PAHs at 680 mg/kg).

Suspended peroxide oxidation combined acidity and sulphur (SPOCAS) results indicated three of the ten samples were classified as potential acid sulphate soils (locations BH518 3.9-4 m, BH537 4.9-5m and BH537 6.9-7m). The leachability estimates for PAHs and metals were comparable to estimates derived in JBS 2011a.

The reported concentrations in shallow groundwater were:

- PAHs at 12 locations ranging from 0.2 μg/L to 8.5 μg/L;
- Arsenic at 14 locations ranging from 1 μg/L to 140 μg/L;
- Cadmium at 20 locations ranging from 0.1 μg/L to 0.5 μg/L;
- Chromium at one location at 0.2 μg/L;
- Copper at four locations ranging from 1 μg/L to 6 μg/L;
- Nickel at 10 locations ranging from 1 μg/L to 9 μg/L;
- Zinc at each of the 24 locations ranging from 1 μg/L to 52 μg/L;
- Ammonia at 19 locations ranging from 0.02 mg/L to 40 mg/L;
- Benzene at four locations ranging from 3,000 μg/L to 41,000 μg/L;
- Toluene at two locations at 2,000 μg/L;
- Ethylbenzene at two locations ranging from 1,000 μg/L to 9,000 μg/L;
- Xylenes at two locations ranging from 5,000 μg/L to 10,000 μg/L.

BTEX concentrations were reported in shallow monitoring on the south east boundary of the Barangaroo Central Site (locations MW539, MW540S, MW541S and MW542), hydraulically down-gradient of the Declaration Area.

The reported concentrations in deep groundwater were:

- PAHs in five of the six locations ranging from 0.2 μg/L to 2,817.9 μg/L;
- Arsenic at two location at 1 μg/L and 2 μg/L;
- Cadmium at five locations ranging from 0.1 μg/L to 0.3 μg/L;
- Chromium at two locations at 0.2 μg/L;
- Copper at three locations ranging from 1 μg/L to 12 μg/L;
- Nickel at each location ranging from 4 μg/L to 41 μg/L;
- Zinc at each location ranging from 5 μg/L to 120 μg/L;
- Ammonia at each location ranging from 0.02 mg/L to 42 mg/L;
- Chloroform at four locations ranging from 2 μg/L to 5 μg/L;
- Benzene at two locations at 5 μg/L and 4,300 μg/L;
- Toluene at two locations at 4 μg/L and 1,900 μg/L;
- Ethylbenzene at one location at 78 μg/L;
- Xylenes at two locations ranging at 3 μg/L and 760 μg/L.

PAHs, BTEX and chloroform concentrations were reported in deep monitoring on the south east boundary of the Barangaroo Central Site (locations MW540D and MW541D), hydraulically down-gradient of the Declaration Area. Chloroform and PAHs were also detected on the south-western boundary of the Barangaroo Central Site (locations MW529D, MW544D and MW525D (PAHs only)).

The report recommended:

- Fill materials located at near surface depth across the site were considered unsuitable to be used as growing zone soils;
- Soils and groundwater (which may occur as seepage water into future site basements) which have levels of constituents exceeding adopted human health investigation levels be assessed by human health risk assessment;
- Tar Impacted Materials, located at depth at the south-east of the Barangaroo Central Site (at locations BH541D and BH542), will require future remediation / management based on identified impacts to groundwater; and
- An Acid Sulphate Soils Management Plan is required to be prepared for the site where any excavation of saturated soils is proposed.

4.1.8 HHERA for Declaration Area (Development Works) (AECOM 2011a)

AECOM (2011a)[15] developed a human health and ecological risk assessment for portions of the Stage 1 Development Site including: the Declaration Area; Blocks 1 to 3 of the Stage 1 Development Area, also referred to as the Other Remediation Works South

[15] *Human Health and Ecological Risk Assessment Declaration Site (Development Works) Remediation Works Area – Barangaroo*, 9 June 2011, AECOM (AECOM 2011a)

(ORWS) area; and the Other Remediation Works North (ORWN) Area located to the west of the Declaration Area.

Soil criteria were derived for a range of land-uses proposed within the assessment area including: lower most basement car park level below the water table; upper most basement car park level, partially above the water table; unpaved public domain / open space; pave public domain / open space; typical commercial slab on grade construction; short term ground-intrusive maintenance; and typical residential residence with basement construction. The criteria are reported to have considered potential human exposures and health effects, potential odours of constituents and protection of the ecological environment of Darling Harbour adjoining the site.

Potentially unacceptable risks were identified on the basis of potential inhalation exposure to hydrocarbon vapours for the lower basement, upper basement, commercial slab on ground and high density residential exposure scenarios. Potentially unacceptable risks were also identified for the sub-surface maintenance worker scenario based on potential direct contact to hydrocarbon impacted soils or groundwater. No potential unacceptable health risks was identified for recreational exposure scenarios, with the majority of material from the site considered suitable to be re-used in these areas.

It was recommended that: basement designs include engineering controls to prevent the accumulation of contaminated groundwater, maintain basement areas at lower pressure levels than overlying occupied areas, isolation of sump rooms from lift wells and maintain air exchange rates of four volume changes per hour; tar be removed from the immediate vicinity of the outer basement walls and engineering controls to prevent tar seepage into basements; and covering of recreational areas with a 0.5m depth of clean fill material.

4.1.9 Addendum HHERA for ORWS (AECOM 2011b)

The Other Remediation Works South (ORWS) area is defined in AECOM (2011b)[16] as the areas of Blocks 1 to 3 and the proposed Public Domain in the Stage 1 Development Area. This is located to the south and south-west of the extent of the Declaration Area, and to the south of Barangaroo Central.

Potential exposure scenarios as assessed by AECOM (2011b) were based on the assessment completed with AECOM (2011a) and included: Adult / Child Resident Exposure in Lower Basement Area subject to limited groundwater seeps through wall and floor. It is assumed that 50% of the surface area of the basement acts as a continuous vapour source; Adult Worker Exposure in Upper Basement Area. It is assumed that advective flow of vapours will occur through the upper 2m of the basement wall and within 1m of 2 of the 4 basement walls will be subject to seepage, so that 50% of the wall area is covered in water; Adult / Child Recreational Exposure in unpaved Public Domain Area. This exposure scenario has assumed that sub-surface biodegradation of hydrocarbon vapours will occur; Adult / Child Recreational Exposure in Paved Public Domain Area. This exposure scenario has assumed that sub-surface biodegradation of hydrocarbon vapours will occur; Adult Worker Exposure in commercial slab on grade building, where no basement is present. It is assumed that the building type will not exceed 2 levels; Intrusive Maintenance Worker as potentially engaged on a short term basis within shallow excavations on the site. Potential water contact has been assessed by potential infiltrating seepage water and volatilisation of constituents form pooled seepage water; Adult / Child Resident Exposure in residential building as constructed

[16] *Human Health and Ecological Risk Assessment Addendum Other Remediation Works (South) Area, Barangaroo*, 4 July 2011, AECOM (AECOM 2011b)

above basement consistent with the parameters described for the Upper Basement Area; and Worker exposure in multi-story commercial slab on grade building.

As well as the human health and odour risks reported in AECOM (2011a), potential ecological risks were also identified by the addendum risk assessment. A strip of land consistent with the location of ORWS Public Domain, at the western portion of the site, was identified being in hydraulic connection with Darling Harbour. It was also proposed to beneficially re-use material in this area. The ecological risk assessment was based on the in-situ material, and potential additional material re-used in this area. Potential risks were identified for a range of heavy metals, total petroleum hydrocarbons and polycyclic aromatic hydrocarbons and ecological screening criteria were derived for these constituents.

4.1.10 ORWS Remedial Action Plan (AECOM 2011c)

AECOM (2011c)[17] has been prepared to detail the required remedial and validation works on the ORWS site. The proposed development of the site includes a deep basement at the east of the site and a shallow basement over the central and western portion of the site. An unexcavated Public Domain area was also proposed.

The shallow and deep basement excavations were proposed to be supported by a series of groundwater control walls including: diaphragm walls extending to and keyed into bedrock and generally constructed around the southern, western and northern boundaries; and a secant pile or equivalent walls extending to and keyed into bedrock and generally constructed along the eastern boundaries. The groundwater control walls were intended to isolate the basements from the surrounding ground conditions.

The scope of remediation works has been determined by the comparison of levels of impact in soils to soils criteria as developed by human health and ecological risk assessment. The extent of remediation was then further assessed against the extent of remediation that would be considered to be remediation to the extent practicable. A remediation method of excavation of impacted materials and beneficial re-use at Barangaroo Headland Park or the Stage 1 Development site was adopted. Materials unsuitable for beneficial re-use were proposed to be disposed from the site to landfill.

A range of validation measures were also proposed, including a validation plan to assess material adjoining basement walls. Of note, validation criteria included:

- That median groundwater concentrations at the point of discharge to Darling Harbour should on average not exceed the adopted assessment criteria for protection of ecological receptors within Darling Harbour for a range of heavy metals, TPH, PAHs;
- Comparison of soil data sets to soil assessment criteria to be undertaken on the basis of 95% UCL_{avg} concentrations;
- Soil validation sampling at a general rate of one sample per 400m^3;
- Sampling of excavation bases and walls on the basis on one sample per 10m or 10m grid samples;
- Quarterly groundwater monitoring during and subsequent to remediation works including installation of additional monitoring wells;

[17] *Amended Remedial Action Plan Barangaroo – ORWS Area*, 7 July 2011, AECOM (AECOM 2011c)

- Visual inspection of all excavations and re-used fill materials to confirm absence of asbestos contaminating materials (ACM); and
- Exposed bedrock adjoining basements to be inspected to confirm absence of ACM and tar containing material (TCM). Any identified TCM was reported to require removal.

4.1.11 HHERA for Declaration Area (AECOM 2012d)

AECOM (2012d)[18] has derived human health and ecological based criteria for proposed limited remediation works on the Declaration Area portion of the site. Potential human exposures assessed by the risk assessment were restricted to paved open space areas used for recreational purposes and short term ground-intrusive maintenance workers. An ecological risk assessment was also undertaken on the basis of assessment of potential ecological impacts at the western boundary as adjoining Darling Harbour.

Potential human health risks were identified for potential direct contact to soil and groundwater hydrocarbon impact by sub-surface intrusive maintenance workers. Remediation works were also identified as being required to minimise the risk of adverse impact to the environment. Contaminants as anticipated with gasworks based constituents were considered to be migrating from the Declaration Site.

4.1.12 ORWS Site Audit Report (Environ 2011)

Environ (2011)[19] was prepared as a Site Audit Report to assess whether the ORWS area could be made suitable for the proposed commercial, high density residential and open space land use. The Site Audit Report identifies widespread impact to fill materials on the ORWS site by heavy end TPH, PAHs and some heavy metals as derived from historical importation of fill and gasworks based contaminants. Impact has also been identified to extent to natural materials underlying fill based soils. The absence of detailed characterisation for asbestos is also reported by the Auditor.

Significant groundwater impact by TPH, BTEX and PAHs is reported by the Auditor at the northern portion of the ORWS site. Lower levels of impact were reported in proximity to the shoreline, though at concentrations that did exceed adopted assessment criteria.

The Auditor agreed with the proposed remedial and validation approach proposed by AECOM (2011c) for the ORWS area. The Site Auditor required that a Post-Remediation Groundwater Monitoring Program (GMP) and a Site Management Plan (SMP) to be prepared for future land owners. The documents were required to consider the final design of the basement groundwater retention wall system and the validation data set as prepared for the site.

In respect of the proposed validation of the Site, the Site Auditor additionally required that: statistical validation was not applied when assessing soil impact to criteria derived for terrestrial soils; and further justification was required for potential omission of PAH constituents from the proposed groundwater validation monitoring.

[18] *Human Health and Ecological Risk Assessment VMP Remediation Works Area (Addressing the NSW EPA Remediation Site Declaration 21122, Millers Point)*, 25 October 2012, AECOM (AECOM 2012d)
[19] *Site Audit Report Remedial Action Plan, Other Remediation Works (South) Barangaroo*, July 2011, Environ Australia

4.1.13 Remedial Work Plan for Declaration Area (AECOM 2013)

AECOM (2013)[20] was prepared to define the proposed extent of remediation in the Declaration Area. The Declaration Area adjoining the western and southern portions of Barangaroo Central, and the proposed residential development at the south of Barangaroo Central is proposed to extend into the Declaration Area.

Remediation goals were identified for the Declaration Area on the basis of the protection of human health and the surrounding environment. Human health exposures were limited to recreational activities within a paved area and potential short duration sub-surface maintenance works. This is described in the document as a limited use. Potential ecological exposures were identified at Darling Harbour located to the west of the Declaration Area. Remediation goals were defined as:

- Removal / remediation of Separate Phase Gasworks Waste and Tar (SPWGT) to the extent practicable;
- Remedial / remediation of confirmed impacted material (CIM), as identified by comparison to human health and ecological based screening criteria for the site. Soil criteria were provided for unsaturated materials as based on human health and ecological exposures and for saturated materials as based on ecological exposures only; and
- Groundwater quality within fill material leaving the site to approach the adopted marine water quality criteria.

Remediation criteria were presented in AECOM (2012d).

The proposed lateral extent of remediation is shown on **Figures 7** and **8**. The vertical extent of remediation was not proposed to extend beyond 10m depth below ground level. The extent of remediation was considered sufficient to address to remove 100% of all primary contamination sources, 97% of secondary contamination sources and 88 to 92% of the contaminant mass within fill materials. The extent of remediation is reported to have considered the extent of clean-up to the extent practicable.

4.1.14 Human Health Risk Assessment for Imported Soils (JBS 2012b)

A human health and ecological risk assessment (HHERA) was completed for the purposes of setting site acceptability criteria for materials to be imported to the site in JBS (2012b)[21]. The HHERA has considered exposure scenarios including: Recreational user exposures in unpaved areas; Commercial / industrial (i.e. gardener) exposures in open space areas; Intrusive sub-surface maintenance worker exposures in outdoor areas of the site; Recreational exposures in paved outdoor areas of the site; Adult and child resident exposures within basement car parks and overlying residential apartments; Commercial / industrial worker exposures within basement car parks; and Commercial / industrial exposures within a 'Cultural Space' building constructed as slab on grade.

Soil criteria, and associated decision rules for application of the criteria, were prepared for the site as specific to the proposed area of placement of any future fill materials.

[20] *VMP Remediation Extent VMP Remediation Works Area (Parts of Barangaroo and Hickson Road), Millers Point, NSW*, 13 March 2013, AECOM

[21] *Human Health Risk Assessment for Proposed Imported Soils Barangaroo Delivery Authority Barangaroo Central Hickson Road, Sydney, NSW*, May 2012, JBS Environmental (JBS 2012b)

Additional risk assessment was undertaken on some of the exposure scenarios assessed in JBS (2012b) and present in JBS (2013a)[22] on the basis of revised exposure and characterisation parameters for the residential basements. Criteria in JBS (2012b) have bene required to be updated as per the mor recent calculations in JBS (2013a)

4.1.15 Human Health Risk Assessment of Site Conditions (JBS 2013b)

A human health risk assessment (HHRA) was completed for the assessment of soils and groundwater located within the Barangaroo Central Site (JBS 2013b)[23] as recommended in JBS 2012a.

The risk assessment considered a range of human health exposure scenarios for the proposed future uses of the Barangaroo Central Site. The key aspects of the proposed developments that have been considered in the risk assessment include:

- Construction of basement car park with overlying residential building;
- Recreational / open space areas; and
- Sub-surface services / infrastructure over the open space area of Barangaroo Central typically to a maximum depth of 0.5 m.

On the basis of the results of the risk assessment calculations and considering the recommendations as made within the Data Gap Investigation for Barangaroo Central (JBS 2012a):

- The Barangaroo Central Site does not pose an unacceptable level of human health risk for a proposed recreational / open space use, but that growing media soils are required to be imported for near-surface use in vegetated areas and pavement / surface cover being provided to remaining areas; and
- In its current environmental condition, the Barangaroo Central Site is not considered appropriate from a human health perspective for the proposed residential development with basements on the basis of potential levels of groundwater constituents adjoining the southern basement assuming a conventional basement design.

The risk assessment recommended that a Remedial Action Plan be prepared to make the site suitable for the proposed uses. Risk based critreria were present in JBS (2013a) to be used for soils / groundwater adjoining the basement. However these were not exceeded for the soils and groundwater adjoining the northern basement. An alternate basement design is proposed for the southern basement as discusse din the following sections of the Remedial Action Plan and the finidngs of JBS (2013a and 2013b) are not valid for this proposed basement.

[22] *Additional Human Health Risk Assessment Calculations – Basement Exposures Barangaroo Central Residential Development*, 25 January 2013, JBS Environmental (JBS 2013a)
[23] *Human Health Risk Assessment Barangaroo Delivery Authority Barangaroo Central Hickson Road, Sydney, NSW*, May 2013, JBS Environmental (JBS 2013b)

4.1.16 Ecological Risk Assessment for Imported Soils (JBS 2012c)

An ecological risk assessment (JBS 2012d)[24] was prepared to assess the potential for ecological risk to ecological populations that will be introduced to the site by the proposed Barangaroo Central development (i.e. plants in open space areas) and potential ecological impacts to Darling Harbour.

The ecological assessment has considered potential direct exposure to soils on future plants / ecological receptors present on the site area and potential discharge of future leachate / seepage from imported fill materials to Darling Harbour.

Soil criteria, and associated decision rules for application of the criteria, were prepared for the site as specific to the proposed area of placement of any future fill materials.

4.1.17 Air Quality and Health Impact Assessment (JBS 2012d)

JBS (2012f)[25] was prepared to assess potential air quality impacts during construction and remediation works on the Barangaroo Central Site. This specifically considered potential air emissions with handling of soils as would occur during placement of fill materials during beneficial re-use scenarios and excavation of impacted soils. It was recommended that air quality controls as previously recommended for the Barangaroo Headland Park works were adopted for Barangaroo Central. Of specific relevance to the RAP, this includes recommended soil criteria for soils to be handled / imported to the site for a range of hydrocarbon constituents and cyanide.

4.1.18 The 'Driscoll Report' (2013)

During the commencement of development works in the southern portion of the Barangaroo project site, Barangaroo South, asbestos was encountered in greater quantities than was anticipated from the previous borehole investigations. In response to this, the NSW Environment Protection Authority (EPA) commissioned Associate Professor Tim Driscoll, of the Sydney University School of Public Health, to conduct an independent review and prepare a report detailing the findings (the `Driscoll Report'[26]). The Driscoll Report was aimed at ensuring that there were no:

- *"unacceptable risks to worker or public health arising from exposure to asbestos as a result of the proposed methods of excavation and transfer of materials by Lend Lease to the Headland Park;*
- *Unacceptable risks to worker or public health arising from exposure to asbestos as a result of the proposed methods of receipt and use of materials at Headland Park by Baulderstone; and*
- *Adverse long-term impacts arising from exposure to asbestos of the Headland Park at completion."*

The Driscoll Report was released in March 2013. The Driscoll Report has recommended asbestos remediation criteria for the protection of the construction workforce including criteria for remediating soils be at least as stringent as those contained in the Western Australia guidelines, and specifically that they include:

- No free asbestos or asbestos fibres (i.e., no fibrous asbestos or asbestos fines);

[24] Ecological Risk Assessment for Proposed Imported Soils Barangaroo Delivery Authority Barangaroo Central Hickson Road, Sydney, NSW, May 2012, JBS Environmental (JBS 2012c)
[25] *Air Quality and Health Impact Assessment Barangaroo Central,* JBS Environmental Pty Ltd, September 2012 (JBS 2012d)
[26] *The Use of Asbestos-Contamianted Soils on Barangaroo Final Report*, Associate Professor Tim Driscoll Sydney School of Public Health, Sydney Medical School, University of Sydney, March 2013 (Driscoll 2013)

- Less than 0.001% asbestos / less than 0.006% asbestos containing material (ACM); and
- No visible ACM.

The Driscoll Report has also made recommendations as to air monitoring to be completed on the Barangaroo site during construction works including adopting an air monitoring action level for asbestos on the Barangaroo site of 0.01 fibres/ml, with 0.02 fibres/ml set as the level at which work would typically cease in order to find and control the source of the asbestos fibres.

4.2 Data Gaps

A considerable soil and groundwater dataset is available for soil and groundwater the Barangaroo Central Site and no data gaps exist that require further assessment. However, a potential data gap is present in relation to sampling densities of materials from other areas of the Barangaroo Project Site that may be intended for reuse as fill within the Barangaroo Central Site. Additional data may be required to assess the suitability of these materials from other parts of the Barangaroo Project Site if these materials are proposed to be reused in the Barangaroo Central Site.

4.3 Compatibility of Remediation to South of Site

The proposed basement associated with the residential building at the south of the Barangaroo Central Site will extend south of Barangaroo Central into the Declaration Area. The remediation standards to be applied to materials in proximity of the southern basement on Barangaroo Central and those in proximity within the Declaration Area require consistency. AECOM (2012d and 2013) propose remediation works on the Declaration Area of the site to protect human receptors as associated with a paved recreational use and potential short duration sub-surface intrusive maintenance works. The potential human exposures as associated with a basement and associated residential building are considered most likely to be more sensitive than the human exposure scenarios assessed in AECOM (2012d and 2013). Remediation works assessed in this RAP will potentially require to extend to remediation works within the Declaration Area to ensure a common standard of acceptable remediation works adjoining the proposed basement.

4.4 Conceptual Site Model

4.4.1 Constituents of Potential Concern

COPCs identified to adversely impact soils and/or groundwater within the Barangaroo Central Site include:

- Heavy metals including arsenic, cadmium, copper, lead, nickel and zinc;
- Total petroleum hydrocarbons (TPH);
- Polycyclic aromatic hydrocarbons (PAHs);
- Monocyclic Aromatic Hydrocarbons (MAHs); and
- Ammonia.

The principal COPCs are considered to be heavy metals and PAHs. Other hydrocarbon constituents, including TPH and MAHs, typically occur where higher levels of PAHs are present.

Investigations undertaken by JBS and others across other parts of the Barangaroo Project Site have also identified asbestos containing materials (ACM) present throughout fill materials and appropriate protocols will need to be implemented during the remediation and construction works to ensure that the potential risks posed by further finds of ACM are adequately controlled.

4.4.2 Sources and Distribution of Environmental Impact

The principal sources of environmental impact on the Barangaroo Central Site are considered to include:

- Historical filling; and
- The operation of the former gasworks to the east of the southern portion of the Barangaroo Central Site.

The Barangaroo Central Site was substantially filled from approximately 1950 to the early 1970s. The source of fill materials is not known but there is a potential that fill materials have been sourced from a range of potentially contaminated sites. By the nature of filling over such a long period and the potential occurrence of a range of source sites, contamination present in fill materials has the potential to be localised with no apparent association with surrounding materials.

The former gasworks was historically located within the area shown as the Declaration Area on **Figure 2**, adjoining the eastern boundary of the southern portion of Barangaroo Central. The former gasworks is reported in previous assessments as being present over an area of 5420 m^2 and to have contained infrastructure including a retort house, meter house, tar tank, engine house, gasholders and purifier beds. Tar- impacted materials, occurring as separate phase impacts, have been previously identified in proximity of the historical gasworks infrastructure.

There is a potential that the tar impacted materials from the former gasworks have migrated onto the Barangaroo Central Site. Tars in gasworks waste commonly occur as dense non aqueous phase liquids (DNAPLs) and consequently migrate to significant depths from the source. To this extent, elevated levels of hydrocarbon constituents consistent with tar contamination have been identified in natural sediments present at significant depths on the Barangaroo Central Site in proximity of the former Declaration Area.

Fill materials are unlikely to be a secondary source of gasworks contamination for the following reasons:

- Historical filling of the Barangaroo Central Site did not commence until 30 years after the cessation of the gasworks operation; and
- More mobile constituents degrade at a higher rate and given the time between cessation of the gasworks operation and filling of the Barangaroo Central Site, only older, less mobile hydrocarbon based contaminants are likely to be present in localised areas.

Notwithstanding, impact consistent with phase separated hydrocarbons has been reported in a monitoring well screened near to the base of the fill materials between the depth of 8 to 11 m bgs (overlying sandstone bedrock) potentially indicating a limited migration of gasworks based hydrocarbon impact into fill materials on the Barangaroo Central Site (sample location BH541 as shown on **Figures 4** to **6**). The extent of this migration is localised, with no significant levels of hydrocarbon impact recorded in deep fill materials

at any other sample location on the Barangaroo Central Site. This localised impact is considered to be deep tar impacted material.

Groundwater from underlying the Declaration Area discharges into the southern portion of the Barangaroo Central Site. Elevated levels of ammonia (as N) and hydrocarbon constituents consistent with gasworks contaminants have been identified in groundwater in proximity of the eastern boundary of the southern portion of the site. The highest levels of contamination have been reported in monitoring wells screened deeper in the fill materials. This environmental impact is considered to be consequent of the migration of contamination sources on the Declaration Area.

Based on an assessment of hydrogeologically up-gradient and down-gradient levels of contamination in site groundwater, but excluding the gasworks based contaminants at the south-eastern portion of the Barangaroo Central Site associated with the Declaration Area, the fill materials and naturally occurring soils on the Barangaroo Central Site in close proximity of the Declaration Area are considered not to be acting as a source of groundwater contamination. Furthermore, the contamination present in proximity of the Declaration Area is not causing contamination to be discharged from the Barangaroo Central Site into Darling Harbour at levels likely to cause a risk to human or ecological receptors.

Groundwater Impact Adjoining Northern Portion of Development Site

An assessment of groundwater quality adjoining the potential site basements (northern and southern) was completed in JBS (2013a and 2013b) Levels of COPCs which may potentially cause unacceptable levels of human health risk to basement occupants / overlying residential populations included:

- A maximum level of benzo(a)pyrene exceeding 0.7 µg/L;
- An average level of benzene exceeding 0.02 mg/L; and
- An average level of naphthalene exceeding 0.23 mg/L.

Monitoring well locations in proximity of the proposed basements are shown on **Figure 6**. Monitoring wells MW179, MW501, MW502, MW506S, MW507 and MW514 to MW516 are located in proximity of the proposed northern basement. Constituent levels measured in these monitoring wells are summarised in **Table 4.1** following.

Table 4.1: Summary of Groundwater Data in Proximity of Proposed Northern Basement on Barangaroo Central (mg/L)

Constituent	Maximum Concentration	Minimum Concentration	Average Concentration[1]
Heavy Metals and Inorganics			
Arsenic	0.007	<0.001	0.002
Cadmium	0.0004	<0.0001	0.0001
Chromium (total)	0.002	<0.001	0.0007
Copper	0.002	<0.001	0.001
Lead	<0.001	<0.001	-
Mercury	<0.00005	<0.00005	-
Nickel	0.002	<0.001	0.001
Zinc	0.052	0.006	0.019
Ammonia	6.8	<0.005	2.7
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	0.0009	<0.0001	0.0003
Acenaphthylene	0.0001	<0.0001	0.0001
Anthracene	0.0007	<0.0001	0.0002
Benz(a)anthracene	<0.0001	<0.0001	-
Benzo(a)pyrene	<0.0001	<0.0001	-
Benzo(b&k)fluoranthene	<0.0001	<0.0001	-
Benzo(g,h,i)perylene	<0.0001	<0.0001	-
Chrysene	<0.0001	<0.0001	-
Dibenz(a,h)anthracene	<0.0001	<0.0001	-

Constituent	Maximum Concentration	Minimum Concentration	Average Concentration[1]
Fluoranthene	0.0005	<0.0001	0.0002
Fluorene	0.0005	<0.0001	0.0002
Indeno(1,2,3-c,d)pyrene	<0.0001	<0.0001	-
Naphthalene	0.0013	<0.0001	0.0005
Phenanthrene	0.0012	<0.0001	0.0005
Pyrene	0.0005	<0.0001	0.0002
Monocyclic Aromatic Hydrocarbons			
Benzene	<0.001	<0.001	-
Toluene	<0.001	<0.001	-
Ethylbenzene	<0.001	<0.001	-
Xylenes	<0.003	<0.003	-

Note: 1. Half detection limits adopted for wells reported below detection limits

As can be observed by review of **Table 4.1**, the levels of each of the constituents nominated in the risk assessment as potentially posing a risk have corresponding levels in proximity of the northern basement either below or at detection limits. The levels of groundwater impact which pose a potential human health risk are present adjoining the southern basement.

4.4.3 Exposure Pathways

The human exposure pathways considered to be potentially complete for the Barangaroo Central Site, considering the interim and long term development scenarios for the site, include:

- Inhalation of COPC vapours migrating upwards from current in-situ impacted soils and/or groundwater; and/or
- Inhalation of COPC vapours migrating upwards and laterally from current in-situ impacted soils and/or groundwater and accumulating within basements or overlying residential buildings; and/or
- Potential dermal and oral contact to impacted soils present at shallow depths and/or accessible by future service excavations with the proposed site design; and/or
- Potential oral and dermal contact to shallow groundwater as accessible by potential future service excavations; and/or
- Potential oral and dermal contact to groundwater and potential inhalation of volatilised constituents, of groundwater as may seep into basements.

Oral and dermal contact of regular site users to current 'in-situ' soils on the Barangaroo Central Site is anticipated to be restricted over the majority of the area by the extent of site basements and associated pavement with the extent of the residential buildings. Areas of accessible soils will be formed by imported fill materials. Soils located on the Barangaroo Central Site are considered unsuitable to be used as growing medium based on potential phytotoxicity impacts, necessitating the importation of growing soils.

It is not anticipated that any groundwater extraction will occur over the area of the Barangaroo Central Site. Levels of total dissolved solids, consistent with marine water, cause the groundwater underlying the site to be unsuitable for beneficial use. There is also anticipated to be a surplus of grey water, harvested from near surface seepage water flows, available from the Headland Park Site. As such, this has not been considered as a complete exposure pathway for potential surface users as per either of the development scenarios.

Basements are, however, proposed to be constructed with the residential buildings that extend below the current depth of groundwater. Users of the basement will be potentially

exposed to infiltrating seepage water, in lieu of basement design that prevents / minimises potential pooling of seepage water within basements.

4.4.4 Receptors

Potential human receptors of COPCs include:

- Future recreational users of the Barangaroo Central Site; and/or
- Future residents of the residential buildings and associated basements (sub-surface car parks); and/or
- Excavation / construction / maintenance workers conducting activities at or in the vicinity of the Barangaroo Central Site, who may potentially be exposed to COPCs through inhalation of vapours or via direct dermal contact with impacted soils present within excavations.

4.4.5 Identified Contamination and Site Suitability

A summary of the soil investigation data for the Barangaroo Central Site is presented in tables in **Appendices A** and **C**. Sample locations are shown on **Figures 4** to **6**.

The most recent assessment of the contamination status of the Barangaroo Central Site, which has considered all available environmental data, has been reported in JBS (2012a). With regard to the proposed Barangaroo Central Site uses it was found:

- Near-surface unsaturated zone soils are unsuitable to be used as growing medium based on potential phytotoxicity risk posed by elevated levels of copper, nickel and heavy polycyclic aromatic hydrocarbons (PAHs);
- Localised areas of near-surface unsaturated zone soils are considered unsuitable for future use in areas of the site with unrestricted human exposure based on elevated levels of lead and PAHs;
- Potential seepage water migration into the proposed southern basements as partially constructed on the Barangaroo Central Site has been found to exceed adopted human health investigation criteria and may pose a potential human health risk and aesthetic issues in lieu of basement design to restrict infiltration of seepage to the accessible areas of the basement. The highest levels of seepage water impact occur in proximity of the southern basement (as discussed in **Section 4.4.2**). Levels of impact in seepage water / groundwater adjoining the northern basement are not found to pose a potential health risk.

A summary of the most recent groundwater investigation data for the Barangaroo Central Site is presented in tables included in **Appendix C**. Sample locations are shown on **Figure 6**.

5 Site Acceptance Criteria

5.1 Summary of Available Criteria

A range of remediation criteria have been derived for the Barangaroo Central Site and the adjoining Declaration Area and Stage 1 Development (ORWS). Previous risk assessment and air quality impact assessment documents have been summarised in **Section 4.1**. Each of the criteria and their proposed application are summarised in **Table 5.1**, which identifies whether the criteria are potentially applicable to each of the developments, and the areas of the proposed development that the criteria are applicable.

Table 5.1: Summary of Remediation Criteria for Barangaroo Central, Declaration Area and ORWS

Source Document	Remediation Criteria	Applicability to Stage 1 Public Domain Development	Applicability to Residential / Open Space Development
AECOM (2011a)	Scenario 1 – Lower Basement	No No basements proposed.	Yes Southern basement design will be consistent with proposed Stage 1 Development Basement Design.
	Scenario 2 – Upper Basement	No No basements proposed.	Yes Southern basement design will be consistent with proposed Stage 1 Development Basement Design.
	Scenario 3 – Unpaved Recreation	No Biodegradation of vapours assumed to occur. Insufficient data form Barangaroo Central to support occurrence of biodegradation.	No Biodegradation of vapours assumed to occur. Insufficient data form Barangaroo Central to support occurrence of biodegradation.
	Scenario 4 – Paved Recreation	No Biodegradation of vapours assumed to occur. Insufficient data form Barangaroo Central to support occurrence of biodegradation.	No Biodegradation of vapours assumed to occur. Insufficient data form Barangaroo Central to support occurrence of biodegradation.
	Scenario 5 – Commercial Slab on Ground (2 storeys)	No No commercial buildings proposed.	No No commercial buildings proposed.
	Scenario 6 – Intrusive Maintenance	Yes Potentially applicable to sub-surface maintenance works that extend to the depth of groundwater / seepage water.	Yes Potentially applicable to sub-surface maintenance works that extend to the depth of groundwater / seepage water.
	Scenario 7 – High density residential (basement multi-storey)	No No basements or residential dwellings proposed.	Yes Southern basement design will be consistent with proposed Stage 1 Development Basement Design. Barangaroo Central will similarly have high density residential dwellings overlying basement.
	Scenario 8 – Commercial Slab on Ground (multi-storey building)	No No commercial buildings proposed.	No No commercial buildings proposed.
	Criteria for Protection of Plants and Soils	Yes	Yes
AECOM (2011b)	Scenario 1 – Lower Basement	No No basements proposed.	Yes Southern basement design will be consistent with proposed Stage 1 Development Basement Design.
	Scenario 2 – Upper Basement	No No basements proposed.	Yes Southern basement design will be consistent with proposed Stage 1 Development Basement Design.
	Scenario 3 – Unpaved Recreation	No Biodegradation of vapours assumed to occur. Insufficient data form Barangaroo Central to support occurrence of biodegradation.	No Biodegradation of vapours assumed to occur. Insufficient data from Barangaroo Central to support occurrence of biodegradation.
	Scenario 4 – Paved Recreation	No Biodegradation of vapours assumed to occur. Insufficient data form Barangaroo Central to support occurrence of biodegradation.	No Biodegradation of vapours assumed to occur. Insufficient data from Barangaroo Central to support occurrence of biodegradation.
	Scenario 5 –	No	No

Source Document	Remediation Criteria	Applicability to Stage 1 Public Domain Development	Applicability to Residential / Open Space Development
	Commercial Slab on Ground (2 storeys)	No commercial buildings proposed.	No commercial buildings proposed.
	Scenario 6 – Intrusive Maintenance	Yes Potentially applicable to sub-surface maintenance works that extend to the depth of groundwater / seepage water.	Yes Potentially applicable to sub-surface maintenance works that extend to the depth of groundwater / seepage water.
	Scenario 7 – High density residential (basement multi-storey)	No No basements or residential dwellings proposed.	Yes Southern basement design will be consistent with proposed Stage 1 Development Basement Design. Barangaroo Central will similarly have high density residential dwellings overlying basement.
	Scenario 8 – Commercial Slab on Ground (multi-storey building)	No No commercial buildings proposed.	No No commercial buildings proposed.
	Criteria for Protection of Plants and Soils	Yes	Yes
	Site Specific Ecological Screening Criteria for In-Situ Material	No Groundwater data is available to characterise the potential leachability of in-situ soils on the Barangaroo Central site	No Groundwater data is available to characterise the potential leachability of in-situ soils on the Barangaroo Central site
	Site Specific Ecological Screening Criteria for beneficial re-use material	Yes	Yes
AECOM (2012d)	Scenario 1 – Paved Recreation	No Biodegradation of vapours assumed to occur. Insufficient data form Barangaroo Central to support occurrence of biodegradation.	No Biodegradation of vapours assumed to occur. Insufficient data from Barangaroo Central to support occurrence of biodegradation.
	Scenario 2 – Intrusive Maintenance	Yes Potentially applicable to sub-surface maintenance works that extend to the depth of groundwater / seepage water.	Yes Potentially applicable to sub-surface maintenance works that extend to the depth of groundwater / seepage water.
JBS (2012b) as partly amended by JBS (2013a)	Zone 1 – Soils within 0.5m of finished surface of Park	Yes	Yes
	Zone 2 – Soils located below a depth of 0.5m bgs and more than 30m away from Buildings	Yes	Yes
	Zone 3 – Soils located within 10m of basements to residential buildings	No No basements or residential dwellings proposed.	Yes However only applicable to typical basement design with leaky walls as proposed for northern basement. Proposed basement design at south of site (as based on AECOM designs and documents) not considered by JBS risk assessment scenarios.
	Zone 4 – Soils used as fill materials greater than 10m and less than 30m from basements to residential buildings	No No basements or residential dwellings proposed.	Yes However only applicable to typical basement design with leaky walls as proposed for northern basement. Proposed basement design at south of site (as base don AECOM designs and documents) not considered by JBS risk assessment scenarios.
	Zone 5 – Soils used as fill material within 10m of Cultural Space	No No commercial buildings proposed.	No No commercial buildings proposed.
	Zone 6 – Soils used as fill materials greater than 10m and less than 30m from	No No commercial buildings proposed.	No No commercial buildings proposed.

Source Document	Remediation Criteria	Applicability to Stage 1 Public Domain Development	Applicability to Residential / Open Space Development
	Cultural Space		
JBS (2013b) also considering JBS (2013a)	Groundwater in proximity of basement to seep into basement	No No basements proposed	Yes However only applicable to typical basement design with leaky walls as proposed for northern basement. Proposed basement design at south of site (as based on AECOM designs and documents) not considered by JBS risk assessment scenarios.
JBS (2012c)	Upper depth (growing soils)	Yes	Yes
	Imported soils in saturated zone	Yes	Yes
	Imported soils in unsaturated zone	Yes	Yes
JBS (2012d)	All imported soil	Yes	Yes
Driscoll (2013)	Asbestos containing material – Barangaroo Site	Yes	Yes

Each of the risk based criteria identified in **Table 5.1** that are potentially applicable to the Barangaroo Central Site have been adopted for the purposes of validation apart from the criteria listed below. The criteria below, presented in AECOM assessments, have been excluded since alternate criteria for common exposure scenarios are available in Barangaroo Central specific assessments.

- The criteria provided for Scenario 6 (intrusive maintenance) in AECOM (2011a, 2011b and 2012d) have not been considered further. Criteria specific to the Barangaroo Central site are available for this exposure scenario as provided in JBS (2012b);
- The criteria provided for Scenario 7 (High density residential, basement multi storey) provided in AECOM (2011a and 2011b) have not been referred to further as these are considered to apply to the same area as Scenario 1 or Scenario 2 criteria and are less conservative than these criteria. The application of the Scenario 1 / Scenario 2 criteria will be protective of the potential application of the higher Scenario 7 criteria;
- The criteria provided for protection of plants and soils to AECOM (2011a and 2011b) have not been referred to further. Criteria specific to the Barangaroo Central site are available for this exposure scenario as provided in JBS (2012c);
- The site specific ecological screening criteria for beneficial re-use material as provided in AECOM (2011b) have not been considered further. Criteria specific to the Barangaroo Central site are available for this exposure scenario as provided in JBS (2012b, 2012c and 2013);
- The criteria in JBS (2013b) have not been required to be referred to. The adoption of the alernate basement for the southern basement causes the risk based criteria derived in this assessment to not be required to be considered further; and
- The asbestos criteria adopted in each assessments have also been replaced by the asbestos criteria provided in Driscoll (2013).

Each of the adopted criteria are discussed further in the following sections. These criteria are referred to as the Site Acceptance Criteria (SAC) throughout the remainder of the site remediation and validation sections.

5.2 AECOM (2011a and 2011b) Human Health Risk Based Criteria for Proposed Southern Basement

The AECOM (2011a and 2011b) criteria for the protection of human health as proposed to be used with AECOM (2011a, 2011b and 2011c) basement design are summarised in **Tables 5.2** and **5.3** following for groundwater and soil based contaminants respectively.

Table 5.2: AECOM (2011a and 2011b) Risk Based Criteria for Groundwater – to be applied to Southern Basement (mg/L)

Constituent	Scenario 1 – Lower Basement	Scenario 2 – Upper Basement
Ammonia	2400	6800
Benzene	21	95
Methynaphthalene, 2-	38	120
Methylphenol, 3-&4-	1000	2700
Naphthalene	0.92	2.9
Phenol	310 000	NC
TPH C_6-C_9 (aliphatic)	28 000	90 000
TPH C_{10}-C_{14} (aliphatic / aromatic)	7.7	15
Trimethylbenzene, 1,2,4-	87	280

Table 5.3: AECOM (2011a and 2011b) Risk Based Criteria for Soils – to be applied to Southern Basement (mg/kg)

Constituent	Scenario 2 – Upper Basement
Benzene	15
Ethylbenzene	600
Methynaphthalene, 2-	1100
Methylphenol, 3-&4-	8800
Naphthalene	41
TPH C_6-C_9 (aliphatic)	3400
TPH C_{10}-C_{14} (aliphatic / aromatic)	13 000
Trimethylbenzene, 1,2,4-	14

The key assumptions to the derivation of the criteria in **Tables 5.2** and **5.3** include:

- The soils criteria apply to unsaturated soils only. No criteria have been considered for soil constituents in saturated horizons.
- Tar is removed from the immediate vicinity of outer basement walls to the extent practicable and basement design and engineering controls should ensure that tar seepage into basements does not occur.
- In the lower and upper basements a wind speed of 0.03 m/s occurs within the basements.
- The air exchange rate within the basement car park has been assumed to be 4 volume changes per hour.
- No more than two walls will be in contact with contaminated soil / groundwater (with Scenario 1 also considering exposures to the floor). This is based on building plans provided to inform this risk assessment that assumed that basement areas would be compartmentalised with each compartment adjacent to basement areas leaving a maximum of 2 exposed walls.
- The basement groundwater retention walls system will comprise a secant pile wall, extending to and keyed into bedrock, with a reinforced concrete basement wall, constructed on the inside. A sealed plenum constructed immediately inside the reinforced concrete basement wall will include (a) passive ventilation to the atmosphere; and (b) dish drains that will drain any seepage.

In regards to the criteria in **Tables 5.2** and **5.3**, the following recommendations are also provided:

- Basement design plans must include engineering controls to ensure that contaminated groundwater does accumulate in compartments which are ventilated to basement airspaces since potentially adverse risk and odours have been estimated to arise from low concentrations of volatile groundwater contaminants it water enters basements. The following is also recommended:
    - Basement levels should be maintained at lower pressure than occupied areas in accordance with AS1668.2 (Standards Australia 2002);
    - Sump rooms should be placed as far as possible from lift wells;
    - Air exchange rates within basement areas should be maintained at a minimum of the Australian Standard of 4 volume changes per hour;
- Tar should be removed from the immediate vicinity of outer basement walls to the extent practicable, and basement designs and engineering controls should ensure that tar seepage into basements does not occur;
- Validation of soil and groundwater following remediation should be undertaken using appropriate statistical methodologies to ensure the arithmetic average concentration of contaminants are below relevant screening criteria, in accordance with NSW EPA (1995) guidelines. The validation process is recommended to include:
    - Use of systematic sampling patterns;
    - Collection of an appropriate number of samples for estimation of the arithmetic average concentration of contaminant(s) within relevant environmental media and land-use areas (land use areas should be determined based on specific development plans with consideration to areas of soil and groundwater from which vapours may enter a given basement structure); and
    - Estimation of the 95% upper confidence limit (UCL) of the arithmetic average concentration within relevant environmental media and exposure areas.

Additional guidance for applying these criteria is provided in AECOM (2011c) which is the only remedial document available that describes the implementation of the risk based basement criteria. In addition to the requirements listed above, the following are noted:

- The 95% upper confidence limit (UCL) of the mean concentration is less than the adopted human health based criteria;
- Each individual sample concentration does not exceed the adopted human health based criteria by more than 2.5 times;
- The standard deviation of the sample set is not more than 50% of the human health criteria; and
- The criteria are intended to apply to the extent of the basements only, referred to in AECOM (2011c) as ‘Area C’.

The validation of the AECOM (2011a) criteria, as adopted in AECOM (2011b), is described in AECOM (2011c) as comprising two components, relating to the basement construction and the soil and groundwater conditions adjoining the basement.

The validation the basement design is intended to confirm that the key assumptions regarding the proposed basement construction method was implemented. AECOM

(2011c) proposes that validation include review of appropriate documentation nominated as:

- 'Issue for construction' drawings that verify the key elements of the proposed basement design relied upon in the derivation of the risk based criteria (as summarised above) will be constructed; and
- 'As constructed' drawings that document the key elements of the proposed basement design relied upon in the derivation of the risk based criteria (as summarised above).

The validation of the ground conditions is reported by AECOM (2011c) to require the following:

- Inspection of all basement excavation walls and bases by a qualified environmental engineer / scientist to confirm that the excavated material is free of asbestos containing materials (ACM). AECOM (2011c) requires that where ACM is encountered during these works, soil removal and validation works require to be undertaken;
- Removal of tar containing material from the immediate vicinity of the outer basement walls to the extent practicable;
- Visual observation of the deep basement area excavation, as it is proposed to be constructed in rock with observations to confirm that:
    - The final surface is generally free of tar containing material (TCM), specifically;
        - Any TCM present is contained within rock defects;
        - Any TCM present is not mobile (that it does not migrate out of the defects under normal weather conditions); and
        - The area of the TCM impacted defects is less than 5% of the exposed rock face; and/or
    - Surface waters will be free of a sheen associated with contamination.

AECOM (2011c) required that the observations were confirmed via photographic documentation.

Additional clarification of the application of the risk based screening criteria is provided to Environ (2011). The following is noted here:

- Soil based human health criteria only require application to soils underlying the basement excavation; and
- Soil and groundwater based criteria require application to soils adjoining the area of the proposed basement.

5.3 JBS (2012b) Criteria for Open Space Areas

JBS (2012b) provides criteria for the protection of human health in open space areas. These criteria are summarised in **Table 5.4**.

Table 5.4: JBS (2012b) Human Health Based Criteria for Open Spaces

Constituent	Risk Based Soil Criteria, 0-0.5m Soil Horizon (mg/kg)	Risk Based Soil Criteria, Soils >0.5m below Site Surface (mg/kg)
Acenaphthene	900	49 000
Acenaphthylene	900	170 000
Ammonia	5 200	16 000
Anthracene	4500	NC
Arsenic	190	NC
Benzo(a)pyrene	2.0	NC
Benzene	0.9	4.8
Chromium	630	NC
Copper	6 400	NC
Cyanide	310	14 000
Dibenzofuran	4 400	150 000
2,4-dimethylphenol	1 800	NC
Ethylbenzene	130	130
Fluoranthene	610	NC
Fluorene	600	250 000
Lead	480	NC
2-methylnaphthalene	60	9 600
Cresols	4 300	NC
Naphthalene	33	170
Phenanthrene	4 500	NC
Phenol	25 000	25 000
Pyrene	460	NC
Toluene	92	92
TPH C_6-C_8 (aliphatic)	890	4 400
TPH C_{10}-C_{14}	830	4 500
TPH $C_{>15}$	5 100	NC
1,2,4-trimethylbenzene	6.3	215
Xylenes	33	33

The 0-0.5m criteria were based on potential recreational worker exposure and the >0.5m criteria were based on potential sub-surface maintenance / excavation worker exposure. The criteria were intended to be assessed by comparison of a 95% UCL_{avg} concentration of constituents.

5.4 JBS (2012b and 2013a) Criteria for Soils Adjoining Northern Basement

JBS (2012b and 2013a) provides criteria for the protection of human health for potential basement users (**Table 5.5**). These criteria were based on a standard basement design and contained no provisions for specialist designs to prevent infiltration of seepage water / tar etc. It is considered that these criteria will apply only to the proposed northern basement with the residential development of the site.

Table 5.5: Human Health Based Criteria for Soils Adjoining Northern Basement

Constituent	Risk Based Soil Criteria, Soil Within 10m of Basement Car Park (mg/kg)	Risk Based Soil Criteria, Unsaturated Soil Within 30m and Greater than 10m from Basement Car Park (mg/kg)
Acenaphthene	470	17 000
Acenaphthylene	1400	31 000
Ammonia	<LOR	5300
Anthracene	49 000	No criteria
Benzo(a)pyrene	62	No criteria
Benzene	<LOR	0.8
Chromium	59 000	No criteria
Cyanide	75	5300
Dibenzofuran	3.2	24 000
2,4-dimethylphenol	3300	No criteria
Ethylbenzene	<LOR	120
Fluoranthene	180 000	No criteria
Fluorene	750	45 000
2-methylnaphthalene	2.5	1900

Constituent	Risk Based Soil Criteria, Soil Within 10m of Basement Car Park (mg/kg)	Risk Based Soil Criteria, Unsaturated Soil Within 30m and Greater than 10m from Basement Car Park (mg/kg)
Cresols	7200	No criteria
Naphthalene	0.6	31
Phenanthrene	41 000	No criteria
Phenol	88	25 000
Pyrene	99 000	No criteria
Toluene	<LOR	90
TPH C_6-C_8 (ali)	210	910
TPH C_8-C_{16} (ali)	160	690
TPH C_8-C_{16} (aro)	290	1200
Trimethylbenzene	<LOR	70
Xylenes	<LOR	33

Note: <LOR, less than laboratory detection limit

All criteria were derived by potential exposure of residential receptors and commercial workers within the basements, and by reference to residential receptors, also within the overlying residential apartments. The criteria are only applicable to imported materials that are placed on the Barangaroo Central Site. The criteria for soils within 10m of the basement apply to soils within the saturated and unsaturated zones. Criteria for soils greater than 10m and less than 30m only applies to soils within the unsaturated zone.

The criteria were intended to be assessed by comparison of a 95% UCL_{avg} concentration of constituents.

JBS (2013a) also undertook an assessment of soil and groundwater quality to identify any potential risks. Groundwater criteria were generated by this assessment as summarised following in **Table 5.6** following. These criteria are applicable only to seepage water / groundwater adjoining the northern basement. The southern basement design has not been considered in these criteria.

Table 5.6: Risk Based Criteria for Groundwater / Seepage Water Adjoining Basement (mg/L)

Constituent	Groundwater / Seepage Water Criteria Adjoining Northern Basement (mg/L)
Acenaphthene	3.69
Acenaphthylene	8.36
Ammonia	5.26
Anthracene	9.57
Arsenic	2340
Benzo(a)pyrene	$3.51*10^{-2}$
Benzene	$4.44*10^{-3}$
Chromium	14.7
Copper	>SOLUBILITY
Cyanide	0.751
Dibenzofuran	0.118
2,4-dimethylphenol	2170
Ethylbenzene	0.253
Fluoranthene	154
Fluorene	8.03
Lead	41 100
2-methylnaphthalene	1.46
Cresols	7600
Naphthalene	$2.73*10^{-2}$
Phenanthrene	9.61
Phenol	9.73
Pyrene	9.01
Toluene	0.319
TPH C_6-C_8 (ali)	8000
TPH C_8-C_{16} (ali)	>SOLUBILITY
TPH $C>_{16}$ (ali)	>SOLUBILITY
TPH C_8-C_{16} (aro)	543

Constituent	Groundwater / Seepage Water Criteria Adjoining Northern Basement (mg/L)
TPH $C_{>16}$ (aro)	117
Trimethylbenzene	0.226
Xylenes	$6.77*10^{-2}$

Levels of impact in groundwater adjoining the proposed northern basement do not exceed these levels, and these criteria do not require to be considered further.

5.5 JBS (2012c) Criteria for Protection of On-Site Ecological Receptors

JBS (2012c) provides criteria for soils proposed to be used as growing media on the site as summarised in **Table 5.7**.

Table 5.7: JBS (2012c) Criteria to be Used for Soils to be used as Growing Medium

Constituent	Ecological Criteria
	Ecological Investigation Level Protective of Potential Phytotoxicity Effects
	mg/kg
Arsenic	20
Cadmium	3
Chromium (total)	190
Copper	60
Lead	1100
Mercury	1
Nickel	30
Zinc	200
Cyanide (free)	0.9
Ammonia	20
Benzene	0.2
Toluene	0.3
Ethylbenzene	0.8
Acenaphthene	29 (sum)
Acenaphthylene	
Anthracene	
Fluorene	
Naphthalene	
Phenanthrene	
Benz(a)anthracene	18 (sum)
Benzo(a)pyrene	
Benzo(b)fluoranthene	
Benzo(g,h,i)perylene	
Benzo(k)fluoranthene	
Chrysene	
Dibenz(a,h)anthracene	
Fluoranthene	
Indeno(1,2,3-c,d)pyrene	
Pyrene	
Phenol	3.8
Cresols	3.8
2,4-dimethylphenol	3.8
TPH C_6-C_9	210
TPH C_{10}-C_{14}	150
TPH C_{15}-C_{36}	300

JBS (2012c) required maximum concentrations of constituents to be compared to these criteria.

5.6 JBS (2012c) Criteria for Protection of Off-Site Ecological Receptors

JBS (2012c) provides criteria for unsaturated soils and saturated soils for the protection of off-site ecological receptors. The most potentially sensitive ecological receptor was identified as Darling Harbour. The criteria are based on potential leaching of constituents from soils to impact groundwater which will potentially discharge to Darling Harbour. The criteria are summarised in **Table 5.8**.

Table 5.8: Summary of Ecological Risk Based Criteria for Imported Fill to be Used at Barangaroo Central

Constituent	Ecological Investigation Level Protective of Surface Water	
	Saturated Soils	Unsaturated Soils
	mg/kg	mg/kg
Arsenic	4.6	18
Cadmium	0.1	0.2
Chromium (VI)[1]	18	70
Cobalt	1.7	6.7
Copper	6.8	27
Lead	46	190
Mercury	0.2	0.9
Nickel	210	850
Vanadium	300	1200
Zinc	20	79
Cyanide (free)	0.4	1.6
Ammonia	<LOR	<LOR
Benzene	0.1	0.3
Toluene	<LOR	0.1
Ethylbenzene	<LOR	0.1
Xylene	<LOR	0.1
Styrene	<LOR	0.4
Acenaphthene	0.4	1.5
Acenaphthylene	0.7	2.7
Anthracene	<LOR	<LOR
Fluorene	1.2	4.7
Naphthalene	1.6	6.4
Phenanthrene	0.1	0.5
2-methylnaphthalene	<LOR	<LOR
Benzo(a)pyrene	0.2[1]	0.7[1]
Fluoranthene	1.2	4.7
Pyrene	<LOR	0.1
Dibenzofuran	<LOR	<LOR
Cresols	<LOR	<LOR
2,4-dimethylphenol	<LOR	<LOR
TPH C_6-C_9	<LOR	<LOR
TPH C_{10}-C_{14}	<LOR	<LOR

1. To be assessed as per equivalent toxicity equivalence factor (TEF) to benzo(a)pyrene. Sum of carcinogenic PAHs to be summed, with multiplication of TEF, and assessed to benzo(a)pyrene criteria. As per WHO (2003) 'Polynuclear aromatic hydrocarbons in Drinking-water' relative potencies of Benz(a)anthracene – 0.1; Benzo(a)pyrene – 1.0; Benzo(b)fluoranthene – 0.1; Benzo(g,h,i)perylene – 0.01; Benzo(k)fluoranthene – 0.1; Chrysene – 0.01; Dibenz(a,h)anthracene – 1.0; and Indeno(1,2,3-c,d)pyrene – 0.1.

The criteria were intended to be applied to imported soils only. Existing groundwater data was used to assess the potential impact of existing soils and associated leachates to groundwater. The existing groundwater data did not indicate a potentially unacceptable level of impact in groundwater that would pose an ecological risk to Darling Harbour. The average concentration of soil constituents is required to comply with the risk based criteria. The extent of fill materials relative to the existing mass of soils as already present in the nominated zone, as considered with the existing leachability of the soils, may also be considered in the application of the criteria and estimation of potential average leachability.

5.7 JBS (2012d) Air Quality Criteria

Fill materials as sourced from other areas of the Barangaroo site are potentially malodorous, consequent of the part of the site's historical use as a gasworks. Consequently, fill materials to be imported to the site have a potential be malodorous. The malodorous potential may be increased by the spreading and compaction of materials as proposed with the emplacement of the fill materials. JBS (2012d) derived soil criteria that would be protective of potential malodorous impacts of soils as summarised in **Table 5.9** following.

Table 5.9: Summary of Allowable Levels of Malodorous Constituents to Prevent Offensive Odours – 'Protection of Construction Odours Soil Criteria'

Constituent	Maximum Criteria	Daily Mean Criteria
Benzene	5.2	2.8
Ethylbenzene	10	2.8
Toluene	12	3.3
Xylene (total)	43	12
2-methylnaphthalene	200	55
Acenaphthene	19	5.2
Naphthalene	170	160
Phenol	3	0.8
Dibenzofuran	53	15
Trimethylbenzenes	30	8
Styrene	7	2
Cyanide	2	0.6

The decision rules for the application of the criteria are summarised in **Table 5.9** following. The criteria do not relate to potential human health effects, but instead potential odours as generated during construction works.

5.8 Driscoll (2013) Asbestos Criteria for Barangaroo Site

Driscoll (2013) has nominated asbestos criteria to be applied across the soils on the Barangaroo Site as may be potentially accessible during construction phases of works. These criteria are summarised following:

- No free asbestos or asbestos fibres (i.e., no fibrous asbestos or asbestos fines);
- Less than 0.001% asbestos / less than 0.006% asbestos containing material (ACM); and
- No visible ACM.

This criteria requires to be applied to all imported soils and all potentially accessible soils with the proposed extent of excavation / construction works on the Barangaroo Central site. Soils which exceed this criteria require remediation for asbestos impact. The criteria is proposed to be complied with on the basis of an average concentration.

6 Remedial Action Plan

6.1 Remediation / Management Goals

The remediation/management goals for the Barangaroo Central Site are to:

- Make the site suitable, from a contamination perspective, for the proposed Stage 1 Public Domain and long-term residential landuse;
- Ensure that the Barangaroo Central Site does not pose an unacceptable risk to the surrounding environment, including to neighbouring communities; and
- Ensure no unacceptable risk is posed to the natural environment, including groundwater and the water of Darling Harbour.

6.2 Extent of Remediation / Management Required

Environmental data for the Barangaroo Central Site have been assessed as part of the human health and ecological risk assessment process, as summarised in **Section 4.4**. No remedial works were identified as required for the current uses of the Barangaroo Central Site from a potential human health risk perspective. However, the issues referred to below have been identified in the existing in-situ soils that require remediation / management for the proposed land-uses.

The location and estimated extent of remediation required, based on the available data, are shown in **Figure 7**, summarised in **Table 6.1** and discussed in the following sections.

Table 6.1: Summary of Identified Soil Contamination Requiring Remediation / Management

Contamination	Location	Approx. Dimensions (m)*	Approx. Area (m^2)*	Approx. Volume (m^3)*	Approx. Depth (m bgs)
Surface Soils	Whole Site	N/A	N/A	N/A	N/A
Asbestos Fibre Impacted Fill	BH401	20 m x 20 m	400 m^2	400 m^3	9 – 10 m bgs
Shallow Tar Impacted Materials	BH70 (AECOM) BH74 (AECOM)	10 m x 20 m 10 m x 20 m	200 m^2 200 m^2	200 m^3 1000 m^3	2 – 3 m bgs 1 – 6 m bgs
Deeper Tar Impacted Materials	BH074 (ERM) BH541 BH403	15 m x 20 m 15 m x 20 m 15 m x 20 m	300 m^2 300 m^2 300 m^2	1500 m^3 1050 m^3 300 m^3	5 – 10 m bgs 6.5 – 10 m bgs 9 – 10 m bgs

Note:* The actual extent of remediation required will be determined through validation inspection, sampling and analyses. The values presented in this table are indicative estimates only and are based on the limitations of the reports from which the data have been sourced.

6.2.1 Surface Soils

Surface soils on essentially all of the Barangaroo Central Site have been identified as being unsuitable to be used as growing media. Appropriate soils will need to be brought onto the Barangaroo Central Site for use as growing media in landscaped areas.

6.2.2 Asbestos

Asbestos fibre impacted fill materials have been identified beneath the south-eastern portion of the Barangaroo Central Site at location BH401 at a depth of 9.0-9.4 m bgs, which lies within the footprint of one of the proposed basements. The estimated volume of known asbestos fibre impacted material is approximately 400 m^3, based on the estimated dimensions shown in **Table 6.1** and giving consideration to the nearest sampling locations where similar impact was not observed.

Recent maintenance / excavation works undertaken in the south-western portion of the Barangaroo site has also identified bonded ACM as within the fill materials at a shallow depth. ACM is anticipated throughout the site.

Further, since ACM has been identified in fill materials in other parts of the Barangaroo Project Site, appropriate protocols also will need to be implemented during the remediation and construction works to ensure that the potential risks posed by further finds of ACM are adequately controlled.

6.2.3 Shallow Tar Impacted Material

Tar impacted material has been identified at the following locations at the Barangaroo Central Site:

- BH70 (AECOM) at 2.5 m bgs in fill materials;
- BH74 (AECOM) as estimated between the depths of 1 and 6m bgs in fill materials;
- BH074 (ERM) as estimated between the depths of 5 – 10 m bgs in fill materials;
- BH403 at 9.0-9.4 m bgs in natural clayey sand and silty/sandy clays; and
- BH541 at 6.9-10.0 m bgs in fill materials.

The tar impacted material, if mobile, poses an ongoing source of groundwater impact. Potential vapours from highly impacted soils, as identified by reference to risk based criteria in AECOM (2012c) or JBS (2012b) will potentially cause unacceptable exposures in proposed site basements and/or overlying residential apartments.

Sample locations BH70 (AECOM), BH400, BH402, BH403 and BH541 are located within the proposed extent of the southern basement at the Barangaroo Central Site. The basement is proposed to be constructed to a depth of 10 m bgs. Shallow tar impacted material above this depth will be removed by the excavation works. It is likely that tar-/gasworks-based contaminants will extend below the proposed basement depth of 10 m bgs in the western extent of the proposed basement.

Tar impact associated with sample location BH74 (AECOM) is located outside the proposed extent of the basement and will not be addressed with the overall basement excavation works.

The estimated volume of shallow tar impacted materials requiring remediation is provided in **Table 6.1**, and is based on the estimated dimensions shown in **Table 6.1** and giving consideration to the nearest sampling locations where similar impact was not observed.

6.2.4 Assessment of Deep Naturally Occurring Soils/Sediments

The conceptual site model prepared in **Section 4.4** identified a potential for heterogeneous pathways of tar-/gasworks-based contaminant migration to have occurred within natural soils/sediments at depth on the Barangaroo Central Site. As identified in **Section 2.6**, the depth of the natural soils/sediments increases in a westerly direction towards Darling Harbour. On this basis, where further tar impact was present, it would be anticipated well below a depth of 10 m bgs, which is below the extent of the proposed excavation works and is well below the depth of accessible soils for future occupants.

For the purposes of this RAP, no remediation of “deep” (i.e., > 10 m bgs) material is proposed, since such works are both impracticable and unnecessary. The limit of excavation of 10 m bgs has been adopted based on:

- The absence of tar impacted material occurring below this depth in fill materials. Tar impacted material below this depth on Barangaroo Central outside of the extent of the southern basement is contained within naturally occurring soils/sediments. Assessments of the potential of the tar impacted material within

the natural soil to act as significant source materials for future hydrocarbon migration completed by AECOM (2012a and 2012c) have reported negligible potential for future migration;

- The proposal for consistency in remediation and validation standards between the Barangaroo Central Site and the hydrogeologically upgradient Declaration Area. The requirement for consistency is further applicable as the southern basement of the proposed residential building crosses the boundary of the Barangaroo Central Site and the Declaration Area;
- There being no evidence that the occurrence of hydrocarbon-impacted materials within the Barangaroo Central Site are causing unacceptable ecological impacts to Darling Harbour (**Section 4.4**). Concentrations of environmental contaminants in hydrogeologically downgradient monitoring wells will not be reduced as a result of the removal of deep materials on the Barangaroo Central Site (even if such works were technically feasible, environmental sustainable or financially viable);
- The absence of potential unacceptable human health risks where the basement construction methods incorporate the groundwater control walls proposed on Barangaroo South and discussed in **Section 4.1.8**;
- The generation of unnecessary waste materials, inconsistent with the requirements of the *Waste Avoidance and Resource Recovery Act 2001* (**Section 11.5**); and
- The potential environmental impact of the deep remediation works causing an environmental impact relative to environmental benefit inconsistent with the principles of ecologically sustainable development as discussed further in **Section 11.8**.

Regulatory Requirements Related to Deep Source Material

The tar impacted material on the Barangaroo Central Site in proximity of the Declaration Area may be present as non-aqueous phase liquids (NAPLs) within the natural soils/sediments at considerable depths below the fill materials. Current regulatory guidance (DEC 2007[27]) requires NAPLs to be, "removed or treated as much as practicable."

Removal or treatment of the deep source material present in the naturally occurring soils/sediments is considered impracticable for the following reasons, consistent with the relevant matters requiring consideration under current regulatory guidance (DEC 2007):

Technical Capability

Although both ex-situ and in-situ remediation methods which are potentially suitable to address the residual contamination in the deep naturally occurring soils/sediments are available, the practicability of implementing the methods is considered to be low, as discussed below.

Ex-situ Remediation Methods - excavation is a well understood and regularly-adopted methodology in which contaminated soils are excavated and either: treated and replaced into the excavation; treated and disposed to appropriate offsite facilities; or directly disposed to offsite facilities. However, these methods are not practicable for dealing with the residual contamination in the deep, natural soils/sediments for the following reasons:

[27] *Guidelines for the Assessment and Management of Groundwater Contamination*, 2007, NSW DEC

- The depth of contamination would require extensive shoring/stabilisation works to enable excavation. Assuming a maximum excavation depth of approximately 18 m, shoring/stabilization would be required to more than 20 m bgs;
- Dewatering would be required throughout the excavation. The millions of litres of groundwater extracted during dewatering would require treatment prior to discharge; and
- Site limitations (i.e. the limited available space on the BCS would preclude temporary stockpiling over overburden materials) would require that all excavated material (not just contaminated soils) be disposed at an appropriately licensed off-site facility. Following excavation, appropriate clean fill materials would be required to restore ground levels at the site to suit the proposed development.

In-situ Remediation Methods – while there are a range of potentially suitable methods for in-situ remediation of the residual contamination in the deep naturally occurring soils/sediments, the most likely applicable technologies given the contamination characteristics and site setting are considered to be chemical oxidation and thermal treatment. The impracticable nature of both these options are discussed below.

In-Situ Chemical Oxidation (ISCO) - involves the delivery and distribution of oxidants and other amendments into the subsurface to degrade contaminants into CO_2, water, and inorganic compounds. The applicability of ISCO depends on matching the oxidant and delivery system to the site contaminants and conditions. The most common oxidants utilised for ISCO are hydrogen peroxide (Fenton's reagent), potassium and sodium permanganate, sodium persulfate and ozone. These methods are not practicable for dealing with the residual contamination in the deep natural soils/sediments for the following reasons:

- Ensuring distribution of the oxidant into deep target layers is difficult. This is particularly relevant at the Barangaroo Central Site as the natural soils/sediments are relatively thin and the delivery of oxidant into this layer is technically problematic due to the considerable depth to the layer and the presence of more permeable fill material above the natural soils/sediments;
- The low permeability of the target layer makes it difficult to ensure adequate contact between the oxidant and contaminant and this will (as a minimum) result in the requirement for multiple injection events and may require the use of oxidants with increased longevity. This increases the complexity of injections and potentially requires additional actions, such as heat and/or increasing pH, to activate the oxidant. Furthermore, these changes can also result in enhanced mobilization of NAPL and require extreme caution in application, especially given the proximity of the Barangaroo Central Site to Darling Harbour;
- Where NAPL is present, the rate of destruction is slow as reactions only occur on the surface of the liquid and long-term/multiple applications are required for treatment. Even with long-term/multiple applications, complete destruction of the liquid is unlikely, and where multiple applications are required, the timeframes typically extend for (at least) several years which does not align with the committed development timeframes for the Barangaroo Central Site;
- The potential for secondary water quality effects can be significant, with the effects being dependent on the type of oxidant used, although in all cases the significant changes to redox conditions will alter geochemical conditions at the site for at least the short-term and potentially longer;

- The difficulty to reliably monitor the progress of the chemical oxidation reaction/s and to monitor impact to the waters of Darling Harbour.

In-Situ Thermal Treatment - involves heating the subsurface to temperatures around the boiling point of water. This has the effect of enhancing the mobility of, and/or actually boiling the contaminants. These physical effects lead to several ways the contaminants can be removed from the subsurface, including:

- displacement and extraction with pumped groundwater;
- vaporization and extraction in the vapour phase;
- volatilization, migration in the steam phase, and condensation in groundwater that is subsequently removed by pumping; and
- dissolution and desorption and removal with extracted groundwater.

In addition to physical removal, biological and chemical degradation may also occur during and after thermal treatment by mechanisms including:

- microbial mineralization of liquid components;
- hydrous pyrolysis oxidation in the vapour phase at temperatures exceeding 90 degrees Celsius; and
- hydrolysis at elevated temperatures for some compounds, particularly low molecular weight compounds.

Heating source zones at sites characterised by higher permeability zones and clay-rich layers usually requires a combination of heating techniques, such as steam and electrical heating. Steam is generally used to heat the more permeable zones such as “steam-enhanced extraction” which is the process using steam injection and aggressive fluids extraction.

Electrical heating is accomplished by either electrical resistance heating (ERH) or thermal (electrical) conductive heating (TCH). ERH uses an electrical current to heat less permeable soils such as clays and fine-grained sediments so that water and contaminants trapped in these relatively non-conductive regions are vaporized for removal in the vapour phase. TCH applies heat that flows through the soil primarily by conduction from a network of electrically powered heating elements (“heater” wells). Because the temperature at the heater well is controllable, any operational temperature can be implemented between ambient and around 800˚C.

As the soil is heated, VOC and SVOCs, including liquids form, are vaporized and/or destroyed by:

- evaporation into the subsurface air stream;
- steam distillation;
- boiling;
- hydrolysis;
- oxidation; and
- pyrolysis (thermo-chemical decomposition in the absence of oxygen).

The vaporised water and contaminants are drawn counter-current to the heat flow into vacuum extraction wells.

These methods are not practicable for dealing with the residual contamination in the deep natural soils/sediments on the Barangaroo Central Site for the following reasons:

- Even where detailed characterization of contamination is available, there remains a significant risk of additional mobilisation and spreading of contaminants, which is a significant concern given the proximity of the Barangaroo Central Site to Darling Harbour;
- The provision of suitable services to enable operation of the thermal system is challenging given the site location and due to the significant redevelopment works just commencing at the site;
- Collected material (liquid and contaminated groundwater) requires treatment/disposal;
- The thermal nature of the methods result in a very high carbon footprint due to extremely high energy requirements; and
- Operation of the system may be required for extended periods (years) to enable significant contaminant mass removal, which does not align with the committed development timeframes for the Barangaroo Central Site.

Clean-up costs

Remediation of the deep residual contamination in the natural soils/sediments is not economically viable, with indicative cleanup costs presented in **Table 6.2**. In providing indicative remediation costs, the general scope of the works relates to a 2 m `band' of naturally occurring soils/sediments over an approximate area of 5000 m^2 (100 m long x 50 m wide), at an average depth of 15 m bgs, equating to a total of 10 000 m^3 of deep residual impacted material and another 15 000 m^3 of overburden material, assuming that overburden down to 10 m bgs is removed as part of the basement excavation.

Table 6.2: Indicative Remediation Costs to Address Deep Residual Contamination*

Remediation Method		$AUD (gst exc)
Ex-situ (excavation / disposal)	Mobilisation/Establishment (item)	$100,000
	Odour enclosure and emissions control system (item)	$2,500,000
	Extending basement secant pile wall depth from 15 m to 25 m @ $500/$m^2$	$1,500,000
	Dewatering and treatment (item)	$2,500,000
	Excavation of materials @ $20 /$m^3$	$1,500,000
	Off-site disposal of overburden below basement depth @ $150/tonne	$4,000,000
	Handling & treatment of deep materials to allow off-site disposal @ $100/$m^3$	$1,000,000
	Off-site disposal of treated deep materials @ $150/tonne	$3,000,000
	Reinstatement of excavation to underside of basement @ $30 / m^3	$500,000
	Demobilisation	$50,000
	Indicative Approximate Total	**$16,500,000**
In-Situ Chemical Oxidation	Mobilisation/Establishment (item)	$50,000
	Data Gathering and Treatment Trial (item)	$1,000,000
	Full scale treatment (first round) @ $500 / m^3	$5,000,000
	Three additional injection rounds and monitoring @ $750,000 / round	$2,250,000
	Decommissioning	$500,000
	Indicative Approximate Total	**$9,000,000**
In-Situ Thermal	Mobilisation/Establishment (item)	$1,500,000
	Data Gathering and Treatment Trial (item)	$1,500,000
	Full scale treatment @ $300 / m^3	$3,000,000
	Groundwater/vapour treatment and liquids disposal (item)	$1,500,000
	Decommissioning	$500,000
	Indicative Approximate Total	**$8,000,000**

*Note: These costs are preliminary in nature and are based on indicative current market rates for the various technologies. They are intended to provide an indication only as to the potential costs and may be accurate to within +/-50% for ex-situ methods and +/-100% for in-situ methods. The estimates provided are for the specific purpose stated in this report and must not be used for any other purpose. The costs are based on rates as at the time of preparation of this report and may be subject to change in the future. It is further noted that the estimates provided for the in-situ method assume successful pilot trial outcomes.

Based on the indicative remediation costs of between $8 M to $15 M to address the deep residual contamination at the Barangaroo Site, this equates to a unit cost of approximately $800/m^3 to $1500/m^3 in volumetric terms or $16 M/Ha to $30 M/Ha in area terms. On a unit cost basis, this is anticipated to be as high, or higher, than any other remediation works previously conducted on some of Australia's most contaminated sites, with far more significant contamination issues than the Barangaroo Central Site. As such, the costs associated with remediating the deep residual contamination are considered to be prohibitive and inconsistent with the minimal risk posed by the natural soils/sediments beneath the Barangaroo Central Site.

The Value of the Groundwater Resource

The groundwater at the site offers limited potential as a resource, given:

- The generally degraded existing quality of the groundwater in the general vicinity of the Barangaroo Central Site, due to past industrial activities and the disturbance caused by extensive filling/reclamation activities; and
- The aquifer properties and small/highly developed catchment mean that there is little available groundwater within the natural soils/sediments.

The primary resource value of the groundwater at the Barangaroo Central Site is related to its discharge to the receiving environment of Darling Harbour. Data collected in the groundwater discharge zone at Darling Harbour indicate that contaminant concentrations are below the relevant water quality guidelines, hence, the value of the groundwater resource is already being realised without remediation of the deep natural soils/sediments.

Threats the Contamination Poses to Human or Ecological Health

Contamination present in the deep natural soils/sediments does not pose a significant risk to either human or ecological health, given that it is present at considerable depths and has not been measured in the receiving waterbody at concentrations exceeding relevant water quality criteria. In addition, because the migration of groundwater within the deep natural soils/sediments is so low, the presence of tar will not give rise to an increase in the concentrations of contaminants over time. This situation is different for that of tar in the shallow fill materials, through which groundwater and tidal waters of Darling Harbour migrate readily, and tar is expected to give rise to an increase in the concentrations of contaminants over time.

Despite the period of time since the contamination occurred, no impact or measurable contaminant concentrations have been observed in the receiving environment.

Remediation of shallow soils at the Barangaroo Central Site and in the up-gradient Declaration Area will result in decreased mass flux from these source areas providing additional protection to human and ecological health.

Adopted Strategy Given that Complete Removal or Treatment is Impracticable

Given that complete removal or treatment of tar in deep natural soils is impracticable for the reasons discussed above, on-going monitoring and management of the contamination is required and the adopted strategy for controlling the residual contamination is required to have the following objectives (DEC 2007):

- Ensure the protection of human and ecological health;
- Control further migration of contaminants from sub-surface NAPLs to the surrounding groundwater; and

- Reduce NAPL mass (i.e. tar in the Barangaroo Central Site) to the extent practicable (source removal or treatment).

The approach outlined in this RAP for the deep residual contamination is consistent with this regulatory guidance given:

- A basement construction method will be adopted for the south of the Barangaroo Central Site that will control the potential human health risk;
- The Barangaroo Central Site has been demonstrated to not pose a potential ecological risk;
- The NAPL (i.e. tar in the Barangaroo Central Site) that will be left will primarily occur in natural soils / sediments which have negligible migration potential;
- NAPL mass will be reduced by the basement excavation works to a depth of 10 m which is considered the extent practicable; and
- On-going monitoring / management can be incorporated in the LTEMP which is required for other identified contamination issues at the Barangaroo Central Site.

6.2.5 Seepage Water within Basements

Potential seepage water that may migrate into future deep basements constructed on the southern portion of the site have been found to pose a potential human health risk and potential aesthetic issue as per the risk assessment completed in JBS (2013a and 2013b). This issue has been previously assessed in AECOM (2011a, 2011b and 2011c). A basement design methodology has been proposed to mitigate the potential impacts of adjoining impacted materials.

- The air exchange rate within the basement car park is maintained at least at 4 volume changes per hour;
- Tar should be removed from the immediate vicinity of outer basement walls to the extent practicable, and basement designs and engineering controls should ensure that tar seepage into basements does not occur;
- Construction of compartments in the overall basement with each compartment adjacent to basement areas leaving a maximum of 2 exposed walls in contact with contaminated soil / groundwater;
- The basement groundwater retention walls system to comprise a secant pile wall, extending to and keyed into bedrock, with a reinforced concrete basement wall, constructed on the inside. A sealed plenum constructed immediately inside the reinforced concrete basement wall to include (a) passive ventilation to the atmosphere; and (b) dish drains that will drain any seepage;
- Basement design plans to include engineering controls to ensure that contaminated groundwater does accumulate in compartments which are ventilated to basement airspaces;
- Basement levels should be maintained at lower pressure than occupied areas in accordance with AS1668.2 (Standards Australia 2002); and
- Sump rooms should be placed as far as possible from lift wells.

Additional detail has been provided to **Appendix D**.

This basement design has been adopted for the proposed southern basement with the residential development stage of the Barangaroo site. This basement design, with the

implementation of the associated validation strategy (as described in **Section 5.1**) will mitigate potential impacts of deep impact to the potential future occupants of the basement.

6.2.6 Remediation Regulatory Guidance

Soil Remediation

The *Contaminated Sites Guidelines for the NSW Auditor Scheme* (DEC 2006) lists the following order of preference for soil remediation and management:

1. On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;
3. Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill; and
4. Consolidation and isolation of the soil on-site by containment within a properly designed barrier.

In addition, it is also a requirement that remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed. Where large quantities of soil with low levels of contamination, alternative strategies are required to be considered or developed (DEC 2006). The principles of ecologically sustainable development are also required to be implemented (DEC 2007).

Consideration of each of the available options for the proposed remediation of materials as defined in **Sections 6.2.1** to **6.2.3** is presented in **Table 6.3**. No consideration is given to remediation of deep natural soils/sediments for the reasons discussed in **Section 6.2.4**.

Groundwater Remediation

Groundwater has not been found to be significantly impacted by material present beneath the majority of the Barangaroo Central Site. Assessment of groundwater impact in proximity of the proposed northern portions of the basements on the site in **Section 4.4.5** has not identified a potential human health risk to future basement users, as assessed by JBS (2013a and 2013b). However levels of ammonia, PAHs and MAHs in groundwater were reported at elevated concentrations hydrogeologically down-gradient of the Declaration Area in proximity of the southernmost basement proposed with the residential development of the site. As summarised in **Section 4.4** the concentrations attenuate at the down gradient boundary of the Barangaroo Central Site.

Remediation criteria are provided for soils adjoining the northern most of the residential basements and the southern most of the residential basements. The remediation criteria are specific to the basement design as proposed for each basement. Remediation of soils and/or groundwater will require to be undertaken to meet these criteria.

Based on the outcomes of the Barangaroo Central HHRA (JBS, 2012b and 2013), groundwater impact is considered not to pose unacceptable risks to future users of the Barangaroo Central Site as the Stage 1 Public Domain use or long-term residential use where groundwater control walls are incorporated into the construction of the southernmost basement on Barangaroo Central and remediation objectives for the northern portion of the Declaration Area are achieved prior to occupation of the

basements. Remediation works are proposed to be completed by others on the northern part of the Declaration Area in proximity of the most southern of the proposed basements on the Barangaroo Central Site.

Levels of groundwater impact discharging from the Barangaroo central have been demonstrated by previous JBS assessment to not pose a potential ecological risk to Darling Harbour.

If human health based remediation objectives are not achieved on the northern portion of the Declaration Area, then remediation works within the Declaration Area will require to be undertaken as a contingency action as part of the remediation of the Barangaroo Central Site to allow the area surrounding the proposed southern basement to be suitable for the proposed uses. This is detailed further in **Section 8**.

6.2.7 Site-Specific Guidance

The Overarching RAP for the Barangaroo Site (ERM 2010) outlines a range of remediation options and identifies the following preferred remediation option for "Area 4" and "Area 2", in which the Barangaroo Central Site lies:

- Excavation of "hotspots" of contaminated soil, treatment for re-use onsite and/or on-site management in accordance with the requirements established in the Barangaroo Central HHERA (JBS 2012b);
- Excavation of "hotspots" of contaminated soils, followed by classification and off-site disposal of materials which are not able to be managed on-site in accordance with the requirements established in the Barangaroo Central HHERA (JBS 2012b); and
- (Likely) ongoing monitoring of groundwater.

The Site Audit Statement and accompanying Site Audit Report (ENVIRON 2010) confirmed the appropriateness of the Overarching RAP for the Barangaroo Site (ERM 2010). The Site Auditor noted that:

"Specific remediation action plans and more detailed remediation work plans will be prepared for each individual portion of the site. The principles incorporated into the overarching RAP which should be incorporated into each individual RAP include:

- *Establishment of appropriate remediation end points applicable to both human health and the environment by a risk assessment that considers future landuse and potential long term impacts to Darling Harbour*
- *Establishment of a lateral and vertical extent of remediation that will address remediation end points*
- *Development of technical details for the remediation methods proposed that support that the selected method(s) are technically feasible with a low chance of failure*
- *Sustainable remediation, by reuse of material within the Barangaroo project area where possible*
- *Documentation of a methodical and rigorous process for validation of the results of remediation."*

Table 6.3 Remediation Options Assessment Matrix – Barangaroo Central Site

Option	Discussion	Conclusion
Option 1 On-site treatment so that the contaminants are either destroyed or the associated hazards are reduced to an acceptable level.	Impacted fill materials unsuitable for growing media Metals are unable to be destroyed. However, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified contaminants of concern (e.g., cement stabilisation). In addition, for low level hydrocarbon impacted soils landfarming is potentially suitable.	Metals are unable to be destroyed, so this is not an option which is able to be considered. Microencapsulation is not considered necessary given the absence of identified groundwater impacts and also the protection offered to. Potentially suitable for low level hydrocarbon impacted soils.
	Shallow tar impacted materials (<10 m bgs) Shallow tar impacted materials can be treated with thermal methods to reduce/destroy the contamination, however, the close proximity of the Barangaroo Project Site to high density human receptors and sensitive environments (i.e. the Harbour), can present land-use conflicts during the operation of such equipment. Treatment by immobilisation prior to off-site disposal to a licensed waste facility under an EPA approved Immobilisation Approval is a proven and cost-effective remediation approach.	Thermal method not a preferred option. Treatment by immobilisation and offsite disposal the preferred option for Tar Impacted Materials.
	Asbestos Fibres Containing Materials There is no known technology to remove asbestos fibres from soils.	There is no known or proven treatment method for removing asbestos fibres from soils.
Option 2 Off-site treatment so that the contaminants are either destroyed or the associated hazards are reduced to an acceptable level, after which the soil is returned to the site.	Impacted fill materials As above (Option 1).	Not a suitable option.
	Shallow tar impacted materials As above (Option 1), however, additional time, energy and costs are incurred to take soils off site and return them to the site, in addition to there being no currently licensed facilities to undertake thermal treatment. Off-site immobilisation or bioremediation can also be used, however there are no suitably licensed treatment facilities in close proximity of the site (requiring considerable transportation and associated impacts) and heavily impacted materials may take significant timeframes to achieve the validation endpoints.	Not a suitable option.
	Asbestos Fibres Containing Materials As above (on-site treatment).	There is no treatment method for asbestos fibres.
Option 3 Excavation and off-site removal of the impacted material.	Impacted fill materials There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting the identified contaminants within fill materials which have not been impacted by the former gasworks activities at the site.	A potentially applicable option but inferior to on-site reuse/retention (option 4) due to additional costs and environmental impacts.
	Shallow tar impacted materials Tar impacted materials can be stabilised in order to facilitate disposal to landfill under an immobilisation permit issued by NSW EPA and, in certain cases. It is noted that highly impacted materials require treatment prior to landfilling, due to the waste classification of such materials.	The preferred option for highly impacted soils.

Table 6.3 Remediation Options Assessment Matrix – Barangaroo Central Site

Option	Discussion	Conclusion
	Asbestos Fibres Containing Materials There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting the identified contaminants within fill materials. The asbestos fibres impact is at a depth of 9.0-9.4 m bgs which lies within the proposed lateral and vertical extent of the proposed basement. As such, excavation and off-site removal is the preferred option as the material will be excavated in any event to facilitate the construction of the proposed basement	The preferred option for asbestos impacted materials at this location given the impact lies within the proposed basement footprint and requires excavation.
Option 4 Consolidation and isolation of the soil by on-site containment within a properly designed barrier and ongoing management.	Impacted fill Materials Based on risk-based criteria established in the Barangaroo Central HHERA (JBS 2012b), the Barangaroo Central materials are generally suitable for retention within the Barangaroo Central Site, subject to placement details. Barangaroo Central material can be managed with imported fill used as a growing media instead of the current surface soil.	This is the preferred option as soils are suitable for retention onsite with imported fill as growing media.
	Shallow tar impacted Materials Tar Impacted Materials (i.e., heavily impacted) are not suitable for reuse/placement in the Barangaroo Central Site without additional capping/containment and ongoing management requirements. In addition, on-site treatment of certain materials may be required prior to reuse in specific parts of the Barangaroo Central Site.	Not a suitable option due to treatment required.
	Asbestos Fibres Containing Materials The asbestos fibres materials will not pose a potential groundwater risk and will not pose a potential inhalation risk if retained and undisturbed at its current location beneath the site. On this basis, the asbestos fibres materials are suitable for retention on the site below the anticipated future depth of site excavation, which is typically 0.5m below the proposed site level.	Not the preferred option for the identified asbestos impact, given its location within a proposed basement footprint which requires excavation and removal from the site (the preferred option). However, this may be a suitable option if additional asbestos contamination is identified, and will be dealt with in accordance with the unexpected finds protocol (Section 7.1).

6.3 Preferred Remediation Option

With consideration to NSW EPA's hierarchy for remediation, and to the site-specific contaminants and environmental setting, the following remediation/management approach has been adopted for the Barangaroo Central Site:

Surface Soils

Soils are required to be imported to the Barangaroo Central Site to be used as growing media in proposed areas of vegetation as the current surface fill is not suitable for growing media. Placement of such materials for growing media will occur once it is demonstrated that the Site Acceptance Criteria established in this RAP have been met.

Shallow Tar Impacted Material (<10 m)

Remediation of shallow tar impacted material (via excavation and off-site disposal) will be undertaken to the extent practicable and necessary. The identified extent of shallow tar impacted materials occurs within the extent of the proposed basement excavation at the south of the Barangaroo Central Site and will be removed with this excavation, apart from one hotspot. An additional targeted excavation will be undertaken to address the impact associated with this additional hotspot.

Deep Tar Impacted Material (>10 m)

For the reasons stated in **Section 6.2.4**, remediation of the deep tar-impacted materials in the natural soils/sediments is not practicable and, consistent with the currently regulatory guidance (DEC 2006, 2007), will remain in-situ and be subject to on-going monitoring/management provisions in the LTEMP to be prepared for the Barangaroo Central Site at the completion of the remediation works.

Asbestos

Excavation and off-site removal of the identified asbestos impacted soil at BH401 is the preferred option as this lies within the lateral and vertical extent of the proposed basement.

Seepage Water within Basements

Construction of the southern basement consistent with the methods adopted on the Stage 1 Development within the Declaration Area) incorporating groundwater control walls is the preferred remediation/management option for this identified impact. The associated risk based criteria and validation method will be adopted with this approach.

6.4 Scope of Remediation Works

6.4.1 Introduction

This section of the RAP provides principles and guidance for measures that are required to be implemented by the Remediation Contractor prior to and during works. The Remediation Contractor will be required to:

- Develop and implement a comprehensive Construction Environmental Management Plan (CEMP) to manage, monitor, maintain and report environmental control measures; and
- Develop and implement a comprehensive Occupational Health and Safety Management Plan (OHSMP) to manage, monitor, maintain and report health, safety and rehabilitation measures.

In addition to the above plans, and further to scope outlined in the following sections, a detailed RWP for the remediation/management works on the Barangaroo Central Site has been prepared and is included as **Appendix B**. The Remediation Consultant is required to implement the RWP.

6.4.2 Site Establishment

The Barangaroo Central Site boundary and any other relevant boundaries such as the Barangaroo Site boundary or the Barangaroo Project Site boundary will be defined by survey and contained, as appropriate using 2 m high chain-wire fences or similar and appropriate environmental control measures, to ensure that all safety and environmental controls are implemented, including necessary contractor briefings and inductions for the remediation workforce. The details of the controls are provided in **Section 8**.

6.4.3 Demolition of Pavements and Structures

A number of structures and areas of pavement are to be demolished on the Barangaroo Central Site. All materials generated as part of this shall be managed in accordance with the protocols described in **Section 8**. No structures and areas of pavement are to be demolished on the other parts of the Barangaroo Project Site as part of the requirements of this RAP.

6.4.4 Excavation and Removal of Shallow Tar Impacted Material in Fill

The following remediation works shall be undertaken:

- Survey to determine the location of the identified shallow tar impacted material listed in **Table 5.1** and the area to be excavated to be marked-out:
- Services search prior to excavation;
- Excavation of the impacted material to the nominated depths in **Table 5.1**. It is noted that the area and depth estimates are based on contamination extending approximately half way to the nearest `clean' sampling locations and the actual area, depth and volume requiring excavation will be confirmed through validation sampling and analyses;
- Inspection by the environmental consultant of the base and walls of the excavation and assess the need for further excavation based on visual/olfactory observations;
- Where further excavation is required, excavate a further 0.2 m in the required direction(s), to enable the remediation consultant to inspect the base and walls of the excavation and to collect validation samples;
- Immobilisation approvals will be required from the NSW EPA as per NSW DECC (2009) where it is proposed to immobilise soils excavated on the site prior to off-site disposal;
- Immobilisation via the use of cement, or otherwise, in accordance with the immobilisation approval;
- Transport and disposal of the material to a licensed waste facility; and
- Following validation of the excavation as outlined in **Section 6,** backfill the excavation with material that meet the site acceptance criteria (SAC) if required to achieve the proposed development levels.

As discussed in **Section 5.1**, the excavation faces at the proposed southern basement are proposed to be inspected for tar containing material. Where tar containing material is

identified that requires remediation, this shall be undertaken by the method provided above for progressing excavations where validation criteria fail. Consistent with the AECOM (2011a, 2011b and 2011c) validation criteria, excavation will require to extend beyond the extent of the immediate proximity of the basement.

Extent of Tar Material in Declaration Area

As discussed further in **Section 8**, there is a potential that remediation works will not be completed at the Declaration Area prior to the construction of the basement. Environmental data for the Declaration Area, as reported in AECOM (2012b) has been reviewed in proximity of the proposed extent of the basement. Sample locations in proximity, but exterior to the extent of the proposed excavation, include BH4, BH6, BH15, BH020, BH021, BH59, BH61, BH075, BH200 and BH404.

TCM, as required to be removed in proximity of the basement walls, and materials exceeding the risk based criteria in **Section 5.2**, have been identified and are shown on **Figure 9**. Tar containing materials have been identified from an approximate depth of 2m bgs at sample location BH59 with some soil criteria exceeded. Tar odours were identified in natural clayey sand soils at a depth of approximately 3m overlying sanmdstine bedrock at 3.5m bgs at smaple location BH61. The naphthalene criteria nas been exceeded at sample location BH200 at a depth of 1.0m. The naphthalwene criteria has also been exceeded at sample location BH404 at the sample depth of 7.0-7.4m bgs.

6.4.5 Excavation and Removal of Asbestos Fibre Impacted Soil

The following remediation works shall be undertaken:

- Survey to determine the location of the identified asbestos fibre impacted material listed in **Table 6.1** and the area to be excavated to be marked-out:
- Services search prior to excavation;
- Excavation of the impacted material to the nominated depths in **Table 6.1**. It is noted that the area and depth estimates are based on contamination extending approximately half way to the nearest `clean' sampling locations and the actual area, depth and volume requiring excavation will be confirmed through validation sampling and analyses;
- Inspection by the environmental consultant of the base and walls of the excavation and assess the need for further excavation based on visual observations;
- Where further excavation is required, excavate a further 0.2 m in the required direction(s), to enable the remediation consultant to inspect the base and walls of the excavation and to collect validation samples;
- Transport and disposal of the material to a licensed waste facility; and
- Following validation of the excavation as outlined in **Section 7,** backfill the excavation with material that meet the site acceptance criteria (SAC) if required to achieve the proposed development levels.

6.4.6 Material Characterisation and Storage

A program of materials characterisation shall be undertaken for the following purposes:

- To verify that the composition of materials received for placement within the Barangaroo Central Site from the broader Barangaroo Project Site are consistent with that indicated by existing in-situ data and meet the SAC; and

- To assess the suitability of any materials excavated around an unexpected find of contaminated materials, such as drums or gasworks waste, for placement within the Barangaroo Central Site.

Details of the characterisation program are provided in **Section 7**.

The storage of materials is envisaged, to allow a programming interface between material receipt and placement.

A Materials Compliance Management System (MCMS) shall be developed prior to receipt of Site Materials for reuse on the Barangaroo Central Site, as described in **Section 7.3.5**.

No materials will be accepted on to the Barangaroo Central Site from the Declaration Area.

6.4.7 Installation of Groundwater Control Walls within the Southern Basement

In order to address the potential human health risk and aesthetic issues posed by contaminated groundwater in proximity of the southern basement, groundwater control walls will be incorporated into the basement wall design, consistent with the methods adopted on the Stage 1 Development as described in **Sections 5.1** and **6.2.4** and further in **Appendix D**.

6.4.8 Validation

Validation of the remedial/management works will be undertaken to demonstrate that the works were undertaken in accordance with the requirements of this RAP. Details of the validation program are provided in **Section 7**. An independent Site Audit, completed by a Site Auditor accredited by the NSW EPA, will be conducted to review:

- The validation report(s) that will be prepared when the validation criteria are achieved; and
- The LTEMP prepared after completion of the remediation works to document the ongoing monitoring/management requirements to ensure the suitability of the Barangaroo Central Site for the intended uses.

7 Validation Plan

7.1 Soil Characterisation / Validation Sampling and Analyses

The Validation Plan addresses the requirement to validate remediation excavations and materials sourced from:

- The identified asbestos and shallow tar impacted areas listed in **Table 5.1**;
- The Barangaroo Project Site (excluding the Declaration Area);
- Imported fill materials from off-site sources; and
- The footprint of the water treatment plant.

7.2 Validation Sampling and Analysis Quality Plan

The remediation/management of the site is to occur as series of staged tasks, as outlined in the RWP (**Appendix B**).

Prior to the commencement of any sampling works, a Validation Sampling, Analysis and Quality Plan (VSAQP) for all the required elements shall be prepared in accordance with the requirements of relevant guidelines for review and endorsement by the appointed Site Auditor.

As *in-situ* pre-classification is proposed for all Site Materials to be used as fill within the Barangaroo Central landform, the VSAQP will need to address the requirements for adequate material classification of source areas in accordance with the following sections. The VSAQP will need to:

- Demonstrate the density of supplementary sampling required by documenting the existing dataset available for each proposed source area; and
- Provide detail on how the final dataset will be managed during works and in conjunction with the MCMS.

7.3 Validation of Soil Remediation Works

7.3.1 Soil Validation Sampling and Analyses

The proposed soil sampling and analytical program is outlined in **Table 7.1** and is based on the following rationale:

- In validation excavations - inspection of the excavated surface is required to be made and sampling is to commence only if no evidence of contamination is identified by visual or olfactory means.
- The sampling frequency for the excavated materials (non Declaration Area source) received for placement in the Barangaroo Central Site is intended to supplement, not replace, the existing in-situ data presented in ERM (2007 and 2008a). The adopted frequency is consistent with the frequency presented in the RAP prepared for the Blocks 1 – 3 within the Stage 1 Development (AECOM 2010b)[28].
- The sampling frequency may be decreased, with agreement of the Site Auditor, for materials that are judged to be homogeneous following inspection by the

[28] *Barangaroo Remedial Action Plan – Other Remediation Works (South),* AECOM Australia Pty Ltd, June 2010 (AECOM 2010b)

environmental consultant. Where a lesser frequency of sampling is sought this should be proposed within the VSAQP for consideration.

- The minimum validation grid size for unexpected finds is 25 m, which is capable of detecting circular hotspots of 29.5 m diameter or greater with 95% confidence, using Procedure A from *Contaminated Sites Sampling Design Guidelines* (EPA 1995), which is considered adequate given the proposed development layout of the Barangaroo Central Site.
- Analytical requirements are consistent with the COPCs identified at the Barangaroo Project Site and also meet the requirements for imported fill materials outlined in *Contaminated Sites Guidelines for Assessing Service Station Sites* (EPA 1994).
- Imported material sampling frequencies exceed the minimum one composite sample requirement outlined in EPA 1995, and are based on having sufficient data to generate reliable 95%UCL_{avg} concentrations.

Table 7.1 Validation Sampling and Analytical Program

Item	Sampling Frequency			Analytes
	Excavation floors	Excavation Walls from distinct horizon/ material	Materials	
Validation - Asbestos contaminated soils identified as requiring remediation excavated from within the Barangaroo Central Site	1/400 m^2	1/20 m	1/400 m^3 for each material type[1]	Asbestos
Validation – Shallow tar-impacted material	1 per 25m2	1/5 m lateral 1 sample if less than metre vertically or 1m zones vertically if greater than 1m thickness of Shallow Tar Impacted Material	-	pH Metals TPH/BTEX PAHs Asbestos Visual inspection for Shallow Tar Impacted Material
Validation – Footprint of Water Treatment Plant	1/400m2	1/20m	-	pH Metals TPH/BTEX PAHs Asbestos Visual inspection for Shallow Tar Impacted Material
Material Characterisation - Excavated fill materials provided for placement in the Barangaroo Central Site (Non Declaration Area Source)	1/400 m^2	1/20 m	1/400 m^3 for each material type[1]	pH Metals TPH/BTEX PAHs Total Cyanide Asbestos
Material Characterisation - Aesthetically impacted materials provided for placement in the Barangaroo Central Site	N/A	N/A	1/25 m^3	pH Metals TPH/BTEX PAHs Phenols Total Cyanide ASLP (Metals) ASLP (TPH) ASLP (PAHs) Asbestos
Material Characterisation -	N/A	N/A	Minimum 10	pH

Item	Sampling Frequency			Analytes
	Excavation floors	Excavation Walls from distinct horizon/ material	Materials	
Imported Soils (if required), either "VENM" or other waste regulatory framework exempt materials (e.g., "ENM")			samples per source site to enable calculation of 95%UCL_{avg} concentrations[2]	8 metals TPH/BTEX PAHs OCPs/PCBs Asbestos
Material Characterisation - Specially Exempted Imported Soils (as required), only commercially supplied landscaped products (e.g. mulch, blended materials)	N/A	N/A	Minimum 10 samples per source site to enable calculation of 95%UCL_{avg} concentrations[4]	pH 8 metals TPH/BTEX PAHs OCPs/PCBs Asbestos
Unexpected finds	1/25 m^2	1/5 m	1/25 m^3	As appropriate, depending on the nature of the find

Notes:
1. This frequency may be relaxed for homogeneous materials which will be defined by the environmental consultant as agreed with the Site Auditor
2. Validation of VENM materials shall be undertaken in accordance with the requirements of EPA 1995, which requires review of the (source) site history and inspection of materials prior to/during/after importation onto the site.
3. TCLP analysis not required on all samples provided demonstration of a representative dataset for comparison to the DECC (2009) Waste Classification Guidelines.
4. No sample is >250% of SAC and standard deviation is<50% of SAC.

7.3.2 Sampling Methodology

Samples shall be collected by appropriately trained and experienced personnel from by the use of a hand trowel, or in excavations deeper than approximately 1 m from the central part of the bucket of an excavator or back-hoe. For tar impacted validation sampling, discrete samples will be collected in each 1m vertical zone (i.e 0 to 1m, 1m to 2m) should the tar impact material extend greater than 1m vertically. One sample will be collected on each of the walls should shallow tar impacted material be less than 1m in thickness.

Where samples are obtained from stockpiles, they will be collected from at least 0.2 m beneath the surface of the stockpile. No composite samples are proposed. The hand trowel will be thoroughly decontaminated using a solution of a phosphate-free detergent and potable water between each sampling location. Where samples are required within large stockpiles or embankments, samples shall be collected by testpits placed using an excavator. Samples shall be collected from the centre of the excavator bucket ensuring that no part of the sample has contacted the sides of the excavator bucket. During the collection of soil samples, features such as material uniformity, seepage, discolouration, staining, exotic materials, presence/absence of visible asbestos-containing materials, odours and other indications of contamination will be noted on the field documentation.

Collected soil samples will be immediately transferred to laboratory-supplied glass jars and sealed using Teflon-lined screw caps and filled so that there is minimum headspace. Sample labels will record: job number; sample identification number; sampler's initials; and date and time of sampling. Sample containers will be transferred to a chilled ice box for sample preservation prior to and during shipment to the testing laboratory. A chain-of-custody form will be completed and forwarded with the samples to the testing laboratory.

Soil validation samples shall be analysed by a primary laboratory which shall be NATA accredited for the required analyses. The secondary (check) laboratory responsible for analysing a certain proportion and type of QA/QC samples shall also be NATA accredited

for the required analyses. Both laboratories will also be required to meet the environmental consultant's internal quality assurance requirements.

7.3.3 Data Quality Objectives and Data Quality Indicators

Prior to commencing the validation program, the Remediation Consultant is required to establish the DQOs that are required to be achieved to ensure the reliability of the validation program. The DQO program is required to meet the requirements of DEC 2006 and shall be detailed in the VSAQP.

The reliability of data (i.e. quality assurance / quality control) generated by the validation program are required to be assessed by reference to pre-determined Data Quality Indicators (DQIs) established for the validation program which are discussed below in relation to precision, accuracy, representativeness, comparability and completeness (PARCC parameters), and are shown in **Table 7.2**.

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of laboratory and field methods is assessed by reference to the parameters listed in Appendix V of NSW DEC (2006) and by calculating the Relative Percent Difference (RPD)[29] of duplicate samples. Precision of field data is assessed by reference to standard operating procedures.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the field and laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy of laboratory data is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards. Accuracy of field data is assessed by reference to standard operating procedures.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy. Representativeness of field data is assessed by reference to standard operating procedures.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods. Comparability of field data is assessed by reference to standard operating procedures and other field quality requirements specified in the VSAQP.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study. Completeness of field data is assessed by reference to standard operating procedures and other field quality requirements specified in the VSAQP.

[29] $$RPD(\%) = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where C_0 is the analyte concentration of the original sample
C_d is the analyte concentration of the duplicate sample

Table 7.2: Summary of Data Quality Indicators for Data Gap Investigation and Validation Program

	PARCC Components	Frequency	Data Quality Indicator Limits
Precision	*Field*		
	Appropriate standard operating procedures for sample collection & handling	All Samples	All samples
	Collection of blind and split duplicate samples	1/20 samples	-
	Possession of lab-prepared trip spike during fieldworks	1/day	-
	Laboratory		
	Blind duplicate analyses (intra laboratory)	1/20 samples	<50% RPD[1]
	Split duplicate analyses (inter laboratory)	1/20 samples	<50% RPD[1]
	Laboratory duplicate analyses	1/batch	<50% RPD[1]
	Trip spike analyses	1/batch[2]	70-130%
Accuracy	*Field*		
	Appropriate standard operating procedures for sample collection & handling	All Samples	All samples
	Preparation and collection of rinsate blanks for each type of sampling equipment	1/day	-
	Possession of field blanks during fieldworks	1/day	-
	Laboratory		
	Trip blank analyses	1/20 samples	<LOR
	Rinsate blank analyses	1/20 samples	<LOR
	Surrogate spikes	All organics	70-130%
	Matrix spikes	1/batch	70-130%
	Matrix spike duplicates	1/batch	<50% RPD[1]
	Laboratory blanks	1/batch	<LOR
Represent-ativeness	*Field*		
	Sampling appropriate for media and analytes	All media / analytes	All media / analytes
	Laboratory		
	Samples analysed for correct (pre-defined) constituents	As per plan	-
	Samples extracted and analysed within holding times	All samples	As per NEPC 1999
Comparability	*Field*		
	Standard operating procedures for sample collection & handling	All Samples	All samples
	Consistent field conditions and sampling personnel	All Samples	All samples
	Appropriately trained and experienced sampling personnel	All Samples	All samples
	Laboratory		
	Standard & consistent analytical methods used for all analyses	All Samples	All samples
	Limits of reporting appropriate and consistent	All Samples	All samples
Completeness	*Field*		
	Critical locations sampled	As per plan	-
	Proposed locations sampled and samples retrieved from target depths	As per plan	-
	Sample description and COCs completed and appropriate	All Samples	All samples
	Appropriate documentation	All Samples	-
	Standard operating procedures for sample collection & handling	All Samples	All samples
	Appropriately trained and experienced sampling personnel	All Samples	All samples
	Laboratory		
	Satisfactory frequency and result for QC samples	All QA/QC samples	100%
	Data from critical samples is considered valid	All samples	Critical samples valid

(1) If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgement will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.
(2) Required for all sample batches.

7.3.4 Site Materials Compliance Management

Beneficial re-use of materials is proposed within the Barangaroo Site, except as stated above that no materials from the Declaration Area will be reused on the Barangaroo Central Site. This will result in surplus soils from other areas of the Barangaroo Project Site being imported onto the Barangaroo Central site and used as fill material. A Materials Compliance Management System (MCMS) shall be developed for the reuse of materials on the Barangaroo Central Site. It shall include two primary elements:

1. Materials Management Guideline (material qualities); and

2. Materials Tracking Plan (quantity / movement / location).

The MCMS also includes the following specific details:

- Definition of responsibilities, including the Remediation Contractor(s), other contractor(s) e.g. Remediation Consultant (JBS) and the Site Auditor.
- Procedures for confirming material quality, summarising existing analytical (in-situ) data, additional analytical (ex-situ) data, additional observations to satisfy other acceptance criteria (e.g., % tar) and alignment of all data to enable classification as established in the HHERA (JBS 2012b).
- Procedures for confirming the origin of materials and the waste classification have they been given, noting that source depths for excavated materials are not critical if tied to material type, while placement depths of imported fill materials are critical since tied to groupings of criteria for the Barangaroo Central Site.
- Procedures for recording where the materials have been placed (lateral & vertical limits) and results of inspections during placement.
- Procedures for recording the quantity of placed materials.
- Site grid squares or sub zones/ Site survey data (GPS / GIS), noting size of grid and elevations.
- Frequency of data collection, with consideration to both program (time) and area/material type.
- Material Tracking Records.
- Standard forms / documentation.
- Non-conformances / Unexpected Finds.
- QA/QC.

The MCMS may also need to include or make reference to additional material placement requirements to meet design elements such as those relating to subsurface drainage, suitability of soils from a plant nutrient perspective, and engineering properties of materials to be placed, which are outside the scope of this RAP.

7.3.5 Imported Soils Compliance with Validation Plan

As stated in the Validation Plan (**Section 6.3.1**), only materials which meet the definition of VENM or ENM, as defined under relevant regulations, will be imported onto the Barangaroo Central Site from a location other than the Barangaroo Site (excluding the Declaration Area). Some exceptions may be made for specific landscaping materials (e.g. mulch or blended materials) as required for landscaping of 70 % of the Barangaroo Central Site, however these materials, if imported, will also require validation in accordance with **Section 6.3**. as stated above, no materials from the Declaration Area will be imported onto the Barangaroo Central Site.

Prior to VENM or ENM materials being accepted onto the site, the following compliance procedure will be implemented:

- The source site(s) and material type(s) shall each be inspected by the Remediation Consultant and confirm that the site history indicates the site is uncontaminated and that the soil proposed to be excavated is natural, visually clean, odour free and is undisturbed;

- The documentation relating to the materials shall be reviewed by the Remediation Consultant and assessed against the requirements outlined in **Section 6.3** of this RAP and any additional requirements such as specific sampling/analytical requirements for ENM, as prescribed by relevant regulations. If the data is incomplete / insufficient (according to the relevant DQIs), the materials will not be accepted onto the Barangaroo Central Site until additional data have been collected in accordance with the requirements of this RAP and relevant regulatory requirements have been achieved to the satisfaction of the Remediation Consultant;
- Regular inspections of imported materials accepted for importation on the Barangaroo Central Site shall be undertaken by the Remediation Consultant. In the event that imported materials are observed by the Remediation Consultant to be inconsistent with that described in the imported material classification documentation and/or that observed by the Remediation Consultant at the source site and/or if suspected signs of contamination are identified, the importation of soils from the specific source site(s) shall be suspended until such time as confirmatory sampling/analyses is undertaken by the Remediation Consultant to confirm the suitability of the materials for acceptance onto the Barangaroo Central Site.
- Should the imported materials be rejected or suspended from use, the supplier will be contacted and alternative sources will be sought. The process of rejection or suspension will be documented in the validation report for any material brought onto the Barangaroo Central Site.

7.3.6 Offsite Disposal of Tar Impacted Material

Immobilisation approvals will be required from the NSW EPA, according to the requirements of DECC (2009), where it is proposed to immobilise PAH impacted soils excavated on the site prior to off-site disposal.

7.4 Soil Characterisation / Validation Criteria

7.4.1 Background

A range of site-specific risk-based criteria have been developed in the Barangaroo Central Site HHERA as summarised in Section 5. Each of the risk based criteria have rules with respect to the area of application

The risk-based criteria derived for the interim Stage 1 Public Domain use of the site provides a range of criteria for soil zones, as follows (JBS 2012a):

- Growing Media – In the vicinity of turfed areas soils that extend to a depth within 0.5 m of the finished surface of the landscaped areas; in the vicinity of shrubs and trees areas soils that extend to a depth within 1.4 m of the finished surface; and in the vicinity of large trees that extend to a depth within 1.5 m of the finished surface; and
- General Fill – Soils used as fill materials greater than 0.5 m from the finished surface of landscaped area; in the vicinity of shrubs and trees areas soils that extend greater than a depth of 1.4 m of the finished surface; and in the vicinity of large trees that extend to a depth greater than 1.5 m of the finished surface.

Additional risk-based criteria are also provided for fill materials placed near the basement to be constructed in the northern portion of the Barangaroo Central Site. These criteria include (JBS 2012a, 2013):

- Soils within 10 m of northern basement; and
- Soils greater than 10 m and within 30 m of northern basement.

Risk based criteria are also provided for soil and groundwater quality in the immediate proximity of the southern basement. These remediation criteria are based on the proposed design and construction of the southern basement.

In addition to the quantitative criteria referred to in this RAP, the following aesthetic considerations will also supplement the characterisation/validation process:

- Observations made regarding the condition of visible asbestos-containing materials in addition to laboratory analyses for the presence of asbestos fibres;
- The presence of odorous or discoloured soils (caused by contamination);
- Potential odours as generated by handling of soils during construction works.

Material tracking details shall be prepared as part of the MCMS (**Section 7.3.4**) prior to commencement of the remediation/management works, detailing the material inspection/tracking/ testing protocols, consistent with the validation program outlined in **Section 7.3** and **Section 7.4**.

7.4.2 Site Acceptance Criteria

Surface soils have been identified as being unsuitable to be used as growing media. Soils are required to be imported to be used as growing media in proposed areas of vegetation. Additional soils are also required to be imported to meet the balance of the fill material requirements.

SAC for Barangaroo Site Materials

Imported soils as sourced from the Barangaroo site are required to meet one to potentially several of the SAC as derived for the site as per the following:

- Soil to be imported to be used as growing media require to comply with the SAC provided in **Section 5.4**;
- Soils to be used in the upper 0.5 m of the site require to comply with the SAC provided in **Section 5.2**;
- Soils to be used below a depth of 0.5 m and more than 30 m from the northern basement require to comply with the SAC provided to **Section 5.2**;
- Soils to be used within 10 m of the proposed northern basement require to comply with the SAC provided to **Section 5.3**;
- Soils to be used in the immediate proximity of the southern basement require to comply with the soils criteria provided to **Section 5.1**;
- Soils to be imported to be used within 10 m, less than 30 m, and above the depth of groundwater (i.e. unsaturated zone)require to comply with the SAC provided to **Section 5.3**;
- All soils to be imported require compliance with the SAC provided to **Sections 5.5** to **5.7**.

The decision rules to be adopted in the application of each of the criteria are summarised in **Sections 5.1** to **5.7**.

Generally materials will only be retained or accepted on the Barangaroo Central Site if:

1. The concentrations of contaminants within the materials meet each of the relevant Site Acceptance Criteria (**Sections 5.1** to **5.7**) and the materials are not Tar Impacted Materials as defined in **Section 7.4.1**; and
2. The materials are not from the Declaration Area.

In addition to the specific decision rules as nominated within the relevant risk assessments and discussed throughout Sections 5.1 to 5.7, materials which are assessed by comparison of a 95% UCL_{avg} concentration will additionally require to be compared to the SAC as per the following decision rules:

- No single analyte concentration shall exceed 250 % of the SAC for each COPC; and
- The standard deviation of the results must be less than 50 % of the SAC for each COPC.

SAC for Imported Materials

Imported materials will only be accepted on the Barangaroo Central Site if they:

- Meet the definition of Virgin Excavated Natural Material (VENM) as defined in relevant legislation, noting that all reported concentrations of organic constituents should be below the laboratory limits of reporting and the reported concentrations of inorganic constituents consistent with published background levels (NEPC 1999);
- Meet the definition of Excavated Natural Material (ENM) as defined in relevant regulations; or
- In the case of specific commercial products required for landscaping (i.e. mulch, blended materials) have been sampled and validated in accordance with **Section 6.3.6** as meeting the appropriate SAC prior to receipt on the Barangaroo Central Site.

SAC for Site Impact

Soils and groundwater in the immediate proximity of the southern basement require to comply with the criteria provided in **Section 5.1**. The construction of the southern basement requires to comply with the performance criteria identified in **Section 5.1**.

Levels of soil and groundwater impact in proximity of the northern basement have not been found to pose a potential human health risk.

Remediation of surface soils for ecological protection purposes has been addressed by the importation requirements for growing media.

Groundwater discharges form the site has not been found to pose a potential ecological risk to Darling Harbour.

Aesthetics

Aesthetically impacted materials shall not be permitted at the site surface.

7.5 Water Characterisation / Validation

The following Sections address the requirements that must be met for surface and groundwater required to be discharged from the Barangaroo Central Site during remediation/management/construction activities.

7.5.1 Water Sampling and Analyses

Water samples shall be collected by suitably trained and experienced personnel.

Laboratory-supplied sample bottles of appropriate size, composition and preservation shall be labelled as described for soil sample containers. Bottles shall be filled directly and transferred to a chilled ice box for transport to the testing laboratories under chain-of-custody conditions. The ice box shall remain in the custody of the sampler until relinquished under the chain-of-custody protocol.

Water samples shall be analysed by a primary laboratory, which shall be NATA accredited for the required analyses. The secondary (check) laboratory responsible for analysing a certain proportion and type of QA/QC samples shall also be NATA accredited for the required analyses. Both laboratories will also be required to meet the environmental consultant's own internal quality assurance requirements.

7.5.2 Water Validation Criteria

As noted in **Sections 5.1** and **5.3**, no groundwater remediation is required on the basis of current levels of groundwater impact in proximity of the northern basement and anticipated conditions on removal of tar containing materials in immediate proximity of the southern basement.

Any water discharged from the site shall be required to meet the water validation criteria as provided to the Environmental Protection Licence (EPL), which is required to be obtained from NSW EPA for discharges from the site.

7.6 Validation of Soil Placement Areas

Areas where soils are reused to form the Barangaroo Central Site shall be subject to the following data recording process for future reference purposes, and shall be detailed in the CEMP:

- A location plan of the placed materials with co-ordinates relative to the lot boundaries;
- The levels in mAHD of the base of the placement location(s) prior to the material placement;
- The levels in mAHD of the placement locations once all materials have been placed; and
- The total placed volume of materials.

At the completion of the Stage 1 Public Domain on the Barangaroo Central Site, a LTEMP will be prepared documenting the presence of the placed materials and the on-going monitoring/management measures that are expected to be implemented to ensure environmental compliance over the life of the Barangaroo Central Site.

7.7 Validation of Basement Construction

AECOM (2011c) and Environ (2011) detail the specific validation requirements to be undertaken with the application of the proposed site remediation criteria to the basement

design as proposed at the southern portion of the Barangaroo Central site. The specific requirements are listed in **Section 5.1** and must be adopted in validation of the southern basement.

Construction Quality Assurance Plans (CQAPs) must be prepared as part of the detailed design of the southern basement construction with regards to the groundwater control wall elements.

Adequate supervision and monitoring of the construction/installation of these items are required, to ensure compliance and to document for future records, that the southern basement is constructed in accordance with the appropriate specifications.

The CQAPs must include the following general elements:

- Parameters to be determined and the types of tests to be undertaken (field and laboratory);
- Number and frequency of tests;
- Test methodologies;
- Calibration of field procedures and equipment;
- Required accreditation for testing laboratory(s) / personnel;
- Quality control tests undertaken by external/independent parties/laboratories; and
- Be consistent with the validation requirements of AECOM (2011c) and Environ (2011) as summarised earlier.

It is particularly important that detailed '"issue for construction" and "as built" drawings are developed, in order to assist with any future maintenance and also to ensure that any intrusive works in close proximity do not damage certain elements of the construction. As per **Section 5.1**, these further require review to ensure consistency with the basement design objectives.

The data obtained from the CQAP will be combined with the detailed "as built" drawings to validate the groundwater control walls within the basement were successfully installed and are required to be provided in the LTEMP.

7.8 Validation Reporting

7.8.1 Validation Reports

The Barangaroo Central Site validation report will be required to be in general accordance with the *Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites* (EPA 2011) and with other relevant guidelines endorsed by NSW EPA and must be of sufficient reliability to allow the Site Auditor to compete the Site Audit Statement having due regard to the requirements of *Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd edition)* (DEC 2006) and with other relevant guidelines endorsed by NSW EPA.

The overall Barangaroo Central Site validation report will contain information including:

- Details of the remediation works conducted;
- Information demonstrating that the objectives of this RAP have been achieved, in particular the validation sample results and assessment of the data against both the pre-defined data quality objectives and the SAC;

- Information demonstrating compliance with relevant regulatory requirements;
- Any variations to the strategy undertaken during the implementation of the remedial works. It should be noted that in accordance with the RWP, any deviations from the strategy detailed in this RAP will require written endorsement from the Site Auditor prior to implementation;
- Summary results of all environmental monitoring undertaken during the course of the remedial works;
- Summary details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents;
- Details on waste classification, tracking and off-site disposal;
- Clear statement of the suitability of the site (or part of the site) that is the subject of the validation report, for the proposed use(s);
- Other information as appropriate, including the stand-alone LTEMP that will apply to the Barangaroo Central Site of to that part of the Barangaroo Central Site that is the subject of the validation report.

The validation report will serve to document the remediation works for future reference.

7.8.2 On-going Management

In addition to the requirements of the Validation Plan presented in **Section 7**, the proposed remediation strategy for the Barangaroo Central Site will require long-term management.

To this end, a LTEMP will be prepared to detail the on-going management and monitoring requirements for the Barangaroo Central Site. However, the precise nature and extent of the management requirements will not be known until remediation/management works are conducted and the validation data obtained.

The LTEMP will be prepared following the completion of the validation report for the Barangaroo Central Site.

The LTEMP shall contain, as appropriate, the following elements:

- A statement of the objectives of the LTEMP – i.e., to ensure on-going suitability of the site after it has been remediated;
- Description of the responsibilities of the various nominated parties for implementing elements of the provisions contained in the LTEMP, including the person (by office) who has ultimate responsibility for implementation of the LTEMP;
- Description of the frequency of monitoring and reporting requirements, including to whom reports are required to be provided;
- Description of the material requiring management, including the type of contamination and location on the site (including a plan prepared by a registered surveyor);
- The data obtained from the CQAP, combined with the detailed “as built” drawings for the groundwater control walls within the basement;
- Description of the environmental controls to manage the residual contamination issue(s);
- Description of criteria required to be met for all monitoring procedures;

- Description of corrective actions required to be implemented if monitoring criterion are not met;
- Description of the reporting requirements;
- Timeframe for implementing various elements of the provisions contained in the LTEMP;
- Health and safety requirements for particular activities;
- A program of review and audits;
- The provisions in the LTEMP are feasible (i.e. are able to be implemented) and able to be legally enforceable (i.e. a mechanism exists, such as development consent conditions, to give the plan a basis in law); and
- The relevant consent authority is satisfied that the inclusion of a development consent condition relating to the implementation of the LTEMP is acceptable.

8 Contingency Plan

A review of the proposed contamination-related aspects of the works associated with the development of Barangaroo Central Site has been undertaken and has identified a number of potential risks, which are outlined in the following sections. Assessment of the risks has led to the development of contingencies that will be implemented to ensure that the objectives of this RAP are met.

The Contingency Plan is required to be part of the CEMP, as described in **Section 8**, below, and part of the OHSMP, as described in **Section 9**.

8.1 Unexpected Finds

The possibility exists for hazards that have not been identified to date to be present at the Barangaroo Central Site, which are referred to as “unexpected finds”. By review of the potential and actual COPCs, unexpected finds are anticipated to be detectable through visual or olfactory means, for example:

- Fragments of asbestos-containing materials (visible) or aggregates of friable asbestos materials (visible);
- Construction/Demolition Waste (visible);
- Hydrocarbon-impacted materials (visible/odorous);
- Drums or underground storage tanks (USTs) (visible); and
- Ash and/or slag contaminated soils/fill materials (visible).

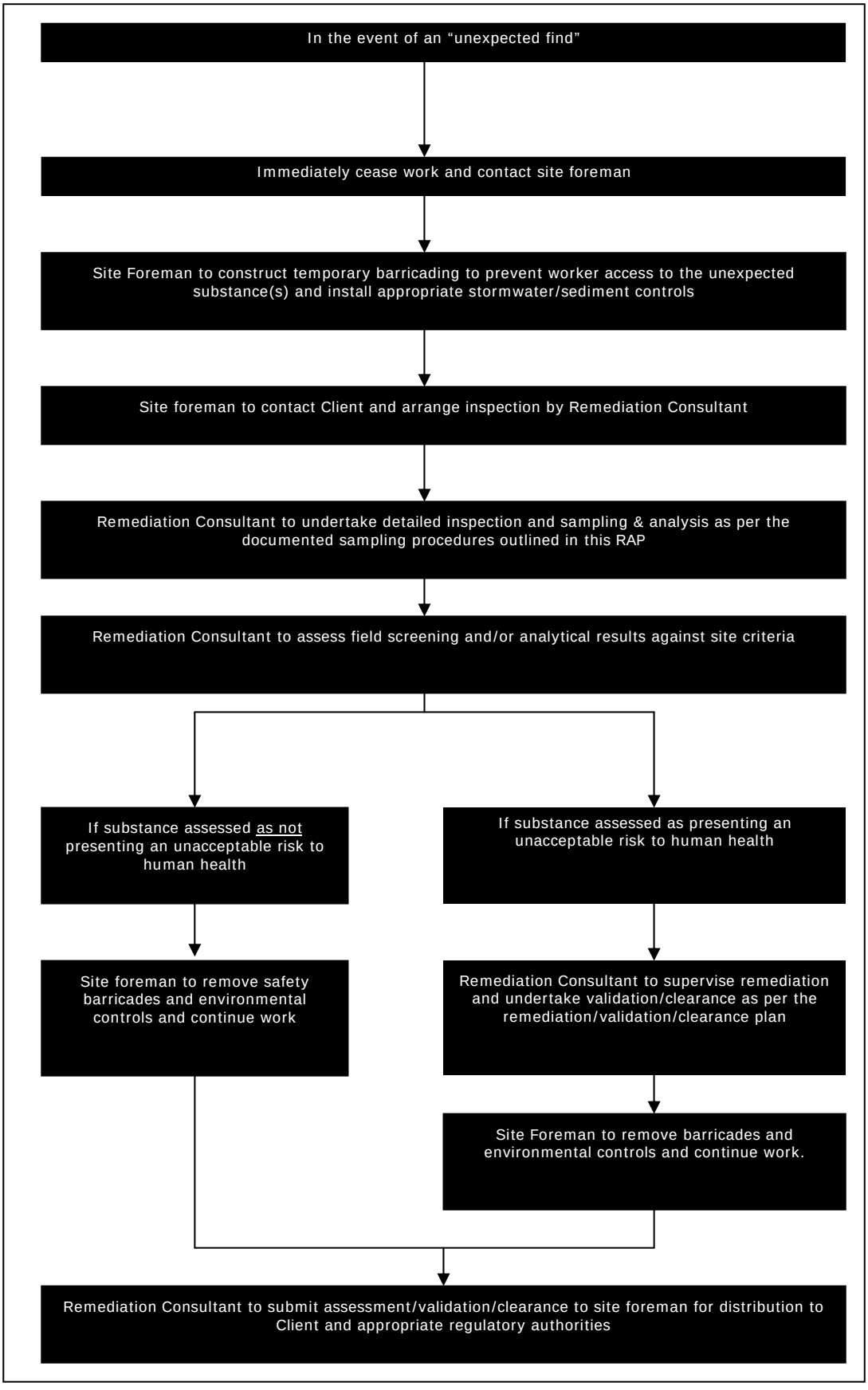
As a precautionary measure to ensure the protection of the workforce and the surrounding community, should any of the abovementioned substances (or any other unexpected potentially hazardous substance) be identified, the procedure summarised in **Figure 8.1** is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use on site, shall be posted in the Site Office and referred to during the Induction to the Barangaroo Central Site by the Remediation Contractor.

The sampling strategy for each unexpected find shall be designed by a suitably qualified environmental consultant. The strategy will, however, be aimed at determining the nature of the substance – if it is hazardous and, if so, is it at concentrations which pose an unacceptable risk to human health or the environment?

Whether the substance if hazardous or not shall be determined by collection and chemical analysis of representative samples of the substance by the Remediation Consultant. The sampling frequency of the identified substance/materials shall meet the minimum requirements outlined in EPA 1995, but must be commensurate with the dimensions of the unexpected find, in addition to those outlined in **Section 7**.

Figure 8.1 - Unexpected Finds Protocol



8.2 Contingency Scenarios

8.2.1 Identification of Tar Impacted Materials

In the event that tar impacted materials or suspected tar impacted materials are encountered, the provisions outlined in the unexpected finds protocol will be implemented, comprising inspection, testing and appropriate action as advised by the Remediation Consultant (**Section 8.1**).

Any suspected tar impacted materials (i.e based on odours and discolouration) must be segregated from other excavated materials and placed in a designated area with appropriate odour controls until such time as an appropriate assessment and methodology is confirmed for their appropriate management. In the event that the unexpected finds are identified as tar impacted materials that do not meet the SAC, they shall be stored in a secure area for later treatment and disposal, in accordance with the requirements in **Section 9**.

8.2.2 Identification of Asbestos Impacted Materials

In the event that asbestos containing materials or materials that potentially contain asbestos are encountered, the materials will be characterised in accordance with **Section 5.7** to identify the nature and extent of the impact. Recommendations shall be made as to the requirement for removal / management of the asbestos impact on the basis of compliance with asbestos SAC.

8.2.3 Material Storage Breach

In the event that any materials storage containment controls are breached and stockpiled materials have escaped or have the potential to escape, then the breach is to be corrected as soon as practicable and the management controls shall be rectified and investigations undertaken to review the adequacy of the controls and any improvements implemented. The CEMP (**Section 9**) shall include a documented process for identifying, responding to, reporting and recording such incidents.

8.2.4 Incorrect Material Placement

In the event that any part of the Barangaroo Central site incorrectly receives material unsuitable for placement within it, then the following action shall be undertaken:

- Placement of fill within the Barangaroo Central Site shall be halted;
- The location of the incorrectly placed material shall be located using the GPS co-ordinates recorded at the time of placement;
- The area of the incorrectly placed material shall be dug out, and stockpiled separately. The nominal dimensions of the area to be recovered shall be a 5 m x 5 m x 1 m section, however this should be refined as appropriate based on the quantity of the material to be recovered and available GPS data;
- The resulting excavation shall be validated in accordance with **Section 7.3** (and sampling frequency provided in **Table 7.1**) to demonstrate the remaining soils within the zone are compliant with the SAC. If validation results are unacceptable the excavation should be extended until results of validation sampling are compliant with the SAC;
- The recovered material shall be stockpiled separately on the Barangaroo Central Site, outside the filling area. The material shall be assessed for suitability for placement in other parts of the site by utilising the available dataset or through the collection of additional samples; and

- A review of management controls, communication plans and investigations shall be undertaken to assess the adequacy of the MCMS in view of the system failure. Filling works on Barangaroo Central shall recommence once any recommendations for improvements have been implemented.

The CEMP (discussed in **Section 9**) shall include a documented process for identifying and responding to such incidents. Details of each incident and of corrective actions are required to be documented in the Validation Report.

8.2.5 Emissions Complaints

Due to the nature of the activities and type of contaminants identified at the Barangaroo Project Site, there is potential for complaints to be received from members of the public relating to environmental emissions including:

- Odour emissions arising from handling of malodorous soil/groundwater;
- Noise and vibration arising from excavation, tunnelling and other works;
- Dust emissions arising from excavation, material handling and placement; and
- Silty water discharging to Darling Harbour.

Monitoring of all environmental emissions shall be undertaken during the works as detailed in the CEMP (discussed in **Section 9**) and appropriate actions taken to further control emissions following receipt of a complaint. Such additional controls may include the following actions, as appropriate, which are required to be detailed in the CEMP (discussed in **Section 9**):

- Notification to the Client at the earliest opportunity;
- Notification to the Remediation Contractor at the earliest opportunity;
- Increased application of odour-masking chemicals on odorous materials;
- Disturbance of soils during meteorologically favourable periods only; and/or
- Covering highly impacted soils which are generating excessive odours; and/or
- Ceasing discharge of water to Darling Harbour.

8.2.6 Incomplete Remediation Works on Northern Portion of Declaration Area

Remediation works are proposed on the Declaration Area to make this portion of the site suitable for the proposed uses, including for use of the southern basement construction. The remediation standards for these remediation works has assumed that the southernmost basement is constructed with groundwater control walls. However, no timeframe for completion of the remediation works on the northern portion of the Declaration Area is provided in AECOM (2012c) and there is a potential that the remediation works on the Declaration Area may not be completed to the associated risk-based criteria for the protection of the occupation of a basement constructed with groundwater control walls prior to the proposed occupation of the basement on the Barangaroo Central Site. Under this scenario, there will be a need to complete remediation works on the Barangaroo Central Site in proximity of the residential basement.

If the remediation methods proposed in AECOM (2012c) have not been completed at the time the remediation works on the Barangaroo Central Site are implemented, the following additional remediation works shall be undertaken on the Barangaroo Central Site by:

- Installation of retention structures at a distance of 10 m outwards from the extent of the southern basement within the northern portion of the Declaration Area sufficient to support potential excavation to a depth of up to 10 m bgs;
- Excavation of materials identified by AECOM (2013) as environmentally unsuitable within the extent of the retained area (as described in **Section 4.1.13** and shown on **Figure 7**);
- Transfer of impacted materials to Barangaroo South for treatment (if possible / available) otherwise transport off-site for treatment / disposal. At the time of preparation of this RAP, suitable facilities appear to be available in Unanderra (Transpacific Industrial Solutions Pty Ltd licence no 10251) and Cootamundra (EESI Contracting Pty Ltd licence no 13413);
- Validation of the extent of excavation as consistent with the relevant requirements outlined in **Section 7**; and
- Backfilling of the excavation with fill material meeting the specification nominated in **Section 7**.

9 Construction Environmental Management Plan

9.1 Preparation of a Construction Environmental Management Plan

Prior to commencement of remediation works on the Barangaroo Central Site, a stand-alone CEMP shall be prepared by the Remediation Contractor, which documents the environmental monitoring and management measures required to be implemented during the remediation and construction related activities associated with the redevelopment of the Barangaroo Central Site .

The CEMP shall address each of the nominated items in **Section 9.2** and shall include the Contingency Plan, referred to in **Section 8**, above.

9.2 Required Elements / Procedures

An assessment of the proposed activities required to be incorporated into the CEMP in detail is provided in **Table 9.1**. The CEMP is required to address each of the required elements and procedures in full detail and to include detailed monitoring processes and procedures, corrective actions and reporting requirements.

Table 9.1 Required Elements of the CEMP

Element	Specific Minimum Requirements to be included in CEMP
1. Dust and Airborne Hazard Control	Visual monitoring at site boundary involving regular inspections of the site boundary to assess for the presence of visible dust impacts. Real time airborne dust analyser monitoring. Asbestos air monitoring if/as required. Provisions for dust control based on monitoring results.
2. Flora and Fauna	Procedures for the protection of flora and fauna specifically including vegetation established on the site during the Stage 1 Public Domain works during the potential ensuing remediation works in proximity of the Declaration Area.
3. Heritage/Archaeological	In accordance with relevant heritage/archaeological studies.
4. Visual Impacts	Specific colour requirements for various controls/measures, including PPE (e.g., navy coveralls)
5. Emergency Response	Procedures in the event of an emergency at least including definition of site conditions causing a site emergency and site evacuation procedures. Procedures required for spill incident response including material storage breach.
6. Noise Control	Hours of operation, consistent with the consent conditions. Boundary monitoring at commencement of work site activities with potential for environmental noise emissions. Potential noise monitoring at nearest receptors. Procedures for control and management of noise emissions, as appropriate (e.g., restricted hours).
7. Traffic	Controls on vehicle movements on public roads. Controls on transport of tar impacted materials.
8. Protection of Adjoining Structures	As appropriate.
9. Odour Control	Enclosure of all potential tar odour generating activities (i.e., excavation of sewage overflow storage) with appropriate ventilation controls, including provisions of a negative-pressure enclosure from which air is passed through an odour filtration system (for enclosure) design requirements, incorporating safeguards and monitoring. Daily monitoring of odour levels at boundary during handling of malodorous materials. Procedures for addressing elevated odour monitoring results, including, but not limited to: reduction in earthworks activities within odorous material areas during adverse meteorological conditions; application of odour masking solutions at the odour source or between identified source(s) and receptor(s); and covering identified odour sources by hydromulching or with less odorous materials.
10. Handling of Contaminated Soil	Soil and water management (stockpiling, site access, excavation pump out, reinstatement).
11. Soil Storage/Placement Areas	Soil and water management (stockpiling, site access, excavation pump out, reinstatement). Bunding. Heavy vehicle/personnel decontamination.

Element	Specific Minimum Requirements to be included in CEMP
	Interim storage requirements for materials requiring later treatment. Site drainage requirements, incorporating clean/dirty areas and modifications to existing surface water and drainage controls beneath retained pavements. Monitoring as required.
12. Sediment Control	Bunding. Collection/treatment/handling impacted sediments.
13. Operation of Site Office	As appropriate.
14. Decontamination of Heavy Equipment	As appropriate.
15. Environmental Monitoring	Monitoring of dusts, noise, odour. Monitoring as required for vibration and water releases. Monitoring as required for asbestos. Inspection checklists and field forms. Discharge of water to Darling Harbour.
16. Environmental Criteria	Soil criteria sourced from Barangaroo Central HHERA (JBS 2012b).
17. Material Classification	As detailed in this RAP (Section 6). Materials tracking, including QA/QC inspection and sampling.
18. Community Relations Plan	Refer to BDA project specific communication protocols, incorporating nomination of specific contact persons & details and requirements for communications/response register.
19. Incident Reporting	As appropriate, including standard form/checklist.
20. Security and Signage	Secure site perimeter. Site boundary signage.
21. EMP Review	As appropriate.
22. Training	As appropriate.
23. Contact Details	Company/personnel details, including names/phone numbers for: - Barangaroo Delivery Authority - Site Auditor - Remediation Consultant - Remediation Contractor - OH&S Compliance - Environmental Compliance

9.3 Induction

The CEMP shall document the requirement for induction of all workers involved in the remediation works attending an induction into the requirements of the CEMP prior to commencing work.

9.4 Corrective Actions

The CEMP shall document the requirement for monitoring and reporting and the procedure for corrective actions should any aspects of the CEMP not be met.

9.5 Community Relations Plan

The CEMP will include a community relations plan which will be consistent with the Client communication protocols.

9.6 Certification

Prior to commencement of remediation works on the Barangaroo Central Site, the Remediation Contractor is required to have the draft CEMP endorsed as acceptable by the Remediation Consultant, Barangaroo Delivery Authority and the finalised CEMP by the Remediation Consultant and Barangaroo Delivery Authority and by NSW EPA, as part of the project DGRs.

A copy of the CEMP and the endorsement by the Site Auditor and NSW EPA to the satisfaction of BDA are required to be provided to the BDA prior to commencement of remediation works on the Barangaroo Central Site.

10 Health and Safety

10.1 Occupational Health and Safety Management Plan

An Occupational Health & Safety Management Plan (OHSMP) shall be prepared by the Remediation Contractor prior to commencement of remediation works on the Barangaroo Central Site. The Plan shall contain procedures and requirements that are to be implemented as a minimum during the works, in addition to the Contingency Plan, referred to in **Section 8**.

The objectives of the OHSMP are to:

- Apply standard procedures that minimises risks resulting from the works;
- Ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- Have procedures to protect other site workers and the general public.

These objectives will be achieved by:

- Assignment of responsibilities;
- An evaluation of hazards;
- Establishment of personal protection standards, mandatory safety practices and procedures;
- Monitoring of potential hazards and implementation of corrective measures; and
- Provision for contingencies that may arise while operations are being conducted at the site.

10.2 Additional Site-Specific Elements/Procedures

In addition to the normal construction-related matters, the OHSMP shall address the following site-specific specific hazards associated with the works relating to the management of contaminated soil and groundwater:

- Under/aboveground services, specifically former gasworks infrastructure;
- Use of plant and machinery within confined spaces;
- Contact with contaminated soil (incl. dust), groundwater and vapours, including requirements for specific Personal Protective Equipment (PPE);
- Operation of water treatment plant; and
- Heat/Cold stress.

10.3 Additional Consideration of Chemical Contaminants

In addition to general assessment of the potential for exposure to chemical contaminants, the OHSMP shall also include specific consideration of additional contaminants such as 2-methylnapthalene and some semi-volatile organic compounds (SVOCs) such as styrene and trimethylbenzenes, which are listed as COPCs within the Barangaroo Project Site but external to the Barangaroo Central Site boundary.

As a precautionary measure, the OHSMP should include the requirement for the plan to be revised in the event of an unexpected find of contaminated material during remediation construction.

When working with contaminated materials in general, care needs to be taken to ensure that the contamination is not introduced to the worker via ingestion, inhalation or absorption. The OHSMP must detail the PPE and decontamination requirements to be followed to control the risks posed by potential exposure to chemical contaminants at the site.

10.4 Certification

Prior to commencement of remediation works on the Barangaroo Central Site, the Remediation Contractor is required to have the draft OHSMP endorsed as acceptable by an accredited occupational health and safety hygienist and the Barangaroo Delivery Authority.

A copy of the OHSMP and the endorsement by the accredited occupational health and safety hygienist are required to be provided to the BDA prior to commencement of remediation works on the Barangaroo Central Site.

11 Regulatory Approvals / Licensing

As noted previously, the RAP has been prepared in accordance with the Director General requirements (DGRs) relating to the Project Application SSD_5374, confirming BDA's commitment to completing remedial works to meet appropriate regulatory requirements. In accordance with the DGRs relating to the Project Application SSD_5374, this RAP and the RWP, must be the subject of a Site Audit Statement completed by an accredited NSW EPA Site Auditor, confirming the Barangaroo Central Site will have achieved '*remediation to a standard commensurate with the final intended land use*' if this RAP is implemented.

11.1 Environment Planning and Assessment Act 1979

The Barangaroo Site is listed as a State Significant Site within Schedule 3 of the Major Projects State Environmental Planning Policy. As such, development approval for the project falls under the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979.*

Since the works have been assessed under Part 3A of the EP&A Act, the remediation works are ancillary to other development, and the consent authority is the Director General of the NSW Department of Planning and Infrastructure.

11.2 Protection of the Environment Operations Act 1997

No waste materials, other than VENM/ENM, are to be imported onto the Barangaroo Central Site, as defined in this RAP. As such, it is not expected that any licensing requirements in relation to waste/resource recovery are required. In the event that any materials are required to be removed from the Barangaroo Central Site, all activities will be undertaken in accordance with the requirements of the Act, including ensuring:

- Reuse of materials wherever practicable;
- Generation of waste is minimised;
- Waste is classified in accordance with relevant guidelines;
- Waste is transported by an appropriately licensed transporter;
- Movement of the waste materials is recorded appropriately;
- Waste is disposed to appropriately licensed facilities;
- Records of waste disposal are maintained by the Remediation Contractor and copies are provided to the Site Auditor;
- Other materials are removed to facilities lawfully able to accept such materials.

Any waters released from the Barangaroo Project Site shall not result in pollution of waters and be undertaken in accordance with the EPL (Environment Protection Licence 13336).

11.3 Protection Of The Environment Operations (Waste) Regulation 2005

The regulations make requirements relating to non-licensed waste activities and waste transporting. The proposed works on the Barangaroo Central Site will not require to be licensed. Section 48 of the Regulation requires that wastes are stored in an environmentally safe manner. It also stipulates that vehicles used to transport waste must be covered when loaded.

11.4 Water Management Act 2000

Temporary dewatering of groundwater may be adopted during various elements of the proposed remediation works a contingency to the CEMP. Whilst approval is not required under the Water Management Act 2000 due to certain provisions under the EP&A Act, any bores (spears) required for dewatering purposes may require to be licensed under the requirements of the Water Management Act 2000.

11.5 Waste Avoidance and Resource Recovery Act 2001

Section 3 of the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) includes the following objectives:

a) to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development;

b) to ensure that resource management options are considered against a hierarchy of the following order:

i. avoidance of unnecessary resource consumption,

ii. resource recovery (including reuse, reprocessing, recycling and energy recovery),

iii. disposal,

c) to provide for the continual reduction in waste generation,

d) to minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste …

The efficient use of resources / resource recovery is being encouraged on the Barangaroo Central Site by the development of SAC for the beneficial re-use of surplus soils from other portions of the Barangaroo Project Site. Surplus / non suitable materials that may be removed from areas of potentially sensitive future exposures on the Barangaroo Central Site will be re-used in other less sensitive portions of the Barangaroo Project Site, again consistent with the range of acceptance criteria specifically derived for each portion of the overall site. Material re-use will occur in preference to disposal in accordance with the requirements of s.3(b) of the WARR Act.

The avoidance of unnecessary resource consumption and the reduction in waste generation has been achieved through a risk based approach in setting remediation / site acceptability standards for the site. The consideration of future site uses in setting these criteria, with actual measured contaminant distribution across the site has reduced the extent of the required remediation works. Remediation works consume resources and generate waste materials.

The same environmental assessments have not identified a requirement to remediate deep impacted materials (i.e. deeper than 10m bgs). The remediation of these materials by ex-situ methods would be considered to be a breach of the WARR Act and is consequently not proposed to be undertaken.

11.6 Waste Classification Guidelines (DECC 2009)

All wastes generated and proposed to be disposed off-site shall be assessed, classified and managed in accordance with the *Waste Classification Guidelines: Part 1: Classifying Waste* (DECC 2009).

11.7 Asbestos Regulations

In the event that asbestos impacted fill materials are encountered, all related works and the disposal of asbestos waste shall be undertaken in accordance with the requirements of the:

- *Work Health & Safety Act 2011*
- *Work Health & Safety Regulation 2011*
- NSW Code of Practice 2011 – *How to Manage and Control Asbestos in the Workplace*
- NSW Code of Practice 2011 – *How to Safely Remove Asbestos*; and
- *Guideline: Your Guide to Working With Asbestos* (WorkCover 2008); and
- *Waste Classification Guidelines: Part 1: Classifying Waste* (DECC 2009).

11.8 Ecologically Sustainable Development

The *National Strategy for Ecologically Sustainable Development* facilitates the adoption of ecologically sustainable development (ESD) in environmental decision making. The strategy was adopted by all levels of Australian Government in 1992.

Section 9 of the *Contaminated Land Management Act* 1997 makes specific references to principles of ecologically sustainable development.

(3) … … Ecologically sustainable development can be achieved through the implementation of the following principles and programs:

> *(a) the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
>
> > *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
> >
> > *(ii) an assessment of the risk-weighted consequences of various options,*
>
> *(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*
>
> *(c) conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
>
> *(d) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services*

The precautionary principle has been achieved by the implementation of human health and ecological risk assessments for the Barangaroo Central site. Decision making in the human and ecological risk assessments have been based on NSW EPA endorsed levels of acceptable risk. Constituents with the potential to cause future environmental degradation have been identified and the extent of remediation determined.

Inter-generational equity has been achieved through the exposure durations assessed in the risk assessment. For example potential exposures of future residential occupants of the site has been based on exposure durations of 70 years, most likely spanning two to

three generations of future site occupants. The risk assessment process has also considered the potential for constituent levels to increase in the future, including consideration of degradation products. Constituents have been found to degrade to less harmful by-products which will be protective of the exposures of future generations.

The nearest potentially sensitive ecological receptors have been identified as Darling Harbour adjoining the western boundary of the site and proposed future areas of surface plantings. The ecological risk assessment has been based on ecological protection criteria which are protective of a range of ecological receptors. The protection criteria consider a range of factors including bioaccumulation, ecotoxicity, availability of ecological populations etc. The derivation of risk based outcomes on the basis of the ecological risk assessment will ensure that the Barangaroo Central site does not cause a reduction in biological diversity and is protective of current and future ecological receptors.

Environmental factors have been considered in the selection of remediation options for the site as summarised in **Table 6.1**. Remediation approaches have been selected on the basis of the valuation of environmental benefits and potential emissions from the site. This has resulted in the identification of opportunities for beneficial re-use of impacted materials on the site in preference to waste creation or resource consumption in the off-site disposal of materials.

It is considered that the excavation of materials located below a depth of 10 m is inconsistent with the principles of ESD. The precautionary principle is considered not to apply to this material as no significant threat or environmental damage has been identified currently or potentially into the future. The retention of this material at depth will not affect the future amenity / usability of the site and consequently does not impact on intergenerational equity.

Within the extent of the Barangaroo Central Site, the constituents associated with tar / gasworks based impact have not been identified in discharges from the site, and hence pose no potential threat to biological diversity or ecological integrity of the nearest potentially sensitive ecological receptor of Darling Harbour. The extent of environmental emissions that would occur via the remediation of this material is considered to far exceed any potential environmental discharge that may occur from the materials into the future. Environmental emissions during remediation would be consequent of resource consumption, waste generation and disposal and the creation of impacted materials removed from previously environmentally stable settings.

12 Conclusions and Recommendations

12.1 Conclusions

Overall, it is considered that the proposed actions outlined in this RAP conform to the requirements of DEC 2006 because they are: technically feasible; environmentally justifiable; and consistent with relevant laws, policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this RAP and subject to the limitations in **Section 13**, it is concluded that the Barangaroo Central Site can be made suitable for the intended Stage 1 Public Domain use and long term residential use and that the risks posed by contamination arising from the creation of the Barangaroo Central Site can be managed in such a way as to be adequately protective of human health and the environment.

12.2 Recommendations

It is recommended that the proposed actions outlined in this RAP be implemented and that the following documentation be developed and implemented to ensure the risks and impacts are controlled in an appropriate manner:

- A CEMP, to document the monitoring and management measures required to control the environmental impacts of the works and ensure the validation protocols are being addressed; and
- An OHSMP to document the procedures to be followed to manage the risks posed to the health of the remediation workforce.

The CEMP and the OHSMP are required to contain a plan addressing plausible contingencies and to be submitted for acceptance by the BDA prior to commencement of remediation works on the Barangaroo Central Site.

Upon completion of the remediation and development works on the Barangaroo Central Site, a validation report and an on-going LTEMP for impacted materials retained beneath the Barangaroo Central Site are required to be submitted by the Remediation Consultant to the BDA and, when acceptable to the BDA, to the Site Auditor for certification that the Barangaroo Central Site is suitable for the proposed uses, subject to implementation of the LTEMP.

13 Limitations

This report has been prepared for use by the client who commissioned the works in accordance with the project brief only and has been based in part on information obtained from other parties. The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose. Additionally, this report has been based on investigation results documented by others in previous reports. The reader is referred to these reports for the limitations of the investigations.

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Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements and site history, not on sampling and analysis of all media at all locations for all potential contaminants.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS Environmental Pty Ltd reserves the right to review the report in the context of the additional information.

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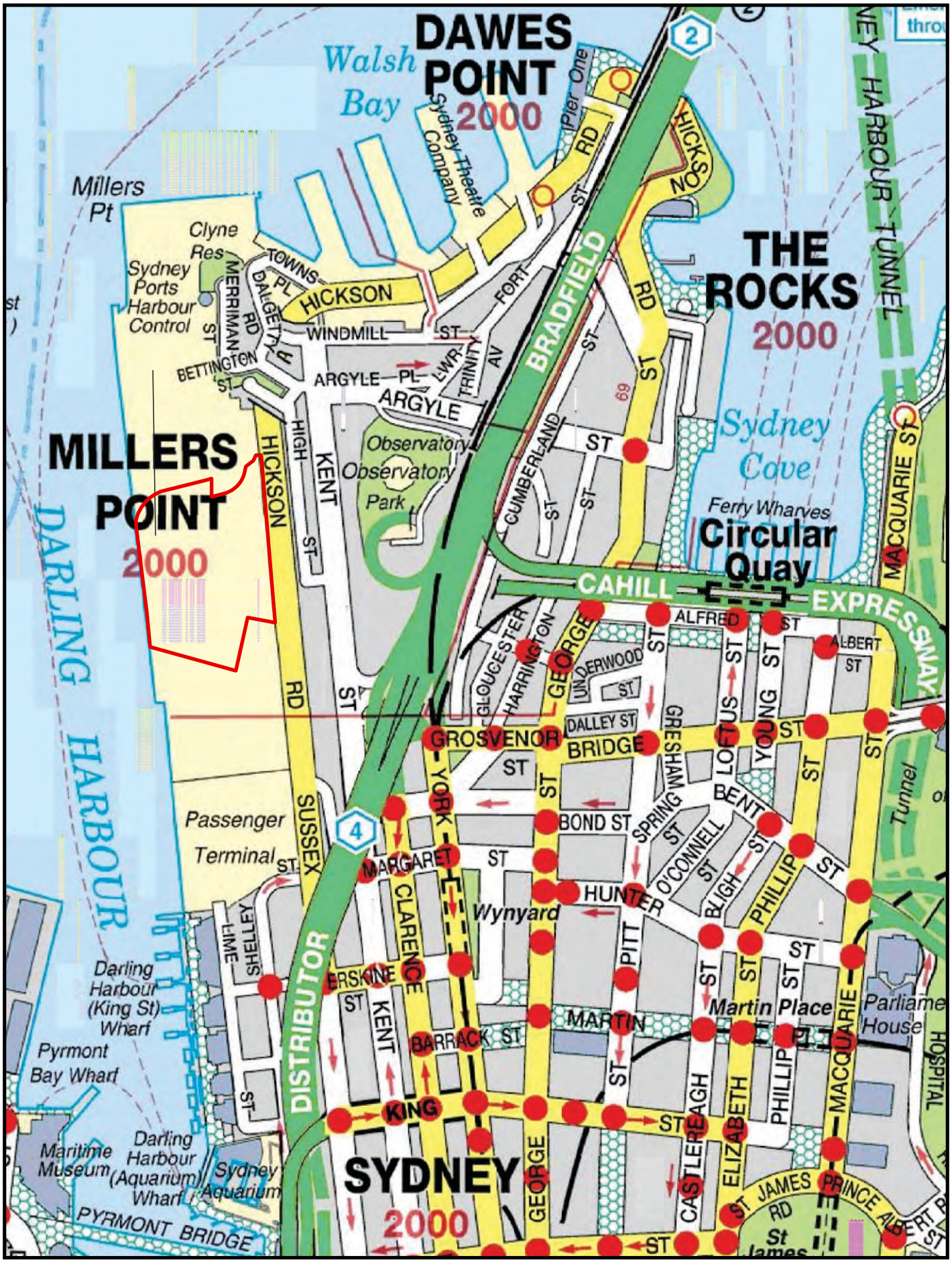
Figures



Source: Base Image - © 2008 Universal Publishers Pty Ltd

0 75 125 250 m

Scale: Approximate

Datum: MGA94 Zone 56 - AHD

Rev	Description	Drn.	Date
A4			
G	Issue - R06	RF	27-3-2013

Legend:

Approximate Boundary - Barangaroo Central

JBS ENVIRONMENTAL

Figure 1: Location of Barangaroo Central Site

Client: Barangaroo Delivery Authority

Project: Barangaroo Central

Job No: 42021 File Name: 42021_01

Source: Base Image www.nearmap.com (23-10-2011)

0 15 30 60 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

A4			
G	Original Issue - R06	RF	27-3-2013
Rev	Description	Drn.	Date:

Legend:

- Approximate Site Boundary - Barangaroo Central
- Inaccessible for soil and groundwater sampling

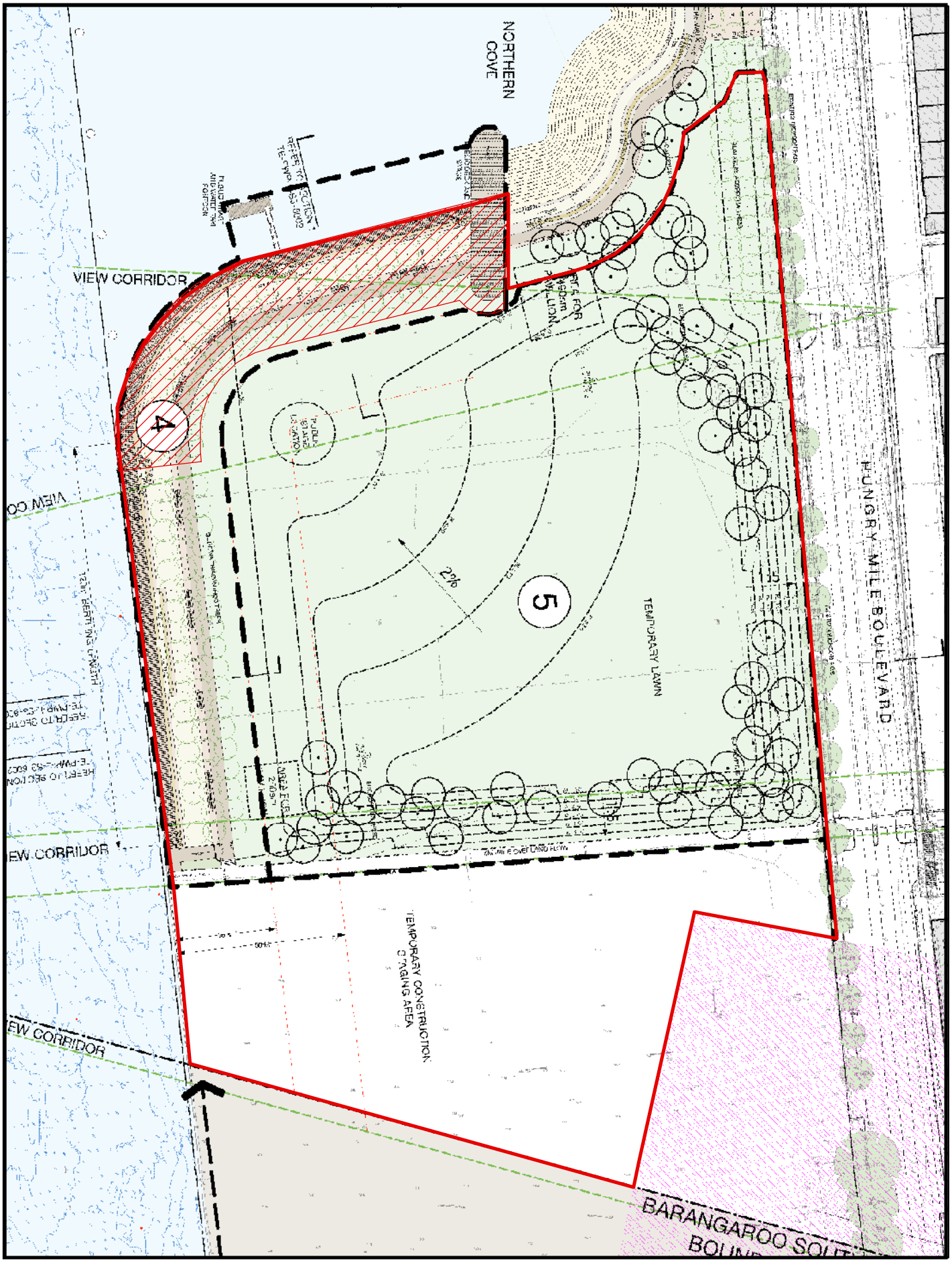
JBS ENVIRONMENTAL

Figure 2: Boundary of Barangaroo Central and Features

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_02



Source: JPW / PWP 120315 8001 Areas (UPDATED TENDER)

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Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
G	Original Issue - R06	RF	27-3-2013

Legend:

- Approximate Site Boundary - Barangaroo Central
- Overlap of Area Already Assessed (Headland Park)

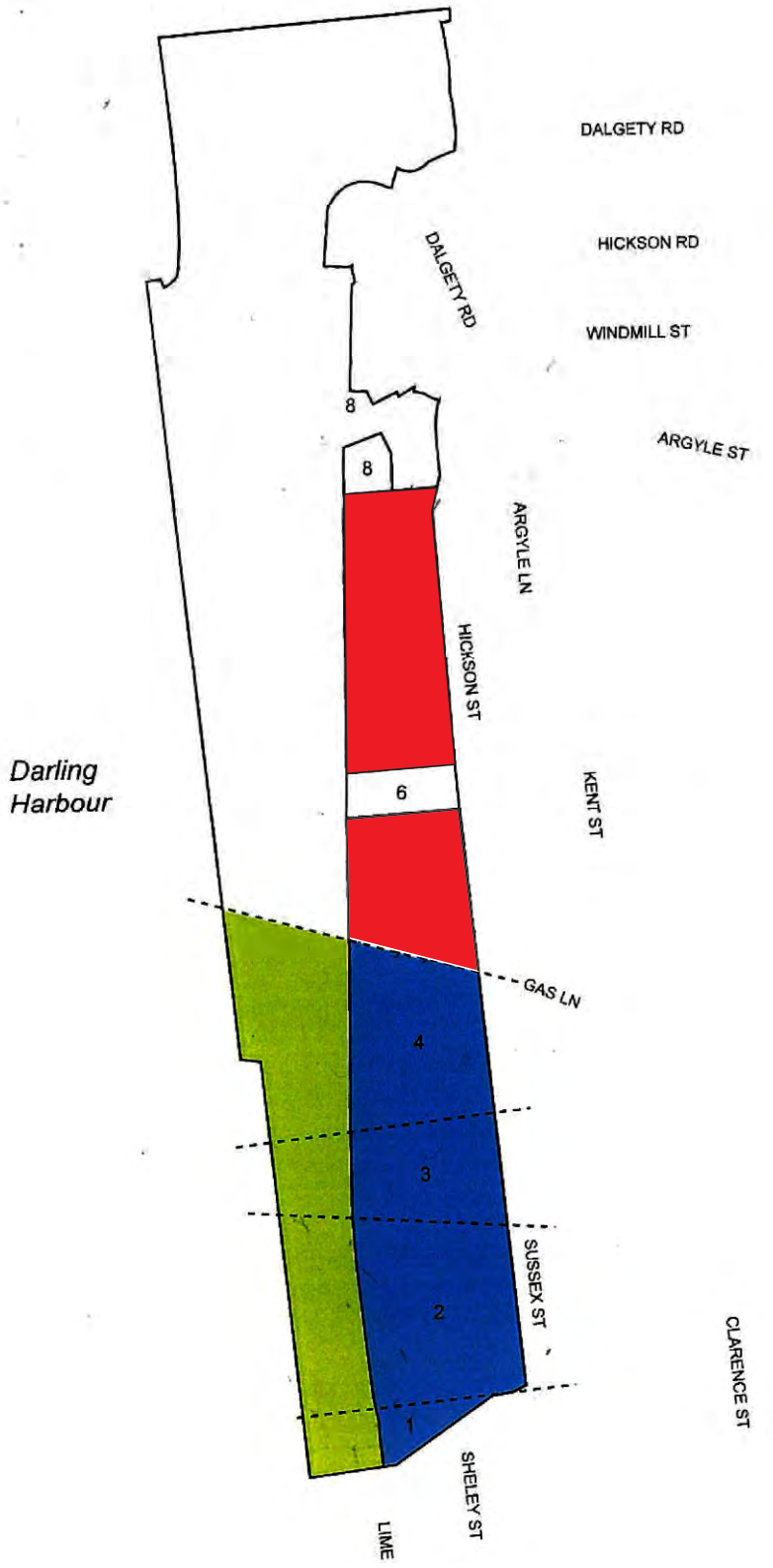
JBS ENVIRONMENTAL

Figure 3A: Barangaroo Central Concept Plan - Barangaroo Central Stage 1 Public Domain

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_03A



Block 1
Max Height = RL 62
Max SEPP GFA = 11,800m²
Max Concept Plan GFA = 11,800m²

Block 2
Max Height = RL 180
Max SEPP GFA = 180,000m²
Max Concept Plan GFA = 211,907m²

Block 3
Max Height = RL 112
Max SEPP GFA = 56,000m²
Max Concept Plan GFA = 85,568m²

Block 4
Max Height = RL 100
Max SEPP GFA = 74,500m²
Max Concept Plan GFA = 121,000m²

Source: Site Concept Plan and State Significant Site Listing - August 2010

0 65 130 260 m
Scale: 1:6,000
Datum: MGA94 Zone 56 - AHD

Rev	Description	Drn.	Date
A4			
I	Original Issue - R06	SE	17-6-2013

Legend:
- RE1 Public Recreation
- B4 Mixed Use
- Residential (10m Depth)

JBS ENVIRONMENTAL

Figure 3b: Barangaroo Central Concept Plan - Barangaroo Residential/Open Space Development

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_03b

Source: Base Image www.nearmap.com (23-10-2011)

0 12.5 25 50 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

A4			
G	Original Issue - R06	RF	27-3-2013
Rev	Description	Drn.	Date:

Legend:

- Historic Groundwater Monitoring Wel / Soil Sample Locations
- Historic Soil Sample Locations
- Approximate Site Boundary
- Barangaroo Central Residential Basements (10 m Depth)
- Overlap of Area Already Assessed (Headland Park)
- Inaccessible for soil and groundwater sampling
- Part of Declaration Area - Approximate Extent

JBS ENVIRONMENTAL

Figure 4: Historical Soil and Groundwater Sample Locations

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_04

Source: Base Image www.nearmap.com (23-10-2011)

0 12.5 25 50 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
G	Original Issue - R06	RF	27-3-2013

Legend:

- Soil Sample Locations (JBS May 2012)
- Historic Soil Sample Locations
- Approximate Site Boundary
- Barangaroo Central Residential Basements (10 m Depth)
- Overlap of Area Already Assessed (Headland Park)
- Inaccessible for soil and groundwater sampling
- Part of Declaration Area - Approximate Extent

JBS ENVIRONMENTAL

Figure 5: JBS (2012a) Soil Sample Locations

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_05

Source: Base Image www.nearmap.com (23-10-2011)

0 15 30 60 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

A4			
G	Original Issue - R06	RF	27-3-2012
Rev	Description	Drn.	Date:

Legend

- Groundwater Gauging Locations (JBS May 2012)
- Groundwater Monitoring Well Locations (JBS May 2012)
- Historic Groundwater Monitoring Wel Locations
- Approximate Site Boundary - Barangaroo Central
- Overlap of Area Already Assessed (Headland Park)
- Barangaroo Central Residential Basements (10 m Depth)
- Inaccessible for soil and groundwater sampling
- Part of Declaration Area - Approximate Extent

JBS ENVIRONMENTAL

Figure 6: JBS (2012a) Groundwater Monitoring Well Locations

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_06

Source: Base Image www.nearmap.com (23-10-2011)

0 10 20 40 m

Scale: 1:1,034

Datum: MGA94 Zone 56 - AHD

A4			
H	Original Issue - R06	RF	27-5-2013
Rev	Description	Drn.	Date:

Legend:

- Soil Sample Location- Impact
- Soil Remediation Zone - Asbestos Impact
- Soil Remediation Zone - Tar Impact
- Approximate Site Boundary
- Barangaroo Central Residential Basements (10 m Depth)
- Inaccessible for soil and groundwater sampling
- Part of Declaration Area - Approximate Extent

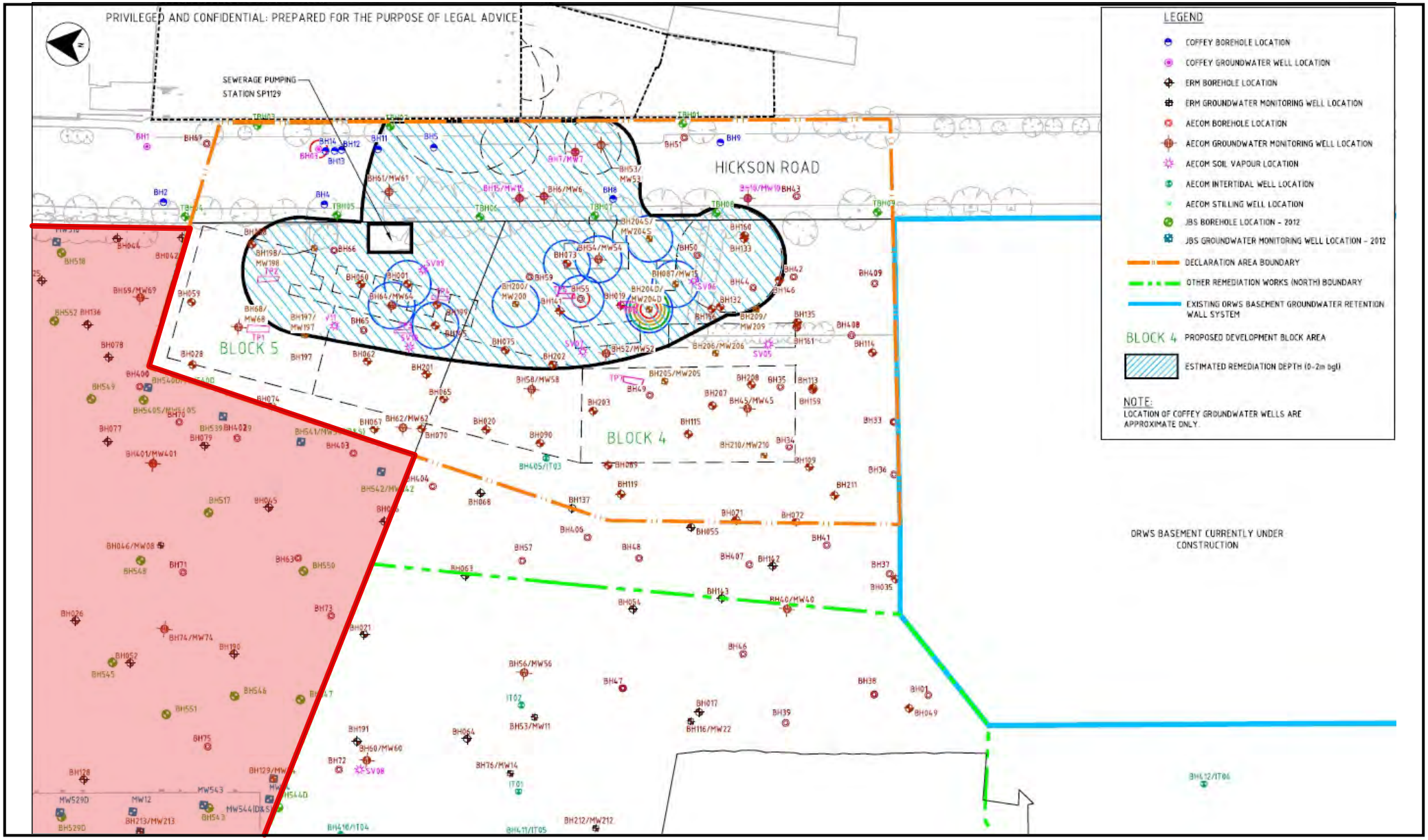
JBS ENVIRONMENTAL

Figure 7: Areas / Extent of Known Remediation Required

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_07



Source: AECOM Australia Pty Ltd, Extent of Remediation (Unsaturated), Drawing Number 60247139-DRG-10-VMPRE-F7 06-10-2012

0 15 30 60 m
Scale: Approximate

Datum: MGA94 Zone 56 - AHD

A4			
G	Original Issue - R06	RF	27-3-2013
Rev	Description	Drn.	Date

Legend:

Approximate Site Boundary - Barangaroo Central

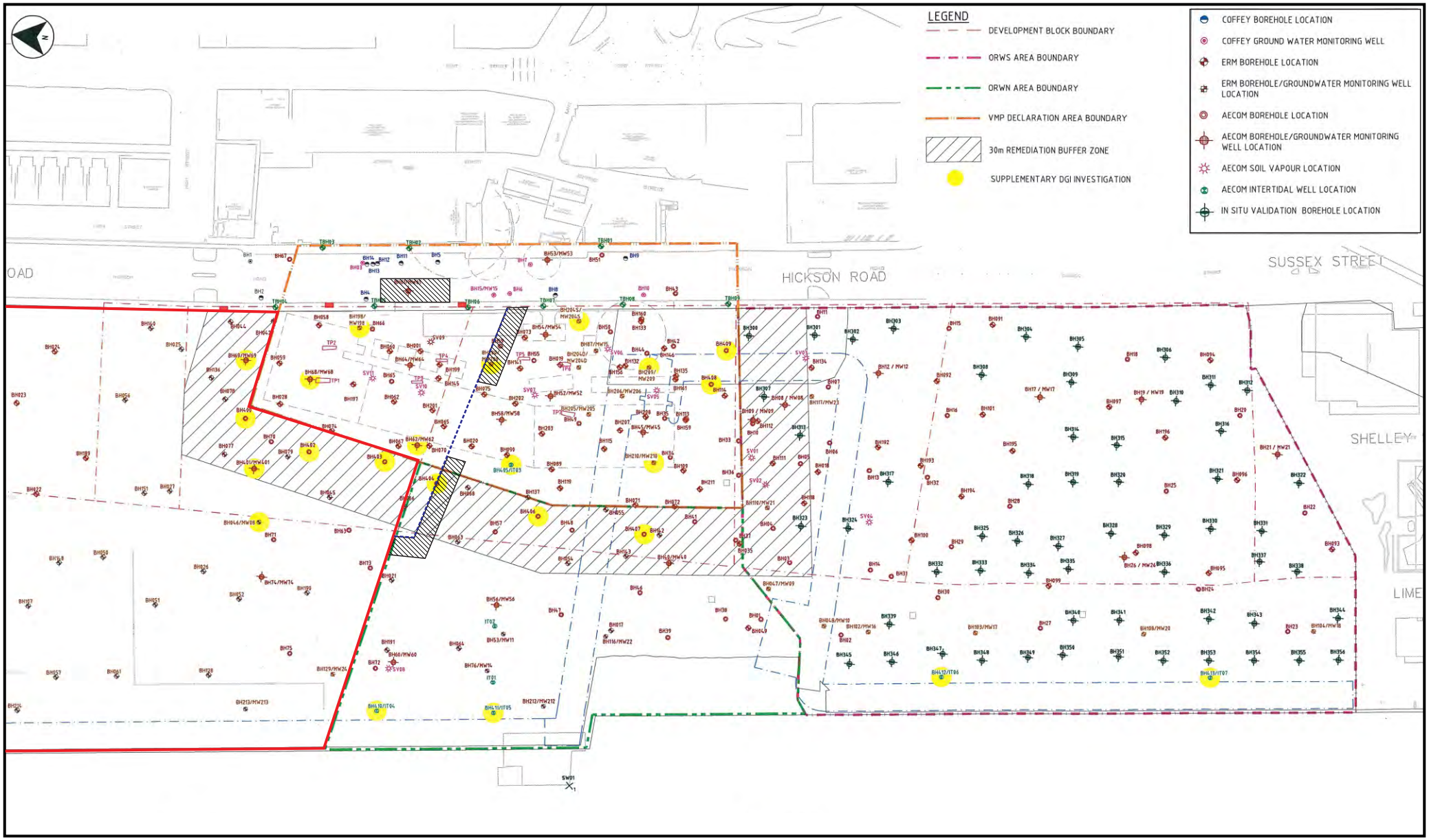
JBS ENVIRONMENTAL

Figure 8: Extent of Proposed Unsaturated Soils Remediation on Adjoining Declaration Area

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_08



Source: Base Image - AECOM 2011

0 20 40 80 m

Scale: Approximate

Datum: MGA94 Zone 56 - AHD

Rev	Description	Drn.	Date
A4			
H	Original Issue - R06	RF	29-5-2013

Legend:

- Tar Impact in Proximity to Basement
- Southern Extent of Basement Footprint
- Approximate Southern Site Boundary - Barangaroo Central

JBS ENVIRONMENTAL

Figure 9:Extent of Impact Adjoining Southern Basement External to Barangaroo Central

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_09

Appendix A – Historical Summary Data Tables

Table 1
Historical Soil Results - Polycyclic Aromatic Hydrocarbons and Phenols
Barangaroo Central

all units in mg/kg

Sample id	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	Polycyclic Aromatic Hydrocarbons																														
							Total PAHs	2,4 - dimethylphenol	2 - chloronaphthalene	2 - methylnaphthalene	2 - methylphenol	2 - nitrophenol	3 -&4 - methylphenol	3 - methylcholanthrene	4 - chloro - 3 - methylphenol	4 - nitrophenol	Dibenzofuran	Hexachlorophene	Acenaphthylene	Acenaphthene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo (b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3,cd)pyrene	Naphthalene	Phenanthrene	Phenol	Pyrene	7,12 - dimethylbenz(a)anthracene
Assessment criteria [1]																						2															
PQL							0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	###	0.5	####	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.5
BH021	333621.97	6251691.71	2.21	0.3-0.5	FILL:Sand	ERM 2007	28.8	.	.	.	.	.	.	.	.	.	.	.	<0.5	0.9	0.9	2.2	2.3	.	2.8	1.2	1.1	1.8	<0.5	4.5	<0.5	1.2	0.8	2.8	.	4.8	.
BH021	333621.97	6251691.71	2.21	16.0-16.5	Silty clayey sand	ERM 2007	151.3	.	.	.	.	.	.	.	.	.	.	.	1.5	8.9	7.3	5.1	3.8	.	4.5	1.4	1.8	3.9	<0.5	13.8	8.9	1.3	56.2	20.8	.	11.6	.
BH022	333644.6	6251851.63	2.81	0.3-0.5	FILL:Silty sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH023	333682.71	6251864.66	2.51	1.5-1.95	FILL:Gravelly sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH023	333682.71	6251864.66	2.51	13.5-13.8	Sandy Clay	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH024	333707.06	6251850.27	2.32	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH025	333713.78	6251794.82	2.22	0.3-0.5	FILL:Gravelly sand	ERM 2007	12.9	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.9	0.7	.	1.3	0.5	0.8	1.2	<0.5	1.6	<0.5	<0.5	0.7	1.7	.	1.7	.
BH025	333713.78	6251794.82	2.22	8.5-9.0	Clayey Sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH026	333617.2	6251774.86	2.35	0.3-0.5	FILL:Gravelly sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH027	333650.91	6251793.26	2.84	0.3-0.6	FILL:Silty sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH029	333709.24	6251985.27	2.553	0.3-0.5	FILL:Gravelly sand	ERM 2007	11.5	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.9	1	.	0.8	0.7	0.8	0.9	<0.5	1.5	<0.5	0.6	0.5	0.8	.	<0.5	.
BH029	333709.24	6251985.27	2.553	9.0-9.5	Clayey Sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH032	333654.69	6251923.5	2.44	0.3-0.5	FILL:Gravelly clayey sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH040	333609.17	6251893.69	2.37	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH042	333730.26	6251755.77	2.241	0.3-0.5	FILL: Silty Sand	ERM 2007	54	.	.	.	.	.	.	.	.	.	.	.	1	<0.5	1.9	4.2	3.9	-	2.8	2.6	3.6	4.1	0.8	9.2	0.7	2.3	0.7	6.8	-	8.9	-
BH042	333730.26	6251755.77	2.241	1.5-1.7	FILL: Clayey Sand.	ERM 2007	23.1	.	.	.	.	.	.	.	.	.	.	.	0.8	<0.5	<0.5	2.6	1.9	-	1.9	1	1.6	2.6	<0.5	2.7	<0.5	1.1	<0.5	0.9	-	3.5	-
BH042	333730.26	6251755.77	2.241	6.0-6.5	Sandy Clay/Clayey sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-
BH044	333726.06	6251774.48	2.289	0.3-0.5	FILL: Silty Sand	ERM 2007	147.2	.	.	.	.	.	.	.	.	.	.	.	3.1	<0.5	3.8	.12.7	12.7	-	10.6	8.3	11.2	11.9	2.5	24	<0.5	7.5	1.4	12.2	-	24.3	-
BH044	333726.06	6251774.48	2.289	2.3-2.7	FILL: Silty Sand	ERM 2007	8.2	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	-	0.6	-
BH044	333726.06	6251774.48	2.289	4.0-4.5	Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH045	333655.53	6251722.86	2.39	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH046	333641.38	6251752.7	2.57	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH050	333618.89	6251819.47	2.44	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH051	333600.24	6251794.48	2.3	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH052	333606.71	6251757.95	2.31	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH056	333688.86	6251817.14	2.53	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH057	333564.03	6251834.68	2.28	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH061	333567.17	6251808.1	2.31	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH066	333654.96	6251689.34	2.24	0.3-0.5	FILL:Gravelly clayey sand	ERM 2007	12.9	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.9	1	.	1.2	0.7	<0.5	0.8	<0.5	1.6	<0.5	0.5	<0.5	1	.	1.7	.
BH066	333654.96	6251689.34	2.24	1.5-1.95	FILL:Gravelly clayey sand	ERM 2007	9.4	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5	0.9	.	1	.
BH077	333669.55	6251771.03	2.833	0.3-0.5	FILL: Sandy Gravel	ERM 2007	10	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.6	0.5	-	0.7	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5	0.8	-	1.2	-
BH077	333669.55	6251771.03	2.833	3.0-3.45	FILL: Sandy Gravelly Clay	ERM 2007	123.7	.	.	.	.	.	.	.	.	.	.	.	0.7	<0.5	9.4	8.7	7.1	-	8.7	4.5	3.4	6.8	0.8	36.6	<0.5	3.6	<0.5	1.2	-	30.7	-
BH078	333693.78	6251773.32	2.509	1.5-1.95	FILL: Gravelly Sand	ERM 2007	11.7	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.8	0.7	-	0.9	0.5	<0.5	0.6	<0.5	1.8	<0.5	<0.5	<0.5	0.7	-	11.7	-
BH078	333693.78	6251773.32	2.509	3-3.45	FILL: Clayey Sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	-
BH079	333671.46	6251743.17	2.739	0.3-0.5	FILL: Gravelly Sand	ERM 2007	17.5	.	.	.	.	.	.	.	.	.	.	.	0.8	<0.5	0.6	1.2	1	-	1.3	0.8	0.6	1	<0.5	2.7	<0.5	0.6	<0.5	2.3	-	2.6	-
BH079	333671.46	6251743.17	2.739	1.5-1.95	FILL: Gravelly Sand	ERM 2007	30.2	.	.	.	.	.	.	.	.	.	.	.	<0.5	0.6	1.8	2	1.6	-	1.9	1	0.8	1.5	<0.5	5.4	0.7	0.8	<0.5	5.7	-	4.9	-
BH080	333669.21	6251935.85	2.543	0.3-0.5	FILL:Clayey sand	ERM 2007	15.8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	1.1	1.1	.	0.9	0.8	0.9	1.1	<0.5	2.4	<0.5	0.6	<0.5	1.2	.	2.7	.
BH080	333669.21	6251935.85	2.543	19.0-19.5	Clayey sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH107	333594.08	6251850.09	2.32	1.5-1.95	FILL:Silty sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH128	333571.82	6251767.73	2.44	1.5-1.7	FILL:Clayey sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH128	333571.82	6251767.73	2.44	20.0-20.5	Sandy Clay/Clayey sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH129	333577.76	6251713.33	2.4	0.4-0.6	FILL:Gravelly sand	ERM 2007	11.1	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.8	0.8	.	0.9	0.5	<0.5	0.7	<0.5	1.4	<0.5	<0.5	<0.5	0.6	.	1.4	.
BH129	333577.76	6251713.33	2.4	12.5-13	Clayey Sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH136	333702.56	6251780.37	2.361	3.0-3.45	FILL: Gravelly Sand	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH136	333702.56	6251780.37	2.361	8.0-8.5	Sandstone	ERM 2007	8.5	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	0.8	.	0.8	.
BH140	333721.59	6251809.19	2.34	1.5-1.95	FILL:Gravelly sand	ERM 2007	10.1	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.6	0.6	.	0.7	<0.5	<0.5	0.6	<0.5	1.2	<0.5	<0.5	<0.5	0.7	.	1.2	.
BH140	333721.59	6251809.19	2.34	6.0-6.5	Sandy clay	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH147	333712.32	6251933.44	2.65	1.6-2.05	FILL:Sandy gravel	ERM 2007	8.7	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	0.6	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	0.8	.	0.8	.
BH147	333712.32	6251933.44	2.65	8.9-9.2	Silty clay	ERM 2007	14.8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	0.7	1	0.8	.	0.9	<0.5	<0.5	0.8	<0.5	2.6	<0.5	<0.5	<0.5	1.7	.	2.3	.
BH148	333614.41	6251838.6	2.38	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH151	333649.13	6251803.48	2.79	.	.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH155	333712.78	6251933.5	2.646	0.4-0.5	FILL:Sandy loam	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH155	333712.78	6251933.5	2.646	0.9-1.0	FILL:Reworked sandy clay	ERM 2007	8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH179	333708.26	6251901.9	2.458	1.5-2.0	FILL:Gravelly sand	ERM 2008	19.5	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	1.8	1.6	.	1.6	1	1.1	1.3	<0.5	3.5	<0.5	0.8	<0.5	1.4	.	3.4	.
BH179	333708.26	6251901.9	2.458	7	Clay	ERM 2008	315.6	.	.	.	.	.	.	.	.	.	.	.	8.2	2	8	30	28.3	.	32.8	16.6	18.6	26.7	3.6	53.6	4.4	13.9	3.5	21.2	.	56.4	.
BH179	333708.26	6251901.9	2.458	11	Clayey Sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH180	333670.087	6251872.95	2.691	14.3	Clayey Sand	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH183	333554.971	6251884.78	2.451	2.2	FILL:Sand with some silt	ERM 2008	593.3	.	.	.	.	.	.	.	.	.	.	.	3.2	9.4	12.1	56.2	38.9	.	61.8	30.8	16.5	47.1	6.9	150	1.1	26.1	<0.5	14.9	.	118	.
BH183	333554.971	6251884.78	2.451	8	FILL:Sandstone cobbles	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH183	333554.971	6251884.78	2.451	30.3	Clayey Sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH183	333554.971	6251884.78	2.451	31.6	Sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH184	333604.524	6251922.67	2.411	4.8	FILL:Sand with little silt and sandstone	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH184	333604.524	6251922.67	2.411	9.6	FILL:Silt and cobbles with trace sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH184	333604.524	6251922.67	2.411	23.3	Clay	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH186	333579.031	6251907.93	2.398	3.6	FILL:Silty sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH186	333579.031	6251907.93	2.398	11	FILL:Silty sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH186	333579.031	6251907.93	2.398	13.5	Clay	ERM 2008	35	.	.	.	.	.	.	.	.	.	.	.	1	<0.5	1.1	3.3	3.4	.	4.1	2.2	1.5	2.4	<0.5	5	<0.5	1.7	<0.5	2.4	.	5.9	.
BH187	333588.75	6251879.22	2.243	3.6	FILL:Gravelly sand	ERM 2008	7.55	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.6	0.5	.	0.6	<0.5	<0.5	0.5	<0.5	1.2	<0.5	<0.5	<0.5	0.7	.	1.2	.
BH187	333588.75	6251879.22	2.243	10	FILL:Silt and gravel	ERM 2008	21.65	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	0.7	1.8	1.8	.	2	1.1	1	1.4	<0.5	3.8	<0.5	0.8	<0.5	1.6	.	4.4	.
BH187	333588.75	6251879.22	2.243	25	Clayey Sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH188	333636.006	6251875.72	2.689	2.9	FILL:Sand with some sandstone cobbles	ERM 2008	38.4	.	.	.	.	.	.	.	.	.	.	.	<0.5	0.5	1.4	3.6	2.9	.	3.5	1.8	1.2	2.7	<0.5	6.5	0.6	1.4	0.7	4.6	.	6.5	.
BH188	333636.006	6251875.72	2.689	11.5	FILL:Sand and gravel	ERM 2008	87.7	.	.	.	.	.	.	.	.	.	.	.	1.3	1.3	3.6	6.9	6.6	.	7.5	3.8	3.1	5.1	0.8	13.1	1.4	3	1	9.2	.	20	.

Table 1
Historical Soil Results - Polycyclic Aromatic Hydrocarbons and Phenols
Barangaroo Central

all units in mg/kg

Sample id	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	Polycyclic Aromatic Hydrocarbons																														
							Total PAHs	2,4 - dimethylphenol	2 - chloronaphthalene	2 - methylnaphthalene	2 - methylphenol	2 - nitrophenol	3 -&4 - methylphenol	3 - methylcholanthrene	4 - chloro - 3 - methylphenol	4 - nitrophenol	Dibenzofuran	Hexachlorophene	Acenaphthylene	Acenaphthene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo (b)&(k)fluoranthene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3,cd)pyrene	Naphthalene	Phenanthrene	Phenol	Pyrene	7,12 - dimethylbenz(a)anthracene
Assessment criteria [1]																						2															
PQL							0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	###	0.5	####	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.5
BH188	333636.006	6251875.72	2.689	15.1	Clayey Sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH189	333661.693	6251831.66	2.831	16	Clayey Sand	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH189	333661.693	6251831.66	2.831	3.7	FILL:Siltstone	ERM 2008	7.2	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.6	<0.5	.	0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	0.9	0.9	.	0.9	.
BH189	333661.693	6251831.66	2.831	7.2	FILL:Sand with little gravel	ERM 2008	27	.	.	.	.	.	.	.	.	.	.	.	0.6	<0.5	1.1	2.3	2	.	2.3	1.1	1	1.7	<0.5	4.5	<0.5	0.9	<0.5	3	.	5.5	.
BH190	333612.449	6251728.48	2.235	.	.	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH213	333558.557	6251749.96	2.337	3.6	FILL:Sand with some sandstone cobbles and silt	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH213	333558.557	6251749.96	2.337	10.5	FILL:Clayey sand with some sandstone cobbles and silt	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH213	333558.557	6251749.96	2.337	18.5	Sandy clay	ERM 2008	14.95	.	.	.	.	.	.	.	.	.	.	.	0.6	<0.5	0.6	1.5	1.2	.	1.1	0.5	0.7	1.1	<0.5	2.7	<0.5	<0.5	<0.5	1	.	2.7	.
BH214	333547.714	6251850.17	2.103	6.3	FILL:Sand with trace silt and trace brick fragments	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH214	333547.714	6251850.17	2.103	15	FILL:Bricks and concrete with some silt	ERM 2008	4.25	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	0.5	.
BH214	333547.714	6251850.17	2.103	16	Clay	ERM 2008	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH63	-	-	-	13-13.3	-	AECOM 2010	.	1.2	.	.	0.7	<0.5	<1	.	<0.5	.	.	.	<0.5	0.7	0.7	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	0.7	<0.5	2.9	2	<0.5	1	.
BH69	6251766.02	333711.9	2.29	1-1.15	FILL: Sand	AECOM 2010	68.8	<0.5	.	<0.5	<0.5	<0.5	<1	.	<0.5	.	.	.	<0.5	2.3	3.3	5.8	3.4	.	5.8	1.9	1.7	4.8	<0.5	11.6	1.8	1.4	2.9	11.3	<0.5	10.8	.
BH69	6251766.02	333711.9	2.29	4-4.2	FILL: Silty Sand	AECOM 2010	15.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	.	.	<0.5	<0.5	0.6	1.5	1.4	.	1.9	0.6	1.1	1.2	<0.5	2	<0.5	0.7	<0.5	1.4	<0.5	2.6	.
BH69	6251766.02	333711.9	2.29	10-10.2	Sandstone	AECOM 2010	73.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	.	.	1.6	5.9	4.7	3.1	1.4	2	.	<0.5	.	2.8	<0.5	11.3	4.6	<0.5	<0.5	24.4	<0.5	12.4	<0.5
BH70	-	-	-	01-0.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	0.08-0.15	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	2.5-2.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	7-7.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	10-10.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	13-13.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	15-15.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	19-19.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	23.5-23.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH73	-	-	-	-	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	1-1.2	-	AECOM 2010	.	.	<0.5	2.8	<0.5	<0.5	<0.5	<0.5	<0.5	.	4	.	3.1	1.3	5.4	4.6	2.8	4	.	1	.	3.7	<0.5	17.1	4.2	1	5.2	20.3	<0.5	14.8	<0.5
BH74	6250749.11	333617.43	2.34	5.5-5.7	-	AECOM 2010	.	<0.5	.	.	.	.	.	.	.	.	.	.	1	<0.5	1.9	2.8	1.8	.	2.6	0.7	0.7	2.4	<0.5	6.7	<0.5	.	0.9	7.1	.	6.3	.
BH74	6250749.11	333617.43	2.34	8.5-8.8	-	AECOM 2010	.	<0.5	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	0.8	0.7	.	0.8	<0.5	<0.5	0.7	<0.5	1.2	<0.5	<0.5	<0.5	1.3	.	3.1	.
BH74	6250749.11	333617.43	2.34	10-10.5	-	AECOM 2010	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	13-13.5	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	16-16.5	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH75	-	-	-	4-4.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH75	-	-	-	16-16.2	-	AECOM 2010	.	<0.5	.	.	<0.5	<0.5	<0.5	.	<1	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.
BH400	333686.28	6251763.54	2.61	6-6.4	FILL: Gravelly Sandy Clay	AECOM 2012	14.4	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	6.1	0.7	.	0.8	.
BH400	333686.28	6251763.54	2.61	9-9.4	FILL: Gravelly Sand	AECOM 2012	39.4	.	.	.	.	.	.	.	.	.	.	.	<0.5	0.6	0.8	3.2	2.5	.	3.2	1.3	1.2	2.5	<0.5	10.3	<0.5	1	<0.5	1.4	.	9.4	.
BH400	333686.28	6251763.54	2.61	12-12.4	FILL: Gravelly Sand	AECOM 2012	28.9	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	1.2	2.3	1.9	.	2.4	1	0.8	1.9	<0.5	5.4	<0.5	0.8	<0.5	3.4	.	5.3	.
BH400	333686.28	6251763.54	2.61	13.2-13.4	FILL: Gravelly Sand	AECOM 2012	8.8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	0.5	.	0.9	.
BH400	333686.28	6251763.54	2.61	14-14.2	Sandy Clay	AECOM 2012	22.4	.	.	.	.	.	.	.	.	.	.	.	<0.5	1.3	1.2	0.8	<0.5	.	0.6	<0.5	<0.5	0.6	<0.5	2	1.3	<0.5	6	3.8	.	1.8	.
BH400	333686.28	6251763.54	2.61	15-15.4	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.54	2.61	16-16.4	Clayey Sand	AECOM 2012	1992	.	.	.	.	.	.	.	.	.	.	.	26.2	215	78.4	46.1	26	.	26.7	7.6	8	35.3	2.2	111	156	6.8	734	363	.	150	.
BH401	333666.65	6251757.5	2.91	3-3.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	5-5.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	9-9.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	10-10.4	FILL: Clayey Sandy Gravel	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	11-11.4	FILL: Gravelly Sand	AECOM 2012	26.3	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	1.2	1.8	1.6	.	1.8	1.2	0.7	1.5	<0.5	4.7	0.6	0.9	0.8	3.6	.	4.4	.
BH401	333666.65	6251757.5	2.91	13-13.4	FILL: Sand	AECOM 2012	42.1	.	.	.	.	.	.	.	.	.	.	.	0.6	0.7	1.8	3.1	2.8	.	3.7	1.5	1.3	2.5	<0.5	7.5	1	1.2	<0.5	6.3	.	7.1	.
BH401	333666.65	6251757.5	2.91	14-14.2	-	AECOM 2012	156.4	.	.	.	.	.	.	.	.	.	.	.	0.8	5.4	5.1	14.6	13.5	.	16.7	5.8	7.6	11	1.3	27.1	1.3	5.2	1.3	9.5	.	30.2	.
BH401	333666.65	6251757.5	2.91	17-17.4	Clayey Sand	AECOM 2012	<8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	.
BH401	333666.65	6251757.5	2.91	19.2-19.4	Sandy Clay	AECOM 2012	370.4	.	.	.	.	.	.	.	.	.	.	.	5	30.9	195	12.9	8.5	.	10	2.8	3.5	9.8	0.7	28.4	26	2.6	120	61.3	.	28.5	.
BH401	333666.65	6251757.5	2.91	20-20.15	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.07	2.61	4.0-4.2	FILL: Gravelly Silty Sand	AECOM 2012	-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.07	2.61	9-9.3	FILL: Gravelly Silty Sand	AECOM 2012	29.7	.	.	.	.	.	.	.	.	.	.	.	<0.5	0.6	1.1	2.7	2.3	.	2.6	1.5	1.2	2.1	<0.5	4.6	<0.5	1.2	<0.5	3.4	.	4.4	.
BH402	333674.472	6251734.07	2.61	11-11.2	-	AECOM 2012	8.8	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	0.5	.	0.9	.
BH402	333674.472	6251734.07	2.61	14-14.5	Silty Sandy Clay	AECOM 2012	471.9	.	.	.	.	.	.	.	.	.	.	.	4.3	28.4	24.8	16.7	11	.	10.5	4.6	4.3	11.9	<4	43.1	28.5	<4	168	69.7	.	38.1	.
BH402	333674.472	6251734.07	2.61	15-15.5	Clayey Silty Sand	AECOM 2012	.	.	.	54.4	.	.	.	.	.	.	23.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.07	2.61	16-16.3	Clayey Silty Sand	AECOM 2012	.	.	.	4.5	.	.	.	.	.	.	2.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.07	2.61	17-17.4	Clayey Silty Sand	AECOM 2012	2865	.	.	.	.	.	.	.	.	.	.	.	27.7	220	158	93.3	69.6	.	65.2	30.4	23	73.8	7.4	278	169	24.8	957	417	.	251	.
BH402	333674.472	6251734.07	2.61	19.1-19.4	Silty Clay	AECOM 2012	106.5	.	.	.	.	.	.	.	.	.	.	.	<4	6.2	4.4	<4	<4	.	<4	<4	<4	<4	<4	7.7	5.1	<4	27.6	12.7	.	6.8	.
BH403	333673.623	6251700.26	2.36	2-2.4	FILL: Gravelly Sand	AECOM 2012	19	.	.	.	.	.	.	.	.	.	.	.	<0.5	<0.5	0.8	1.5	1	.	1	0.6	<0.5	1.3	<0.5	3.2	<0.5	<0.5	<0.5	3	.	3.1	.
BH403	333673.623	6251700.26	2.36	4-4.4	FILL: Gravelly Sand	AECOM 2012	90.4	.	.	.	.	.	.	.	.	.	.	.	6	<4	<4	<4	<4	.	<4	<4	<4	<4	<4	4.9	<4	<4	23.7	7.8	.	<4	.
BH403	333673.623	6251700.26	2.36	8-8.4	Silty Clay	AECOM 2012	1543	1.34	.	.	1.55	<0.02	3.37	.	<0.02	<0.02	.	<0.02	37.4	48.2	98	112	70.5	.	84.9	27.5	34.4	77.6	7.3	227	95	24.4	146	267	2	186	.
BH403	333673.623	6251700.26	2.36	10-10.4	Sandy Clay	AECOM 2012	.	.	.	528	.	.	.	.	.	.	222	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.26	2.36	12-12.4	Sandy Clay	AECOM 2012	3215	380	.	.	503	<0.25	1119	.	<0.25	<0.25	.	.	31.4	214	157	120	60.9	.	87.6	26.6	40	91.2	6.2	253	251	22.1	1160	480	616	214	.
BH403	333673.623	6251700.26	2.36	15-15.4	Sandy Clay	AECOM 2012	.	.	.	324	.	.	.	.	.	.	130	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.26	2.36	16-16.4	Silty Sandy Clay	AECOM 2012	2935	.	.	.	.	.	.	.	.	.	.	.	31.9	200	170	115	68.4	.	93	25.5	34.2	86.4	6.8	280	192	22.6	941	420	.	248	.
BH403	333673.623	6251700.26	2.36	17-17.3	Weathered Sandstone	AECOM 2012	1179	.	.	.	.	.	.	.	.	.	.	.	12	57	58.6	39.7	27.2	.	30.6	9.7	13.6	29.1	<4	114	80.9	8.9	441	160	.	92.4	.

Table 2
Historical Soil Results - Heavy Metals, Sulphate, Cyanide and Asbestos
Barangaroo Central

all units in mg/kg

Sample id	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	Heavy Metals														Sulphate	Cyanide (total)	Asbestos
							As	Ba	Be	Cd	Cr	Co	Cu	Fe	Pb	Hg	Mn	Ni	V	Zn			
PQL							**5**	**10**	**1**	**1**	**2**	**2**	**5**	**50**	**5**	**0.1**	**5**	**2**	**5**	**5**	**100**	**1**	**0.1**
BH75	-	-	-	16-16.2	-	AECOM 2010	<5	20	<1	<1	8	<2	<5	760	11	<0.1	<5	<2	7	<5	.	<1	-
BH400	333686.28	6251763.541	2.61	6-6.4	FILL: Gravelly Sandy Clay	AECOM 2012																	ND
BH400	333686.28	6251763.541	2.61	6-6.4	FILL: Gravelly Sandy Clay	AECOM 2012	5	.	.	2	7	.	14	.	234	3.2	.	3	.	163	.	.	.
BH400	333686.28	6251763.541	2.61	9-9.4	FILL: Gravelly Sand	AECOM 2012	<5	.	.	<1	6	.	164	.	86	0.1	.	10	.	122	.	.	.
BH400	333686.28	6251763.541	2.61	12-12.4	FILL: Gravelly Sand	AECOM 2012	<5	.	.	<1	4	.	13	.	226	0.3	.	5	.	98	.	.	.
BH400	333686.28	6251763.541	2.61	13.2-13.4	FILL: Gravelly Sand	AECOM 2012	8	.	.	<1	13	.	<5	.	10	0.2	.	<2	.		.	.	.
BH400	333686.28	6251763.541	2.61	14-14.2	Sandy Clay	AECOM 2012	<5	.	.	<1	9	.	<5	.	<5	<0.1	.	<2	.	<5	.	.	.
BH400	333686.28	6251763.541	2.61	15-15.4	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<1	
BH400	333686.28	6251763.541	2.61	16-16.4	Clayey Sand	AECOM 2012	10	.	.	<1	20	.	<5	.	6	<0.1	.	<2	.	<5	.	.	.
BH401	333666.65	6251757.5	2.91	3-3.4	-	AECOM 2012	<5	.	.	<1	8	.	18	.	230	0.7	.	4	.	143	.	.	ND
BH401	333666.65	6251757.5	2.91	5-5.4	-	AECOM 2012	6	.	.	<1	33	.	9	.	462	0.2	.	4	.	184	.	.	.
BH401	333666.65	6251757.5	2.91	9-9.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	**Chrysotile Fibres**
BH401	333666.65	6251757.5	2.91	10-10.4	FILL: Clayey Sandy Gravel	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<1	-
BH401	333666.65	6251757.5	2.91	11-11.4	FILL: Gravelly Sand	AECOM 2012	<5	.	.	<1	10	.	18	.	59	<0.1	.	8	.	29	.	.	.
BH401	333666.65	6251757.5	2.91	13-13.4	FILL: Sand	AECOM 2012	11	.	.	<1	11	.	48	.	216	0.7	.	8	.	145	.	.	.
BH401	333666.65	6251757.5	2.91	14-14.2	-	AECOM 2012	30	.	.	1	62	.	199	.	1490	6.9	.	16	.	813	.	.	.
BH401	333666.65	6251757.5	2.91	17-17.4	Clayey Sand	AECOM 2012	<5	.	.	<1	4	.	<5	.	8	<0.1	.	<2	.	<5	.	.	.
BH401	333666.65	6251757.5	2.91	19.2-19.4	Sandy Clay	AECOM 2012	<5	.	.	<1	14	.	<5	.	7	<0.1	.	<2	.	<5	.	.	.
BH401	333666.65	6251757.5	2.91	20-20.15	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<1	
BH402	333674.472	6251734.066	2.61	4.0-4.2	FILL: Gravelly Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-	ND
BH402	333674.472	6251734.066	2.61	9-9.3	FILL: Gravelly Silty Sand	AECOM 2012	16	.	.	3	28	.	716	.	1500	4.1	.	19	.	3780	.	.	.
BH402	333674.472	6251734.066	2.61	11-11.2	-	AECOM 2012	<5	.	.	<1	9	.	64	.	86	0.2	.	5	.	99	.	.	.
BH402	333674.472	6251734.066	2.61	14-14.5	Silty Sandy Clay	AECOM 2012	<5	.	.	<1	10	.	<5	.	9	<0.1	.	2	.	12	.	.	.
BH402	333674.472	6251734.066	2.61	15-15.5	Clayey Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<1	.
BH402	333674.472	6251734.066	2.61	16-16.3	Clayey Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<1	.
BH402	333674.472	6251734.066	2.61	17-17.4	Clayey Silty Sand	AECOM 2012	<5	.	.	<1	7	.	<5	.	8	<0.1	.	2	.	7	.	.	.
BH402	333674.472	6251734.066	2.61	19.1-19.4	Silty Clay	AECOM 2012	<5	.	.	<1	8	.	<5	.	31	<0.1	.	<2	.	8	.	.	.
BH403	333673.623	6251700.264	2.36	2-2.4	FILL: Gravelly Sand	AECOM 2012	<5	.	.	<1	17	.	32	.	31	0.1	.	12	.	31	.	.	.
BH403	333673.623	6251700.264	2.36	4-4.4	FILL: Gravelly Sand	AECOM 2012	<5	.	.	<1	30	.	40	.	182	<0.1	.	39	.	129	.	.	ND
BH403	333673.623	6251700.264	2.36	8-8.4	Silty Clay	AECOM 2012	16	.	.	<1	42	.	156	.	289	<8.3	.	20	.	404	.	.	.
BH403	333673.623	6251700.264	2.36	10-10.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<1	.
BH403	333673.623	6251700.264	2.36	12-12.4	Sandy Clay	AECOM 2012	<5	.	.	<1	7	.	<5	.	8	<0.1	.	3	.	10	.	.	.
BH403	333673.623	6251700.264	2.36	15-15.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<1	.
BH403	333673.623	6251700.264	2.36	16-16.4	Silty Sandy Clay	AECOM 2012	<5	.	.	<1	18	.	<5	.	11	<0.1	.	3	.	8	.	.	.
BH403	333673.623	6251700.264	2.36	17-17.3	Weathered Sandstone	AECOM 2012	<5	.	.	<1	11	.	<5	.	10	<0.1	.	<2	.	<5	.	.	.

ND = Not detected

Table 3
Historical Soil Results - Total Petroleum Hydrocarbons
Barangaroo Central

all units in mg/kg

Sample id	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	TPH				
							C6-C9	C10-C14	C15-C28	C29-C36	C10-C36
Assessment criteria [1]							**65**		**-**		**1000**
PQL							**2**	**50**	**100**	**100**	
BH021	333621.97	6251691.71	2.21	0.3-0.5	FILL:Sand	ERM 2007	<2	<50	130	100	280
BH021	333621.97	6251691.71	2.21	16.0-16.5	Silty clayey sand	ERM 2007	32	510	1210	380	2100
BH022	333644.6	6251851.63	2.81	0.3-0.5	FILL:Silty sand	ERM 2007	<2	<50	<100	120	270
BH023	333682.71	6251864.66	2.51	1.5-1.95	FILL:Gravelly sand	ERM 2007	<2	<50	100	<100	<250
BH023	333682.71	6251864.66	2.51	13.5-13.8	Sandy Clay	ERM 2007	<2	<50	<100	<100	<250
BH024	333707.06	6251850.27	2.32	.	.	ERM 2007	.	.	.	.	.
BH025	333713.78	6251794.82	2.22	0.3-0.5	FILL:Gravelly sand	ERM 2007	<2	<50	110	<100	260
BH025	333713.78	6251794.82	2.22	8.5-9.0	Clayey Sand	ERM 2007	<2	<50	<100	<100	<250
BH026	333617.2	6251774.86	2.35	0.3-0.5	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH027	333650.91	6251793.26	2.84	0.3-0.5	FILL:Silty sand	ERM 2007	<2	<50	<100	<100	<250
BH029	333709.24	6251985.27	2.553	0.3-0.5	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH029	333709.24	6251985.27	2.553	9.0-9.5	Clayey Sand	ERM 2007	<2	<50	<100	<100	<250
BH032	333654.69	6251923.5	2.44	0.3-0.5	FILL:Gravelly clayey sand	ERM 2007	<2	<50	<100	<100	<250
BH040	333609.17	6251893.69	2.37	0.3-0.5	FILL:Silty sand	ERM 2007	<2	<50	<100	<100	<250
BH040	333609.17	6251893.69	2.37	1.5-1.95	FILL:Silty sand	ERM 2007	<2	<50	<100	<100	<250
BH042	333730.26	6251755.77	2.241	0.3-0.5	FILL: Silty Sand	ERM 2007	<2	<50	150	<100	300
BH042	333730.26	6251755.77	2.241	1.5-1.7	FILL: Clayey Sand.	ERM 2007	<2	<50	170	<100	320
BH042	333730.26	6251755.77	2.241	6.0-6.5	Sandy Clay/Clayey sand	ERM 2007	<2	<50	<100	<100	<250
BH044	333726.06	6251774.48	2.289	0.3-0.5	FILL: Silty Sand	ERM 2007	<2	<50	410	280	710
BH044	333726.06	6251774.48	2.289	2.3-2.7	FILL: Silty Sand	ERM 2007	<2	<50	<100	<100	<250
BH044	333726.06	6251774.48	2.289	4.0-4.5	Silty Sand	ERM 2007	<2	<50	<100	<100	<250
BH045	333655.53	6251722.86	2.39	0.3-0.5	FILL:Silty sand	ERM 2007	<2	<50	190	170	410
BH045	333655.53	6251722.86	2.39	3.0-3.45	FILL:Silty sand	ERM 2007	<2	<50	420	460	930
BH046	333641.38	6251752.7	2.57	1.5-1.95	FILL:Clayey sand	ERM 2007	<2	<50	380	320	750
BH050	333618.89	6251819.47	2.44	0.3-0.5	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH050	333618.89	6251819.47	2.44	1.5-1.8	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH051	333600.24	6251794.48	2.3	1.5-1.7	FILL:Sand	ERM 2007	<2	<50	<100	<100	<250
BH052	333606.71	6251757.95	2.31	3.0-3.45	FILL:Sandy clay	ERM 2007	<2	<50	<100	<100	<250
BH056	333688.86	6251817.14	2.53	1.5-1.95	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH057	333564.03	6251834.68	2.28	1.5-1.7	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH057	333564.03	6251834.68	2.28	16.5-17.0	Silty clay	ERM 2007	<2	<50	<100	<100	<250
BH061	333567.17	6251808.1	2.31	1.5-1.95	FILL:Sandy gravel	ERM 2007	<2	<50	<100	<100	<250
BH061	333567.17	6251808.1	2.31	3.0-3.45	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH066	333654.96	6251689.34	2.24	0.3-0.5	FILL:Gravelly clayey sand	ERM 2007	<2	<50	<100	<100	<250
BH066	333654.96	6251689.34	2.24	1.5-1.95	FILL:Gravelly clayey sand	ERM 2007	<2	<50	160	210	420
BH077	333669.55	6251771.03	2.833	0.3-0.5	FILL: Sandy Gravel	ERM 2007	<2	<50	<100	<100	<250
BH077	333669.55	6251771.03	2.833	3.0-3.45	FILL: Sandy Gravelly Clay	ERM 2007	<2	260	1210	490	1960
BH078	333693.78	6251773.32	2.509	1.5-1.95	FILL: Gravelly Sand	ERM 2007	<2	<50	<100	<100	<250
BH078	333693.78	6251773.32	2.509	3-3.45	FILL: Clayey Sand	ERM 2007	<2	<50	<100	<100	<250
BH079	333671.46	6251743.17	2.739	0.3-0.5	FILL: Gravelly Sand	ERM 2007	<2	<50	110	<100	260
BH079	333671.46	6251743.17	2.739	1.5-1.95	FiLL: Gravelly Sand	ERM 2007	<2	<50	150	100	300
BH080	333669.21	6251935.85	2.543	0.3-0.5	FILL:Clayey sand	ERM 2007	<2	<50	<100	<100	<250
BH080	333669.21	6251935.85	2.543	19.0-19.5	Clayey sand	ERM 2007	<2	<50	<100	<100	<250
BH107	333594.08	6251850.09	2.32	3.0-3.45	FILL:Sand	ERM 2007	<2	<50	<100	<100	<250
BH128	333571.82	6251767.73	2.44	1.5-1.7	FILL:Clayey sand	ERM 2007	<2	<50	<100	<100	<250
BH128	333571.82	6251767.73	2.44	20.0-20.5	Sandy Clay/Clayey sand	ERM 2007	<2	<50	<100	<100	<250
BH129	333577.76	6251713.33	2.4	0.4-0.6	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH129	333577.76	6251713.33	2.4	12.5-13	Clayey Sand	ERM 2007	<2	<50	<100	<100	<250
BH136	333702.56	6251780.37	2.361	3.0-3.45	FILL: Gravelly Sand	ERM 2007	<2	<50	<100	<100	<250
BH136	333702.56	6251780.37	2.361	8.0-8.5	Sandstone	ERM 2007	<2	<50	<100	<100	<250
BH140	333721.59	6251809.19	2.34	1.5-1.95	FILL:Gravelly sand	ERM 2007	<2	<50	<100	<100	<250
BH140	333721.59	6251809.19	2.34	6.0-6.5	Sandy clay	ERM 2007	<2	<50	<100	<100	<250
BH147	333712.32	6251933.44	2.65	1.6-2.05	FILL:Sandy gravel	ERM 2007	<2	<50	<100	<100	<250
BH148	333614.41	6251838.6	2.38	.	.	ERM 2007	.	.	.	.	.
BH151	333649.13	6251803.48	2.79	.	.	ERM 2007	.	.	.	.	.

Table 3
Historical Soil Results - Total Petroleum Hydrocarbons
Barangaroo Central

all units in mg/kg

Sample id	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	TPH				
							C6-C9	C10-C14	C15-C28	C29-C36	C10-C36
Assessment criteria [1]							**65**		**-**		**1000**
PQL							**2**	**50**	**100**	**100**	
BH155	333712.78	6251933.5	2.646	0.4-0.5	FILL:Sandy loam	ERM 2007	<2	<50	<100	<100	<250
BH155	333712.78	6251933.5	2.646	0.9-1.0	FILL:Reworked sandy clay	ERM 2007	<2	<50	<100	<100	<250
BH179	333708.26	6251901.896	2.458	.	.	ERM 2008	.	.	.	.	.
BH180	333670.087	6251872.951	2.691	4.7	FILL:Silty sand	ERM 2008	<10	<50	<100	<100	<250
BH180	333670.087	6251872.951	2.691	8.7	FILL:Sandy clay	ERM 2008	<10	<50	<100	<100	<250
BH180	333670.087	6251872.951	2.691	14.3	Clayey Sand	ERM 2008	<10	<50	<100	<100	<250
BH183	333554.971	6251884.783	2.451	2.2	FILL:Sand with some silt	ERM 2008	<10	<50	740	480	1245
BH183	333554.971	6251884.783	2.451	8	FILL:Sandstone cobbles	ERM 2008	<10	<50	<100	<100	<250
BH183	333554.971	6251884.783	2.451	30.3	Clayey Sand	ERM 2008	<10	<50	<100	<100	<250
BH183	333554.971	6251884.783	2.451	31.6	Sand	ERM 2008	<10	<50	<100	<100	<250
BH184	333604.524	6251922.673	2.411	4.8	FILL:Sand with little silt and sandstone	ERM 2008	<10	<50	<100	<100	<250
BH184	333604.524	6251922.673	2.411	9.6	FILL:Silt and cobbles with trace sand	ERM 2008	<10	<50	<100	<100	<250
BH184	333604.524	6251922.673	2.411	23.3	Clay	ERM 2008	<10	<50	<100	<100	<250
BH186	333579.031	6251907.925	2.398	3.6	FILL:Silty sand	ERM 2008	<10	<50	<100	<100	<250
BH186	333579.031	6251907.925	2.398	11	FILL:Silty sand	ERM 2008	<10	<50	<100	<100	<250
BH186	333579.031	6251907.925	2.398	13.5	Clay	ERM 2008	<10	<50	530	430	985
BH187	333588.75	6251879.223	2.243	3.6	FILL:Gravelly sand	ERM 2008	<10	<50	<100	<100	<250
BH187	333588.75	6251879.223	2.243	10	FILL:Silt and gravel	ERM 2008	<10	<50	230	210	465
BH187	333588.75	6251879.223	2.243	25	Clayey Sand	ERM 2008	<10	<50	<100	<100	<250
BH188	333636.006	6251875.724	2.689	2.9	FILL:Sand with some sandstone cobbles	ERM 2008	<10	<50	190	140	355
BH188	333636.006	6251875.724	2.689	11.5	FILL:Sand and gravel	ERM 2008	<10	<50	290	190	505
BH188	333636.006	6251875.724	2.689	15.1	Clayey Sand	ERM 2008	<10	<50	<100	<100	<250
BH189	333661.693	6251831.66	2.831	3.7	FILL:Siltstone	ERM 2008	<10	<50	230	320	575
BH189	333661.693	6251831.66	2.831	7.2	FILL:Sand with little gravel	ERM 2008	<10	<50	120	110	255
BH189	333661.693	6251831.66	2.831	16	Clayey Sand	ERM 2008	<10	<50	<100	<100	<250
BH190	333612.449	6251728.476	2.235	.	.	ERM 2008	.	.	.	.	.
BH213	333558.557	6251749.964	2.337	3.6	FILL:Sand with some sandstone cobbles and s	ERM 2008	<10	<50	<100	<100	<250
BH213	333558.557	6251749.964	2.337	10.5	FILL:Clayey sand with some sandstone cobble	ERM 2008	<10	<50	<100	<100	<250
BH213	333558.557	6251749.964	2.337	18.5	Sandy clay	ERM 2008	<10	<50	130	<100	205
BH214	333547.714	6251850.172	2.103	6.3	FILL:Sand with trace silt and trace brick fragm	ERM 2008	<10	<50	<100	<100	<250
BH214	333547.714	6251850.172	2.103	15	FILL:Bricks and concrete with some silt	ERM 2008	<10	<50	<100	<100	<250
BH214	333547.714	6251850.172	2.103	16	Clay	ERM 2008	<10	<50	<100	<100	<250
BH63	-	-	-	13-13.3	-	AECOM 2010	<10	<50	<100	<100	<50
BH69	-	-	-	1-1.15	FILL: Sand	AECOM 2010	<10	<50	260	200	460
BH69	-	-	-	4-4.2	FILL: Silty Sand	AECOM 2010	<10	<50	320	27	590
BH69	-	-	-	10-10.2	Sandstone	AECOM 2010	<10	<50	420	<100	420
BH70	-	-	-	01-0.2	-	AECOM 2010	.	.	.	.	.
BH71	-	-	-	0.08-0.15	-	AECOM 2010	.	.	.	.	.
BH71	-	-	-	2.5-2.7	-	AECOM 2010	.	.	.	.	.
BH71	-	-	-	7-7.2	-	AECOM 2010	.	.	.	.	.
BH71	-	-	-	10-10.2	-	AECOM 2010	.	.	.	.	.
BH71	-	-	-	13-13.2	-	AECOM 2010	.	.	.	.	.
BH71	-	-	-	15-15.2	-	AECOM 2010	.	.	.	.	.
BH71	-	-	-	19-19.2	-	AECOM 2010	.	.	.	.	.
BH71	-	-	-	23.5-23.7	-	AECOM 2010	.	.	.	.	.
BH73	-	-	-	-	-	AECOM 2010	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	1-1.2		AECOM 2010	<10	<50	340	150	490
BH74	6250749.11	333617.43	2.34	5.5-5.7		AECOM 2010	<10	<50	200	<100	200
BH74	6250749.11	333617.43	2.34	8.5-8.8		AECOM 2010	<10	<50	<100	<100	<50
BH74	6250749.11	333617.43	2.34	10-10.5		AECOM 2010	<10	<50	130	100	230
BH74	6250749.11	333617.43	2.34	13-13.5		AECOM 2010	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	16-16.5		AECOM 2010	<10	<50	<100	<100	<50
BH75				4-4.2		AECOM 2010	<10	<50	<100	<100	<50
BH75				16-16.2		AECOM 2010	<10	<50	<100	<100	<50
BH400	333686.28	6251763.541	2.61	6-6.4	FILL: Gravelly Sandy Clay	AECOM 2012	<10	<50	<100	<100	<50

Table 3
Historical Soil Results - Total Petroleum Hydrocarbons
Barangaroo Central

all units in mg/kg

Sample id	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	TPH				
							C6-C9	C10-C14	C15-C28	C29-C36	C10-C36
Assessment criteria [1]							**65**		**-**		**1000**
PQL							**2**	**50**	**100**	**100**	
BH400	333686.28	6251763.541	2.61	9-9.4	FILL: Gravelly Sand	AECOM 2012	<10	<50	370	200	570
BH400	333686.28	6251763.541	2.61	12-12.4	FILL: Gravelly Sand	AECOM 2012	<10	<50	<100	<100	<50
BH400	333686.28	6251763.541	2.61	13.2-13.4	FILL: Gravelly Sand	AECOM 2012	<10	<50	<100	<100	<50
BH400	333686.28	6251763.541	2.61	14-14.2	Sandy Clay	AECOM 2012	<10	<50	<100	<100	<50
BH400	333686.28	6251763.541	2.61	15-15.4	Clayey Sand	AECOM 2012	<10	<50	.	.	<50
BH400	333686.28	6251763.541	2.61	16-16.4	Clayey Sand	AECOM 2012	331	3000	5600	810	9410
BH401	333666.65	6251757.5	2.91	3-3.4	-	AECOM 2012	<10	<50	<100	<100	<50
BH401	333666.65	6251757.5	2.91	5-5.4	-	AECOM 2012	<10	<50	130	120	250
BH401	333666.65	6251757.5	2.91	9-9.4	-	AECOM 2012	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	10-10.4	FILL: Clayey Sandy Gravel	AECOM 2012	<10	<50	.	.	<50
BH401	333666.65	6251757.5	2.91	11-11.4	FILL: Gravelly Sand	AECOM 2012	<10	<50	<100	<100	<50
BH401	333666.65	6251757.5	2.91	13-13.4	FILL: Sand	AECOM 2012	<10	<50	140	<100	140
BH401	333666.65	6251757.5	2.91	14-14.2	-	AECOM 2012	<10	<50	1720	1180	2900
BH401	333666.65	6251757.5	2.91	17-17.4	Clayey Sand	AECOM 2012	<10	<50	<100	<100	<50
BH401	333666.65	6251757.5	2.91	19.2-19.4	Sandy Clay	AECOM 2012	22	470	970	210	1650
BH401	333666.65	6251757.5	2.91	20-20.15	Clayey Sand	AECOM 2012	<10	<50	.	.	<50
BH402	333674.472	6251734.066	2.61	4.0-4.2	FILL: Gravelly Silty Sand	AECOM 2012	-	-	-	-	-
BH402	333674.472	6251734.066	2.61	9-9.3	FILL: Gravelly Silty Sand	AECOM 2012	<10	<50	650	210	860
BH402	333674.472	6251734.066	2.61	11-11.2	-	AECOM 2012	<10	<50	<100	<100	<50
BH402	333674.472	6251734.066	2.61	14-14.5	Silty Sandy Clay	AECOM 2012	66	690	1560	660	2910
BH402	333674.472	6251734.066	2.61	15-15.5	Clayey Silty Sand	AECOM 2012	67	740	.	.	740
BH402	333674.472	6251734.066	2.61	16-16.3	Clayey Silty Sand	AECOM 2012	35	150	.	.	150
BH402	333674.472	6251734.066	2.61	17-17.4	Clayey Silty Sand	AECOM 2012	470	3060	4860	1470	9390
BH402	333674.472	6251734.066	2.61	19.1-19.4	Silty Clay	AECOM 2012	15	180	250	<100	430
BH403	333673.623	6251700.264	2.36	2-2.4	FILL: Gravelly Sand	AECOM 2012	<10	<50	<100	<100	<50
BH403	333673.623	6251700.264	2.36	4-4.4	FILL: Gravelly Sand	AECOM 2012	<10	220	1340	1760	3320
BH403	333673.623	6251700.264	2.36	8-8.4	Silty Clay	AECOM 2012	31	1300	8870	3600	13770
BH403	333673.623	6251700.264	2.36	10-10.4	Sandy Clay	AECOM 2012	930	12300	.	.	12300
BH403	333673.623	6251700.264	2.36	12-12.4	Sandy Clay	AECOM 2012	651	7080	11200	3460	21700
BH403	333673.623	6251700.264	2.36	15-15.4	Sandy Clay	AECOM 2012	95	9340	.	.	9340
BH403	333673.623	6251700.264	2.36	16-16.4	Silty Sandy Clay	AECOM 2012	434	5540	9740	2900	18180
BH403	333673.623	6251700.264	2.36	17-17.3	Weathered Sandstone	AECOM 2012	13	1800	3290	980	6070

Table 4
Historical Soil Results - Monocyclic Aromatic Hydrocarbons and Phenols
Barangaroo Central

all units in mg/kg

Sample id	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	Monocyclic Aromatic Hydrocarbons						Halogenated Phenols						
							Benzene	Toluene	Ethylbenzene	meta&para Xylene	ortho Xylene	Styrene	2,3,4,6 - tetrachlorophenol	2,4,5 - trichlorophenol	2,4,6 - trichlorophenol	2,4 - dichlorophenol	2,6 - dichlorophenol	2 - chlorophenol	Pentachlorophenol
Assessment criteria							-	-	-	-		-	-	-	-	-	-	-	-
PQL							0.2	0.5	0.5	0.5		0.5	10000	0.5	0.5	0.5	0.5	0.5	2
BH021	333621.97	6251691.71	2.21	0.3-0.5	FILL:Sand	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH021	333621.97	6251691.71	2.21	16.0-16.5	Silty clayey sand	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH022	333644.6	6251851.63	2.81	0.3-0.5	FILL:Silty sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH023	333682.71	6251864.66	2.51	1.5-1.95	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH023	333682.71	6251864.66	2.51	13.5-13.8	Sandy Clay	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH024	333707.06	6251850.27	2.32	.	.	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH025	333713.78	6251794.82	2.22	0.3-0.5	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH025	333713.78	6251794.82	2.22	8.5-9.0	Clayey Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH026	333617.2	6251774.86	2.35	0.3-0.5	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH027	333650.91	6251793.26	2.84	0.3-0.5	FILL:Silty sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH029	333709.24	6251985.27	2.553	3.0-3.45	FILL:Gravelly clayey sand	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH029	333709.24	6251985.27	2.553	9.0-9.5	Clayey Sand	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH029	333709.24	6251985.27	2.553	0.3-0.5	FILL:Gravelly sand	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH032	333654.69	6251923.5	2.44	0.3-0.5	FILL:Gravelly clayey sand	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH040	333609.17	6251893.69	2.37	0.3-0.5	FILL:Silty sand	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH040	333609.17	6251893.69	2.37	1.5-1.95	FILL:Silty sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH042	333730.26	6251755.77	2.241	0.3-0.5	FILL: Silty Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH042	333730.26	6251755.77	2.241	1.5-1.7	FILL: Clayey Sand.	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH042	333730.26	6251755.77	2.241	6.0-6.5	Sandy Clay/Clayey sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH044	333726.06	6251774.48	2.289	0.3-0.5	FILL: Silty Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH044	333726.06	6251774.48	2.289	2.3-2.7	FILL: Silty Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH044	333726.06	6251774.48	2.289	4.0-4.5	Silty Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH045	333655.53	6251722.86	2.39	0.3-0.5	FILL:Silty sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH045	333655.53	6251722.86	2.39	3.0-3.45	FILL:Silty sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH046	333641.38	6251752.7	2.57	1.5-1.95	FILL:Clayey sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH050	333618.89	6251819.47	2.44	0.3-0.5	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH050	333618.89	6251819.47	2.44	1.5-1.8	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH051	333600.24	6251794.48	2.3	1.5-1.7	FILL:Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH052	333606.71	6251757.95	2.31	3.0-3.45	FILL:Sandy clay	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH056	333688.86	6251817.14	2.53	1.5-1.95	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH057	333564.03	6251834.68	2.28	1.5-1.7	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH057	333564.03	6251834.68	2.28	16.5-17.0	Silty clay	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH061	333567.17	6251808.1	2.31	1.5-1.95	FILL:Sandy gravel	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH061	333567.17	6251808.1	2.31	3.0-3.45	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH066	333654.96	6251689.34	2.24	0.3-0.5	FILL:Gravelly clayey sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH066	333654.96	6251689.34	2.24	1.5-1.95	FILL:Gravelly clayey sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH077	333669.55	6251771.03	2.833	0.3-0.5	FILL: Sandy Gravel	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH077	333669.55	6251771.03	2.833	3.0-3.45	FILL: Sandy Gravelly Clay	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH078	333693.78	6251773.32	2.509	1.5-1.95	FILL: Gravelly Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH078	333693.78	6251773.32	2.509	3-3.45	FILL: Clayey Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH079	333671.46	6251743.17	2.739	0.3-0.5	FILL: Gravelly Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH079	333671.46	6251743.17	2.739	1.5-1.95	FiLL: Gravelly Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH080	333669.21	6251935.85	2.543	0.3-0.5	FILL:Clayey sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH080	333669.21	6251935.85	2.543	19.0-19.5	Clayey sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH107	333594.08	6251850.09	2.32	3.0-3.45	FILL:Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH128	333571.82	6251767.73	2.44	1.5-1.7	FILL:Clayey sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH128	333571.82	6251767.73	2.44	20.0-20.5	Sandy Clay/Clayey sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH129	333577.76	6251713.33	2.4	0.4-0.6	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH129	333577.76	6251713.33	2.4	12.5-13	Clayey Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH136	333702.56	6251780.37	2.361	3.0-3.45	FILL: Gravelly Sand	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH136	333702.56	6251780.37	2.361	8.0-8.5	Sandstone	ERM 2007	<0.2	<0.2	<0.2	<0.4									
BH140	333721.59	6251809.19	2.34	1.5-1.95	FILL:Gravelly sand	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.

Table 4
Historical Soil Results - Monocyclic Aromatic Hydrocarbons and Phenols
Barangaroo Central

all units in mg/kg

							Monocyclic Aromatic Hydrocarbons						Halogenated Phenols						
Sample id	**Easting**	**Northing**	**Elevation**	**Sampling Depth (m AHD)**	**Material / Soil Description**	**Source**	**Benzene**	**Toluene**	**Ethylbenzene**	**meta&para Xylene**	**ortho Xylene**	**Styrene**	**2,3,4,6 - tetrachlorophenol**	**2,4,5 - trichlorophenol**	**2,4,6 - trichlorophenol**	**2,4 - dichlorophenol**	**2,6 - dichlorophenol**	**2 - chlorophenol**	**Pentachlorophenol**
Assessment criteria							-	-	-	-		-	-	-	-	-	-	-	-
PQL							**0.2**	**0.5**	**0.5**	**0.5**		**0.5**	**10000**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**2**
BH140	333721.59	6251809.19	2.34	6.0-6.5	Sandy clay	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH147	333712.32	6251933.44	2.65	1.6-2.05	FILL:Sandy gravel	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH148	333614.41	6251838.6	2.38	.	.	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH151	333649.13	6251803.48	2.79	.	.	ERM 2007	.	.	.	.		.	.	.	.	.	.	.	.
BH155	333712.78	6251933.5	2.646	0.4-0.5	FILL:Sandy loam	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH155	333712.78	6251933.5	2.646	0.9-1.0	FILL:Reworked sandy clay	ERM 2007	<0.2	<0.2	<0.2	<0.4		.	.	.	.	.	.	.	.
BH179	333708.26	6251901.896	2.458	.	.	ERM 2008	.	.	.	.		.	.	.	.	.	.	.	.
BH180	333670.087	6251872.951	2.691	4.7	FILL:Silty sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH180	333670.087	6251872.951	2.691	8.7	FILL:Sandy clay	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH180	333670.087	6251872.951	2.691	14.3	Clayey Sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH183	333554.971	6251884.783	2.451	2.2	FILL:Sand with some silt	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH183	333554.971	6251884.783	2.451	8	FILL:Sandstone cobbles	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH183	333554.971	6251884.783	2.451	30.3	Clayey Sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH183	333554.971	6251884.783	2.451	31.6	Sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH184	333604.524	6251922.673	2.411	4.8	FILL:Sand with little silt and sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH184	333604.524	6251922.673	2.411	9.6	FILL:Silt and cobbles with trace s	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH184	333604.524	6251922.673	2.411	23.3	Clay	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH186	333579.031	6251907.925	2.398	3.6	FILL:Silty sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH186	333579.031	6251907.925	2.398	11	FILL:Silty sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH186	333579.031	6251907.925	2.398	13.5	Clay	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH187	333588.75	6251879.223	2.243	3.6	FILL:Gravelly sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH187	333588.75	6251879.223	2.243	10	FILL:Silt and gravel	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH187	333588.75	6251879.223	2.243	25	Clayey Sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH188	333636.006	6251875.724	2.689	2.9	FILL:Sand with some sandstone c	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH188	333636.006	6251875.724	2.689	11.5	FILL:Sand and gravel	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH188	333636.006	6251875.724	2.689	15.1	Clayey Sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH189	333661.693	6251831.66	2.831	16	Clayey Sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH189	333661.693	6251831.66	2.831	3.7	FILL:Siltstone	ERM 2008	<0.2	0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH189	333661.693	6251831.66	2.831	7.2	FILL:Sand with little gravel	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH190	333612.449	6251728.476	2.235	.	.	ERM 2008	.	.	.	.		.	.	.	.	.	.	.	.
BH213	333558.557	6251749.964	2.337	3.6	FILL:Sand with some sandstone c	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH213	333558.557	6251749.964	2.337	10.5	FILL:Clayey sand with some sand	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH213	333558.557	6251749.964	2.337	18.5	Sandy clay	ERM 2008	<0.2	0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH214	333547.714	6251850.172	2.103	6.3	FILL:Sand with trace silt and trac	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH214	333547.714	6251850.172	2.103	15	FILL:Bricks and concrete with sor	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH214	333547.714	6251850.172	2.103	16	Clay	ERM 2008	<0.2	<0.5	<0.5	<0.5		.	.	.	.	.	.	.	.
BH63	-	-	-	13-13.3	-	AECOM 2010	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	<2
BH69	-	-	-	1-1.15	FILL: Sand	AECOM 2010	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH69	-	-	-	4-4.2	FILL: Silty Sand	AECOM 2010	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH69	-	-	-	10-10.2	Sandstone	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH70	-	-	-	01-0.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	0.08-0.15	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	2.5-2.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	7-7.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	10-10.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	13-13.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	15-15.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	19-19.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	23.5-23.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH73	-	-	-		-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	1-1.2	-	AECOM 2010	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	5.5-5.7	-	AECOM 2010	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	<2

Table 4
Historical Soil Results - Monocyclic Aromatic Hydrocarbons and Phenols
Barangaroo Central

all units in mg/kg

Sample id	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	Monocyclic Aromatic Hydrocarbons						Halogenated Phenols						
							Benzene	Toluene	Ethylbenzene	meta&para Xylene	ortho Xylene	Styrene	2,3,4,6 - tetrachlorophenol	2,4,5 - trichlorophenol	2,4,6 - trichlorophenol	2,4 - dichlorophenol	2,6 - dichlorophenol	2 - chlorophenol	Pentachlorophenol
Assessment criteria							-	-	-	-		-	-	-	-	-	-	-	-
PQL							0.2	0.5	0.5	0.5		0.5	10000	0.5	0.5	0.5	0.5	0.5	2
BH74	6250749.11	333617.43	2.34	8.5-8.8	-	AECOM 2010	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	<2
BH74	6250749.11	333617.43	2.34	10-10.5	-	AECOM 2010	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	13-13.5	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	16-16.5	-	AECOM 2010	.	.	.	.	.	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	<2
BH75	-	-	-	4-4.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.
BH75	-	-	-	16-16.2	-	AECOM 2010	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	<0.5	<0.5	<0.5	<0.5	<0.5	<2
BH400	333686.28	6251763.541	2.61	6-6.4	FILL: Gravelly Sandy Clay	AECOM 2012	0.3	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	9-9.4	FILL: Gravelly Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	12-12.4	FILL: Gravelly Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	13.2-13.4	FILL: Gravelly Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	14-14.2	Sandy Clay	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	15-15.4	Clayey Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	16-16.4	Clayey Sand	AECOM 2012	40.3	99.4	11.2	78.2	37.9	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	3-3.4	-	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	5-5.4	-	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	9-9.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	10-10.4	FILL: Clayey Sandy Gravel	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	11-11.4	FILL: Gravelly Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	13-13.4	FILL: Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	14-14.2	-	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	17-17.4	Clayey Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	19.2-19.4	Sandy Clay	AECOM 2012	1.4	5.9	0.7	7.2	2.9	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	20-20.15	Clayey Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	4.0-4.2	FILL: Gravelly Silty Sand	AECOM 2012	-	-	-	-	-	-	-	-	-	-	-	-	-
BH402	333674.472	6251734.066	2.61	9-9.3	FILL: Gravelly Silty Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	11-11.2	-	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	14-14.5	Silty Sandy Clay	AECOM 2012	6.2	15.7	1.5	20.4	7.4	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	15-15.5	Clayey Silty Sand	AECOM 2012	3.7	8	2	19	10	<0.5	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	16-16.3	Clayey Silty Sand	AECOM 2012	0.8	6.4	1	10	4.9	0.8	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	17-17.4	Clayey Silty Sand	AECOM 2012	63.4	127	9	128	46.1	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	19.1-19.4	Silty Clay	AECOM 2012	2.9	3.3	<0.5	2.6	1	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	2-2.4	FILL: Gravelly Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	4-4.4	FILL: Gravelly Sand	AECOM 2012	<0.2	<0.5	<0.5	<0.5	<0.5	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	8-8.4	Silty Clay	AECOM 2012	4.2	5	4.3	6.6	3.6	.	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BH403	333673.623	6251700.264	2.36	10-10.4	Sandy Clay	AECOM 2012	83.7	202	20.6	318	93.3	112	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	12-12.4	Sandy Clay	AECOM 2012	124	145	10.2	131	48.2	.	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
BH403	333673.623	6251700.264	2.36	15-15.4	Sandy Clay	AECOM 2012	7	29.8	2.4	38.4	11.6	17	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	16-16.4	Silty Sandy Clay	AECOM 2012	60	117	8.7	116	41.3	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	17-17.3	Weathered Sandstone	AECOM 2012	1.5	2.9	<0.5	3.3	1.1	.	.	.	.	.	.	.	.

Table 5
Historical Soil Results - Organochlorine Compunds, Organophosphorous Compounds, Polychlorinated Biphenyls, Herbicides and Pesticides
Barangaroo Central

all units in mg/kg

							Herbicide	OCPs												
Sample ID	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	Diallite	4,4 - DDE	a - BHC	Aldrin	Aldrin + Dieldrin	b - BHC	d - BHC	DDD	DDT	DDT + DDE + DDD	Dieldrin	Endosulfan I	Endosulfan II	Endodulfan sulphate
Assessment criteria							-	-	-	-	-	-	-	-	-	-	-	-	-	-
PQL							0.5	0.05	0.05	0.05	-	0.05	0.05	0.05	2	0.5	0.05	0.05	0.05	0.05
BH042	333730.26	6251755.77	2.241	0.3-0.5	FILL: Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH042	333730.26	6251755.77	2.241	1.5-1.7	FILL: Clayey Sand.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH042	333730.26	6251755.77	2.241	6.0-6.5	Sandy Clay/Clayey sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH044	333726.06	6251774.48	2.289	0.3-0.5	FILL: Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH044	333726.06	6251774.48	2.289	2.3-2.7	FILL: Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH044	333726.06	6251774.48	2.289	4.0-4.5	Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH077	333669.55	6251771.03	2.833	0.3-0.5	FILL: Sandy Gravel	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH077	333669.55	6251771.03	2.833	3.0-3.45	FILL: Sandy Gravelly Clay	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH078	333693.78	6251773.32	2.509	1.5-1.95	FILL: Gravelly Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH078	333693.78	6251773.32	2.509	3-3.45	FILL: Clayey Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH079	333671.46	6251743.17	2.739	0.3-0.5	FILL: Gravelly Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH079	333671.46	6251743.17	2.739	1.5-1.95	FiLL: Gravelly Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH136	333702.56	6251780.37	2.361	3.0-3.45	FILL: Gravelly Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH136	333702.56	6251780.37	2.361	8.0-8.5	Sandstone	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH63	-	-	-	13-13.3	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH69	-	-	-	1-1.15	FILL: Sand	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH69	-	-	-	4-4.2	FILL: Silty Sand	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH69	-	-	-	10-10.2	Sandstone	AECOM 2010	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<2	<0.5	<0.5	<0.5	<0.5
BH70	-	-	-	01-0.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	0.08-0.15	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	2.5-2.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	7-7.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	10-10.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	13-13.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	15-15.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	19-19.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	23.5-23.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH73	-	-	-	-	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	1-1.2	-	AECOM 2010	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5
BH74	6250749.11	333617.43	2.34	5.5-5.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	8.5-8.8	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	10-10.5	-	AECOM 2010	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5
BH74	6250749.11	333617.43	2.34	13-13.5	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	16-16.5	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH75	-	-	-	4-4.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH75	-	-	-	16-16.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	6-6.4	FILL: Gravelly Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	9-9.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	12-12.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	13.2-13.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	14-14.2	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	15-15.4	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	16-16.4	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	3-3.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	5-5.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	9-9.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	10-10.4	FILL: Clayey Sandy Gravel	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	11-11.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	13-13.4	FILL: Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	14-14.2	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	17-17.4	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	19.2-19.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	20-20.15	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	4.0-4.2	FILL: Gravelly Silty Sand	AECOM 2012	-	-												
BH402	333674.472	6251734.066	2.61	9-9.3	FILL: Gravelly Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 5
Historical Soil Results - Organochlorine Compunds, Organophosphorous Compounds, Polychlorinated Biphenyls, Herbicides and Pesticides
Barangaroo Central

all units in mg/kg

							Herbicide	OCPs													
Sample ID	**Easting**	**Northing**	**Elevation**	**Sampling Depth (m AHD)**	**Material / Soil Description**	**Source**	**Diallite**	**4,4 - DDE**	**a - BHC**	**Aldrin**	**Aldrin + Dieldrin**	**b - BHC**	**d - BHC**	**DDD**	**DDT**	**DDT + DDE + DDD**	**Dieldrin**	**Endosulfan I**	**Endosulfan II**	**Endodulfan sulphate**
Assessment criteria							-	-	-	-	-	-	-	-	-	-	-	-	-	-
PQL							0.5	0.05	0.05	0.05	-	0.05	0.05	0.05	2	0.5	0.05	0.05	0.05	0.05
BH402	333674.472	6251734.066	2.61	11-11.2	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	14-14.5	Silty Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	15-15.5	Clayey Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	16-16.3	Clayey Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	17-17.4	Clayey Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	19.1-19.4	Silty Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	2-2.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	4-4.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	8-8.4	Silty Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	10-10.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	12-12.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	15-15.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	16-16.4	Silty Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	17-17.3	Weathered Sandstone	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 5
Historical Soil Results - Organochlorine Compunds, Organophosphorous Compounds, Barangaroo Central

all units in mg/kg

							OCPs				OPPs									
Sample ID	**Easting**	**Northing**	**Elevation**	**Sampling Depth (m AHD)**	**Material / Soil Description**	**Source**	**Endrin**	**b - BHC (Lindane)**	**Heptachlor**	**Heptachlor Epoxy**	**Chlorfenvinphos**	**Chlorpyrifos**	**Chlorpyrifos-methyl**	**Diazinon**	**Dichlorvos**	**Dimethoate**	**Ethion**	**Ethyl methanesulfonate**	**Fenthion**	**Isosafrole (cis)**
Assessment criteria							-	-	-	-	-	-	-	-	-	-	-	-	-	-
PQL							**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.5**	**0.05**	**0.5**
BH042	333730.26	6251755.77	2.241	0.3-0.5	FILL: Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH042	333730.26	6251755.77	2.241	1.5-1.7	FILL: Clayey Sand.	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH042	333730.26	6251755.77	2.241	6.0-6.5	Sandy Clay/Clayey sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH044	333726.06	6251774.48	2.289	0.3-0.5	FILL: Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH044	333726.06	6251774.48	2.289	2.3-2.7	FILL: Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH044	333726.06	6251774.48	2.289	4.0-4.5	Silty Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH077	333669.55	6251771.03	2.833	0.3-0.5	FILL: Sandy Gravel	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH077	333669.55	6251771.03	2.833	3.0-3.45	FILL: Sandy Gravelly Clay	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH078	333693.78	6251773.32	2.509	1.5-1.95	FILL: Gravelly Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH078	333693.78	6251773.32	2.509	3-3.45	FILL: Clayey Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH079	333671.46	6251743.17	2.739	0.3-0.5	FILL: Gravelly Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH079	333671.46	6251743.17	2.739	1.5-1.95	FiLL: Gravelly Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH136	333702.56	6251780.37	2.361	3.0-3.45	FILL: Gravelly Sand	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH136	333702.56	6251780.37	2.361	8.0-8.5	Sandstone	ERM 2007	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH63	-	-	-	13-13.3	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH69	-	-	-	1-1.15	FILL: Sand	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH69	-	-	-	4-4.2	FILL: Silty Sand	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH69	-	-	-	10-10.2	Sandstone	AECOM 2010	<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
BH70	-	-	-	01-0.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	0.08-0.15	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	2.5-2.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	7-7.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	10-10.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	13-13.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	15-15.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	19-19.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH71	-	-	-	23.5-23.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH73	-	-	-	-	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	1-1.2	-	AECOM 2010	<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
BH74	6250749.11	333617.43	2.34	5.5-5.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	8.5-8.8	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	10-10.5	-	AECOM 2010	<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
BH74	6250749.11	333617.43	2.34	13-13.5	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	16-16.5	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH75	-	-	-	4-4.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH75	-	-	-	16-16.2	-	AECOM 2010	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	6-6.4	FILL: Gravelly Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	9-9.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	12-12.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	13.2-13.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	14-14.2	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	15-15.4	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH400	333686.28	6251763.541	2.61	16-16.4	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	3-3.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	5-5.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	9-9.4	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	10-10.4	FILL: Clayey Sandy Gravel	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	11-11.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	13-13.4	FILL: Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	14-14.2	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	17-17.4	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	19.2-19.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH401	333666.65	6251757.5	2.91	20-20.15	Clayey Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	4.0-4.2	FILL: Gravelly Silty Sand	AECOM 2012														
BH402	333674.472	6251734.066	2.61	9-9.3	FILL: Gravelly Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 5
Historical Soil Results - Organochlorine Compunds, Organophosphorous Compounds, Barangaroo Central

all units in mg/kg

							OCPs				OPPs									
Sample ID	**Easting**	**Northing**	**Elevation**	**Sampling Depth (m AHD)**	**Material / Soil Description**	**Source**	**Endrin**	**b - BHC (Lindane)**	**Heptachlor**	**Heptachlor Epoxy**	**Chlorfenvinphos**	**Chlorpyrifos**	**Chlorpyrifos-methyl**	**Diazinon**	**Dichlorvos**	**Dimethoate**	**Ethion**	**Ethyl methanesulfonate**	**Fenthion**	**Isosafrole (cis)**
Assessment criteria							-	-	-	-	-	-	-	-	-	-	-	-	-	-
PQL							**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.5**	**0.05**	**0.5**
BH402	333674.472	6251734.066	2.61	11-11.2	-	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	14-14.5	Silty Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	15-15.5	Clayey Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	16-16.3	Clayey Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	17-17.4	Clayey Silty Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH402	333674.472	6251734.066	2.61	19.1-19.4	Silty Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	2-2.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	4-4.4	FILL: Gravelly Sand	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	8-8.4	Silty Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	10-10.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	12-12.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	15-15.4	Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	16-16.4	Silty Sandy Clay	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BH403	333673.623	6251700.264	2.36	17-17.3	Weathered Sandstone	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 5
Historical Soil Results - Organochlorine Compunds, Organophosphorous Compounds, Barangaroo Central

all units in mg/kg

								OPPs					Pesticides		PCB
Sample ID	Easting	Northing	Elevation	Sampling Depth (m AHD)	Material / Soil Description	Source	Isosafrole (trans)	Malathion	Methyl methanosulfonate	Methyl parathion	Prothiofos	Safrole	Chlorobenzilate	Pirimphos-ethyl	Total PCBs
Assessment criteria							-	-	-		-	-	-	-	-
PQL							0.5	0.05	0.5	0.2	0.05	0.5	0.05	0.05	0.05
BH042	333730.26	6251755.77	2.241	0.3-0.5	FILL: Silty Sand	ERM 2007	.	.	.		.	.	.	.	<0.1
BH042	333730.26	6251755.77	2.241	1.5-1.7	FILL: Clayey Sand.	ERM 2007	.	.	.		.	.	.	.	-
BH042	333730.26	6251755.77	2.241	6.0-6.5	Sandy Clay/Clayey sand	ERM 2007	.	.	.		.	.	.	.	<0.1
BH044	333726.06	6251774.48	2.289	0.3-0.5	FILL: Silty Sand	ERM 2007	.	.	.		.	.	.	.	<0.1
BH044	333726.06	6251774.48	2.289	2.3-2.7	FILL: Silty Sand	ERM 2007	.	.	.		.	.	.	.	<0.1
BH044	333726.06	6251774.48	2.289	4.0-4.5	Silty Sand	ERM 2007	.	.	.		.	.	.	.	-
BH077	333669.55	6251771.03	2.833	0.3-0.5	FILL: Sandy Gravel	ERM 2007	.	.	.		.	.	.	.	<0.1
BH077	333669.55	6251771.03	2.833	3.0-3.45	FILL: Sandy Gravelly Clay	ERM 2007	.	.	.		.	.	.	.	<0.1
BH078	333693.78	6251773.32	2.509	1.5-1.95	FILL: Gravelly Sand	ERM 2007	.	.	.		.	.	.	.	<0.1
BH078	333693.78	6251773.32	2.509	3-3.45	FILL: Clayey Sand	ERM 2007	.	.	.		.	.	.	.	<0.1
BH079	333671.46	6251743.17	2.739	0.3-0.5	FILL: Gravelly Sand	ERM 2007	.	.	.		.	.	.	.	<0.1
BH079	333671.46	6251743.17	2.739	1.5-1.95	FiLL: Gravelly Sand	ERM 2007	.	.	.		.	.	.	.	<0.1
BH136	333702.56	6251780.37	2.361	3.0-3.45	FILL: Gravelly Sand	ERM 2007	.	.	.		.	.	.	.	-
BH136	333702.56	6251780.37	2.361	8.0-8.5	Sandstone	ERM 2007	.	.	.		.	.	.	.	.
BH63	-	-	-	13-13.3	-	AECOM 2010	.	.	.		.	.	.	.	.
BH69	-	-	-	1-1.15	FILL: Sand	AECOM 2010	.	.	.		.	.	.	.	.
BH69	-	-	-	4-4.2	FILL: Silty Sand	AECOM 2010	.	.	.		.	.	.	.	.
BH69	-	-	-	10-10.2	Sandstone	AECOM 2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH70	-	-	-	01-0.2	-	AECOM 2010	.	.	.		.	.	.	.	.
BH71	-	-	-	0.08-0.15	-	AECOM 2010	.	.	.		.	.	.	.	.
BH71	-	-	-	2.5-2.7	-	AECOM 2010	.	.	.		.	.	.	.	.
BH71	-	-	-	7-7.2	-	AECOM 2010	.	.	.		.	.	.	.	.
BH71	-	-	-	10-10.2	-	AECOM 2010	.	.	.		.	.	.	.	.
BH71	-	-	-	13-13.2	-	AECOM 2010	.	.	.		.	.	.	.	.
BH71	-	-	-	15-15.2	-	AECOM 2010	.	.	.		.	.	.	.	.
BH71	-	-	-	19-19.2	-	AECOM 2010	.	.	.		.	.	.	.	.
BH71	-	-	-	23.5-23.7	-	AECOM 2010	.	.	.		.	.	.	.	.
BH73	-	-	-	-	-	AECOM 2010	.	.	.		.	.	.	.	.
BH74	6250749.11	333617.43	2.34	1-1.2	-	AECOM 2010	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5
BH74	6250749.11	333617.43	2.34	5.5-5.7	-	AECOM 2010	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	8.5-8.8	-	AECOM 2010	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	10-10.5	-	AECOM 2010	<0.5	<0.5	<0.5	.	<0.5	<0.5	<0.5	<0.5	<0.5
BH74	6250749.11	333617.43	2.34	13-13.5	-	AECOM 2010	.	.	.	.	.	.	.	.	.
BH74	6250749.11	333617.43	2.34	16-16.5	-	AECOM 2010	.	.	.		.	.	.	.	.
BH75	-	-	-	4-4.2	-	AECOM 2010	.	.	.		.	.	.	.	.
BH75	-	-	-	16-16.2	-	AECOM 2010	.	.	.		.	.	.	.	.
BH400	333686.28	6251763.541	2.61	6-6.4	FILL: Gravelly Sandy Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH400	333686.28	6251763.541	2.61	9-9.4	FILL: Gravelly Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH400	333686.28	6251763.541	2.61	12-12.4	FILL: Gravelly Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH400	333686.28	6251763.541	2.61	13.2-13.4	FILL: Gravelly Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH400	333686.28	6251763.541	2.61	14-14.2	Sandy Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH400	333686.28	6251763.541	2.61	15-15.4	Clayey Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH400	333686.28	6251763.541	2.61	16-16.4	Clayey Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	3-3.4	-	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	5-5.4	-	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	9-9.4	-	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	10-10.4	FILL: Clayey Sandy Gravel	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	11-11.4	FILL: Gravelly Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	13-13.4	FILL: Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	14-14.2	-	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	17-17.4	Clayey Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	19.2-19.4	Sandy Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH401	333666.65	6251757.5	2.91	20-20.15	Clayey Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH402	333674.472	6251734.066	2.61	4.0-4.2	FILL: Gravelly Silty Sand	AECOM 2012								-	-
BH402	333674.472	6251734.066	2.61	9-9.3	FILL: Gravelly Silty Sand	AECOM 2012	.	.	.		.	.	.	.	.

Table 5
Historical Soil Results - Organochlorine Compunds, Organophosphorous Compounds, Barangaroo Central

all units in mg/kg

								OPPs						Pesticides		PCB
Sample ID	**Easting**	**Northing**	**Elevation**	**Sampling Depth (m AHD)**	**Material / Soil Description**	**Source**	**Isosafrole (trans)**	**Malathion**	**Methyl methanosulfonate**	**Methyl parathion**	**Prothiofos**	**Safrole**	**Chlorobenzilate**	**Pirimphos-ethyl**	**Total PCBs**
Assessment criteria							-	-	-		-	-	-	-	-
PQL							**0.5**	**0.05**	**0.5**	**0.2**	**0.05**	**0.5**	**0.05**	**0.05**	**0.05**
BH402	333674.472	6251734.066	2.61	11-11.2	-	AECOM 2012	.	.	.		.	.	.	.	.
BH402	333674.472	6251734.066	2.61	14-14.5	Silty Sandy Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH402	333674.472	6251734.066	2.61	15-15.5	Clayey Silty Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH402	333674.472	6251734.066	2.61	16-16.3	Clayey Silty Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH402	333674.472	6251734.066	2.61	17-17.4	Clayey Silty Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH402	333674.472	6251734.066	2.61	19.1-19.4	Silty Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH403	333673.623	6251700.264	2.36	2-2.4	FILL: Gravelly Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH403	333673.623	6251700.264	2.36	4-4.4	FILL: Gravelly Sand	AECOM 2012	.	.	.		.	.	.	.	.
BH403	333673.623	6251700.264	2.36	8-8.4	Silty Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH403	333673.623	6251700.264	2.36	10-10.4	Sandy Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH403	333673.623	6251700.264	2.36	12-12.4	Sandy Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH403	333673.623	6251700.264	2.36	15-15.4	Sandy Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH403	333673.623	6251700.264	2.36	16-16.4	Silty Sandy Clay	AECOM 2012	.	.	.		.	.	.	.	.
BH403	333673.623	6251700.264	2.36	17-17.3	Weathered Sandstone	AECOM 2012	.	.	.		.	.	.	.	.

Table 6
Historical Groundwater Results - Polycyclic Aromatic Hydrocarbons and Phenols
Barangaroo Central

Sample id	Easting	Northing	Elevation	Depth to Water (m AHD)	Date sample was taken	Source	Polycyclic Aromatic Hydrocarbons															Phenol								
							Total PAHs	Acenaphthylene	Acenaphthene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b) & (k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3,cd)pyrene	Naphthalene	Phenanthrene	Pyrene	2,4 - dimethylphenol	2 - chloronaphthalene	2 - methylnaphthalene	2 - methylphenol	2 - nitrophenol	3 -&4 - methylphenol	3 - methylcholanthrene	4 - chloro - 3 - methylphenol	Phenol
PQL							0.5	0.5	0.5	0.5	0.5	0.3	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.5
Units							ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Assessment criteria [1]																														
MW08=BH046	333641.38	6251752.7	2.565		25/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		16/08/2007	ERM 2008	98.6	2	4.6	4.9	2.6	3.1	3.8	1.6	2.2	<1	6	2.9	1.4	49.5	7.4	6.1	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		7/05/2008	ERM 2008	67.1	1.3	6.1	3.1	<1	0.6	<1	<1	<1	<1	2.8	4.2	<1	37.6	5.5	2.4	.	.	.	.	.	.	.	.	.
MW12=BH057	333564.03	6251834.68	2.279		14/07/2006	ERM 2008	<15.5	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.68	2.279		14/08/2007	ERM 2008	<15.5	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.68	2.279		13/05/2008	ERM 2008	<15.5	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	.	.	.	.	.	.	.	.	.
MW13=BH061	333567.17	6251808.1	2.305		14/07/2006	ERM 2008	<15.5	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305		14/08/2007	ERM 2008	<15.5	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305		13/05/2008	ERM 2008	<15.5	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	.	.	.	.	.	.	.	.	.
MW24=BH129	333577.76	6251713.33	2.4		25/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.33	2.4		15/08/2007	ERM 2008	14.85	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	7.6	<1	<1	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.33	2.4		6/05/2008	ERM 2008	<15.5	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	.	.	.	.	.	.	.	.	.
MW179=BH179	333708.26	6251901.896	2.458		6/05/2008	ERM 2008	9.9	<1	<1	<1	<1	0.7	<1	<1	<1	<1	1.4	<1	<1	<1	<1	1.3	.	.	.	.	.	.	.	.	.
MW213=BH213	333558.557	6251749.964	2.337		8/05/2008	ERM 2008	<15.5	<1	<1	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	.	.	.	.	.	.	.	.	.
MW214=BH214	333547.714	6251850.172	2.103		8/5/2008 and 12/5/2008	ERM 2008	0.825	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	.	.	.	.	.	.	.	.	.
MW69	333711.9	6251766.02	2.29		19/03/2010	AECOM 2010	2450	35	158	28	14	6	6	<2	12	<2	34	64	<2	1920	126	47	138	<2	326	20	<2	20	<2	<2	2
MW74	333617.43	6251749.11	2.34		18/03/2010	AECOM 2010	18	1	<0.9	1	1	<0.9	<2	<0.9	<0.9	<0.9	3	1	<0.9	4	4	3	<0.9	<0.9	1	<0.9	<0.9	<2	<0.9	<0.9	<0.9
MW69	333711.9	6251766.02	2.29		25/02/2012	AECOM 2012	360	11.7	37.2	8.9	<5	<5	<5	<5	<5	<5	7.4	5.7	<5	202	32	15.1	<5	.	.	<5	<5	<10	.	<5	<5
MW401	333666.65	6251757.5	2.91		24/02/2012	AECOM 2012	298.2	10.5	12.8	<4.9	<4.9	<4.9	<4.9	<4.9	<4.9	<4.9	<4.9	9.4	<4.9	195	16.3	5.2	108	.	.	63.4	<4.9	111	.	<4.9	15
MW08	333641.38	6251752.7	2.565		28/02/2012	AECOM 2012	27.7	<1	2.1	1.9	<1	<0.5	<1	<1	<1	<1	<1	2.2	<1	7.9	3.1	<1	16.4	.	.	15	<1	10.4	.	2.1	<1

Table 7
Historical Groundwater Results - Heavy Metals, Inorganics and Total Organic Carbon
Barangaroo Central

Sample id	Easting	Northing	Elevation	Depth to Water (m AHD)	Date sample was taken	Source	Heavy Metals																			Cyanide				
							Al	Sb	As	Ba	Be	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Hg	Ni	K	Ag	V	Zn	Cyanide (total)	Alkalinity (Hydroxide) as CaCo3	Alkalinity (Total) as CaCo3	Bicarbonate as CaCo3	Ammonia as N
PQL							0.005	0.0002	0.0002	0.0005	0.0001	0.00005	1	0.0002	0.0001	0.0005	0.05	0.0001	1	0.0005	0.0001	0.0005	1	0.0001	0.0002	0.001	0.004	1000	1	1	10
Units							mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	mg/L	mg/L	ug/L
Assessment Criteria																															
MW08	333641.38	6251752.7	2.565		25/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	0.006	.	0.555	.	.	.	.	.	.	.	0.764	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		16/08/2007	ERM 2008	.	.	0.012	.	.	0.0002	.	0.002	.	0.005	.	0.014	.	.	<0.0001	0.08	.	.	.	0.071	<0.004	.	.	.	16.3
MW08	333641.38	6251752.7	2.565		7/05/2008	ERM 2008	.	.	0.0037	.	.	0.0104	.	0.0006	.	<0.001	.	<0.0002	.	.	<0.0001	0.0656	.	.	.	<0.005	<0.004	.	.	.	12.4
MW12	333564.03	6251834.68	2.279		14/07/2006	ERM 2008	.	.	<0.01	.	.	<0.001	.	<0.01	.	<0.001	.	0.0006	.	.	<0.0001	<0.01	.	.	.	0.015	.	.	.	.	.
MW12	333564.03	6251834.68	2.279		14/08/2007	ERM 2008	.	.	<0.01	.	.	0.0018	.	<0.01	.	0.038	.	<0.01	.	.	<0.0001	0.16	.	.	.	<0.05	<0.004	.	.	.	0.907
MW12	333564.03	6251834.68	2.279		13/05/2008	ERM 2008	.	.	<0.0005	.	.	<0.0002	.	<0.0005	.	<0.001	.	<0.0002	.	.	<0.0001	0.0005	.	.	.	0.009	<0.004	.	.	.	0.017
MW13	333567.17	6251808.1	2.305		14/07/2006	ERM 2008	.	.	<0.01	.	.	<0.001	.	<0.01	.	<0.001	.	0.0022	.	.	<0.0001	<0.01	.	.	.	0.028	.	.	.	.	.
MW13	333567.17	6251808.1	2.305		14/08/2007	ERM 2008	.	.	<0.01	.	.	<0.001	.	<0.01	.	<0.02	.	<0.01	.	.	<0.0001	<0.01	.	.	.	<0.05	<0.004	.	.	.	0.839
MW13	333567.17	6251808.1	2.305		13/05/2008	ERM 2008	.	.	<0.0005	.	.	<0.0002	.	<0.0005	.	<0.001	.	<0.0002	.	.	<0.0001	0.0165	.	.	.	0.009	<0.004	.	.	.	<0.015
MW24	333577.76	6251713.33	2.4		25/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	0.002	.	0.0047	.	.	.	.	.	.	.	0.029	.	.	.	.	.
MW24	333577.76	6251713.33	2.4		15/08/2007	ERM 2008	.	.	<0.01	.	.	<0.001	.	<0.01	.	0.03	.	<0.01	.	.	<0.0001	<0.01	.	.	.	<0.05	<0.004	.	.	.	<0.1
MW24	333577.76	6251713.33	2.4		6/05/2008	ERM 2008	.	.	0.0008	.	.	<0.0002	.	<0.0005	.	<0.001	.	0.0012	.	.	<0.0001	0.0058	.	.	.	0.013	<0.004	.	.	.	0.138
MW179	333708.26	6251901.896	2.458		6/05/2008	ERM 2008	.	.	0.0011	.	.	0.0004	.	<0.0005	.	<0.001	.	0.0006	.	.	<0.0001	0.0868	.	.	.	0.036	<0.004	.	.	.	0.218
MW213	333558.557	6251749.964	2.337		8/05/2008	ERM 2008	.	.	0.001	.	.	0.0002	.	<0.0005	.	0.003	.	<0.0002	.	.	<0.0001	0.0057	.	.	.	0.0041	<0.004	.	.	.	<0.015
MW214	333547.714	6251850.172	2.103		8/5/2008 and 12/5/2008	ERM 2008	.	.	0.001	.	.	<0.0002	.	<0.0005	.	<0.001	.	<0.0002	.	.	<0.0001	<0.0005	.	.	.	0.007	<0.004	.	.	.	0.057
MW69	333711.9	6251766.02	2.29		19/03/2010	AECOM 2010	.	.	0.0009	0.104	<0.0001	<0.0002	249	<0.0005	0.0063	<0.001	10.3	<0.0002	574	0.69	<0.0001	0.002	216	.	<0.0005	<0.005	0.004	<1000	761	761	90400
MW74	333617.43	6251749.11	2.34		18/03/2010	AECOM 2010	.	.	0.001	0.179	<0.0001	0.001	.	0.0006	0.0003	<0.001	.	<0.0002	.	0.251	<0.0001	0.0171	.	.	0.0018	0.018	<0.004	.	.	.	.
MW69	333711.9	6251766.02	2.29		25/02/2012	AECOM 2012	0.01	<0.0005	0.0006	0.123	<0.0001	<0.0002	.	<0.0005	0.0003	<0.001	.	<0.0002	.	0.168	<0.0001	<0.0005	.	<0.0001	<0.0005	0.012	<0.004	.	.	.	.
MW401	333666.65	6251757.5	2.91		24/02/2012	AECOM 2012	<0.01	<0.0005	0.0031	5.25	<0.0001	0.0016	.	<0.0005	0.0016	<0.001	.	<0.0002	.	0.406	<0.0001	0.0664	.	<0.0001	0.0005	0.016		.	.	.	.
MW08	333641.38	6251752.7	2.565		28/02/2012	AECOM 2012	0.03	0.0008	0.00082	1.67	<0.0001	0.0002	.	<0.0005	0.0005	<0.001	.	<0.0002	.	0.235	<0.0001	0.0095	.	<0.0001	0.0015	0.006	<0.004	.	.	.	.

Table 7
Historical Groundwater Results - Heavy Metals, Inorganics and Total Organic Carbo
Barangaroo Central

Sample id	Easting	Northing	Elevation	Depth to Water (m AHD)	Date sample was taken	Source	Inorganics															TOC
							Anions (Total)	Carbonate	Cations (Total)	Chloride	Ferrous Iron	Fluoride	Ionic Balance	Nitrate as N	Nitrite as N	Nitrogen (Total Oxidised)	pH (Lab)	Reactive Phosphorous as P	Sodium (Filtered)	Sulphate	Sulphur as S	TOC
PQL							0.01	1	0.01	0.5	0.05	0.02	0.01	0.01	0.01	0.01	0.01	0.01	1	0.5	1	1
Units							meq/L	mg/L	meq/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L
Assessment Criteria																				2000		
MW08	333641.38	6251752.7	2.565		25/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		16/08/2007	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	94	.	.
MW08	333641.38	6251752.7	2.565		7/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	206	.	.
MW12	333564.03	6251834.68	2.279		14/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.68	2.279		14/08/2007	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	2560	.	.
MW12	333564.03	6251834.68	2.279		13/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	2770	.	.
MW13	333567.17	6251808.1	2.305		14/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305		14/08/2007	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	2640	.	.
MW13	333567.17	6251808.1	2.305		13/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	3200	.	.
MW24	333577.76	6251713.33	2.4		25/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.33	2.4		15/08/2007	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	2740	.	.
MW24	333577.76	6251713.33	2.4		6/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	3640	.	.
MW179	333708.26	6251901.896	2.458		6/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	3280	.	.
MW213	333558.557	6251749.964	2.337		8/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	5630	.	.
MW214	333547.714	6251850.172	2.103		8/5/2008 and 12/5/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	5700	.	.
MW69	333711.9	6251766.02	2.29		19/03/2010	AECOM 2010	333	<1	335	9520	.	0.35	0.21	<0.01	<0.01	<0.01	.	<0.01	6200	2090	531	40
MW74	333617.43	6251749.11	2.34		18/03/2010	AECOM 2010	.	.	.	.	.	.	.	.	.	.	6.37	.	.	.	.	6
MW69	333711.9	6251766.02	2.29		25/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW401	333666.65	6251757.5	2.91		24/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		28/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 8
Historical Groundwater Results - Total Petroleum Hydrocarbons
Barangaroo Central

all units in ug/L

Sample id	Easting	Northing	Elevation	Date sample was taken	Source	TPH				
						C6-C9	C10-C14	C15-C28	C29-C36	C10-C36
Assessment criteria [1]						**65**		**-**		**1000**
PQL						**2**	**50**	**100**	**100**	
MW08	333641.38	6251752.7	2.565	25/07/2006	ERM 2008	.	.	.	.	.
MW08	333641.38	6251752.7	2.565	16/08/2007	ERM 2008	<20	1490	8300	1660	11450
MW08	333641.38	6251752.7	2.565	7/05/2008	ERM 2008	<20	1070	4300	960	6330
MW12	333564.03	6251834.68	2.279	14/07/2006	ERM 2008	<20	<50	<100	<50	<200
MW12	333564.03	6251834.68	2.279	14/08/2007	ERM 2008	<20	<50	<100	<50	<200
MW12	333564.03	6251834.68	2.279	13/05/2008	ERM 2008	<20	<50	<100	<50	<200
MW13	333567.17	6251808.1	2.305	14/07/2006	ERM 2008	<20	<50	<100	<50	<200
MW13	333567.17	6251808.1	2.305	14/08/2007	ERM 2008	<20	<50	<100	<50	<200
MW13	333567.17	6251808.1	2.305	13/05/2008	ERM 2008	<20	<50	<100	<50	<200
MW24	333577.76	6251713.33	2.4	25/07/2006	ERM 2008	.	.	.	.	.
MW24	333577.76	6251713.33	2.4	15/08/2007	ERM 2008	<20	<50	<100	<50	<200
MW24	333577.76	6251713.33	2.4	6/05/2008	ERM 2008	<20	<50	<100	<50	<200
MW179	333708.26	6251901.896	2.458	6/05/2008	ERM 2008	<20	<50	200	820	1045
MW213	333558.557	6251749.964	2.337	8/05/2008	ERM 2008	<20	<50	<100	<50	<200
MW214	333547.714	6251850.172	2.103	8/5/2008 and 12/5/20	ERM 2008	<20	<50	<100	<50	<200
MW69	333711.9	6251766.02	2.29	19/03/2010	AECOM 2010	3400	7200	3900	360	11460
MW74	333617.43	6251749.11	2.34	18/03/2010	AECOM 2010	<20	<50	280	140	420
MW69	333711.9	6251766.02	2.29	25/02/2012	AECOM 2012	210	530	330	<50	860
MW401	333666.65	6251757.5	2.91	24/02/2012	AECOM 2012	350	790	1070	<50	1860
MW08	333641.38	6251752.7	2.565	28/02/2012	AECOM 2012	<20	560	2110	160	2830

Table 9
Historical Groundwater Results - Monocyclic Aromatic Hydrocarbons, Organochlorine Pesticides and Organophosphorous Pesticides
Barangaroo Central

all units in ug/L

						Monocyclic Aromatic Hydrocarbons					OCPs																		
Sample id	Easting	Northing	Elevation	Date sample was taken	Source	Benzene	Toluene	Ethylbenzene	meta&para Xylene	ortho Xylene	4,4 - DDE	a - BHC	Aldrin	Aldrin + Dieldrin	b - BHC	c - BHC	DDD	DDT	DDT + DDE + DDD	Dieldrin	Endosulfan I	Endosulfan II	Endodulfan sulphate	Endrin	g - BHC (Lindane)	Heptachlor	Heptachlor epoxide	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl
PQL						1	2	2	2		0.3	0.3	0.3	-	0.3	0.3	0.3	0.6	-	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Assessment criteria						-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW08	333641.38	6251752.7	2.565	25/07/2006	ERM 2008	.	.	.	.		.	.	.	.	.		.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565	16/08/2007	ERM 2008	4	<2	3	7		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565	7/05/2008	ERM 2008	2	<5	3	4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.7	2.279	14/07/2006	ERM 2008	<1	<2	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.7	2.279	14/08/2007	ERM 2008	<1	<2	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.7	2.279	13/05/2008	ERM 2008	<1	<5	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305	14/07/2006	ERM 2008	<1	<2	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305	14/08/2007	ERM 2008	<1	<2	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305	13/05/2008	ERM 2008	<1	<5	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.3	2.4	25/07/2006	ERM 2008	.	.	.	.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.3	2.4	15/08/2007	ERM 2008	<1	<2	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.3	2.4	6/05/2008	ERM 2008	<1	<5	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW179	333708.26	6251901.9	2.458	6/05/2008	ERM 2008	<1	<5	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW213	333558.557	6251750	2.337	8/05/2008	ERM 2008	<1	<5	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW214	333547.714	6251850.2	2.103	8/5/2008 and 12/5/20	ERM 2008	<1	<5	<2	<4		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW69	333711.9	6251766	2.29	19/03/2010	AECOM 2010	868	804	77	240	144	<2	<2	<2	<4	<2	<2	<2	<4	<8	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW74	333617.43	6251749.1	2.34	18/03/2010	AECOM 2010	<1	<5	<2	<2	<2	<0.9	<0.9	<0.9	<1.8	<0.9	<0.9	<0.9	<0.9	<2.7	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<1	<0.9	<0.9
MW69	333711.9	6251766	2.29	25/02/2012	AECOM 2012	52	9	16	13	13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW401	333666.65	6251757.5	2.91	24/02/2012	AECOM 2012	127	108	<5	27	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565	28/02/2012	AECOM 2012	6	<5	2	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 9
Historical Groundwater Results - Monocyclic Aromatic Hydrocarl
Barangaroo Central

all units in ug/L

Sample id	Easting	Northing	Elevation	Date sample was taken	Source	OPPs													
						Diazinon	Dichlorvos	Dimethoate	Ethion	Ethyl methanesulfonate	Fenthion	Isosafrole (sis)	Isosafrole (trans)	Malathion	Methyl methanosulfonate	Prothiofos	Safrole	N-Nitrosodiphenyl & Duphenylar	Pronamide
PQL						0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	1	0.5
Assessment criteria						-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW08	333641.38	6251752.7	2.565	25/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565	16/08/2007	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565	7/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.7	2.279	14/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.7	2.279	14/08/2007	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW12	333564.03	6251834.7	2.279	13/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305	14/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305	14/08/2007	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW13	333567.17	6251808.1	2.305	13/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.3	2.4	25/07/2006	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.3	2.4	15/08/2007	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW24	333577.76	6251713.3	2.4	6/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW179	333708.26	6251901.9	2.458	6/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW213	333558.557	6251750	2.337	8/05/2008	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW214	333547.714	6251850.2	2.103	8/5/2008 and 12/5/20	ERM 2008	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW69	333711.9	6251766	2.29	19/03/2010	AECOM 2010	<2	<2	<2	<2	.	<2	.	.	<2	.	<2	.	<4	<2
MW74	333617.43	6251749.1	2.34	18/03/2010	AECOM 2010	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<2	<0.9
MW69	333711.9	6251766	2.29	25/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW401	333666.65	6251757.5	2.91	24/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565	28/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 10
Historical Groundwater Results - Semi Volatile Organic Compounds
Barangaroo Central

all units in ug/L

Sample id	Easting	Northing	Elevation	Depth to Water (m AHD)	Date sample was taken	Source	N-nitrosodiethylamine	N-nitrosodi - n - butylamine	N-nitrosodi - n - propylamine	N-Nitrosomethylethylamine	1 - naphthylamine	2 - nitroanaline	3 - nitroanaline	4 - chloroanaline	4 - nitroaniline	2 - methyl - 5 - nitroaniline	Aniline	1,3,5 - Trinitrobenzene	2,4 - Dinitrotoluene	2,6 - dinitrotoluene	Nitrobenxene	2,3,4,6 - tetrachlorophenol	2,4,5 - trichlorophenol	2,4,6 - trichlorophenol	2,4 - dichlorophenol	2,6 - dichlorophenol	2 - chlorophenol	Pentachlorophenol	1,2,3 - trichlorobenzene	1,2,4,5 - terachlorobenzene
PQL							0.5	0.5	0.5	0.5	0.5	1	1	0.5	0.5	0.5	0.5	0.5	1	1	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.6	5	0.3
Assessment criteria							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW69	333711.9	6251766	2.29		19/03/2010	AECOM 2010	<2	<2	<2	<2	<2	<4	<4	<2	<2	<2	<2	<2	<4	<4	<2	.	<2	<2	<2	<2	<2	<4	<5	.
MW74	333617.43	6251749.1	2.34		18/03/2010	AECOM 2010	<0.9	<0.9	<0.9	<0.9	<0.9	<1	<1	<0.9	<0.9	<0.9	<0.9	<0.9	<1	<1	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<2	<5	<2
MW69	333711.9	6251766	2.29		25/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<5	<5	<5	<5	<5	<10	.	.
MW401	333666.65	6251757.5	2.91		24/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<4.9	<4.9	<4.9	<4.9	<4.9	<9.8	.	.
MW08	333641.38	6251752.7	2.565		28/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	<1	<1	<1	<1	<1	<2	.	.

Table 10
Historical Groundwater Results - Semi Volatile Organic Compounds
Barangaroo Central

all units in ug/L

							SVOCs																							
Sample id	**Easting**	**Northing**	**Elevation**	**Depth to Water (m AHD)**	**Date sample was taken**	**Source**	**1,2,4 - trichlorobenzene**	**1,2 - dichlorobenzene**	**1,3,5 - Trichlorobenzene**	**1,3 - dichlorobenzene**	**1,4 - dichlorobenzene**	**2 - chlorotoluene**	**4 - chlorotoluene**	**Bromobenzene**	**Chlorobenzene**	**Hexachlorobenzene**	**Pentachlorobenzene**	**7,12 - dimethylbenz(a) anthracene**	**Chlorobenzinate**	**Pirimphos - ethyl**	**Bis(2 - ethylhexyl) phthalate**	**Butyl benzyl phthalate**	**Diethylphthalate**	**Dimethyl phthalate**	**Di - n - butyl phthalate**	**Di - n -octyl phthalate**	**Diallate**	**2 - (acetylamino) fluorene**	**2 - Picoline**	**3,3 - Dichlorobenzinide**
PQL							**0.5**	**0.5**	**0.3**	**0.5**	**0.5**	**5**	**5**	**5**	**5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.3**	**20**	**2**	**0.5**	**0.5**	**2**	**0.5**	**0.3**	**0.5**	**0.5**	**0.5**
Assessment criteria							**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
MW69	333711.9	6251766	2.29		19/03/2010	AECOM 2010	<2	<2	.	<2	<2	<5	<5	<5	<5	<4	<2	<2	<2	<2	<20	<2	<2	<2	3	<2	.	<2	<2	<2
MW74	333617.43	6251749.1	2.34		18/03/2010	AECOM 2010	<0.9	<0.9	<0.9	<0.9	<0.9	<5	<5	<5	<5	<0.9	<0.9	<0.9	<0.9	<0.9	<20	<2	<0.9	<0.9	<2	<0.9	<0.9	<0.9	<0.9	<0.9
MW69	333711.9	6251766	2.29		25/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW401	333666.65	6251757.5	2.91		24/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		28/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 10
Historical Groundwater Results - Semi Volatile Organic Compounds
Barangaroo Central

all units in ug/L

Sample id	Easting	Northing	Elevation	Depth to Water (m AHD)	Date sample was taken	Source	4 - (dimethylamino) azobenzene	4 - aminobiphenyl	4 - bromophenyl phenyl ehter	4 - chlorophenyl phenyl ehter	4 - nitroquinooline - N - oxide	Acetophenone	Azobenzene	Bis(2 - chloroethoxy) methane	Carbazole	Dibenzofuran	Hexachloropropene	Methapyrilene	N - nitrosomorpholine	N - nitrosopiperidine	N - nitrosopyrrolidine	Pentachloronitrobenzene	Phenacetin
PQL							**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**	**1**	**0.5**	**0.5**
Assessment criteria							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW69	333711.9	6251766	2.29		19/03/2010	AECOM 2010	<2	<2	<2	<2	<2	5	<2	<2	<2	9	11	<2	<2	<2	<4	<2	<2
MW74	333617.43	6251749.1	2.34		18/03/2010	AECOM 2010	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	1	<0.9	<0.9	<0.9	<0.9	<1	<0.9	<0.9
MW69	333711.9	6251766	2.29		25/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW401	333666.65	6251757.5	2.91		24/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		28/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 11
Historical Groundwater Results - Volatile Organic Compounds
Barangaroo Central

all units in ug/L

Sample id	Easting	Northing	Elevation	Depth to Water (m AHD)	Date sample was taken	Source	VOCs																															
							1,1,1,2 - tetrachloroethane	1,1,1, - trichloroethane	1,1,2,2 - terachloroethane	1,1,2 - trichloroethane	1,1 - dichloroethane	1,1 - dichloroethene	1,1 - dichloropropene	1,2,3 - trichloropropane	1,2 - dibromo - 3 - chloropropane	1,2 - dichloroethane	1,2 - dichloropropane	2,2 - dichloropropane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	cis - 1,2 - dichloroethene	cis - 1,3 - dichloropropene	Dibromomethae	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Trichloroethene	Tetrachloroethene	trans - 1,2 - dichloroethene	trans - 1,3 - dichloropropene	Vinyl Chloride	1,2 - dibromoethane	Iodomethane	Trichlorofluoromethane	1,2,4 - trimethylbenzene
PQL							5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	50	5	5	5	5	0.5	0.5	0.5	5	5	5	5	50	5	5	50	5
Assessment criteria							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW69	333711.9	6251766.02	2.29		19/03/2010	AECOM 2010	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5	<2	<10	<2	<5	<5	<5	<5	<50	<5	<5	<50	63
MW74	333617.43	6251749.11	2.34		18/03/2010	AECOM 2010	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5	<0.9	<0.9	<0.9	<5	<5	<5	<5	<50	<5	<5	<50	<5
MW69	333711.9	6251766.02	2.29		25/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW401	333666.65	6251757.5	2.91		24/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		28/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 11
Historical Groundwater Results - Volatile Organic Compounds
Barangaroo Central

all units in ug/L

Sample id	Easting	Northing	Elevation	Depth to Water (m AHD)	Date sample was taken	Source	1,3,5 - trimethylbenzene	Isopropylbenzene	n - butylbenzene	n - propylbenzene	p - iospropyltoluene	sec - butylbenzene	Styrene	tert - butylbenzene	Methyl Ethyl Ketone	2 - hexanone (MBK)	4 - Methyl - 2 - pentanone	Isophorone	Vinyl acetate	Bromomethane	Carbon disulfide	Chloromethane	cis 1,4 - Dichloro - 2 - butene	Dichlorodifluoromethane	Pentachloroethane	trans - 1,4 - Dichloro - 2 - butene
PQL							5	5	5	5	5	5	5	5	5	5	5	0.5	5	50	5	50	5	50	2	5
Assessment criteria							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW69	333711.9	6251766.02	2.29		19/03/2010	AECOM 2010	19	<5	<5	6	<5	<5	194	<5	<50	<50	<50	<2	<50	<50	<5	<50	<5	<50	<5	<5
MW74	333617.43	6251749.11	2.34		18/03/2010	AECOM 2010	<5	<5	<5	6	<5	<5	194	<5	<50	<50	<50	<0.9	<50	<50	<5	<50	<5	<50	<5	<5
MW69	333711.9	6251766.02	2.29		25/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW401	333666.65	6251757.5	2.91		24/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MW08	333641.38	6251752.7	2.565		28/02/2012	AECOM 2012	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 12
Historical Groundwater Field Parameters
Barangaroo Central

all units as marked

Sample Identification	Easting	Northing	Elevation	Date sample was taken	Source	Field Parameters					
						PIH Head Space Screening (ppmV)	Dissolved Oxygen (mg/L)	Electrical conductivity (mS/cm)	pH (pH_Units)	Temperature (oC)	Redox (mV)
Assessment criteria [1]											
PQL											
MW08	333641.38	6251752.7	2.565	7/05/2008	ERM 2008	0	-0.19	25.8	7.41	22.4	-320
MW12	333564.03	6251834.68	2.279	13/05/2008	ERM 2008	0	1.63	47.8	7.42	22.1	-89
MW13	333567.17	6251808.1	2.305	13/05/2008	ERM 2008	0	0.2	45.6	6.95	23.2	-42
MW24	333577.76	6251713.33	2.4	5/06/2008	ERM 2008	.	0.9	48.5	7.86	21.8	57
MW179	333708.26	6251901.9	2.458	6/05/2008	ERM 2008	.	1.46	47.8	7.5	20.8	-48
MW213	333558.557	6251749.96	2.337	12/05/2008	ERM 2008	.	3.68	48.3	7.98	20.6	72
MW214	333547.714	6251850.17	2.103	8/05/2008	ERM 2008	0	0.25	47.5	7.83	21.9	-168
MW69	333711.9	6251766.02	2.29	19/03/2010	AECOM 2010	.	0.15	24.9	6.97	22.9	-135
MW74	333617.43	6251749.11	2.34	18/03/2010	AECOM 2010	.	0.14	44.6	6.34	23.9	-149
MW69	333711.9	6251766.02	2.29	25/02/2012	AECOM 2012	.	0.93	24.8	7.12	22.3	22.3
MW401	333666.65	6251757.5	2.91	24/02/2012	AECOM 2012	.	0.21	37.8	6.56	23.9	-122.7
MW08	333641.38	6251752.7	2.565	28/02/2012	AECOM 2012	.	0.1 (ppm)	23.7	7.87	25.6	-231.5

PIH Headspace screening reported in parts per million volume (ppmv)
Dissolved oxygen reported in milograms per litre (mg/L)
Electrical conductivity reported in Microsiemens per centimetre (ms/cm)
pH measured in pH units
Temperature reported in degrees celcius (^{0}C)
Redox reported in millivolts (mV)

Appendix B – Remedial Works Plan

Appendix B – Remedial Works Plan

B1 - Introduction

This Remedial Works Plan (RWP) applies only to remedial works undertaken on the Barangaroo Central Site, as defined in the Barangaroo Central RAP.

B2 - Referenced Reports

The extent of remedial works required and the criteria referenced herein have been based on the Barangaroo Central RAP (JBS 2013b[30]) and this RWP is intended to be read in conjunction with JBS (2013b) for a full understanding of the inherent assumptions, limitations and uncertainties associated with this RWP.

Requirements for air quality controls during the remedial works have been based on the findings of 'Air Quality and Health Assessment, Barangaroo Central, Hickson Road, Sydney, NSW' (JBS 2012d)[31].

B3 - Objectives

The objectives of this RWP are:

- to document the methodology, procedures and staging required as part of remedial works to aid in successful implementation of remedial works in accordance with the Barangaroo Central RAP (JBS 2012c); and
- to document the plans to be developed and/or implemented during the remedial works to protect the environment and the health, safety and amenity of workers undertaking the works and the general public in proximity to the Barangaroo Central Site.

This RWP has been prepared with consideration of:

- the Barangaroo Central RAP;
- the Director General's Requirements relating to Project Application SSD_5374; and
- the requirements of the Overarching RAP prepared for the Barangaroo Project Site (ERM 2010)[32] and the associated Site Audit Statement and Site Audit Report (ENVIRON 2010)[33].

B4 - Remedial Works Plan

The RWP is provided as **Table B1** as a formal list of work stages anticipated for the remediation/management program, and the individual tasks/items required during each stage. The parties responsible for each task/item are also listed in **Table B1**.

As stated in the Barangaroo Central RAP, this RWP has been devised such that, on successful execution, a Site Audit Report and Site Audit Statement (SAS) can be prepared by the appointed independent NSW EPA Accredited Site Auditor, confirming that the Barangaroo Central Site is suitable for the proposed landuses subject to the implementation of any agreed management requirements.

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[30] *Remedial Action Plan, Barangaroo Central*, JBS Enviromental Pty Ltd, May 2013 (JBS 2013b)
[31] *Air Quality and Health Assessment – Barangaroo Central, Hickson Road, Sydney, NSW, Revision A* JBS Environmental Pty Ltd, 7 September 2012 (JBS 2012d)
[32] *Overarching Remedial Action Plan for The Barangaroo Project Site, Sydney,* ERM, June 2010 (ERM 2010)
[33] *Site Audit Report and Site Audit Statement GN439A, Overarching Remedial Action Plan, Barangaroo,* Graeme Nyland of ENVIRON Australia Pty Ltd, June 2010 (ENVIRON 2010).

Where the execution of the remedial/management works requires deviation from the specific requirements of the RAP (JBS 2013b) and this RWP, the Contractor is responsible for consulting with BDA prior to initiating any changes to the remedial program, and for obtaining endorsement of the alternate scope of works from the appointed Site Auditor.

Stage	Tasks	Barangaroo Central RAP Reference	Responsible Party for Completion
1.	**PLANNING**		
	a. Remedial Action Plan (RAP), Human Health Risk Assessment (HHRA) endorsed by Site Auditor.	-	BDA/Remediation Consultant
	b. Obtain a Section (b) Site Audit Statement (SAS) stating that the plan provided in the RAP can make the site suitable for the intended use.	-	BDA/Site Auditor
	c. Design of Stage 1 Public Domain finalised.	Section 1.6.1	BDA
	d. Cut and Fill Plan for Site finalized.	-	BDA
	e. Plan of Imported Fill Sources for Site finalised	-	BDA
	f. Material Compliance Management System (MCMS) prepared including a Material Tracking System (MTS)	Section 7.3.5	Remediation Contractor / Remediation Consultant
	g. MTS endorsed by Site Auditor		Site Auditor
	h. VSAQP Including CQAP for basement walls endorsed by Auditor	Section 7.2 and 7.7	Site Auditor
	i. Construction Environmental Management Plan (CEMP) prepared	Section 9 Sections 9.1 and 9.2	Remediation Contractor
	j. CEMP reviewed/endorsed by NSW EPA	Section 9.6	Remediation Consultant
	k. Occupational Health & Safety (OH&S) Management Plan prepared	Section 10.1 and 10.2	Remediation Contractor
2.	**SITE ESTABLISHMENT**		
	a. Commence contractor briefing and inductions as required	Section 9.3	Remediation Contractor
	b. Survey and ground mark-out of Barangaroo Central boundaries.	6.4.2	Remediation Contractor / Remediation Consultant
	c. Installation of environmental controls on Site as specified in endorsed CEMP	-	Remediation Contractor

Stage	Tasks	Barangaroo Central RAP Reference	Responsible Party for Completion
	d. Installation of safety controls on Site as specified in the OH&S Management Plan	-	Remediation Contractor
	e. Commence routine environmental and personnel monitoring as specified in endorsed CEMP and the OH&S Management Plan (including reporting and review of procedures as required).	-	Remediation Contractor / Remediation Consultant
3.	**GROUND PREPARATION**		
	a. Demolition of Pavements and Structures within Barangaroo Central Boundary (as required) i. Management of the exposed in-situ fill/soils in accordance with the requirements from non-work areas in the AQMP (JBS, 2012d); ii. Immediate disposal[1] of pavement material/structures to a licensed landfill or recycling facility; or iii. In the event that immediate disposal is not possible, stockpiling of the material. Management of the stockpiles in accordance with the requirements of the AQMP (JBS, 2012d).	Section 6.4.3	Remediation Contractor
	b. Termination and re-location of in-ground services by a licensed contractors as required	-	Remediation Contractor
4.	**EXCAVATION AND REMEDIATION OF CONTAMINATED SOILS**		
	a. Excavation of identified asbestos and shallow tar impacted soils	Section 6.4.4 and 6.4.5	Remediation Contractor
	b. Validation of remediation excavations	Section 7 and Sections 6.4.4. and 6.4.5	Remediation Consultant
	c. Treatment (as required) of excavated materials prior to off-site removal	Section 6.4.4	Remediation Contractor
	d. Validation testing / waste classification of excavated materials prior to off-site removal	Section 6.4.4 and 6.4.5	Remediation Consultant
	e. Disposal of materials to appropriate licensed facilities	Section 6.4.4 and 6.4.5	Remediation Contractor
5.	**MANAGEMENT OF FILL DURING EARTHWORKS – FILLING WORKS (Relocation of Ex-situ Fill)**		

[1] Building and demolition waste that is deemed to be not contaminated must be disposed of in accordance with relevant state regulations. Evidence of appropriate transports and disposal of any building and demolition waste must be retained by the Contractor.

Stage	Tasks	Barangaroo Central RAP Reference	Responsible Party for Completion
	a. Prior to acceptance of fill material from the Barangaroo Project Site obtain material characterisation[2] data for any imported fill to be place on the Site. Data must be in accordance with the pre-receipt requirements of the MTS (Item 1f) and obtained for each material type to be received.	Section 6.4.6 Section 7.3.5	Remediation Contractor / Remediation Consultant
	b. Prior to acceptance of material from sites other than the Barangaroo Project site, obtain a Material Characterisation Assessment which confirms the material is Virgin Excavated Natural Soil (VENM), Excavated Natural Soil (ENM), validated blended material or validated mulch. Data must be in accordance with the pre-receipt requirements of the MTS (Item 1f) and obtained for each material type to be received.	Section 6.4.6	Remediation Contractor / Remediation Consultant
	HOLD POINT[3] A – clearance of pre-receipt data prior to compliance		
	c. Commencement of fill with any material deemed acceptable for use on Barangaroo Central Site. Inspection and survey of volume/location details in accordance with the requirements of the MTS (Item 1f).	Section 7.3.5	Remediation Contractor / Remediation Consultant
	d. Routine status reports provide to BDA/Site Auditor to demonstrate compliance with RAP, this RWP and CEMP	-	Remediation Contractor / Remediation Consultant
	e. Site landscaping works once required ground levels are achieved.	-	Remediation Contractor
6.	**REMEDIATION/MANAGEMENT – Requirements of Long Term Management**		
	a. Review MTS data available for the Site on completion and determine requirements for long term monitoring/management of the Site.	Section 7.8.2	Remediation Consultant
	b. Requirements for long term monitoring/management of the Site endorsed by the Auditor.	-	Remediation Consultant / Site Auditor
	c. Undertake intrusive works for endorsed long-term requirements	Section 7.8.2	Remediation Contractor / Remediation Consultant
7.	**SITE DIS-ESTABLISHMENT**		
	a. Reinstate disconnected or new services as required.	-	Remediation Contractor
	b. Remove all site facilities associated with remediation/management works	-	Remediation Contractor

[2] Material characterisation data must demonstrate compliance with SAC in accordance with Section 6.2.1 and Section 6.2.2 of the RAP (JBS 2012)
[3] Hold Points are verification points beyond which work should not proceed further without written confirmation that the works can continue in accordance with the RAP (JBS 2012) and this RWP. Where review at the hold point stage de

Stage	Tasks	Barangaroo Central RAP Reference	Responsible Party for Completion
	c. Validate plant decontamination areas, or any areas disturbed during reconnection of services in accordance with endorsed CEMP	-	Remediation Consultant
8.	**REPORTING**		
	a. Completion of a Validation Report[4] for the site confirming the suitability of Barangaroo Central for its Stage 1 Public Domain use	Section 6.8.1	Remediation Consultant
	b. Completion of Long Term Environmental Monitoring Plan (LTEMP)[7] for the site.	Section 6.8.2	Remediation Consultant

[4] Reports should be consistent with the requirements of *Contaminated Sites: Guideline for Consultants Reporting on Contaminated Sites*, NSW EPA 1997 (EPA 1997)

Appendix C – Relevant Tables and Figures from Barangaroo Central DGI (JBS 2012a)

Source: Base Image www.nearmap.com (23-10-2011)

0 15 30 60 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

A4			
A	Original Issue - R04	RF	25-6-2012
Rev	Description	Drn.	Date:

Legend:

- Historic Groundwater Monitoring Well/Soil Sample Locations
- Historic Soil Sample Locations
- Approximate Site Boundary - Barangaroo Central
- Overlap of Area Already Assessed (Headland Park)
- Inaccessible for soil and groundwater sampling

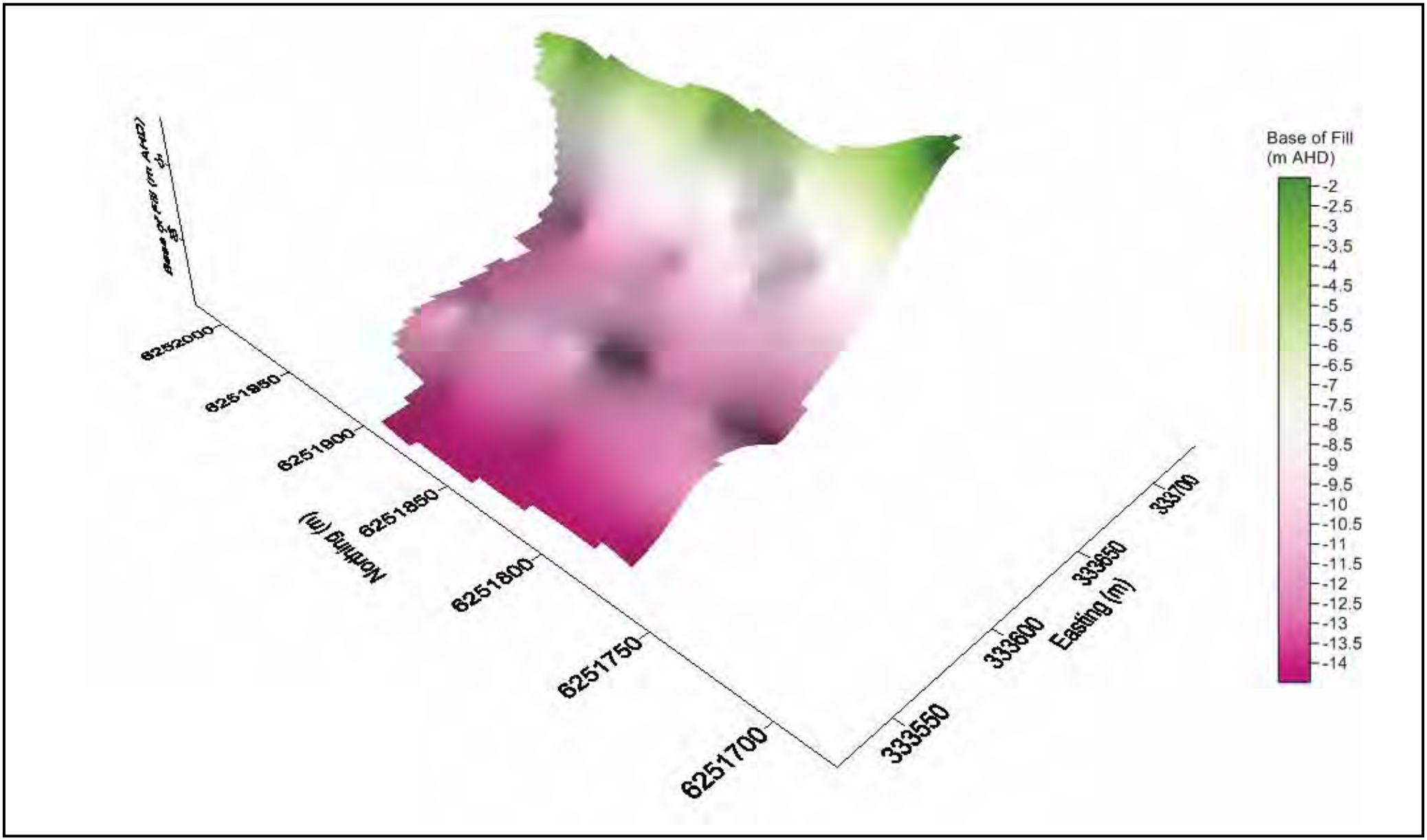
JBS ENVIRONMENTAL

Figure 5: Historical Soil and Groundwater Sample Locations

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_05



Rev	Description	Drn.	Date
A4			
A	Original Issue - R04	MP	12-4-2012

JBS ENVIRONMENTAL

Figure 6: Estimate of Fill Material on Barangaroo Central Site

Client: Barangaroo Delivery Authority

Project: Barangaroo Central

Job No: 42021 File Name: 42021_06

Source: Base Image www.nearmap.com (23-10-2011)

0 15 30 60 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
A	Original Issue - R04	RF	26-6-2012

Legend

- Soil Sample Locations (JBS May 2012)
- Historic Soil Sample Locations
- Approximate Site Boundary - Barangaroo Central
- Overlap of Area Already Assessed (Headland Park)
- Residential Building Basements / Carparks
- Inaccessible for soil and groundwater sampling
- Part of Declaration Area - Approximate Extent

JBS ENVIRONMENTAL

Figure 7: Current Soil Sample Locations

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_07

Source: Base Image www.nearmap.com (23-10-2011)

0 15 30 60 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

A4			
A	Original Issue - R04	RF	26-6-2012
Rev	Description	Drn.	Date:

Legend

- Groundwater Gauging Locations (JBS May 2012)
- Groundwater Monitoring Well Locations (JBS May 2012)
- Historic Groundwater Monitoring Well Locations
- Approximate Site Boundary - Barangaroo Central
- Overlap of Area Already Assessed (Headland Park)
- Residential Building Basements / Carparks
- Inaccessible for soil and groundwater sampling
- Part of Declaration Area - Approximate Extent

JBS ENVIRONMENTAL

Figure 8: Current Groundwater Monitoring Well Locations

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_08

Source: Base Image www.nearmap.com (23-10-2011)

0 15 30 60 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

A4			
A	Original Issue - R04	RF	5-7-2012
Rev	Description	Drn.	Date:

Legend:

- Soil Sample Locations (JBS May 2012)
- Historic Soil Sample Locations
- Approximate Site Boundary - Barangaroo Central
- Overlap of Area Already Assessed (Headland Park)
- Residential Building Basements / Carparks

JBS ENVIRONMENTAL

Figure 9: Extent of Soils in Unsaturated Zone Exceeding Human Health Risk Criteria

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_09

Source: Base Image www.nearmap.com (23-10-2011)

0 15 30 60 m

Scale: 1:1,500

Datum: MGA94 Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
A	Original Issue - R04	RF	5-7-2012

Legend:

- Soil Sample Locations (JBS May 2012)
- Historic Soil Sample Locations
- Approximate Site Boundary - Barangaroo Central
- Overlap of Area Already Assessed (Headland Park)
- Residential Building Basements / Carparks

JBS ENVIRONMENTAL

Figure 10: Extent of Soils in Unsaturated Zone Exceeding Protection of Surface Water Ecological Investigation Level

Client: Barangaroo Delivery Authority

Project: Barangaroo - Central

Job No: 42021 File Name: 42021_10

Project No. 42021
Barangaroo Central
Table 3 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Unsaturated Zone (>1m AHD)

							Metals								PAH													
							Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Field_ID	x coord	y coord	Elevation	Depth	Sample Date	Zone	SampleCode																						
BH501	333707.7	6251947	2.241852	0.2-0.3	2/05/2012	Unsaturated	72660-85	<4	<0.5	7	50	3	0.3	79	32	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH501	333707.7	6251947	1.941852	0.5-0.6	2/05/2012	Unsaturated	72660-86	<4	<0.5	11	54	120	0.3	53	100	<0.1	0.4	0.4	1.9	2.1	2.9	1.2	1.6	0.3	3.7	<0.1	1.2	0.1	1.7	3.6
BH501	333707.7	6251947	1.441852	1-1.1	2/05/2012	Unsaturated	72660-87	<4	<0.5	9	25	340	0.4	10	62	0.1	0.3	0.4	1.8	1.9	2.7	1.2	1.5	0.2	3.7	0.2	1.1	0.1	2.3	3.5
BH502	333696.6	6251974	2.190542	0.2-0.3	2/05/2012	Unsaturated	72660-74	<4	<0.5	6	58	2	<0.1	92	36	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH502	333696.6	6251974	1.190542	1.2-1.3	2/05/2012	Unsaturated	72660-75	11	<0.5	25	140	17	0.3	31	38	<0.1	<0.1	<0.1	0.2	0.09	<0.2	<0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.4	0.3
BH503	333682.7	6251958	2.135142	0.2-0.3	3/05/2012	Unsaturated	72647-14	<4	<0.5	7	62	3	<0.1	99	38	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH503	333682.7	6251958	1.835142	0.5-0.6	3/05/2012	Unsaturated	72647-15	<4	<0.5	11	99	100	0.3	23	82	<0.1	0.2	0.3	1.1	1.1	1.6	0.6	1.2	0.1	2.3	<0.1	0.6	0.2	1.2	2.3
BH503	333682.7	6251958	1.335142	1-1.1	3/05/2012	Unsaturated	72647-16	<4	<0.5	9	58	51	<0.1	9	52	<0.1	0.4	0.6	1.5	1.5	2.1	0.7	1.6	0.2	2.8	0.1	0.8	0.2	2.5	3
BH504	333688.4	6251926	2.303345	0.2-0.3	3/05/2012	Unsaturated	72647-27	<4	<0.5	10	80	4	<0.1	82	43	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH504	333688.4	6251926	2.003345	0.5-0.6	3/05/2012	Unsaturated	72647-28	<4	<0.5	11	42	77	0.1	43	74	<0.1	0.1	0.1	0.7	0.96	1.1	0.5	0.7	0.1	1.2	<0.1	0.4	<0.1	0.5	1.2
BH504	333688.4	6251926	1.503345	1-1.1	3/05/2012	Unsaturated	72647-29	4	<0.5	12	34	230	0.3	9	150	0.1	0.5	0.6	2.4	3.9	4.4	1.9	3	0.4	5.6	0.2	1.7	0.1	3.4	4.7
BH504	333688.4	6251926	1.003345	1.5-1.6	3/05/2012	Unsaturated	72647-30	5	<0.5	10	52	350	0.4	5	290	0.2	1.6	1.7	5.5	8.3	9.4	3.8	6.4	0.8	13	0.7	3.5	0.5	8	11
BH505	333694.2	6251879	2.040177	0.3-0.4	1/05/2012	Unsaturated	72660-61	<4	<0.5	10	71	4	<0.1	97	42	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH505	333694.2	6251879	1.840177	0.5-0.6	1/05/2012	Unsaturated	72660-62	6	<0.5	11	83	430	0.8	8	310	0.7	1.3	1.6	7.3	12	16	6	8.9	1.4	16	0.7	6	0.7	9.3	15
BH505	333694.2	6251879	1.440177	0.9-1	1/05/2012	Unsaturated	72660-63	7	<0.5	11	440	490	0.9	11	650	0.4	1	1	5.5	9.9	14	5.3	6.8	1.3	12	0.5	5.3	0.5	6.1	9.9
BH506D	333712.9	6251865	2.001018	0.2-0.3	1/05/2012	Unsaturated	72660-1	<4	<0.5	10	78	3	<0.1	88	40	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH506D	333712.9	6251865	1.701018	0.5-0.6	1/05/2012	Unsaturated	72660-2	5	<0.5	13	55	150	0.3	25	89	0.2	0.9	1.6	5.4	6.1	8.2	2.2	5.6	0.6	11	0.4	2.9	0.6	7.3	11
BH506D	333712.9	6251865	1.201018	1-1.1	1/05/2012	Unsaturated	72660-3	5	<0.5	12	32	110	0.2	5	95	<0.1	0.4	0.4	2.5	2.8	4.1	1	2.5	0.3	4.3	0.1	1.4	0.2	1.7	4.4
BH507	333720.5	6251832	2.016553	0.2-0.3	4/05/2012	Unsaturated	72750-10	<4	<0.5	7	64	2	<0.1	89	35	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH507	333720.5	6251832	1.816553	0.4-0.5	4/05/2012	Unsaturated	72750-11	6	<0.5	9	90	220	0.6	7	180	0.1	0.6	1	3.5	4.1	5.6	2.1	3.7	0.5	6.7	0.3	2.3	0.3	3.7	6.7
BH507	333720.5	6251832	1.316553	0.9-1	4/05/2012	Unsaturated	72750-12	9	<0.5	9	56	240	0.7	8	150	0.2	0.7	1.1	3.7	4.5	6	2.2	3.4	0.5	7.7	0.4	2.7	0.2	4.7	7.6
BH508	333694.9	6251832	2.169557	0.2-0.3	4/05/2012	Unsaturated	72750-20	<4	<0.5	41	55	14	<0.1	23	250	<0.1	<0.1	0.2	0.7	1.1	1.5	0.7	0.9	0.1	1.6	<0.1	0.7	<0.1	0.6	1.7
BH508	333694.9	6251832	1.969557	0.4-0.5	4/05/2012	Unsaturated	72750-21	<4	<0.5	6	49	36	0.7	8	67	<0.1	<0.1	<0.1	0.3	0.43	0.6	0.2	0.3	<0.1	0.5	<0.1	0.2	<0.1	0.2	0.5
BH508	333694.9	6251832	1.469557	0.9-1	4/05/2012	Unsaturated	72750-22	<4	<0.5	7	34	38	0.2	12	78	<0.1	0.1	0.1	0.5	0.61	0.9	0.3	0.5	<0.1	0.9	<0.1	0.3	<0.1	0.4	0.9
BH509	333713.5	6251892	2.170392	0.2-0.3	1/05/2012	Unsaturated	72660-14	<4	<0.5	12	72	4	<0.1	90	40	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH509	333713.5	6251892	1.870392	0.5-0.6	1/05/2012	Unsaturated	72660-15	<4	<0.5	11	67	110	0.3	27	81	0.1	0.3	0.4	1.6	1.7	2.4	1.1	1.4	0.2	3.3	0.2	1.1	0.3	1.8	3.3
BH509	333713.5	6251892	1.370392	1-1.1	1/05/2012	Unsaturated	72660-16	<4	<0.5	84	37	86	0.2	22	58	0.2	0.6	1.2	2.6	4.2	5.9	2.3	3.6	0.5	6.2	0.4	2.2	0.6	7.3	6.1
BH510	333670	6251896	2.216963	0.2-0.3	4/05/2012	Unsaturated	72750-1	<4	<0.5	12	63	11	<0.1	52	43	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH510	333670	6251896	2.016963	0.4-0.5	4/05/2012	Unsaturated	72750-2	5	<0.5	6	19	12	<0.1	6	20	<0.1	<0.1	<0.1	0.3	0.34	0.5	0.2	0.4	<0.1	0.7	<0.1	0.2	<0.1	0.2	0.7
BH510	333670	6251896	1.516963	0.9-1	4/05/2012	Unsaturated	72750-3	<4	<0.5	7	30	240	0.2	4	160	<0.1	0.3	0.5	1.9	2.5	3.3	1.5	2.1	0.3	3.6	<0.1	1.5	<0.1	1.6	3.9
BH510	333670	6251896	1.016963	1.4-1.5	4/05/2012	Unsaturated	72750-4	<4	<0.5	9	45	520	0.2	6	200	0.2	2	4.2	11	12	15	6.3	11	1.6	22	1.1	6.6	0.6	19	23
BH511	333652.1	6251942	2.345451	0.2-0.3	4/05/2012	Unsaturated	72750-29	<4	<0.5	5	57	1	<0.1	80	31	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH511	333652.1	6251942	2.145451	0.4-0.5	4/05/2012	Unsaturated	72750-30	<4	<0.5	13	19	34	<0.1	16	50	<0.1	0.1	<0.1	0.4	0.57	0.9	0.3	0.5	<0.1	0.7	<0.1	0.3	<0.1	0.3	0.8
BH511	333652.1	6251942	1.645451	0.9-1	4/05/2012	Unsaturated	72750-31	<4	<0.5	10	23	40	<0.1	19	50	<0.1	<0.1	<0.1	0.2	0.28	0.5	0.2	0.2	<0.1	0.4	<0.1	0.2	<0.1	0.2	0.4
BH511	333652.1	6251942	1.145451	1.4-1.5	4/05/2012	Unsaturated	72750-32	<4	<0.5	9	9	18	<0.1	5	35	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH512	333633.9	6251924	2.127733	0.2-0.3	9/05/2012	Unsaturated	72984-1	<4	<0.5	8	59	3	<0.1	71	32	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1
BH512	333633.9	6251924	1.927733	0.4-0.5	9/05/2012	Unsaturated	72984-2	<4	<0.5	11	4	9	<0.1	4	16	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH512	333633.9	6251924	1.427733	0.9-1	9/05/2012	Unsaturated	72984-3	<4	<0.5	10	4	10	<0.1	4	21	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH513	333625.4	6251880	2.412834	0.1-0.2	9/05/2012	Unsaturated	72984-19	<4	<0.5	17	50	19	<0.1	17	120	<0.1	0.2	0.3	1.2	1.8	2.4	1	1.2	0.1	2.2	<0.1	1.1	<0.1	0.9	2.3
BH513	333625.4	6251880	2.112834	0.4-0.5	9/05/2012	Unsaturated	72984-20	<4	<0.5	5	8	8	<0.1	4	21	<0.1	<0.1	<0.1	0.2	0.26	0.4	0.1	0.2	<0.1	0.4	<0.1	0.2	<0.1	0.3	0.4
BH513	333625.4	6251880	1.612834	0.9-1	9/05/2012	Unsaturated	72984-21	<4	<0.5	3	2	6	<0.1	1	12	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH513	333625.4	6251880	1.112834	1.4-1.5	9/05/2012	Unsaturated	72984-22	<4	<0.5	4	4	9	<0.1	2	15	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH514	333642.5	6251859	2.228934	0.5-0.6	9/05/2012	Unsaturated	72989-2	<4	<0.5	7	48	10	<0.1	33	33	<0.1	<0.1	<0.1	<0.1	0.41	0.7	0.3	0.1	<0.1	0.1	<0.1	0.3	<0.1	<0.1	0.1
BH514	333642.5	6251859	1.728934	1-1.1	9/05/2012	Unsaturated	72989-3	<4	<0.5	7	3	9	<0.1	3	18	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH514	333642.5	6251859	1.228934	1.5-1.6	9/05/2012	Unsaturated	72989-4	<4	<0.5	5	4	31	<0.1	2	49	<0.1	<0.1	<0.1	0.1	0.21	0.6	0.1	0.3	<0.1	0.4	<0.1	0.1	<0.1	0.4	0.4
BH515	333643.2	6251826	2.506299	0.2-0.3	9/05/2012	Unsaturated	72989-16	<4	<0.5	6	54	3	<0.1	66	31	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH515	333643.2	6251826	2.206299	0.5-0.6	9/05/2012	Unsaturated	72989-17	<4	<0.5	11	16	16	<0.1	23	39	<0.1	<0.1	<0.1	<0.1	0.06	0.2	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH515	333643.2	6251826	1.706299	1-1.1	9/05/2012	Unsaturated	72989-18	<4	<0.5	7	5	14	<0.1	4	23	<0.1	<0.1	<0.1	<0.1	0.1	0.3	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH515	333643.2	6251826	1.206299	1.5-1.6	9/05/2012	Unsaturated	72989-19	<4	<0.5	6	5	21	<0.1	2	24	<0.1	<0.1	<0.1	0.1	0.18	0.5	0.1	0.2	<0.1	0.3	<0.1	<0.1	<0.1	0.3	0.3
BH516	333647.2	6251898	2.24321	0.2-0.3	3/05/2012	Unsaturated	72647-1	<4	<0.5	19	34	36	<0.1	31	91	<0.1	0.1	0.3	1.1	1.9	2.4	1.7	1.3	0.2	2.1	<0.1	1.5	<0.1	0.8	2.3
BH516	333647.2	6251898	1.94321	0.5-0.6	3/05/2012	Unsaturated	72647-2	<4	<0.5	17	46	23	<0.1	38	70	<0.1	0.1	0.1	0.4	0.61	0.8	0.4	0.5	<0.1	0.8	<0.1	0.4	<0.1	0.3	0.8
BH516	333647.2	6251898	1.44321	1-1.1	3/05/2012	Unsaturated	72647-3	<4	<0.5	14	28	38	<0.1	13	61	<0.1	0.1	0.1	0.4	0.49	0.7	0.3	0.4	<0.1	0.8	<0.1	0.3	<0.1	0.4	0.8
BH517	333652.2	6251740	2.101501	0.5	23/05/2012	Unsaturated	74005-1	<4	<0.5	15	34	350	0.2	7	69	0.1	2.1	2.1	7.9	9.6	14	5	7.5	1.2	13	0.5	5	0.9	5.7	14
BH517	333652.2	6251740	1.601501	1	23/05/2012	Unsaturated	74005-2	<4	<0.5	10	38	150	0.2	7	64	0.3	3.7	3.6	13	15	21	7.1	12	1.8	22	1.1	7	1.6	11	24
BH517	333652.2	6251740	1.101501	1.5	23/05/2012	Unsaturated	74005-3	-	-	-	-	-	-	-	-	0.2	2.9	3.2	8.7	10	14	4.7	7.8	1.2	16	1	4.6	1.2	9.5	17
BH518	333722.4	6251790	2.397784	0.1-0.2	18/05/2012	Unsaturated	73678-11	<4	<0.5	9	61	4	<0.1	90	39	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
BH518	333722.4	6251790	1.597784	0.9-1	18/05/2012	Unsaturated	73678-13	49	<0.5	11	76	1000	0.4	13	180	0.4	0.7	1	3.4	3.8	5.9	2.1	3.4	0.5	7	0.4	2.3	0.8	4	7.1
BH519	333670.7	6251807	2.534637	0.2-0.3	10/05/2012	Unsaturated	73247-8	<4	<0.5	11	64	3	<0.1	81	37	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH519	333670.7	6251807	2.234637	0.5-0.6	10/05/2012	Unsaturated	73247-9	<4	<0.5	9	14	38	<0.1	13	41	<0.1	0.2	0.2	0.5	0.6	0.9	0.3	0.5	<0.1	1.1	<0.1	0.4	<0.1	0.9	1.1
BH519	333670.7	6251807	1.734637	1-1.1	10/05/2012	Unsaturated	73247-10	<4	<0.5	30	10	35	0.1	4	32	0.1	0.1	0.3	0.7	0.72	1.3	0.4	0.7	<0.1	1.6	0.2	0.5	<0.1	1.2	1.7
BH519	333670.7	6251807	1.234637	1.5-1.6	10/05/2012	Unsaturated	73247-11	<4	<0.5	7	2	9	<0.1	1	46	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH520	333623.8	6251800	2.240476	0.2-0.3	10/05/2012	Unsaturated	73247-20	<4	<0.5	10	69	3	<0.1	71	35	<0.1	<0.1	<0.1	<0.1	0.09	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.2
BH520	333623.8	6251800	1.940476	0.5-0.6	10/05/2012	Unsaturated	73247-21	<4	<0.5	9	62	4	<0.1	65	33	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH520	333623.8	6251800	1.440476	1-1.1	10/05/2012	Unsaturated	73247-22	<4	<0.5	12	12	27	<0.1	11	51	<0.1	<0.1	<0.1	0.1	0.17	0.3	0.1	0.1	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.3
BH521	333582.5	6251918	2.224002	0.1-0.2	7/05/2012	Unsaturated	72848-1	<4	<0.5	7	66	2	<0.1	93	38	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	1.824002	0.5-0.6	7/05/2012	Unsaturated	72848-2	<4	<0.5	10	39	6	<0.1	47	39	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	1.374002	1	7/05/2012	Unsaturated	72848-3	<4	<0.5	12	16	9	<0.1	25	50	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Project No. 42021
Barangaroo Central
Table 3 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Unsaturated Zone (>1m AHD)

								Metals								PAH													
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Field_ID	x coord	y coord	Elevation	Depth	Sample Date	Zone	SampleCode																							
BH522	333602.3	6251810	1.772199	0.5-0.6	9/05/2012	Unsaturated	72989-34	<4	<0.5	7	6	13	<0.1	5	26	<0.1	0.2	0.3	0.6	0.46	0.7	0.2	0.5	<0.1	1.3	0.1	0.2	<0.1	1.2	1.2
BH522	333602.3	6251810	1.272199	1-1.1	9/05/2012	Unsaturated	72989-35	<4	<0.5	15	13	16	<0.1	5	23	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH523	333600.6	6251935	2.242337	0.2-0.3	7/05/2012	Unsaturated	72848-17	<4	<0.5	7	53	2	<0.1	89	32	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH523	333600.6	6251935	2.042337	0.4-0.5	7/05/2012	Unsaturated	72848-18	<4	<0.5	7	7	7	<0.1	5	18	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH523	333600.6	6251935	1.542337	0.9-1	7/05/2012	Unsaturated	72848-19	<4	<0.5	11	10	14	<0.1	10	30	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH523	333600.6	6251935	1.042337	1.4-1.5	7/05/2012	Unsaturated	72848-20	<4	<0.5	5	15	17	<0.1	2	20	<0.1	<0.1	<0.1	0.1	0.1	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH524	333571.6	6251814	1.936112	0.4-0.5	8/05/2012	Unsaturated	72910-1	<4	<0.5	8	11	20	<0.1	7	33	<0.1	<0.1	<0.1	0.1	0.13	0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH524	333571.6	6251814	1.336112	1-1.1	8/05/2012	Unsaturated	72910-2	<4	<0.5	9	8	10	<0.1	10	31	<0.1	<0.1	<0.1	<0.1	0.06	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.1
BH525D	333568.1	6251818	1.543829	0.8-0.9	1/05/2012	Unsaturated	72660-26	<4	<0.5	11	11	22	<0.1	11	33	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH525D	333568.1	6251818	1.043829	1.3-1.4	1/05/2012	Unsaturated	72660-27	<4	<0.5	11	17	13	<0.1	8	25	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH525S	333567.9	6251819	2.043516	0.3-0.4	1/05/2012	Unsaturated	72660-43	<4	<0.5	10	17	18	<0.1	9	39	<0.1	0.2	0.2	0.5	0.34	0.5	0.1	0.4	<0.1	0.9	0.1	0.1	0.1	0.7	0.9
BH525S	333567.9	6251819	1.843516	0.5-0.6	1/05/2012	Unsaturated	72660-44	<4	<0.5	10	18	31	<0.1	8	45	<0.1	0.3	0.3	0.7	0.48	0.8	0.1	0.6	<0.1	1.4	0.1	0.2	<0.1	1	1.3
BH526	333548.9	6251878	1.752963	0.6-0.7	7/05/2012	Unsaturated	72863-1	<4	<0.5	10	9	26	<0.1	9	37	<0.1	<0.1	<0.1	0.7	0.74	1.1	0.3	0.8	<0.1	1.2	<0.1	0.3	<0.1	0.5	1.3
BH526	333548.9	6251878	1.352963	1-1.1	7/05/2012	Unsaturated	72863-2	<4	<0.5	10	8	27	<0.1	6	34	<0.1	<0.1	<0.1	<0.1	0.09	<0.2	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH527	333554.7	6251919	2.244327	0.2-0.3	7/05/2012	Unsaturated	72863-16	<4	<0.5	7	61	3	<0.1	96	36	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH527	333554.7	6251919	1.944327	0.5-0.6	7/05/2012	Unsaturated	72863-17	<4	<0.5	9	25	57	<0.1	8	40	<0.1	<0.1	<0.1	0.3	0.52	0.8	0.3	0.5	<0.1	0.6	<0.1	0.3	<0.1	0.3	0.6
BH527	333554.7	6251919	1.444327	1-1.1	7/05/2012	Unsaturated	72863-18	13	<0.5	12	<1	10	<0.1	<1	2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	1.865648	0.5-0.6	10/05/2012	Unsaturated	73247-30	<4	<0.5	9	22	16	<0.1	7	28	<0.1	0.3	0.3	0.9	0.98	1.4	0.4	0.8	<0.1	1.8	0.1	0.5	0.1	1	1.7
BH528	333571.2	6251794	1.365648	1-1.1	10/05/2012	Unsaturated	73247-31	<4	<0.5	26	28	17	<0.1	64	57	<0.1	0.1	<0.1	0.3	0.33	0.5	0.1	0.3	<0.1	0.6	<0.1	0.2	<0.1	0.3	0.5
BH529D	333560.4	6251773	1.775913	0.6	14/05/2012	Unsaturated	73242-11	5	<0.5	12	5	36	<0.1	1	17	<0.1	<0.1	<0.1	0.2	0.27	0.4	0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.3	0.5
BH529D	333560.4	6251773	1.375913	1	14/05/2012	Unsaturated	73242-12	<4	<0.5	11	13	15	<0.1	14	41	<0.1	<0.1	<0.1	0.2	0.25	0.4	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.3	0.5
BH530	333671.7	6251915	2.156345	0.2-0.3	4/05/2012	Unsaturated	72744-1	<4	<0.5	10	65	2	<0.1	65	34	<0.1	<0.1	<0.1	0.2	0.16	0.3	0.1	0.2	<0.1	0.7	<0.1	0.1	<0.1	0.6	0.6
BH530	333671.7	6251915	1.856345	0.5-0.6	4/05/2012	Unsaturated	72744-2	<4	<0.5	9	46	36	0.1	41	51	<0.1	0.5	0.6	2.9	4	5.2	1.7	2.9	0.3	4.1	<0.1	1.9	0.1	1.6	4.7
BH530	333671.7	6251915	1.356345	1-1.1	4/05/2012	Unsaturated	72744-3	5	<0.5	18	37	140	2	24	100	<0.1	0.2	0.4	1.6	2	2.8	0.8	1.6	0.2	2.6	<0.1	0.9	<0.1	0.8	2.9
BH531	333552.7	6251858	1.854683	0.5-0.6	7/05/2012	Unsaturated	72863-9	6	<0.5	14	11	35	<0.1	1	24	<0.1	<0.1	<0.1	0.1	0.17	0.3	0.1	0.2	<0.1	0.2	<0.1	0.1	<0.1	0.1	0.3
BH531	333552.7	6251858	1.354683	1-1.1	7/05/2012	Unsaturated	72863-10	<4	<0.5	11	6	18	<0.1	2	14	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH532	333567.2	6251900	1.885194	0.5-0.6	8/05/2012	Unsaturated	72909-4	4	<0.5	7	7	26	<0.1	2	18	<0.1	<0.1	<0.1	0.1	0.12	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2
BH532	333567.2	6251900	1.385194	1-1.1	8/05/2012	Unsaturated	72909-5	<4	<0.5	10	10	14	<0.1	4	31	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH533	333676.3	6251855	2.387538	0.2-0.3	8/05/2012	Unsaturated	72908-10	<4	<0.5	8	62	2	<0.1	77	36	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH533	333676.3	6251855	2.187538	0.4-0.5	8/05/2012	Unsaturated	72908-11	<4	<0.5	37	32	42	<0.1	8	46	<0.1	<0.1	<0.1	0.2	0.3	0.5	0.2	0.2	<0.1	0.4	<0.1	0.2	<0.1	0.2	0.4
BH533	333676.3	6251855	1.687538	0.9-1	8/05/2012	Unsaturated	72908-12	<4	<0.5	33	29	47	<0.1	16	52	<0.1	<0.1	<0.1	0.2	0.29	0.4	0.1	0.2	<0.1	0.4	<0.1	0.2	<0.1	0.3	0.5
BH533	333676.3	6251855	1.187538	1.4-1.5	8/05/2012	Unsaturated	72908-13	<4	<0.5	17	25	380	0.1	5	170	<0.1	0.1	0.1	0.6	0.79	1.1	0.4	0.6	<0.1	1.1	<0.1	0.4	<0.1	0.6	1.2
BH534	333623	6251907	2.171312	0.15-0.25	9/05/2012	Unsaturated	72988-1	<4	<0.5	6	51	3	<0.1	62	29	<0.1	<0.1	<0.1	0.1	0.09	<0.2	<0.1	0.1	<0.1	0.4	<0.1	<0.1	<0.1	0.3	0.3
BH534	333623	6251907	1.921312	0.4-0.5	9/05/2012	Unsaturated	72988-2	<4	<0.5	7	11	99	0.2	7	79	<0.1	<0.1	<0.1	0.1	0.14	0.2	0.1	0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	0.2
BH534	333623	6251907	1.421312	0.9-1	9/05/2012	Unsaturated	72988-3	<4	<0.5	9	22	130	0.2	11	100	<0.1	0.2	0.3	1	0.96	1.4	0.5	1	0.1	1.9	<0.1	0.5	<0.1	1	2.2
BH535	333570.3	6251854	1.965731	0.4-0.5	11/05/2012	Unsaturated	73154-32	<4	<0.5	7	11	32	<0.1	5	34	<0.1	<0.1	<0.1	0.2	0.25	0.4	0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.3	0.5
BH535	333570.3	6251854	1.465731	0.9-1	11/05/2012	Unsaturated	73154-33	<4	<0.5	9	5	16	<0.1	6	30	<0.1	<0.1	<0.1	<0.1	0.09	<0.2	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.2
BH536D	333604.7	6251798	1.771852	0.5-0.6	11/05/2012	Unsaturated	73154-9	<4	<0.5	10	25	11	<0.1	5	37	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH536D	333604.7	6251798	1.271852	1-1.1	11/05/2012	Unsaturated	73154-10	<4	<0.5	7	10	32	<0.1	4	28	<0.1	<0.1	0.1	0.4	0.37	0.6	0.2	0.4	<0.1	0.8	<0.1	0.2	<0.1	0.5	0.7
BH537	333706.8	6252000	2.387006	0.01-0.2	17/05/2012	Unsaturated	73540-1	<4	<0.5	5	58	3	<0.1	81	32	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH537	333706.8	6252000	2.042006	0.4-0.5	17/05/2012	Unsaturated	73540-2	<4	<0.5	9	54	120	0.2	31	100	0.1	0.1	0.7	2.5	2.7	3.7	1.7	2.2	0.3	5	<0.1	1.6	0.2	2.5	5.2
BH537	333706.8	6252000	1.542006	0.9-1	17/05/2012	Unsaturated	73540-3	<4	<0.5	9	35	140	0.2	23	91	<0.1	0.4	0.6	2.4	2.4	3.4	1.4	1.8	0.3	4.7	<0.1	1.4	0.1	2.2	4.7
BH537	333706.8	6252000	1.042006	1.4-1.5	17/05/2012	Unsaturated	73540-4	7	<0.5	13	47	210	0.3	12	140	0.3	0.6	1.1	3.8	3.9	5.4	3	3	0.7	7.3	0.5	2.8	0.7	4.8	6.5
BH538	333702.2	6251812	2.148839	0.2-0.3	10/05/2012	Unsaturated	73247-1	<4	<0.5	10	74	3	<0.1	71	38	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH538	333702.2	6251812	1.848839	0.5-0.6	10/05/2012	Unsaturated	73247-2	7	<0.5	10	86	480	0.6	8	140	0.5	0.6	1.2	4.6	5.1	7.3	2.4	4.5	0.5	9.7	0.7	2.6	0.9	6.8	9.3
BH538	333702.2	6251812	1.348839	1-1.1	10/05/2012	Unsaturated	73247-3	7	<0.5	18	76	300	0.8	15	140	1.9	1.1	2.6	10	12	17	5.5	9.9	1.3	21	2	6	4.1	16	19
BH539	333677.6	6251738	2.369516	0.15-0.25	18/05/2012	Unsaturated	73678-22	<4	<0.5	10	50	28	0.1	68	53	<0.1	<0.1	0.1	0.3	0.34	0.5	0.2	0.3	<0.1	0.6	<0.1	0.2	<0.1	0.3	0.6
BH539	333677.6	6251738	2.119516	0.4-0.5	18/05/2012	Unsaturated	73678-23	-	-	-	-	-	-	-	-	<0.1	0.2	0.2	0.7	0.66	1	0.4	0.6	<0.1	1.3	<0.1	0.4	<0.1	0.9	1.3
BH540D	333682.6	6251762	2.474919	0.15-0.25	17/05/2012	Unsaturated	73540-14	<4	<0.5	7	59	3	<0.1	84	35	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH540D	333682.6	6251762	2.224919	0.4-0.5	17/05/2012	Unsaturated	73540-15	<4	<0.5	10	18	83	<0.1	17	46	<0.1	0.3	0.3	1.2	1.3	1.7	0.7	1.1	0.1	2.5	<0.1	0.7	<0.1	1.3	2.6
BH540D	333682.6	6251762	1.724919	0.9-1	17/05/2012	Unsaturated	73540-16	<4	<0.5	11	17	27	<0.1	20	30	<0.1	0.2	0.2	0.6	0.6	0.8	0.3	0.5	<0.1	1.4	0.1	0.3	<0.1	0.9	1.4
BH541D	333675.2	6251712	1.921312	0.4-0.5	19/05/2012	Unsaturated	73677-24	<4	<0.5	11	25	93	0.3	15	67	0.1	0.5	0.6	1.3	1.3	1.9	0.4	1.1	0.1	2.7	0.3	0.5	0.5	1.9	2.6
BH541D	333675.2	6251712	1.421312	0.9-1	19/05/2012	Unsaturated	73677-25	<4	<0.5	12	110	290	0.4	19	91	<0.1	0.3	0.5	1.5	1.5	2.1	0.5	1.3	0.1	2.6	0.2	0.6	0.2	1.6	2.6
BH542	333668	6251690	1.798813	0.4-0.5	19/05/2012	Unsaturated	73677-2	<4	<0.5	16	28	92	0.5	28	94	<0.1	0.2	0.4	1.1	1.2	1.9	0.5	1.2	0.1	2.2	0.2	0.6	0.1	1.5	2.2
BH542	333668	6251690	1.298813	0.9-1	19/05/2012	Unsaturated	73677-3	<4	<0.5	12	18	120	5.2	11	68	0.1	0.3	0.7	1.7	1.8	2.6	0.7	1.5	0.2	3.2	0.4	0.8	0.2	2.4	3.4
BH543	333567.4	6251731	1.814779	0.6-0.7	15/05/2012	Unsaturated	73391-1	<4	<0.5	12	16	38	<0.1	19	64	0.2	0.8	1.1	2.4	2.4	3.2	1	2	0.3	4.9	0.6	1.1	0.8	3.7	4.1
BH543	333567.4	6251731	1.414779	1-1.1	15/05/2012	Unsaturated	73391-2	<4	<0.5	8	8	26	<0.1	5	37	0.1	0.5	0.8	1.5	1.4	1.8	0.6	1.2	0.1	3.4	0.4	0.6	0.8	3.2	3.4
BH544D	333569.7	6251711	1.853805	0.55-0.65	16/05/2012	Unsaturated	73446-8	<4	<0.5	8	14	36	<0.1	10	46	<0.1	<0.1	0.1	0.3	0.3	0.4	0.2	0.3	<0.1	0.6	<0.1	0.2	<0.1	0.4	0.6
BH544D	333569.7	6251711	1.503805	0.9-1	16/05/2012	Unsaturated	73446-9	<4	<0.5	13	18	66	<0.1	18	120	<0.1	0.1	0.2	0.8	0.99	1.2	0.6	0.6	0.1	1.6	<0.1	0.5	<0.1	0.8	1.7
BH544D	333569.7	6251711	1.003805	1.4-1.5	16/05/2012	Unsaturated	73446-10	<4	<0.5	9	11	45	<0.1	5	62	<0.1	<0.1	0.1	0.4	0.42	0.6	0.2	0.4	<0.1	0.8	<0.1	0.2	<0.1	0.5	0.9
BH545	333606.3	6251763	1.868031	0.4-0.5	24/05/2012	Unsaturated	73980-1	<4	<0.5	8	58	37	0.2	5	42	0.1	0.7	1.4	4.5	4.5	6.3	2.1	4.4	0.4	9.1	0.4	2	0.3	6.3	9.3
BH545	333606.3	6251763	1.368031	0.9-1	24/05/2012	Unsaturated	73980-2	<4	<0.5	10	54	48	0.1	6	53	0.2	0.9	1.1	2.7	2.9	4.1	1.3	2.5	0.3	5.8	0.5	1.4	0.5	4.4	5.6
BH546	333600.3	6251727	1.777544	0.5	23/05/2012	Unsaturated	74005-13	<4	<0.5	13	30	12	<0.1	5	26	<0.1	0.1	0.2	0.5	0.5	0.7	0.2	0.4	<0.1	0.9	<0.1	0.2	<0.1	0.5	0.9
BH546	333600.3	6251727	1.277544	1	23/05/2012	Unsaturated	74005-14	-	-	-	-	-	-	-	-	<0.1	0.2	0.4	1	1.1	1.5	0.4	1	<0.1	2.5	0.1	0.4	0.2	1.4	2.3
BH547	333601.3	6251708	1.927705	0.5	23/05/2012	Unsaturated	74005-23	<4	<0.5	14	55	67	0.1	11	44	0.7	5.8	7.3	16	18	26	7.4	15	2	31	3.6	8.7	2.8	21	29
BH547	333601.3	6251708	1.427705	1	23/05/2012	Unsaturated	74005-24	7	<0.5	14	45	100	0.3	18	68	1.1	8.7	11	24	30	37	10	22	2.8	64	5.9	12	4.2	33	61
BH548	333636.4	6251758	2.125347	0.4-0.5	24/05/2012	Unsaturated	73980-9	<4	<0.5	12	27	37	0.1	28	52	<0.1	0.6	0.6	1.7	1.9	2.7	0.9	1.6	0.2	3.5	0.2	1	0.3	2.2	3.4

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Table 3 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Unsaturated Zone (>1m AHD)

								Metals								PAH														
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Field_ID	**x coord**	**y coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCode**																							
BH548	333636.4	6251758	1.625347	0.9-1	24/05/2012	Unsaturated	73980-10	-	-	-	-	-	-	-	-	<0.1	0.3	0.3	0.8	0.85	1.3	0.5	0.8	0.1	1.6	0.1	0.5	0.1	1.2	1.6
BH548	333636.4	6251758	1.125347	1.4-1.5	24/05/2012	Unsaturated	73980-11	<4	<0.5	13	30	93	0.4	19	64	<0.1	0.3	0.3	1	1.1	1.6	0.6	0.9	0.1	2	0.1	0.6	0.2	1.4	2
BH549	333681.3	6251777	2.227188	0.4-0.5	25/05/2012	Unsaturated	74023-2	<4	0.8	11	52	21	<0.1	61	48	<0.1	<0.1	<0.1	0.2	0.24	0.4	0.2	0.3	<0.1	0.4	<0.1	0.2	<0.1	0.2	0.4
BH550	333638.3	6251711	2.162472	0.15-0.25	25/05/2012	Unsaturated	74023-13	<4	<0.5	10	71	2	<0.1	80	38	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH551	333593	6251746	1.848296	0.45-0.55	24/05/2012	Unsaturated	73980-17	<4	<0.5	11	38	39	<0.1	10	99	0.2	1.4	1.7	4	4.4	6.2	1.9	3.7	0.5	8.7	1	2.1	1	5.7	8.2
BH551	333593	6251746	1.398296	0.9-1	24/05/2012	Unsaturated	73980-18	<4	<0.5	10	29	67	0.2	7	63	0.4	2.7	3.5	8.4	9.1	13	3.7	7.9	1	17	1.5	4.2	1.5	12	16
BH552	333702.6	6251790	1.906845	0.4-0.5	25/05/2012	Unsaturated	74023-26	6	<0.5	11	45	260	0.5	13	96	<0.1	0.3	0.6	2.1	2.1	3.1	0.9	1.9	0.1	4.2	0.2	1.1	0.1	2.6	4.2

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Table 4 - Soil Analytical Results: Volatile Organic Compounds - Unsaturated Zone (>1m AHD)

							Chlorinated Hydrocarbons															
							1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Bromodichloromethane	Bromoform	Carbon tetrachloride
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCode**																
BH525S	333567.9	6251819	1.843516	0.5-0.6	1/05/2012	Unsaturated	72660-44	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH525S	333567.9	6251819	2.043516	0.3-0.4	1/05/2012	Unsaturated	72660-43	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

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Table 4 - Soil Analytical Results: Volatile Organic Compounds - Unsaturated Zone (>1m AHD)

								Chlorinated Hydrocarbons													Halogenated Benzenes			
								Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCo**																	
BH525S	333567.9	6251819	1.843516	0.5-0.6	1/05/2012	Unsaturated	72660-44	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH525S	333567.9	6251819	2.043516	0.3-0.4	1/05/2012	Unsaturated	72660-43	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

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Table 4 - Soil Analytical Results: Volatile Organic Compounds - Unsaturated Zone (>1m AHD)

								Halogenated Hydrocarbons					Solvents	MAH						
								1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Chlorobenzene	1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Trichlorofluoromethane	Cyclohexane	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total	1,2,4-trimethylbenzene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								1	1	1	1	1	1	1	1	1	1	0.1	1	0.5	2	1		1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCo**																	
BH525S	333567.9	6251819	1.843516	0.5-0.6	1/05/2012	Unsaturated	72660-44	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<1	<0.5	<2	<1	<3	<1
BH525S	333567.9	6251819	2.043516	0.3-0.4	1/05/2012	Unsaturated	72660-43	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.1	<1	<0.5	<2	<1	<3	<1

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Table 4 - Soil Analytical Results: Volatile Organic Compounds - Unsaturated Zone (>1m AHD)

								MAH							
								1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	Styrene	tert-butylbenzene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCo**								
BH525S	333567.9	6251819	1.843516	0.5-0.6	1/05/2012	Unsaturated	72660-44	<1	<1	<1	<1	<1	<1	<1	<1
BH525S	333567.9	6251819	2.043516	0.3-0.4	1/05/2012	Unsaturated	72660-43	<1	<1	<1	<1	<1	<1	<1	<1

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Table 5 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Saturated Zone (<1m AHD)

								Metals								PAH											
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCode**																							
BH501	333707.7	6251947	0.941852	1.5-1.6	2/05/2012	Saturated	72660-88	4	<0.5	10	12	1900	0.4	3	59	<0.1	<0.1	0.1	0.3	0.42	0.6	0.2	0.3	<0.1	0.7	<0.1	0.2	<0.1	0.4	0.7
BH501	333707.7	6251947	0.441852	2-2.1	2/05/2012	Saturated	72660-89	<4	<0.5	11	25	750	0.4	16	67	<0.1	0.1	0.2	0.7	0.72	1	0.4	0.7	<0.1	1.3	<0.1	0.4	<0.1	0.7	1.3
BH501	333707.7	6251947	-0.558148	3-3.1	2/05/2012	Saturated	72660-90	-	-	-	-	-	-	-	-	0.1	1.5	1.6	3.5	3.9	5.5	2.4	3.4	0.5	7.4	0.7	2.3	0.4	6	7.3
BH501	333707.7	6251947	-1.558148	4-4.1	2/05/2012	Saturated	72660-91	5	<0.5	7	40	160	0.6	5	110	0.5	2.1	4.5	6.5	8.7	12	3.4	7.7	0.9	15	3.1	3.7	0.8	14	14
BH501	333707.7	6251947	-2.558148	5-5.1	1/05/2012	Saturated	72660-92	-	-	-	-	-	-	-	-	0.4	0.9	2.8	8.1	12	17	4.7	10	1.4	15	0.9	5.3	0.5	6.7	14
BH501	333707.7	6251947	-3.558148	6-6.1	1/05/2012	Saturated	72660-93	15	<0.5	24	65	150	<0.1	8	74	<0.1	0.1	0.8	1.4	1.2	1.9	0.5	1.2	0.1	2.7	0.1	0.5	<0.1	1	2.3
BH501	333707.7	6251947	-4.558148	7-7.1	1/05/2012	Saturated	72660-94	-	-	-	-	-	-	-	-	<0.1	0.4	0.8	2.2	2.3	3.5	1.1	2.1	0.3	4.1	0.3	1.1	0.1	2.4	3.9
BH501	333707.7	6251947	-5.558148	8-8.1	1/05/2012	Saturated	72660-95	5	<0.5	16	4	35	<0.1	2	11	<0.1	<0.1	<0.1	<0.1	0.15	0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.1
BH501	333707.7	6251947	-6.458148	8.9-9	1/05/2012	Saturated	72660-96	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH502	333696.6	6251974	0.890542	1.5-1.6	2/05/2012	Saturated	72660-76	5	<0.5	11	39	42	0.6	10	44	<0.1	<0.1	<0.1	0.3	0.37	0.5	0.2	0.3	<0.1	0.6	<0.1	0.2	0.2	0.4	0.6
BH502	333696.6	6251974	0.390542	2-2.1	2/05/2012	Saturated	72660-77	-	-	-	-	-	-	-	-	<0.1	0.2	0.2	0.7	0.88	1.2	0.4	0.6	<0.1	1.4	<0.1	0.4	<0.1	0.8	1.4
BH502	333696.6	6251974	-0.609458	3-3.1	2/05/2012	Saturated	72660-78	6	<0.5	14	52	250	0.2	6	120	0.8	1.4	2	5.9	9.1	12	4.1	8	1	14	1.3	4.2	1.1	9.1	13
BH502	333696.6	6251974	-1.609458	4-4.1	2/05/2012	Saturated	72660-79	-	-	-	-	-	-	-	-	0.2	0.9	1.3	3.3	3.7	4.7	1.7	3	0.4	7.4	0.6	1.7	0.3	3.7	7.4
BH502	333696.6	6251974	-2.609458	5-5.1	2/05/2012	Saturated	72660-80	10	<0.5	15	15	51	0.3	6	25	<0.1	<0.1	0.2	0.8	0.93	1.4	0.3	0.8	0.1	1.3	<0.1	0.4	<0.1	0.5	1.3
BH502	333696.6	6251974	-3.609458	6-6.1	2/05/2012	Saturated	72660-81	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH502	333696.6	6251974	-4.609458	7-7.1	2/05/2012	Saturated	72660-82	9	<0.5	24	30	120	<0.1	8	68	0.1	0.4	0.8	2.6	3	4	1.3	2.2	0.3	5.2	0.3	1.4	0.2	2.4	5.2
BH502	333696.6	6251974	-5.609458	8-8.1	2/05/2012	Saturated	72660-83	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH502	333696.6	6251974	-6.509458	8.9-9	2/05/2012	Saturated	72660-84	6	<0.5	26	2	7	<0.1	2	4	<0.1	<0.1	<0.1	0.1	0.06	<0.2	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.2
BH503	333682.7	6251958	-7.664858	10-10.1	3/05/2012	Saturated	72647-24	-	-	-	-	-	-	-	-	0.1	0.4	0.6	1.9	2.5	2.8	1.3	1.9	0.3	3.8	0.2	1.1	0.3	2.2	3.8
BH503	333682.7	6251958	-6.664858	9-9.1	3/05/2012	Saturated	72647-23	4	<0.5	15	33	140	0.4	11	100	0.2	0.4	0.8	3.1	3.6	4.2	1.8	3.2	0.3	6.3	0.2	1.5	0.3	2.8	6.1
BH503	333682.7	6251958	-4.664858	7-7.1	3/05/2012	Saturated	72647-22	-	-	-	-	-	-	-	-	0.1	0.3	0.5	1.6	2	2.3	1	1.5	0.2	3.3	0.2	0.8	0.3	2.3	3.3
BH503	333682.7	6251958	-5.664858	6-6.1	3/05/2012	Saturated	72647-21	<4	<0.5	23	52	170	0.3	11	110	0.5	1.7	3.2	7	6.8	9.9	3	6.9	0.8	15	1.7	3.6	0.6	13	14
BH503	333682.7	6251958	-2.664858	5-5.1	3/05/2012	Saturated	72647-20	-	-	-	-	-	-	-	-	0.1	0.3	0.6	1.5	1.6	2.4	0.8	1.6	0.2	3.3	0.2	0.9	0.3	2.3	3.3
BH503	333682.7	6251958	-1.664858	4-4.1	3/05/2012	Saturated	72647-19	6	<0.5	36	40	140	0.3	11	110	0.1	0.4	0.7	1.9	2.2	3.1	1	2	0.3	4.1	0.3	1.2	0.3	2.7	4.1
BH503	333682.7	6251958	-0.664858	3-3.1	3/05/2012	Saturated	72647-18	-	-	-	-	-	-	-	-	0.2	0.4	0.8	2.3	2.5	3.6	1.3	2.4	0.3	4.7	0.3	1.4	0.2	2.8	4.7
BH503	333682.7	6251958	0.335142	2-2.1	3/05/2012	Saturated	72647-17	<4	<0.5	13	34	77	0.2	11	68	0.1	0.5	0.7	2	2.2	3.2	1.1	2	0.3	3.8	0.2	1.3	0.2	2.1	4
BH503	333682.7	6251958	0.835142	1.5-1.6	3/05/2012	Saturated	72647-39	5	<0.5	17	15	25	<0.1	15	19	0.3	0.1	0.9	1.8	2.1	2.4	1	1.9	0.2	4	0.4	0.8	0.2	3.2	3.6
BH504	333688.4	6251926	0.503345	2-2.1	3/05/2012	Saturated	72647-31	16	<0.5	15	43	210	0.4	18	110	0.1	0.8	1.1	3.7	5.9	6.8	2.8	5.1	0.6	8.6	0.4	2.5	0.2	5	7.3
BH504	333688.4	6251926	-0.496655	3-3.1	3/05/2012	Saturated	72647-40	7	<0.5	19	44	240	0.4	12	160	0.2	0.9	1.1	4.3	6.6	7.7	3.1	5.4	0.7	9.9	0.5	2.8	0.3	5.9	8.4
BH504	333688.4	6251926	-3.496655	6-6.1	3/05/2012	Saturated	72647-32	<4	0.6	8	15	49	0.2	3	57	<0.1	<0.1	<0.1	0.1	0.19	0.2	0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2
BH504	333688.4	6251926	-5.496655	8-8.1	3/05/2012	Saturated	72647-33	<4	<0.5	8	5	15	<0.1	1	12	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH505	333694.2	6251879	-4.359823	6.7-6.8	1/05/2012	Saturated	72660-70	-	-	-	-	-	-	-	-	0.4	0.7	1.2	3.7	4.9	6.5	2.5	3.7	0.6	8.8	0.8	2.5	0.5	5.8	8.1
BH505	333694.2	6251879	-3.559823	5.9-6	1/05/2012	Saturated	72660-69	<4	<0.5	11	43	83	0.3	9	68	0.2	0.7	1.2	3.3	4.1	5.4	2	3.1	0.5	7.4	0.5	2	0.3	4	7.4
BH505	333694.2	6251879	-2.559823	4.9-5	1/05/2012	Saturated	72660-68	-	-	-	-	-	-	-	-	<0.1	0.3	0.4	1.8	1.9	2.7	1.3	1.5	0.3	3.8	0.1	1.3	0.2	1.8	3.5
BH505	333694.2	6251879	-1.559823	3.9-4	1/05/2012	Saturated	72660-67	<4	<0.5	9	81	110	0.3	27	100	0.1	0.3	0.5	1.9	2.1	2.8	1.3	1.5	0.3	4	0.2	1.3	0.3	2.4	3.8
BH505	333694.2	6251879	-0.559823	2.9-3	1/05/2012	Saturated	72660-66	-	-	-	-	-	-	-	-	0.3	0.7	0.8	4	5.8	8	3.2	4.4	0.8	8.5	0.3	3.2	0.4	4	8.4
BH505	333694.2	6251879	0.440177	1.9-2	1/05/2012	Saturated	72660-65	6	<0.5	11	460	320	0.7	22	300	0.3	1.1	2	5	7.6	10	3.8	6.2	0.9	12	0.8	3.8	0.4	11	11
BH505	333694.2	6251879	0.940177	1.4-1.5	1/05/2012	Saturated	72660-64	-	-	-	-	-	-	-	-	0.3	0.4	0.7	2.8	3.7	5.3	2	3.4	0.5	6.3	0.2	2	0.5	3.5	5.9
BH506D	333712.9	6251865	-6.798982	9-9.1	1/05/2012	Saturated	72660-12	<4	<0.5	15	2	7	<0.1	<1	4	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH506D	333712.9	6251865	-5.798982	8-8.1	1/05/2012	Saturated	72660-11	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.3	0.37	0.5	0.2	0.3	<0.1	0.5	<0.1	0.2	<0.1	0.2	0.6
BH506D	333712.9	6251865	-4.798982	7-7.1	1/05/2012	Saturated	72660-10	7	<0.5	17	19	74	0.2	6	62	<0.1	0.1	0.2	1	0.96	1.4	0.6	0.8	0.1	1.9	<0.1	0.6	0.1	1	1.8
BH506D	333712.9	6251865	-3.798982	6-6.1	1/05/2012	Saturated	72660-9	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.4	0.5	0.7	0.2	0.3	<0.1	0.7	<0.1	0.2	0.2	0.3	0.8
BH506D	333712.9	6251865	-2.798982	5-5.1	1/05/2012	Saturated	72660-8	<4	<0.5	34	37	110	0.3	16	81	0.1	0.2	0.4	1.4	1.5	2.1	1	1.2	0.2	3.1	0.2	1	0.3	1.9	3
BH506D	333712.9	6251865	-1.798982	4-4.1	1/05/2012	Saturated	72660-7	-	-	-	-	-	-	-	-	<0.1	0.2	0.3	1.2	1.2	1.5	0.7	0.9	0.2	2.5	0.1	0.7	0.1	1.1	2.5
BH506D	333712.9	6251865	-0.798982	3-3.1	1/05/2012	Saturated	72660-6	<4	<0.5	13	42	130	0.5	7	73	<0.1	0.2	0.3	1.1	1.2	1.6	0.7	1	0.2	2.5	0.1	0.7	0.2	1.5	2.4
BH506D	333712.9	6251865	0.201018	2-2.1	1/05/2012	Saturated	72660-5	-	-	-	-	-	-	-	-	0.2	0.3	0.4	1.9	2.2	3	1.4	1.7	0.3	3.9	0.2	1.4	0.4	2.4	3.8
BH506D	333712.9	6251865	0.701018	1.5-1.6	1/05/2012	Saturated	72660-4	<4	<0.5	10	10	110	0.3	2	79	<0.1	0.2	0.2	0.8	0.73	1	0.5	0.7	<0.1	1.7	<0.1	0.4	<0.1	1.1	1.6
BH507	333720.5	6251832	-4.683447	6.9-7	4/05/2012	Saturated	72750-19	<4	<0.5	6	6	9	<0.1	2	13	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH507	333720.5	6251832	-3.883447	6.1-6.2	4/05/2012	Saturated	72750-18	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH507	333720.5	6251832	-2.683447	4.9-5	4/05/2012	Saturated	72750-17	7	<0.5	7	15	20	0.7	3	18	<0.1	<0.1	<0.1	0.2	0.27	0.4	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.3	0.5
BH507	333720.5	6251832	-1.683447	3.9-4	4/05/2012	Saturated	72750-16	-	-	-	-	-	-	-	-	3.6	0.7	4.1	12	13	19	6.2	13	1.7	28	3.6	7.5	6.6	24	24
BH507	333720.5	6251832	-0.683447	2.9-3	4/05/2012	Saturated	72750-15	4	<0.5	10	140	120	0.9	11	92	0.2	1.3	2.1	4.6	4.8	6.6	2.2	4.6	0.6	9.2	0.7	2.5	0.3	6.3	8.8
BH507	333720.5	6251832	0.316553	1.9-2	4/05/2012	Saturated	72750-14	-	-	-	-	-	-	-	-	<0.1	0.9	1.4	4	4.3	5.8	1.9	4	0.4	8.1	0.4	2.2	0.2	4.5	7.8
BH507	333720.5	6251832	0.816553	1.4-1.5	4/05/2012	Saturated	72750-13	<4	<0.5	8	130	110	0.6	7	80	0.1	1.1	1.8	3.8	4.4	6	2	3.7	0.5	8	0.6	2.3	0.2	5.4	7.7
BH508	333694.9	6251832	-3.530443	5.9-6	4/05/2012	Saturated	72750-28	<4	<0.5	3	3	6	<0.1	<1	10	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH508	333694.9	6251832	-2.530443	4.9-5	4/05/2012	Saturated	72750-27	<4	<0.5	2	2	5	<0.1	<1	7	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH508	333694.9	6251832	-1.530443	3.9-4	4/05/2012	Saturated	72750-26	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH508	333694.9	6251832	-0.530443	2.9-3	4/05/2012	Saturated	72750-25	<4	<0.5	4	3	4	<0.1	<1	4	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH508	333694.9	6251832	0.469557	1.9-2	4/05/2012	Saturated	72750-24	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.08	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH508	333694.9	6251832	0.969557	1.4-1.5	4/05/2012	Saturated	72750-23	<4	<0.5	7	31	84	0.4	3	53	<0.1	0.1	0.1	0.7	1.1	1.4	0.5	0.7	0.1	1.1	<0.1	0.5	<0.1	0.2	1.4
BH509	333713.5	6251892	-6.629608	9-9.1	1/05/2012	Saturated	72660-25	<4	<0.5	22	1	13	<0.1	<1	4	<0.1	<0.1	<0.1	<0.1	0.06	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH509	333713.5	6251892	-5.629608	8-8.1	1/05/2012	Saturated	72660-24	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH509	333713.5	6251892	-4.629608	7-7.1	1/05/2012	Saturated	72660-23	6	<0.5	16	10	31	0.1	5	24	<0.1	0.2	0.3	1.1	1.2	1.6	0.4	1.1	0.1	2.2	0.1	0.5	<0.1	1.4	2.3
BH509	333713.5	6251892	-3.629608	6-6.1	1/05/2012	Saturated	72660-22	-	-	-	-	-	-	-	-	<0.1	0.2	0.2	0.9	1.3	1.8	0.6	0.7	0.1	1.8	<0.1	0.6	0.2	0.8	1.9
BH509	333713.5	6251892	-2.629608	5-5.1	1/05/2012	Saturated	72660-21	6	<0.5	15	43	180	0.9	4	140	0.4	1.4	1.5	6.9	8.9	12	2.7	6.8	0.8	13	0.6	3.9	0.6	5.4	13
BH509	333713.5	6251892	-1.629608	4-4.1	1/05/2012	Saturated	72660-20	-	-	-	-	-	-	-	-	<0.1	0.3	0.5	1.6	1.6	2.4	0.6	1.7	0.1	3.5	0.2	0.7	0.1	2.2	3.2
BH509	333713.5	6251892	-0.629608	3-3.1	1/05/2012	Saturated	72660-19	4	<0.5	27	43	130	0.3	7	76	<0.1	0.2	0.3	1.1	1.5	2	0.7	1	0.2	2.4	<0.1	0.7	0.1	1.3	2.4
BH509	333713.5	6251892	0.370392	2-2.1	1/05/2012	Saturated	72660-18	<4	<0.5	29	35	100	0.2	18	61	0.4	0.6	1.2	3.3	4.1	5.8	2.3	3.4	0.5	8.4	0.4	2.3	0.7	7	7.9
BH509	333713.5	6251892	0.870392	1.5-1.6	1/05/2012	Saturated	72660-17	-	-	-	-	-	-	-	-	0.2	0.8	1.4	2.9	4.1	5.7	2.3	3.6	0.5	8.6	0.5	2.2	0.8	8.5	7.4
BH510	333670	6251896	-10.483037	12.9-13	8/05/2012	Saturated	72908-7	4	<0.5	16	33	120	0.8	4	160	<0.1	0.2	0.3	0.7	0.83	1.2	0.3	0.6	<0.1	1.5	0.1	0.4	0.2	0.8	1.7

Project No. 42021
Barangaroo Central
Table 5 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Saturated Zone (<1m AHD)

								Metals								PAH											
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BH510	333670	6251896	-9.483037	11.9-12	8/05/2012	Saturated	72908-6	<4	<0.5	11	20	100	0.2	3	75	0.1	0.2	0.4	0.9	1	1.5	0.5	0.8	0.1	2.2	0.2	0.5	0.2	1.4	2.3
BH510	333670	6251896	-8.483037	10.9-11	8/05/2012	Saturated	72908-5	<4	<0.5	9	12	56	<0.1	3	59	<0.1	<0.1	0.2	0.4	0.43	0.6	0.2	0.3	<0.1	0.9	<0.1	0.2	<0.1	0.5	1.1
BH510	333670	6251896	-7.483037	9.9-10	8/05/2012	Saturated	72908-4	<4	<0.5	14	15	87	<0.1	2	62	0.1	0.1	0.3	0.6	0.79	1.1	0.3	0.5	<0.1	1.5	0.1	0.4	0.2	0.9	1.7
BH510	333670	6251896	-6.483037	8.9-9	8/05/2012	Saturated	72908-3	<4	<0.5	11	29	240	0.2	5	120	0.3	0.5	1.2	3.5	4	5.5	1.8	3	0.5	7.7	0.5	2.1	0.4	4.8	8.1
BH510	333670	6251896	-5.483037	7.9-8	8/05/2012	Saturated	72908-2	-	-	-	-	-	-	-	-	0.2	0.2	0.5	1.4	1.6	2.2	0.7	1.2	0.1	3.2	0.3	0.8	0.3	1.7	3.2
BH510	333670	6251896	-4.483037	6.9-7	8/05/2012	Saturated	72908-1	<4	<0.5	11	49	250	0.3	5	160	0.3	0.3	0.6	1.5	1.7	2.5	0.8	1.3	0.2	3.7	0.3	0.9	0.7	2.2	3.7
BH510	333670	6251896	-3.483037	5.9-6	4/05/2012	Saturated	72750-9	<4	<0.5	8	19	290	0.2	4	180	<0.1	0.2	0.5	1.3	1.4	1.8	0.7	1.3	0.2	2.7	0.1	0.7	0.1	1.8	3
BH510	333670	6251896	-2.483037	4.9-5	4/05/2012	Saturated	72750-8	<4	<0.5	8	19	320	0.7	4	170	<0.1	0.3	0.5	1.6	1.7	2.3	0.9	1.6	0.2	3	0.2	0.9	<0.1	1.8	4
BH510	333670	6251896	-1.483037	3.9-4	4/05/2012	Saturated	72750-7	8	<0.5	43	49	73	0.1	2	42	<0.1	0.1	0.2	0.7	0.77	1.1	0.4	0.7	<0.1	1.7	<0.1	0.4	<0.1	0.5	1.8
BH510	333670	6251896	0.516963	1.9-2	4/05/2012	Saturated	72750-5	<4	<0.5	10	19	590	0.2	5	240	<0.1	0.7	1.2	3.4	3.7	4.9	1.9	3.6	0.4	6.9	0.3	2.2	0.2	5.6	7.3
BH511	333652.1	6251942	-6.354549	8.9-9	4/05/2012	Saturated	72750-39	<4	<0.5	11	11	27	<0.1	7	38	<0.1	0.4	0.3	1.2	0.9	1.1	0.2	1.2	<0.1	1.7	0.1	0.3	<0.1	0.3	2.4
BH511	333652.1	6251942	-4.354549	6.9-7	4/05/2012	Saturated	72750-38	<4	<0.5	9	11	27	<0.1	7	42	<0.1	<0.1	0.1	0.2	0.26	0.4	0.1	0.3	<0.1	0.6	<0.1	0.1	<0.1	0.3	0.6
BH511	333652.1	6251942	-3.354549	5.9-6	4/05/2012	Saturated	72750-37	<4	<0.5	9	10	39	<0.1	7	42	<0.1	<0.1	<0.1	0.2	0.21	0.3	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.3	0.5
BH511	333652.1	6251942	-2.354549	4.9-5	4/05/2012	Saturated	72750-36	<4	<0.5	10	8	23	<0.1	5	39	<0.1	0.1	0.1	0.3	0.26	0.4	0.1	0.3	<0.1	0.6	<0.1	0.1	<0.1	0.2	0.6
BH511	333652.1	6251942	-1.354549	3.9-4	4/05/2012	Saturated	72750-35	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.3	0.28	0.4	0.1	0.3	<0.1	0.6	<0.1	0.1	<0.1	0.3	0.6
BH511	333652.1	6251942	-0.354549	2.9-3	4/05/2012	Saturated	72750-34	<4	<0.5	8	13	29	<0.1	7	53	<0.1	0.2	0.2	1	1.1	1.5	0.4	0.9	0.1	1.5	<0.1	0.5	<0.1	0.4	1.7
BH511	333652.1	6251942	0.645451	1.9-2	4/05/2012	Saturated	72750-33	<4	<0.5	9	8	17	<0.1	5	32	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH512	333633.9	6251924	-11.572267	13.9-14	9/05/2012	Saturated	72984-13	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.3	0.24	0.4	0.1	0.3	<0.1	0.6	<0.1	0.1	<0.1	0.3	0.7
BH512	333633.9	6251924	-10.572267	12.9-13	9/05/2012	Saturated	72984-12	5	<0.5	12	31	370	0.9	6	210	<0.1	0.2	0.2	0.7	0.67	1.3	0.4	0.7	<0.1	1.2	<0.1	0.3	<0.1	0.5	1.6
BH512	333633.9	6251924	-6.572267	8.9-9	9/05/2012	Saturated	72984-11	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.07	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.2
BH512	333633.9	6251924	-5.572267	7.9-8	9/05/2012	Saturated	72984-10	<4	<0.5	13	6	19	<0.1	2	18	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH512	333633.9	6251924	-4.572267	6.9-7	9/05/2012	Saturated	72984-9	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.08	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.2
BH512	333633.9	6251924	-2.572267	4.9-5	9/05/2012	Saturated	72984-8	<4	<0.5	10	9	36	<0.1	3	30	<0.1	<0.1	<0.1	0.2	0.16	0.3	<0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.3
BH512	333633.9	6251924	-1.572267	3.9-4	9/05/2012	Saturated	72984-7	-	-	-	-	-	-	-	-	0.4	2.2	2.3	3.2	2.9	4	1	2.8	0.1	9.1	2	1.2	0.2	9.6	7.5
BH512	333633.9	6251924	-0.602267	2.9-3	9/05/2012	Saturated	72984-6	<4	<0.5	11	6	22	<0.1	2	25	<0.1	<0.1	<0.1	0.1	0.05	<0.2	<0.1	0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.2	0.2
BH512	333633.9	6251924	0.427733	1.9-2	9/05/2012	Saturated	72984-5	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH512	333633.9	6251924	0.927733	1.4-1.5	9/05/2012	Saturated	72984-4	<4	<0.5	9	5	18	<0.1	1	17	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH513	333625.4	6251880	-11.387166	13.9-14	11/05/2012	Saturated	73154-30	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.3	0.45	0.6	0.2	0.3	<0.1	0.7	<0.1	0.2	<0.1	0.4	0.9
BH513	333625.4	6251880	-10.387166	12.9-13	11/05/2012	Saturated	73154-29	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.2	0.28	0.4	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.4	0.6
BH513	333625.4	6251880	-9.387166	11.9-12	11/05/2012	Saturated	73154-28	<4	<0.5	10	13	60	<0.1	3	39	<0.1	<0.1	<0.1	0.2	0.19	0.3	<0.1	0.2	<0.1	0.3	<0.1	<0.1	<0.1	0.2	0.4
BH513	333625.4	6251880	-8.387166	10.9-11	11/05/2012	Saturated	73154-27	-	-	-	-	-	-	-	-	<0.1	<0.1	0.2	0.4	0.38	0.5	0.1	0.4	<0.1	1	0.1	0.2	<0.1	0.9	1
BH513	333625.4	6251880	-3.387166	5.9-6	9/05/2012	Saturated	72984-27	<4	<0.5	8	9	27	<0.1	5	48	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH513	333625.4	6251880	-2.387166	4.9-5	9/05/2012	Saturated	72984-26	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH513	333625.4	6251880	-1.387166	3.9-4	9/05/2012	Saturated	72984-25	<4	<0.5	7	12	49	<0.1	3	83	<0.1	<0.1	<0.1	<0.1	0.06	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH513	333625.4	6251880	-0.387166	2.9-3	9/05/2012	Saturated	72984-24	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH513	333625.4	6251880	0.612834	1.9-2	9/05/2012	Saturated	72984-23	<4	<0.5	6	5	12	<0.1	3	23	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH514	333642.5	6251859	-8.271066	11-11.1	9/05/2012	Saturated	72989-15	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.12	0.3	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH514	333642.5	6251859	-7.271066	10-10.1	9/05/2012	Saturated	72989-14	<4	<0.5	6	9	99	<0.1	2	74	<0.1	<0.1	<0.1	0.1	0.2	0.5	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.3
BH514	333642.5	6251859	-6.271066	9-9.1	9/05/2012	Saturated	72989-13	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.29	0.7	0.1	0.3	<0.1	0.5	<0.1	0.1	<0.1	0.3	0.5
BH514	333642.5	6251859	-5.271066	8-8.1	9/05/2012	Saturated	72989-12	<4	<0.5	8	7	120	<0.1	3	71	<0.1	<0.1	<0.1	0.2	0.31	0.8	0.1	0.3	<0.1	0.6	<0.1	0.1	<0.1	0.4	0.6
BH514	333642.5	6251859	-4.271066	7-7.1	9/05/2012	Saturated	72989-11	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.3	0.39	0.9	0.2	0.3	<0.1	0.6	<0.1	0.2	<0.1	0.4	0.6
BH514	333642.5	6251859	-3.271066	6-6.1	9/05/2012	Saturated	72989-10	<4	<0.5	6	52	190	<0.1	<1	56	<0.1	<0.1	<0.1	0.1	0.16	0.4	<0.1	0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.2	0.3
BH514	333642.5	6251859	-2.271066	5-5.1	9/05/2012	Saturated	72989-9	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.35	0.8	0.2	0.3	<0.1	0.5	<0.1	0.2	<0.1	0.3	0.5
BH514	333642.5	6251859	-1.271066	4-4.1	9/05/2012	Saturated	72989-8	<4	<0.5	17	15	190	0.1	3	160	<0.1	<0.1	<0.1	0.4	0.48	1.1	0.2	0.4	<0.1	0.8	<0.1	0.2	<0.1	0.5	0.8
BH514	333642.5	6251859	-0.271066	3-3.1	9/05/2012	Saturated	72989-7	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.07	0.2	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH514	333642.5	6251859	0.728934	2-2.1	9/05/2012	Saturated	72989-5	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.1	0.3	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1
BH515	333643.2	6251826	-9.293701	12-12.1	9/05/2012	Saturated	72989-30	<4	<0.5	9	7	31	<0.1	1	26	<0.1	<0.1	<0.1	0.2	0.18	0.5	0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.2	0.5
BH515	333643.2	6251826	-8.293701	11-11.1	9/05/2012	Saturated	72989-29	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.15	0.4	<0.1	0.2	<0.1	0.3	<0.1	<0.1	<0.1	0.2	0.3
BH515	333643.2	6251826	-7.293701	10-10.1	9/05/2012	Saturated	72989-28	<4	<0.5	11	8	26	<0.1	2	28	<0.1	<0.1	<0.1	0.1	0.12	0.4	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.3
BH515	333643.2	6251826	-6.293701	9-9.1	9/05/2012	Saturated	72989-27	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.4	0.39	1	0.2	0.4	<0.1	1	<0.1	0.2	<0.1	0.8	0.9
BH515	333643.2	6251826	-5.293701	8-8.1	9/05/2012	Saturated	72989-26	<4	<0.5	22	8	15	0.1	1	21	<0.1	<0.1	<0.1	<0.1	0.11	0.3	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2
BH515	333643.2	6251826	-4.293701	7-7.1	9/05/2012	Saturated	72989-25	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.1	0.2	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.2
BH515	333643.2	6251826	-3.293701	6-6.1	9/05/2012	Saturated	72989-24	<4	<0.5	17	8	19	<0.1	4	20	<0.1	<0.1	0.1	0.3	0.3	0.7	0.1	0.3	<0.1	0.7	<0.1	0.1	<0.1	0.7	0.7
BH515	333643.2	6251826	-2.293701	5-5.1	9/05/2012	Saturated	72989-23	-	-	-	-	-	-	-	-	<0.1	<0.1	0.2	0.4	0.49	1.2	0.2	0.5	<0.1	1.2	<0.1	0.2	<0.1	0.9	1.1
BH515	333643.2	6251826	-1.293701	4-4.1	9/05/2012	Saturated	72989-22	<4	<0.5	17	10	36	0.1	3	30	<0.1	0.1	0.2	1.4	1.8	4.1	0.6	1.4	0.1	2.9	<0.1	0.7	<0.1	1	2.8
BH515	333643.2	6251826	-0.293701	3-3.1	9/05/2012	Saturated	72989-21	<4	<0.5	5	12	11	<0.1	1	21	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH515	333643.2	6251826	0.706299	2-2.1	9/05/2012	Saturated	72989-20	<4	<0.5	12	8	15	<0.1	4	22	<0.1	<0.1	<0.1	<0.1	0.1	0.3	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.2
BH516	333647.2	6251898	-8.55679	11-11.1	3/05/2012	Saturated	72647-11	<4	<0.5	12	6	56	<0.1	5	38	<0.1	<0.1	0.2	0.5	0.49	0.7	0.2	0.5	<0.1	1.3	0.2	0.2	<0.1	1	1.3
BH516	333647.2	6251898	-5.55679	8-8.1	3/05/2012	Saturated	72647-10	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.31	0.4	0.2	0.2	<0.1	0.3	<0.1	0.2	<0.1	0.2	0.4
BH516	333647.2	6251898	-3.55679	6-6.1	3/05/2012	Saturated	72647-9	<4	<0.5	16	27	110	0.3	12	130	1.1	0.4	2.3	4	3.9	5.5	1.8	4	0.4	9.6	1.2	1.9	0.9	8.1	9.5
BH516	333647.2	6251898	-2.55679	5-5.1	3/05/2012	Saturated	72647-8	-	-	-	-	-	-	-	-	6.7	1.2	8.5	15	14	21	6.8	16	1.7	32	5.3	8.2	4.6	25	31
BH516	333647.2	6251898	-1.55679	4-4.1	3/05/2012	Saturated	72647-7	4	<0.5	16	26	89	0.3	14	120	0.1	0.1	0.5	0.9	1	1.4	0.5	1	0.1	2.2	0.2	0.5	0.1	1.7	2.3
BH516	333647.2	6251898	-0.55679	3-3.1	3/05/2012	Saturated	72647-6	-	-	-	-	-	-	-	-	<0.1	0.5	2	3.3	2.9	4.1	1.2	3.2	0.3	8.5	0.4	1.3	0.1	8.1	8
BH516	333647.2	6251898	0.44321	2-2.1	3/05/2012	Saturated	72647-5	<4	<0.5	12	14	23	<0.1	10	47	<0.1	<0.1	<0.1	0.1	0.16	0.2	0.1	0.2	<0.1	0.2	<0.1	0.1	<0.1	0.1	0.2
BH516	333647.2	6251898	0.94321	1.5-1.6	3/05/2012	Saturated	72647-4	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.2	0.3	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.3
BH517	333652.2	6251740	-10.398499	13	23/05/2012	Saturated	74005-12	-	-	-	-	-	-	-	-	0.1	0.3	0.7	1.8	2	2.9	0.8	1.7	0.2	4.1	0.3	0.9	0.2	2.5	3.7
BH517	333652.2	6251740	-6.398499	9	23/05/2012	Saturated	74005-11	-	-	-	-	-	-	-	-	0.1	0.3	0.4	1.2	1.4	2	0.6	1.2	0.1	2.5	0.2	0.6	0.2	1.5	2.6
BH517	333652.2	6251740	-5.398499	8	23/05/2012	Saturated	74005-10	<4	<0.5	13	57	160	1	6	200	0.7	0.2	0.8	1.4	1.5	2.1	0.6	1.3	0.1	3.3	0.5	0.6	0.5	3	3.3
BH517	333652.2	6251740	-4.398499	7	23/05/2012	Saturated	74005-9	-	-	-	-	-	-	-	-	0.9	0.4	1.4	2.3	2.5	3.7	1.1	2.2	0.2	5.9	0.8	1.1	0.6	4.7	5.6
BH517	333652.2	6251740	-3.398499	6	23/05/2012	Saturated	74005-8	-	-	-	-	-	-	-	-	<0.1	0.1	0.3	0.7	0.77	1.1	0.4	0.6	<0.1	1.3	0.1	0.3	0.1	1	1.3
BH517	333652.2	6251740	-2.398499	5	23/05/2012	Saturated	74005-7	-	-	-	-	-	-	-	-	0.1	0.1	0.4	1	1.2	1.6	0.5	1	0.1	2	0.1	0.5	0.2	1.5	2.1

Project No. 42021
Barangaroo Central
Table 5 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Saturated Zone (<1m AHD)

								Metals								PAH													
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BH517	333652.2	6251740	-1.398499	4	23/05/2012	Saturated	74005-6	-	-	-	-	-	-	-	-	0.1	0.1	0.3	0.7	0.82	1.2	0.4	0.8	<0.1	1.5	0.2	0.4	0.2	1.3	1.5
BH517	333652.2	6251740	-0.398499	3	23/05/2012	Saturated	74005-5	<4	<0.5	11	9	62	<0.1	8	43	<0.1	0.2	0.2	0.8	0.92	1.3	0.5	0.7	0.1	1.3	<0.1	0.4	<0.1	0.8	1.5
BH517	333652.2	6251740	0.601501	2	23/05/2012	Saturated	74005-4	-	-	-	-	-	-	-	-	0.2	0.6	1.1	2.4	3.1	4	2	2.3	0.4	4.4	0.3	1.7	0.2	3	4.9
BH518	333722.4	6251790	-3.402216	5.9-6	18/05/2012	Saturated	73678-19	-	-	-	-	-	-	-	-	<0.1	0.2	0.5	1.7	1.7	2.6	0.7	1.6	0.2	3.3	0.1	0.8	0.1	1.2	3.3
BH518	333722.4	6251790	-2.402216	4.9-5	18/05/2012	Saturated	73678-18	-	-	-	-	-	-	-	-	<0.1	0.2	0.5	1.8	1.6	2.3	0.6	1.5	0.1	3.3	0.1	0.7	<0.1	1	3.2
BH518	333722.4	6251790	-1.402216	3.9-4	18/05/2012	Saturated	73678-17	6	<0.5	8	48	130	0.4	5	130	<0.1	0.4	1.2	3.7	3.4	5.1	1.3	3.2	0.4	6.8	0.3	1.6	0.2	2.3	6.3
BH518	333722.4	6251790	-0.402216	2.9-3	18/05/2012	Saturated	73678-16	-	-	-	-	-	-	-	-	0.1	0.1	0.2	0.6	0.67	1	0.4	0.6	<0.1	1.1	<0.1	0.4	0.2	0.7	1.1
BH518	333722.4	6251790	0.597784	1.9-2	18/05/2012	Saturated	73678-15	-	-	-	-	-	-	-	-	0.8	0.8	3.3	6.9	6.6	9.9	3.1	6.2	0.8	15	1.2	3.7	0.5	12	13
BH519	333670.7	6251807	-7.265363	10-10.1	10/05/2012	Saturated	73247-17	<4	<0.5	17	14	98	0.3	5	59	<0.1	0.2	0.3	1	1.4	1.8	0.6	0.9	0.1	1.7	0.1	0.7	<0.1	0.7	2
BH519	333670.7	6251807	-3.265363	6-6.1	10/05/2012	Saturated	73247-16	-	-	-	-	-	-	-	-	0.1	0.1	0.3	1.1	1	2.1	0.7	1.2	0.1	2.6	0.1	0.7	<0.1	0.8	2.7
BH519	333670.7	6251807	-2.265363	5-5.1	10/05/2012	Saturated	73247-15	-	-	-	-	-	-	-	-	0.1	0.1	0.3	0.8	0.69	1.6	0.5	0.9	0.1	2.2	0.1	0.5	<0.1	0.8	2.2
BH519	333670.7	6251807	-1.265363	4-4.1	10/05/2012	Saturated	73247-14	-	-	-	-	-	-	-	-	<0.1	0.1	0.2	0.7	0.67	1.3	0.4	0.8	<0.1	1.8	<0.1	0.4	<0.1	0.6	1.8
BH519	333670.7	6251807	-0.265363	3-3.1	10/05/2012	Saturated	73247-13	<4	<0.5	19	24	39	0.4	23	60	<0.1	0.1	0.2	0.7	0.62	1.4	0.4	0.8	<0.1	1.8	0.1	0.4	<0.1	0.7	1.8
BH519	333670.7	6251807	0.734637	2-2.1	10/05/2012	Saturated	73247-12	-	-	-	-	-	-	-	-	0.3	0.1	1.1	1.9	1.7	3.2	0.9	2.1	0.2	4.5	0.3	0.8	0.3	1.2	4.9
BH520	333623.8	6251800	-6.559524	9-9.1	10/05/2012	Saturated	73247-29	-	-	-	-	-	-	-	-	0.5	0.2	0.7	1.3	1.5	2.1	0.6	1.2	0.1	3	0.5	0.7	0.4	2.7	3
BH520	333623.8	6251800	-5.559524	8-8.1	10/05/2012	Saturated	73247-28	<4	<0.5	19	35	160	0.8	10	110	0.5	0.2	0.9	1.9	2.1	2.9	0.9	1.8	0.2	4.4	0.6	1	0.5	3.6	4.4
BH520	333623.8	6251800	-3.559524	6-6.1	10/05/2012	Saturated	73247-26	-	-	-	-	-	-	-	-	0.8	0.3	0.8	1	0.96	1.4	0.4	0.9	<0.1	2.8	0.6	0.4	1.1	3.6	2.4
BH520	333623.8	6251800	-2.559524	5.0-5.1	10/05/2012	Saturated	73247-25	-	-	-	-	-	-	-	-	6.5	0.5	3.4	2.5	2.5	3.4	1.1	2.3	0.2	8.8	4	1.2	5.7	15	7.8
BH520	333623.8	6251800	-4.559524	7.0-7.1	10/05/2012	Saturated	73247-27	-	-	-	-	-	-	-	-	0.3	0.3	0.6	1.6	1.8	2.5	0.7	1.5	0.2	3.5	0.4	0.8	0.3	2.6	3.4
BH520	333623.8	6251800	-0.559524	3-3.1	10/05/2012	Saturated	73247-24	8	<0.5	11	18	440	2	7	150	0.1	<0.1	0.3	0.6	0.73	1.1	0.4	0.7	<0.1	1.6	0.2	0.3	0.2	1.3	1.5
BH520	333623.8	6251800	0.440476	2-2.1	10/05/2012	Saturated	73247-54	-	-	-	-	-	-	-	-	<0.1	0.1	0.2	0.8	1.1	1.6	0.7	0.9	0.1	1.3	<0.1	0.6	<0.1	0.6	1.4
BH520	333623.8	6251800	0.940476	1.5-1.6	10/05/2012	Saturated	73247-23	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.3	0.44	0.6	0.2	0.4	<0.1	0.7	<0.1	0.2	<0.1	0.3	0.7
BH521	333582.5	6251918	-8.625998	11	7/05/2012	Saturated	72848-14	<4	<0.5	7	4	11	<0.1	4	18	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	-7.625998	10	7/05/2012	Saturated	72848-13	<4	<0.5	9	7	16	<0.1	7	27	<0.1	<0.1	<0.1	0.1	0.11	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.3
BH521	333582.5	6251918	-6.625998	9	7/05/2012	Saturated	72848-12	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.06	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	-5.625998	8	7/05/2012	Saturated	72848-11	<4	<0.5	13	11	10	<0.1	14	35	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	-4.625998	7	7/05/2012	Saturated	72848-10	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	-3.625998	6	7/05/2012	Saturated	72848-9	<4	<0.5	10	8	11	<0.1	9	34	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	-2.625998	5	7/05/2012	Saturated	72848-8	<4	<0.5	13	11	12	<0.1	11	44	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	-1.625998	4	7/05/2012	Saturated	72848-7	<4	<0.5	12	11	9	<0.1	13	48	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	-0.625998	3	7/05/2012	Saturated	72848-6	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	0.374002	2	7/05/2012	Saturated	72848-5	<4	<0.5	17	18	9	<0.1	34	48	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH521	333582.5	6251918	0.874002	1.5	7/05/2012	Saturated	72848-4	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH522	333602.3	6251810	-9.727801	12-12.1	9/05/2012	Saturated	72989-47	-	-	-	-	-	-	-	-	0.3	0.1	0.5	0.7	0.67	1.2	0.4	0.7	<0.1	1.6	0.3	0.5	0.3	1.8	1.5
BH522	333602.3	6251810	-8.777801	11-11.2	9/05/2012	Saturated	72989-46	<4	<0.5	13	9	50	<0.1	4	41	0.2	<0.1	0.3	0.4	0.26	0.4	0.2	0.3	<0.1	0.7	0.2	0.2	0.2	0.9	0.8
BH522	333602.3	6251810	-7.727801	10-10.1	9/05/2012	Saturated	72989-45	-	-	-	-	-	-	-	-	0.3	<0.1	0.6	0.6	0.61	1	0.4	0.6	<0.1	1.7	0.4	0.4	0.4	2	1.5
BH522	333602.3	6251810	-6.727801	9-9.1	9/05/2012	Saturated	72989-44	<4	<0.5	13	10	57	0.1	3	48	0.6	0.1	0.9	1.1	0.97	1.6	0.5	1	0.1	2.8	0.7	0.6	0.8	3.3	2.9
BH522	333602.3	6251810	-5.727801	8-8.1	9/05/2012	Saturated	72989-43	-	-	-	-	-	-	-	-	0.8	0.2	1.1	1.4	1.4	2	0.8	1.3	0.2	3.9	0.8	0.9	1.1	3.9	3.3
BH522	333602.3	6251810	-4.727801	7-7.1	9/05/2012	Saturated	72989-42	<4	<0.5	13	12	85	0.2	4	57	1.6	0.2	3.1	3.1	3.5	5.2	1.4	2.9	0.4	9.6	2.1	1.8	1.3	10	9.2
BH522	333602.3	6251810	-3.727801	6-6.1	9/05/2012	Saturated	72989-41	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.31	0.5	0.2	0.2	<0.1	0.5	<0.1	0.2	<0.1	0.2	0.6
BH522	333602.3	6251810	-2.727801	5-5.1	9/05/2012	Saturated	72989-40	<4	<0.5	11	10	180	<0.1	3	120	<0.1	0.1	0.8	1.8	2.1	3.2	0.8	1.8	0.2	4.7	0.1	1.1	<0.1	2.9	3.7
BH522	333602.3	6251810	-1.727801	4-4.1	9/05/2012	Saturated	72989-39	<4	<0.5	17	8	34	<0.1	3	29	<0.1	<0.1	<0.1	0.1	0.11	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH522	333602.3	6251810	-0.727801	3-3.1	9/05/2012	Saturated	72989-38	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH522	333602.3	6251810	0.272199	2-2.1	9/05/2012	Saturated	72989-37	<4	<0.5	10	5	11	<0.1	4	25	<0.1	0.7	0.7	1.5	1.4	2.1	0.7	1.3	0.2	3.4	0.4	0.8	0.6	2.9	3.1
BH522	333602.3	6251810	0.772199	1.5-1.6	9/05/2012	Saturated	72989-36	-	-	-	-	-	-	-	-	<0.1	0.1	0.1	0.4	0.32	0.5	0.2	0.3	<0.1	0.8	<0.1	0.2	<0.1	0.4	0.7
BH523	333600.6	6251935	-11.457663	13.9-14	7/05/2012	Saturated	72848-33	<4	<0.5	13	6	24	0.2	2	26	<0.1	<0.1	<0.1	0.3	0.3	0.5	0.2	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.2	0.6
BH523	333600.6	6251935	-10.957663	13.4-13.5	7/05/2012	Saturated	72848-36	6	<0.5	13	27	120	0.9	4	140	0.1	0.2	0.5	1	1	1.5	0.5	0.9	<0.1	2.3	0.2	0.4	<0.1	1.7	2.2
BH523	333600.6	6251935	-10.457663	12.9-13	7/05/2012	Saturated	72848-32	-	-	-	-	-	-	-	-	<0.1	0.2	0.3	1.1	1.2	1.8	0.7	1	0.1	2.1	0.1	0.6	0.1	1	2.3
BH523	333600.6	6251935	-9.457663	11.9-12	7/05/2012	Saturated	72848-31	<4	<0.5	10	9	39	0.2	3	50	<0.1	<0.1	<0.1	0.1	0.14	0.2	<0.1	0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.2	0.3
BH523	333600.6	6251935	-8.457663	10.9-11	7/05/2012	Saturated	72848-30	<4	<0.5	9	6	15	<0.1	4	31	<0.1	<0.1	<0.1	0.1	0.08	<0.2	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1
BH523	333600.6	6251935	-7.457663	9.9-10	7/05/2012	Saturated	72848-29	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH523	333600.6	6251935	-6.457663	8.9-9	7/05/2012	Saturated	72848-28	<4	<0.5	10	6	19	<0.1	3	38	<0.1	<0.1	0.1	0.2	0.17	0.3	0.1	0.2	<0.1	0.5	<0.1	<0.1	<0.1	0.5	0.5
BH523	333600.6	6251935	-5.457663	7.9-8	7/05/2012	Saturated	72848-27	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.17	0.3	0.1	0.2	<0.1	0.5	<0.1	<0.1	<0.1	0.3	0.4
BH523	333600.6	6251935	-4.457663	6.9-7	7/05/2012	Saturated	72848-26	<4	<0.5	9	6	25	<0.1	3	38	<0.1	<0.1	<0.1	0.2	0.13	0.2	<0.1	0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.3	0.3
BH523	333600.6	6251935	-3.457663	5.9-6	7/05/2012	Saturated	72848-25	-	-	-	-	-	-	-	-	<0.1	0.1	0.1	0.3	0.3	0.5	0.2	0.4	<0.1	0.8	<0.1	0.1	<0.1	0.6	0.7
BH523	333600.6	6251935	-2.457663	4.9-5	7/05/2012	Saturated	72848-24	<4	<0.5	15	6	20	<0.1	3	33	<0.1	<0.1	0.1	0.3	0.22	0.4	0.1	0.3	<0.1	0.6	<0.1	0.1	<0.1	0.6	0.6
BH523	333600.6	6251935	-1.457663	3.9-4	7/05/2012	Saturated	72848-23	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.1
BH523	333600.6	6251935	-0.457663	2.9-3	7/05/2012	Saturated	72848-22	<4	<0.5	8	4	19	<0.1	1	21	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH523	333600.6	6251935	0.542337	1.9-2	7/05/2012	Saturated	72848-21	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.1	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH524	333571.6	6251814	-3.663888	6-6.1	8/05/2012	Saturated	72910-8	<4	<0.5	20	9	30	<0.1	6	45	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH524	333571.6	6251814	-2.663888	5-5.1	8/05/2012	Saturated	72910-7	<4	<0.5	30	10	42	<0.1	8	36	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH524	333571.6	6251814	-1.663888	4-4.1	8/05/2012	Saturated	72910-6	<4	<0.5	32	6	58	<0.1	5	40	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH524	333571.6	6251814	-0.663888	3-3.1	8/05/2012	Saturated	72910-5	<4	<0.5	11	3	10	<0.1	4	23	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH524	333571.6	6251814	0.336112	2-2.1	8/05/2012	Saturated	72910-4	<4	<0.5	9	6	19	<0.1	6	32	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH524	333571.6	6251814	0.836112	1.5-1.6	8/05/2012	Saturated	72910-3	<4	<0.5	9	13	10	<0.1	9	25	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH525D	333568.1	6251818	-15.556171	17.9-18	1/05/2012	Saturated	72660-41	-	-	-	-	-	-	-	-	<0.1	0.3	0.3	0.7	0.95	1.4	0.4	0.6	<0.1	1.6	0.1	0.4	0.1	0.7	1.8
BH525D	333568.1	6251818	-14.656171	17-17.1	1/05/2012	Saturated	72660-40	<4	<0.5	17	25	55	<0.1	6	72	0.1	0.5	0.5	1.1	1.8	2.4	0.8	1.3	0.2	3.1	0.3	0.8	0.2	1.6	3.3
BH525D	333568.1	6251818	-13.656171	16-16.1	1/05/2012	Saturated	72660-39	-	-	-	-	-	-	-	-	0.2	0.8	0.8	2.2	2.4	3.4	0.7	2.1	0.2	4.5	0.4	1	0.3	2.1	4.8
BH525D	333568.1	6251818	-12.656171	15-15.1	1/05/2012	Saturated	72660-38	4	<0.5	16	26	83	0.4	6	95	0.2	0.9	1	2.8	2.9	3.8	0.8	2.6	0.2	5.8	0.4	1.1	0.3	2.9	5.7
BH525D	333568.1	6251818	-7.656171	10-10.1	1/05/2012	Saturated	72660-37	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.33	0.5	0.2	0.3	<0.1	0.5	<0.1	0.2	<0.1	0.3	0.5
BH525D	333568.1	6251818	-6.656171	9-9.1	1/05/2012	Saturated	72660-36	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.7	0.99	1.5	0.7	0.7	0.1	1.5	<0.1	0.6	<0.1	0.7	1.4

Project No. 42021
Barangaroo Central
Table 5 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Saturated Zone (<1m AHD)

								Metals								PAH											
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BH525D	333568.1	6251818	-5.656171	8-8.1	1/05/2012	Saturated	72660-35	<4	<0.5	38	13	56	<0.1	7	51	<0.1	<0.1	<0.1	0.3	0.37	0.6	0.3	0.2	<0.1	0.6	<0.1	0.2	<0.1	0.3	0.5
BH525D	333568.1	6251818	-4.656171	7-7.1	1/05/2012	Saturated	72660-34	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH525D	333568.1	6251818	-3.656171	6-6.1	1/05/2012	Saturated	72660-33	<4	<0.5	26	11	26	<0.1	8	42	<0.1	<0.1	<0.1	<0.1	0.13	0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH525D	333568.1	6251818	-2.656171	5-5.1	1/05/2012	Saturated	72660-32	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.06	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH525D	333568.1	6251818	-0.656171	3.0-3.1	1/05/2012	Saturated	72660-30	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH525D	333568.1	6251818	-1.656171	4-4.1	1/05/2012	Saturated	72660-31	<4	<0.5	10	10	99	<0.1	12	39	<0.1	<0.1	<0.1	<0.1	0.06	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH525D	333568.1	6251818	0.143829	2.2-2.3	1/05/2012	Saturated	72660-29	<4	<0.5	42	15	110	0.2	6	86	<0.1	0.1	0.1	0.8	1.1	1.6	0.8	0.7	0.1	1.7	<0.1	0.7	<0.1	0.8	1.6
BH525D	333568.1	6251818	0.543829	1.8-1.9	1/05/2012	Saturated	72660-28	-	-	-	-	-	-	-	-	0.1	0.2	0.3	1.8	2	3.3	1	2.1	0.2	3.9	<0.1	1.2	<0.1	1.8	3.5
BH526	333548.9	6251878	-1.647037	4-4.1	7/05/2012	Saturated	72863-6	<4	<0.5	28	14	38	<0.1	6	53	<0.1	<0.1	<0.1	<0.1	0.1	<0.2	<0.1	0.2	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.2
BH526	333548.9	6251878	-0.647037	3-3.1	7/05/2012	Saturated	72863-5	<4	<0.5	27	16	72	0.1	6	110	<0.1	<0.1	<0.1	0.2	0.32	0.5	0.2	0.4	<0.1	0.5	<0.1	0.2	<0.1	0.4	0.5
BH526	333548.9	6251878	0.352963	2-2.1	7/05/2012	Saturated	72863-4	<4	<0.5	31	12	40	<0.1	6	64	<0.1	<0.1	0.2	0.6	0.6	1	0.3	0.7	<0.1	1.2	<0.1	0.3	<0.1	1	1.2
BH526	333548.9	6251878	0.852963	1.5-1.6	7/05/2012	Saturated	72863-3	<4	<0.5	21	12	24	0.1	6	35	<0.1	<0.1	<0.1	0.1	0.2	0.3	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.3
BH527	333554.7	6251919	-10.555673	13-13.1	8/05/2012	Saturated	72909-1	<4	<0.5	13	16	41	<0.1	8	66	0.1	0.4	0.5	1.1	1.2	1.8	0.4	1.1	0.1	2.7	0.2	0.5	0.1	1.6	3
BH527	333554.7	6251919	-3.555673	6-6.1	7/05/2012	Saturated	72863-21	4	<0.5	16	28	74	<0.1	11	82	2	8.6	13	14	12	15	5.1	15	1.5	50	10	5.2	1.5	92	52
BH527	333554.7	6251919	-2.555673	5-5.1	7/05/2012	Saturated	72863-20	5	<0.5	16	28	93	<0.1	11	88	<0.1	0.2	0.6	1.6	1.4	1.8	0.4	1.2	<0.1	2.9	0.4	0.5	0.1	3.2	3.2
BH527	333554.7	6251919	-1.555673	4-4.1	7/05/2012	Saturated	72863-19	<4	<0.5	19	32	84	<0.1	14	83	0.1	0.3	0.8	2.9	2.8	3.7	0.9	2.4	0.2	5.1	0.3	1.1	0.3	4	5.1
BH527	333554.7	6251919	-0.555673	3-3.1	7/05/2012	Saturated	72852-3	6	<0.5	11	35	110	0.5	9	130	<0.1	0.2	0.4	1.8	1.7	2.4	0.9	1.8	0.2	3.1	<0.1	0.8	<0.1	1.3	4
BH527	333554.7	6251919	0.444327	2-2.1	7/05/2012	Saturated	72852-2	<4	<0.5	14	47	15	<0.1	14	31	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1
BH527	333554.7	6251919	0.944327	1.5-1.6	7/05/2012	Saturated	72852-1	<4	<0.5	11	18	12	<0.1	5	27	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1
BH528	333571.2	6251794	-12.634352	15-15.1	10/05/2012	Saturated	73247-42	<4	<0.5	12	16	26	<0.1	8	38	0.3	1.5	1.9	5.4	5.1	7.3	2	4.9	0.5	12	0.7	2.3	0.6	6.9	12
BH528	333571.2	6251794	-9.634352	12-12.1	10/05/2012	Saturated	73247-41	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	-6.634352	9-9.1	10/05/2012	Saturated	73247-40	<4	<0.5	18	7	16	<0.1	6	29	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	-5.634352	8-8.1	10/05/2012	Saturated	73247-39	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	-4.634352	7-7.1	10/05/2012	Saturated	73247-38	<4	<0.5	20	6	16	<0.1	6	29	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	-3.634352	6-6.1	10/05/2012	Saturated	73247-37	<4	<0.5	11	4	10	<0.1	4	25	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	-2.634352	5-5.1	10/05/2012	Saturated	73247-36	<4	<0.5	20	6	13	<0.1	6	32	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	-1.634352	4-4.1	10/05/2012	Saturated	73247-35	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	-0.634352	3-3.1	10/05/2012	Saturated	73247-34	<4	<0.5	29	15	19	<0.1	16	37	<0.1	<0.1	<0.1	0.1	0.14	0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH528	333571.2	6251794	0.365648	2-2.1	10/05/2012	Saturated	73247-33	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH528	333571.2	6251794	0.865648	1.5-1.6	10/05/2012	Saturated	73247-32	<4	<0.5	29	34	11	<0.1	53	88	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH529D	333560.4	6251773	-12.624087	15	14/05/2012	Saturated	73242-25	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.3	0.36	0.5	0.2	0.3	<0.1	0.7	<0.1	0.2	<0.1	0.4	0.7
BH529D	333560.4	6251773	-6.624087	9	14/05/2012	Saturated	73242-21	<4	<0.5	12	16	26	0.1	9	110	<0.1	<0.1	<0.1	0.2	0.19	0.3	0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.2	0.5
BH529D	333560.4	6251773	-5.624087	8	14/05/2012	Saturated	73242-20	-	-	-	-	-	-	-	-	<0.1	0.1	0.1	0.5	0.65	1	0.4	0.6	<0.1	1.1	<0.1	0.4	<0.1	0.6	1.3
BH529D	333560.4	6251773	-4.624087	7	14/05/2012	Saturated	73242-19	-	-	-	-	-	-	-	-	<0.1	0.3	0.8	2.8	2.7	3.7	1.3	2.8	0.1	6.6	0.1	1.3	<0.1	3.9	7.1
BH529D	333560.4	6251773	-3.624087	6	14/05/2012	Saturated	73242-18	<4	<0.5	11	10	27	<0.1	7	50	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH529D	333560.4	6251773	-2.624087	5	14/05/2012	Saturated	73242-17	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.22	0.3	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.4
BH529D	333560.4	6251773	-1.624087	4	14/05/2012	Saturated	73242-16	<4	<0.5	10	15	57	<0.1	8	74	<0.1	<0.1	<0.1	0.2	0.29	0.4	0.2	0.3	<0.1	0.5	<0.1	0.1	<0.1	0.3	0.6
BH529D	333560.4	6251773	-0.624087	3	14/05/2012	Saturated	73242-15	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.12	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.2
BH529D	333560.4	6251773	0.375913	2	14/05/2012	Saturated	73242-14	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.09	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH530	333671.7	6251915	-6.643655	9-9.1	4/05/2012	Saturated	72744-12	<4	<0.5	14	8	88	0.2	2	36	0.2	<0.1	0.2	0.5	0.69	0.9	0.2	0.5	<0.1	1.3	0.2	0.3	0.2	0.8	1.5
BH530	333671.7	6251915	-5.643655	8-8.1	4/05/2012	Saturated	72744-11	<4	<0.5	13	12	67	0.7	2	34	0.3	<0.1	0.2	0.5	0.95	1.3	0.4	0.6	<0.1	1.4	0.1	0.4	0.1	0.6	2
BH530	333671.7	6251915	-4.643655	7-7.1	4/05/2012	Saturated	72744-10	<4	<0.5	13	10	110	0.1	5	68	0.5	0.1	0.6	1.2	2	2.7	0.7	1.3	0.1	3.1	0.5	0.8	0.5	2.1	5.8
BH530	333671.7	6251915	-3.643655	6-6.1	4/05/2012	Saturated	72744-9	<4	<0.5	15	22	220	0.1	7	160	0.3	0.6	1.1	2	1.9	2.7	0.6	1.7	0.1	5	0.7	0.8	0.4	4.6	4.4
BH530	333671.7	6251915	-2.643655	5-5.1	4/05/2012	Saturated	72744-8	<4	<0.5	20	12	100	0.2	7	78	0.6	0.5	1	2.5	2.6	3.6	1	2.2	0.2	5.7	0.6	1.2	0.8	3.6	5.8
BH530	333671.7	6251915	-1.643655	4-4.1	4/05/2012	Saturated	72744-7	<4	<0.5	20	15	96	0.2	7	56	0.7	0.5	1.2	2.4	2.6	3.6	0.9	2.1	0.2	5.7	0.8	1.2	1	4.4	5.6
BH530	333671.7	6251915	-0.643655	3-3.1	4/05/2012	Saturated	72744-6	6	<0.5	17	30	280	0.5	11	110	0.1	0.5	0.8	2	2.3	3.2	0.8	1.8	0.2	4.5	0.3	1	0.2	2.6	4.4
BH530	333671.7	6251915	0.356345	2-2.1	4/05/2012	Saturated	72744-5	10	<0.5	19	60	170	1.2	10	140	1.5	13	19	58	56	81	18	50	5.5	140	6	22	2.2	79	130
BH530	333671.7	6251915	0.856345	1.5-1.6	4/05/2012	Saturated	72744-4	<4	<0.5	20	120	350	3.5	18	240	<0.1	<0.1	0.1	0.4	0.59	0.8	0.3	0.4	<0.1	0.7	<0.1	0.3	<0.1	0.3	0.8
BH531	333552.7	6251858	-0.645317	3-3.1	7/05/2012	Saturated	72863-13	<4	<0.5	13	16	120	<0.1	5	91	<0.1	<0.1	<0.1	0.3	0.39	0.6	0.2	0.3	<0.1	0.4	<0.1	0.2	<0.1	0.2	0.4
BH531	333552.7	6251858	0.354683	2-2.1	7/05/2012	Saturated	72863-12	<4	<0.5	11	24	430	0.4	6	160	<0.1	<0.1	<0.1	0.2	0.27	0.4	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.3
BH531	333552.7	6251858	0.854683	1.5-1.6	7/05/2012	Saturated	72863-11	<4	<0.5	11	9	35	<0.1	5	36	<0.1	<0.1	<0.1	0.2	0.2	0.3	0.1	0.3	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.4
BH532	333567.2	6251900	-13.614806	16-16.1	8/05/2012	Saturated	72909-13	<4	<0.5	14	26	75	0.1	12	120	<0.1	<0.1	<0.1	0.2	0.21	0.3	0.1	0.2	<0.1	2.5	<0.1	0.1	<0.1	0.3	2.5
BH532	333567.2	6251900	-12.614806	15-15.1	8/05/2012	Saturated	72909-12	<4	<0.5	14	16	19	<0.1	14	51	<0.1	<0.1	0.1	0.3	0.33	0.5	0.2	0.2	<0.1	0.6	<0.1	0.2	<0.1	0.4	0.7
BH532	333567.2	6251900	-11.614806	14-14.1	8/05/2012	Saturated	72909-11	<4	<0.5	14	18	35	<0.1	13	67	<0.1	<0.1	<0.1	0.2	0.27	0.4	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.3	0.6
BH532	333567.2	6251900	-3.614806	6-6.1	8/05/2012	Saturated	72909-10	<4	<0.5	12	15	47	<0.1	3	75	<0.1	0.3	0.4	1.3	1.4	2.1	0.7	1.2	0.2	2.5	0.1	0.8	0.1	1.1	2.5
BH532	333567.2	6251900	-2.614806	5-5.1	8/05/2012	Saturated	72909-9	5	<0.5	16	16	88	0.1	9	68	0.3	0.6	0.8	2.4	3.9	5.4	2.7	2.1	0.5	5	0.2	2.9	0.3	2.6	5.4
BH532	333567.2	6251900	-0.614806	3-3.1	8/05/2012	Saturated	72909-8	<4	<0.5	12	18	72	<0.1	8	60	0.2	1	1.1	3.6	4.5	6.5	3.1	2.9	0.7	6.9	0.3	3.2	0.5	2.9	6.7
BH532	333567.2	6251900	0.385194	2-2.1	8/05/2012	Saturated	72909-7	<4	<0.5	8	30	160	0.1	5	110	<0.1	<0.1	<0.1	0.2	0.28	0.4	0.2	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1	0.4
BH532	333567.2	6251900	0.885194	1.5-1.6	8/05/2012	Saturated	72909-6	<4	<0.5	12	23	16	<0.1	5	190	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH533	333676.3	6251855	-10.312462	12.9-13	8/05/2012	Saturated	72907-7	<4	<0.5	11	17	68	0.3	3	63	<0.1	<0.1	0.1	0.4	0.5	0.7	0.2	0.4	<0.1	0.9	<0.1	0.2	<0.1	0.5	0.9
BH533	333676.3	6251855	-9.312462	11.9-12	8/05/2012	Saturated	72907-6	<4	<0.5	11	23	78	0.4	4	75	0.2	0.1	0.3	0.7	0.72	1	0.3	0.7	<0.1	1.6	0.2	0.3	0.6	1.1	1.6
BH533	333676.3	6251855	-8.312462	10.9-11	8/05/2012	Saturated	72907-5	<4	<0.5	10	14	62	0.3	5	58	<0.1	<0.1	0.2	0.4	0.38	0.6	0.2	0.3	<0.1	0.9	0.1	0.2	0.2	0.7	0.9
BH533	333676.3	6251855	-7.312462	9.9-10	8/05/2012	Saturated	72907-4	<4	<0.5	10	27	41	0.7	3	44	<0.1	<0.1	0.3	0.6	0.7	1	0.3	0.6	<0.1	1.5	<0.1	0.4	<0.1	1	1.5
BH533	333676.3	6251855	-6.312462	8.9-9	8/05/2012	Saturated	72907-3	<4	<0.5	11	17	110	0.2	5	95	0.1	0.2	0.4	0.7	0.75	1.1	0.3	0.7	<0.1	1.9	0.3	0.4	0.5	1.7	1.8
BH533	333676.3	6251855	-5.312462	7.9-8	8/05/2012	Saturated	72907-2	<4	<0.5	19	7	60	<0.1	5	60	0.1	<0.1	0.2	0.3	0.4	0.5	0.2	0.3	<0.1	0.9	0.1	0.2	0.3	0.7	0.9
BH533	333676.3	6251855	-4.312462	6.9-7	8/05/2012	Saturated	72907-1	<4	<0.5	28	13	38	<0.1	51	48	<0.1	<0.1	<0.1	0.1	0.13	0.2	<0.1	0.1	<0.1	0.4	<0.1	<0.1	<0.1	0.3	0.3
BH533	333676.3	6251855	-3.312462	5.9-6	8/05/2012	Saturated	72908-18	<4	<0.5	16	8	71	<0.1	7	51	<0.1	<0.1	0.2	0.4	0.34	0.5	0.1	0.3	<0.1	0.9	0.1	0.2	0.1	0.8	0.8
BH533	333676.3	6251855	-2.312462	4.9-5	8/05/2012	Saturated	72908-17	<4	<0.5	14	14	130	0.2	8	130	2.7	0.4	2.3	2.6	2.4	3.6	0.9	2.6	0.3	7.5	2	1.1	6.8	9.4	6.7
BH533	333676.3	6251855	-1.312462	3.9-4	8/05/2012	Saturated	72908-16	<4	<0.5	14	22	290	0.2	7	180	1	0.1	0.7	1.2	1.5	1.9	0.6	1.2	0.2	2.5	0.7	0.7	2.6	3	2.5
BH533	333676.3	6251855	-0.312462	2.9-3	8/05/2012	Saturated	72908-15	<4	<0.5	12	28	500	0.2	4	240	<0.1	0.2	0.4	1.1	1.4	1.8	0.6	1	0.2	2.3	0.1	0.7	<0.1	1.6	2.4
BH533	333676.3	6251855	0.187538	1.9-3	8/05/2012	Saturated	72908-14	<4	<0.5	16	27	300	0.1	6	150	<0.1	0.1	0.1	0.5	0.66	0.9	0.3	0.5	<0.1	1	<0.1	0.3	<0.1	0.5	1

Project No. 42021
Barangaroo Central
Table 5 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Saturated Zone (<1m AHD)

								Metals								PAH											
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BH534	333623	6251907	-10.578688	12.9-13	9/05/2012	Saturated	72988-15	-	-	-	-	-	-	-	-	<0.1	0.3	0.4	1	1.3	2	0.6	1	0.2	2	0.1	0.8	0.1	0.8	2.3
BH534	333623	6251907	-9.578688	11.9-12	9/05/2012	Saturated	72988-14	<4	<0.5	5	14	55	<0.1	3	49	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH534	333623	6251907	-8.778688	11.1-11.2	9/05/2012	Saturated	72988-13	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.27	0.4	0.1	0.2	<0.1	0.4	<0.1	0.2	<0.1	0.2	0.5
BH534	333623	6251907	-6.578688	8.9-9	9/05/2012	Saturated	72988-12	<4	<0.5	7	6	35	0.1	6	45	1.8	0.3	3.1	2.9	2.7	3.8	1.3	2.5	0.3	8.9	1.2	1.6	0.2	11	8.2
BH534	333623	6251907	-5.578688	7.9-8	9/05/2012	Saturated	72988-11	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.2	0.16	0.2	<0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.2	0.5
BH534	333623	6251907	-4.578688	6.9-7	9/05/2012	Saturated	72988-10	<4	<0.5	8	75	130	<0.1	8	110	0.2	0.1	0.5	0.6	0.56	0.8	0.3	0.6	<0.1	1.9	0.3	0.3	<0.1	1.2	1.9
BH534	333623	6251907	-3.578688	5.9-6	9/05/2012	Saturated	72988-9	-	-	-	-	-	-	-	-	<0.1	<0.1	0.2	0.3	0.33	0.5	0.2	0.3	<0.1	1	0.1	0.2	<0.1	0.5	1.1
BH534	333623	6251907	-2.578688	4.9-5	9/05/2012	Saturated	72988-8	8	<0.5	17	25	300	0.2	18	270	0.2	0.4	0.9	1.9	2.1	3.2	1	2.1	0.3	5.2	0.5	1.4	0.4	4.4	5.2
BH534	333623	6251907	-1.578688	3.9-4	9/05/2012	Saturated	72988-7	<4	<0.5	24	16	290	0.4	11	140	0.2	0.2	0.5	1.1	1.2	1.9	0.6	1.2	0.2	2.9	0.3	0.8	0.2	1.8	3.1
BH534	333623	6251907	-0.578688	2.9-3	9/05/2012	Saturated	72988-6	<4	<0.5	7	10	130	<0.1	8	100	<0.1	<0.1	<0.1	0.2	0.22	0.3	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.4	0.5
BH534	333623	6251907	0.421312	1.9-2	9/05/2012	Saturated	72988-5	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.22	0.3	0.1	0.2	<0.1	0.4	<0.1	0.2	<0.1	0.2	0.4
BH534	333623	6251907	0.921312	1.4-1.5	9/05/2012	Saturated	72988-4	<4	<0.5	7	13	91	0.1	10	63	<0.1	0.1	<0.1	0.3	0.38	0.6	0.2	0.3	<0.1	0.6	<0.1	0.3	<0.1	0.2	0.7
BH535	333570.3	6251854	-12.584269	15	14/05/2012	Saturated	73242-7	-	-	-	-	-	-	-	-	<0.1	0.4	0.4	1.1	1.1	1.5	0.5	0.9	0.1	2.3	0.2	0.5	0.2	0.8	2.3
BH535	333570.3	6251854	-11.584269	14	14/05/2012	Saturated	73242-6	-	-	-	-	-	-	-	-	0.2	2	2.1	6.1	6	8.2	2.4	4.9	0.6	13	1	2.6	0.8	5.3	12
BH535	333570.3	6251854	-9.584269	12	14/05/2012	Saturated	73242-4	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH535	333570.3	6251854	-8.584269	11	14/05/2012	Saturated	73242-3	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH535	333570.3	6251854	-7.584269	10	14/05/2012	Saturated	73242-2	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH535	333570.3	6251854	-6.584269	9	14/05/2012	Saturated	73242-1	<4	<0.5	13	13	16	<0.1	18	47	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH535	333570.3	6251854	-2.534269	4.9-5	11/05/2012	Saturated	73154-38	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.26	0.4	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	<0.1	0.5
BH535	333570.3	6251854	-1.534269	3.9-4	11/05/2012	Saturated	73154-37	<4	<0.5	15	10	15	<0.1	9	37	0.1	<0.1	<0.1	0.1	0.13	0.2	<0.1	0.1	<0.1	0.5	<0.1	<0.1	<0.1	0.3	0.4
BH535	333570.3	6251854	-0.534269	2.9-3	11/05/2012	Saturated	73154-36	<4	<0.5	9	10	13	<0.1	7	37	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2
BH535	333570.3	6251854	0.465731	1.9-2	11/05/2012	Saturated	73154-35	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.1	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2
BH535	333570.3	6251854	0.965731	1.4-1.5	11/05/2012	Saturated	73154-34	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH536D	333604.7	6251798	-10.728148	13-13.1	11/05/2012	Saturated	73154-22	-	-	-	-	-	-	-	-	<0.1	0.1	0.1	0.5	0.56	0.7	0.2	0.4	<0.1	1	<0.1	0.2	<0.1	0.4	1.2
BH536D	333604.7	6251798	-9.728148	12-12.1	11/05/2012	Saturated	73154-21	-	-	-	-	-	-	-	-	0.1	0.2	0.6	1.5	1.6	2.3	0.7	1.4	0.1	2.7	0.4	0.7	0.3	1.8	4.7
BH536D	333604.7	6251798	-7.728148	10-10.1	11/05/2012	Saturated	73154-20	<4	<0.5	9	9	170	<0.1	4	130	0.1	0.2	0.5	1.1	1.3	1.8	0.5	1	0.1	2.2	0.3	0.6	0.3	1.7	2.9
BH536D	333604.7	6251798	-6.728148	9-9.1	11/05/2012	Saturated	73154-19	5	<0.5	13	15	80	<0.1	10	73	<0.1	0.1	0.3	1.1	1.3	1.7	0.5	1.1	<0.1	1.8	0.1	0.6	0.1	0.6	4
BH536D	333604.7	6251798	-5.728148	8-8.1	11/05/2012	Saturated	73154-18	-	-	-	-	-	-	-	-	<0.1	<0.1	0.2	0.6	0.82	1.2	0.4	0.7	<0.1	1.4	0.1	0.4	<0.1	0.9	1.5
BH536D	333604.7	6251798	-4.728148	7-7.1	11/05/2012	Saturated	73154-17	-	-	-	-	-	-	-	-	0.4	0.3	1.1	1.7	1.8	2.4	0.7	1.5	0.2	3.7	0.8	0.8	0.7	3.8	3.9
BH536D	333604.7	6251798	-3.728148	6-6.1	11/05/2012	Saturated	73154-16	-	-	-	-	-	-	-	-	0.1	0.2	0.5	1.5	1.7	2.3	0.7	1.5	<0.1	2.9	0.2	0.8	0.2	1.4	4.2
BH536D	333604.7	6251798	-2.728148	5-5.1	11/05/2012	Saturated	73154-15	-	-	-	-	-	-	-	-	0.1	0.1	0.3	0.8	0.95	1.3	0.4	0.8	<0.1	1.7	0.2	0.5	0.2	1	2.2
BH536D	333604.7	6251798	-1.728148	4-4.1	11/05/2012	Saturated	73154-14	<4	<0.5	9	13	150	0.2	6	84	<0.1	0.1	0.3	1.1	1.2	1.8	0.5	1.1	<0.1	1.8	0.2	0.6	0.1	0.9	3.7
BH536D	333604.7	6251798	-0.728148	3-3.1	11/05/2012	Saturated	73154-13	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.08	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.3	0.2
BH536D	333604.7	6251798	0.271852	2-2.1	11/05/2012	Saturated	73154-12	-	-	-	-	-	-	-	-	<0.1	0.1	0.2	0.3	0.28	0.4	0.1	0.3	<0.1	0.8	0.2	0.1	0.2	1	0.7
BH536D	333604.7	6251798	0.771852	1.5-1.6	11/05/2012	Saturated	73154-11	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH537	333706.8	6252000	-3.457994	5.9-6	17/05/2012	Saturated	73540-9	-	-	-	-	-	-	-	-	0.1	0.1	0.5	2.2	2	3	0.9	1.6	0.3	3.8	0.2	1	0.2	1.9	3.6
BH537	333706.8	6252000	-2.457994	4.9-5	17/05/2012	Saturated	73540-8	-	-	-	-	-	-	-	-	0.4	0.2	2.2	7.2	8.2	12	3.7	7	1.2	13	0.9	3.9	0.2	9.4	11
BH537	333706.8	6252000	-1.457994	3.9-4	17/05/2012	Saturated	73540-7	-	-	-	-	-	-	-	-	0.1	0.2	0.8	3.6	3.1	4.7	1.4	2.7	0.4	6.1	0.2	1.5	0.2	2.7	5.5
BH537	333706.8	6252000	-0.457994	2.9-3	17/05/2012	Saturated	73540-6	5	<0.5	13	140	300	2.2	4	64	<0.1	<0.1	0.2	0.8	0.74	1.1	0.4	0.6	<0.1	1.5	<0.1	0.4	0.1	0.8	1.4
BH537	333706.8	6252000	0.542006	1.9-2	17/05/2012	Saturated	73540-5	-	-	-	-	-	-	-	-	<0.1	0.1	0.2	0.9	0.88	1.2	0.5	0.7	0.1	1.8	0.1	0.5	0.1	1.1	1.7
BH538	333702.2	6251812	0.348839	2-2.1	10/05/2012	Saturated	73247-5	<4	<0.5	10	9	25	<0.1	1	26	<0.1	0.1	0.2	1	1.3	1.8	0.7	1.1	0.1	1.9	<0.1	0.7	<0.1	0.7	2.1
BH538	333702.2	6251812	0.848839	1.5-1.6	10/05/2012	Saturated	73247-4	5	<0.5	44	64	260	0.7	6	170	0.3	0.4	0.6	3.1	3.7	5.3	1.7	3	0.4	6	0.3	1.9	0.5	3.2	5.8
BH539	333677.6	6251738	-10.380484	12.9-13	18/05/2012	Saturated	73678-43	5	<0.5	11	80	250	1.1	4	170	0.4	1.6	1.8	2.1	2	2.9	0.9	1.9	0.2	4.8	1.8	0.9	13	5.5	4.7
BH539	333677.6	6251738	-9.380484	11.9-12	18/05/2012	Saturated	73678-36	-	-	-	-	-	-	-	-	0.1	0.5	1.3	2.7	2.8	4.1	1.6	2.8	0.4	6.3	0.4	1.6	0.2	5.3	6.5
BH539	333677.6	6251738	-8.380484	10.9-11	18/05/2012	Saturated	73678-35	-	-	-	-	-	-	-	-	0.1	0.4	0.9	1.8	1.8	2.6	0.9	1.7	0.2	4.1	0.3	0.9	0.2	3.4	4
BH539	333677.6	6251738	-7.380484	9.9-10	18/05/2012	Saturated	73678-34	-	-	-	-	-	-	-	-	0.2	0.2	0.4	0.9	0.9	1.3	0.4	0.9	0.1	1.9	0.2	0.5	0.3	1.4	1.9
BH539	333677.6	6251738	-6.380484	8.9-9	18/05/2012	Saturated	73678-33	6	<0.5	9	35	240	1	4	170	1.1	0.3	1.3	1.9	2	2.9	1	1.9	0.2	4.5	0.9	1	1.7	4.4	4.5
BH539	333677.6	6251738	-5.380484	7.9-8	18/05/2012	Saturated	73678-32	-	-	-	-	-	-	-	-	0.6	0.3	0.9	1.7	1.9	2.8	0.9	1.7	0.2	3.9	0.6	1	0.8	3.1	3.8
BH539	333677.6	6251738	-4.380484	6.9-7	18/05/2012	Saturated	73678-31	-	-	-	-	-	-	-	-	1.1	0.2	1	1.6	1.6	2.4	0.8	1.5	0.2	3.9	0.8	0.9	2.2	3.7	3.7
BH539	333677.6	6251738	-3.380484	5.9-6	18/05/2012	Saturated	73678-30	<4	<0.5	8	57	290	0.4	5	190	1	0.3	1.5	2.6	2.7	3.9	1.4	2.5	0.3	6.2	0.5	1.5	0.5	3.5	6.1
BH539	333677.6	6251738	-2.380484	4.9-5	18/05/2012	Saturated	73678-29	-	-	-	-	-	-	-	-	1.5	0.7	2.6	4.7	5.2	7.5	2.6	4.7	0.6	11	1.5	2.7	1.3	8.2	11
BH539	333677.6	6251738	-1.380484	3.9-4	18/05/2012	Saturated	73678-28	-	-	-	-	-	-	-	-	0.8	0.3	1.4	2.7	2.9	4.3	1.5	2.7	0.3	6.3	0.7	1.5	0.7	4.2	6.3
BH539	333677.6	6251738	-0.380484	2.9-3	18/05/2012	Saturated	73678-27	-	-	-	-	-	-	-	-	<0.1	0.4	0.5	2	2.3	3.3	1.2	1.9	0.3	3.8	0.1	1.3	0.1	1.6	3.9
BH539	333677.6	6251738	0.619516	1.9-2	18/05/2012	Saturated	73678-26	-	-	-	-	-	-	-	-	0.2	0.6	1.1	3.4	4	5.7	2.2	3.3	0.5	7.3	0.3	2.3	0.2	3.8	7.2
BH540D	333682.6	6251762	-10.275081	12.9-13	17/05/2012	Saturated	73540-19	-	-	-	-	-	-	-	-	0.3	0.2	0.7	1.2	1.1	1.4	0.6	0.9	0.1	2.9	0.3	0.5	0.4	2.6	2.9
BH540D	333682.6	6251762	-7.275081	9.9-10	17/05/2012	Saturated	73540-18	-	-	-	-	-	-	-	-	1.6	0.6	2	3.1	4.2	5.4	2.1	3	0.5	7.8	1.6	2	4.7	8.3	7.6
BH540D	333682.6	6251762	-6.275081	8.9-9	17/05/2012	Saturated	73540-17	-	-	-	-	-	-	-	-	1.9	0.5	2	3.2	4.1	5.3	2.1	3.2	0.4	8.3	1.7	2	3.6	8.6	8.3
BH540D	333682.6	6251762	-5.275081	7.9-8	17/05/2012	Saturated	73540-27	-	-	-	-	-	-	-	-	0.5	0.4	1.4	2.6	3.5	4.7	1.6	2.9	0.4	7.3	0.7	1.6	1.1	6.3	6.4
BH540D	333682.6	6251762	-4.275081	6.9-7	17/05/2012	Saturated	73540-26	-	-	-	-	-	-	-	-	0.7	0.7	1.8	3.5	4.5	5.7	1.9	3.5	0.4	8.1	1	1.9	1.5	7.3	8.2
BH540D	333682.6	6251762	-3.275081	5.9-6	17/05/2012	Saturated	73540-25	<4	<0.5	9	78	490	<0.1	6	150	1.6	0.6	1.8	2.9	3.6	4.9	1.7	3.1	0.4	7	1.5	1.7	6.6	7.6	6.9
BH540D	333682.6	6251762	-2.275081	4.9-5	17/05/2012	Saturated	73540-24	<4	<0.5	15	21	94	0.2	13	68	1.6	0.5	2	2.9	3.8	4.8	1.8	3.2	0.4	7.5	1.6	1.7	5.5	8.3	7.4
BH540D	333682.6	6251762	-1.275081	3.9-4	17/05/2012	Saturated	73540-23	-	-	-	-	-	-	-	-	1.8	0.3	1.6	2.7	3.2	4.3	1.5	2.9	0.3	6.8	1.5	1.5	4.9	7	6.7
BH540D	333682.6	6251762	-0.275081	2.9-3	17/05/2012	Saturated	73540-22	<4	<0.5	9	10	61	<0.1	7	41	0.3	0.5	1.1	1.8	1.9	2.5	1	1.4	0.2	4.5	0.5	1	0.2	3.9	3.8
BH540D	333682.6	6251762	0.724919	1.9-2	17/05/2012	Saturated	73540-21	<4	<0.5	10	17	220	0.1	6	77	0.9	0.2	1.3	2	2.1	2.8	1.1	1.8	0.2	5.1	0.8	1.1	0.4	4.2	5.1
BH541D	333675.2	6251712	-7.578688	9.9-10	19/05/2012	Saturated	73677-35	-	-	-	-	-	-	-	-	22	140	110	97	84	110	37	80	11	240	140	37	1100	380	210
BH541D	333675.2	6251712	-6.578688	8.9-9	19/05/2012	Saturated	73677-34	-	-	-	-	-	-	-	-	18	23	52	77	80	100	31	65	8.8	160	28	36	19	150	150
BH541D	333675.2	6251712	-5.578688	7.9-8	19/05/2012	Saturated	73677-33	-	-	-	-	-	-	-	-	7.1	14	19	42	40	52	17	35	5.2	96	8	21	9.4	49	86
BH541D	333675.2	6251712	-4.578688	6.9-7	19/05/2012	Saturated	73677-32	-	-	-	-	-	-	-	-	10	31	33	43	45	55	15	37	4.3	92	33	17	200	79	85
BH541D	333675.2	6251712	-3.578688	5.9-6	19/05/2012	Saturated	73677-31	7	1.2	15	190	530	1.9	10	590	<0.1	0.2	0.4	1.1	1.2	1.9	0.7	1	0.2	1.9	0.2	0.7	0.2	1.2	1.9
BH541D	333675.2	6251712	-2.578688	4.9-5	19/05/2012	Saturated	73677-30	-	-	-	-	-	-	-	-	0.6	0.3	1.2	2.4	2.8	3.9	1.4	2.3	0.3	5.3	0.8	1.5	0.2	3.6	5.3
BH541D	333675.2	6251712	-1.578688	3.9-4	19/05/2012	Saturated	73677-29	-	-	-	-	-	-	-	-	0.2	0.3	0.7	1.8	1.7	2.6	0.6	1.6	0.2	3.5	0.4	0.7	0.2	2.6	3.5

Project No. 42021
Barangaroo Central
Table 5 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Saturated Zone (<1m AHD)

								Metals								PAH											
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BH541D	333675.2	6251712	-0.578688	2.9-3	19/05/2012	Saturated	73677-28	8	0.6	11	170	340	2.5	9	710	3	1.9	7.5	17	15	23	4.9	14	1.5	35	4.3	6.3	0.6	25	35
BH541D	333675.2	6251712	0.421312	1.9-2	19/05/2012	Saturated	73677-27	-	-	-	-	-	-	-	-	3.6	1	6.5	12	11	16	3.6	10	1.1	27	3.8	4.6	0.3	19	27
BH541D	333675.2	6251712	0.921312	1.4-1.5	19/05/2012	Saturated	73677-26	-	-	-	-	-	-	-	-	0.9	5.6	7.2	14	12	18	3.3	11	1.1	31	3.5	4.6	0.8	27	27
BH542	333668	6251690	-11.701187	13.9-14	19/05/2012	Saturated	73677-12	9	<0.5	23	130	260	2.1	9	230	13	22	34	37	31	41	11	29	3.5	87	42	13	230	120	76
BH542	333668	6251690	-10.701187	12.9-13	19/05/2012	Saturated	73677-11	-	-	-	-	-	-	-	-	3	2.6	5.3	9.3	8.4	12	2.4	7.4	0.8	20	3.9	2.9	2.5	18	19
BH542	333668	6251690	-9.701187	11.9-12	19/05/2012	Saturated	73677-10	-	-	-	-	-	-	-	-	0.7	0.2	0.8	1.1	1	1.5	0.3	1	0.1	2.8	0.6	0.4	1.2	2.8	2.7
BH542	333668	6251690	-3.701187	5.9-6	19/05/2012	Saturated	73677-9	-	-	-	-	-	-	-	-	0.8	0.3	1.1	1.7	1.4	2.2	0.5	1.4	0.1	4.5	0.8	0.5	0.7	3.8	4.2
BH542	333668	6251690	-2.701187	4.9-5	19/05/2012	Saturated	73677-8	<4	<0.5	24	16	290	0.4	11	140	0.9	0.2	1.1	1.5	1.3	1.9	0.4	1.3	0.1	4.2	0.9	0.5	0.6	3.9	3.8
BH542	333668	6251690	-1.701187	3.9-4	19/05/2012	Saturated	73677-7	-	-	-	-	-	-	-	-	1	0.4	1.4	2.5	2.1	3.1	0.7	2.1	0.2	6.1	1	0.8	0.6	5.5	5.8
BH542	333668	6251690	-0.701187	2.9-3	19/05/2012	Saturated	73677-6	-	-	-	-	-	-	-	-	2.7	0.4	2.7	2.9	2.4	3.5	0.8	2.4	0.2	9.1	2.5	1	1.1	9.9	8.1
BH542	333668	6251690	0.298813	1.9-2	19/05/2012	Saturated	73677-5	17	<0.5	17	20	74	0.4	12	58	0.8	0.2	1.2	1.3	1.2	1.7	0.4	1.1	0.1	4	0.7	0.5	0.5	3.4	3.6
BH542	333668	6251690	0.798813	1.4-1.5	19/05/2012	Saturated	73677-4	-	-	-	-	-	-	-	-	4.5	1.4	7.6	10	10	14	3.4	9	0.9	29	4.4	4	1.1	26	26
BH543	333567.4	6251731	-6.585221	9-9.1	15/05/2012	Saturated	73391-10	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.3	0.44	0.6	0.2	0.2	<0.1	0.6	<0.1	0.2	<0.1	0.4	0.8
BH543	333567.4	6251731	-5.585221	8-8.1	15/05/2012	Saturated	73391-9	-	-	-	-	-	-	-	-	<0.1	0.2	0.5	0.8	0.83	1.1	0.3	0.7	<0.1	1.7	0.3	0.3	0.2	1.7	1.8
BH543	333567.4	6251731	-3.585221	6-6.1	15/05/2012	Saturated	73391-8	<4	<0.5	11	7	61	0.2	5	57	<0.1	<0.1	<0.1	0.1	0.16	0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.2	0.3
BH543	333567.4	6251731	-2.585221	5-5.1	15/05/2012	Saturated	73391-7	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.26	0.3	0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.3	0.5
BH543	333567.4	6251731	-1.585221	4-4.1	15/05/2012	Saturated	73391-6	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.3	0.4	0.5	0.2	0.2	<0.1	0.5	<0.1	0.2	<0.1	0.3	0.7
BH543	333567.4	6251731	-0.585221	3-3.1	15/05/2012	Saturated	73391-5	<4	<0.5	16	12	120	0.7	15	99	<0.1	<0.1	0.1	0.3	0.53	0.7	0.2	0.3	<0.1	0.6	<0.1	0.2	<0.1	0.3	0.8
BH543	333567.4	6251731	0.414779	2-2.1	15/05/2012	Saturated	73391-4	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.3	0.27	0.4	0.1	0.2	<0.1	0.6	<0.1	0.1	<0.1	0.5	0.6
BH543	333567.4	6251731	0.914779	1.5-1.6	15/05/2012	Saturated	73391-3	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.15	0.2	<0.1	0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.3	0.3
BH544D	333569.7	6251711	-12.496195	14.9-15	16/05/2012	Saturated	73446-17	-	-	-	-	-	-	-	-	0.1	0.6	0.7	2	2.5	3.3	1.1	1.7	0.3	3.9	0.3	1.1	0.4	1.8	4.7
BH544D	333569.7	6251711	-9.496195	11.9-12	16/05/2012	Saturated	73446-16	5	<0.5	14	45	100	0.1	9	77	0.2	0.3	0.6	2.2	3.8	5	1.7	2.4	0.4	4.1	0.1	1.7	0.1	1.1	7.7
BH544D	333569.7	6251711	-3.496195	5.9-6	16/05/2012	Saturated	73446-15	-	-	-	-	-	-	-	-	0.3	0.4	0.9	3	4.9	6.6	2.2	3.2	0.6	6.2	0.2	2.2	0.3	2.1	8
BH544D	333569.7	6251711	-2.496195	4.9-5	16/05/2012	Saturated	73446-14	-	-	-	-	-	-	-	-	0.4	0.3	1.4	3.4	5.2	6.8	2.2	3.6	0.5	7.6	0.3	2.3	0.2	2.9	9.2
BH544D	333569.7	6251711	-1.496195	3.9-4	16/05/2012	Saturated	73446-13	<4	<0.5	16	28	190	0.1	8	96	0.4	0.4	1.4	3.5	5.4	7.2	2.4	3.8	0.5	7.5	0.3	2.5	0.2	3.5	9
BH544D	333569.7	6251711	-0.496195	2.9-3	16/05/2012	Saturated	73446-12	-	-	-	-	-	-	-	-	0.3	0.3	0.9	2.6	4.3	5.6	2	2.4	0.4	5.3	0.2	2	0.1	1.9	7.2
BH544D	333569.7	6251711	0.503805	1.9-2	16/05/2012	Saturated	73446-11	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.5	0.57	0.8	0.3	0.4	<0.1	1	<0.1	0.3	<0.1	0.5	1.1
BH545	333606.3	6251763	-1.631969	3.9-4	24/05/2012	Saturated	73980-6	-	-	-	-	-	-	-	-	<0.1	0.1	0.2	0.3	0.4	0.5	0.2	0.3	<0.1	0.8	0.1	0.2	<0.1	0.7	0.8
BH545	333606.3	6251763	-0.631969	2.9-3	24/05/2012	Saturated	73980-5	<4	<0.5	10	6	48	<0.1	4	54	<0.1	0.9	1.1	2.8	2.8	3.8	1.1	2.4	0.3	5.8	0.2	1.2	0.2	2.8	6.1
BH545	333606.3	6251763	0.368031	1.9-2	24/05/2012	Saturated	73980-4	-	-	-	-	-	-	-	-	0.1	1	1.3	2.3	2.9	3.8	2	2.1	0.3	5.6	0.7	1.8	0.3	4.2	5.3
BH545	333606.3	6251763	0.868031	1.4-1.5	24/05/2012	Saturated	73980-3	-	-	-	-	-	-	-	-	0.3	1.4	2	3.7	3.9	5.3	1.8	3.2	0.4	8.7	1.1	2	0.7	7.1	7.9
BH546	333600.3	6251727	-3.722456	6	23/05/2012	Saturated	74005-20	-	-	-	-	-	-	-	-	<0.1	0.1	0.2	0.6	0.78	1.1	0.3	0.6	<0.1	1.2	<0.1	0.3	<0.1	0.5	1.3
BH546	333600.3	6251727	-2.722456	5	23/05/2012	Saturated	74005-19	-	-	-	-	-	-	-	-	<0.1	0.2	0.2	0.7	0.89	1.2	0.3	0.7	<0.1	1.4	<0.1	0.4	<0.1	0.6	1.6
BH546	333600.3	6251727	-1.722456	4	23/05/2012	Saturated	74005-18	<4	<0.5	12	9	41	<0.1	5	56	<0.1	0.2	0.3	1.1	1.5	2	0.6	1	0.1	2.1	<0.1	0.6	<0.1	0.9	2.4
BH546	333600.3	6251727	-0.722456	3	23/05/2012	Saturated	74005-17	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.4	0.5	0.7	0.2	0.3	<0.1	0.8	<0.1	0.2	<0.1	0.3	0.7
BH546	333600.3	6251727	0.277544	2	23/05/2012	Saturated	74005-16	-	-	-	-	-	-	-	-	0.1	0.8	1.2	4.6	6	8	2.7	4.1	0.6	8.7	0.2	2.7	0.2	3.4	8.5
BH546	333600.3	6251727	0.777544	1.5	23/05/2012	Saturated	74005-15	-	-	-	-	-	-	-	-	<0.1	0.1	0.2	0.5	0.84	1.1	0.5	0.6	<0.1	1.1	<0.1	0.4	<0.1	0.6	1.1
BH547	333601.3	6251708	-10.572295	13	23/05/2012	Saturated	74005-32	-	-	-	-	-	-	-	-	3.1	4.6	6	5.8	5.5	7.4	1.6	4.7	0.5	13	7.2	2	35	18	12
BH547	333601.3	6251708	-9.572295	12	23/05/2012	Saturated	74005-31	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.09	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.2
BH547	333601.3	6251708	-6.572295	9	23/05/2012	Saturated	74005-30	-	-	-	-	-	-	-	-	0.1	0.1	0.4	0.8	1.1	1.4	0.5	0.8	<0.1	2.3	0.1	0.5	<0.1	1.5	2.5
BH547	333601.3	6251708	-5.572295	8	23/05/2012	Saturated	74005-29	-	-	-	-	-	-	-	-	<0.1	0.2	0.2	0.6	0.8	1.1	0.3	0.6	<0.1	1.4	0.1	0.4	<0.1	0.8	1.7
BH547	333601.3	6251708	-4.572295	7	23/05/2012	Saturated	74005-28	<4	<0.5	8	11	45	<0.1	3	50	<0.1	0.2	0.4	0.8	1	1.4	0.4	0.7	<0.1	1.8	0.1	0.5	0.1	1.2	2.2
BH547	333601.3	6251708	-0.572295	3	23/05/2012	Saturated	74005-27	-	-	-	-	-	-	-	-	1.3	6.9	8.9	19	19	31	7.8	19	2.4	38	4	9.2	5.7	34	36
BH547	333601.3	6251708	0.427705	2	23/05/2012	Saturated	74005-26	-	-	-	-	-	-	-	-	2.4	17	23	67	62	97	21	64	5.7	150	8.7	24	9.8	140	140
BH547	333601.3	6251708	0.927705	1.5	23/05/2012	Saturated	74005-25	-	-	-	-	-	-	-	-	0.6	5.7	7.4	17	19	27	7.5	16	2	31	3.6	8.7	2.8	21	31
BH548	333636.4	6251758	-3.374653	5.9-6	24/05/2012	Saturated	73980-16	-	-	-	-	-	-	-	-	<0.1	0.2	0.4	0.8	0.9	1.3	0.4	0.8	<0.1	1.9	0.2	0.5	<0.1	1.3	1.9
BH548	333636.4	6251758	-2.374653	4.9-5	24/05/2012	Saturated	73980-15	-	-	-	-	-	-	-	-	<0.1	0.2	0.4	0.8	0.84	1.2	0.4	0.7	<0.1	2	0.2	0.4	0.2	1.4	1.9
BH548	333636.4	6251758	-1.374653	3.9-4	24/05/2012	Saturated	73980-14	-	-	-	-	-	-	-	-	<0.1	0.3	0.4	1	1	1.4	0.4	0.9	<0.1	2.3	0.2	0.5	0.1	1.4	2.3
BH548	333636.4	6251758	-0.374653	2.9-3	24/05/2012	Saturated	73980-13	<4	<0.5	9	31	100	0.6	5	77	<0.1	0.3	0.5	1.2	1.3	1.8	0.7	1.1	0.1	2.7	0.2	0.7	0.1	1.6	2.7
BH548	333636.4	6251758	0.625347	1.9-2	24/05/2012	Saturated	73980-12	-	-	-	-	-	-	-	-	<0.1	0.2	0.3	0.9	1.3	1.8	0.9	0.9	0.1	2	<0.1	0.8	<0.1	0.9	2
BH549	333681.3	6251777	-6.272812	8.9-9	25/05/2012	Saturated	74023-11	-	-	-	-	-	-	-	-	0.3	0.1	0.6	1	1.1	1.5	0.5	1	<0.1	2.5	0.4	0.5	0.4	2.3	2.5
BH549	333681.3	6251777	-5.272812	7.9-8	25/05/2012	Saturated	74023-10	<4	<0.5	10	27	100	0.1	7	230	0.3	0.2	0.7	1.2	1.3	1.8	0.6	1.2	<0.1	3.1	0.5	0.6	0.4	2.9	3
BH549	333681.3	6251777	-4.272812	6.9-7	25/05/2012	Saturated	74023-9	-	-	-	-	-	-	-	-	0.2	0.2	0.6	1.2	1.3	1.8	0.6	1.1	<0.1	2.9	0.3	0.7	0.4	2.5	2.8
BH549	333681.3	6251777	-3.272812	5.9-6	25/05/2012	Saturated	74023-8	-	-	-	-	-	-	-	-	<0.1	0.2	0.3	0.9	1.1	1.5	0.5	0.8	<0.1	1.8	0.1	0.6	0.2	1.3	1.8
BH549	333681.3	6251777	-2.272812	4.9-5	25/05/2012	Saturated	74023-7	-	-	-	-	-	-	-	-	<0.1	<0.1	0.2	0.5	0.68	0.9	0.4	0.5	<0.1	0.9	<0.1	0.4	0.1	0.6	1
BH549	333681.3	6251777	-0.272812	2.9-3	25/05/2012	Saturated	74023-6	<4	<0.5	14	18	210	0.2	18	96	<0.1	0.1	0.3	1.6	1.6	2.4	0.8	1.5	0.2	2.9	<0.1	0.9	<0.1	1.8	3
BH549	333681.3	6251777	0.727188	1.9-2	25/05/2012	Saturated	74023-5	-	-	-	-	-	-	-	-	<0.1	<0.1	0.3	0.9	1.1	1.6	0.6	0.9	<0.1	1.6	0.1	0.7	<0.1	1	1.6
BH550	333638.3	6251711	-10.587528	12.9-13	25/05/2012	Saturated	74023-22	6	<0.5	9	7	86	<0.1	2	52	0.7	3.8	3.1	2.6	2.1	2.9	0.7	2.1	0.2	6.3	4.2	0.7	27	10	5.7
BH550	333638.3	6251711	-3.587528	5.9-6	25/05/2012	Saturated	74023-21	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.3	0.34	0.5	0.2	0.3	<0.1	0.7	<0.1	0.2	<0.1	0.4	0.7
BH550	333638.3	6251711	-2.587528	4.9-5	25/05/2012	Saturated	74023-20	-	-	-	-	-	-	-	-	<0.1	<0.1	0.2	0.6	0.54	0.7	0.2	0.5	<0.1	0.9	<0.1	0.2	<0.1	0.5	1
BH550	333638.3	6251711	-1.587528	3.9-4	25/05/2012	Saturated	74023-19	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.3	0.32	0.5	0.1	0.3	<0.1	0.6	<0.1	0.1	<0.1	0.4	0.6
BH550	333638.3	6251711	-0.587528	2.9-3	25/05/2012	Saturated	74023-18	-	-	-	-	-	-	-	-	<0.1	0.1	0.2	0.9	0.9	1.3	0.4	0.8	<0.1	1.6	<0.1	0.4	<0.1	0.7	1.7
BH550	333638.3	6251711	0.412472	1.9-2	25/05/2012	Saturated	74023-17	5	0.6	14	76	1500	0.2	7	730	<0.1	<0.1	0.2	0.8	1.1	1.5	0.6	0.7	0.1	1.1	<0.1	0.6	<0.1	0.5	1.5
BH550	333638.3	6251711	0.912472	1.4-1.5	25/05/2012	Saturated	74023-16	-	-	-	-	-	-	-	-	<0.1	0.2	0.3	1	1.1	1.6	0.6	0.9	<0.1	2	0.1	0.6	<0.1	1.1	2
BH551	333593	6251746	-6.601704	8.9-9	24/05/2012	Saturated	73980-21	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.06	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH551	333593	6251746	-3.601704	5.9-6	24/05/2012	Saturated	74003-4	<4	<0.5	12	7	18	<0.1	6	32	<0.1	0.1	0.1	0.4	0.39	0.6	0.2	0.4	<0.1	0.9	<0.1	0.2	<0.1	0.6	0.8
BH551	333593	6251746	-2.601704	4.9-5	24/05/2012	Saturated	74003-3	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.2	0.22	0.3	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.4	0.5
BH551	333593	6251746	-1.601704	3.9-4	24/05/2012	Saturated	74003-2	-	-	-	-	-	-	-	-	<0.1	<0.1	0.1	0.2	0.25	0.4	0.1	0.3	<0.1	0.6	<0.1	0.1	<0.1	0.5	0.6
BH551	333593	6251746	-0.601704	2.9-3	24/05/2012	Saturated	74003-1	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.2	0.19	0.3	<0.1	0.2	<0.1	0.4	<0.1	<0.1	<0.1	0.3	0.4
BH551	333593	6251746	0.398296	1.9-2	24/05/2012	Saturated	73980-20	<4	<0.5	9	7	13	<0.1	5	28	<0.1	<0.1	0.1	0.2	0.22	0.3	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.5	0.5
BH551	333593	6251746	0.898296	1.4-1.5	24/05/2012	Saturated	73980-19	-	-	-	-	-	-	-	-	0.2	1	1.3	3.1	3.3	4.6	1.3	2.8	0.3	6.6	0.6	1.5	0.6	4.4	6.3

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Table 5 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Saturated Zone (<1m AHD)

								Metals								PAH											
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
BH552	333702.6	6251790	-8.093155	10.4-10.5	25/05/2012	Saturated	74023-33	-	-	-	-	-	-	-	-	<0.1	<0.1	0.2	0.4	0.47	0.7	0.2	0.4	<0.1	0.9	0.1	0.2	<0.1	0.6	0.9
BH552	333702.6	6251790	-3.593155	5.9-6	25/05/2012	Saturated	74023-32	-	-	-	-	-	-	-	-	0.1	0.8	1.5	3.2	2.8	4.2	1.2	2.8	0.2	7.8	0.5	1.3	0.2	7	7.2
BH552	333702.6	6251790	-2.593155	4.9-5	25/05/2012	Saturated	74023-31	<4	<0.5	10	9	120	0.1	4	46	0.2	<0.1	0.4	0.6	0.6	0.9	0.2	0.6	<0.1	1.7	0.2	0.3	<0.1	1.5	1.6
BH552	333702.6	6251790	-0.593155	2.9-3	25/05/2012	Saturated	74023-30	-	-	-	-	-	-	-	-	0.3	1.7	1.8	4	3.7	5.2	1.5	3.8	0.2	9.7	1.1	1.7	0.2	11	9.8
BH552	333702.6	6251790	0.406845	1.9-2	25/05/2012	Saturated	74023-29	-	-	-	-	-	-	-	-	<0.1	0.2	0.3	1.3	1.4	2	0.6	1.2	<0.1	2.5	0.1	0.7	<0.1	1.3	2.6
BH552	333702.6	6251790	0.906845	1.4-1.5	25/05/2012	Saturated	74023-28	-	-	-	-	-	-	-	-	<0.1	0.2	0.3	1.1	1.1	1.7	0.5	1	<0.1	2	<0.1	0.6	<0.1	1.2	2

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Table 6 - Soil Analytical Results: Volatile Organic Compounds - Saturated Zone (<1m AHD)

								BTEX						Chlorinated Hydrocarbons										
								Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.1	1	0.5	2	1		1	1	1	1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCode**																	
BH506D	333712.9	6251865	-3.798982	6-6.1	1/05/2012	Saturated	72660-9	<0.1	<1	<0.5	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH510	333670	6251896	-4.483037	6.9-7	8/05/2012	Saturated	72908-1	<0.1	<1	<0.5	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH541D	333675.2	6251712	-7.578688	9.9-10	19/05/2012	Saturated	73677-35	64	8	69	62	25	87	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH541D	333675.2	6251712	-6.578688	8.9-9	19/05/2012	Saturated	73677-34	2	2	1	2	1	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH542	333668	6251690	-11.701187	13.9-14	19/05/2012	Saturated	73677-12	16	7	17	19	8	27	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH547	333601.3	6251708	-0.572295	3	23/05/2012	Saturated	74005-27	0.3	<1	0.5	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-10.587528	12.9-13	25/05/2012	Saturated	74023-22	0.7	<1	1	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

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Table 6 - Soil Analytical Results: Volatile Organic Compounds - Saturated Zone (<1m AHD)

							1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCo**																
BH506D	333712.9	6251865	-3.798982	6-6.1	1/05/2012	Saturated	72660-9	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH510	333670	6251896	-4.483037	6.9-7	8/05/2012	Saturated	72908-1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH541D	333675.2	6251712	-7.578688	9.9-10	19/05/2012	Saturated	73677-35	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH541D	333675.2	6251712	-6.578688	8.9-9	19/05/2012	Saturated	73677-34	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH542	333668	6251690	-11.701187	13.9-14	19/05/2012	Saturated	73677-12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH547	333601.3	6251708	-0.572295	3	23/05/2012	Saturated	74005-27	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-10.587528	12.9-13	25/05/2012	Saturated	74023-22	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

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Table 6 - Soil Analytical Results: Volatile Organic Compounds - Saturated Zone (<1m AHD)

									Halogenated Benzenes									Halogenated Hydrocarbons				MAH	
							trans-1,3-dichloropropene	Vinyl chloride	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Chlorobenzene	1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Trichlorofluoromethane	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCo**																
BH506D	333712.9	6251865	-3.798982	6-6.1	1/05/2012	Saturated	72660-9	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH510	333670	6251896	-4.483037	6.9-7	8/05/2012	Saturated	72908-1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH541D	333675.2	6251712	-7.578688	9.9-10	19/05/2012	Saturated	73677-35	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	27	15
BH541D	333675.2	6251712	-6.578688	8.9-9	19/05/2012	Saturated	73677-34	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1
BH542	333668	6251690	-11.701187	13.9-14	19/05/2012	Saturated	73677-12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	10	5
BH547	333601.3	6251708	-0.572295	3	23/05/2012	Saturated	74005-27	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-10.587528	12.9-13	25/05/2012	Saturated	74023-22	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

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Table 6 - Soil Analytical Results: Volatile Organic Compounds - Saturated Zone (<1m AHD)

														Solvents
							Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	Styrene	tert-butylbenzene	Cyclohexane
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCo**							
BH506D	333712.9	6251865	-3.798982	6-6.1	1/05/2012	Saturated	72660-9	<1	<1	<1	<1	<1	<1	<1	<1
BH510	333670	6251896	-4.483037	6.9-7	8/05/2012	Saturated	72908-1	<1	<1	<1	<1	<1	<1	<1	<1
BH541D	333675.2	6251712	-7.578688	9.9-10	19/05/2012	Saturated	73677-35	11	<1	1	<1	<1	31	<1	<1
BH541D	333675.2	6251712	-6.578688	8.9-9	19/05/2012	Saturated	73677-34	<1	<1	<1	<1	<1	<1	<1	<1
BH542	333668	6251690	-11.701187	13.9-14	19/05/2012	Saturated	73677-12	<1	<1	<1	<1	<1	1	<1	<1
BH547	333601.3	6251708	-0.572295	3	23/05/2012	Saturated	74005-27	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-10.587528	12.9-13	25/05/2012	Saturated	74023-22	<1	<1	<1	<1	<1	<1	<1	<1

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Table 7 - Soil Analytical Results: Polycyclic Aromatic Hydrocarbons and Metals - Natural

								Metals								PAH													
								Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								4	0.5	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCode**																							
BH503	333682.7	6251958	-11.664858	14-14.1	3/05/2012	Natural	72647-25	<4	<0.5	18	3	14	<0.1	3	19	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH504	333688.4	6251926	-6.496655	9-9.1	3/05/2012	Natural	72647-34	<4	<0.5	8	4	15	<0.1	<1	15	<0.1	<0.1	<0.1	0.2	0.23	0.3	0.1	0.2	<0.1	0.4	<0.1	0.1	<0.1	0.2	0.4
BH506D	333712.9	6251865	-7.698982	9.9-10	1/05/2012	Natural	72660-13	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	0.1	0.07	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2
BH510	333670	6251896	-11.483037	13.9-14	8/05/2012	Natural	72908-8	5	<0.5	12	3	15	<0.1	1	13	<0.1	<0.1	<0.1	<0.1	0.09	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2
BH512	333633.9	6251924	-14.172267	16.5-16.6	9/05/2012	Natural	72984-14	<4	<0.5	8	15	94	0.5	3	77	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH515	333643.2	6251826	-10.293701	13-13.1	9/05/2012	Natural	72989-31	5	<0.5	14	3	22	<0.1	2	10	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH516	333647.2	6251898	-11.35679	13.8-13.9	3/05/2012	Natural	72647-12	<4	<0.5	9	10	37	0.2	7	48	<0.1	<0.1	<0.1	0.1	0.21	0.3	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.1	0.4
BH521	333582.5	6251918	-9.625998	12	7/05/2012	Natural	72848-15	<4	<0.5	7	11	36	<0.1	3	38	<0.1	<0.1	<0.1	0.1	0.12	<0.2	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2
BH524	333571.6	6251814	-13.663888	16-16.1	8/05/2012	Natural	72910-9	<4	<0.5	13	11	18	<0.1	4	39	<0.1	<0.1	<0.1	0.2	0.21	0.3	0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.3	0.6
BH526	333548.9	6251878	-13.647037	16-16.1	7/05/2012	Natural	72863-7	15	<0.5	24	7	37	<0.1	3	28	<0.1	<0.1	<0.1	0.2	0.29	0.5	0.1	0.3	<0.1	0.5	<0.1	0.1	<0.1	0.3	0.6
BH527	333554.7	6251919	-11.555673	14-14.1	8/05/2012	Natural	72909-2	<4	<0.5	16	22	98	0.1	12	120	<0.1	0.2	0.3	0.7	0.64	1	0.2	0.6	<0.1	1.5	0.2	0.3	<0.1	0.9	1.6
BH530	333671.7	6251915	-11.643655	14-14.1	4/05/2012	Natural	72744-13	<4	<0.5	10	2	22	0.1	2	12	<0.1	<0.1	<0.1	0.2	0.27	0.4	<0.1	0.2	<0.1	0.5	<0.1	0.1	<0.1	0.2	0.5
BH531	333552.7	6251858	-13.645317	16-16.1	7/05/2012	Natural	72863-14	17	<0.5	20	4	15	<0.1	4	14	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH532	333567.2	6251900	-14.064806	16.5-16.5	8/05/2012	Natural	72909-14	16	<0.5	25	17	23	<0.1	8	30	<0.1	0.1	0.1	0.4	1.1	1.6	1.1	0.3	0.2	0.8	<0.1	1.1	<0.1	0.2	0.8
BH533	333676.3	6251855	-11.312462	13.9-14	8/05/2012	Natural	72907-8	7	<0.5	18	3	12	<0.1	2	12	<0.1	<0.1	<0.1	<0.1	0.05	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
BH534	333623	6251907	-11.578688	13.9-14	9/05/2012	Natural	72988-16	4	<0.5	10	30	82	0.8	3	99	<0.1	0.3	0.3	0.9	1	1.5	0.4	0.8	0.1	1.6	0.1	0.5	<0.1	0.6	1.8
BH542	333668	6251690	-12.301187	14.5-14.6	19/05/2012	Natural	73677-13	9	<0.5	37	47	230	1.6	4	110	17	94	75	63	52	70	11	51	4.3	160	100	15	690	270	130
BH543	333567.4	6251731	-13.585221	16-16.1	15/05/2012	Natural	73391-11	12	<0.5	24	15	53	0.2	4	51	<0.1	0.2	0.2	0.7	0.78	1.1	0.3	0.5	<0.1	1.4	<0.1	0.4	0.2	0.6	1.6
BH545	333606.3	6251763	-11.531969	13.8-13.9	24/05/2012	Natural	73980-7	51	<0.5	50	6	19	0.1	5	15	<0.1	<0.1	<0.1	<0.1	0.07	<0.2	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2
BH549	333681.3	6251777	-8.772812	11.4-11.5	25/05/2012	Natural	74023-12	<4	<0.5	6	3	18	<0.1	3	32	<0.1	<0.1	<0.1	0.2	0.19	0.3	0.1	0.2	<0.1	0.3	<0.1	0.1	<0.1	0.2	0.4
BH550	333638.3	6251711	-12.587528	14.9-15	25/05/2012	Natural	74023-24	9	<0.5	10	<1	9	<0.1	<1	7	<0.1	0.1	0.2	<0.1	0.06	<0.2	<0.1	<0.1	<0.1	0.3	0.2	<0.1	0.8	0.6	0.3
BH550	333638.3	6251711	-11.587528	13.9-14	25/05/2012	Natural	74023-23	18	<0.5	12	3	37	<0.1	2	23	0.3	1.3	1.2	1	0.78	1.1	0.2	0.8	<0.1	2.4	1.6	0.3	9.7	4	2.2

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Table 8 - Soil Analytical Results: Volatile Organic Compounds - Natural

								BTEX						Chlorinated Hydrocarbons										
								Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloropropene	1,2,3-trichloropropane	1,2-dibromo-3-chloropropane	1,2-dichloroethane	1,2-dichloropropane
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								0.1	1	0.5	2	1		1	1	1	1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCode**																	
BH542	333668	6251690	-12.301187	14.5-14.6	19/05/2012	Natural	73677-13	41	9	62	63	24	87	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-12.587528	14.9-15	25/05/2012	Natural	74023-24	0.2	<1	<0.5	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-11.587528	13.9-14	25/05/2012	Natural	74023-23	0.5	<1	0.9	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

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Table 8 - Soil Analytical Results: Volatile Organic Compounds - Natural

							1,3-dichloropropane	2,2-dichloropropane	Bromochloromethane	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCo**																
BH542	333668	6251690	-12.301187	14.5-14.6	19/05/2012	Natural	73677-13	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-12.587528	14.9-15	25/05/2012	Natural	74023-24	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-11.587528	13.9-14	25/05/2012	Natural	74023-23	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

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Table 8 - Soil Analytical Results: Volatile Organic Compounds - Natural

								Halogenated Benzenes										Halogenated Hydrocarbons				MAH	
								trans-1,3-dichloropropene	Vinyl chloride	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Chlorobenzene	1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Trichlorofluoromethane	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene
								mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Field_ID	**x_coord**	**y_coord**	**Elevation**	**Depth**	**Sample Date**	**Zone**	**SampleCo**																	
BH542	333668	6251690	-12.301187	14.5-14.6	19/05/2012	Natural	73677-13	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	28	15
BH550	333638.3	6251711	-12.587528	14.9-15	25/05/2012	Natural	74023-24	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH550	333638.3	6251711	-11.587528	13.9-14	25/05/2012	Natural	74023-23	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

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Table 9 - Soil Analytical Results: SPOCAS

								SPOCAS						
								Acid Reacted Calcium	Calcium in Peroxide	KCl Extractable Calcium	KCl Extractable Magnesium	Magnesium in Peroxide	Peroxide Oxidisable Sulfur	Sulfur in Peroxide
								%	%	%	%	%	%	%
EQL								0.005	0.005	0.005	0.005	0.005	0.005	0.005
Field_ID	**x_coord**	**y_coord**	**Sample_Elevatio**	**Sample_D**	**Sampled_**	**Zone**	**SampleCode**							
BH510	333670	6251896	-7.483037	9.9-10	8/05/2012	Saturated	72908-4	0.19	0.36	0.17	0.007	0.028	0.04	0.06
BH518	333722.4	6251790	-3.902216	6.4-6.5	18/05/2012	Natural	73678-20	0.17	0.27	0.1	0.016	0.027	0.03	0.05
BH518	333722.4	6251790	-1.402216	3.9-4	18/05/2012	Saturated	73678-17	0.32	0.45	0.13	0.025	0.067	0.57	0.6
BH530	333671.7	6251915	-11.643655	14-14.1	4/05/2012	Natural	72744-13	0.1	0.2	0.09	0.024	0.045	0.02	0.03
BH533	333676.3	6251855	-11.312462	13.9-14	8/05/2012	Natural	72907-8	0.011	0.06	0.05	0.034	0.039	0.01	0.02
BH533	333676.3	6251855	-5.312462	7.9-8	8/05/2012	Saturated	72907-2	0.12	0.29	0.17	0.005	0.045	0.05	0.06
BH537	333706.8	6252000	-4.457994	6.9-7	17/05/2012	Natural	73540-10	0.11	0.22	0.11	0.025	0.056	0.37	0.4
BH537	333706.8	6252000	-2.457994	4.9-5	17/05/2012	Saturated	73540-8	0.13	0.29	0.16	0.054	0.072	0.32	0.38
BH540D	333682.6	6251762	-11.375081	14-14.1	17/05/2012	Natural	73540-28	0.043	0.17	0.12	0.013	0.029	0.03	0.06
BH540D	333682.6	6251762	-4.275081	6.9-7	17/05/2012	Saturated	73540-26	0.95	1.2	0.28	<0.005	0.039	0.06	0.08

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Table 10 - Column Leachate Results

							Metals								PAH													
							Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
							mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL							0.001	0.0001	0.001	0.001	0.001	0.00005	0.001	0.001	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Field_ID	**x_coord**	**y_coord**	**Sample_Elevation**	**Sample_Depth_Range**	**Sampled_Date-Time**	**SampleCode**																							
BH503	333682.7499	6251957.941	0.335142	2-2.1	3/05/2012	72647-A-17	<0.001	<0.0001	<0.001	0.002	<0.001	<0.00005	<0.001	0.023	1	<0.1	0.2	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.2	0.7	<0.1	0.9	1	0.1
BH507	333720.522	6251832.346	-4.483447	6.5-7	4/05/2012	72746-1	<0.001	<0.0001	<0.001	0.002	0.002	0.00009	0.004	0.037	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH508	333694.9099	6251831.512	0.669557	1.5-2	4/05/2012	72746-2	<0.001	<0.0001	<0.001	0.002	0.001	0.00009	<0.001	0.032	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH513	333625.403	6251880.026	-9.187166	11.5-12	11/05/2012	73161-1	0.003	0.0005	0.001	0.024	0.011	<0.00005	0.011	0.057	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH515	333643.185	6251825.673	-0.493701	3-3.5	9/05/2012	72975-2	0.002	0.0006	<0.001	0.008	0.004	<0.00005	0.008	0.041	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH524	333571.5969	6251813.95	-2.863888	5-5.5	8/05/2012	72908-A-20	0.002	0.0004	<0.001	0.009	0.002	<0.00005	0.005	0.031	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH527	333554.71	6251918.997	0.244327	2-2.5	7/05/2012	72853-2	0.003	0.0001	0.006	0.031	<0.001	<0.00005	0.009	0.036	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH528	333571.1705	6251794.443	-3.834352	6-6.5	10/05/2012	73247-A-53	0.003	0.0003	0.001	0.011	0.015	0.0011	0.017	0.062	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH529D	333560.38	6251773.111	-3.374087	5.5-6	14/05/2012	73488-2	0.001	0.0003	<0.001	0.01	0.002	<0.00005	0.008	0.053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH532	333567.2052	6251900.14	-0.314806	2.5-3	8/05/2012	72908-A-21	0.004	0.0007	0.001	0.029	0.003	0.00011	0.011	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH533	333676.2999	6251855.18	-1.612462	4-4.5	8/05/2012	72908-A-19	0.019	<0.0001	0.001	0.018	0.007	<0.00005	0.011	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH534	333622.9595	6251906.749	-1.878688	4-4.5	9/05/2012	72975-1	0.003	0.0004	<0.001	0.012	0.004	0.00009	0.007	0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH535	333570.34	6251853.995	-1.834269	4-4.5	11/05/2012	73161-2	0.003	0.0009	0.001	0.011	0.007	<0.00005	0.035	0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH536D	333604.6608	6251798.112	-6.428148	8.5-9	11/05/2012	73161-4	0.006	<0.0001	<0.001	0.002	0.003	<0.00005	0.003	0.018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH537	333706.7988	6252000.343	-0.207994	2.5-2.9	17/05/2012	73544-2	0.021	0.0003	0.002	0.032	0.002	<0.00005	0.006	0.034	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH539	333677.557	6251737.54	-3.130484	5.5-5.9	18/05/2012	73676-1	0.009	0.0001	<0.001	0.004	<0.001	0.00009	0.002	<0.001	2.4	0.1	0.4	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.5	1.3	<0.1	8.3	2.1	0.3
BH540D	333682.581	6251761.501	-2.025081	4.5-4.9	17/05/2012	73544-1	0.01	0.0006	<0.001	0.047	0.055	<0.00005	0.005	0.035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH540S	333682.559	6251762.194	-0.36898	3-3.1	18/05/2012	73676-2	0.009	0.0001	0.004	0.008	0.014	<0.00005	0.007	0.028	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH541D	333675.16	6251711.619	-0.328688	2.5-2.9	19/05/2012	73676-3	0.012	0.0002	0.001	0.027	0.053	0.00013	0.006	0.047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH541S	333674.312	6251711.74	-3.326578	5.5-5.9	19/05/2012	73676-4	0.026	0.0002	0.012	0.084	0.015	0.00034	0.06	0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH542	333668.025	6251689.528	-12.001187	14-14.5	19/05/2012	73676-6	0.13	0.0001	0.023	0.007	0.024	0.00034	0.027	0.041	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH542	333668.025	6251689.528	-2.451187	4.5-4.9	19/05/2012	73676-5	0.12	0.0003	0.013	0.007	0.031	0.0002	0.086	0.036	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH546	333600.3244	6251727.24	-1.722456	4	23/05/2012	74007-2	0.019	0.0002	0.007	0.006	0.009	<0.00005	0.006	0.021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH547	333601.3166	6251707.727	-4.572295	7	23/05/2012	74007-1	0.021	0.0005	0.006	0.006	0.011	0.00007	0.01	0.029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH548	333636.374	6251758.328	-0.124653	2.5-2.9	24/05/2012	73981-1	0.002	<0.0001	0.001	0.005	0.003	0.00015	0.001	0.005	<0.1	0.1	0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.1	0.2	<0.1	0.1	0.6	0.1

Job No: 42021
Barangaroo Central
Table 11 - Current Groundwater Gauging

Well ID	Date Measured	Total Depth (m)	Top of Well (MGA)	Depth to Water* (m)	Depth to PSH* (m)	PSH Thickness (m)	Product Gravity	Hydraulic Equivalent (m)	Corrected Water (MGA)	Comments
Shallow Monitoring Wells										
MW08	24/05/2012	Not gauged - under stockpile								
MW12	25/05/2012	6.500	2.264	2.023	-	-	-	-	0.241	
MW13	24/05/2012	6.001	2.294	1.971	-	-	-	-	0.323	
MW24	24/05/2012	6.665	2.394	2.087	-	-	-	-	0.307	
MW179	24/05/2012	6.739	2.448	2.310	-	-	-	-	0.138	
MW213	24/05/2012	15.569	2.315	2.099	-	-	-	-	0.216	
MW214	24/05/2012	15.299	2.086	1.279	-	-	-	-	0.807	
MW501	24/05/2012	5.991	2.410	2.216	-	-	-	-	0.194	
MW502	24/05/2012	6.104	2.366	2.159	-	-	-	-	0.207	
MW506S	24/05/2012	5.971	2.110	1.934	-	-	-	-	0.176	
MW507	24/05/2012	6.042	2.094	1.890	-	-	-	-	0.204	
MW514	24/05/2012	5.916	2.754	2.484	-	-	-	-	0.270	
MW515	24/05/2012	5.893	2.709	2.442	-	-	-	-	0.267	
MW516	24/05/2012	5.962	2.379	2.292	-	-	-	-	0.087	
MW518	24/05/2012	5.633	2.077	1.775	-	-	-	-	0.302	
MW525S	24/05/2012	5.910	2.251	2.122	-	-	-	-	0.129	
MW526	24/05/2012	5.689	2.369	2.205	-	-	-	-	0.164	
MW527	24/05/2012	5.529	2.395	2.223	-	-	-	-	0.172	
MW529S	24/05/2012	5.436	2.324	2.095	-	-	-	-	0.229	
MW539	24/05/2012	5.455	2.628	2.339	-	-	-	-	0.289	
MW540S	24/05/2012	5.791	2.617	2.291	-	-	-	-	0.326	
MW541S	24/05/2012	5.805	2.346	2.099	-	-	-	-	0.247	
MW542	24/05/2012	4.919	2.225	2.013	-	-	-	-	0.212	
MW543	24/05/2012	5.315	2.443	2.211	-	-	-	-	0.232	
MW544S	24/05/2012	5.371	2.402	2.165	-	-	-	-	0.237	
Deep Monitoring Wells										
MW506D	24/05/2012	8.379	2.085	1.836	-	-	-	-	0.249	
MW525D	24/05/2012	11.296	2.272	2.142	-	-	-	-	0.130	
MW529D	24/05/2012	12.861	2.316	1.993	-	-	-	-	0.323	
MW540D	24/05/2012	13.551	2.592	2.334	-	-	-	-	0.258	
MW541D	24/05/2012	10.344	2.318	2.029	-	-	-	-	0.289	
MW544D	24/05/2012	12.323	2.442	2.104	-	-	-	-	0.338	

Notes:
* top of well casing
ID = identification
mAHD = map grid Australia
m = metres
PSH = phase separated hydrocarbons

Field Equipment Used:
Solinst Inferface Probe
Pre purge gauging data only

Job No: 42021
Barangaroo Central
Table 12 - Current Groundwater Parameters

Well ID	Date Measured	Dissolved Oxygen		Electrical Conductivity	TDS	Redox Potential	pH	Temperature	Comments
		mg/L	%	(uS/cm)	(ppm)	(mV)		(oC)	
MW08		Not sampled - under stockpile							
MW12	25/05/2012	1.89	21.0	45800	32300	50	7.28	20.7	
MW13	28/05/2012	0.40	4.5	42100	29400	-87	7.25	21.2	Sulfur odour
MW24	25/05/2012	0.18	2.1	49100	34600	-86	7.83	20.8	
MW179	25/05/2012	2.48	28.0	35800	24600	27	7.33	20.8	Slight odour
MW213	25/05/2012	6.98	7.8	51000	36200	39	72.90	21.4	
MW214	25/05/2012	0.23	23.0	28600	17200	-206	7.87	20.6	
MW501	24/05/2012	0.85	6.6	41300	28900	-126	12.38*	3.8*	Slight sulfur odour/sheen
MW502	28/05/2012	0.22	2.7	36300	25000	-205	7.48	22.9	Slight sulfur odour/sheen
MW506S	28/05/2012	0.89	6.7	36100	25600	-174	7.65	22.3	Sulfur odour
MW506D	24/05/2012	0.10	0.5	21950	14120	-192	7.64	-	
MW507	24/05/2012	0.70	0.4	23700	15020	-244	7.27	-	Sulfur odour
MW514	24/05/2012	0.29	3.3	31600	21500	-253	7.59	23.7	
MW515	24/05/2012	0.49	3.8	33500	22300	-217	7.75	5.5*	Hydrocarbon odour/slight sheen
MW516	24/05/2012	0.39	3.9	40200	28300	-213	8.35	20.9	Sulfur odour
MW518	28/05/2012	0.44	5.0	23400	14400	-176	8.20	24.8	Sulfur odour
MW525S	28/05/2012	0.12	1.3	42200	29500	-186	7.80	21.3	Sulfur odour
MW525D	24/05/2012	0.30	1.7	28700	19800	-134	8.15	20.5	
MW526	25/05/2012	0.75	6.1	48000	34000	-50	8.03	20.5	
MW527	25/05/2012	0.63	7.6	45600	32100	-199	8.04	22.3	Slight ammonia odour
MW529S	25/05/2012	0.00	0.0	49100	34600	-140	7.68	21.4	
MW529D	25/01/1900	1.51	14.8	20500	14690	91	8.04	20.6	
MW539	25/05/2012	0.07	1.0	22950	15430	-279	8.59	24.4	Hydrocarbon/sulfur odour
MW540S	25/05/2012	0.22	2.1	18200	12050	-280	8.19	24.0	Sulfur odour
MW540D	25/05/2012	0.30	0.4	21000	17900	175	5.92	22.8	
MW541S	28/05/2012	0.13	1.6	15540	10220	-215	8.76	23.0	Slight hydrocarbon odour
MW541D	25/05/2012	0.90	1.2	28800	15280	-284	7.00	22.1	
MW542	28/05/2012	0.04	0.8	21580	14270	-325	8.65	22.6	Sulfur odour
MW543	25/05/2012	4.85	52.3	47200	33500	142	6.51	20.7	
MW544S	23/05/2012	2.13	30.1	47800	33100	-91	7.58	22.1	
MW544D	24/05/2012	0.89	9.2	84200	53000	179	4.58	19.8	

Notes:
ID = identification
* probe was faulty
ppm = parts per million
uS/cm = microsiemen per centimetre
mV = millivolts
^{o}C = degrees Celsius
Note that readings are post purge only.

Project No. 42021
Barangaroo Central
Table 13 - Groundwater Analytical Results: Polycyclic Aromatic Hydrocarbons

all units in µg/L

					PAHs														
Sample ID	Eastings	Northings	Source	Date	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)&(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
EQL					0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Shallow Monitoring Wells																			
MW12	333564.030	6251752.700	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW13	333567.170	6251808.100	JBS May 2012	28/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW24	333577.760	6251713.330	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW179	333708.260	6251901.896	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
MW213	333558.557	6251749.964	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW214	333547.714	6251850.172	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW501	333708.201	6251948.228	JBS May 2012	24/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
MW502	333698.744	6251976.075	JBS May 2012	28/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1
MW506S	333715.541	6251867.665	JBS May 2012	28/05/2012	0.3	0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.3	0.3	<0.1	1.3	0.5	0.3
MW507	333719.958	6251832.377	JBS May 2012	24/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.3	0.2	0.1
MW514	333644.261	6251858.845	JBS May 2012	24/05/2012	0.3	0.1	0.7	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.5	0.5	<0.1	0.9	1.2	0.4
MW515	333644.287	6251826.375	JBS May 2012	24/05/2012	0.4	0.1	0.2	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.3	0.3	<0.1	1	0.8	0.3
MW516	333649.535	6251901.703	JBS May 2012	24/05/2012	0.9	<0.1	0.2	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.5	0.5	<0.1	0.4	1	0.5
MW518	333725.374	6251791.725	JBS May 2012	28/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1	0.2	0.1
MW525S	333555.717	6251818.117	JBS May 2012	28/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
MW526	333549.506	6251880.882	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW527	333558.345	6251920.538	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	0.1	0.1
MW529S	333561.639	6251773.540	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW539	333680.283	6251738.730	JBS May 2012	25/05/2012	8.7	1.4	1.8	0.2	0.1	<0.2	<0.1	0.2	<0.1	2	5.2	<0.1	69	7	1.6
MW540S	333686.342	6251761.110	JBS May 2012	25/05/2012	13	0.5	2.1	0.1	<0.1	<0.2	<0.1	0.1	<0.1	1.9	6.6	<0.1	73	9	1.3
MW541S	333675.320	6251715.635	JBS May 2012	28/05/2012	1.1	1.2	0.5	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.4	1.6	<0.1	3.4	2.3	0.4
MW542	333669.167	6251691.752	JBS May 2012	28/05/2012	4.7	0.5	0.8	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.7	3.6	<0.1	20	4.4	0.5
MW543	333568.058	6251732.752	JBS May 2012	24/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW544S	333571.752	6251713.890	JBS May 2012	25/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Deep Monitoring Wells																			
MW506D	333715.541	6251867.665	JBS May 2012	24/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MW525D	333555.717	6251818.117	JBS May 2012	24/05/2012	0.3	0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
MW529D	333561.639	6251773.540	JBS May 2012	24/05/2012	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
MW540D	333593.048	6251745.761	JBS May 2012	25/05/2012	1.5	1	0.4	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.4	1.4	<0.1	16	2	0.3
MW541D	333675.320	6251715.635	JBS May 2012	25/05/2012	34	97	56	50	50	61	17	40	3.9	120	81	18	1900	170	120
MW544D	333571.752	6251713.890	JBS May 2012	24/05/2012	<0.1	<0.1	0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.6	0.2	0.1

Project No. 42021
Barangaroo Central
Table 14 - Groundwater Analytical Results: Metals, Ammonia and Solvents

all results in mg/L

					Metals								Inorganics	Solvents
Sample ID	Eastings	Northings	Source	Date	Lead (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)	Ammonia	Cyclohexane
EQL					0.001	0.001	0.0001	0.001	0.001	0.00005	0.001	0.001	0.005	0.001
Shallow Monitoring Wells														
MW12	333564.030	6251752.700	JBS May 2012	25/05/2012	<0.001	<0.001	0.0004	<0.001	<0.001	<0.00005	<0.001	0.019	0.02	<0.001
MW13	333567.170	6251808.100	JBS May 2012	28/05/2012	<0.001	<0.001	0.0003	<0.001	<0.001	<0.00005	0.002	0.025	0.02	<0.001
MW24	333577.760	6251713.330	JBS May 2012	25/05/2012	<0.001	<0.001	0.0002	<0.001	<0.001	<0.00005	<0.001	0.014	<0.005	<0.001
MW179	333708.260	6251901.896	JBS May 2012	25/05/2012	<0.001	0.002	0.0004	<0.001	0.001	<0.00005	<0.001	0.034	<0.005	<0.001
MW213	333558.557	6251749.964	JBS May 2012	25/05/2012	<0.001	<0.001	0.0005	<0.001	<0.001	<0.00005	<0.001	0.015	<0.005	<0.001
MW214	333547.714	6251850.172	JBS May 2012	25/05/2012	<0.001	<0.001	0.0003	<0.001	<0.001	<0.00005	0.001	0.02	0.068	<0.001
MW501	333708.201	6251948.228	JBS May 2012	24/05/2012	<0.001	0.004	0.0002	0.002	<0.001	<0.00005	<0.001	0.052	1.1	<0.001
MW502	333698.744	6251976.075	JBS May 2012	28/05/2012	<0.001	0.002	0.0001	<0.001	<0.001	<0.00005	<0.001	0.01	2.1	<0.001
MW506S	333715.541	6251867.665	JBS May 2012	28/05/2012	<0.001	0.007	<0.0001	<0.001	0.002	<0.00005	0.001	0.02	0.54	<0.001
MW507	333719.958	6251832.377	JBS May 2012	24/05/2012	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.00005	<0.001	0.011	1.5	<0.001
MW514	333644.261	6251858.845	JBS May 2012	24/05/2012	<0.001	0.002	0.0001	<0.001	<0.001	<0.00005	<0.001	0.006	6.7	<0.001
MW515	333644.287	6251826.375	JBS May 2012	24/05/2012	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.00005	<0.001	0.015	6.8	<0.001
MW516	333649.535	6251901.703	JBS May 2012	24/05/2012	<0.001	0.001	0.0002	<0.001	<0.001	<0.00005	0.002	0.007	0.056	<0.001
MW518	333725.374	6251791.725	JBS May 2012	28/05/2012	<0.001	0.003	<0.0001	<0.001	<0.001	<0.00005	0.002	0.008	0.72	<0.001
MW525S	333555.717	6251818.117	JBS May 2012	28/05/2012	<0.001	0.001	0.0002	<0.001	<0.001	<0.00005	0.002	0.015	0.02	<0.001
MW526	333549.506	6251880.882	JBS May 2012	25/05/2012	<0.001	0.001	0.0004	<0.001	<0.001	<0.00005	<0.001	0.007	0.008	<0.001
MW527	333558.345	6251920.538	JBS May 2012	25/05/2012	<0.001	<0.001	0.0002	<0.001	<0.001	<0.00005	<0.001	0.002	0.04	<0.001
MW529S	333561.639	6251773.540	JBS May 2012	25/05/2012	<0.001	0.002	0.0004	<0.001	<0.001	<0.00005	<0.001	0.02	0.13	<0.001
MW539	333680.283	6251738.730	JBS May 2012	25/05/2012	<0.001	0.004	0.0003	<0.001	<0.001	<0.00005	0.002	0.012	15	<0.001
MW540S	333686.342	6251761.110	JBS May 2012	25/05/2012	<0.001	0.004	0.0002	<0.001	<0.001	<0.00005	<0.001	0.019	15	<0.001
MW541S	333675.320	6251715.635	JBS May 2012	28/05/2012	<0.001	0.01	0.0001	<0.001	<0.001	<0.00005	0.009	0.024	40	<0.001
MW542	333669.167	6251691.752	JBS May 2012	28/05/2012	<0.001	0.14	0.0002	<0.001	<0.001	<0.00005	0.007	0.001	14	<0.001
MW543	333568.058	6251732.752	JBS May 2012	24/05/2012	0.004	<0.001	0.0002	<0.001	0.006	<0.00005	0.009	0.035	0.03	<0.001
MW544S	333571.752	6251713.890	JBS May 2012	25/05/2012	<0.001	0.001	0.0005	<0.001	0.003	<0.00005	<0.001	0.023	0.03	<0.001
Deep Monitoring Wells														
MW506D	333715.541	6251867.665	JBS May 2012	24/05/2012	<0.001	0.004	0.0001	<0.001	<0.001	<0.00005	0.021	0.019	5.7	<0.001
MW525D	333555.717	6251818.117	JBS May 2012	24/05/2012	<0.001	<0.001	0.0001	<0.001	0.001	<0.00005	0.02	0.022	0.02	<0.001
MW529D	333561.639	6251773.540	JBS May 2012	24/05/2012	0.001	0.001	0.0003	<0.001	0.012	<0.00005	0.008	0.061	0.27	<0.001
MW540D	333593.048	6251745.761	JBS May 2012	25/05/2012	0.002	0.004	0.0003	0.002	0.004	<0.00005	0.018	0.12	18	<0.001
MW541D	333675.320	6251715.635	JBS May 2012	25/05/2012	<0.001	0.003	0.0003	0.002	<0.001	<0.00005	0.004	0.005	42	<0.001
MW544D	333571.752	6251713.890	JBS May 2012	24/05/2012	<0.001	0.002	<0.0001	<0.001	<0.001	<0.00005	0.041	0.072	0.54	<0.001

Project No. 42021
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Table 15 - Groundwater Analytical Results: Chlorinated Hydrocarbons

all units in mg/L

					Chlorinated Hydrocarbons																												
Sample ID	**Eastings**	**Northings**	**Source**	**Date**	**1,1,1,2-tetrachloroethane**	**1,1,1-trichloroethane**	**1,1,2,2-tetrachloroethane**	**1,1,2-trichloroethane**	**1,1-dichloroethane**	**1,1-dichloroethene**	**1,1-dichloropropene**	**1,2,3-trichloropropane**	**1,2-dibromo-3-chloropropane**	**1,2-dichloroethane**	**1,2-dichloropropane**	**1,3-dichloropropane**	**2,2-dichloropropane**	**Bromochloromethane**	**Bromodichloromethane**	**Bromoform**	**Carbon tetrachloride**	**Chlorodibromomethane**	**Chloroethane**	**Chloroform**	**Chloromethane**	**cis-1,2-dichloroethene**	**cis-1,3-dichloropropene**	**Dibromomethane**	**Hexachlorobutadiene**	**Trichloroethene**	**Tetrachloroethene**	**trans-1,2-dichloroethene**	**trans-1,3-dichloropropene**	**Vinyl chloride**
EQL					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10	1	10	1	1	1	1	1	1	1	10
Shallow Monitoring Wells																																	
MW12	333564.030	6251752.700	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW13	333567.170	6251808.100	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW24	333577.760	6251713.330	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW179	333708.260	6251901.896	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW213	333558.557	6251749.964	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW214	333547.714	6251850.172	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW501	333708.201	6251948.228	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW502	333698.744	6251976.075	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW506S	333715.541	6251867.665	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW507	333719.958	6251832.377	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW514	333644.261	6251858.845	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW515	333644.287	6251826.375	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW516	333649.535	6251901.703	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW518	333725.374	6251791.725	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW525S	333555.717	6251818.117	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW526	333549.506	6251880.882	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW527	333558.345	6251920.538	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW529S	333561.639	6251773.540	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW539	333680.283	6251738.730	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW540S	333686.342	6251761.110	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW541S	333675.320	6251715.635	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW542	333669.167	6251691.752	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW543	333568.058	6251732.752	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW544S	333571.752	6251713.890	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
Deep Monitoring Wells																																	
MW506D	333715.541	6251867.665	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW525D	333555.717	6251818.117	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW529D	333561.639	6251773.540	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	4	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW540D	333593.048	6251745.761	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<10	5	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW541D	333675.320	6251715.635	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	2	<10	<1	<1	<1	<1	<1	<1	<1	<10
MW544D	333571.752	6251713.890	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<10	4	<10	<1	<1	<1	<1	<1	<1	<1	<10

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Barangaroo Central

Table 16 - Groundwater Analytical Results: Halogenated Benzenes, Halogenated Hydrocarbons, Monocylic Aromatic Hydrocarbons

all units in mg/L

					Halogenated Benzenes									Halogenated Hydrocarbons				MAH													
Sample ID	Eastings	Northings	Source	Date	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Chlorobenzene	1,2-dibromoethane	Bromomethane	Dichlorodifluoromethane	Trichlorofluoromethane	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	Styrene	tert-butylbenzene	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total
EQL					1	1	1	1	1	1	1	1	1	1	10	10	10	1	1	1	1	1	1	1	1	1	1	1	1	2	1	
Shallow Monitoring Wells																															
MW12	333564.030	6251752.700	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW13	333567.170	6251808.100	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW24	333577.760	6251713.330	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW179	333708.260	6251901.896	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW213	333558.557	6251749.964	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW214	333547.714	6251850.172	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW501	333708.201	6251948.228	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW502	333698.744	6251976.075	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW506S	333715.541	6251867.665	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW507	333719.958	6251832.377	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW514	333644.261	6251858.845	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW515	333644.287	6251826.375	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW516	333649.535	6251901.703	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW518	333725.374	6251791.725	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW525S	333555.717	6251818.117	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW526	333549.506	6251880.882	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW527	333558.345	6251920.538	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW529S	333561.639	6251773.540	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW539	333680.283	6251738.730	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	41	2	9	6	4	10
MW540S	333686.342	6251761.110	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	38	2	1	3	2	5
MW541S	333675.320	6251715.635	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	4	<1	2	<2	<1	<3
MW542	333669.167	6251691.752	JBS May 2012	28/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3	<1	<1	<2	<1	<3
MW543	333568.058	6251732.752	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW544S	333571.752	6251713.890	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
Deep Monitoring Wells																															
MW506D	333715.541	6251867.665	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW525D	333555.717	6251818.117	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW529D	333561.639	6251773.540	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3
MW540D	333593.048	6251745.761	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	5	<1	4	2	1	3
MW541D	333675.320	6251715.635	JBS May 2012	25/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	83	32	4	1	2	1	<1	7	<1	4300	78	1900	520	240	760
MW544D	333571.752	6251713.890	JBS May 2012	24/05/2012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<10	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<3

Appendix D – Groundwater Control Walls to Basements

Review of Groundwater Control Wall for the Bulk Excavation and Basement Car Parking of Barangaroo South Development Project

The basement groundwater retention wall system will be constructed around the perimeter of the basement car park within Blocks 1, 2 and 3 and will be keyed into bedrock.

The locations of Blocks 1,2 and 3 and the proposed extent of the groundwater retention wall system is shown in Figure 1, Appendix A of the *Human Health and Ecological Risk Assessment Addendum* (AECOM 2011).

The only exception to this will be a small section in the south eastern corner of Block 1 which will be excluded from the retention wall system in order to facilitate future development of a belowground metro station. This design feature is not considered to exhibit potential groundwater contaminant risk to the harbour because:

- The Data Gap Investigation Report (AECOM, 2010a) indicated an absence of significant contamination (BH094); and
- The retention wall section is at considerable distance from the harbour and dilution and attention effects are considered to apply to groundwater potentially migrating to the harbour.

Additionally, the existing caisson walls associated with the historic wharf structures will be retained along the western (Darling Harbour) side of the project public domain.

The perimeter walls of the basement groundwater retention wall system will include:

- Diaphragm walls, extending to and keyed into bedrock and generally constructed around the southern, western and northern boundary; and
- A secant pile or equivalent walls, extending to and keyed into bedrock and generally constructed along the eastern boundary.

Where basement excavations extend into bedrock, exposed bedrock surfaces will be covered with shotcrete. It is anticipated that perimeter walls and shotcrete covered bedrock, together with other controls forming standard practice for basement construction, will effectively isolate the basement from surrounding ground.

Further details of the basement groundwater retention wall system are provided as follows which are shown in Figure 3 of Appendix A, AECOM 2011:

Above the depth of the bedrock:

Perimeter walls (diaphragm / secant piles) will be constructed with a minimum thickness of 600 mm and will be keyed into the bedrock (irrespective of the depth of the basement that will be constructed within them).

In some areas a secondary reinforced concrete wall (treated with chemical additives for improved waterproofing) will be constructed within the perimeter walls as the internal car park basement wall.

A sealed plenum will be constructed by a 200 mm thick block work wall (bagged to provide a relatively air tight zone) immediately inside the reinforced concrete car park basement wall. The sealed plenum will be configured to:

- Collect and drain seepage water that may permeate through the perimeter and basement car park walls. Seepage water (if any) will drain via a dish drain to a drainage sump located at the lowest basement level (away from the lift wells) from where it will be appropriately disposed of; and

- Vent vapours from seepage water that may permeate through the perimeter and basement car park walls. Vapour will be vented via a passive pipe riser to the height of the roof level of the above buildings.

Below the depth of the bedrock:

The exposed vertical, sandstone surface will be shotcreted (100mm minimum thickness).

A secondary 350 mm thick reinforced concrete wall (treated with chemicals additives for improved waterproofing) will be constructed within the shotcrete covered sandstone.

A sealed plenum will be constructed by a 200 mm thick blockwork wall (bagged to provide a relatively air tight zone) immediately inside the reinforced concrete car park basement wall. The sealed plenum will be configured as described above for above the depth to bedrock.

In addition to the design features of the retention wall system(s) described above, a number of drainage features required by the construction process, but which will also act to mitigate the risk of water or vapour entering the basement car parks, will be constructed. These include:

- A 500 mm thick gravel filled void between the perimeter wall and the secondary reinforced concrete basement car park wall; and
- Measures required for construction of the system(s), it is considered that the basements (and fill material remaining *in* situ below the basements) will be effectively isolated from the surrounding ground conditions.

In the unlikely event that groundwater or vapour does penetrate through the wall (into the sealed plenum), it will be prevented from entering the ventilation plenum and/or car park basement by the drainage and venting within the sealed plenum. A second plenum, herein referred to as the ventilation plenum, is proposed to be constructed adjacent to and inside the sealed plenum as part of the car park ventilation system.

Figures depicting the proposed basement groundwater retention wall system are provided in Figure 6 of Appendix A, AECOM 2011.

References

Barangaroo Stage 1- PA1- Bulk Excavation and Basement Car Parking (MP10_0023) Geotechnical Report, Arup Pty Ltd, June 2010 (ARUP 2010)

Human Health and Ecological Risk Assessment Addendum- Other Remediation Works (South) Area, Barangaroo, AECOM Australia Pty Ltd, July 2011 (AECOM 2011)

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