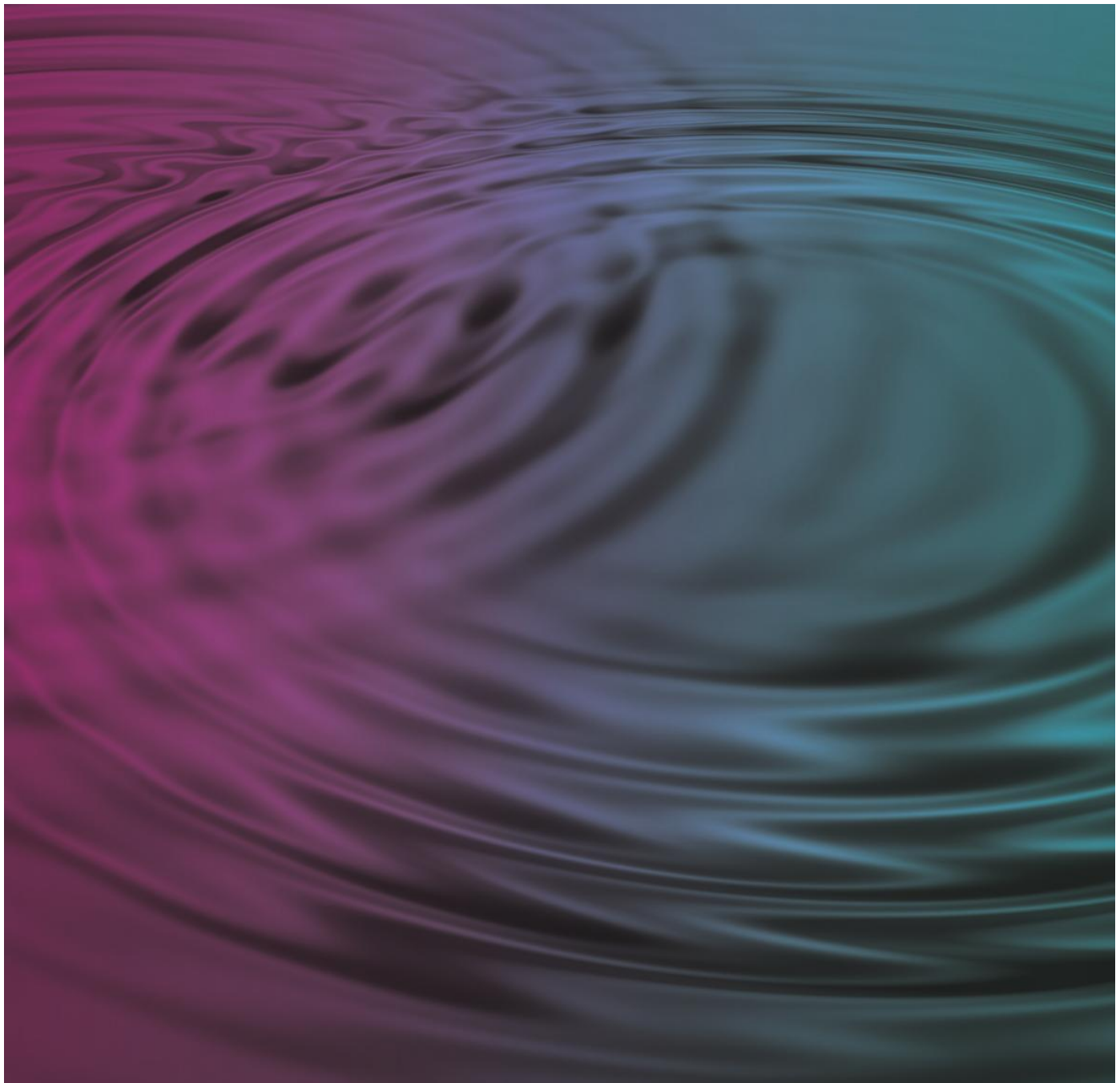


VMP Remediation Extent

VMP Remediation Works Area, (Parts of Barangaroo and Hickson Road),
Millers Point, NSW



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Client: Lend Lease (Millers Point) Pty Limited

ABN: 15 127 727 502

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia

T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

ABN 20 093 846 925

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Job No.: 60264796

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Glossary of Terms

Term	Description
AECOM	AECOM Australia Pty Limited
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASLP	Australian Standard Leaching Procedure
ASSMAC	New South Wales Acid Sulfate Soils Management Advisory Committee
As	Arsenic
Ba	Barium
BaP/ B(a)P	Benzo(a)pyrene
BDA	Barangaroo Delivery Authority (the Authority)
BH	Borehole location
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
BTOC	Below Top of Casing
Cd	Cadmium
CIM	Confirmed Impacted Material
<i>CLM Act</i>	<i>Contaminated Land Management Act (2007)</i>
Co	Cobalt
CoC	Chain of Custody
CO ₂	Carbon Dioxide
Cr	Chromium
CoPC	Chemicals of Potential Concern
cPAHs	carcinogenic Polycyclic Aromatic Hydrocarbons
Cu	Copper
CUTEP	Clean Up to the Extent Practicable
DEC	Department of Environment and Conservation NSW (superseded)
DECC	Department of Environment and Climate Change NSW (superseded)
DECCW	Department of Environment, Climate Change and Water NSW (superseded)
DGI	Data Gap Investigation
DoPI	NSW Department of Planning and Infrastructure
DP	Deposited Plan
DQO	Data Quality Objectives
Declaration Area	As defined by the NSW EPA Declaration
DSI	Detailed Site Investigation
EC	electrical conductivity
EMP	Environment Management Plan

Term	Description
ESCO	<i>Ex situ</i> Chemical Oxidation
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
ESD	Ecologically Sustainable Development
GDS	Groundwater Discharge Study
GMP	Groundwater Management Plan
Hg	Mercury
HHERA	Human Health and Ecological Risk Assessment
HI	Hazard Index
HIL	Health Investigation Level
ISCO	<i>In situ</i> Chemical Oxidation
ISS	<i>In situ</i> Solidification / Stabilisation
JBS	JBS Environmental Pty Limited
m bgl	metres below ground level
Mn	Manganese
MW	Monitoring Well Location
MWQC	Marine Water Quality Criteria
LOR	Limit of Reporting
Lend Lease	Lend Lease (Millers Point) Pty Limited
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	(National Environmental Protection (Assessment of Site Contamination) Measure
Ni	Nickel
NHMRC	National Health and Medical Research Council
NSW	New South Wales
OEH	Office of Environment and Heritage
ORWN	Other Remediation Works (North) Area
ORWS	Other Remediation Works (South) Area
PAH	Polycyclic Aromatic Hydrocarbons
PID	Photoionisation Detector
Pb	Lead
<i>POEO Act</i>	<i>Protection of the Environment Operations Act (1997) NSW</i>
PPE	Personal Protective Equipment
RAP	Remedial Action Plan
RL	Relative Level
SAQP	Sampling Analysis and Quality Plan

Term	Description		
SAS	Site Audit Statement		
SEPP	State Environmental Planning Policy		
SEPR™	Surfactant Enhanced Product Recovery		
SHFA	Sydney Harbour Foreshore Authority		
SIL	Soil Investigation Level		
S-ESCO™	Surfactant Enhanced <i>Ex situ</i> Chemical Oxidation		
S-ISCO®	Surfactant-enhanced In Situ Chemical Oxidation		
SPGWT	Separated Phase Gasworks Waste and Tar		
SPOCAS	Suspension Peroxide Oxidation Combined Acidity & Sulfate		
SWL	Standing Water Level		
SVE	Soil vapour extraction		
SVOC	Semi Volatile Organic Compound		
TCM	Tar Containing Material		
TEQ	Toxicity Equivalency Factor		
TOC	Top of Casing		
TPH	Total Petroleum Hydrocarbons		
VMP	Voluntary Management Proposal		
VOC	Volatile Organic Compound		
UCL	Upper Confidence Level		
US EPA	United States Environment Protection Agency		
Zn	Zinc		
Units of Measurement			
°C	degrees Celsius	mg	milligrams
cm	Centimetre	mS	milli-Siemens
ha	Hectare	mV	millivolts
kg	Kilogram	ppm	parts per million
km	Kilometre	µg	microgram
m	Metres	%	percent

Executive Summary

AECOM Australia Pty Limited (AECOM) has been commissioned by Lend Lease (Millers Point) Pty Ltd (LL) to prepare this *VMP Remediation Extent* report for the NSW Environment Protection Authority (NSW EPA) Declaration Area (hereafter referred to as 'the Site'), located at Hickson Road, Millers Point, NSW (refer to **Figure F1**). The Site (NSW EPA Declaration Area also known as the "Voluntary Management Proposal (VMP) Remediation Works Area") comprises:

- a section of Hickson Road;
- part of Barangaroo Block 4 (within Barangaroo South); and
- part of Barangaroo Block 5 (within Barangaroo Central).

In May 2009, the NSW EPA, determined that part of the Barangaroo site and part of Hickson Road (corresponding with the location of part of the former gas works) was contaminated in such a way as to present a significant risk of harm (SROH) to human health and the environment. As a consequence, the NSW EPA declared the Site to be a remediation site (Declaration Number 21122; Area Number 3221, here-in referred to as the NSW EPA Declaration) under the then Section 9 of the *Contaminated Land Management (CLM) Act* (1997). The Site coincides with the area of the NSW EPA Declaration.

This report has been prepared to describe:

- The remediation goals, based on the assessment of risk in the *VMP Human Health and Ecological Risk Assessment* (VMP HHERA, AECOM, 2012c) and developed to meet NSW EPA policy requirements, that are applicable to remediation of the Site to achieve the nominated remediation objectives; and
- The extent of remediation required to achieve the remediation goals on which the *VMP/Block 4 Remedial Action Plan* (VMP/Block 4 RAP, AECOM, 2013b) will be based.

As such, this document represents a link between the *VMP HHERA* (AECOM, 2012c) and the *VMP/Block 4 RAP* (AECOM, 2013b) and should be read in conjunction with these reports.

Remediation Objectives

The key objective of the remediation of the Site is to enable the NSW EPA Declaration to be revoked. Additional objectives of the remediation works are to:

- Ensure that NSW EPA policy requirements are met, specifically:
 - the *Guidelines for the Assessment and Management of Groundwater Contamination* (NSW, DEC, 2007) which incorporate the requirements for removal or treatment of Light¹ or Dense Non-Aqueous Phase Liquids (NAPLs) to the extent practicable and consideration of Clean-up to the extent practicable (CUTEP);
 - the principle of Ecologically Sustainable Development (ESD) as required by Section 9 of the *CLM Act* (1997); and
 - The *Waste Avoidance and Resource Recovery Act* (2001).
- Ensure the remediated Site is protective of human health in the context of its current form and land use;
- Ensure that the remediated Site is, to the extent practicable, protective of the environment (specifically groundwater within fill material at the down hydraulic gradient Site boundary and ultimately surface water in Darling Harbour) by minimising the risk of ongoing contamination; and
- Comply with applicable legislative requirements including the appropriate requirements of the NSW Department of Planning (DoP) and NSW EPA.

AECOM understands that removal of the NSW EPA Declaration would require demonstration that contamination at the Site is not *significant enough to warrant regulation* (as per the *CLM Act*, 1997) under the current land use scenario, or land use scenarios allowable at the Site without a development approval. Based on the current zoning of the developable portion of the Site (Zone B4 Mixed Use under the Environmental Planning Policy (Major Development) Amendment (Barangaroo) 2012)), no development is allowed without planning consent. The

¹ It is noted that LNAPLs have not been identified at the Site and, as such, are not discussed further.

remediation goals developed by this document are therefore based on the current Site usage which is considered to comprise of limited use with the majority of the Site being vacant, paved open space areas.

Scope

The scope of work associated with the preparation of this document included:

- Review the Conceptual Site Model for the Site including consideration of available data from previous environmental investigations at the Site to assess the potential for contamination at the Site;
- Development of remediation goals for the protection of human health and the environment based on the recommendations of the *VMP HHERA* (AECOM, 2012c) and to meet NSW EPA policy requirements;
- Consideration of the extent to which the remediation goals can be practicably achieved based on:
 - Comparison of available site data for soil and groundwater to the remediation goals;
 - Identification of areas where contamination has been identified which requires remediation/management as part of the VMP, based on consideration of the remediation goals; and
 - Consideration of the standard and extent of remediation that can be practicably achieved by the remediation technologies that are most likely to be implemented at the Site and as required by:
 - The Guidelines for the Assessment and Management of Groundwater Contamination (NSW, DEC, 2007) which incorporate the principle of Clean-up to the extent practicable (CUTEP) (Section 4.3);
 - The principle of Ecologically Sustainable Development (ESD) as required by Section 9 of the *CLM Act* (1997); and
 - The *Waste Avoidance and Resource Recovery Act* (2001).

Remediation Goals

The remediation goals for the protection of human health and the environment have been developed based on the recommendations of the *VMP HHERA* (AECOM, 2012c) and to meet NSW EPA policy requirements. The remediation goals are:

- As a primary goal, removal / remediation of Separate Phase Gasworks Waste and Tar (SPGWT²) to the extent practicable as required by the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*; and
- As a secondary goal, removal / remediation of soil, to the extent practicable:
 - That is representative of Confirmed Impacted Material (CIM), which is defined as:
 - Unsaturated soil concentrations exceeding the soil Site-Specific Target Criteria (SSTC); and/or
 - Unsaturated or saturated soil concentrations that are considered to be the source of groundwater concentrations exceeding the groundwater SSTCs in fill material; and
 - Such that groundwater quality within fill material leaving the Site (measured in fill at the down hydraulic gradient Site boundary) approaches the Marine Water Quality Criteria (MWQC).

² For the purposes of this report, SPGWT refers to:

- Tar Containing Materials (TCM) which are defined as described below; and
- Dense Non Aqueous Phase Liquids (DNAPLs).

The presence or otherwise of TCM is based on comparison of observed site conditions and analytical data to the following criteria:

- Greater than 10% visible coal tar (where coal tar is a phase separated hydrocarbon by-product from coal gasification); and/or
- Contaminant concentrations exceeding the following limits:
 - Polycyclic Aromatic Hydrocarbons (PAHs): 2,000 mg/kg; or
 - Benzo(a)Pyrene (B(a)P): 150 mg/kg.

Remediation Extent

The extent of remediation in the unsaturated and saturated zones is presented on **Figure F14** and **Figure F15**, respectively.

The lateral extent of remediation has been determined based on consideration of:

- The presence of historic gasworks infrastructure, the distribution of SPGWT and CIM within the respective Site areas; and
- The extent of remediation that can be practicably achieved for the protection of the environment based on:
 - The standard of remediation that can be practically achieved by the remediation technologies that are most likely to be implemented;
 - Regulatory policy requirements including:
 - source removal, removal of NAPL to the extent practicable, and clean-up to the extent practicable as contemplated by the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*;
 - The principles of ESD as required by Section 9 of the *CLM Act* (1997); and
 - The principles of the *Waste Avoidance and Resource Recovery Act* (2001).

The standard of remediation to be achieved within the proposed Remediation Extent should equal the higher of:

- Removal of SPGWT to the extent practicable, for the protection of human health and the environment;
- Removal / remediation of soil and groundwater concentrations present within fill material exceeding the relevant SSTCs, to the extent practicable; and
- Removal/remediation of contaminated fill materials such that the contaminant mass within the Remediation Extent fill material is reduced, on average, by 90%, to the extent practicable (calculated based on the estimated mass of naphthalene and TPH C₁₀ - C₁₄).

The vertical extent of remediation has been broadly defined as remediation to the depth of the underlying natural bedrock to a maximum depth of 10 m below ground level (bgl). The vertical extent of remediation is based on consideration of:

- locations where SPGWT has been reported;
- locations where exceedances of the groundwater SSTC and unsaturated soil SSTC have been reported;
- the footprint of historical gasworks structures and infrastructure; and
- the depth to bedrock (noting that the depth to bedrock steadily increases to the west beyond the 10 m bgl rock contour).

It is noted that SPGWT and CIM have been reported in the natural marine sediments both within the Site and in some hydraulically down gradient areas to the west of the Site. However, the negligible contaminant flux from these natural materials is not considered to pose a significant risk to human health or the environment (refer to **Section 2.5**). As such, the proposed extent of remediation works excludes remediation of natural marine sediments which are present below a depth of 10 m bgl.

The proposed extent of remediation is considered to be consistent with the key requirements of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, in particular:

- Source Control and remediation of NAPL to the extent practicable – the proposed extent of remediation includes all of the identified primary contaminant sources (i.e. historical gasworks structures) and the majority of all secondary contaminant sources in fill (i.e. areas where SPGWT has been observed); and
- Clean Up to the Extent Practicable – based on consideration of:
 - *Technical capability to achieve the clean-up* – the technical capability of the most likely remediation technologies applied to the proposed remediation extent will result in a reduction in gasworks related contaminant mass of between 88-92% within fill materials.
 - *Threats the contamination poses to human or ecological health* – following the proposed remedial works, it is expected that there will not be an unacceptable ongoing risk to human health (under current

land use) or the environment. Protection of the environment has been demonstrated by contaminant mass flux modelling which has shown: significant improvement to the groundwater quality in fill at the down hydraulic gradient boundary of the Site: and, groundwater quality discharging to Darling Harbour from residual contamination will be less than the MWQC

- *The value of the groundwater resource* - multiple lines of evidence have been provided to demonstrate that residual contamination that will remain *in situ* following completion of the proposed remediation will not represent a threat to ecological health and will be protective of the identified groundwater value.
- *Clean-up costs* – Any proposal to achieve a higher level of protection for the environment than proposed would be inconsistent with the principles of ESD (as required by the *CLM Act* [1997]), the *Waste Avoidance and Resource Recovery Act* (2001) and Section 4.4 of *NSW DEC* (2007) which requires that the benefits from undertaking groundwater clean-up (for example the reduction in contaminant mass) must outweigh any incidental negative impacts to human health or the environment that could arise from the clean-up (for example the volume of remediation required to achieve the requisite contaminant mass reduction).

1.0 Introduction

AECOM Australia Pty Limited (AECOM) has been commissioned by Lend Lease (Millers Point) Pty Ltd (LL) to prepare this *Voluntary Management Proposal (VMP) Remediation Extent* report for the NSW Environment Protection Authority (EPA) Declaration Area (hereafter referred to as 'the Site'), located at Hickson Road, Millers Point, NSW (refer to **Figure F1**). The Site (NSW EPA Declaration Area also known as the "Voluntary Management Proposal" (VMP) Remediation Works Area") comprises:

- a section of Hickson Road;
- part of Barangaroo Block 4 (within Barangaroo South); and
- part of Barangaroo Block 5 (within Barangaroo Central) (refer to **Figure F2**).

In May 2009, the NSW EPA determined that part of the Barangaroo site and part of Hickson Road (corresponding with the location of part of the former gas works) was contaminated in such a way as to present a significant risk of harm (SROH³) to human health and the environment.

As a consequence, the NSW EPA declared the Site to be a remediation site (Declaration Number 21122; Area Number 3221, here-in referred to as the NSW EPA Declaration) under the then Section 9 of the *CLM Act* (1997). The Site coincides with the area of the NSW EPA Declaration.

This report has been prepared to describe:

- The remediation goals, based on the assessment of risk in the *VMP Human Health and Ecological Risk Assessment* (VMP HHERA, AECOM, 2012c) and developed to meet NSW EPA policy requirements, that are applicable to remediation of the Site to achieve the nominated objectives (refer to **Section 1.1**); and
- The extent of remediation required to achieve the remediation goals on which the *VMP/Block 4 Remedial Action Plan (VMP/Block 4 RAP, AECOM, 2013b)* is based.

As such, this document represents a link between the *VMP HHERA* (AECOM, 2012c) and the *VMP/Block 4 RAP* (AECOM, 2013b) and should be read in conjunction with these reports.

1.1 Remediation Objectives

The key objective of the remediation of the Site is to enable the NSW EPA Declaration to be revoked. Additional objectives of the remediation works are to:

- Ensure that NSW EPA policy requirements are met, specifically:
 - the *Guidelines for the Assessment and Management of Groundwater Contamination* (NSW, DEC, 2007) which incorporate the requirements for removal or treatment of Non-Aqueous Phase Liquids (NAPLs) to the extent practicable and consideration of Clean-up to the extent practicable (CUTEP);
 - the principle of Ecologically Sustainable Development (ESD) as required by Section 9 of the *CLM Act* (1997); and
 - The *Waste Avoidance and Resource Recovery Act* (2001).
- Ensure the remediated Site is protective of human health in the context of its current form and land use;
- Ensure that the remediated Site is, to the extent practicable, protective of the environment (specifically groundwater within fill material at the down hydraulic gradient Site boundary and ultimately surface water in Darling Harbour) by minimising the risk of ongoing contamination; and
- Comply with applicable legislative requirements including the appropriate requirements of the NSW Department of Urban Affairs and Planning (DUAP), NSW Department of Planning (DoP) and NSW EPA.

AECOM understands that removal of the NSW EPA Declaration would require demonstration that contamination at the Site is not *significant enough to warrant regulation* (as per the *CLM Act*, 1997) under the current land use scenario, or land use scenarios allowable at the Site without a development approval. Based on the current zoning of the developable portion of the Site (Zone B4 Mixed Use under the Environmental Planning Policy (Major

³ As an amendment to the *CLM Act* on 1 July 2009, reference to SROH was removed. *Significantly contaminated land* is now referred to as *land is contaminated and that the contamination is significant enough to warrant regulation*.

Development) Amendment (Barangaroo 2012)), no development is allowed without planning consent. The remediation goals developed by this document are therefore based on the current Site usage which is considered to comprise of limited use with the majority of the Site being vacant, paved open space areas.

1.2 Scope of Work

The scope of work associated with the preparation of this document included:

- Review the Conceptual Site Model for the Site including consideration of available data from previous investigations at the Site to assess the potential for contamination at the Site;
- Development of remediation goals for the protection of human health and the environment based on the recommendations of the *VMP HHERA* (AECOM, 2012c);
- Consideration of the extent to which the remediation goals can be practicably achieved based on:
 - Comparison of available site data for soil and groundwater to the remediation goals;
 - Identification of areas where contamination has been identified which requires remediation/management as part of the VMP, based on consideration of the remediation goals; and
 - Consideration of the standard and extent of remediation that can be practicably achieved by the remediation technologies that are most likely to be implemented at the Site and as required by:
 - The *Guidelines for the Assessment and Management of Groundwater Contamination* (NSW, DEC, 2007) which incorporate the principle of Clean-up to the extent practicable (CUTEP) (Section 4.3);
 - The principles of ESD as required by Section 9 of the *CLM Act* (1997); and
 - The *Waste Avoidance and Resource Recovery Act* (2001).

1.3 Document Structure

The document structure for this VMP Remediation Extent report is based on the Scope of Work described in **Section 1.2** and is summarised as follows.

- Review of Conceptual Site Model and available soil and groundwater data:
 - Section 2: Conceptual Site Model.
- Development of Remediation Goals based on the recommendations of the *VMP HHERA* (AECOM, 2012c):
 - Section 3: Remediation Goals;
- Recommended Remediation Extent - for the purpose of this document, the remediation extent resulting from application, to the extent practicable, of which of the remediation goals will be considered in turn:
 - Section 4: Contaminant Characterisation for Protection of Human Health;
 - Section 5: Remediation Extent for Protection of Human Health;
 - Section 6: Remediation Extent for Protection of the Environment including assessment of remediation requirements adopting the principles of CUTEP (as provided for by Section 4.3 of the NSW DEC [2007] *Guidelines for the Assessment and Management of Groundwater Contamination*);
- Consolidated remediation requirements for Protection of Human Health and the Environment:
 - Section 7: Conclusions.

2.0 Conceptual Site Model

2.1 Previous Investigations

A Conceptual Site Model (CSM) for the Site has been developed based on the findings of the following reports:

- ERM, 2007. *Environmental Site Assessment, East Darling Harbour, Sydney, NSW*. June 2007;
- Coffey Environments (Coffey), 2008. *Preliminary Environmental Investigation, 30-38 Hickson Road, Millers Point, NSW* 2000. May 2008;
- Coffey. 2010. *Barangaroo Stage 1 Development Geotechnical Report*. 15 October.
- ERM, 2008a. *Additional Investigation Works at Barangaroo, Hickson Road, Millers Point, NSW*. July 2008;
- AECOM, 2010b. *Data Gap Investigation, EPA Declaration Area (Parts of Barangaroo Site and Hickson Road), Hickson Road, Millers Point, NSW*. September 2010;
- AECOM, 2010c. *Data Gap Investigation, Other Remediation Works (North) Area, Hickson Road, Millers Point, NSW*. November, 2010;
- AECOM 2010d. *Groundwater Discharge Study, Stage 1 Barangaroo Development*. 3 November 2010;
- AECOM, 2011. *Declaration Site (Development Works) Remediation Works Area HHERA* (hereafter referred to as the Declaration Site [Development Works] HHERA) – Barangaroo. 9 June.
- AECOM, 2012a. *VMP Supplementary Data Gap Investigation, Site, Millers Point, NSW*, March 2012;
- AECOM, 2012b. *Contaminant Flux and Discharge Estimates for Natural Residual Soil and Marine Sediments, EPA Declaration Area 21122 and adjacent areas of Barangaroo South and Barangaroo Central*, 14 March 2012. Refer to **Appendix C**;
- AECOM, 2012c. *HHERA, VMP Remediation Works Area, (Addressing the NSW EPA Remediation Site Declaration 21122, Millers Point)*. October 2012 (Draft);
- AECOM, 2013a. *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*. 8 March 2013, refer to **Appendix D**; and
- AECOM, 2013b. *VMP/Block 4 RAP, VMP Remediation Works Area, (Parts of Barangaroo and Hickson Road)*. March 2013 (Draft);
- JBS Environmental, 2012. *Barangaroo Central DGI*. August.

A summary of these reports (and others) is presented in Section 2.6 of the *VMP HHERA* (2012c). Summaries of the *JBS Barangaroo Central DGI* report (JBS, 2012), which is not summarised in the *VMP HHERA*, is provided in **Section 2.1.1** below and summaries of AECOM (2010d) and AECOM (2012b) are provided in **Section 2.5.2**.

2.1.1 JBS Barangaroo Central DGI (2012)

JBS Environmental Pty Limited (JBS) was commissioned by the Barangaroo Delivery Authority (the Authority) to undertake the *Barangaroo Central DGI* within the Barangaroo Central site area (comprising parts of Lots 5 and 6 of Deposited Plan 876514). It is understood that the Barangaroo Central area is initially proposed to be developed as the Barangaroo Stage 1 Public Domain (comprising a range of open space land uses and car parking) and, in the future, will be developed for a mixture of high density residential and open space land uses.

The *Barangaroo Central DGI* involved drilling and soil sampling at 52 boreholes across the Barangaroo Central site. Of these boreholes, 24 were converted to either shallow or deep groundwater monitoring wells. None of the JBS groundwater monitoring wells installed down hydraulic gradient of the Site were screened within the natural marine sediments.

The following soil and groundwater sampling locations were located in proximity to the Site (i.e. within 30 metres of the western and northern Site boundaries, refer to **Figure F3**):

- Soil sampling locations:
 - BH539 to BH442 and BH549;

- Groundwater sampling locations:

- MW539 - screened between 3 and 6 m bgl. Natural clay was reported at 14 m bgl;
- MW540 (shallow) - screened between 3 and 6 m bgl;
- MW540 (deep) - screened between 10.7 and 13.7 m bgl. Natural clay was reported at 14 m bgl;
- MW541 (shallow) - screened between 3 and 6 m bgl;
- MW541 (deep) - screened between 7.5 and 10.5 m bgl. Bedrock was reported to be present at 10.8 m bgl (natural clays were not encountered during the drilling works); and
- MW542 - screened between 2.5 and 5.5 m bgl. Natural clay was reported at 14.5 m bgl.

As detailed in Table 7.1.1 of the *Barangaroo Central DGI* report, higher PAH concentrations and BTEX concentrations were reported to be present within the fill materials at depths greater than 6.9 m bgl at BH541 and BH542 (located 10m west of the Site boundary in Block 5). A 'slight hydrocarbon, hydrogen sulphide and methane odour' was observed in the fill material at BH541 below a depth of 6.9 m bgl and a 'hydrogen sulphide odour' was observed at a depth of 13 m bgl at BH542. No visual or olfactory evidence of tar was noted in the JBS borehole logs for the sampling locations listed above.

Total PAHs (2,798 mg/kg) were reported to exceed the Tar Containing Material (TCM⁴) criteria (as described in **Section 3.3.1**) at a depth of 9.9-10.0 m bgl at BH541 (refer to **Figure F3**). Benzene and naphthalene groundwater concentrations in fill material also exceeded the Block 4 SSTCs at this location (MW541D, refer to **Table T16**). This well is screened between 7.5 to 10.5 m bgl. The Conclusions section of the *Barangaroo Central DGI* report indicated that impacted material in the south-eastern corner of the Barangaroo Central site was 'considered to be acting as a source of groundwater contamination'. Based on the finding of the *Barangaroo Central DGI*, it was recommended that 'tar impacted materials as located at depth at the south-east of the site will require remediation/management based on identified impacts to groundwater in this area of the site'.

No soil CoPC concentrations were reported at concentrations exceeding the SSTC (refer to **Section 3.2**) in the sampling locations detailed above.

The JBS groundwater monitoring results reported adjacent to the Site boundary (i.e. monitoring wells MW539 to MW542) indicated that arsenic, PAHs and ammonia concentrations variably exceeded the MWQC. The results support the *VMP HHERA* (AECOM, 2012c) conclusion that groundwater quality at the Site boundary represents a potential for unacceptable risk to the environment.

2.2 Geology

Lithologic conditions vary across the Site, but generally comprise fill material overlying sandy clays and clays and marine sediments, which in turn overlie weathered Hawkesbury Sandstone bedrock. Sandstone bedrock is generally present underlying natural weathered bedrock soils or in some instances directly under fill materials.

The fill thickness is variable across the Site, ranging from approximately 1 metre below ground level (m bgl) in the east (Hickson Road) to approximately 16 m bgl in the west (in the vicinity of the BH404, refer to **Figure F10** to **Figure F13**). The fill material is generally shallower in the eastern portion of the Site closest to Hickson Road and deeper in the western portion of the Site closest to Darling Harbour. The top of bedrock also varies across the Site from approximately 3 m bgl in the east to greater than 16 m bgl in the west. The natural soil and marine sediments generally thicken from east to west as illustrated in the cross sections presented as **Figure F10** to **Figure F13**.

A more detailed description of the regional geology and site specific geological conditions, based on the previous investigations listed in **Section 2.1** is presented in Section 2.7 of the *VMP HHERA* (AECOM, 2012c).

⁴ The presence of TCM is based on comparison of observed site conditions and analytical data to the following criteria:

- Greater than 10% visible coal tar (where coal tar is a phase separated hydrocarbon by-product from coal gasification); and/or
- Contaminant concentrations exceeding the following limits:
 - Polycyclic Aromatic Hydrocarbons (PAHs): 2,000 mg/kg; or
 - Benzo(a)Pyrene (B(a)P): 150 mg/kg.

2.3 Hydrogeology

Previous investigation results indicate that groundwater beneath the Site is present as an unconfined, shallow saturated zone within the fill materials and the underlying natural soil and marine sediments. Groundwater is also likely to occur as a deeper bedrock aquifer within the underlying Hawkesbury Sandstone. Groundwater within the sandstone bedrock would occur as a fractured bedrock aquifer, potentially confined by an overlying clay unit in some areas of the Site.

Due to the proximity of the Site to Darling Harbour, the depth to groundwater is shallow and the overall direction of groundwater flow is expected to be towards Darling Harbour. Groundwater at the Site is tidally influenced, resulting in the fluctuation of groundwater levels within the fill materials and natural sediments. The flow direction and gradients change/reverse during the flooding and ebbing tides.

The *Groundwater Discharge Study* (GDS, AECOM, 2010d) (refer to **Section 2.5.1**) indicated that due to tidal influences at the Site there is a discrepancy between the net migration rate and the linear groundwater flow velocity due to the alternation of the hydraulic gradient, which causes water and particles to oscillate rather than move constantly in a single direction (as assumed by the linear groundwater velocity equation). In this instance the oscillation and resultant net migration of contaminant particles can be visualised as a process whereby an individual particle migrates 10 steps eastward during the flood tide and 11 steps westward on the ebb tide (i.e. net migration and therefore net discharge occurs at a rate of one tenth of the estimated linear groundwater flow velocity).

Recharge to the Site is limited to exposed sandstone and soil areas to the immediate east of the Site at Observatory Hill. Since the Site is currently covered by hardstand areas, the majority of potential recharge flows off Site as stormwater outflow.

A more detailed description of the regional hydrogeology and site specific hydrogeological conditions, based on the previous investigations listed in **Section 2.1** is presented in Section 2.8 of the *VMP HHERA* (AECOM, 2012c).

2.4 Contamination

2.4.1 Historic Gasworks Infrastructure

The former AGL (now Jemena) gasworks historically occupied the eastern portions of Block 4 and Block 5 (within the Site) and extended to the area now occupied by Hickson Road (refer to **Figure F3**). It is understood that URS (2001) estimated that the footprint occupied by the former gasworks⁵ was approximately 5,420 m². The following infrastructure is understood to have been present within this footprint:

- Retort House;
- Meter House;
- Tar tank;
- Engine House;
- Gasholders; and
- Purifier Beds.

Previous investigations and remediation works (undertaken at 30 -34 Hickson Road, refer to **Figure F3**) have identified that existing gasworks infrastructure extends across Hickson Road, including part of the annulus of the former main gasholder, a smaller secondary gas holder and a tar tank (Coffey, 2008).

For the purposes of this document, the remnant historic gas holder annuli and tar tank infrastructure located beneath the Site (which are understood to comprise of excavations cut into the underlying bedrock) will be referred to as described in **Table 1** (refer also to **Figure F3**):

⁵ AECOM did not have access to the URS (2001) report and cannot confirm whether this area refers to the entire gasworks site or only the gasworks infrastructure.

Table 1 Historic Gas Works Infrastructure Details

Historic gas works infrastructure	Site area	Relevant sampling location	Approximate depth of cut into bedrock (m bgl)
Main gas holder annulus (part of)	Hickson Road	BH5	10
1870 gas holder annulus	Block 4/Hickson Road	MW10/MW15	9.4
Tar tank	Hickson Road	MW7/BH7 and BH53/MW53	5.5
Small gas holder	Hickson Road	NA (located directly north of the southern tar tank and coinciding with the location of the main gasholder annulus)	Not known

2.4.2 Contaminants of Potential Concern

The Contaminants of Potential Concern (CoPC) for the VMP Remediation Works are presented in **Table 2**. The CoPC are based on those chemicals that the *VMP HHERA* (AECOM, 2012c) determined were present at the Site at concentrations that represented a risk to human health and/or the environment. **Table 2** also identifies, based on the *VMP HHERA*, whether the CoPC represents a risk to human health, the environment or both.

Table 2 CoPCs for VMP Remediation

CoPC	Risk to Human Health	Risk to the Environment
Benzene	✓	✓
Ethylbenzene	×	✓
Toluene	×	✓
Xylenes	×	✓
cPAH ¹	✓	×
Acenaphthene	×	✓
Acenaphthylene	✓	✓
Anthracene	×	✓
Fluorene	×	✓
Naphthalene	✓	✓
Phenanthrene	×	✓
Phenol	×	✓
Ammonia	✓	✓
TPH C6 - C9	×	✓
TPH C10 - C14	✓	✓
TPH C15 – C28	✓	✓
TPH C29 – C36	✓	✓

Notes: ¹ cPAH - carcinogenic PAHs. Includes: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h) anthracene and indeno (1,2,3-c d)pyrene. The application of cPAH requires adjustment of the individual concentrations for each constituent listed in accordance with the Toxicity Equivalency Factors (TEFs) outlined in Table 2 of PAH toxicity profile, Appendix D in the *VMP HHERA*. The sum of the adjusted TEF concentrations is compared to the cPAH value presented above.

It should be noted that the CoPC considered by the *VMP HHERA* (AECOM, 2012c) were based on those defined by the NSW EPA for the Declaration Area. The complete list of chemicals which have been identified in soil and groundwater at the Site by previous investigations at the Site have been considered separately within the *Declaration Site (Development Works) HHERA* (AECOM, 2011).

2.4.3 Receptors

2.4.3.1 Human Health Receptors

The VMP HHERA (AECOM, 2012c) considered two human receptor groups which may be exposed to Site contaminants based on the current site use:

- Scenario 1 – Recreational Receptors. The paved recreation scenario was assumed to represent areas of the Site which, under current Site use, are used for public open space and which have a hardstand concrete surface covering. No unpaved areas currently exist across the Site; and
- Scenario 2 – Intrusive Maintenance Workers. The intrusive maintenance scenario was considered to account for potential intrusive maintenance activities which may be undertaken at the Site. The intrusive worker considered in this assessment was assumed to only occasionally and/or intermittently conduct intrusive works at the Site (e.g. as required to maintain underground services), but is not assumed to undertake longer term intrusive works, such as construction or redevelopment of the Site.

2.4.3.2 Ecological Receptors

The closest ecological receptor identified by the *VMP HHERA* (AECOM, 2012c) was aquatic ecosystems within the groundwater down hydraulic gradient of the Site boundary, between the Site and Darling Harbour. It is noted that there is little known about the lifecycles and environmental requirements of groundwater dependant ecosystems. Therefore, the precautionary principle was adopted and the ecological receptor (in relation to the assessment of ecological risk) was defined as the down hydraulic gradient boundary of the Site. This approach is consistent with the requirements and policies of the NSW EPA, in particular:

- The *CLM Act* (1997), Section 9, which requires adoption of the precautionary principle where the lack of scientific certainty is not a reason for postponing measures. With respect to the Site, this relates to the protection of groundwater dependant ecosystems down hydraulic gradient of the Site and the requirement for remediation to the extent practicable (even in the absence of data demonstrating the presence, or otherwise, of such ecosystems now, or in the future);
- The NSW DEC (now the NSW EPA, 2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, which reemphasise the requirements of the *CLM Act* (1997) requiring protection of groundwater ecosystems according to the precautionary principle;
- The ANZECC (2000) *Water Quality Guidelines*, Section 1, require that the protection of underground aquatic ecosystems and their novel fauna require the highest level of protection; and
- The *National Environment Protection Measure* Schedule B(6) (NEPC, 1997) which states that determination of the point of use of groundwater is a jurisdictional matter and that the transfer of contaminated groundwater from a contaminated Site is not considered to be acceptable, even if the relevant guidelines are achieved at the point of use / discharge.

It is considered that application of the precautionary approach to protection of aquatic ecosystems in groundwater present within the fill material down hydraulic gradient of the Site will also be protective of the aquatic ecological community in Darling Harbour.

The Site currently comprises paved open space with minimal terrestrial organisms. The Site and surrounding terrestrial area have been extensively developed, contain minimal natural vegetation and do not contain threatened or vulnerable terrestrial species, populations, communities or significant habitats (NSW Department of Planning, 2007). The terrestrial habitat at the Site is considered to have a low level of environmental sensitivity and was not considered to include ecological receptors which required protection.

2.4.4 Contaminant Migration Pathways

A range of contaminant migration pathways were considered by the *VMP HHERA* (AECOM, 2012c) for each of the identified human health and ecological receptors.

- Human Health:
 - Incidental ingestion of CoPC in soil and/or groundwater;
 - Dermal absorption of CoPC from soil and/or groundwater;
 - Inhalation of CoPC in soil-derived airborne particulates; and
 - Inhalation of groundwater derived vapours.
- Ecological:
 - Off Site migration of Separated Phase Gasworks Waste and Tar (SPGWT) and CoPC impacted groundwater in fill.

2.4.5 Contamination in Bedrock

The conceptual model depicted in Figure 20 of ERM (2008) is generally consistent with the findings of the AECOM site investigations with the exception of deep bedrock contamination. The boreholes constructed by AECOM (2010a), AECOM (2010b) and AECOM (2010c) did not extend more than 0.5 m into bedrock and therefore the contaminated bedrock interpreted by ERM (2008) to be in BH205, BH206 and BH209 was not confirmed.

Review of the ERM (2008) borehole logs and soil analysis data indicates that the most impacted zones of highly gasworks related contamination appear to be in the natural soil at the bedrock interface and decrease with depth into the bedrock. AECOM notes that: the wells installed at BH206 and BH209 are screened across the natural soil and sandstone bedrock suggesting that contamination from the overlying natural soil could be impacting groundwater analysis results; and, the only evidence of bedrock contamination in BH205 is tar reported in the well (which could be related to well completion issues, given the difficult nature of the drilling at the Site, rather than the presence of tar in the bedrock).

Borehole logs from Coffey (2010) reported localised (vertically and horizontally) bedrock impact at the Site.

AECOM considers that the overall Site dataset does not support the presence of significant gasworks related contamination within the bedrock underlying the Site. This opinion is supported by observations noted during excavation of the basement for 30 The Bond (located at 30-34 Hickson Road - directly to the east of the Site, refer to **Figure F3**) which included remediation of the eastern portion of the 1870 gas holder annulus. These remediation works indicated that the movement of gasworks related contaminants into the surrounding bedrock was limited both vertically and horizontally due to the relatively impermeable nature of the natural sandstone and the limited presence of bedrock fracture zones.

2.5 Consideration of Contamination at Depth within Natural Marine Clays and Sediment

2.5.1 Groundwater Discharge Study, AECOM (2010d)

The *GDS* (AECOM 2010d) was prepared to inform the *VMP HHERA* (AECOM, 2012c) with respect to the interaction of groundwater from Barangaroo South (including the Site) with Darling Harbour and the potential for contaminant mass flux due to mixing of seawater prior to discharge.

AECOM installed a transect of multilevel piezometers, comprising two arrays of three piezometers, and a stilling well in Darling Harbour (to measure the sea level), immediately adjacent to the multilevel piezometer transect. Instantaneous hydraulic head measurements, groundwater and surface samples were collected from these locations during the investigation.

Relative to that occurring from the fill sequence, groundwater discharge volumes and therefore contaminant mass flux from the marine sediments was considered to be negligible from a hydrogeological perspective. Groundwater discharge occurring via the basal Hawkesbury Sandstone was not considered significant in the context of contaminant flux due to very low values of permeability reported for this formation in the literature.

A complete summary of the GDS (AECOM, 2010d) is presented in Section 5.12 of the VMP/Block 4 RAP (AECOM, 2012c).

2.5.2 Contaminant Mass Flux Study, AECOM (2012b)

AECOM undertook a study to assess the significance of contaminant mass flux and discharge in the natural soil, marine sediments and groundwater underlying the Site. The Contaminant Mass Flux Study (AECOM, 2012b) is provided as **Appendix C**.

Multiple lines of evidence were assessed as summarised following:

- Hydraulic Conductivity and Velocity;
- Tide Effects;
- Hydraulic Head Distribution; and
- Mass Flux and Discharge.

Based on the Conceptual Site Model (refer to **Figure 1**), collation of hydraulic parameters and mass flux/discharge modelling for the Site, the following conclusions were made:

- Lithology and hydraulic conductivity data indicate that groundwater flow in the underlying natural soil and marine sediments is very low and in the order 0.4 metre per year, with contaminant velocities likely to be at least an order of magnitude lower due to attenuation (sorption, biological degradation, etc.);
- The effect of the twice daily tide provides changes in hydraulic head that further reduce the migration of groundwater and hence the contaminants;
- Mass discharge modelling indicates that both the mass and impact from the natural soil and marine sediments underlying the Site to the receiving water are insignificant and could not be measured due to the low expected concentrations;
- The lines of evidence assessed do not indicate there is a significant flux and discharge of contamination from the natural soil and marine sediments underlying the Site into Darling Harbour; and
- Remediation of the deep natural soil and marine sediments is not warranted based on the results presented in the discussed assessment. The cost and potential environmental harm associated with an attempt to remove this material would outweigh any real benefit to the environment, which does not appear to be significantly impacted by the contamination present in the natural soil and marine sediments.

The groundwater analytical results reported at monitoring well IT03 (BH405 in Block 4) confirm the conclusions described above (i.e. that there is negligible flux of CoPCs migrating from the natural sediments into the overlying fill material). In particular, two sampling ports (IT03S and IT03M) were installed in this well at different depths in the fill material (2.5 and 8 m bgl). A third sampling port (IT03D) was installed deeper within the natural sand/silty sandy clay (13.5 m bgl). While elevated groundwater CoPC concentrations were reported in the deep sample port (where elevated soil CoPC concentrations were also reported), CoPCs concentrations in the shallow and middle depth sampling ports were generally non-detect (refer to **Table T10**).

2.5.3 Supplementary Contaminant Mass Flux Study (AECOM, 2013a)

AECOM undertook a supplementary Contaminant Mass Flux study (following on from AECOM [2012b] above) to assess:

- The decrease in contaminant flux that could be expected to result from the proposed remediation extent (refer to **Section 5.0**); and
- potential impacts to water quality in Darling Harbour from the contamination that will remain *in situ* in fill material and marine sediment both within the Site and in off Site areas to the west (i.e. Barangaroo Central and the ORWN area) as an outcome of the proposed remediation extent.

A complete summary of this supplementary study is presented in **Section 6.5.2.1**. However, one of the conclusions from the supplementary study was that less than 0.1% of the contaminant mass flux into Darling harbour (associated with residual contamination to remain *in situ* following the proposed remediation) would be from the marine sediment. This conclusion supports the conclusions of the previous contaminant mass flux study (AECOM, 2012b) and the GDS (AECOM, 2010d) that there is not a significant flux and discharge of contamination from the natural soil and marine sediments underlying the Site into Darling Harbour.

2.6 Conclusion

Based on the CSM developed and described in the previous sections, it is concluded that:

- SPGWT and other fill materials contaminated with CoPCs (refer to **Section 2.4.2**) have been identified in a number of locations within the footprint of the former gasworks, indicating these locations are primary source areas of soil and groundwater contamination. The former gasworks infrastructure is identified as follows (refer to **Figure F2** and **Figure F3**):
 - Retort House;
 - Meter House;
 - Tar tank;
 - Engine House;
 - Gasholders including:
 - Main gas holder annulus (part of);
 - 1870 gas holder annulus;
 - Tar tank; and
 - Small gas holder.
 - Purifier Sheds and Beds.
- Contamination, including SPGWT, has been reported in the natural soil underlying fill material in the former gasworks area;
- Analytical soil and groundwater results from locations outside and down hydraulic gradient (west) of the Site indicate that gasworks related contamination has migrated outside the Declaration Area boundary in both soil and groundwater (refer to **Figure F6**);
- Soil and groundwater contamination, including SPGWT, reported at depth, west (down hydraulic gradient) of the Site is typically present in the natural marine sediments immediately underlying the fill material;
- Some localised areas of soil contamination are present in the fill material down hydraulic gradient of the Site (for example sampling locations BH70 and BH74, refer to **Section 4.3.1** and **Figure F6**) which, based on the Site's history, is possibly related to the historic reclamation activities using impacted fill material rather, than the migration of gasworks related contaminants from the former gasworks site; and
- Soil contamination reported at BH60/MW60 and BH191 is also present in the natural material but does not appear to be connected with contamination identified closer to the Site boundary.

The most highly impacted soil is generally present:

- within the footprint of the former gasworks infrastructure or in relatively close proximity to these historic structures; and,
- at the base of the fill material, within the natural marine sediments and at the top of the weathered sandstone.

This is consistent with a Site at which DNAPLs (such as SPGWT) is present and where highly variable and permeable fill material overlies a relatively low permeability natural soil/bedrock. In such circumstances, the DNAPL would generally migrate downwards and pool/adsorb on the less permeable underlying strata. Furthermore, contaminant concentrations in the lower permeability natural soil / marine sediment which has less tidal connectivity would be expected to be comparatively higher than those in the overlying fill material given the:

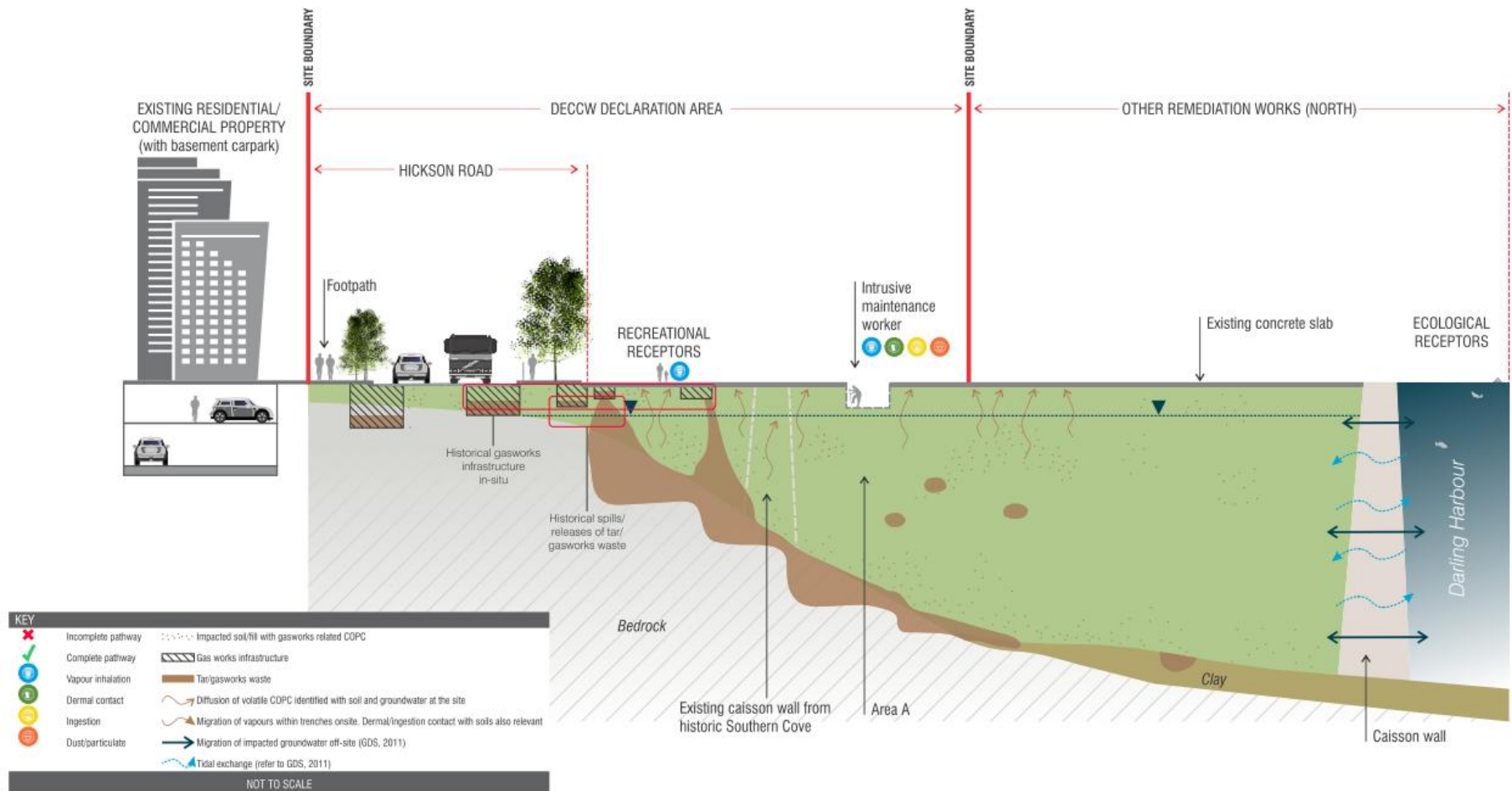
- Age of the contamination: the gasworks ceased operations in the late 1920's;
- Relatively high permeability of the fill; and
- Tidal connectivity of the fill.

It is considered unlikely that contamination from the above mentioned impact would have migrated significantly into the underlying sandstone because the sandstone has a significantly lower bulk hydraulic conductivity and hence lower water transmitting properties than the overlying fill and natural material.

The CSM is shown schematically in **Figure 1** below (the alignment of this schematic cross section is shown in **Figure F3**).

As identified by **Figure 1**, gasworks related contamination has been identified within marine sediments located below the western portions of the Site and in the areas down hydraulic gradient (west) of the Site. Based on the assessment of multiple lines of evidence (refer to **Section 2.5**), there is no significant flux and discharge of contamination from the natural soil and marine sediments underlying the Site (and areas down hydraulic gradient of the Site) into Darling Harbour. As such, remediation of the deep natural soil and marine sediments is not considered warranted. The cost and potential environmental harm associated with an attempt to remove this material would outweigh any real benefit to the environment, which does not appear to be significantly impacted by the contamination present in the natural soil and marine sediments.

Figure 1 Schematic of the Conceptual Site Model (taken from the VMP HHERA)



3.0 Remediation Goals

3.1 Soil and Groundwater Generic Assessment Criteria

The current Generic Assessment Criteria used in NSW to evaluate possible human health risk from soil analytical results are based on the:

- NSW DEC (2006) *Guidelines for the NSW Site Auditor Scheme*;
- NSW EPA (1994) *Guidelines for Assessing Service Station Sites*; and
- *National Environment Protection (Assessment of Site Contamination) Measure* (National Environment Protection Council [NEPC], 1999).

These guidelines present a range of Health-Based Soil Investigation Levels (SILs), sensitive land use thresholds and expected background concentration ranges for urban redevelopment sites in NSW.

SILs are not available for all CoPCs identified at the Site and are generally considered inappropriate and potentially unnecessarily conservative for remediation works. Therefore, as described by the *VMP HHERA* (AECOM, 2012c) it is necessary and appropriate to adopt a site-specific health-based approach to determining:

- Whether the concentrations of CoPCs identified at the Site represent a risk to human health; and
- Site Specific Target Criteria (SSTC) for soil and groundwater to define the remediation required for the Site to be protective of human health.

3.2 Development of Site-Specific Target Criteria (SSTC)

The following sections summarise development of the soil and groundwater SSTC for the protection of human health at the Site as detailed in the *VMP HHERA* (AECOM, 2012c).

The objective of the *VMP HHERA* (AECOM, 2012c) was to develop SSTC for soil and groundwater for use in defining the remediation end-point for the Site. The remediation end-point is defined as that required to render the Site suitable for continued use based on its current land use with no change to the site conditions. For the purposes of the *VMP HHERA* (AECOM, 2012c), a 'suitable for use' endpoint was considered to be that required to enable the NSW EPA Declaration to be revoked and ensure that unacceptable risks to human health or the environment will not occur.

3.2.1 Key Assumptions

The key assumptions used in the derivation of the soil and groundwater SSTCs are detailed in Section 6.2.4 of the *VMP HHERA* (AECOM, 2012c) and are as follows:

- CoPC considered in the HHERA are limited to those identified within the NSW EPA Declaration (PAHs, BTEX, TPH, ammonia, phenol and cyanide);
- Removal and/or remediation of SPGWT, to the extent practicable, should be undertaken as the primary remediation objective to minimise the risk to human health and the environment;
- There are significant biodegradation processes occurring within sub-surface soils based on measured oxygen concentrations beneath the sub-surface. To account for these biodegradation processes, a 10 fold factor (Davis 2009) has been adopted for the assessment of risk and development of soil SSTC (human health) for the paved areas of the Site, where biodegradation processes are considered to be significant;
- The assessment of threshold risk for each scenario and the development of SSTCs have accounted for the presence of mixtures of chemicals at the Site within the same media;
- The current theoretical estimation of vapour concentrations within indoor and outdoor air is based on partitioning modelling which has been demonstrated to overestimate concentrations between 10-1,000 fold. To account for this conservatism, an adjustment factor of 10 has been applied to all modelled soil results for BTEX, TPH C₆-C₉ and C₁₀-C₁₄ for the human health SSTC;
- Risks associated with mixtures of chemicals have been modelled by applying proportional risks as follows: BTEX (HI 0.25 each), PAH (HI 0.2), TPH (HI 0.25 total for aliphatic and aromatic per fraction), all other chemicals HI = 1; and

- Chemicals are assumed to be volatile if Henry's Law constant is greater than 1×10^{-5} atm-m³/mole (USEPA, 2004).

3.2.2 Exposure Scenarios

In consideration of risk to human health, the following scenarios were considered for the derivation of SSTCs:

- **Scenario 1:** Paved Recreation (as the entire Site is currently covered with concrete/hardstand paving); and
- **Scenario 2:** Short term ground-intrusive maintenance (for maintenance of utility services).

Table 3 below summarises the land use scenarios and assumptions as discussed in the *VMP HHERA* (AECOM, 2012c).

Table 3 Summary of Land Use Scenarios Considered in the VMP Human Health and Ecological Risk Assessment

Scenario Number	Name and Description	Most Sensitive Human Receptor	General Assumptions
1	Paved Recreation: The entire Site is currently covered with concrete/hardstand paving. This scenario has assumed that contaminated soil may be present directly underlying concrete surface cover.	Recreational Users Assumed to be exposed 2 hrs/day, 365 days/year, for 70 years.	Open Space with Concrete surface covering. Assume that there is significant oxygen movement through the top 2m of the soil based on the oxygen measurements collected during the soil gas sampling (AECOM 2010a and 2010b). Concrete assumed to be minimum 15 cm thick and to have crack fraction of 0.001 (to account for higher cracking possible in surface covering).
2	Intrusive Maintenance: Short term intrusive maintenance scenario, e.g. for maintenance of utility services.	Adult worker 8 hrs/day, 15 days/year for 1 year. Direct contact with groundwater may occur due to shallow water – no more than 1 hour per day. Vapour may be derived from pooled groundwater or from exposed soils in trench.	Short term maintenance work or site investigation may be required Assumed not to exceed 3 working weeks per year by same worker. While maintenance work may be expected to be predominantly within existing infrastructure easements and structures, ground-intrusive work may conceivably be planned.

3.2.3 Adopted SSTCs

A summary of the soil and groundwater SSTCs derived for each exposure scenario by the *VMP HHERA* (AECOM, 2012c) is provided in **Table T1** and **T2, Appendix B**.

Tables T1 and **T2, Appendix B**, also present the hybrid criteria that are applicable to the Site based on the lowest of the SSTCs for the applicable land use scenarios (that is where more than one SSTC is applicable, the lowest SSTC has been adopted).

It is noted that soil SSTCs have been derived for the unsaturated soils only (assumed based on the depth of groundwater reported across the Site to be soils shallower than 2.0 m bgl). As described by the *VMP HHERA* (AECOM, 2012c), this approach is based on the potential exposure pathways identified for the Scenario 1 and Scenario 2 land uses (refer to **Table 3**).

3.2.4 Implementation of the SSTCs

For the purpose of this document, CIM is considered to be material that represents an unacceptable risk to human health and so warrants remediation. The presence, or absence, of CIM and the resultant extent of remediation will be determined by comparison of soil and groundwater analytical results with the soil and groundwater SSTC developed by the *VMP HHERA* (AECOM, 2012c).

3.3 Remediation Goals for the Protection of Human Health

The remediation goals for the protection of human health, as recommended by the *VMP HHERA* (AECOM, 2012c) are:

- As a primary goal, removal / remediation of SPGWT to the extent practicable; and
- As a secondary goal:
 - Removal/remediation, to the extent practicable, of CIM (that is material containing soil concentrations exceeding the soil SSTCs) from unsaturated soil; and
 - Removal/remediation, to the extent practicable, of CIM (that is material considered to be the source of groundwater concentrations exceeding the groundwater SSTCs).

The process for assessing the extent of remediation based on the identification of SPGWT and CIM is summarised by the following sections.

The outcomes of this process are documented in **Section 4.0** and **5.0**.

3.3.1 Separate Phase Gasworks Waste and Tar

For the purposes of this report, SPGWT refers to:

- Tar Containing Materials (TCM, as described below); and
- Dense Non Aqueous Phase Liquids (DNAPLs).

The presence or otherwise of TCM is based on comparison of observed site conditions and analytical data to the following criteria:

- Greater than 10% visible coal tar (where coal tar is a phase separated hydrocarbon by-product from coal gasification); and/or
- Contaminant concentrations exceeding the following limits:
 - Polycyclic Aromatic Hydrocarbons (PAHs): 2,000 mg/kg; or
 - Benzo(a)Pyrene (B(a)P): 150 mg/kg.

The above TCM definition was originally proposed by AECOM and adopted by Lend Lease/the Authority to define TCM at the Site, particularly in the context of material that is unsuitable for beneficial reuse (in conjunction with the site-specific risk based criteria which were derived in the *VMP HHERA* [AECOM, 2012c]).

Section 4.2.4 of the *VMP HHERA* (AECOM, 2012c) notes that the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* requires that:

- *"Where light NAPLs (LNAPLs) or dense NAPLs (DNAPLs) are present in the subsurface they must be removed or treated as much as practicable".*

Consequently, in accordance with NSW EPA policy and guidelines, and the remediation goals recommended by the *VMP HHERA* (AECOM, 2012c), all SPGWT identified on the Site and in adjacent off Site areas is required to be remediated to the extent practicable.

3.3.2 CIM based on Soil SSTCs

The decision process for the determination of whether CIM is present based on the soil SSTCs is summarised following.

- Assessment of whether SPGWT is present (refer to **Section 3.2.3**). SPGWT will be removed or remediated to the extent practicable; and
- Assessment of whether soil concentrations between 0 and 2 m bgl exceed the relevant SSTCs for unsaturated soil (refer to **Section 3.2.3**).

3.3.3 CIM based on Groundwater SSTCs

The decision process for the determination of whether CIM is present based on the groundwater SSTCs is summarised following.

- Assessment of whether SPGWT is present (refer to **Section 3.2.2**). SPGWT will be removed or remediated to the extent practicable;
- Assessment of whether groundwater concentrations exceed the relevant SSTCs for groundwater (refer to **Section 3.2.3**); and
- Assessment of soil concentrations considered to be the source of the identified groundwater contamination.

3.3.4 Extent of Remediation

If CIM is identified to be present, the significance of the impacted soils and the corresponding requirement for remediation to the extent practicable will be assessed with due consideration of whether the identified CIM is present in fill material or within marine sediments.

The outcomes of the process are documented in **Section 5.0**.

3.4 Remediation Goals for the Protection of the Environment

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

- As a primary goal, removal / remediation of SPGWT to the extent practicable; and
- As a secondary goal - remediation of the soil within the unsaturated and saturated zones, to the extent practicable, such that groundwater quality within fill material leaving the Site (measured in fill at the down hydraulic gradient Site boundary) approaches the Marine Water Quality Criteria (MWQC).

The process for assessing the extent of remediation based on the identification of SPGWT will be as described for the protection of human health (refer to **Section 3.3.1**).

The process for assessing the extent of remediation that can be practicably achieved with a view to ultimately improving groundwater quality in fill material at the Site such that it approaches the MWQC (measured in fill at the down hydraulic gradient Site boundary) is summarised by the following sections.

The outcomes of the process are documented in **Section 6.0**.

3.4.1 Separate Phase Gasworks Waste and Tar

As per **Section 3.3.1**, in accordance with NSW EPA policy and guidelines, and the remediation goals recommended by the VMP HHERA (AECOM, 2012c), SPGWT identified on the Site and in adjacent off Site areas is required to be remediated to the extent practicable.

3.4.2 Marine Water Quality Criteria (MWQC)

The selection of MWQC relevant to protection of aquatic ecological receptors is described by Section 8.4 of the VMP HHERA (AECOM, 2012c). The MWQC have been selected, in consultation with the NSW EPA, as suitable screening criteria that are protective of the environment including: groundwater dependant ecosystems which may be present down hydraulic gradient of the Site boundary currently or in the future; and, Darling Harbour.

The MWQC are based on:

- Groundwater and surface water: ANZECC (2000) trigger values for marine water (95% protection level). Low reliability trigger values have been adopted where no other value is available; and
- Groundwater and surface water: ANZECC (2000) trigger values for marine water (99% protection level) for chemicals with the potential to have bioaccumulative impacts. Low reliability trigger values have been adopted where no other value is available.

In addition, where the ANZECC (2000) *Water Quality Guidelines* did not include appropriate criteria, the following secondary sources were adopted:

- CCME, 1999. *Canadian environmental quality guidelines*. Canadian Council of Ministers of the Environment, Winnipeg; and

- Oakridge (Suter and Tsao), 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota, 1996 Revision*. Risk Assessment Program Health Sciences Research Division. US Department of Energy Office of Environmental Management. Tier II Secondary Chronic Values. June.

The selected MWQC are summarised in **Table 4** below.

Table 4 Marine Water Quality Criteria

Analyte	Criteria (µg/L)	Source
Low MW PAHs		
Acenaphthene	5.8	CCME (1999) Freshwater Guideline
Acenaphthylene	5.8	Adopted criteria for Acenaphthene as surrogate
Anthracene	0.1 ^a	ANZECC (2000) 99% Marine Water Trigger Value (0.01 µg/L) identified to be lower than LOR.
Fluorene	3	CCME (1999) Freshwater Guideline
Naphthalene	70	ANZECC (2000) 95% Marine Water Trigger Value, moderate reliability
Phenanthrene	0.6 ^a	ANZECC (2000) 99% Marine Water Trigger Value
Other Organics		
Phenol	400	ANZECC (2000) 95% Marine Water Trigger Value
Petroleum Hydrocarbons		
Benzene	700	ANZECC (2000) 95% Marine Water Trigger Value, moderate reliability
Ethylbenzene	80	ANZECC (2000) 95% Fresh Water Trigger Value, low reliability
Toluene	180	ANZECC (2000) 95% Marine Water Trigger Value, low reliability
Xylene (m & p)	75	ANZECC (2000) 95% Marine Water Trigger Value, low reliability for <i>m</i> -xylene.
Xylene (o)	350	Adoption of the ANZECC (2000) 95% Marine Water Trigger Value, low reliability for xylene (o).
TPH C ₆ - C ₉	110	CCME (2008a) Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil – Table B-9 values for TPH C ₆ to C ₈ and C ₈ ⁺ to C ₁₀ . Criteria calculated from a weighted average assuming a Coal Tar composition of 25% aliphatic and 75% aromatic components
TPH C ₁₀ - C ₁₄	40	CCME (2008a) Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil – Table B-9 values for TPH C ₁₀ to C ₁₂ and C ₁₂ ⁺ to C ₁₆ . Criteria calculated from a weighted average assuming a Coal Tar composition of 25% aliphatic and 75% aromatic components
TPH C ₁₅ -C ₂₈	100	No guidelines values available, therefore the standard laboratory Limit of Reporting (LOR) has been adopted.
TPH C ₂₉ -C ₃₆	50	No guidelines values available, therefore the standard LOR has been adopted.

Notes: (a) It is noted that these MWQC are less than the laboratory standard LOR. The laboratory standard LOR will be adopted in place of the MWQC where: (i) analysis of these chemicals is required; or, (ii) where the MWQC are considered in derivation of risk based criteria.

3.4.3 Extent of Remediation

As described in Section 8.1 of the *VMP HHERA* (AECOM, 2012c), the determination of potential risks to the environment required consideration of the potential for risks posed to underground aquatic ecosystems and their novel fauna (as required by Section 1 of the ANZECC [2000] *Water Quality Guidelines*). This is in accordance with the requirements of the NSW EPA which require that the level of protection of groundwater within fill material

at the down hydraulic gradient boundary of the Site is based on the level of protection required for the nearest surface water receptor, Darling Harbour (that is the MWQC).

The current groundwater monitoring wells are not located immediately on or adjacent to the down hydraulic gradient Site boundary. Further, groundwater monitoring wells are variably screened in the fill and/or in the underlying natural material and depending on the location or the groundwater monitoring wells, and the timing of the sampling activities relative to the tide, the groundwater sampled in the wells may not be representative of groundwater quality leaving the Site. Therefore, it is not considered appropriate to rely solely on the existing (limited) groundwater monitoring data set from groundwater monitoring wells located near the down hydraulic gradient Site boundary. Consequently, groundwater concentrations within fill material both at the down hydraulic gradient Site boundary and across the Site were compared by the *VMP HHERA* (AECOM, 2012c) to the MWQC to assess risk to the environment.

Widespread exceedances of the MWQC have been identified in groundwater both within the Site and at the Site boundary, indicating an unacceptable risk to the environment. The distribution of exceedances is described on Figure F7 of the *VMP HHERA* (AECOM, 2012c). In summary:

- The exceedances are most concentrated in the vicinity of the former gasworks infrastructure within Hickson Road and the eastern portion of Block 4; but
- Exceedances are also evident within Block 5, the western portion of Block 4 and beyond the down hydraulic gradient Site boundary within Block 5 and Block 4.

Based on the identified MWQC exceedances remediation, to the extent practicable, of soil contamination that is considered to be the source of the groundwater MWQC exceedances within fill material, is required to minimise the risk of adverse impact to the environment.

The assessment of the extent of remediation that can be practicably achieved will be based on consideration of the requirements of the:

- NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*.

As part of this process, consideration will also be given to the principles of:

- ESD, as required by Section 9 of the *CLM Act* (1997); and
- the *Waste Avoidance and Resource Recovery Act* (2001).

3.5 Other Contaminants

3.5.1 Asbestos in Soil

Asbestos in soils was not included in the NSW EPA Declaration and the *VMP HHERA* (AECOM, 2012c) did not consider that asbestos was a CoPC for which specific risk based criteria were required to be calculated. Rather, the *VMP HHERA* (AECOM, 2012c) recommended that the risk of asbestos was most appropriately managed through implementation of appropriate management tools in the *VMP/Block 4 RAP*.

As such, the risk of asbestos in soil is not considered further by this document.

3.5.2 Acid Sulfate Soils

The previous investigations undertaken at the Site have included analysis of samples for Suspension Peroxide Oxidation Combined Acidity & Sulfur (SPOCAS) to evaluate the potential for potential acid sulphate soils (PASS) or actual acid sulfate soils (AASS) to be present.

The *VMP/Block 4 RAP* will consider the results of this analysis and whether, or not, they indicate there is a potential that AASS or PASS are present at the Site.

4.0 Contaminant Characterisation for Protection of Human Health

The remediation goals for the protection of human health, as described by **Section 3.3**, are:

- As a primary goal, removal / remediation of SPGWT to the extent practicable; and
- As a secondary goal:
 - Removal / remediation, to the extent practicable, of CIM (that is material containing soil concentrations exceeding the soil SSTCs) from unsaturated soil; and
 - Removal / remediation, to the extent practicable, of CIM (that is material considered to be the source of groundwater concentrations exceeding the groundwater SSTCs within fill material).

The following Sections compare the Site's soil and groundwater analytical data to these remediation goals to identify materials at the Site which may be representative of SPGWT or CIM and therefore may require remediation.

Soil analytical data beyond the Site boundary has also been assessed. This assessment has been included because the Site Auditor is required by NSW DEC (2006) to include in his/her site audit an assessment of Site impacts and the risk of cross contamination of onsite areas from off Site areas. The off Site analytical data considered as part of this assessment are limited to gasworks related impacted material that is considered to be directly related to the Site. Contamination that may be present in areas beyond the Site boundary but that is not considered to be related to the gasworks previously located on the Site (for example as a result of historical filling activities) will be assessed separately as part of the respective HHERA and RAP prepared in relation to the Other Remediation Works North (ORWN) Area (Block 4) and Barangaroo Central (Block 5).

The process for assessing the extent of remediation based on the identification of SPGWT and CIM is summarised by **Section 3.3**. It is proposed that remediation of the Site may be undertaken in stages, depending on final logistical and other requirements associated with the broader Barangaroo development. This may require that key Site areas be remediated and validated separately, such that the EPA Declaration is removed progressively. In consideration of this, the following Site areas have been addressed individually:

- Block 4 and 5;
- Hickson Road;
- Off Site areas west of the Site (i.e. down-gradient of the Site within the ORWN and Barangaroo Central areas); and
- Off Site areas east of the Site.

The soil and groundwater analytical data for the Site is compared to the applicable soil and groundwater SSTCs in **Table T3 to T13, Appendix B**.

The off-Site soil and groundwater analytical data, for the area west of the Site within Block 5 and the ORWN area, is compared to the relevant SSTCs and presented in **Table T14 to T16, Appendix B**.

4.1 Block 4 and 5

The presence of CIM within Block 4 and Block 5 was assessed using soil and groundwater analytical data from the investigations detailed in **Section 2.1**.

4.1.1 Separate Phase Gasworks Waste and Tar (Block 4 and Block 5)

As detailed in **Table 4**, based on consideration of both field observations (i.e. during soil and groundwater sampling activities) and soil analytical results, SPGWT has primarily been identified in the following areas (refer to **Figure F6**):

- Across most of the eastern portion of Block 4, in areas where the depth of bedrock is generally shallower than 10 m bgl (approximately Relative Level [RL] -7.5 m Australian Height Datum [AHD]), and in association with former gasworks infrastructure;
- Across part of the western portion of Block 4, down gradient from the former gasworks infrastructure in the vicinity of BH49 and BH119; and
- In relatively isolated locations, either associated with the migration of SPGWT from former gasworks infrastructure or with historical filling practices in:
 - The southern portion of Block 4, in the vicinity of BH42/BH408; and
 - The eastern portion Block 5 (as described below), in areas where the depth of bedrock is generally shallower than 10 m bgl.

Observations from bulk samples collected as part of the ex-situ stabilisation trial (EPS, 2012) indicate that SPGWT is likely to be present in the eastern part of Block 5 (refer to TP02 on **Figure F3**) adjacent to the former gasworks infrastructure. Based on the reported analytical results, it is likely that SPGWT is present at a depth of approximately 4.2 m bgl at TP02. Bedrock was not encountered at this location to the maximum depth of 4.8 m bgl. SPGWT was also encountered at TP05 and TP06 at depths ranging between 2.9 and 4.0 m bgl (refer to **Table 5** below).

Table 5 SPGWT Identified within Block 4 and Block 5

Site Area	Approximate SPGWT Depth Range (m bgl)	TCM identified in fill or natural material?
Eastern Block 4		
BH49	9.2 - 12.7 (depth of bedrock) ²	Fill and natural sandy clay
BH52	4.2 - 4.4 (bedrock present at 5.2) ¹	Fill
BH54	1.0 - 1.8 (bedrock present at 3.0) ¹	Fill
BH55	1.0 - 2.9 (depth of bedrock) ³	Fill
BH59	3.4 - 4.4 (depth of bedrock) ³	Fill
BH087	1.5 - 7.5 (depth of bedrock?) ³	Fill
BH019	2.5 - 3.6 (depth of bedrock) ³	Fill
BH141	3.0 – 4.1 (depth of bedrock) ³	Fill
BH204S	1.0 (bedrock present at 1.3) ¹	Fill
BH204D	1.5 - 5.0 (natural clayey sand present at 4.1) ³	Fill and natural sandy clay
BH205/MW205	DNAPL observed in groundwater (bedrock present at 11.0) ²	Natural clayey sand
BH206/MW206	DNAPL observed in groundwater (bedrock present at 8.0) ²	Bedrock
TP05	3.1 - 4.0 (bedrock present at 4.0) ²	Fill
TP06	2.9 - 3.1 (bedrock present at 3.1) ²	Fill

Site Area	Approximate SPGWT Depth Range (m bgl)	TCM identified in fill or natural material?
TP07	2.0 – 4.3 (depth of bedrock now known) ²	Fill
Eastern Block 5		
TP02	4.2 - 4.8 (bedrock present at 4.8) ²	Fill
Southern Block 4		
BH42	3.2 - 3.5 (depth of bedrock) ³	Fill
BH408	8.0 - 9.4 (depth of bedrock) ²	Natural silty sandy clay
Western Block 4		
BH119	7.5 - 10 (depth of bedrock not known) ³	Fill
BH405	14 - 14.45 (within natural silty sandy clay, bedrock at 14.45 m bgl) ¹	Natural silty sandy clay

Notes: The distribution of SPGWT described above is based on a review of the analytical results and field observations as denoted below:

1 based on laboratory analytical data

2 based on field observations (i.e. greater than 10% tar noted to be present in observed fill/soil)

3 based on laboratory analytical data and field observations

It is noted that, based on observations from previous investigations, it is likely that SPGWT is present in other areas where former gasworks infrastructure that was not intersected by the previous investigations is present.

With the exception of some isolated areas of SPGWT, possibly related to historical filling practices, the distribution of SPGWT appears to be principally related to:

- Proximity to former gasworks related infrastructure (specifically the main gas holder annulus, the tar tank and the 1870 gas holder);
- Location relative to former gasworks related infrastructure (i.e. SPGWT is generally present down gradient of the former gasworks related infrastructure); and
- The reduced permeability of the underlying marine sediments and the sandstone bedrock profile which generally dips to the west (i.e. SPGWT is generally contained within the marine sediments but has generally not penetrated the underlying bedrock).

Consequently, the distribution of SPGWT is typically shallower in the eastern portion of Block 4 (generally 1.0 to 4.0 m bgl) and deeper in the western portion (approximately 7.5 to 15.0 m bgl) where it has been reported within the underlying marine sediments.

As discussed in **Section 3.3.1**, DNAPL is included within the definition of SPGWT. DNAPL has been identified at the following Block 4 borehole locations (refer to **Figure F6**):

- BH87/MW15;
- BH204D/MW204D;
- BH205/MW205; and
- BH206/MW206.

4.1.2 Soil Analytical Results (Block 4 and Block 5)

The analytical results from soil samples collected across the Block 4 and Block 5 Area are presented in **Table T5** to **T7** (for unsaturated and saturated soils respectively).

A summary of the Block 4 and Block 5 Area unsaturated soil analytical data (i.e. shallower than 2 m bgl) reported at concentrations exceeding the soil SSTC is presented in **Table 6** below. All other analytes were reported at concentrations below the soil SSTC.

Table 6 Block 4 and Block 5 – Soil Concentrations exceeding the Unsaturated Soil SSTC

CoPC (SSTC, mg/kg)	EQL	Number		Concentration Range (mg/kg)		Mean (S D)	Number of Results > SSTC	Exceed.
		Results	Detections	Min	Max			
cPAH ¹ (67)	-	60	42	0.06	921.56	56 (166)	10	BH001_1.0 BH200/1.0 BH204S/1.0 BH204D/1.5 BH145_0.3-0.5 BH073_1.5-1.95 BH087_1.5-1.95 BH55_1.0-1.2 BH64_1.0-1.2 BH54_1.0-1.4
TPH C ₁₀ - C ₁₄ (54,000)	50	63	17	<50	54,200	1,286 (6,597)	1	BH204D/1.5
TPH C ₁₅ -C ₂₈ (72,000)	100	63	38	<100	72,400	2,471 (9,539)	1	BH204D/1.5

NOTE: EQL – Estimated Quantitation Limit

¹ Soil results have been compared to the cPAH SSTC using the relevant Toxicity Equivalency Factors (TEF, as required by Appendix D of the VMP HHERA (AECOM, 2012c).

4.1.3 Groundwater Analytical Results (Block 4 and 5)

Recent groundwater analytical results for the monitoring wells located across the Block 4 and Block 5 Area are presented in **Table T10** (taken from either 2010 or 2011 sampling events). Historic groundwater results are presented in **Table T11**.

A summary of the Block 4 and Block 5 groundwater analytical data reported at concentrations above the relevant groundwater SSTCs is presented in **Table 7** below. All other analytes were reported at concentrations below the groundwater SSTCs.

Table 7 Block 4 and Block 5 - Groundwater Concentrations exceeding the Groundwater SSTC

CoPC (SSTC, µg/L)	EQL	Number		Statistics (Concentrations)			Number of Results > SSTC	Exceedances
		Results	Detects	Min	Max	Mean (SD)		
Naphthalene (1,300) ¹	0.1	18	11	<1	283,000	18,148 (66,207)	7	MW15 MW54 IT03D MW200 MW204S MW205 MW206
cPAH (1000)	-	18	7	0.32	11,556	672 (2,718)	1	MW205
TPH C ₁₀ -C ₁₄ (17,000) ¹	50	18	10	<50	1,730,000	107,171 (405,521)	5	MW200 MW205 MW206 MW54 MW15
TPH C ₁₅ -C ₂₈ (220,000)	100	18	12	<100	1,520,000	91,259 (356,958)	1	MW205
TPH C ₂₉ -C ₃₆ (250,000)	50	18	9	<50	332,000	19,396 (78,092)	1	MW205
Benzene (2,100) ¹	1	17	9	<1	17,900	2,233 (5,230)	3	MW200 MW206 MW15

NOTE: ¹ SSTC presented are based on those in Appendix C of the *VMP HHERA* (AECOM, 2012c) which have been confirmed to be correct. It is noted that as a result of a transcription error, these values are different to those presented within the body of the *VMP HHERA* (AECOM, 2012c).

4.1.4 Block 4 and Block 5 – Identification of CIM

The results of soil and groundwater analysis from the Block 4 and Block 5 Area indicate that the following CoPCs were reported at concentrations above the relevant SSTCs:

- Benzene;
- TPH C₁₀-C₂₈;
- naphthalene; and
- cPAHs.

SPGWT was also identified in the Block 4 and Block 5 Area.

4.1.4.1 Benzene

Overall assessment of the soil and groundwater results for benzene indicates the following:

- benzene concentrations reported in the unsaturated soil did not exceed the soil SSTC in any of the sampled analysed; and
- benzene concentrations reported in groundwater exceeded the groundwater SSTC in 3 of the 15 Block 4 and Block 5 monitoring wells, with a maximum concentration of 17,900 µg/L reported in MW200.

The 3 wells (MW15, MW200 and MW206) that reported groundwater concentrations exceeding the groundwater SSTCs are all located in areas identified as containing SPGWT. Based on the groundwater results, some benzene concentrations in groundwater are considered representative of CIM and, as such, are discussed further in **Section 5.1.1**.

4.1.4.2 Total Petroleum Hydrocarbons

Overall assessment of the soil and groundwater results for TPH (C₁₀-C₃₆) indicates the following:

- TPH concentrations reported in soil exceeded the soil SSTC for:
 - TPH C₁₀-C₁₄, TPH C₁₅-C₂₈ and TPH C₂₉-C₃₆ in 1 of the 63 soil samples analysed (BH205D/1.5);
- TPH concentrations reported in groundwater exceeded the relevant groundwater SSTC for:
 - TPH C₁₀-C₁₄ in five of the 15 Block 4 and 5 monitoring wells MW200, MW205, MW206, MW54 and MW15);
 - TPH C₁₅-C₂₈ in one of the 15 Block 4 and 5 monitoring wells (MW205); and
 - TPH C₂₉-C₃₆ in one of the 15 Block 4 and 5 monitoring wells (MW205).

The discussed TPH exceedances were predominantly located in areas identified as containing SPGWT. Based on the soil and groundwater concentrations, some TPH concentrations in unsaturated soil and groundwater are considered representative of CIM and, as such, are discussed further in **Section 5.1.1**.

4.1.4.3 Polycyclic Aromatic Hydrocarbons

Overall assessment of the soil and groundwater results for PAHs indicates that naphthalene exceeded the relevant groundwater SSTC in 7 of the 15 Block 4 and 5 monitoring wells (refer to **Table T10**).

Based on the discussed naphthalene concentrations in groundwater, naphthalene is considered representative of CIM and, as such, is discussed further in **Section 5.1.1**.

4.1.4.4 Carcinogenic PAHs

Overall assessment of the soil and groundwater results for cPAHs indicates the following:

- cPAH concentrations reported in soil exceeded the relevant SSTC in 10 of 60 unsaturated soil samples analysed. These locations are all located in the area of the former gasworks infrastructure (refer to **Figure F4**); and
- cPAH concentrations reported in groundwater exceeded the relevant SSTC in 1 of the 15 monitoring wells (MW205).

The exceedances of soil and groundwater SSTC were predominantly located in areas identified as containing SPGWT. Based on the concentrations in unsaturated soil and groundwater, some cPAH concentrations are considered representative of CIM and, as such, are discussed further in **Section 5.1.1**.

4.2 Hickson Road

The presence of CIM within Hickson Road was assessed using soil and groundwater analytical data from the investigations detailed in **Section 2.1**.

4.2.1 Separate Phase Gasworks Waste and Tar (Hickson Road)

As detailed in **Table 8**, based on consideration of both field observations and soil analytical results, SPGWT has been identified beneath parts of Hickson Road, primarily:

- associated with the historic tar tank structures that have been excavated into the bedrock (i.e. sampling locations BH7/MW7, BH10 and BH53);
- at BH15/MW15 (located down hydraulic gradient of the main gas holder annulus and historic tar tank structures); and
- in the northwest area of Hickson Road at BH61.

Table 8 SPGWT Identified in Hickson Road

Site Area	Approximate SPGWT Depth Range (m bgl)	TCM identified in fill or natural material?
BH7/MW7	4.6 – 5.5 (depth of bedrock within historic tar tank) ³	Fill
BH53	4.0 - 5.45 (depth of bedrock within historic tar tank) ³	Fill
BH10/MW10	4.9 – 9.4 (depth of bedrock within gas holder annulus) ³	Fill
BH61	2.0 - 3.45 (depth of bedrock) ³	Fill and natural clayey sand(?)
BH15/MW15	DNAPL observed in groundwater (bedrock at 1.9 m bgl)	Fill
BH6/MW6	Sheen observed in groundwater (bedrock at 4.5 m bgl)	Fill

NOTES: The distribution of SPGWT described above is based on a review of the analytical results and field observations as denoted below:

¹ based on laboratory analytical data

² based on field observations (i.e. greater than 10% tar noted to be present in observed fill/soil)

³ based on laboratory analytical data and field observations

It is noted that, based on observations from previous investigation, it is likely that SPGWT is present in other areas where former gasworks infrastructure that was not intersected by the previous investigations is present.

As discussed in **Section 3.3.1**, DNAPL is included within the definition of SPGWT. DNAPL has been identified at the following Hickson Road locations (refer to **Figure F6**):

- BH7/MW7;
- BH10/MW10;
- BH15/MW15; and
- BH53/MW53.

4.2.2 Soil Analytical Results (Hickson Road)

The analytical results from soil samples collected from the Hickson Road area are presented in **Table T8** and **T9** (for unsaturated and saturated soils respectively). All CoPC concentrations were reported at concentrations less than the unsaturated soil SSTCs.

4.2.3 Groundwater Analytical Results (Hickson Road)

Recent groundwater analytical results for the monitoring wells located in Hickson Road are presented in **Table T13** (taken from 2008 and 2010 sampling events).

A summary of the Hickson Road groundwater data reported at concentrations above the relevant groundwater SSTCs is presented in **Table 9** below. All other analytes were reported at concentrations below the groundwater SSTCs.

Table 9 Hickson Road Groundwater Concentrations exceeding the Groundwater SSTC

CoPC (SSTC, µg/L)	EQL ¹	Concentration				Number of Results > SSTC	Exceedances
		Min	Max	Average	Median (SD)		
Naphthalene (1,300) ¹	0.1	<2	192,000	35,575	2749.5 (76,868)	3	MW7 MW10 MW15
cPAH (1000)	-	3.88	11,162	2,041	11,157 (4,488)	2	MW10 MW15
TPH C ₁₀ -C ₁₄ (17,000) ¹	50	<50	830,000	309,298	248,450 (357,138)	3	MW10 MW7 MW15
TPH C ₁₅ -C ₂₈ (220,000)	100	<100	754,000	159,525	24,840 (297,032)	1	MW15
Benzene (2,100) ¹	1	<1	40,200	11,813	2733 (16,991)	3	MW10 MW7 MW15

NOTE: ¹ SSTC presented are based on those in Appendix C of the *VMP HHERA* (AECOM, 2012c) which have been confirmed to be correct. It is noted that as a result of a transcription error, these values are different to those presented within the body of the *VMP HHERA* (AECOM, 2012c).

4.2.4 Hickson Road – Identification of CIM

The results of groundwater analysis from the Hickson Road area indicate that the following CoPCs were reported at concentrations above the relevant SSTCs:

- Benzene;
- TPH C₁₀-C₂₈;
- naphthalene; and
- cPAHs.

Note that all concentrations in unsaturated soil samples collected within Hickson Road were below the relevant SSTC.

SPGWT was also identified in the Hickson Road Area.

4.2.4.1 Benzene

Overall assessment of the groundwater results for benzene indicates that benzene concentrations reported in groundwater exceeded the groundwater SSTC in 3 of the 6 Hickson Road monitoring wells (MW10, MW7 and MW15).

The three wells that reported groundwater concentrations exceeding the groundwater SSTCs are located in areas identified as containing SPGWT (refer to **Figure F6**). Based on the groundwater concentrations, some benzene concentrations are considered representative of CIM and, as such, are discussed further in **Section 5.1.1**;

4.2.4.2 Total Petroleum Hydrocarbons

Overall assessment of the groundwater results for TPH (C₁₀-C₃₆) indicates that the groundwater SSTCs were exceeded as follows:

- TPH C₁₀-C₁₄ in 3 of the 6 Hickson Road monitoring wells (MW10, MW7 and MW15); and
- TPH C₁₅-C₂₈ in 1 of the 6 Hickson Road monitoring wells (MW15).

The three wells that reported groundwater concentrations generally exceeding the groundwater SSTCs are located in areas identified as containing SPGWT (refer to **Figure F6**). Based on the reported groundwater concentrations, some TPH concentrations are considered representative of CIM and, as such, are discussed further in **Section 5.1.1**.

4.2.4.3 Polycyclic Aromatic Hydrocarbons

Overall assessment of the groundwater results for PAHs indicates that naphthalene concentrations exceeded the relevant SSTCs in 3 of the 15 Hickson Road monitoring wells (MW7, MW10 and MW15) at which SPGWT has also been identified (refer to **Figure F6**).

Based on the discussed groundwater concentrations, naphthalene concentrations are considered representative of CIM and, as such, are discussed further in **Section 5.1.1**.

4.2.4.4 Carcinogenic PAHs

Overall assessment of the groundwater results for cPAHs indicates that cPAH concentrations reported in groundwater exceeded the SSTC in 2 of the 6 Hickson Road monitoring wells (MW10 and MW15) at which SPGWT has also been identified (refer to **Figure F6**).

Based on the cPAH groundwater concentrations, some total cPAH concentrations are considered representative of CIM and, as such, is discussed further in **Section 5.1.1**.

4.3 Off Site Areas - West

The presence of CIM in areas off Site to the west of Block 4 and Block 5 was assessed using soil and groundwater analytical data from the investigations detailed in **Section 2.1**.

The following sections assess impacted soil that is located west of the Site boundary, but that is considered to be directly related to the Site and the Site's historical use as a gasworks.

4.3.1 Separate Phase Gasworks Waste and Tar (Off Site Areas – west)

As detailed in **Table 9** and presented in **Figure F6**, SPGWT has been identified in off-Site areas within the ORWN Area and Block 5. The identified SPGWT is predominantly present in the underlying marine sediments at the interface with the underlying bedrock. The only exception to this is localised areas of SPGWT reported in the fill material at BH70 and BH74.

Table 10 SPGWT Identified in Off Site Areas (west of the Site in Block 5 and ORWN)

Site Area	Approximate SPGWT Depth Range (m bgl)	TCM identified in fill or natural material?
Off Site (Block 5 and Barangaroo Central)		
BH70	2.5 m bgl in fill material (bottom of fill at 16 m bgl) and natural clayey sand (16-16.2 m bgl) ³	Fill and natural clayey sand
BH74	1.0 - 2.5 m bgl in fill material (bottom of fill at 16 m bgl) ²	Fill
BH400	16.8 m bgl at the natural clayey sand/bedrock interface (bottom of fill at 12.4 m bgl) ³	Natural clayey sand
BH402	14.0 - 19.8 m bgl in the silty/sandy clays (bottom of fill at 14.0 m bgl) ³	Natural silty/sandy clays
BH403	9.0 - 17.0 m bgl in the silty/sandy clays (bottom of fill at 8.0 m bgl) ³	Natural clays
BH541	9.9-10.0 m bgl in fill material (bedrock present at 10.8 m bgl, refer to Section 2.1.1) ¹	Fill material

Site Area	Approximate SPGWT Depth Range (m bgl)	TCM identified in fill or natural material?
Off Site (Block 4 and ORWN)		
BH48	14.5 m bgl on bedrock ²	Upper surface of the natural bedrock (no marine sediment present)
BH60	16 - 17.5 m bgl in sandy clay (bottom of fill at 16 m bgl) ²	Natural sandy clay
BH404	15.0 - 16.0 m bgl in 'silty clay' (bedrock at 16.0 m bgl) ²	Natural silty clay
BH406	14.30 - 14.50 m bgl – tar band in fill material and tar noted from 15.0 - 16.8 m bgl in silty clay and silty sand (bedrock at 16.8 m bgl) ³	Fill and natural clays

NOTES: The distribution of SPGWT described above is based on a review of the analytical results and field observations as denoted below:

¹ based on laboratory analytical data

² based on field observations (i.e. greater than 10% tar noted to be present in observed fill/soil)

³ based on laboratory analytical data and field observations

The borehole log for BH404 actually reported the SPGWT to be present within fill at 15.0 to 16.0 m bgl. However, based upon further review, it is considered more likely that the SPGWT is actually present within marine sediments. In particular, while no marine sediments or residual material was reported in the BH404 borehole log:

- the description of the 'fill material' between 15-16 m bgl (described as 'Silty Clay, very pale grey to white, very stiff, very moist, medium plasticity', refer to **Table 10**) is consistent with the description of natural clays in boreholes advanced to bedrock in the surrounding area (i.e. BH403, BH406 and BH63); and
- significant depths of marine sediments were reported in boreholes advanced to bedrock in the surrounding area (i.e. BH403, BH406 and BH63).

The lateral distribution of identified SPGWT impacts within the underlying natural marine sediments is presented in **Figure F6**. The extent of SPGWT impact within the marine sediments immediately west of the Site is considered to have been appropriately delineated (both laterally and vertically) by field observations and soil analytical data obtained from the following sampling locations (in order from north to south, refer to **Figure F6**):

- **Block 5:**
 - BH71 – no odour or staining from 15 m bgl (upper surface of marine sediments) to the depth of bedrock (23.5 m bgl);
 - BH63 – slight to moderate tar odours noted from 13 m bgl to the depth of bedrock (22 m bgl). No staining noted;
 - BH550 – no odour or staining between 13.8 and 15.0 m bgl within the weathered sandstone (clayey sand); and
 - BH73 – slight to strong chemical odours noted from 12.8 m bgl to the depth of bedrock (19 m bgl). No staining noted.
- **Block 4 and ORWN:**
 - BH57 – no odour or staining from 15.8 m bgl to 18.3 m bgl (target depth drilling reached);
 - BH56 – natural sand present at 17.5 m bgl. Moderate tar odour noted from 19 m bgl to the depth of bedrock (21.4 m bgl). No staining noted;
 - BH47 – slight hydrocarbons odours noted from 16 m bgl to the depth of bedrock (18.6 m bgl). No staining noted;
 - BH46 – very strong chemical odour noted from 19 m bgl to 23.7 m bgl (target drilling depth reached). No staining noted;
 - BH39 – no odour or staining from 23.5 m bgl to the depth of bedrock (25 m bgl); and
 - BH38 – no odour or staining from 17.5 m bgl to 20.7 m bgl (target drilling depth reached).

It is noted that SPGWT has been identified in the natural marine sediments in BH60/BH191 located in northern portion of the off Site ORWN area (refer to **Figure F6**). Based on adjacent sampling locations these impacts appear to be localised and are not likely related to impacts in the off Site BH70 and BH541 area due to the presence of shallower bedrock levels between BH60/BH191 and BH70 / B541. Based on the modelled bedrock contours it is considered that impacts from the BH70 and BH541 area would be expected to have migrated to the northwest (refer to **Figure F6**).

4.3.2 Gasworks Related Impacts (Off Site Areas – West)

The following tasks were undertaken to assess the distribution of other gasworks related impacts in the off Site areas west of the Site (i.e. down-gradient of the Site within the ORWN and Barangaroo Central areas).

- Borehole logs were reviewed to assess whether gasworks related impacts were observed either within the fill material, marine sediments or bedrock. Field observations (either olfactory [odour] or visual evidence) of either hydrocarbon or tar based odours have been summarised from the borehole data and noted in **Table T17**; and
- A review of key contaminant concentrations (naphthalene and TPH C₁₀₋₁₄) which exceeded an arbitrary value of 20 and 50 mg/kg respectively (refer to **Figure F7** and **Figure F8** respectively). It is noted that 50 mg/kg was generally the level of detection for the TPH C_{10-C14} analysis. A review of the off Site soil analytical data indicated that the selected arbitrary criteria was appropriate for defining less significant gasworks related impacts in the off Site area to the west of the Site.

Review of off Site field observations

A summary of field observations where tar or hydrocarbon impacted soils were reported to be greater than 'slightly' impacted in the off Site fill material and natural marine sediments is detailed in **Table T17** and illustrated in **Figure F7** and **Figure F8**, respectively. As detailed in **Table 10** and illustrated in **Figure F6**, SPGWT was identified to be present in off Site areas generally within 20 m from the western Site boundary with the exception of the BH60/BH191 area (marine sediments), and BH48 (marine sediments) and BH74 (shallow fill material). The distribution of minor gasworks related impacts (based on field observations) indicates that these off Site impacts are generally sporadic and not indicative of a continuous plume of impacted fill material or marine sediments emanating from historic gasworks activities at the Site.

Review of off Site naphthalene and TPH C₁₀₋₁₄ concentrations

The distribution of naphthalene and TPH C₁₀₋₁₄ concentrations exceeding the arbitrary criteria in the off Site areas indicates that there is a relatively strong correlation between the two contaminants in both the fill material and natural marine sediments (refer to **Figure F7** and **Figure F8** respectively). This is expected given naphthalene is typically reported in the TPH C₁₂ fraction range and therefore would be included in reported TPH C₁₀₋₁₄ concentrations. The minor gasworks related impacts are generally located within approximately 20 m of the Site boundary with some more localised impacts also in the vicinity of BH60/BH191 where SPGWT has also been reported (as discussed in **Section 4.3.1**).

Based on the above off Site field observations and reported low naphthalene and TPH C₁₀₋₁₄ impacts, it can be concluded that the minor gasworks related impacts present in the off Site fill material and marine sediments:

- are sporadic and not indicative of continuous migration of gasworks related impacts from the Site;
- are, based on the horizontal and vertical distribution of the identified impacts, likely to be the result of historic landfilling of impacted fill materials within the Barangaroo Central and ORWN area, as opposed to impacts which have migrated directly from the contaminated materials present on the Site; and
- are, based on the off Site groundwater results within fill materials (refer to **Table T16**), unlikely to be acting as a significant contaminant source to groundwater within the fill material. Consequently, the minor gasworks related impacts are not considered to represent a significant adverse risk to off Site groundwater quality within fill material and ultimately Darling Harbour.

4.3.3 Soil Analytical Results (Off Site Areas - West)

The analytical results from soil samples collected west of the Site (in Block 5 and the ORWN) are presented in **Table T14** and **T15** (for unsaturated and saturated soils respectively). The results indicated that all CoPC concentrations in the unsaturated soils were less than the relevant SSTCs.

4.3.4 Groundwater Analytical Results (Off Site Areas - West)

Groundwater analytical results (2006 to 2011) for the monitoring wells located in the off Site areas (including in Block 5 and the ORWN Area) are presented in **Table T16**. All CoPC concentrations were reported to be less than the relevant SSTCs, with the exception of the following:

- MW60 (ORWN Area) -TPH C₁₀₋₁₄ (18,500 µg/L) and naphthalene (1,500 µg/L);
- MW69 (Block 5) - naphthalene (1,920 µg/L); and
- MW541D (Block 5) - benzene (4,300 µg/L) and naphthalene (1,900 µg/L).

The groundwater results for monitoring wells located on or adjacent to the western Site boundary are also compared to the MWQC in **Table T12**.

4.3.5 Off Site Areas (West) – Identification of CIM

The results of soil and groundwater analysis from the off Site areas west of the Site did not identify CoPC groundwater concentrations in fill material above the relevant SSTCs with the exception of benzene and naphthalene reported at MW541 (as discussed in **Section 2.1.1**).

The groundwater concentrations exceeding the SSTCs reported at MW60 and MW69 (refer to **Section 4.3.4**) are not considered to be representative of CIM as the groundwater impacts are present within either natural marine sediments or within the natural bedrock. As described by **Section 2.5**, there is negligible contaminant flux from these natural materials into the overlying fill.

As such, CIM has only been identified at MW541 and is discussed further in **Section 5.3**.

SPGWT has been identified in the off Site area west of the Site and, as such, is discussed further in **Section 5.3**.

4.4 Off Site Areas – East

The following sections assess impacted soil that is located east of the Site boundary, but that is considered to be directly related to the Site and the Site's historical use as a gasworks.

It is understood that the area east of the Site has been the subject of a series of previous investigation, remediation and construction works. In particular (refer to **Figure F3**):

- 36 Hickson Road, which includes the south east quarter of the main gas holder annulus and (potentially) the eastern edge tar tank, has been the subject of a series of previous intrusive soil and groundwater investigations;
- 30-34 Hickson Road was the subject of basement excavation and construction works which included excavation and remediation of the north east portion of the main gasholder. Based on experience from the 30-34 Hickson Road remediation program, SPGWT is likely to be present at the base of the main gasholder annulus within 36 Hickson Road (and within the Site);
- 38 Hickson Road was the subject of basement excavation and construction works which are likely to have effectively removed residual contamination that may have been present;

As an outcome of the above mentioned work at 30-34 Hickson Road, 36 Hickson Road and 38 Hickson Road, Site Audit Statements were prepared confirming that the sites are suitable for their current land use (refer to **Appendix E**). Therefore, it is considered unlikely that the soil and groundwater contamination that may be present in these off Site areas warrants remediation.

It should also be noted that prior to declaration of the Site as a Remediation Site (under the then Section 9 of the CLM Act) a larger area (that included the Site and 36 Hickson Road) had been declared an Investigation Site. It is understood that on the basis of the results of additional soil and groundwater investigations, 36 Hickson Road was not included as part of the subsequent declaration of a Remediation Site. This observation is considered to further support the conclusions that it is unlikely that soil and groundwater contamination that may be present in these off Site areas warrants remediation.

The following sections specifically assess the potential for SPGWT that is likely to be contained within historic gasworks structures present east of the Site boundary to impact on remediation works within the Site.

4.4.1 Separate Phase Gasworks Waste and Tar (Off Site Areas – East)

As above, remediation works undertaken during construction of the basement for 'The Bond' (located at 30-34 Hickson Road directly to the east of the Site, refer to **Figure F3**) indicated that there is potential for residual SPGWT to be present in the south eastern portion of the main gasholder annulus within 36 Hickson Road. Further, more recent investigations of the tar tank (sampling locations BH7 and BH53), which potentially extends over the Site boundary into 36 Hickson Road, have identified SPGWT within this structure (refer to **Section 4.2.1**).

Given that the proposed remediation works will involve remediation, of SPGWT present within those sections of the main gasholder annulus and tar tank within the Site (refer to **Section 3.3**), to the extent practicable, the risk of residual contamination from beneath 36 Hickson Road impacting on the future remediated Site warrants consideration (refer to **Section 5.3.1**).

4.4.2 Off Site Areas (East) – Identification of CIM

SPGWT has been identified in the off Site area east of the Site (specifically within the eastern portion of the main gasholder annulus and tar tank present beneath 36 Hickson Road) and, as such, is discussed further in **Section 5.4**.

5.0 Remediation Extent for the Protection of Human Health

The remediation goals for the protection of human health are described by **Section 3.3**. The contamination identified within the Site (and in areas adjacent to the Site) have been characterised in the context of these remediation goals (i.e. in terms of the presence of SPGWT and CIM) in **Section 4.1**.

The following Sections present the recommended remediation extent for each of the following Site areas:

- Block 4 and 5;
- Hickson Road;
- Off Site areas: west of the Site; and
- Off Site areas: east of the Site.

5.1 Human Health Remediation Extent (Block 4 and 5)

Based on the analytical data and findings presented in **Section 4.1**, both SPGWT and CIM have been identified in Block 4 and Block 5. The CIM has generally been identified at locations that correspond to the presence of SPGWT, the footprint of historic gas works infrastructure and based on concentrations of the following CoPCs which exceed the unsaturated soil and groundwater SSTCs:

- Benzene;
- TPH C₁₀-C₂₈;
- naphthalene; and
- cPAHs.

5.1.1 Contaminant Distribution (Block 4 and Block 5)

5.1.1.1 Separate Phase Gasworks Waste and Tar

As discussed in **Section 4.1.1** and detailed in **Table 5**, SPGWT has been identified in areas of Block 4 and 5 which will require remediation to be protective of human health.

5.1.1.2 Contamination (non-SPGWT) in Unsaturated Soil

As shown in **Figure F4** exceedances of the unsaturated SSTC for non SPGWT contamination (i.e. concentrations of cPAHs exceeding the SSTCs) are generally distributed across the eastern part of Blocks 4 and 5, in the middle of the Site.

No exceedances of the SSTCs were reported in the unsaturated soil in the southern portion of Block 4.

Remediation of unsaturated soil in areas where CIM has been reported (predominantly based on cPAH concentrations) is required to be protective of human health.

5.1.1.3 Contamination (non-SPGWT) in Groundwater

As shown in **Figure F5** exceedances of the groundwater SSTC for non-SPGWT contamination (i.e. TPH, benzene and PAHs exceeding the groundwater SSTCs) are generally limited to those parts of Block 4 where SPGWT has been identified to be present (i.e. the northeast part of Block 4, refer to **Figure F6**).

The groundwater monitoring results for CoPCs detailed in **Section 4.1.3** indicate that groundwater concentrations which exceed the groundwater SSTC are generally present in the eastern and central portion of Block 4. There were no exceedances of the groundwater SSTC present in Block 5.

Remediation of saturated soil contamination considered to represent the source of the groundwater CIM identified within fill material, is required to be protective of human health. That is, remediation of soil contamination, to the extent practicable, in areas of groundwater CIM identified within fill material, will result in the removal of the contaminant source and, ultimately, a reduction in groundwater CoPC concentrations within fill material to less than the relevant groundwater SSTCs.

5.1.2 Recommended Remediation Extent (Block 4 and Block 5)

Based on the distribution of SPGWT and CIM discussed above, the extent of remediation works in Block 4 and Block 5 is recommended to include the following Site areas, which generally correspond with the location of

historic gasworks structures. The extent of remediation required in the unsaturated and saturated zones is also presented on **Figure F14** and **Figure F15**, respectively.

- Unsaturated zone (i.e. between 0 and 2 m bgl):
 - All Block 4 areas where SPGWT has been identified (refer to **Table 5** and **Figure F6**).
- Saturated zone (i.e. greater than 2 m bgl):
 - All Block 4 areas where SPGWT has been identified (refer to **Table 5** and **Figure F6**);
 - The western portion of the 1870 gasholder annulus (Block 4);
 - The eastern portion of Block 4 and 5 (i.e. east of the 10 m bgl bedrock contour);
 - The south east portion of Block 4 in the vicinity of BH42/BH408; and
 - The western portion of Block 4 in the vicinity of BH49 and BH119.

The vertical extent of remediation will be to the depth of the underlying natural bedrock or to a maximum depth of 10 m bgl. The vertical extent of remediation is based on consideration of:

- locations where SPGWT has been reported (refer to **Section 4.1.1**);
- locations where exceedances of the groundwater SSTC and unsaturated soil SSTC have been reported (refer to **Section 4.1.2** and **4.1.3**);
- the footprint of historical gasworks structures and infrastructure (refer to **Section 2.4.1**); and
- the depth to bedrock (noting the depth to bedrock steadily increases to the west beyond the 10 m bgl rock contour, such that remediation to the depth of underlying natural bedrock would steadily increase beyond this point, refer to the cross sections provided in **Figure F10** to **Figure F13**).

It is noted that SPGWT and CIM have been reported in the natural marine sediments in some Site areas outside the recommended remediation extent. As described by **Section 2.5**, there is negligible contaminant flux from these natural materials into the overlying fill. Therefore, SPGWT and CIM that may be present within the natural marine sediments are not considered to pose a significant risk to human health. As such, the proposed extent of remediation works excludes remediation of natural marine sediments which are present below a depth of 10 m bgl.

5.1.2.1 Recommended Remediation Extent (Block 4 and Block 5) - Depth to Bedrock

As illustrated in cross sections A-A' to C-C' (**Figure F10** to **Figure F12**), the vertical extent of remediation for protection of human health includes remediation to bedrock across the majority of Block 4 and 5. Based on the modelled bedrock contours, two localised areas where fill material is likely to remain below 10 m bgl:

- BH65/BH197 (Block 5, as illustrated in cross section A-A', **Figure F10**) - the following field observations were made:
 - BH65 - tar was observed within the marine sediments at a depth of 9.5 m bgl. As such, the depth of remediation in this area would be expected to extend into the marine sediments (to a depth of 10 mbgl) to facilitate removal, to the extent practicable, of this material; and
 - BH197 - no tar was observed to be present below a depth of 10 m bgl and bedrock was recorded at a depth of 12.8 m bgl.
- BH49 to BH119 (the western portion of Block 4, as illustrated in cross section C-C', **Figure F12**) - The following field observations were made:
 - BH49 - tar was observed at and below 10 m bgl within the fill material. Marine sediments (a very stiff, sandy clay) were reported at 11.2 m bgl. The depth of remediation in this area may be required to locally extend below 10 m bgl to facilitate removal of SPWGT to the extent practicable. Over excavation, if required, would be undertaken in accordance with the requirements of the RAP; and
 - BH119 - no tar was observed within the fill material at this borehole (drilling was terminated within fill material at 10 m bgl).

5.2 Human Health Remediation Extent (Hickson Road)

Based on the analytical data and findings presented in **Section 4.2**, both SPGWT and CIM have been identified in Hickson Road. The CIM has generally been identified at locations that correspond to the presence of SPGWT, the footprint of historic gas works infrastructure and based on concentrations of the following CoPCs which exceed the unsaturated soil and groundwater SSTCs:

- Benzene;
- TPH C₁₀-C₂₈;
- naphthalene; and
- cPAHs.

5.2.1 Contaminant Distribution (Hickson Road)

5.2.1.1 Separate Phase Gasworks Waste and Tar

As discussed in **Section 4.2.1** and detailed **Table 8**, SPGWT has been identified in areas of Hickson Road which will require remediation to be protective of human health.

5.2.1.2 Contamination (non-SPGWT) in Unsaturated Soil

As discussed in **Section 4.2.2** and detailed in **Table 6**, CoPCs were not reported at concentrations exceeding the relevant SSTCs in unsaturated soil within Hickson Road.

5.2.1.3 Contamination in (non-SPGWT) Groundwater

As shown in **Figure F5**, exceedances of the groundwater SSTC for non-SPGWT contamination (i.e. TPH C₁₀-C₂₈, naphthalene, benzene - and cPAHs exceeding the SSTCs) are generally located in the southern portion of Hickson Road and are considered likely to be related to SPGWT within the main gasholder annulus and tar tank structures. Relatively high CoPC concentrations at MW15 are possibly related to contamination associated with nearby historical gas works infrastructure located to the west (i.e. the main gasholder annulus and tar tank).

Remediation of saturated soil contamination (CIM) considered to represent the source of the groundwater CIM, is required to be protective of human health. That is, remediation of soil contamination, to the extent practicable, in areas of groundwater CIM, will result in the removal of the contaminant source and, ultimately, a reduction in groundwater CoPC concentrations within fill material to less than the relevant groundwater SSTCs.

5.2.2 Recommended Remediation Extent (Hickson Road)

Based on the distribution of SPGWT and CIM discussed above, the extent of remediation works in Hickson Road is recommended to include the following historic gas works structures and site areas. The extent of remediation required in the saturated zones (i.e. greater than 2 m bgl) is also presented on **Figure F15**:

- All areas where SPGWT has been identified (refer to **Table 8** and **Figure F15**):
 - The BH7/MW7 and BH53 area – the southern tar tank;
 - The BH10/MW10 area - eastern portion of the 1870 gas holder;
 - The western portion of the main gas holder annulus;
 - The northern tar tank; and
 - The BH6, BH15 and BH61 area - located west and down gradient of the main gas holder annulus and northern/southern tar tanks.

As described by **Section 5.1.2**, the depth of remediation will be to the depth of the underlying natural bedrock or to a maximum depth of 10 m bgl. It is noted that the depth of natural bedrock, even within the historic gasworks structures, is not expected to extend below 10 m bgl. If the depth to bedrock within the historic gasworks structures is greater than 10 m bgl, the depth of remediation will be extended to the depth of bedrock, to the extent practicable.

5.3 Off Site Areas (West) - Extent of Remediation

Based on the analytical data and findings presented in **Section 4.3.1**, SPGWT and CIM have been identified both within the fill material and within marine sediments in areas west of the Site (specifically in the vicinity of BH70 and BH541/MW541).

5.3.1 Contaminant Distribution (Off Site Areas – West)

5.3.1.1 Separate Phase Gasworks Waste and Tar

As discussed in **Section 4.3.1** and detailed in **Table 10**, SPGWT has been identified in localised off Site areas both within the fill material (specifically in the vicinity of BH70 and potentially BH541) and within the underlying marine sediment. Remediation of SPGWT within fill material is required to be protective of human health.

As detailed in **Table 10** and presented in **Figure F6**, while SPGWT has been identified at depth within the natural marine sediments in areas to the west of the Site (i.e. typically within 30 m of the western Site boundary with the exception of BH60), remediation of these materials is not considered to be warranted for the following reasons:

- the contaminant flux from the natural marine sediments is negligible (refer to **Section 2.5**); and
- SPGWT that may be present within the natural marine sediments is not considered to pose a significant risk to human health.

5.3.1.2 Contamination in (non SPGWT) Groundwater

As discussed in **Section 4.3**, in addition to the SPGWT identified in the vicinity of BH70 and potentially BH541, the benzene and naphthalene groundwater concentrations in fill material at MW541 exceeded the groundwater SSTC and is considered to be representative of CIM.

5.3.2 Recommended Remediation Extent (Off Site Areas - West)

Based on the distribution of SPGWT and CIM, the extent of remediation works in the off Site areas west of the Site (in Block 5 or Barangaroo Central) is recommended to include the following (refer to **Figure F15**):

- SPGWT in the vicinity of BH70 (located west of the Block 5 portion of the Site) to a depth of approximately 2 to 3 m bgl in fill material (potential SPGWT); and
- SPGWT and CIM in the vicinity of BH541 (located west of the Block 5 portion of the Site) to a depth of approximately 9.9-10 m bgl in fill material.

As described by **Section 5.1.2**, the vertical extent of remediation will be to the depth of the underlying natural bedrock or to a maximum depth of 10 m bgl.

It is noted that SPGWT and CIM have been reported in the natural marine sediments in some hydraulically down gradient areas to the west of the Site (outside the recommended extent of remediation). As described by **Section 2.5**, there is negligible contaminant flux from these natural materials into the overlying fill. Therefore, SPGWT and CIM that may be present within the natural marine sediments is not considered to pose a significant risk to human health. As such, the proposed vertical extent of remediation works excludes remediation of natural marine sediments which are present below a depth of 10 m bgl.

It is noted that potential SPGWT observed in the fill material at BH74⁶ (located 70 m west of the western Site boundary) may also require remediation for the protection of human health. However, this material is not directly related to the Site and the Site's historical use as a gasworks, and due to the proximity of BH74 from the Site's western boundary does not represent a risk of cross contamination of the Site. Therefore, the requirement for remediation of this material will be assessed separately as part of the Barangaroo Central RAP (to be prepared by the Authority).

⁶ Not to be mistaken for the ERM sampling location BH074 (located on the western Site boundary, Block 5).

5.4 Off Site Areas (East) – Extent of Remediation

Based on the analytical data and findings presented in **Section 4.4.1**, SPGWT may be present in isolated areas immediately east of the Site (specifically in the vicinity of BH70 and BH541).

5.4.1 Contaminant Distribution (Off Site Areas – East)

5.4.1.1 Separate Phase Gasworks Waste and Tar

As discussed in **Section 4.4.1**, there is potential for SPGWT to be present in the south east portion of the main gasholder annulus and the eastern edge of the tar tank which extend beyond the Site boundary to the east (i.e. into 36 Hickson Road). Given that the proposed remediation works will involve remediation, to the extent practicable, of SPGWT from within the Site, there is a risk that SPGWT from the structures remaining beneath 36 Hickson Road could migrate back onto the future remediated Site.

Management measures are required to be protective of human health and to prevent the migration of contamination onto the future remediated Site.

5.4.1.2 Non SPGWT Contamination

As discussed in **Section 4.4**, with the exception of SPGWT identified in the former gasworks structures, non SPGWT contamination requiring remediation for the protection of human health (CIM) has not been identified in unsaturated soil or groundwater in the area immediately east of the Site.

However, as noted in **Section 4.4.2**, management measures are required to be protective of human health and to prevent the migration of groundwater contamination within fill material onto the future remediated Site from the identified SPGWT.

5.4.1.3 Recommended Remediation Extent (Off Site Areas - East)

There is potential SPGWT to be present within the historical gasworks structures east of the Site that may impact on remediation works within the Site. Therefore, the *VMP/Block 4 RAP* will consider management measures (likely engineering controls) that will mitigate the risk of the remediated Site being re contaminated. Such engineering controls may include the construction of a perimeter cutoff wall on the eastern Site boundary in the areas adjacent to the eastern portions of the main gasholder annulus and tar tank.

The SPGWT potentially present in the area directly east of the Site (i.e. in the south east portion of the main gasholder annulus and the eastern edge of the tar tank) is not considered to require remediation for the protection of human health based on the following reasons:

- The existing Site Audit Statement for 36 Hickson Road indicates the site is suitable for its current land use in its current form. This site is not included within the Declaration Area;
- Remediation of Site will include remediation of approximately half of the main gasholder annulus and the majority (if not all) of the tar tank. Therefore, the mass of contamination remaining within the two structures following remediation of the Site will be significantly reduced; and
- It is considered likely that the residual SPGWT remaining within the south east portion of the main gasholder annulus and eastern edge of the tar tank (if it extends across the Site boundary) will be limited in extent (both vertically and laterally) and effectively contained within the gasworks structures. Evidence supporting this conclusion includes:
 - the depth of groundwater within the tar tank has been observed to be higher than groundwater in the surrounding bedrock, suggesting that migration of groundwater out of the structures is limited (i.e. the tar tank is able to hold water); and
 - observations from the remediation works at 30-34 Hickson Road (which included remediation of a portion of the gasholder annulus) indicated that the extent of SPGWT (tar) migration into the bedrock mass is relatively limited (refer to **Section 2.4.5**).

6.0 Remediation Extent for Protection of the Environment

The remediation goals for the protection of the environment, as described by **Section 3.3**, are:

- As a primary goal, removal / remediation of SPGWT to the extent practicable; and
- As a secondary goal; remediation of the soil within the unsaturated and saturated zones, to the extent practicable, such that groundwater quality leaving the Site (measured at the down hydraulic Site boundary) approaches the MWQC.

Sections 4.0 and **5.0** include a comparison of the Site's soil and groundwater analytical data to these remediation goals to identify materials at the Site which may be:

- representative of SPGWT and therefore may require remediation; and
- contaminated such that groundwater leaving the Site (measured at the down hydraulic Site boundary) approaches the MWQC.

The following Sections present the outcome of the process adopted for development of the remediation extent for the protection of the environment.

An iterative approach has been adopted based on consideration of multiple lines of evidence. In summary, the outcome is that the proposed remediation extent (refer to **Section 5.0**) corresponds with the extent of remediation required for protection of the environment to the extent practicable. The proposed extent of remediation is considered consistent with the principles of source removal, removal of NAPL to the extent practicable, and clean-up to the extent practicable as contemplated by the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*.

6.1 Regulatory Policy Requirements

As described by **Section 2.4**, the closest ecological receptor identified by the *VMP HHERA* (AECOM, 2012c) was the potential groundwater aquatic ecosystem down hydraulic gradient of the Site boundary, between the Site and Darling Harbour. As such, in the context of protection of the environment, the protection of groundwater quality is the key contaminant migration pathway that requires consideration.

The NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* describe a best-practice framework for the assessment and management of contaminated groundwater in NSW. The guidelines have been made under section 105 of the *CLM Act* (1997) and therefore must be taken into account by the NSW EPA and site auditors accredited under the *CLM Act* (1997) when relevant. The relevant requirements of NSW DEC (2007) are summarised in the following Sections.

Other regulatory considerations that are relevant to development of the proposed remediation extent are also summarised following:

- Ecological Sustainable Development; and
- Waste Avoidance and Resource Recovery.

6.1.1 *Guidelines for the Assessment and Management of Groundwater Contamination* (NSW DEC, 2007)

Section 3.2 of NSW DEC (2007) prescribes the following management responses to identification of groundwater contamination. In considering the appropriate management responses, NSW DEC (2007) requires that focus first be on the greatest threats and that the benefits of groundwater clean-up must outweigh any incidental negative impacts that could arise.

- Control short-term threats arising from the contamination - acute risks relating to contamination have not been identified based on the current land use. The NSW EPA Declaration and conclusions from the *VMP HHERA* (AECOM, 2012c) are based on the requirement to mitigate long-term or chronic risks;
- Restrict groundwater use - groundwater within the Site is saline and therefore not suitable for use as described by **Section 6.6**;
- Prevent or minimise further migration of contaminants from source materials to groundwater: specifically source control to the extent practicable; and

- Clean up groundwater to protect human and ecological health: as described by **Section 5.1** and **5.2**, in the case of human health and described by **Section 6.5**, in the case of the environment.

6.1.1.1 Source Control

Section 3.5 of NSW DEC (2007) considers that the control of all known and suspected sources of groundwater contamination is an important element for minimising contaminant release to the environment and remediation of groundwater contamination. In the case of the Site, primary contaminant sources are considered to be historical gasworks infrastructure (which has been found to contain SPGWT) and secondary sources are considered to be SPGWT observed in groundwater and soil. Source control can include contaminant removal, *in situ* treatment and containment.

NSW DEC (2007) acknowledges that complete source removal or treatment may not be possible, particularly in cases where: treatment is not technically feasible; the volume of materials or complexity of the Site make it impracticable; or, where severe adverse effects on other aspects of the environment would result.

6.1.1.2 Remediation of NAPL to the extent practicable

Section 3.5.1 of NSW DEC (2007) specifically requires that non-aqueous phase liquids (NAPLs) (which represent a subset of materials considered to be SPGWT) must be cleaned up to the extent practicable. As above, NSW DEC (2007) acknowledges that complete removal or treatment of NAPL may: be impracticable, for example as a result of complex geological conditions; and/or may have high costs with uncertain benefits. If this is the case, ongoing monitoring and management of the contamination is required to ensure protection of human health and the environment.

The objectives of any strategy for the control of NAPL contamination should be:

- Ensuring the protection of human health and the environment;
- Controlling further migration of contaminants from NAPLs; and
- Reduction in the NAPL mass to the extent practicable (through either removal or treatment).

The remediation goals for the protection of human health and the environment established for the Site are described in **Sections 3.3** and **3.4**, respectively, and are consistent with the policy requirements described above. In particular: numerical criteria (SSTCs) have been developed for the Site for the protection of human health; and, the primary goal for protection of the environment is remediation of SPGWT within fill material (which includes NAPL) to the extent practicable.

6.1.2 Clean Up to the Extent Practicable (CUTEP)

Section 4 of NSW DEC (2007) establishes the following clean-up objectives for contaminated groundwater:

- 1) *Clean up so natural background water quality is restored;*
- 2) *Clean up to protect the relevant environmental values of groundwater, and human and ecological health.*
- 3) *Clean up to the extent practicable.*

The clean up objectives for the protection of human health and the environment established for the Site are described in **Sections 3.3** and **3.4**, respectively, and are consistent with this hierarchy. In particular: numerical criteria (SSTCs) have been developed for the protection of human health; and, long-term numerical criteria (MWQC at the down hydraulic gradient Site boundary) have been developed, in consultation with the NSW EPA, for the protection of the environment.

Section 4.3 of NSW DEC (2007) acknowledges that it may not be practicable to clean up groundwater to the point where all long-term environment goals are achieved. In such instances, the NSW EPA may consider interim clean-up goals. In evaluating the remediation extent that is practicable, the following factors must be considered:

- *technical capability to achieve the clean-up;*
- *threats the contamination poses to human or ecological health;*
- *the value of the groundwater resource; and*
- *clean-up costs.*

The proposed remediation extent is considered in the context of each of these factors in **Sections 6.3** to **6.7**.

Section 4.3 of NSW DEC (2007) also requires that any proposal for CUTEP must include consideration of ongoing management and monitoring of groundwater to ensure the protection of human and ecological health. In particular, any proposal for CUTEP should be accompanied by:

- A commitment to ongoing monitoring and evaluation of clean-up practicability - ongoing groundwater monitoring and evaluation is prescribed by Section 17.4 and 19.8 of the *VMP/Block 4 RAP* (AECOM, 2013b);
- A groundwater management plan (GMP) - Section 17.4 of the *VMP/Block 4 RAP* (AECOM, 2013b) includes a requirement for preparation of and implementation of a GMP;
- Acknowledgement that future management may be required if necessary to ensure protection of human and ecological health - Section 20.5 of the *VMP/Block 4 RAP* (AECOM, 2013b) describes the potential for a Site Management Plan to be implemented in the event that future land owners plan to re-develop the Site. Section 23.0 of the *VMP/Block 4 RAP* (AECOM, 2013b) also describes contingency management actions that may be implemented to ensure the protection of human and ecological health; and
- Provision of long-term resourcing and responsibility for implementation of any ongoing management strategy - implementation of any ongoing management strategy (if required) will be the responsibility of the future land owner.

6.1.3 Ecological Sustainable Development

The National Strategy for ESD, endorsed by all Australian jurisdictions in 1992, defines the goal of ESD as *development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.*

In considering the application of ESD to remediation, E.K. Hocking (2001) *Intergenerational Equity and Environmental Restoration Cleanup Levels* observed that while low remediation clean-up criteria could be perceived as this generation's efforts to remediate sites to benefit future generations, the significant resources required to undertake such works may in fact divert funding from other activities that could have a greater beneficial impact on future generations.

Section 9 of the CLM Act (1997) references the principles of inter-generational equity which can be defined as the fairness of access to resources across generations. The key ESD principles set out in Section 9 of the CLM Act (1997) are:

- *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 (the 'precautionary principle');*
- *The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'intergenerational principle');*
- *The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making (the 'biodiversity principle');*
- *Improved valuation, pricing and incentive mechanisms should be promoted (the 'valuation principle').*

One of the objectives of the *Protection of the Environment Operations Act* (the POEO Act, 1997) is also:

- *'to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development'.*

Section 4.4 of NSW DEC (2007) also requires that the benefits from undertaking groundwater clean-up must outweigh any incidental negative impacts to human health or the environment that could arise from the clean-up.

6.1.4 Waste Avoidance and Resource Recovery Act (2001)

The *Waste Avoidance and Resource Recovery Act* (2001) includes the following objectives:

- *to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development,*
- *to ensure that resource management options are considered against a hierarchy of the following order:*
 - *avoidance of unnecessary resource consumption,*

- resource recovery (including reuse, reprocessing, recycling and energy recovery),
- disposal,
- to provide for the continual reduction in waste generation; and
- 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.

Any potential remediation works required at the Site to provide additional protection to the receiving environment need to appropriately consider the *Waste Avoidance and Resource Recovery Act* (2001).

6.2 DNAPL Removal to the Extent Practicable (as per the NSW DEC 2007 Guidelines)

As described by **Section 6.1.1**, contaminated groundwater in NSW is managed in accordance with the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*. The guideline requires that where NAPLs (DNAPLs in the case of this Site which are included as part of the materials referred to as SPGWT by this document) are present on sites, they must be removed or treated as much as practicable. This requirement is consistent with the primary remediation goal for protection of the environment; which is to the remediation of SPGWT within fill material to the extent practicable (refer to **Section 3.4**).

As illustrated in **Figure F6**, the presence of SPGWT, or indications that SPGWT may be present (as evidenced by the presence of a sheen in groundwater or observations of DNAPL), has been documented at the locations summarised in **Table 11**.

Table 11 Identified Area of SPGWT or Sheen and Confirmation of Remediation Requirements

Location		SPGWT identified?	Sheen identified in groundwater?	Located within proposed remediation area?
Block 4				
1.	BH52	Yes	No	Yes*
2.	BH54	Yes	No	Yes*
3.	BH55	Yes	No	Yes*
4.	BH59	Yes	No	Yes*
5.	BH087/MW15	Yes	Yes	Yes*
6.	BH019	Yes	No	Yes*
7.	BH141	Yes	No	Yes*
8.	BH200/MW200	No	Yes	Yes*
9.	BH204S/MW204S	Yes	Yes	Yes*
10.	BH204D/MW204D	Yes	Yes	Yes*
11.	BH205/MW205	Yes	Yes	Yes*
12.	BH206/MW206	Yes	Yes	Yes*
13.	BH209/MW209	No	Yes	Yes*
14.	TP05	Yes	Yes	Yes*
15.	TP06	Yes	Yes	Yes*
Southern Block 4				
16.	BH42	Yes	No	Yes*
17.	BH408	Yes	No	Yes

Location		SPGWT identified?	Sheen identified in groundwater?	Located within proposed remediation area?
Western Block 4				
18.	BH49	Yes	No	Yes*
19.	BH119	Yes	No	Yes
20.	BH405/IT03	Yes	Yes within marine sediments (IT03D)	No
Block 5				
21.	BH198/MW198	No	Yes	Yes*
22.	TP02	Yes	Yes	Yes*
Hickson Road				
23.	BH7/MW7	Yes	Yes	Yes*
24.	BH53/MW53	Yes	Yes	Yes*
25.	BH10/MW10	Yes	Yes	Yes*
26.	BH61	Yes	Yes	Yes
27.	BH15/MW15	Yes	Yes	Yes
28.	BH6/MW6	Yes	Yes	Yes
Off Site (Block 5 and Barangaroo Central)				
29.	BH69/MW69	No	Yes	No
30.	BH70	Yes	No	Yes
31.	BH74	Yes	No	No
32.	BH400	Yes	No	No
33.	BH402	Yes	No	No
34.	BH403	Yes	No	No
35.	BH541/MW541D	Yes	No	Yes
Off Site (Block 4 and ORWN)				
36.	BH48	Yes	No	No
37.	BH60	Yes	No	No
38.	BH404	Yes	No	No
39.	BH406	Yes	No	No

NOTE: * Borehole location is likely to be located within or directly adjacent to the former gasworks infrastructure.

Of the 39 locations at which SPGWT has been observed, or indications that SPGWT may be present have been recorded, 29 locations are located within the proposed remediation extent required for the protection of human health.

Of the 10 locations which are outside the proposed remediation extent:

- 1 location (BH74) is within fill materials:
 - BH74 (depth 1 to 2.5 m bgl) – is located approximately 70 m from the western Site boundary.
- 2 locations (BH48 and BH69) relate to observations of SPGWT within bedrock underlying fill in off Site areas. As noted in **Section 2.4.5**, contaminant flux from the bedrock is likely to be negligible at this location given the relatively impermeable nature of the natural sandstone and the limited presence of bedrock fracture zones:

- BH48 – the SPGWT identified at this borehole is located within the bedrock at greater than 14 m bgl;
- BH69/MW69 - is located adjacent to the northern Site boundary within Barangaroo Central. The impacted groundwater at this location is located within the bedrock. Consequently, the assessment of whether remediation is required at this location will be included in the Barangaroo Central RAP.
- 1 location (BH405) relates to observations from within marine sediments underlying fill at the Site. As noted in **Section 2.5**, contaminant flux from the marine sediments is likely to be negligible given the comparatively low hydraulic conductivity of the marine sediment:
 - BH405/IT03D (located in the western portion of Block 4) the presence of SPGWT at this location was based on soil contaminant concentrations exceeding the TCM criteria at depth of 14 m bgl within marine sediments. No tar was observed at this location. A sheen was also noted within the deep sampling port within the marine sediments. No sheen was observed in the groundwater within the shallow and middle sampling ports (IT03S and IT03M) which were both installed within the fill material. BTEX, TPH and PAH concentrations in groundwater within the shallow and middle sampling ports (IT03S and IT03M) were also generally reported to be non-detect and significantly less than the relevant groundwater SSTCs. As discussed in **Section 2.5.2**, the field observations and analytical results reported at the three IT03 sampling ports confirm the Conceptual Site Model (i.e. there is negligible contaminant flux from the marine sediments to groundwater present in the overlying fill materials, refer to **Section 2.5**).
- 6 locations (BH60, BH400, BH402, BH403, BH404 and BH406) relate to observations from within marine sediments underlying fill within off Site areas. As noted in **Section 2.5**, contaminant flux from the marine sediments is likely to be negligible given the comparatively low hydraulic conductivity of the marine sediment:
 - BH60 – the SPGWT identified at this location is within the marine sediments at a depth of 16 to 17.5 m bgl. BH60 is located approximately 85m west of the western Site boundary;
 - BH400, BH402 and BH403 – the SPGWT identified at these boreholes is located within the marine sediments at generally greater than 10 m bgl;
 - BH404 - the SPGWT identified at this borehole is located within the marine sediments at greater than 15 m bgl;
 - BH406 - the SPGWT identified at this borehole is located within the fill material and marine sediments at greater than 14 m bgl.

Based on the above information, it is considered that the proposed remediation extent is consistent with the requirements of the NSW DEC (2007) guidelines for: (a) source removal; and (b) remediation of NAPL to the extent practicable. In particular, the proposed remediation extent includes:

- All of the known historic gasworks structures, which are considered to be representative of primary contaminant sources; and
- The majority of locations (i.e. 29 out of 30 locations both within the Site and off Site) at which NAPL has been recorded in fill by previous investigations, which are considered to be representative of secondary contaminant sources. It is noted that this calculation excludes the impact reported at:
 - BH48 and BH69 where SPGWT was reported in bedrock;
 - BH405 where SPGWT was reported in marine sediments below the Site; and
 - BH400, BH402, BH403, BH404, BH405, BH406 where SPGWT was reported in marine sediments off Site.

It should also be noted that the contaminant mass calculations presented in **Section 6.4**, are based on sample results that include samples that are considered representative of SPGWT. Therefore, the reduction in contaminant mass that is anticipated will be realised from the proposed remediation extent incorporates a similar reduction in the mass of NAPL.

Removal of the residual pockets of NAPL that have been reported outside the proposed extent of remediation is considered neither practicable nor necessary because:

- The contaminant flux from the underlying bedrock or marine sediment is negligible, such that contaminants present within the marine sediment and bedrock is largely being contained and controlled from further migration;
- The proposed remediation extent is predicated on achieving the remediation goals for protection of human health (refer to **Section 3.3**);
- Contaminant flux modelling (AECOM, 2013a), which includes the presence of residual SPGWT at depth within fill and marine sediments, demonstrates that the residual SPGWT following completion of the proposed remediation will not represent an unacceptable impact to the environment (refer to **Section 6.5.2**);
- The benefit of treating or removing the residual SPGWT does not outweigh the cost in terms of negative impact to the environment (refer to **Section 6.7**).

6.3 CUTEF - Technical Capability to Achieve the Clean-up

As required by Section 4.3 of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, one of the key factors that must be considered to assess whether CUTEF has been achieved is the technical capability to achieve the clean-up.

The following Sections consider the technical capability to achieve the clean-up as follows:

- 1) Identification of the most likely remediation technologies to be adopted (refer to **Section 6.3.1**);
- 2) Consideration of the standard of remediation that can be practicably achieved by the identified most likely remediation technologies (refer to **Section 6.3.2**);
- 3) Consideration of the practicability limitations associated with the most likely remediation technologies and the implications of remediating to greater depths or across larger areas than proposed (refer to **Section 6.3.3**); and
- 4) Consideration of the contaminant mass reduction that will be achieved by implementation of the most likely remediation technologies (refer to **Section 6.4**).

6.3.1 Likely Remediation Strategy

Section 10 of the *VMP/Block 4 RAP* (AECOM, 2013b) describes the process adopted for selection of the preferred remedial technology. Importantly, the process adopted for selection of an appropriate remediation strategy was undertaken based on the nature and distribution of contamination reported within the Site and areas adjacent to the Site. As such, the process was not based on the outcomes of this remediation extent document.

A three stage process was adopted:

- **Identification of Remedial Technology Options** – based on review of the primary information sources to identify potential treatment technologies for the Site;
- **Screening of Remedial Technology Options** –based on an initial comparison of all identified technologies to assess their suitability for implementation at the Site; and
- **Assessment of Remedial Technology Options** – based on a more detailed review of the highest rating technologies from the screening stage, against the key remediation objectives.

Seven remediation technologies were selected based on the first two stages of the technology assessment process (refer to **Table T18**). The seven technologies were:

- **Ex-situ Remediation Technologies:**
 - Excavation and Ex Situ Thermal Desorption (on Site): Desorption and/or destruction of organic contaminants in excavated soil by heating, usually by a direct heating thermal unit. Treated material could be disposed off Site or re used on site;
 - Excavation and ex Situ Thermal Desorption (off Site): Desorption and/or destruction of organic contaminants in excavated soil by heating, usually by direct heating thermal unit. Requires transport of materials to an off-site thermal desorption facility. Treated material would likely be disposed off Site;

- Excavation and ex situ stabilisation (on Site): Encapsulation of contaminant by ex situ blending with chemical binders to immobilise contaminants of concern. Stabilised material could be disposed off Site or re used on Site; and
 - Excavation and Surfactant enhanced ex situ chemical oxidation (S-ESCO™): Ex situ treatment of excavated soils using strong oxidants, such as hydrogen peroxide, permanganate or persulphate, to degrade a wide range of organic contaminants. Treated material could be disposed off Site or re used on Site.
- **In situ Remediation Technologies:**
- Surfactant enhanced *in situ* chemical oxidation (S-ISCO®): Injection of strong oxidants, such as hydrogen peroxide, permanganate or persulphate in the presence of a surfactant, into the subsurface to degrade a wide range of organic contaminants;
 - *In Situ* Stabilisation or Solidification (ISS): Encapsulation of contaminant by *in situ* blending with chemical binders to immobilise contaminants of concern. This could be achieved by large drilling of large diameter borehole and mixing of fly ash, lime, cement with the contaminated soil; and
 - Physical Containment: Containment or capping of contaminated soil to prevent or significantly reduce contaminant migration and to prevent human and environmental exposure. It is considered unlikely that physical containment alone would be considered acceptable by regulators nor would containment alone satisfactorily address the NSW EPA Declaration. Therefore, physical containment has not been considered further by this document.

In considering the most likely remediation strategies, consideration should be given to the proposed phased approach to remediation of the respective areas of the Site. In particular:

- Block 4: excavation of Block 4 is likely required as part of the Barangaroo South development for a potential future basement, so ex situ remediation technologies are appropriate;
- Block 5: planning of the Block 5 development (which is part of Barangaroo Central) is in a preliminary stage and the nature of the development has not yet been defined, therefore *in situ* remediation technologies are appropriate; and
- Hickson Road: this public roadway contains a high density of below ground services and utilities. Therefore, *in situ* remediation technologies that do not necessitate relocation of these services and will minimise disturbance of pedestrian and vehicular traffic are appropriate.

The preferred remediation strategies will be further developed and confirmed as part of the *VMP/Block 4 RAP*. While the details of the preferred remediation strategies will be subject to confirmation in the *VMP/Block 4 RAP*, the approaches nominated above are considered to be representative of the remediation technologies (both *in situ* and ex situ) that are likely to be implemented at the Site and are therefore appropriate for assessment of the technical capability of potential remediation technologies.

6.3.2 Remediation Technology Capability

As described by **Section 6.3.1**, the most likely remediation strategies that have been considered by the following sections for the purpose of assessing remediation technology capability are a combination of:

- Ex-situ Remediation – specifically excavation of contaminated materials, followed by treatment (either on-site or off Site) and beneficial reuse (as appropriate) or off-site disposal to landfill; and/or
- In situ Remediation – either:
 - S-ISCO® and SEPR™ remediation (contingent on the successful completion of a Pilot Trial);
 - ISS remediation (if selected by the *VMP/Block 4 RAP* as the preferred strategy ISS would be contingent on successful bench scale testing and a Pilot Trial).

It is noted that the preferred remediation strategies will be assessed further and final recommendations made as part of the *VMP/Block 4 RAP*. As above, the following sections consider the standard of remediation (or remediation technology capability) that can be practicably achieved by these remediation strategies only.

6.3.2.1 Ex situ Remediation

The extent of remediation that can be practicably achieved through excavation (and subsequent treatment) is linked not to the destruction efficiency of the remediation technology but to the practicability of actual physical excavation. In terms of contamination removal efficiency, excavation can be expected to remove 100% of the contaminant mass from excavated areas.

6.3.2.2 In situ Remediation

A key advantage of *in situ* remediation technologies is that they are designed to manage contaminants *in situ*. Such an approach will:

- Provide for the efficient use of resources and will avoid potentially unnecessary resource consumption, and as such is consistent with the principles of ESD (refer to **Section 6.7.3**);
- Mitigate the requirement to dispose of materials to landfill and, as such is consistent with the *Waste Minimisation Act* (2001) (refer to **Section 6.7.4**); and
- Promotes the destruction or treatment of contamination *in situ* and so is consistent with the remediation hierarchy promoted by the NEPC (1999a) and DEC (2006).

S-ISCO® and SEPR™

VeruTek Technologies Inc. (VeruTEK) has been responsible for development and implementation of the S-ISCO® and SEPR™ for remediation of similar former gasworks and tar impacted sites in the United States. A series of case studies are provided Appendix J of the *Revised Work Plan and Trial Management Plan, Surfactant Enhanced In Situ Chemical Oxidation (S-ISCO) & Surfactant Enhanced Product Recovery (SEPR)* (VeruTEK, 2011).

VeruTEK's project experience implementing S-ISCO® in the United States indicates that the S-ISCO® and SEPR™ process is most efficient when targeting the destruction of between 90% and 95% of the organic contaminant mass. Destruction rates above this level, while possible, become progressively less practicable given the increased quantities of oxidant, surfactant and catalyst required to achieve the relatively small incremental benefit to the environment. VeruTEK project experience also indicates that CoPC contaminant concentrations continue to reduce in the medium to long term after completion of the S-ISCO® injections.

In situ Solidification / Stabilisation

ISS reduces the mobility of contaminants through both physical and chemical means. Contaminants are physically or chemically bound to the medium to produce a non-leachable material. Importantly, the process does not destroy the contaminants but alters the conditions of the material such that risks are significantly reduced. The main soil changes are reduced permeability of the treated mass and decreased mobility of the contaminants.

As such, it is not appropriate to measure the effectiveness of ISS as a function of a particular mass reduction or destruction. An effective decrease in the hydraulic conductivity of the solidified mass in relation to the surrounding media is the benchmark check on performance of the solidification process to ensure long-term protection of groundwater by preventing groundwater contact with contaminants. In the absence of relevant NSW EPA and/or Australian guidelines, United States Environment Protection Agency guidelines (USEPA, 1993 *Resource Document Solidification/Stabilization and its Application to Waste Materials*) are typically adopted for defining the success criteria for ISS. Based on these guidelines, solidified soils are typically required to achieve:

- A hydraulic conductivity of less than 10^{-5} centimetres per second (cm/s); and
- A compressive strength of 50 pounds per square inch (psi) (350 kilo Pascals [kPa]).

Notwithstanding, for the purpose of assessing the technical capability of ISS, it is considered that, in terms of preventing the migration of contamination from soil to groundwater to impacting ecological receptors, implementation of ISS would be at least equivalent to a contaminant mass reduction of at least 90%.

The quantity and type of chemical additives used as part of ISS are typically optimised to achieve the required hydraulic conductivity and compressive strength for a given site through bench scale and pilot scale testing. As such, further reductions in hydraulic conductivity or increases in compressive strength are considered neither practicable nor warranted in terms of increasing the level of protection to the environment (that is use of additional chemical additives will not result in an appreciable improvement in environmental protection).

6.3.3 Remediation Practicability Limitations

6.3.3.1 Ex situ Remediation

Considerations that can limit the practicability of the actual physical excavation and that are pertinent to the Site include:

- The depth of the excavation – deep excavations require shoring. The complexity and cost of shoring increases with increasing excavation depth;
- The nature of the material to be excavated – fill often contains oversize materials that require additional processing. Rock can be time consuming and expensive to excavate;
- The presence of groundwater – that will necessitate dewatering and groundwater treatment (if required) to facilitate disposal. The presence of groundwater can also affect the stability of the excavation (requiring additional shoring);
- The presence of below ground infrastructure – such as historic gasworks structures or seawalls (for example the caisson wall associated with the historic Southern Cove) that may currently be containing or restricting the migration of contamination; and
- The presence of underground services – which typically would require relocation to facilitate excavation of the underlying materials (as would be the case in Hickson Road).

In the case of the Site, it is considered that while remediation through excavation may be possible, extensive excavation extending to significant depths over a wide area may not be consistent with the principles of ESD. That is, the reduction in risk to the environment from excavation of all contaminated material may not be commensurate with the additional cost and time and resource usage required to excavate materials from significant depths, material containing comparatively low contaminant concentrations, and material from below existing underground services.

6.3.3.2 In situ Remediation

Considerations that can limit the practicability of in-situ remediation technologies that are pertinent to the Site include:

- The depth of the contamination – ISS is limited in effectiveness to 12 m bgl. S-ISCO® is more difficult to implement in the unsaturated zone due to difficulties in controlling the even distribution of the oxidising chemicals. The quantity of chemical additives required for treatment also increases with the depth (and resulting mass) of contamination requiring treatment;
- The nature of the material to be treated – ISS is not suitable for treatment of fill containing oversize materials or fine grained material (for example marine sediment). S-ISCO® and SEPR™ in fine grained material requires an increased density of injection (and extraction) locations and increases in associated costs;
- The presence of groundwater – can inhibit the effectiveness of ISS but is beneficial to the implementation of S-ISCO® and SEPR™;
- The presence of below ground infrastructure – as above, ISS is not suitable for treatment of fill surrounding or within historic gasworks structures or seawalls ; and
- The presence of underground services – which typically would require relocation to facilitate ISS (as would be the case in Hickson Road).

6.4 CUTEP - Contaminant Mass Calculations

As required by Section 4.3 of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, one of the key factors that must be considered to assess whether CUTEP has been achieved is the technical capability to achieve the clean-up. Within this context, this section considers the contaminant mass reduction that will be achieved by implementation of the most likely remediation technologies.

6.4.1 Introduction

The estimated mass of CoPC currently present at the Site and in off Site areas (i.e. down-gradient of the Site within the ORWN and Barangaroo Central areas) was estimated based on statistical analysis of the soil analysis results within fill material at the Site. Separate contaminant mass calculations were estimated for the following material types:

- Upper fill material - fill material extending from the ground surface to either:
 - The depth of bedrock (for example in the eastern portions of the Site in which marine sediments are not present or are inconsistent); and
 - Approximately 2 m above the surface of the natural marine sediments underlying the fill (in the case of the western portions of the Site and the areas west of the Site);
- Lower fill material - fill material located within the horizon 2 m above the upper surface of the natural marine sediments (where present in the western portions of the Site and the areas west of the Site); and
- Natural marine sediments (where present). While it has been demonstrated that there is minimal contaminant flux from the marine sediments (refer to **Section 2.5**), they have been included in this analysis in order to provide a conservative assessment of the contaminant mass that will remain following remediation.

The statistical analysis was based on the following data sets (refer to **Table F3, Appendix F**):

- **Zone 1 (human health remediation extent – refer to Figure F15)** – includes all soil analytical results from the materials across Block 4 and Block 5 and Hickson Road (within the Site) that are within the extent of remediation for the protection of human health (including off Site locations BH70 and MW541D, refer to **Figure F15**). It is noted that natural marine sediments reported within Zone 1 are not continuous and where present generally range between 0 and 0.3 m (refer to the cross sections presented in **Figure F10 to Figure F13**). In consideration of this all material within Zone 1 is assumed to comprise of fill;
- **Zone 2 (western Declaration Area – refer to Figure F15)** – includes all soil analytical results from the materials across Block 4 and Block 5 and Hickson Road (within the Site) outside Zone 1 - that is, generally west of the extent of remediation for the protection of human health. Zone 2 materials correspond with that portion of the Site that is outside the extent of remediation shown on **Figure F15**;
- **Zone 3 (off Site within 20m of the Declaration Area – refer to Figure F15)** - includes all soil analytical results from the materials located off Site, within the corridor 20 m west of the western Site boundary (i.e. down hydraulic gradient of the Site within the ORWN and Barangaroo Central areas); and
- **Zone 4 (off Site beyond 20m of the Declaration Area – refer to Figure F15)** – includes all soil analytical results from the materials located off Site, beyond or west of the corridor 20m west of the western Site boundary (i.e. down hydraulic gradient of the Site within the ORWN and Barangaroo Central areas).

The on Site and off Site mass calculations were undertaken to:

- Estimate the distribution of gasworks related contaminant mass present within in and in association with the Site for:
 - The three material types described above, which broadly corresponding to depth; and
 - The proposed remediation extent for the protection of human health (Zone 1, which was sub-divided into Block 4, Block 5 and Hickson Road), the Declaration Area / Site (Zone 2) and the areas outside the Site (Zones 3 and 4);
 - The proposed extent of remediation for the protection of human health (Zone 1, which was again sub-divided into Block 4, Block 5 and Hickson Road) after completion of remediation using the most likely remediation technologies.
- Facilitate consideration of whether contaminant mass located outside the proposed extent of remediation for the human health remediation area (and outside the Site) has the potential to impact the environment.

6.4.2 Calculation Approach

Statistical analysis of the soil CoPC concentrations was undertaken because the remediation strategy for the Site is focussed on the remediation of the soil contamination that is either identified at concentrations above the

relevant SSTC or is considered to represent an ongoing source of groundwater contamination within fill material. For the purpose of the statistical analysis, non-detectable concentrations were assumed to be 50% of the EQL.

The calculation of contaminant mass based on the average CoPC concentration is considered suitable for providing an assessment of the distribution of the contamination. It is noted that the average calculated CoPC concentration may overestimate or underestimate the total mass of contaminant present. The variables which would affect the accuracy of these estimates include the density of the fill material and the analytical data set obtained during the site investigations; which is typically biased toward the laboratory analysis of samples observed (based on field observations and field screening of soil samples) to be more heavily impacted. Thus it is considered likely that the analysis of selected samples based on field observations of contamination will skew the analytical results and overestimate contaminant concentrations at the Site and in off Site areas. As such, the contaminant mass estimates presented would represent a conservative estimate of the contaminant mass.

Notwithstanding these limitations, the mass calculations are intended to assist in providing a preliminary assessment of the relative Site contamination status (and contaminant mass) pre- and post-remediation (based on the proposed human health remediation extent). As such, the precision of the calculated mass is less important than the relative proportions of the pre- and post-remediation estimated masses.

Only data in the upper 5 m of the off Site marine sediments was included in the statistical analysis for the following reasons:

- the analytical results reported within the off Site marine sediments indicated that significant gasworks related impacts did not extend vertically greater than 5 m into the marine sediments (as illustrated by the BH60 and BH191 soil analytical data, refer to **Table T15, Appendix B**); and
- based on a review of the borehole logs and as shown in the cross sections (refer to **Figure F10** to **Figure F12**), the thickness of marine sediments is generally less than 5 m thick in the off Site areas with the exception of the western most parts of Barangaroo Central and the ORWN area where the depth to bedrock increases significantly while the depth to the marine sediments increases only gradually to the west (towards Darling Harbour). For example, the depth to bedrock adjacent to Darling Harbour (BH212, BH213, BH411 and BH412, refer to **Figure F3**) has been observed to be greater than 32 m bgl and the overlying marine sediments are approximately 15 m thick at these boreholes.

It is considered that the above assumptions will improve the accuracy of the average CoPC concentrations estimated in areas of marine sediment (particularly Zone 4) and therefore provide a more accurate estimation of contaminant mass. In terms of Zone 3 and 4, it should also be noted that the identified SPGWT and CIM identified off Site in the vicinity of BH70 and BH541 were included in the Zone 1 calculations and therefore excluded from the Zone 3 calculations.

The separation of the fill material into upper and lower fill strata will also improve the accuracy of the contaminant mass calculations by minimising the potential for elevated localised CoPC concentrations present in the lower fill material to bias (overestimate) the contaminant mass estimates present within the significantly larger volume of upper fill materials.

The estimation of CoPC contaminant masses was also based on consideration:

- the average CoPC concentrations within each zone (noting that Zone 1 was further sub-divided into Block 4, Block 5 and Hickson Road) and material type as detailed in **Table F3, Appendix F**;
- a typical fill density of 2,000 kg/m³ based on the results of geotechnical analysis presented in AECOM (2012d); and
- the estimated fill material volumes in **Table 12** overpage (refer to **Table F3, Appendix F** for further detail regarding calculation of these volumes).

Table 12 Zone 1 to 4 Material Volume Estimates (m³)

Area	Upper Fill Material	Lower Fill Material	Marine Sediments
Zone 1 (total):	82,000		-
- Block 4	(43,000)		-
- Block 5	(23,200)		-
- Hickson Road	(15,800)		-
Zone 2	51,600	11,200	10,100
Zone 3	53,900	8,800	10,000
Zone 4	309,900	50,400	99,400

In addition to estimating the current mass of CoPC, the estimated post remediation mass of CoPC within Zone 1 (that is the area proposed to be remediated for the protection of human health) was also estimated according to the same approach as described above.

6.4.3 Key Gasworks Related CoPC

Table 13 presents a summary of the estimated total contaminant mass (including upper fill, lower fill and marine sediment, as relevant) calculated in Zone 1 and Zone 2. Details of these calculations are presented in **Table F1, Appendix F**.

Table 13 Zone 1 and 2 Estimated Mass Balance Calculations (Current Site Conditions)

CoPC	Zone 1 (Current Conditions)		Zone 2 (Current Conditions)	
	Average (mg/kg)	Contaminant Mass (kg)	Average (mg/kg)	Contaminant Mass (kg)
Acenaphthene	26	4,264	0.33	41
Acenaphthylene	145	23,780	0.83	104
Anthracene	109	17,876	0.99	124
Fluorene	127	20,828	0.52	65
Naphthalene¹	801	131,364	0.82	103
Phenanthrene	357	58,548	2.6	327
TPH C10 - C14¹	3,163	518,732	27	3,391
TPH C6 - C9	327	53,628	3.4	427
Total Xylene	87	14,268	0.37	46
Benzene	66	10,824	0.1	13
Ethylbenzene	11	1,804	0.19	24
Toluene	81	13,284	0.19	24

NOTE: 1. Naphthalene and TPH C₁₀-C₁₄ average concentrations for Zone 1 are based on the analytical data across the entire Zone 1 fill material (i.e. individual averages have not been calculated for Block 4, Block 5 and Hickson Road). This has been undertaken to facilitate comparison of the Zone 1 average concentration to the Zone 2 average concentrations for the purpose of identifying key gasworks related CoPC. It is noted that the average concentrations adopted for Zone 1 in the following sections are based on the individual data sets for those parts of Block 4, Block 5 and Hickson Road that fall within Zone 1.

Table 13 indicates that the two CoPCs with the largest volume of contaminant mass within the Site are naphthalene and TPH C₁₀-C₁₄. Further, the groundwater analysis results presented in **Table T10** and **T13** also indicate that naphthalene and TPH C₁₀-C₁₄ concentrations generally exceed the MWQC by the largest order of magnitude across the Site.

As such, these two CoPCs are considered to be the key gasworks related contaminants with the potential to represent an ongoing risk to the environment. Further, remediation of these two CoPCs would be expected to result in remediation of the other CoPCs listed in **Table 13**.

It is noted that TPH as reported by environmental laboratories is a complex mixture of over 100 compounds which are quantified as unresolved mass peaks on the laboratory gas chromatograph fitted with a specific detector. As such, TPH C₁₀-C₁₄ analysis is likely to be overestimated as TPH is a broad analytical measure and is likely to include other gasworks related contaminants (including naphthalene). TPH C₆-C₉ analysis is also likely to include the reporting of benzene impacts.

Based on these findings, only naphthalene and TPH C₁₀-C₁₄ are considered in further detail by the following contaminant mass analysis.

6.4.4 Current Contaminant Mass Estimates (Zone 1 to 4)

Table 14 below presents the estimated gasworks related contaminant mass calculations for the current conditions across Zones 1 to 4. Details of the contaminant mass calculations are presented in **Table F3, Appendix F**.

Table 14 Zone 1 to 4 Current Contaminant Mass Calculations

Zone Area	CoPC	Ave conc (mg/kg)	Estimated volume (m ³)	Total contaminant mass (kg)	% of Total mass (Zone 1 to 4)
Zone 1 - Onsite within Remediation Area					
Block 4	Naphthalene	809	43,000	69,574	53.5%
	TPH C ₁₀ - C ₁₄	2,621	43,000	225,406	42.6%
Block 5	Naphthalene	64	23,200	2,970	2.3%
	TPH C ₁₀ - C ₁₄	262	23,200	12,157	2.3%
Hickson Road	Naphthalene	1,190	15,800	37,604	28.9%
	TPH C ₁₀ - C ₁₄	5,956	15,800	188,210	35.6%
Zone 1 total	Naphthalene	-	82,000	110,148	84.8%
	TPH C₁₀ - C₁₄	-	82,000	425,772	80.5%
Zone 2 - Onsite within upper fill outside Remediation Area					
	Naphthalene	0.8	51,600	83	0.1%
	TPH C ₁₀ - C ₁₄	26	51,600	2,683	0.5%
Zone 2 - Onsite within lower fill outside Remediation Area					
	Naphthalene	9.3	11,200	208	0.2%
	TPH C ₁₀ - C ₁₄	79	11,200	1,770	0.3%
Zone 2 - Onsite within marine sediments outside Remediation Area					
	Naphthalene	120	10,120	2,429	1.9%
	TPH C ₁₀ - C ₁₄	394	10,120	7,975	1.5%
Zone 3 - Off Site upper fill within 20m of Declaration Area					
	Naphthalene	5.5	53,920	593	0.5%
	TPH C ₁₀ - C ₁₄	61	53,920	6,578	1.2%
Zone 3 - Off Site lower fill within 20m of Declaration Area					
	Naphthalene	41	8,800	722	0.6%
	TPH C ₁₀ - C ₁₄	38	8,800	669	0.1%

Zone Area	CoPC	Ave conc (mg/kg)	Estimated volume (m ³)	Total contaminant mass (kg)	% of Total mass (Zone 1 to 4)
Zone 3 - Off Site marine sediments within 20m of Declaration Area					
	Naphthalene	474	9,960	9,442	7.3%
	TPH C ₁₀ - C ₁₄	2,502	9,960	49,840	9.4%
Zone 4 - Off Site upper fill outside 20m of Declaration Area					
	Naphthalene	1.2	309,920	744	0.6%
	TPH C ₁₀ - C ₁₄	30	309,920	18,595	3.5%
Zone 4 - Off Site lower fill outside 20m of Declaration Area					
	Naphthalene	22	50,400	2,218	1.7%
	TPH C ₁₀ - C ₁₄	25	50,400	2,520	0.5%
Zone 4 - Off Site marine sediments outside 20m of Declaration Area					
	Naphthalene	17.0	99,400	3,380	2.6%
	TPH C ₁₀ - C ₁₄	64.0	99,400	12,723	2.4%

The following observations can be made based on comparison of the estimated contaminant masses presented in **Table 14**:

- Between 80% and 85% (naphthalene and TPH C₁₀ - C₁₄ concentrations, respectively) of the total gasworks related contaminant mass is currently located within Zone 1 (the human health remediation extent) and will be remediated as part of the proposed remediation works;
- Between 0.3% and 0.8% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass is currently located within the fill materials (both upper fill and lower fill) within Zone 2 (i.e. within the Site but outside Zone 1);
- Between 3.3% and 5.3% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass is currently located within the fill materials (both upper and lower fill) within Zones 3 and 4 (i.e. off Site); and
- Between 9.8% and 11.8% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass is currently located within the natural marine sediments within Zones 3 and 4 (i.e. off Site) which are generally present at depths of between approximately 13 m bgl and 32 m bgl.

Based on the observations above, it is evident that the majority (between 80% and 85%) of the gasworks related contaminant mass will be remediated by the proposed Zone 1 extent of remediation. Of the residual gasworks related contamination that will remain *in situ* following the proposed remediation works, the majority (approximately half of the residual or between 9.8% and 11.8% of the total) of the contaminant mass is present within the marine sediments of Zone 3 and 4. As discussed in **Section 2.5**, there is considered to be a negligible potential for contaminant flux and discharge from the natural marine sediments underlying the Site and off Site areas into Darling Harbour.

6.4.5 Post Remediation Contaminant Mass Estimate

Table 15 presents an estimate of the TPH C₁₀-C₁₄ and naphthalene contaminant mass that will remain within Zones 1 to 4 following remediation to the extent practicable within Zone 1. Details of the contaminant mass calculations are presented in **Table F4, Appendix F**. The Zone 1 post remediation contaminant mass estimates presented in **Table 15** are based on the following assumptions.

- **Block 4** – it is assumed that a 100% reduction in contaminant mass will be achieved within the extent of remediation by ex-situ remediation of contamination within Block 4. Ex situ remediation is considered to be the most likely remediation technology for Block 4 given the proposed construction of a basement (including a basement groundwater retention wall system) as part of the Barangaroo South Development;

- **Block 5** – a 90% reduction in the contaminant mass within the extent of remediation is likely to be achieved by S-ISCO® and SEPR™ remediation works (refer to **Section 6.3.2.2**). While it is possible that a basement (possibly incorporating a basement groundwater retention wall system) will be constructed within Block 5 as part of the Barangaroo Central development, the timing of this development is not yet understood. Therefore a 90% reduction in contaminant mass has been conservatively adopted; and
- **Hickson Road** – a 90% reduction in the contaminant mass is likely to be achieved within the extent of remediation by S-ISCO® and SEPR™ remediation works (refer to **Section 6.3.2.2**).

It is noted that the contaminant mass estimates for Zones 2, 3 and 4 (i.e. the unremediated areas) presented in **Table 15** are unchanged from those in **Table 14**.

Table 15 Zone 1 and 4 Estimated Mass Balance Calculations (Post-Remediation)

Zone Area	CoPC	Ave conc (mg/kg)	Estimated volume (m ³)	Total contaminant mass (kg)	% of Residual Mass (post remediation) (Zone 1 to 4)
Zone 1 - Onsite within Remediation Area					
Block 4	Naphthalene	-	-	-	-
	TPH C ₁₀ - C ₁₄	-	-	-	-
Block 5	Naphthalene	6.4	23,200	297	1.2%
	TPH C ₁₀ - C ₁₄	26.2	23,200	1,216	1.0%
Hickson Road	Naphthalene	119.0	15,800	3,760	15.8%
	TPH C ₁₀ - C ₁₄	595.6	15,800	18,821	15.3%
Zone 1 total	Naphthalene	-	39,000	4,057	17.0%
	TPH C₁₀ - C₁₄	-	39,000	20,037	16.2%
Zone 2 - Onsite within upper fill outside Remediation Area					
	Naphthalene	0.8	51,600	83	0.3%
	TPH C ₁₀ - C ₁₄	26	51,600	2,683	2.2%
Zone 2 – Onsite within lower fill outside Remediation Area					
	Naphthalene	9.3	11,200	208	0.9%
	TPH C ₁₀ - C ₁₄	79	11,200	1,770	1.4%
Zone 2 - Onsite within marine sediments outside Remediation Area					
	Naphthalene	120	10,120	2,429	10.2%
	TPH C ₁₀ - C ₁₄	394	10,120	7,975	6.5%
Zone 3 - Off Site upper fill within 20m of Declaration Area					
	Naphthalene	5.5	53,920	593	2.5%
	TPH C ₁₀ - C ₁₄	61	53,920	6,578	5.3%
Zone 3 - Off Site lower fill within 20m of Declaration Area					
	Naphthalene	41	8,800	722	3.0%
	TPH C ₁₀ - C ₁₄	38	8,800	669	0.5%
Zone 3 - Off Site marine sediments within 20m of Declaration Area					
	Naphthalene	474	9,960	9,442	39.5%
	TPH C ₁₀ - C ₁₄	2,502	9,960	49,840	40.4%

Zone Area	CoPC	Ave conc (mg/kg)	Estimated volume (m ³)	Total contaminant mass (kg)	% of Residual Mass (post remediation) (Zone 1 to 4)
Zone 4 - Off Site upper fill outside 20m of Declaration Area					
	Naphthalene	1.2	309,920	744	3.1%
	TPH C ₁₀ - C ₁₄	30	309,920	18,595	15.1%
Zone 4 - Off Site lower fill outside 20m of Declaration Area					
	Naphthalene	22	50,400	2,218	9.3%
	TPH C ₁₀ - C ₁₄	25	50,400	2,520	2.0%
Zone 4 - Off Site marine sediments outside 20m of Declaration Area					
	Naphthalene	17.0	99,400	3,380	14.2%
	TPH C ₁₀ - C ₁₄	64.0	99,400	12,723	10.3%

Based on percentages of the residual (post remediation) contaminant mass presented in **Table 15**, it is evident that following remediation:

- the majority of the residual gasworks related contaminant mass will remain within:
 - Fill within Zone 1 – the remediation extent for the protection of human health (between 17.0% and 16.2% of the residual contaminant mass for naphthalene and TPH C₁₀ - C₁₄, respectively). Notwithstanding, Zone 1 will have been remediated to the extent practicable based on the technical capability of the most likely remedial technologies (refer to **Section 6.3**); and
 - Marine Sediment within Zones 3 and 4 (between 53.7% and 50.7% of the residual contaminant mass for naphthalene and TPH C₁₀ - C₁₄, respectively). As discussed in **Section 2.5**, there is considered to be a negligible potential for contaminant flux and discharge from the natural marine sediments underlying the Site and off Site areas into Darling Harbour and therefore this residual contamination would not be considered to represent a risk to the environment;
- Between 1.2% and 3.6% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the residual gasworks related contaminant mass will remain within the fill materials (both upper fill and lower fill) within Zone 2 (i.e. within the Site but outside Zone 1);
- Between 17.9% and 23% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the residual gasworks related contaminant mass will remain within the fill materials (both upper and lower fill) within Zones 3 and 4 (i.e. off Site). It is noted that these fill materials will be the subject of a separate HHERA and RAP as part of the proposed future development works in the ORWN and Barangaroo Central areas.

Table 16 summarises, for naphthalene and TPH C₁₀-C₁₄ contaminant mass, the estimated percent reduction in contaminant mass achieved by the proposed remediation works in Zone 1 as a function of:

- the total contaminant mass within Zones 1 to 4, including upper fill, lower fill and marine sediments; and
- the total contaminant mass within Zones 1 to 4 within fill material only (i.e. upper fill and lower fill) based on the observation that there is a negligible potential for contaminant flux and discharge from the natural marine sediments underlying the Site and off Site areas into Darling Harbour and therefore residual contamination within the marine sediment would not be considered to represent a risk to the environment (refer to **Section 2.5**).

Table 16 Zone 1 to 4 - Comparison of Estimated Current and Post-Remediation Contaminant Masses (Zone 1 to 4)

	Zone 1 to 4 (Current Conditions)	Zone 1 to 4 (Post Remediation)	
CoPC	Estimated Contaminant Mass (kg)	Estimated Contaminant Mass (kg)	Zone 1 to 4 % contaminant reduction
Within fill material and marine sediments			
Naphthalene	129,965	23,875	81.6%
TPH C10 - C14	529,125	123,389	76.7%
Within fill material only			
Naphthalene	114,715	8,666	92.4%
TPH C10 - C14	458,587	53,044	88.4%

In summary, remediation of Zone 1 to the extent practicable (which is assumed to be equivalent to removal of approximately 90% of the contaminant mass in the case of in-situ remediation technologies and approximately 100% of the contaminant mass by ex-situ remediation in Block 4) will result in a reduction in gasworks related contaminant mass of between 88-92% within fill materials. As described by **Section 2.5**, there is a negligible potential for contaminant flux and discharge from the natural marine sediments underlying the Site and off Site areas into Darling Harbour and therefore contamination within the marine sediment would not be considered to represent a risk to the environment.

It is reasonably expected that a reduction in gasworks related contaminant mass of this magnitude will improve groundwater quality within fill material at the down hydraulic gradient Site boundary and in off Site areas such that the risk to the environment is effectively mitigated. Further assessment of the improvement in groundwater quality that may be realised as a result of the calculated reduction in gasworks related contaminated mass is provided in **Section 6.5**.

6.4.6 Conclusion

The gasworks related contaminant mass estimates described above demonstrate that:

- The majority (between 80% and 85%) of the gasworks related contaminant mass is present within the proposed extent of remediation and will, therefore, be subject to remediation.
- Of the residual gasworks related contamination that will remain *in situ* following the proposed remediation works, more than half (between approximately 57% and 64%) of the residual contaminant mass is present within the marine sediments of Zone 3 and 4. As discussed in **Section 2.5**, there is considered to be a negligible potential for contaminant flux and discharge from the natural marine sediments underlying the Site and off Site areas into Darling Harbour.
- Remediation of Zone 1 to the extent practicable (which is assumed to be equivalent to removal of approximately 90% of the contaminant mass in the case of in-situ remediation technologies for Block 5 and Hickson Road and approximately 100% of the contaminant mass in the case of ex situ remediation of Block 4) will result in a reduction in gasworks related contaminant mass of between 88-92% within fill materials. As described by **Section 2.5**, there is a negligible potential for contaminant flux and discharge from the natural marine sediments underlying the Site and off Site areas into Darling Harbour and therefore contamination within the marine sediment would not be considered to represent a risk to the environment.
- A reduction in gasworks related contaminant mass of this magnitude would be expected to improve groundwater quality within fill material at the down hydraulic gradient Site boundary and in off Site areas such that the risk to the environment is effectively mitigated. Further assessment of the improvement in groundwater quality that may be realised as a result of the calculated reduction in gasworks related contaminated mass is provided in **Section 6.5**.

6.5 CUTEF - Threats the Contamination Poses to Human or Ecological Health

As required by Section 4.3 of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, one of the key factors that must be considered to assess whether CUTEF has been achieved is the threats that the contamination poses to human or ecological health.

The following Sections consider the threat to human and ecological health posed by contamination remaining *in situ* following completion of the proposed remediation extent as follows:

- Consideration of post remediation risk to human health based on the outcomes of the VMP HHERA and resultant remediation extent (refer to **Section 6.5.1**);
- Consideration of the post remediation risk to the environment (refer to **Section 6.5.2**), including assessment of:
 - The improvement in contaminant mass flux that will be realised by the proposed remediation; and
 - The contaminant mass flux from contamination that will remain *in situ* (both on Site and off Site) following the proposed remediation for the protection of human health.
- Consideration of how works to be undertaken as part of the subsequent development of the Site (for example construction of a basement groundwater retention wall as part of the Barangaroo South development) will further minimise the threat to the environment posed by residual contamination remaining *in situ* following completion of the proposed remediation.

6.5.1 Threat to Human Health

As detailed in **Section 5.1** (for Block 4 and 5), **Section 5.2** (for Hickson Road) and **Section 5.3** (for areas west of the Site) the proposed remediation extent is based on remediation of SPGWT and CIM to the extent practicable.

In addition to being the primary remediation goal for the protection of human health (refer to **Section 3.3**), the remediation of SPGWT to the extent practicable is a requirement of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* (refer to **Section 6.2**). The distribution of SPGWT identified at the Site and in off Site areas is detailed in **Figure F6**. As described by **Section 6.2**, the proposed remediation extent (refer to **Figure F14** and **Figure F15**) is considered to constitute remediation of a SPGWT to the extent practicable and is therefore considered to be protective of human health.

CIM is defined as soil containing CoPC concentrations that either: exceed the SSTC (i.e. site-specific health based criteria) for unsaturated soil; or, are considered the source of groundwater contamination that exceeds the SSTC for groundwater. The secondary remediation goal for protection of human health (refer to **Section 3.3**) is remediation of CIM to the extent practicable. The distribution of soil and groundwater concentrations that exceed the SSTCs and so are considered representative of CIM is detailed in **Figure F4** and **Figure F5**. As described by **Section 5.1** (for Block 4 and 5), **Section 5.2** (for Hickson Road) and **Section 5.3** (for areas West of the Site), the proposed remediation extent (refer to **Figure F14** and **Figure F15**) is considered to constitute remediation of SPGWT to the extent practicable and is therefore considered to be protective of human health.

It is noted that SPGWT and CIM have been reported in the natural marine sediments in some Site areas outside the proposed remediation extent. As described by **Section 2.5**, there is negligible contaminant flux from these natural materials into the overlying fill. Therefore, SPGWT and CIM that may be present within the natural marine sediments is not considered to pose a significant risk to human health.

In conclusion if the remediation proposed for protection of human health is completed, as described by **Section 5.0**, there will not be an unacceptable ongoing risk to human health under current land uses.

6.5.2 Threats to the Environment

As described in **Section 6.4.5**, the proposed remediation extent for the protection of human health will result in a comparatively minor quantity of residual contamination remaining *in situ*. The majority of the residual contamination (in the order of 45% will remain within in the Zone 2 to Zone 4 marine sediments (i.e. the western portion of the Site and the areas down hydraulic gradient [west] of the Site). Refer to **Table F4**, **Appendix F**.

As detailed in **Section 2.5**, AECOM has undertaken a series of studies (AECOM 2010d and 2012b) to assess the potential for contaminant mass flux from the marine sediments into the overlying fill and Darling Harbour.

Based on the assessment of multiple lines of evidence (refer to **Section 2.5**), it is concluded there is no significant flux and discharge of contamination from the natural soil and marine sediments underlying the Site (and areas down hydraulic gradient of the Site) into Darling Harbour. As such, remediation of the deep natural soil and marine sediments is not considered warranted for the protection of human health or the environment.

6.5.2.1 Supplementary Contaminant Flux and Discharge Estimations, AECOM (2013a)

Approximately 55% of the residual gasworks related contaminant mass that will remain *in situ* (based on the proposed remediation extent) will be within the fill material. In consideration of this, AECOM undertook a supplementary Contaminant Mass Flux study (following on from AECOM [2012b] - refer to **Section 2.5.2**) to assess:

- The decrease in contaminant flux that could be expected to result from the proposed remediation extent (refer to **Section 5.0**); and
- potential impacts to water quality in Darling Harbour from the contamination that will remain *in situ* in fill material and marine sediment both within the Site and in off Site areas to the west (i.e. Barangaroo Central and the ORWN area) as an outcome of the proposed remediation extent (refer to **Section 5.0**).

The supplementary mass flux discharge modelling was based on the conceptual model, geology, hydrogeology, extent of contamination, aquifer parameters, tidal effects and mass flux and discharge modelling which were presented in AECOM (2012b) (refer to **Section 2.5.2**). The contaminant mass flux was calculated based on groundwater monitoring results from the Site and off Site areas along the following transects:

- Transect A-A' - monitoring wells located within the footprint of the former gasworks and the middle of the proposed remediation area (Block 4 and 5); and
- Transect B-B' – monitoring wells located in off Site areas and in proximity to Darling Harbour (Barangaroo Central and the ORWN area).

The supplementary contaminant mass flux study (AECOM, 2013a) is provided as **Appendix D**.

Based on the proposed remediation extent (refer to **Section 5.0**), the Conceptual Site Model (refer to **Figure 1, Section 2.6**), the available hydraulic parameters and the supplementary mass flux/discharge modelling, the following conclusions were made:

- Improvement in contaminant mass flux that will be realised by the proposed remediation:
 - the groundwater quality in fill at the down hydraulic gradient of the Site would be expected to improve by in the order of 250% to 380% (measured in terms of a reduction in contaminant mass flux) as a result of the proposed remediation extent.
- Contaminant mass flux from contamination that will remain *in situ* (both on Site and off Site) following the proposed remediation for the protection of human health:
 - Less than 1% of the contaminant mass flux at Transect B-B' (associated with residual contamination to remain *in situ* following the proposed remediation) is associated with the marine sediment. This conclusion supports the conclusions of the previous contaminant mass flux study (AECOM, 2012b) and the GDS (AECOM, 2010d) that there is not a significant flux and discharge of contamination from the natural soil and marine sediments underlying the Site into Darling Harbour;
 - Groundwater quality estimated from the contaminant mass flux at Transect B-B' (associated with residual contamination to remain *in situ* following the proposed remediation) entering Darling Harbour is less than the MWQC; and
 - Groundwater quality in fill discharging into Darling Harbour will improve over time because better quality groundwater (that is a lower contaminant mass flux) from Transect A-A' will slowly migrate towards Transect B-B'.

6.5.2.2 Additional Mitigation Resulting from Proposed Future Works

Part of the Site (specifically that part of Barangaroo Block 4 that is within the Declaration Area) and part of the area located down hydraulic gradient of the Site (specifically that part of Barangaroo Block 4 that is outside the Declaration Area and the ORWN Area) are located within the Barangaroo South development (refer to **Figure F3**). As such, these areas will be subject to future proposed development works.

Of particular note, is that the proposed Block 4 development works (to be undertaken as part of the Barangaroo South development) will include construction of a basement groundwater retention wall system around the perimeter of Block 4 (including those parts of Block 4 within and outside the Declaration Area). The basement groundwater retention wall system will extend to and be keyed into bedrock. This will effectively eliminate the pathway for the migration of contamination from Block 4 to the environment.

It should be noted that these potential works are associated with the future development and will be subject to receipt of development consent.

For clarity, the Block 4 development works are not required as part of the VMP Remediation Works contemplated by this document. Further, construction of the above mentioned basement groundwater retention wall system is not required to demonstrate that the proposed remediation extent is protective of the environment in accordance with the principles of CUTEP. However, as mentioned above, the proposed Block 4 development works will include construction of the basement groundwater retention wall system which will further minimise the threat to the environment of residual contamination remaining within Block 4.

6.5.2.3 Conclusion

In conclusion if the proposed remediation is completed, there will not be an unacceptable ongoing risk to the environment.

6.6 CUTEP - The Value of the Groundwater Resource

As required by Section 4.3 of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, one of the key factors that must be considered to assess whether CUTEP has been achieved is the value of the groundwater resource.

The EPA requires the point of compliance for the purpose of assessing ecological risk from the Site is the down hydraulic gradient boundary of the Site. In the absence of any other information, the level of protection of groundwater at the down hydraulic gradient boundary of the Site has been based on the level of protection required for the nearest surface water receptor, Darling Harbour. This approach is consistent with the policies of the NSW EPA, in particular:

- The *CLM Act* (1997), section 9, which requires adoption of the precautionary principle where the lack of scientific certainty is not a reason for postponing measures. With respect to the Site, this relates to the protection of groundwater dependant ecosystems down hydraulic gradient of the Site and the requirement for remediation to the extent practicable (even in the absence of data demonstrating the presence, or otherwise, of such ecosystems now, or in the future);
- The Department of Environment and Conservation NSW (now the NSW EPA) *Guidelines for the Assessment and Management of Groundwater Contamination*, March 2007, section 1, which reemphasise the requirements of the *CLM Act* (1997) requiring protection of groundwater ecosystems according to the precautionary principle;
- The *ANZECC 2000 Water Quality Guidelines*, section 1, which require that the protection of underground aquatic ecosystems and their novel fauna require the highest level of protection; and
- The *National Environment Protection Measure Schedule B(6)* (NEPC, 1999) which states that determination of the point of use of groundwater is a jurisdictional matter and that the transfer of contaminated groundwater from a contaminated Site is not considered to be acceptable, even if the relevant guidelines are achieved at the point of use / discharge.

As described by Section 8.2 of the *VMP HHERA* (AECOM, 2012c), guidance from the NSW EPA indicates that although Darling Harbour is classified as a waterway affected by urban development, the applicable aquatic ecosystem management objectives (and so the value of the groundwater resource) as:

- protection of aquatic ecosystems;
- protection of visual amenity; and
- achievement of secondary contact recreation and primary contact recreation quality goals over a period of some five years.

It is noted that due to the proximity of the Site to Darling Harbour (which is located approximately 100 metres to the west), the Site groundwater is saline and is not considered to be a valuable in terms of providing a water resource (for humans or stock).

The long term remediation goal for protection of the groundwater resource (and ecological health) is compliance with the MWQC at the down hydraulic gradient Site boundary. As described by **Section 3.4.2**, the MWQC have been developed in consultation with the NSW EPA and is considered to be reflective of the value of the groundwater resource.

As described by **Section 6.5.2**, AECOM has demonstrated through consideration of multiple lines of evidence that residual contamination that will remain *in situ* following completion of the proposed remediation will not represent a threat to ecological health and will be protective of the identified groundwater value.

6.7 CUTEF - Clean-up Costs

As required by Section 4.3 of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, one of the key factors that must be considered to assess whether CUTEF has been achieved is the consideration of clean-up costs.

If it is assessed that the proposed extent of remediation does not represent CUTEF and additional remediation is required for protection of the environment, additional remediation of soil beyond the proposed extent of remediation (refer to **Figure F14** and **Figure F15**) would be required. Additional remediation would necessitate the ex-situ and/or *in situ* remediation of soil across an increased area and over an increased depth than currently proposed.

The following Sections consider the additional clean-up costs (expressed in terms of remediation volumes) versus the environmental benefit (expressed in terms of a reduction in contaminant mass) that might be realised from the remediation of additional areas within and adjacent to the Site.

Within this context, the following sections also consider:

- practicality limitations and cost implications of additional remediation;
- the principles of ESD; and
- the principles of waste avoidance and resource recovery.

6.7.1 Remediation Cost verses Benefit

If it was proposed to achieve a higher level of protection for the environment than currently proposed, a substantial increase in remediation works would be required to realise any substantial increase in the contaminant mass reduction. In particular:

- the depth of contamination and so the depth and volume of remediation increases rapidly with increasing distance to the west of the Site, in the direction of Darling Harbour (refer to **Figure F10** to **Figure F13**);
- the estimated mass of gasworks related contamination present within the Zone 2 fill materials within the Site (outside the Remediation Area) and within Zone 3 (20m west of the Site) is small (refer to **Section 6.4**). Fill materials are generally present from the ground surface to between 12 to 16 m bgl in this area. As such, they represent the most accessible material in terms of remediation practicability. However, the benefit, in terms of reduced contaminant mass would be small and in some cases negligible as illustrated by the following data (refer to **Table 14**):
 - Only 0.1% and 0.5% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass is present within the upper fill in Zone 2; and
 - Only 0.5% and 1.2% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass is present within the upper fill in Zone 3.
- The majority of the estimated mass of gasworks related contamination that will remain *in situ* on completion of the proposed remediation is present at substantial depth and within the marine sediments (refer to **Table 14**):
 - Only 1.9% and 1.5% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass is present within the marine sediment in Zone 2 (at a typical depth of 12-14 m bgl);
 - between 7.3% and 9.4% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass (or approximately half of the residual contaminant mass) is present within the marine sediment in Zone 3 (at a typical depth of 14 to 16 m bgl); and

- between 2.6% and 2.4% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass is present within the marine sediment in Zone 4 (at a typical depth of 14 to 18 m bgl);

As discussed in **Section 6.7.2**, remediation of marine sediments would be difficult and subject to significant practicability constraints including, but not limited to: the thickness of overburden, the presence of fine grained material; and the depth below the groundwater table. Further, there is a negligible potential for contaminant flux and discharge from the natural marine sediments underlying the Site and off Site areas into Darling Harbour and therefore contamination within the marine sediment does not represent a risk to the environment (refer to **Section 2.5**).

As outlined in **Table 17** the following Scenarios are illustrative of the significant cost (expressed in terms of remediation volumes) in comparison to the comparatively small benefit (expressed in terms of a percent reduction in gasworks related contaminant mass).

- Scenario 1 - expansion of the proposed remediation extent to incorporate the entire Site (i.e. including upper fill, lower fill and marine sediment with Zone 2);
- Scenario 2 - expansion of the proposed remediation extent to incorporate the entire Site and Zone 3 (including upper fill, lower fill and marine sediment).

Table 17 Scenario 1 to 2 Mass Volume Estimations

Zone Area	Estimated Remediation volume (m3)	Increase in Remediation Volume (%)	Contaminant mass (% of total)		Reduction in contaminant mass (% of total)	
			Naphtha - lene	TPH C10 - C14	Naphtha - lene	TPH C10 - C14
Proposed Remediation: Zone 1 (proposed remediation area) only						
Zone 1	82,000		84.8%	80.5%		
Total	82,000	-	84.8%	80.5%	-	-
Scenario 1: Zone 1 (proposed remediation area) + Zone 2 (On Site outside remediation area)						
Zone 1	82,000		84.8%	80.5%		
Zone 2 - upper fill	51,600		0.1%	0.5%		
Zone 2 - lower fill	11,200		0.2%	0.3%		
Zone 2 - marine sediments	10,120		1.9%	1.5%		
Total	154,920	88.9%	87.0%	82.8%	2.5%	2.8%
Scenario 2: Zone 1 (proposed remediation area) + Zone 2 (On Site outside remediation area) + Zone 3 (within 20m of the Site)						
Zone 1	82,000		84.8%	80.5%		
Zone 2 - upper fill	51,600		0.1%	0.5%		
Zone 2 - lower fill	11,200		0.2%	0.3%		
Zone 2 - marine sediments	10,120		1.9%	1.5%		
Zone 3 - upper fill	53,920		0.5%	1.2%		
Zone 3 - lower fill	8,800		0.6%	0.1%		
Zone 3 - marine sediments	9,960		7.3%	9.4%		
Total	227,600	177.6%	95.4%	93.5%	12.4%	16.1%

In the case of Scenario 1 (proposed remediation extent expanded to incorporate the entire Site):

- The estimated volume of remediation required would increase by approximately 72,920 m³ (which equates to an 89% increase in remediation volume); but

- The corresponding reduction in contaminant mass (assuming 100% removal) would be between 2.5% and 2.8% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass.

In the case of Scenario 2 (proposed remediation extent was expanded to incorporate the entire Site and Zone 3):

- The estimated volume of remediation required would increase by approximately 145,600 m³ (which equates to a 178% increase in remediation volume). It should be noted that of this remediation volume, approximately 20,080 m³ relates to marine sediments; but
- The corresponding reduction in contaminant mass (assuming 100% removal) would be between 12.4% and 16.1% (naphthalene and TPH C₁₀ - C₁₄, respectively) of the total gasworks related contaminant mass. It should be noted that of this reduction, the majority (between 81% and 85% [naphthalene and TPH C₁₀ - C₁₄, respectively]) relates to contaminant mass that is present within the marine sediment and which is not considered to require remediation for protection of the environment (refer to **Section 2.5**).

It is therefore considered that the cost and potential environmental harm associated with expansion of the proposed remediation extent would substantially outweigh any real benefit to the environment.

This conclusion is consistent with Section 4.4 of NSW DEC (2007) which requires that the benefits from undertaking groundwater clean-up must outweigh any incidental negative impacts to human health or the environment that could arise from the clean-up.

6.7.2 Practicability Limitations

As described by **Section 6.7.1**, if it was proposed to achieve a higher level of protection for the environment than currently proposed, a substantial increase in the remediation extent, remediation depth and/or remediation volume would be required to realise any substantial increase in the contaminant mass reduction. The following discussion considers practicability limitations and resultant additional costs that would be incurred should the extent, and in particular, the depth of remediation be increased.

6.7.2.1 Ex situ Remediation (Block 4)

- The strength and complexity of the shoring system required to facilitate the excavation would increase significantly with increasing depth. In particular, increasing the depth below the groundwater table that an excavation is required to progress, substantially increases the loads imposed on the shoring system and therefore the strength required to support the excavation;
- The presence of below ground infrastructure – such as historic seawalls present at depth (for example the caisson wall associated with the historic Southern Cove) that would need to be removed prior to construction of the shoring system;
- The extent and quantity of dewatering required to facilitate excavation to increasing depths below the groundwater table will substantially increase. Additional costs would increase the density of required dewatering points (particularly if the excavation was to extend into lower permeability saturated marine sediments), operation of a water treatment plant (including ongoing operation and maintenance); and disposal of treated water (if required);
- The extent and complexity of the excavation enclosure and associated emissions control system (including ongoing operation and maintenance) would require expansion and additional cost;
- The logistical requirements associated with the physical removal of material from a larger and deeper excavation become more complex with increasing depth of excavation. These logistical considerations would be amplified by the required for conduct of much of the excavation within an excavation enclosure;
- Increased volumes of material requiring treatment will result in increased treatment and/or stabilisation costs required as a precursor to off-site disposal of material in accordance with the DECCW (2009) *Waste Classification Guidelines*.
- The treatment of saturated marine sediments, as will be realised from deeper excavations in the west of the Site and in the ORWN and Barangaroo South areas, will also incur additional costs associated with spadability limitations within the excavation pre-treatment requirements (including reduction in moisture content and increasing the granular content of the feed stock) prior to treatment or stabilisation. These considerations are less onerous for granular materials as would generally be recovered from shallower excavations in fill;

- Increased remediation volumes will result in increased excavation, handling, haulage and waste disposal costs for off Site disposal to landfill of additional excavated materials; and
- Targeting of more significant contamination that is present at depth within marine sediments (for example) would necessitate excavation and management of significant volumes of overburden that would not otherwise require excavation.

6.7.2.2 *In situ* Remediation (Block 5 and Hickson Road)

- In the case of S-ISCO[®] and SEPR[™], additional drilling costs would be realised to facilitate installation of additional infrastructure (including groundwater monitoring wells, injection wells, extraction wells and soil vapour extraction wells) to cover:
 - an increased remediation area - the additional wells would be constructed in areas of the Site where drilling conditions have proven difficult during the previous site investigations;
 - an increased depth of remediation – marine sediments present at depth would require an increased density of injection wells to facilitate adequate distribution of the S-ISCO[®] chemistry.
- In the case of ISS, additional drilling costs would be realised to cover:
 - Treatment of an increased remediation area – noting that ISS is reliant on construction of overlapping and continuous piles, a relative modest increase in remediation area can result in a substantial increase in the number of piles required; and
 - An increased depth of remediation – noting that ISS is limited to remediation to a maximum depth of 12 m bgl.
- Increased volumes of remediation would necessitate increased volumes of treatment agents including:
 - In the case of S-ISCO[®] - oxidants, surfactants and catalyst; and
 - In the case of ISS – cement, lime, flyash and cement kiln dust.
- Increased volumes of remediation would result in an increase to the duration for operation, maintenance and monitoring costs associated with the selected *in situ* remediation strategy.

6.7.3 Ecologically Sustainable Development

In considering the extent of remediation that can be achieved practicably for the protection of the environment, it is appropriate to consider the principles of ESD. The regulatory framework support application of ESD is described in **Section 6.1.3**.

The ESD principles set out in Section 9 of the *CLM Act* (1997) are detailed in **Table 18** along with a description of how the proposed remediation works are consistent with the requirements of the Act.

Table 18 Consideration of the ESD Principles (CLM Act, 1997)

ESD Principles (CLM Act, 1997)	How the proposed remediation works are consistent with the ESD Principles
a) <i>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 (the 'precautionary principle');</i>	- The soil and groundwater analytical data set for the Site is considered to be appropriate to draw conclusions regarding the risk of current soil and groundwater conditions to human health and the environment; - The VMP HHERA (AECOM, 2012c) and this document have been prepared to develop remediation goals and determine the remediation extent required at the Site to mitigate risks to the environment (and human health); - As directed by the NSW EPA, the precautionary principle has been applied to protection of a potential groundwater ecosystem down hydraulic gradient from the Site (refer to Section 6.6); and - As described by Section 6.5.2, while the proposed remediation works will result in residual contamination being left <i>in situ</i>, the residual contamination will not represent a serious or irreversible threat of environmental

ESD Principles (CLM Act, 1997)	How the proposed remediation works are consistent with the ESD Principles
	damage.
<i>The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'intergenerational principle');</i>	- The proposed remediation works will enhance the environment to the benefit of future generations by significantly reducing the contaminant mass within the Site (refer to Section 6.4) and improving the quality of groundwater migrating from the Site and ultimately to Darling Harbour (refer to Section 6.5.2); - The avoidance of off Site disposal of low level contaminated material (which is not necessary to be protective of the environment) will preserve limited landfill space providing for future intergenerational equity; - The use of <i>in situ</i> remediation technologies will minimise the required for off Site disposal of contaminated material and therefore preserve limited landfill space providing for future intergenerational equity; - S-ISCO, if adopted by as the <i>in situ</i> remediation technology will effectively destroy target contamination, degrading it to other less toxic compounds which do not represent a risk to the environment or human health providing for future intergenerational equity; - S-ISCO, if adopted as the remediation works will result in a lower rate of natural resource usage thereby improving the overall environmental performance of the Barangaroo project.
<i>The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making (the 'biodiversity principle'); and</i>	- A key remediation goal for protection of the environment is remediation of the soil within the unsaturated and saturated zones, to the extent practicable, such that groundwater quality leaving the Site (measured at the down hydraulic gradient Site boundary) approaches the MWQC. - As directed by the NSW EPA, the biodiversity principle has been applied to protection of a potential groundwater ecosystem down hydraulic gradient from the Site (refer to Section 6.6) and protection of the surface water ecosystem within Darling Harbour.
<i>Improved valuation, pricing and incentive mechanisms should be promoted (the 'valuation principle').</i>	- Remediation of the Site to enable removal the Declaration is first required to facilitate the proposed Barangaroo development. The development will improve economic efficiency for the CBD and utilise currently vacant land located close to transport hubs; - Use of innovative <i>in situ</i> remediation technologies will provide cost effective alternatives to conventional ex situ remediation technologies; - Appropriate commercial arrangements will be provided to contractors to encourage competitive tendering and pricing for the remediation works.

It is considered that the proposed remediation extent is consistent with the principles of ESD. In particular:

- The proposed remediation works will, notwithstanding a lack of scientific certainty regarding the presence or otherwise of a groundwater ecosystem in the are down hydraulic gradient of the Site, mitigate against serious or irreversible environmental damage – in accordance with the precautionary principle;
- The proposed remediation works substantially enhance the environment through removal of a substantial mass of gasworks related contaminant mass – in accordance with the intergenerational principle;

- The proposed remediation works, including leaving residual contamination on the Site and down hydraulic gradient of the Site, will be protective of ecological health within Darling Harbour and ultimately will be protective of ecological health within the areas down hydraulic gradient of the Site – in accordance with the biodiversity principle; and
- The proposed remediation works contemplate use of innovative *in situ* remediation technologies designed, among other things, to promote efficient pricing of the required remediation works – valuation principle.

Should the proposed remediation extent be required to be increased, the associated cost and potential environmental harm would substantially outweigh any real benefit to the environment and would be inconsistent with the principles of ESD.

6.7.4 Waste Avoidance and Resource Recovery Act (2001)

In considering the extent of remediation that can be achieved practicably for the protection of the environment, it is appropriate to consider the principles of waste avoidance and resource recovery. The objectives and principles encompassed by the *Waste Avoidance and Resource Recovery Act* (2001) are described in **Section 6.1.4**. In summary, the *Act* seeks to avoid generation of wastes by avoidance (including action to reduce the amount of waste created), resource recovery (including reuse, recycling and reprocessing) and, where required/unavoidable, disposal in the most environmentally responsible manner.

If it was proposed to achieve a higher level of protection for the environment than currently proposed, a substantial increase in remediation works would be required to realise any substantial increase in the contaminant mass reduction. Such an increase would also be likely to generate large volumes of excavation spoil which may be unsuitable for beneficial reuse at Barangaroo and, therefore, require disposal to landfill in accordance with the DECCW (2009) *Waste Classification Guidelines*. Minimising the quantity of material deposited in landfills, through the beneficial reuse of material (where possible) is of key importance in terms of sustainability and intergenerational equity. Where beneficial reuse of excavated material is option the potential for Resource Recovery Exemptions can also be considered.

Given that any potential additional remediation works over and above the proposed remediation extent is likely to have only a small incremental benefit to protection of the environment, but as above, result in a substantial increase in the volume of material required disposal to landfill. Such a modification to the proposed remediation extent would therefore be inconsistent with the principles of the *Waste Avoidance and Resource Recovery Act* (2001).

6.8 Conclusions

The assessment of the extent of remediation that can be practicably achieved for protection of the environment was based on consideration of the requirements of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*. As part of this process, consideration was also given to the principles of: (a) ESD, as required by Section 9 of the *CLM Act* (1997); and, (b) the *Waste Avoidance and Resource Recovery Act* (2001).

6.8.1 Recommended Remediation Extent for Protection of the Environment

Based on the assessment described above, the recommended remediation extent for protection of the environment to the extent practicable is:

- Remediation of SPGWT within fill material to the extent practicable (as described by **Section 6.2**);
- Remediation of contaminated soil within the proposed remediation extent recommended for protection of human health – Zone 1 (refer to **Section 5.0** and **Figure F15**) – to the extent practicable such that:
 - the contaminant mass is reduced, on average, by 90% within the Remediation Extent (calculated based on the estimated mass of naphthalene and TPH C₁₀ - C₁₄); and
 - the contaminant concentrations in unsaturated soil and groundwater are less than the relevant SSTCs (for the projection of human health).

6.8.2 Regulatory Compliance

The NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* describe a best-practice framework for the assessment and management of contaminated groundwater in NSW. The recommended remediation extent for protection of the environment (refer to **Section 6.8.1**) is considered to be consistent with the key requirements of this guideline as follows.

Source Control

Source control is a primary objective of the proposed remediation extent. In particular, the primary remediation goal for protection of the environment is removal of SPGWT to the extent practicable (as discussed following). The primary contaminant sources at the Site are considered to be historical gasworks infrastructure (which has been found to contain SPGWT). Secondary contaminant sources are considered to be areas where SPGWT has been observed in groundwater and soil. As such, achievement of the primary remediation goal will substantially satisfy the requirement of this guideline requirement.

Other secondary contaminant sources may be considered to include areas where CIM (that is soil and groundwater concentrations exceeding the SSTCs for the protection of human health) has been identified. The secondary remediation objective for protection of human health is the remediation of CIM to the extent practicable as described by **Section 5.0**.

The proposed remediation extent is considered to be consistent with the requirement for source control for protection of the environment.

Remediation of NAPL to the Extent Practicable

The proposed remediation extent is consistent with the guideline requirement for remediation of NAPL to the extent practicable (as well as the requirement for source removal) because the proposed remediation extent includes:

- All of the known historic gasworks structures, which are considered to be representative of primary contaminant sources; and
- The majority of locations (i.e. 29 out of 30 locations both within the Site and down hydraulic gradient of the Site) at which NAPL has been recorded in fill by previous investigations, which are considered to be representative of secondary contaminant sources. It is noted that this calculation excludes the impact reported at:
 - BH60/MW60 and BH74 which will be addressed by the ORWN and Barangaroo Central RAPs; and
 - BH48, BH69/MW69, BH400, BH402, BH403, BH404, BH405, BH406 where SPGWT was reported in either marine sediments or bedrock.

Removal of the residual pockets of NAPL that have been reported outside the proposed remediation extent is considered neither practicable nor necessary because:

- The majority of these locations are within marine sediment or bedrock. Contaminant flux from the underlying bedrock or marine sediment is negligible, such that contaminants present within the marine sediment and bedrock is largely being contained and does not represent a risk to the environment;
- Contaminant flux modelling (AECOM, 2013a), which includes the presence of residual SPGWT at depth within fill and marine sediments, demonstrates that the residual SPGWT following completion of the proposed remediation will not represent an unacceptable impact to the environment; and
- The benefit of treating or removing the residual SPGWT does not outweigh the cost in terms of negative impact to the environment.

Clean Up to the Extent Practicable

As required by Section 4.3 of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, the key factors that must be considered to assess whether CUTEP has been achieved are:

- **Technical capability to achieve the clean-up:**
 - A range of remediation technologies have been considered as an outcome of the remediation technology assessment presented in the *VMP/Block 4 RAP* (AECOM, 2013b). Importantly, the process

adopted by the *VMP/Block 4 RAP* (AECOM, 2013b) for selection of an appropriate remediation strategy was based on the nature and distribution of contamination reported within the Site and areas adjacent to the Site and was not based on the outcomes of this remediation extent document.

- The technical capability of the most likely remediation technologies range from:
 - 90% for potential *in situ* remediation technologies; to
 - 100% for potential ex situ remediation technologies;
- The technical capability of the most likely remediation technologies applied to the proposed remediation extent will result in a reduction in gasworks related contaminant mass of between 88-92% within fill materials.
- Of the residual gasworks related contamination that will remain *in situ* following the proposed remediation works, the majority (approximately half of the residual) of the contaminant mass is present within the marine sediments down hydraulic gradient of the Site.
- There is considered to be a negligible potential for contaminant flux and discharge from the natural marine sediments underlying the Site and off Site areas into Darling Harbour and remediation of the marine sediments is not considered to be warranted for the protection of the environment (or human health).
- **Threats the contamination poses to human or ecological health:**
 - If the remediation proposed for protection of human health is completed, as described by **Section 5.0**, there will not be an unacceptable ongoing risk to human health under current land uses.
 - If the remediation proposed for protection of human health is completed, as described **Section 5.0**, and to the technical capability of the most likely remediation technologies (i.e. a 90% on average reduction in contaminant mass) there will be no unacceptable ongoing risk to the environment. This conclusion is supported by contaminant flux modelling undertaken by AECOM that demonstrated:
 - The groundwater quality in fill at the down hydraulic gradient boundary of the Site would be expected to improve by between 250% and 380% (measured in terms of a reduction in mass flux) as a result of the proposed remediation; and
 - Less than 1% of the contaminant mass flux discharging to Darling Harbour is associated with the marine sediment;
 - Groundwater quality estimated from the contaminant mass flux discharging to Darling Harbour from residual contamination that will remain *in situ* following the proposed remediation will be less than the MWQC and therefore not represent an unacceptable risk to the environment; and
 - Groundwater quality discharging from fill into Darling Harbour will improve further over time because better quality groundwater (that is with a lower contaminant mass flux) from the Site will slowly migrate towards Darling Harbour.
- **The value of the groundwater resource:**
 - Groundwater at the down hydraulic Site boundary is required by the EPA to be protective of both potential groundwater ecosystems that may be present down hydraulic gradient of the Site (as required by the precautionary principle) and Darling Harbour.
 - AECOM has demonstrated through consideration of multiple lines of evidence that residual contamination that will remain *in situ* following completion of the proposed remediation will not represent a threat to ecological health and will be protective of the identified groundwater value.
- **Clean-up costs:**
 - If it was proposed to achieve a higher level of protection for the environment than currently proposed, a substantial increase in remediation works would be required to realise any substantial increase in the contaminant mass reduction
 - It is considered that the cost and potential environmental harm associated with expansion of the proposed remediation extent would substantially outweigh any real benefit to the environment, which

would be minimal at best, particularly considering that contamination within the marine sediments does not appear to be significantly impacting the environment under current conditions.

- The practicability of implementing the most likely remediation technologies would be reduced as a consequence of increasing the proposed remediation extent and in particular, the depth of remediation including the requirement to remediate saturated marine sediments.
- It is considered that the additional remediation works (as might be required to achieve a greater degree of environment protection), would be impracticable, cost prohibitive and inconsistent with the principles of ESD (in particular providing for intergenerational equity). That is the net cost to the environment of undertaking the additional works would be greater than the environment benefit realised from the additional work at the Site.
- Additional remediation works would be inconsistent with the principles of the *Waste Avoidance and Resource Recovery Act* (2001) which seeks to avoid generation of wastes by avoidance (including action to reduce the amount of waste created), resource recovery (including reuse, recycling and reprocessing) and, where required/unavoidable, disposal in the most environmentally responsible manner.

Additional remediation works would be inconsistent with Section 4.4 of NSW DEC (2007) which requires that the benefits from undertaking groundwater clean-up (for example the reduction in contaminant mass) must outweigh any incidental negative impacts to human health or the environment that could arise from the clean-up (for example the volume of remediation required to achieve the requisite contaminant mass reduction).

7.0 Summary

This VMP Remediation Extent report has been prepared to describe:

- The remediation goals, based on the assessment of risk in the *VMP Human Health and Ecological Risk Assessment* (VMP HHERA, AECOM, 2012c) and developed to meet NSW EPA policy requirements, that are applicable to remediation of the Site to achieve the nominated remediation objectives; and
- The extent of remediation required to achieve the remediation goals on which the *VMP/Block 4 RAP* (AECOM, 2013b) will be based.

Remediation Goals

The remediation goals for the protection of human health and the environment have been developed based on the recommendations of the *VMP HHERA* (AECOM, 2012c) and to meet NSW EPA policy requirements. The remediation goals are:

- As a primary goal, removal / remediation of Separate Phase Gasworks Waste and Tar (SPGWT) to the extent practicable as required by the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*; and
- As a secondary goal, removal / remediation of soil, to the extent practicable:
 - That is representative of Confirmed Impacted Material (CIM), which is defined as:
 - Unsaturated soil concentrations exceeding the soil Site-Specific Target Criteria (SSTC); and/or
 - Unsaturated or saturated soil concentrations that are considered to be the source of groundwater concentrations exceeding the groundwater SSTCs in fill material; and
 - Such that groundwater quality within fill material leaving the Site (measured in fill at the down hydraulic gradient Site boundary) approaches the Marine Water Quality Criteria (MWQC).

Remediation Extent

The extent of remediation in the unsaturated and saturated zones is presented on **Figure F14** and **Figure F15**, respectively.

The lateral extent of remediation has been determined based on consideration of:

- The presence of historic gasworks infrastructure, the distribution of SPGWT and CIM within the respective Site areas; and
- The extent of remediation that can be practicably achieved for the protection of the environment based on:
 - The standard of remediation that can be practically achieved by the remediation technologies that are most likely to be implemented;
 - Regulatory policy requirements including:
 - source removal, removal of NAPL to the extent practicable, and clean-up to the extent practicable as contemplated by the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*;
 - The principles of ESD as required by Section 9 of the *CLM Act* (1997); and
 - The principles of the *Waste Avoidance and Resource Recovery Act* (2001).

The standard of remediation to be achieved within the proposed Remediation Extent should equal the higher of:

- Removal of SPGWT to the extent practicable, for the protection of human health and the environment;
- Removal / remediation of soil and groundwater concentrations present within fill material exceeding the relevant SSTCs, to the extent practicable; and
- Removal/remediation of contaminated fill materials such that the contaminant mass within the Remediation Extent fill material is reduced, on average, by 90%, to the extent practicable (calculated based on the estimated mass of naphthalene and TPH C₁₀ - C₁₄).

The vertical extent of remediation has been broadly defined as remediation to the depth of the underlying natural bedrock to a maximum depth of 10 m below ground level (bgl). The vertical extent of remediation is based on consideration of:

- locations where SPGWT has been reported;
- locations where exceedances of the groundwater SSTC and unsaturated soil SSTC have been reported;
- the footprint of historical gasworks structures and infrastructure; and
- the depth to bedrock (noting that the depth to bedrock steadily increases to the west beyond the 10 m bgl rock contour).

It is noted that SPGWT and CIM have been reported in the natural marine sediments both within the Site and in some hydraulically down gradient areas to the west of the Site. However, the negligible contaminant flux from these natural materials is not considered to pose a significant risk to human health or the environment (refer to **Section 2.5**). As such, the proposed extent of remediation works excludes remediation of natural marine sediments which are present below a depth of 10 m bgl.

The extent of remediation works at the Site is recommended to include the following site areas.

Block 4 and Block 5

- Unsaturated zone (i.e. between 0 and 2 m bgl):
 - All Block 4 areas where SPGWT has been identified (refer to Table 3 and Figure F6).
- Saturated zone (i.e. greater than 2 m bgl):
 - All Block 4 areas where SPGWT has been identified (refer to Table 3 and Figure F6);
 - The western portion of the 1870 gasholder annulus (Block 4);
 - The eastern portion of Block 4 and 5 (i.e. east of the 10 m bgl bedrock contour);
 - The south east portion of Block 4 in the vicinity of BH42/BH408; and
 - The western portion of Block 4 in the vicinity of BH49 and BH119.

Hickson Road

- All areas where SPGWT has been identified (refer to Table 6 and Figure F8):
 - The BH7/MW7 and BH53 area – the southern tar tank;
 - The BH10/MW10 area - eastern portion of the 1870 gas holder;
 - The western portion of the main gas holder annulus;
 - The northern tar tank; and
 - The BH6, BH15 and BH61 area - located west and down gradient of the main gas holder annulus and northern/southern tar tanks.

Off-site Areas (West of the Block 5 portion of the Site)

- BH70 at a depth of approximately 2 to 3 m bgl in fill material (where SPGWT has been potentially identified); and
- BH541 at a depth of approximately 9.9-10 m bgl in fill material (where SPGWT has been potentially identified and the groundwater is considered to be CIM based on benzene concentrations).

Off Site Areas (East)

- The *VMP/Block 4 RAP* must consider management measures to mitigate against the risk of the remediated Site being re contaminated by contaminant migration from SPGWT likely to remain in situ within the portions of the main gasholder annulus and tar tank located east of the Site.

The proposed extent of remediation is considered to be consistent with the key requirements of the NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, in particular:

- Source Control and remediation of NAPL to the extent practicable – the proposed extent of remediation includes all of the identified primary contaminant sources (i.e. historical gasworks structures) and the majority of all secondary contaminant sources in fill (i.e. areas where SPGWT has been observed); and
- Clean Up to the Extent Practicable – based on consideration of:
 - *Technical capability to achieve the clean-up* – the technical capability of the most likely remediation technologies applied to the proposed remediation extent will result in a reduction in gasworks related contaminant mass of between 88-92% within fill materials.
 - *Threats the contamination poses to human or ecological health* – following the proposed remedial works, it is expected that there will not be an unacceptable ongoing risk to human health (under current land use) or the environment. Protection of the environment has been demonstrated by contaminant mass flux modelling which has shown: significant improvement to the groundwater quality in fill at the down hydraulic gradient boundary of the Site; and, groundwater quality discharging to Darling Harbour from residual contamination will be less than the MWQC.
 - *The value of the groundwater resource* - multiple lines of evidence have been provided to demonstrate that residual contamination that will remain *in situ* following completion of the proposed remediation will not represent a threat to ecological health and will be protective of the identified groundwater value.
 - *Clean-up costs* – Any proposal to achieve a higher level of protection for the environment than proposed in this document would be inconsistent with the principles of ESD (as required by the *CLM Act* [1997]), the *Waste Avoidance and Resource Recovery Act* (2001) and Section 4.4 of *NSW DEC* (2007) which requires that the benefits from undertaking groundwater clean-up (for example the reduction in contaminant mass) must outweigh any incidental negative impacts to human health or the environment that could arise from the clean-up (for example the volume of remediation required to achieve the requisite contaminant mass reduction).

8.0 References

- AECOM, 2010b. *Data Gap Investigation, Data Gap Investigation, EPA Declaration Area (Parts of Barangaroo Site and Hickson Road), Hickson Road, Millers Point, NSW*. September 2010.
- AECOM, 2010c. *Data Gap Investigation, Other Remediation Works (North) Area, Hickson Road, Millers Point, NSW*. November, 2010.
- AECOM 2010d. *Groundwater Discharge Study, Stage 1 Barangaroo Development*. 3 November 2010.
- AECOM, 2011. *Declaration Site (Development Works) Remediation Works Area HHERA – Barangaroo*. 9 June.
- AECOM, 2012a. *VMP Supplementary Data Gap Investigation, Site, Millers Point, NSW*, March 2012.
- AECOM, 2012b. *Contaminant Flux and Discharge Estimates for Natural Residual Soil and Marine Sediments, EPA Declaration Area 21122 and adjacent areas of Barangaroo South and Barangaroo Central*, 14 March 2012.
- AECOM, 2012c. *Human Health and Ecological Risk Assessment, VMP Remediation Works Area, (Addressing the NSW EPA Remediation Site Declaration 21122, Millers Point)*. October 2012 (Draft).
- AECOM, 2012d. *Barangaroo Excavations - Geotechnical Materials Assessment, Potential for Re-use as Fill at Selected Sites*. 3 April.
- AECOM, 2013a. *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*. 8 March 2013.
- AECOM, 2013b. *VMP/Block 4 RAP, NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW*. 23 July 2013.
- ANZECC, 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resourced Management Council of Australia and New Zealand.
- CCME 1999. *Canadian environmental quality guidelines*. Canadian Council of Ministers of the Environment, Winnipeg.
- Coffey Environments (Coffey), 2008. *Preliminary Environmental Investigation, 30-38 Hickson Road, Millers Point, NSW 2000*. May 2008.
- Coffey. 2010. *Barangaroo Stage 1 Development Geotechnical Report*. 15 October.
- Davis, GB, Patterson, BM and Trefry, MG, 2009. *Biodegradation of petroleum hydrocarbon vapours*, CRC CARE Technical Report no. 12. CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.
- Department of Environment and Heritage, 1997. *Protection of the Environment Operations Act*.
- Ecologically Sustainable Development Steering Committee (1992). *National Strategy for Ecologically Sustainable Development*, endorsed by Endorsed by the Council of Australian Governments. December.
- E.K. Hocking (2001). *Intergenerational Equity and Environmental Restoration Cleanup Levels*.
- ERM, 2007. *Environmental Site Assessment, East Darling Harbour, Sydney, NSW*. June 2007.
- ERM, 2008a. *Additional Investigation Works at Barangaroo, Hickson Road, Millers Point, NSW*. July 2008.
- JBS Environmental, 2012. *Barangaroo Central DGI*. August.
- NEPC, 1999a. *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*. National Environment Protection Council.
- NEPC, 1999b. *Guideline on the Investigation Levels for Soil and Groundwater. Schedule B(1)*. National Environmental Protection Measure. National Environmental Protection Council.
- NSW DoP, 2007. *Major Project Assessment: Barangaroo – Demolition Proposed by Sydney Harbour Foreshore Authority. Director General's Environmental Assessment Report*. New South Wales Department of Planning. November 2007.
- NSW DEC, 2006. *Guidelines for the NSW Site Auditor Scheme (2nd edition)*.

NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*.

NSW DECCW, 2009. *Waste Classification Guidelines*.

NSW EPA, 1995. *Sampling Design Guidelines*.

Oakridge (Suter and Tsao) 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota, 1996 Revision*. Risk Assessment Program Health Sciences Research Division. US Department of Energy Office of Environmental Management. Tier II Secondary Chronic Values. June.

VeruTEK, 2011. *Revised Work Plan and Trial Management Plan, Surfactant Enhanced In Situ Chemical Oxidation (S-ISCO) & Surfactant Enhanced Product Recovery (SEPR)*.

Appendix A

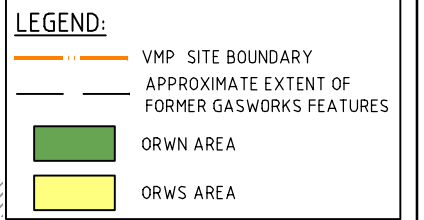
Figures

Appendix A Figures

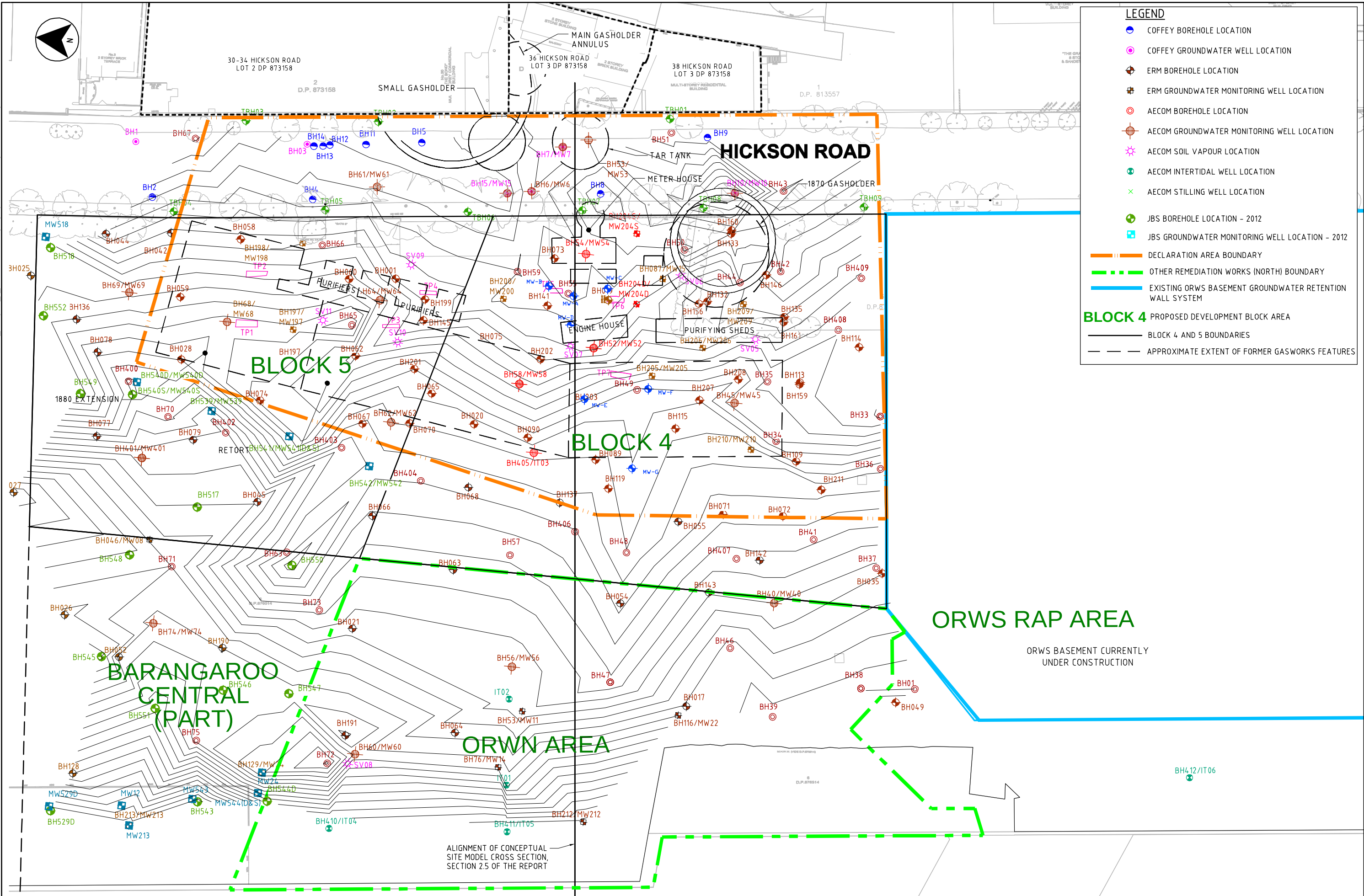
- Figure F1 Site Location
- Figure F2 Site Layout
- Figure F3 Site Plan and Sampling Locations
- Figure F4: Soil SSTC Exceedances (Unsaturated)
- Figure F5: Groundwater SSTC Exceedances
- Figure F6: Locations of Separated Phase Gasworks Waste and Tar (SPGWT)
- Figure F7: Off Site Gasworks Related Impacts in Fill Material
- Figure F8: Off Site Gasworks Related Impacts in Marine Sediments
- Figure F9: Indicative Bedrock and Marine Sediment Contours
- Figure F10: Cross Section A-A' – Indicative Bedrock and Marine Sediment Contours
- Figure F11: Cross Section B-B' – Indicative Bedrock and Marine Sediment Contours
- Figure F12: Cross Section C-C' – Indicative Bedrock and Marine Sediment Contours
- Figure F13: Cross Section D-D' – Indicative Bedrock and Marine Sediment Contours
- Figure F14: Extent of Remediation (Unsaturated)
- Figure F15: Extent of Remediation (Saturated)
- Figure F16: Site Services Plan (Rygate survey plan)



G:\Projects\602 Projects\60247139 Barangaroo\FIGURES\1.03 VMP Remediation Extent\60247139 F1 Barangaroo Site Location 20.06.2013 TO Rev A



This drawing is confidential and shall only be used for the purposes of this project.						SCALES:  1:2000 A3		THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001:2000				CONTRACTOR:		DESIGNER:  AECOM Australia Pty Ltd A.B.N. 20 093 846 925		CLIENT:		VMP REMEDIATION EXTENT, BARANGAROO			
REVISIONS	05	PAS	23.07.13	FINAL ISSUE		AR	DESIGNED	KM	CHECKED	AR	FIGURE F2: SITE LAYOUT AND SAMPLING LOCATIONS										
	04	PAS	20.06.13	DRAFT ISSUE		AR	DRAWN	TT	CHECKED	PAS											
	03	PAS	12.03.13	DRAFT ISSUE		AR	APPROVED	AR	DATE	23.07.13											
	02	PAS	06.03.13	DRAFT ISSUE		AR															
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REVISIONS	05	PAS	23.07.13	FINAL ISSUE	AR	50000 1:1000 A3	DESIGNED	KM	CHECKED	AR	AECOM	AECOM Australia Pty Ltd A.B.N. 20 093 846 925			FIGURE F3: SITE PLAN AND SAMPLING LOCATIONS	STATUS: FINAL	DRAWING NO: 60247139-DRG-20-VMPRE-F3	REV: 05
	04	PAS	20.06.13	DRAFT ISSUE	AR		DRAWN	TT	CHECKED	PAS								
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	No.	BY	DATE	DESCRIPTION			APPD											



-  COFFEY BOREHOLE LOCATION
-  COFFEY GROUNDWATER WELL LOCATION
-  ERM BOREHOLE LOCATION
-  ERM GROUNDWATER MONITORING WELL LOCATION
-  AECOM BOREHOLE LOCATION
-  AECOM GROUNDWATER MONITORING WELL LOCATION
-  AECOM SOIL VAPOUR LOCATION
-  AECOM INTERTIDAL WELL LOCATION
-  AECOM STILLING WELL LOCATION
-  JBS BOREHOLE LOCATION - 2012
-  JBS GROUNDWATER MONITORING WELL LOCATION - 2012

-  DECLARATION AREA BOUNDARY
 OTHER REMEDIATION WORKS (NORTH) BOUNDARY
 EXISTING ORWS BASEMENT GROUNDWATER RETENTION WALL SYSTEM
BLOCK 4 PROPOSED DEVELOPMENT BLOCK AREA
 BLOCK 4 AND 5 BOUNDARIES
 APPROXIMATE EXTENT OF FORMER GASWORKS FEATURES

NOTE:

LOCATION OF COFFEY GROUNDWATER
WELLS ARE APPROXIMATE ONLY.

The diagram consists of three concentric circles. The outermost circle is blue, the middle circle is orange, and the innermost circle is red. Three arrows point from text labels to these circles: one from the blue circle to the label 'CPAHs EXCEEDS SITE SPECIFIC CRITERIA', one from the orange circle to the label 'TPH C10-C14 EXCEEDS SITE SPECIFIC CRITERIA', and one from the red circle to the label 'TPH C15-C28 EXCEEDS SITE SPECIFIC CRITERIA'.

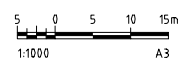
CPAHs EXCEEDS SITE
SPECIFIC CRITERIA

TPH C10-C14 EXCEEDS
SITE SPECIFIC CRITERIA

TPH C15-C28 EXCEEDS
SITE SPECIFIC CRITERIA

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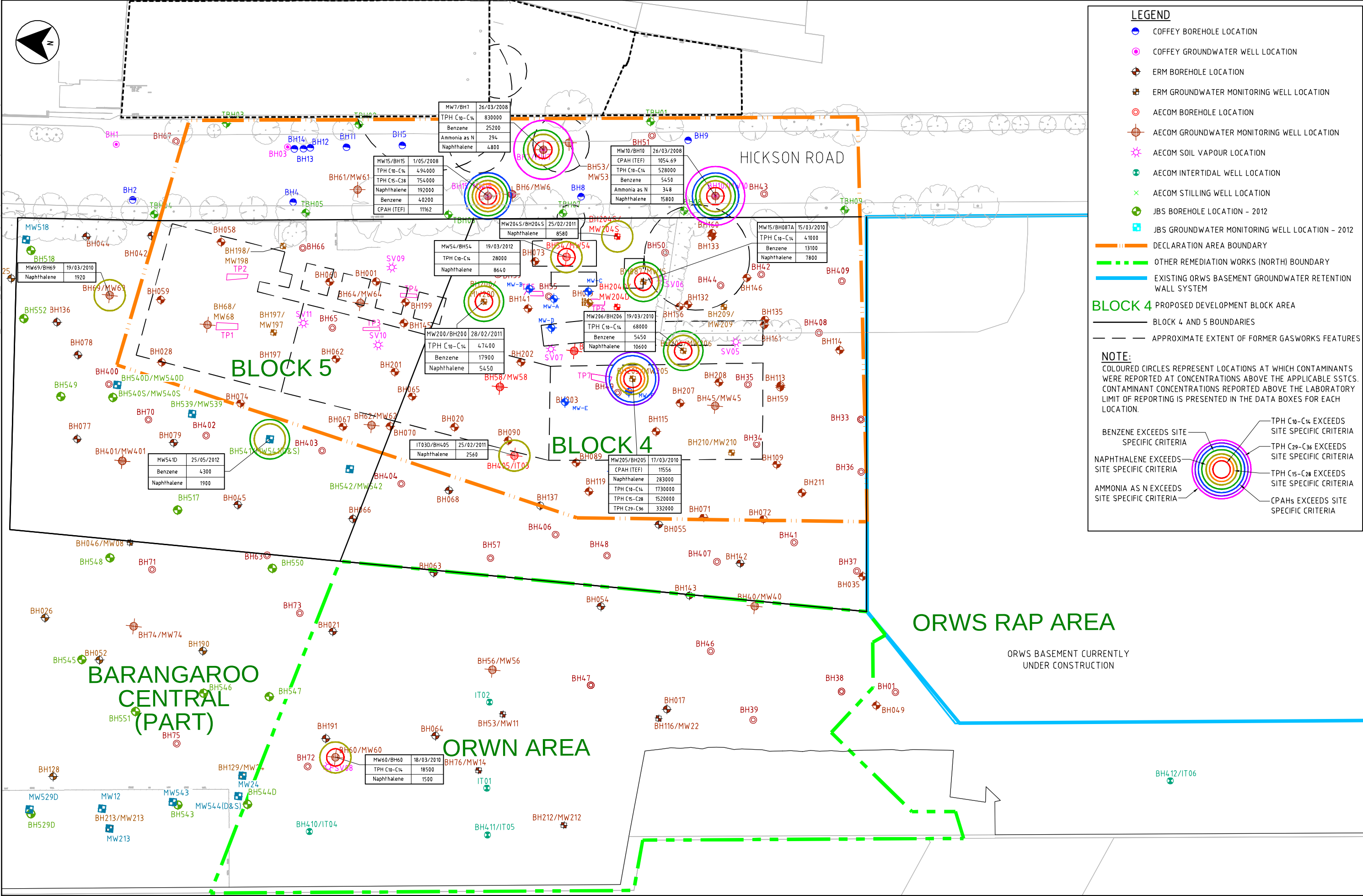
VMP REMEDIATION EXTENT, BARANGAROO

FIGURE F4:
SOIL SSTC EXCEEDENCES (UNSATURATED)

STATUS: FINAL

DRAWING NO:
60247139-DRG-20-VMPRE-F4

EV:
06

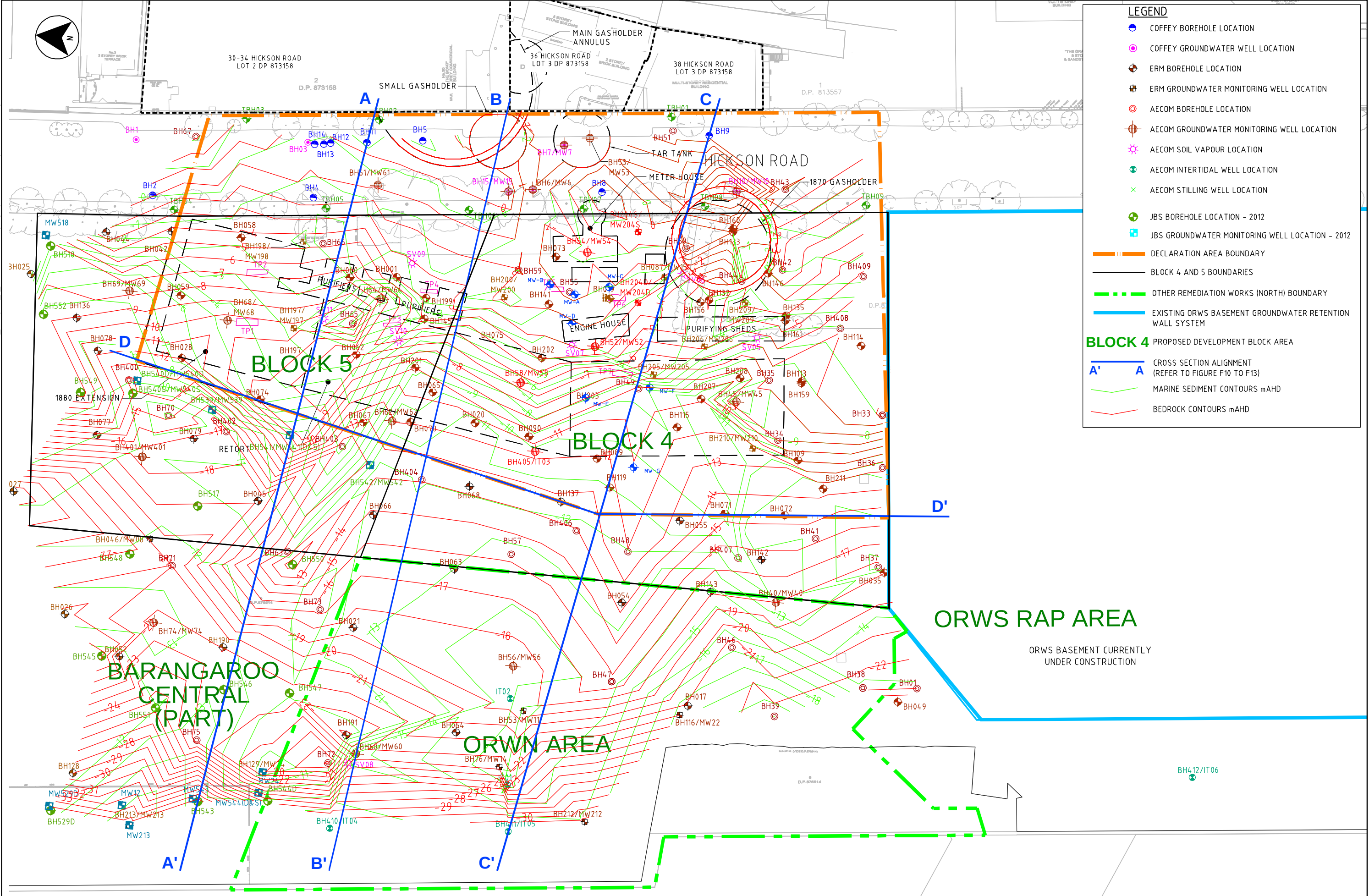


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REVISIONS			DESIGNED KM CHECKED AR			DRAWN TT CHECKED PAS			FIGURE F5: GROUNDWATER SSTC EXCEEDENCES		
06 PAS 23.07.13 FINAL ISSUE AR			APPROVED AR DATE 23.07.13			STATUS: FINAL			DRAWING NO: 60247139-DRG-20-VMPRE-F5		
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No. BY DATE DESCRIPTION APPD											

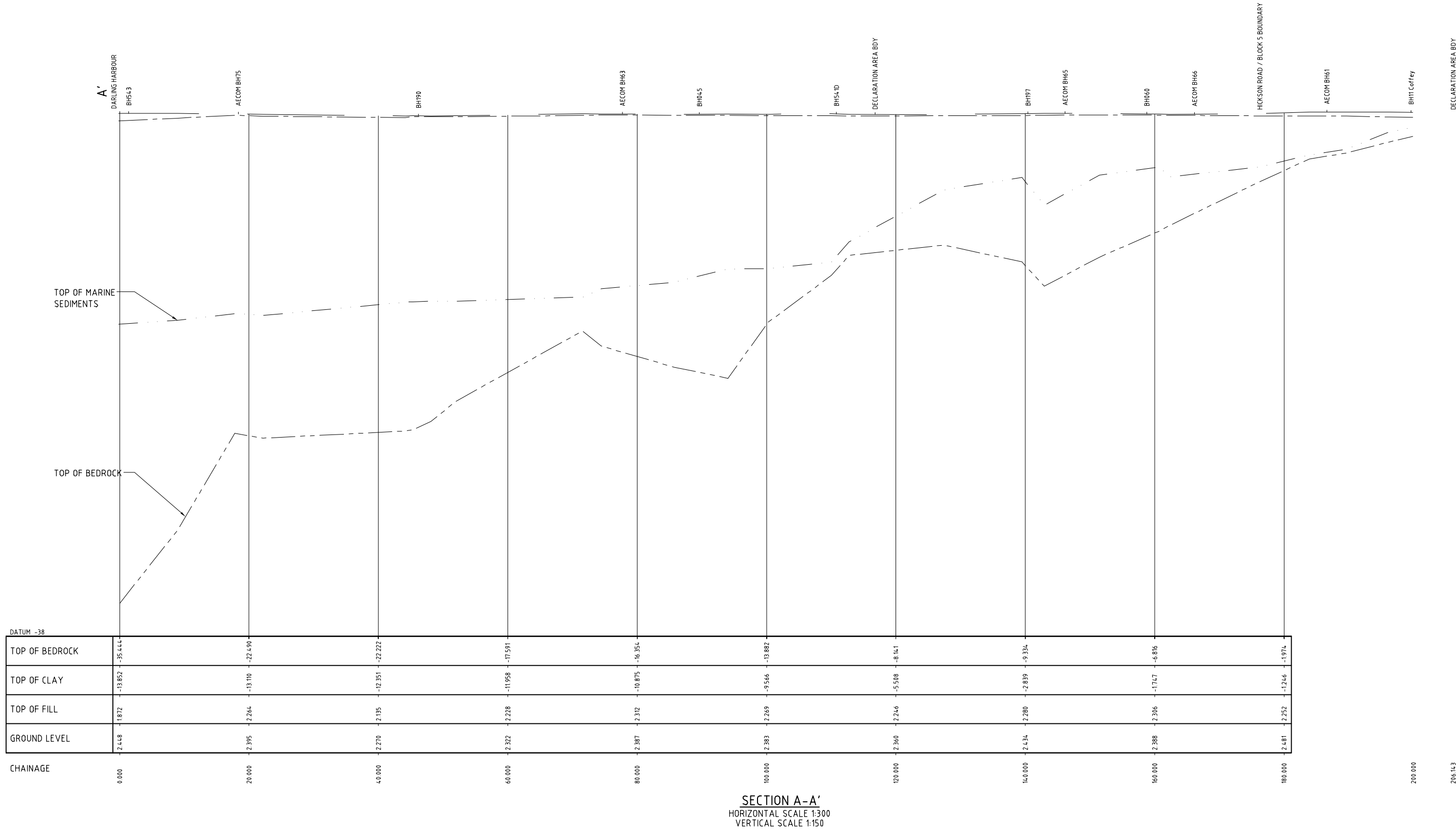
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REVISIONS	05	PAS	23.07.13	FINAL ISSUE	AR	 1:1000 A3		DESIGNED	KM	CHECKED	AR	 AECOM Australia Pty Ltd A.B.N. 20 093 846 925				FIGURE F6: LOCATIONS OF SEPARATED PHASE GASWORKS RELATED WASTES AND TAR (SPGWT)			
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REVISIONS	06	PAS	23.07.13	FINAL ISSUE	AR	 1:1000 A3		DESIGNED	KM	CHECKED	AR	 AECOM Australia Pty Ltd A.B.N. 20 093 846 925						FIGURE F8: OFFSITE GASWORKS RELATED IMPACTS IN MARINE SEDIMENTS				
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REVISIONS	05	PAS	23.07.13	FINAL ISSUE	AR		DESIGNED	KM	CHECKED	AR		AECOM Australia Pty Ltd A.B.N. 20 093 846 925					FIGURE F9: INDICATIVE BEDROCK AND MARINE SEDIMENT CONTOURS			
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1:150 (VERT) FULL SIZE A3

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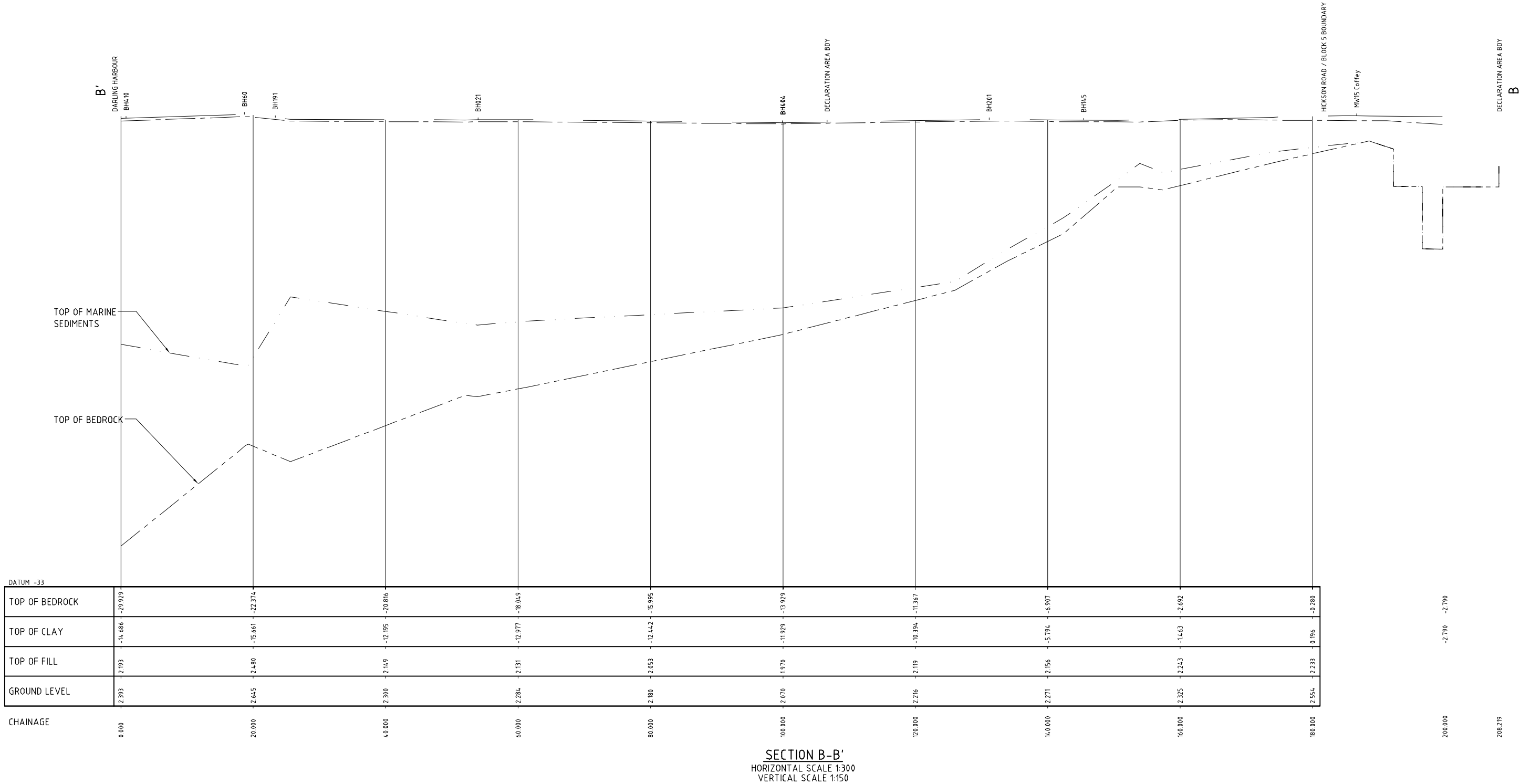
VMP REMEDIATION EXTENT, BARANGAROO

FIGURE F10:
CROSS SECTIONS A-A'
INDICATIVE BEDROCK AND MARINE SEDIMENT CONTOURS

STATUS: FINAL

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REV: 05



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1:150 (VERT)

FULL SIZE A3

FULL SIZE A3

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CLIENT:

VMP REMEDIATION EXTENT, BARANGAROO

FIGURE F11:
CROSS SECTIONS B-B'
INDICATIVE BEDROCK AND MARINE SEDIMENT CONTOURS

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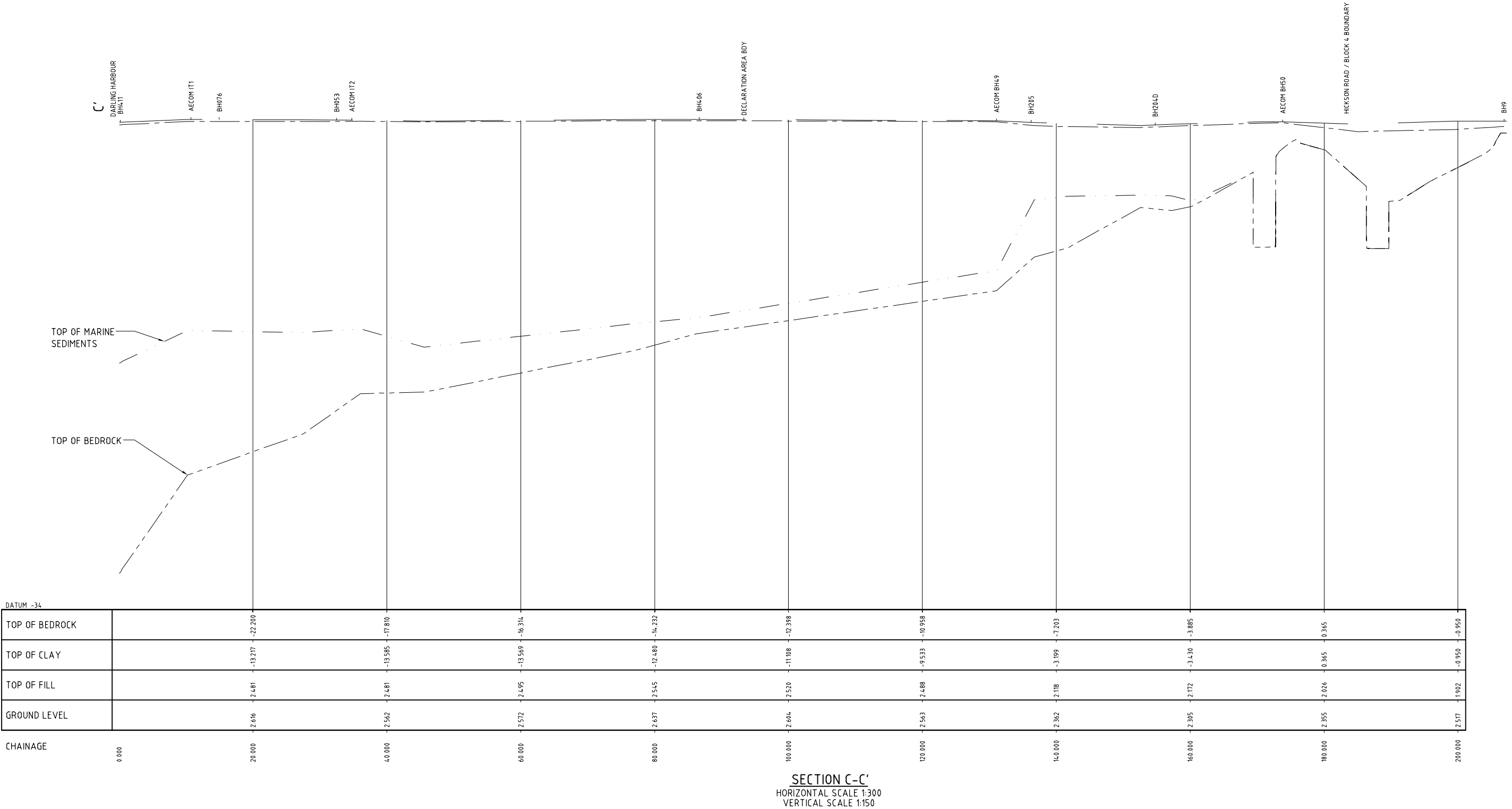
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FULL SIZE A3

1 0 1 2 3 4 5m

1:150 (VERT)

FULL SIZE A3

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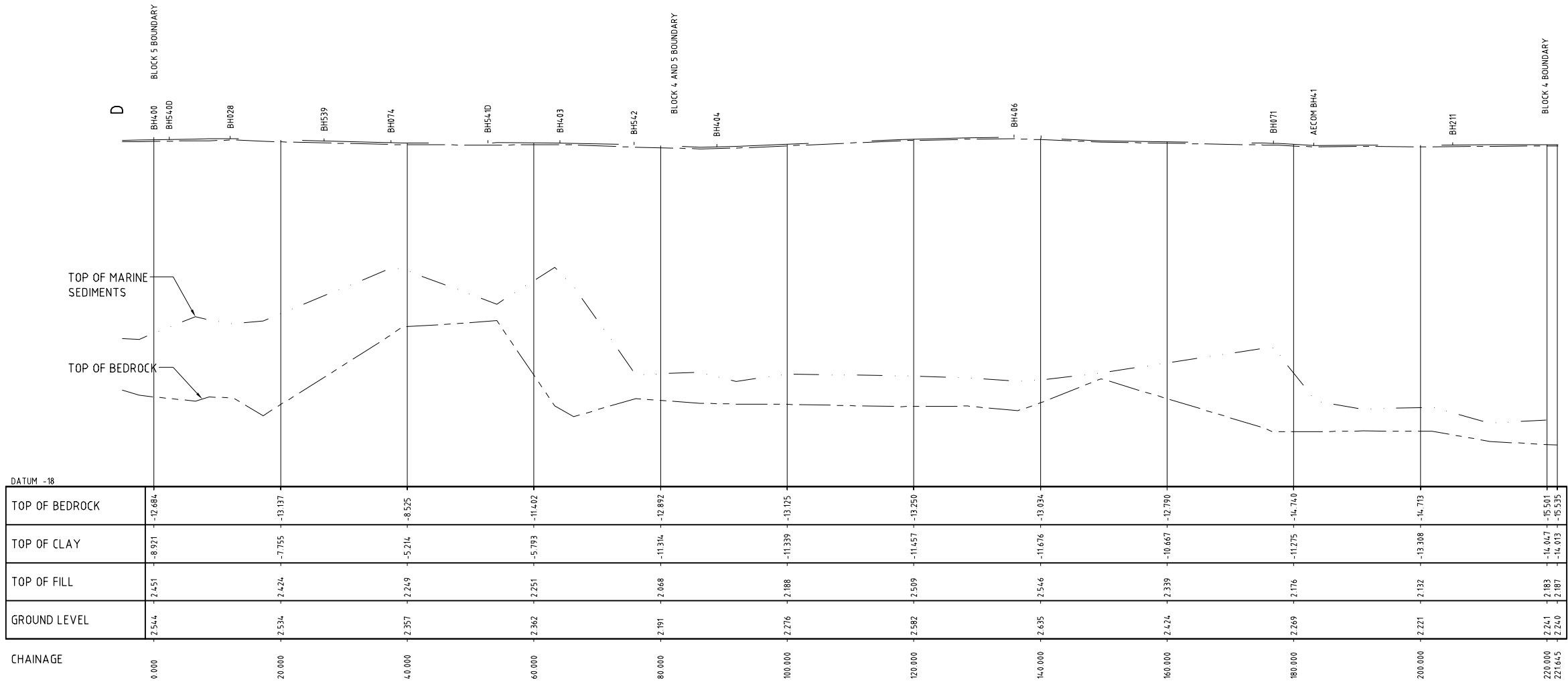
VMP REMEDIATION EXTENT, BARANGAROO

FIGURE F12:
CROSS SECTIONS C-C'
INDICATIVE BEDROCK AND MARINE SEDIMENT CONTOURS

STATUS: FINAL

DRAWING NO: 60247139-DRG-20-VMPRE-F12

REV: 05



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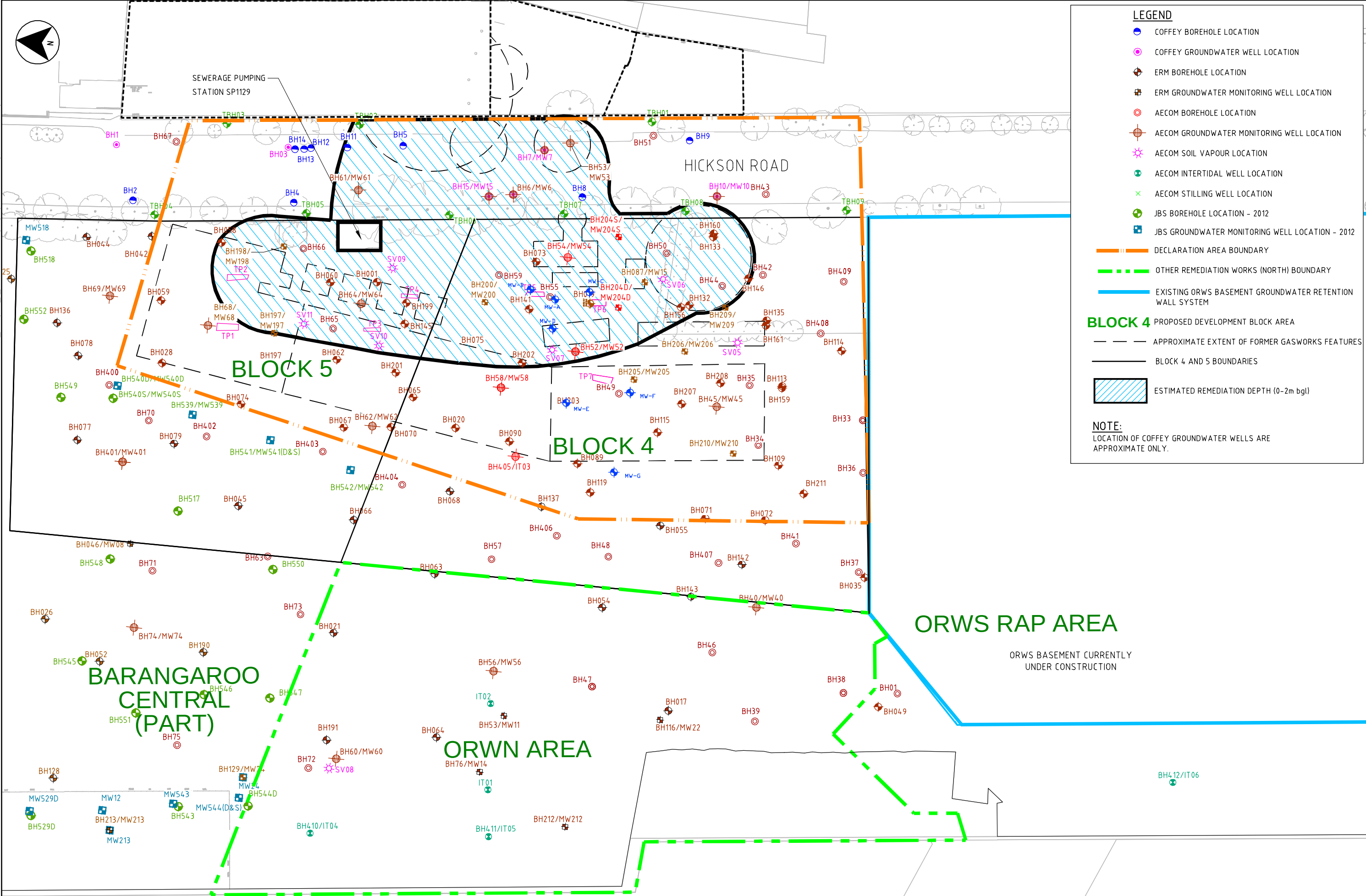
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CLIENT:

VMP REMEDIATION EXTENT, BARANGAROO		
FIGURE F13: CROSS SECTIONS D-D' INDICATIVE BEDROCK AND MARINE SEDIMENT CONTOURS		
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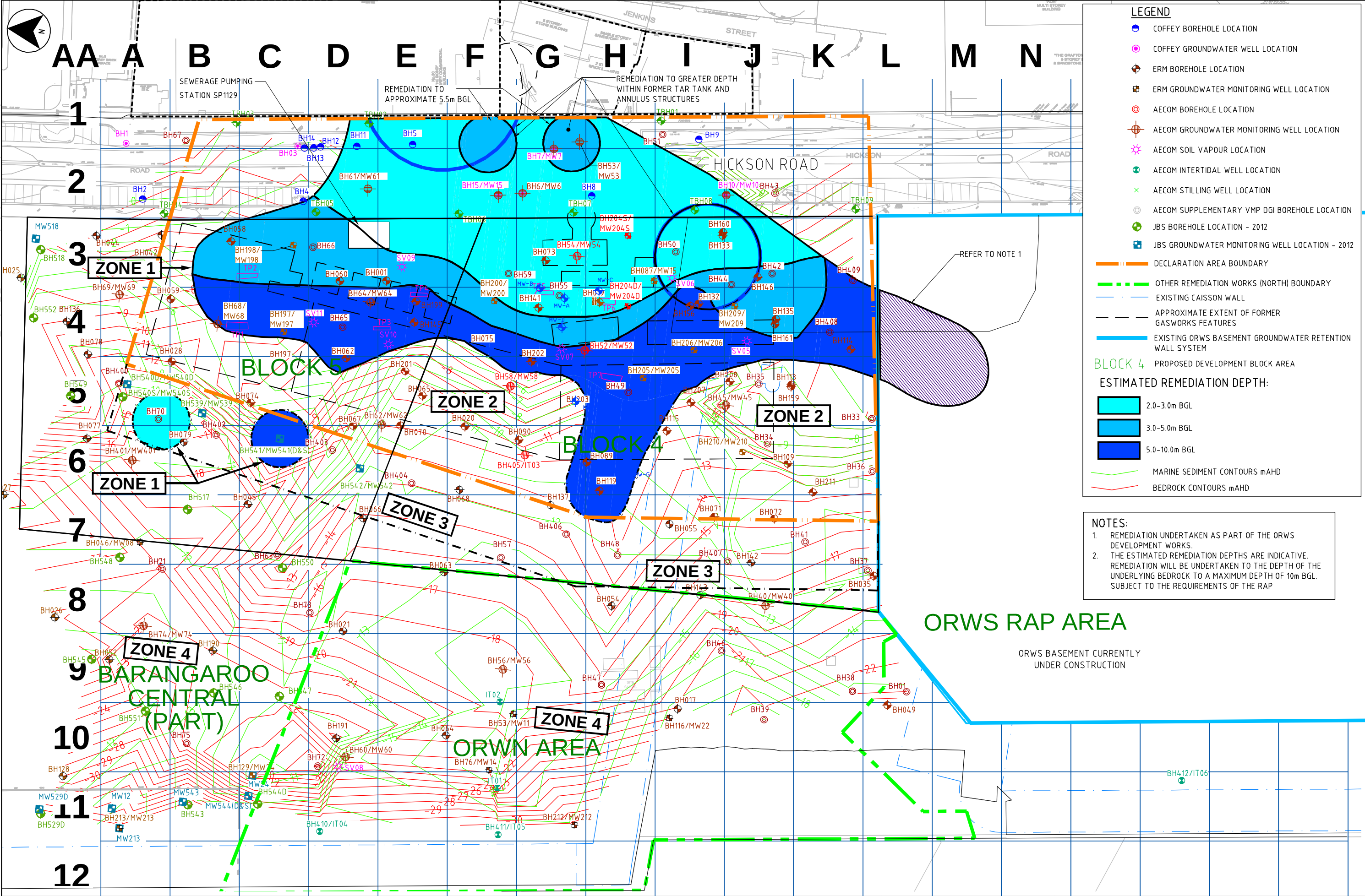
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Last modified: 23 Jul 13 - 14:45



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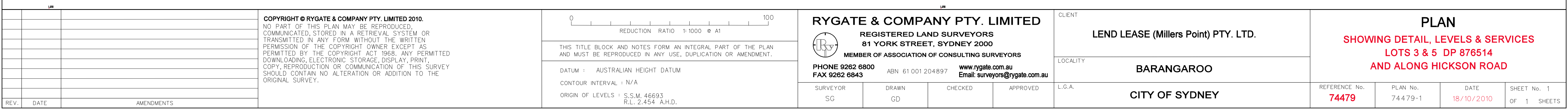
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01	PAS	06.03.13	DRAFT ISSUE		DM

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Last modified: 23 Jul 13 - 14:40



NOTES:
1. REMEDIATION UNDERTAKEN AS PART OF THE ORWS DEVELOPMENT WORKS.
2. THE ESTIMATED REMEDIATION DEPTHS ARE INDICATIVE. REMEDIATION WILL BE UNDERTAKEN TO THE DEPTH OF THE UNDERLYING BEDROCK TO A MAXIMUM DEPTH OF 10m BGL. SUBJECT TO THE REQUIREMENTS OF THE RAP

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				1:1000								AECOM				FIGURE F15: EXTENT OF REMEDIATION (SATURATED)	
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																REV: 04	



Appendix B

Summary Tables

Table T1: Soil Remediation Criteria

Table T2: Groundwater Remediation Criteria

Table T3: Site wide Soil Analytical Results - Unsaturated

Table T4: Site wide Soil Analytical Results – Saturated

Table T5: Block 4 and 5 Soil Analytical Results - Unsaturated

Table T6: Block 4 and 5 Soil Analytical Results - Saturated

Table T7: Block 4 and 5 Asbestos Analytical Results

Table T8: Hickson Road Soil Analytical Results - Unsaturated

Table T9: Hickson Road Soil Analytical Results - Saturated

Table T10: Block 4 and 5 Groundwater Analytical Results (2010-11)

Table T11: Block 4 and 5 Historic Groundwater Analytical Results

Table T12: DECCW Area Site Boundary Groundwater Analytical Results

Table T13: Hickson Road Groundwater Analytical Results (2008-10)

Table T14: Off Site (west) - Soil Analytical Results – Unsaturated

Table T15: Off Site (west) - Soil Analytical Results – Saturated

Table T16: Off Site (west) - Groundwater Analytical Results (west of Block 4 and 5)

Table T17: Offsite Summary of Field Observations of Gasworks Related Impacts

Table T18: Preliminary Technology Screening Matrix

TABLE T1
SOIL REMEDIATION CRITERIA
VMP Remediation Extent
BARANGAROO, NSW

	SOIL REMEDIATION CRITERIA	
CoPC	SRC	Land Use Scenario
Site Area	VMP Area - Unsaturated Soil	
Relevant Land Use Scenarios	mg/kg	Scenarios 1 and 2
Benzene	380	SSTC (Human Health)
TPH C ₁₀ -C ₁₄ aliphatic	54,000	SSTC (Human Health)
TPH C ₁₀ -C ₁₄ aromatic		
TPH C ₁₅ -C ₂₈ aliphatic	72,000	SSTC (Human Health)
TPH C ₁₅ -C ₂₈ aromatic		
TPH C ₂₉ -C ₃₆ aliphatic	21,000	SSTC (Human Health)
TPH C ₂₉ -C ₃₆ aromatic		
CPAH**	67	SSTC (Human Health)

Notes:

All soil criteria in mg/kg

SSTC - Site Specific Target Criteria

TPH - Total Petroleum Hydrocarbons

CPAH= Sum of 8 carcinogenic PAH

Compounds (Benz(a)anthracene

Benzo(a) pyrene; Benzo(b)fluoranthene;

Benzo(g,h,i)perylene;

Benzo(k)fluoranthene; Chrysene;

Dibenz(a,h)anthracene; Indeno(1,2,3-c,d)pyrene)

Land Use Scenarios:

Scenario 1: Public area with concrete/hardstand paving

Scenario 2: Short term intrusive maintenance worker

TABLE T2
GROUNDWATER REMEDIATION CRITERIA
VMP Remediation Extent
BARANGAROO, NSW

	GROUNDWATER REMEDIATION CRITERIA	
CoPC	GRC	Land Use Scenario
Site Area	VMP Area	
Relevant Land Use Scenarios	mg/L	Scenarios 1 and 2
Acenaphthylene	47	SSTC (Scenario 2)
Benzene	2.1	SSTC (Scenario 2)
Naphthalene	1.3	SSTC (Scenario 2)
Ammonia	150	SSTC (Scenario 2)
TPH C ₁₀ -C ₁₄ aliphatic	17	SSTC (Scenario 2)
TPH C ₁₀ -C ₁₄ aromatic		
TPH C ₁₅ -C ₂₈ aliphatic	220	SSTC (Scenario 2)
TPH C ₁₅ -C ₂₈ aromatic		
TPH C ₂₉ -C ₃₆ aliphatic	250	SSTC (Scenario 2)
TPH C ₂₉ -C ₃₆ aromatic		
CPAH	1	SSTC (Scenario 2)

Notes:

All groundwater criteria in mg/L
SSTC - Site Specific Target Criteria
TPH - Total Petroleum Hydrocarbons
CPAH= Sum of 8 carcinogenic PAH Compounds
(Benz(a)anthracene Benzo(a) pyrene;
Benzo(b)fluoranthene; Benzo(g,h,i)perylene;
Benzo(k)fluoranthene; Chrysene;
Dibenz(a,h)anthracene; Indeno(1,2,3-c,d)pyrene)

= an SSTC has not been determined for
remediation purposes as the derived level is at least
10 times greater than saturation/ solubility limits

Land Use Scenarios:

Scenario 1: Public area with concrete/hardstand paving
Scenario 2: Short term intrusive maintenance worker

						PAHs																					
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	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-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
EQL						67		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
SSTC ^{VMP}							2000								150												
Tar Containing Material (TCM) Criteria																											
Location	Sample Depth	Field_ID	Sample Date	Matrix	Area																						
BH001	1	BH001	1/05/2006	Fill	VMP & PDA - Block 5	67.03	699.1				1.1	14.4	19.2	65.9	33.4		98.6	25.5	29.6	70.5	10.4	104	3.6	28.6	11.5	84.4	98.4
BH019	1.5-1.95	BH019 1.5-1.95	8/05/2006	Fill	VMP & PDA - Block 4	<1.21	38.2				<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	1.4	<0.5	29.3	4.1	1.1
BH020	0.3-0.5	BH020 0.3-0.5	9/05/2006	Fill	VMP & PDA - Block 4	9.621	80.3				0.6	1.6	2.5	6.2	6.8		7.7	3.7	2.3	5.4	0.8	14.6	1.2	3.1	0.8	7.8	15.2
BH020	1.5-2.1	BH020 1.5-2.1	9/05/2006	Fill	VMP & PDA - Block 4	6.351	50				<0.5	1.3	1.6	3.9	4.4	5	2.5	1.9	3.6	0.6	8.5	0.7	2.1	0.5	4.7	8.7	
BH021	0.3-0.5	BH021 0.3-0.5	9/05/2006	Fill	VMP & PDA - Block 4	3.06	27.3				<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
BH028	0.3-0.5	BH028 0.3-0.5	12/05/2006	Fill	VMP & PDA - Block 5																						
BH058	1.5-1.95	BH058 1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	39.542	368.6				1.2	8.4	11.1	29	25.3		37.9	19.3	11.8	26.9	4.3	65.3	5.1	16.1	5.7	39.5	61.7
BH059	1.5-1.95	BH059 1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	5.742	52.6				<0.5	2.1	2.1	4.3	3.9	4.6	2.5	1.9	3.7	0.5	8.5	0.6	2	1	6.4	8.5	
BH060	1.7-2	BH060 1.7-2.0	31/05/2006	Fill	VMP & PDA - Block 5	6.082	44				<0.5	1.2	1.3	3.6	3.6	6.3	3.5	2.3	3.7	0.9	5.4	<0.5	2.9	0.6	3.2	5.5	
BH062	1.5-1.95	BH062 1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	30.902	228.3				<0.5	6.6	5.1	17.1	19.9	29.7	14.4	10.1	16.8	3.6	38.2	1.1	14	4	17.1	30.6	
BH065	0.3-0.5	BH065 0.3-0.5	1/06/2006	Fill	VMP & PDA - Block 4	4.098	35.4				<0.5	1.1	1.2	3	3.1	3.6	2.1	1.3	2.7	<0.5	5.9	<0.5	1.6	<0.5	3.6	6.2	
BH065	1.5-1.95	BH065 1.5-1.95	1/06/2006	Fill	VMP & PDA - Block 4	1.134	11.7				<0.5	<0.5	0.6	1.1	0.9	1.1	0.6	<0.5	0.8	<0.5	2.4	<0.5	<0.5	<0.5	1.9	2.3	
BH067	1.5-1.95	BH067 1.5-1.95	1/06/2006	Fill	VMP & PDA - Block 5	1.711	18.6				<0.5	<0.5	0.8	1.2	1.3	1.4	0.9	0.6	1.2	<0.5	3.1	0.7	0.7	0.8	2.9	3	
BH070	0.3-0.5	BH070 0.3-0.5	2/05/2006	Fill	VMP & PDA - Block 4	1.828	17.7				<0.5	0.5	0.6	1.3	1.4	1.6	0.7	0.6	1.1	<0.5	3	<0.5	0.6	0.9	2.3	3.1	
BH070	1.5-1.95	BH070 1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	3.349	30				<0.5	0.7	1.2	2.5	2.5	3.1	1.5	1.2	2.4	<0.5	4.9	<0.5	1.3	<0.5	3.7	5	
BH071	1.5-1.95	BH071 1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH072	0.3-0.5	BH072 0.3-0.5	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH073	1.5-1.95	BH073 1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	140.147	1451.6				20.6	87.8	77.3	107	100	99.3	44	33.5	88.7	10.7	252	56.5	41.4	14.8	190	228	
BH074	1.5-1.95	BH074 1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 5	1.239	11.3				<0.5	0.6	0.5	1.2	1	1.1	<0.5	<0.5	0.9	<0.5	2.4	<0.5	<0.5	<0.5	1.4	2.2	
BH075	0.3-0.5	BH075 0.3-0.5	6/06/2006	Fill	VMP & PDA - Block 4	27.657	242.1				0.5	8.4	7.9	19.4	19	21.2	11.3	9.4	16.4	2.4	42.7	2.2	9.8	2.8	25.7	43	
BH087	1.5-1.95	BH087 1.5-1.95	8/06/2006	Fill	VMP & PDA - Block 4	114.535	2982.2				21.6	177	136	114	78.5	83.6	34	35.2	69.5	8.6	325	182	31.2	925	496	265	
BH089	0.3-0.5	BH089 0.3-0.5	9/06/2006	Fill	VMP & PDA - Block 4	<1.21	2.2				<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	<0.5	0.7	0.7	
BH089	1.5-1.95	BH089 1.5-1.95	9/06/2006	Fill	VMP & PDA - Block 4	4.367	57.4				<0.5	2.5	2.3	3.7	3.3	3.4	1.6	1.7	3.1	<0.5	7.7	2	1.4	9	8.3	7.4	
BH090	1.5-1.95	BH090 1.5-1.95	9/06/2006	Fill	VMP & PDA - Block 4	0.845	5.6				<0.5	<0.5	<0.5	0.6	0.7	0.8	<0.5	<0.5	0.5	<0.5	1.1	<0.5	<0.5	<0.5	0.8	1.1	
BH109 0.3	0.3-0.5	BH109 0.3 0.5	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH113 1.5	1.5-1.95	BH113 1.5 1.95	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH114 0.3	0.3-0.5	BH114 0.3 0.5	28/06/2006	Fill	VMP & PDA - Block 4	2.225	15				<0.5	<0.5	<0.5	1.2	1.7	2	1.3	0.9	1.2	<0.5	2.3	<0.5	0.9	<0.5	1	2.5	
BH115 0.8	0.8-1	BH115 0.8 1.0	28/06/2006	Fill	VMP & PDA - Block 4																						
BH115 1.5	1.5-1.95	BH115 1.5 1.95	28/06/2006	Fill	VMP & PDA - Block 4	0.877	7.4																				

						PAHs																					
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	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-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
EQL						67		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
SSTC ^{VMP}							2000								150												
Tar Containing Material (TCM) Criteria																											
Location	Sample Depth	Field_ID	Sample Date	Matrix	Area																						
MW10	1.9-2	MW10 1.9-2.0	21/02/2008	Fill	VMP & PDA - Hickson Road	12.023	87.2	<0.5	<0.5	<0.5	<0.5	1.6	2.4	21.1	8.6	14		1.2		7.1	1	16.8	<0.5	2.3	<0.5	7.6	17.5
MW15	0.4-0.5	MW15 0.4-0.5	10/04/2008	Fill	VMP & PDA - Hickson Road	<1.11	<7	<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	
MW15	1.4-1.5	MW15 1.4-1.5	10/04/2008	Fill	VMP & PDA - Hickson Road	<1.11	<7	<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	
MW3	0.4-0.5	MW3 0.4-0.5	23/02/2008	Fill	VMP & PDA - Hickson Road	0.16	5.1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	0.8	<0.5	1		1		<0.5	<0.5	0.7	<0.5	0.7	<0.5	0.5	0.8
MW3	0.9-1	MW3 0.9-1.0	23/02/2008	Fill	VMP & PDA - Hickson Road	19.996	468.5	<0.5	<0.5	<0.5	1.7	42.5	13.8	44.6	11.7	62		4.2		23.4	2.7	91.1	8.5	8.6	2.5	120	93.2
MW6	0.8-0.9	MW6 0.8-0.9	20/02/2008	Fill	VMP & PDA - Hickson Road	<1.11	<7	<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	
MW7	1.4-1.5	MW7 1.4-1.5	25/02/2008	FILL	VMP & PDA - Hickson Road	38.745	218	<0.5	0.7	<0.5	0.7	7.7	9.6	41.2	32.1	49		1.4		16.1	1.7	36.6	2	6.5	1.6	24.9	35.9
SV09	0.2-0.4	SV09 0.2-0.4	26/02/2010	Fill	VMP & PDA - Block 5	42.044	495.4		<0.5		1.4	9.9	18.5	45.3	25.4		43.7	14.5	18	33.9	4.2	97.5	3.4	12.6	5.8	69.1	92.2
TBH01	0.43-0.5	TBH01 0.43-0.5	5/02/2011	Fill	VMP & PDA - Hickson Road	2.22	16.5				<0.5	<0.5	0.5	1.9	1.7		1.8	0.6	0.7	1.4	<0.5	3.1	<0.5	0.6	<0.5	1.2	3
TBH03	1.2-1.3	TBH03 1.2-1.3	5/02/2011	Fill	VMP & PDA - Hickson Road	<1.21	<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	
TBH03	1.5-1.6	TBH03 1.5-1.6	5/02/2011	Fill	VMP & PDA - Hickson Road	<1.21	<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	
TBH05	0.6-0.7	TBH05 0.6-0.7	12/02/2011	Fill	VMP & PDA - Hickson Road	<1.21	<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	
TBH05	1.3-1.7	TBH05 1.3-1.7	12/02/2011	Fill	VMP & PDA - Hickson Road	0.85	4.1				<0.5	<0.5	<0.5	0.7	0.7		0.8	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5	0.9	
TBH05	1.8-2	TBH05 1.8-2.0	12/02/2011	Fill	VMP & PDA - Hickson Road	28.753	161.8				0.6	0.9	3.1	15.6	18.8		23.8	15.1	9.3	13.2	3.4	19.1	<0.5	14	0.6	8.3	16
TBH06	0.55-0.6	TBH06 0.55-0.6	5/02/2011	Fill	VMP & PDA - Hickson Road	0.967	7.3				<0.5	<0.5	<0.5	0.9	0.8		0.7	<0.5	<0.5	0.7	<0.5	1.7	<0.5	<0.5	<0.5	0.6	1.9
TBH06	1.5-2	TBH06 1.5-2.0	12/02/2011	Fill	VMP & PDA - Hickson Road	<1.21	<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	
TBH07	0.1-0.15	TBH07 0.1-0.15	4/02/2011	Fill	VMP & PDA - Hickson Road	10.663	58.6				<0.5	1.4	1.4	4.7	7.8		8	6.5	2.7	4.8	0.8	6.4	<0.5	4.1	<0.5	1.4	8.6
TBH08	0.13-0.25	TBH08 0.13-0.25	4/02/2011	Fill	VMP & PDA - Hickson Road	1.828	12.3				<0.5	<0.5	<0.5	1.3	1.5		1.3	0.7	0.5	1.1	<0.5	2.8	<0.5	<0.5	<0.5	<0.5	3.1

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a)pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

						TPH						BTEX					
						TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
						50	100	100	10	100	0.15	0.2	0.2	0.2	0.2	0.2	0.2
						54000	72000	21,000				380					
Tar Containing Material (TCM) Criteria																	
Location	Sample Depth	Field ID	Sample Date	Matrix	Area												
BH001	1	BH001	1/05/2006	Fill	VMP & PDA - Block 5	4470	2360	3280	1190	3	6830	0.2	0.5	<0.2	0.4	0.2	<0.2
BH019	1.5-1.95	BH019 1.5-1.95	8/05/2006	Fill	VMP & PDA - Block 4	<200	100	<100	<100	50	100						
BH020	0.3-0.5	BH020 0.3-0.5	9/05/2006	Fill	VMP & PDA - Block 4	810	<50	460	350	<2	810						
BH020	1.5-2.1	BH020 1.5-2.1	9/05/2006	Fill	VMP & PDA - Block 4	620	<50	280	340	<2	620						
BH021	0.3-0.5	BH021 0.3-0.5	9/05/2006	Fill	VMP & PDA - Block 4	230	<50	130	100	<2	230						
BH028	0.3-0.5	BH028 0.3-0.5	12/05/2006	Fill	VMP & PDA - Block 5	340	<50	200	140	<2	340	<0.01	<0.2	<0.2	<0.2	<0.2	<0.2
BH058	1.5-1.95	BH058 1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	3030	120	1960	1070	8	3150	<0.4	0.3	0.3	0.2	<0.2	<0.2
BH059	1.5-1.95	BH059 1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	550	<50	290	260	<2	550	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH060	1.7-2	BH060 1.7-2.0	31/05/2006	Fill	VMP & PDA - Block 5	140	<50	<100	140	<2	140	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH062	1.5-1.95	BH062 1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	1120	100	610	510	8	1220	0.3	<0.2	<0.2	0.4	0.3	<0.2
BH065	0.3-0.5	BH065 0.3-0.5	1/06/2006	Fill	VMP & PDA - Block 4	530	<50	180	350	<2	530	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH065	1.5-1.95	BH065 1.5-1.95	1/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH067	1.5-1.95	BH067 1.5-1.95	1/06/2006	Fill	VMP & PDA - Block 5	1100	<50	480	620	<2	1100	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH070	0.3-0.5	BH070 0.3-0.5	2/05/2006	Fill	VMP & PDA - Block 4	810	<50	600	210	<2	810	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH070	1.5-1.95	BH070 1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	570	<50	230	340	<2	570	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH071	1.5-1.95	BH071 1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH072	0.3-0.5	BH072 0.3-0.5	2/05/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH073	1.5-1.95	BH073 1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	830	<50	560	270	<2	830	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH074	1.5-1.95	BH074 1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH075	0.3-0.5	BH075 0.3-0.5	6/06/2006	Fill	VMP & PDA - Block 4	1010	<50	570	440	<2	1010	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH087	1.5-1.95	BH087 1.5-1.95	8/06/2006	Fill	VMP & PDA - Block 4	7340	2230	5820	1520	20	9570	10.5	0.7	1.2	0.8	7.3	3.2
BH089	0.3-0.5	BH089 0.3-0.5	9/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH089	1.5-1.95	BH089 1.5-1.95	9/06/2006	Fill	VMP & PDA - Block 4	610	70	440	170	<2	680	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH090	1.5-1.95	BH090 1.5-1.95	9/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH109 0.3	0.3-0.5	BH109 0.3 0.5	27/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH113 1.5	1.5-1.95	BH113 1.5 1.95	27/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH114 0.3	0.3-0.5	BH114 0.3 0.5	28/06/2006	Fill	VMP & PDA - Block 4	340	<50	130	210	<2	340	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH115 0.8	0.8-1	BH115 0.8 1.0	28/06/2006	Fill	VMP & PDA - Block 4	900	<50	560	340	<2	900	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH115 1.5	1.5-1.95	BH115 1.5 1.95	28/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH119 1.6	1.6-2.05	BH119 1.6 2.05	30/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH132	1.5-1.95	BH132 1.5-1.95	6/07/2006	Fill	VMP & PDA - Block 4	890	<50	500	390	<2	890	<0.4	0.5	<0.2	<0.2	<0.2	<0.2
BH133	0.3-0.5	BH133 0.3-0.5	6/07/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH133 1.5	1.5-1.95	BH133 1.5 1.95	6/07/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH135A	0.4-0.6	BH135A 0.4-0.6	11/07/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH141	1.5-1.95	BH141 1.5-1.95	7/07/2006	Fill	VMP & PDA - Block 4	2190	70	1600	590	<2	2260	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH145	0.3-0.5	BH145 0.3-0.5	11/07/2006	Fill	VMP & PDA - Block 5	3390	80	2120	1270	4	3470	0.3	0.2	<0.2	0.4	0.3	<0.2
BH146	1.5-1.95	BH146 1.5-1.95	11/07/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH156	0.4-0.5	BH156 0.4-0.5	14/08/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH156	0.9-1	BH156 0.9-1.0	14/08/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH160	0.3-0.4	BH160 0.3-0.4	14/08/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH161	0.3-0.4	BH161 0.3-0.4	14/08/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH197	0.4	BH197/0.4	3/03/2008	Fill	VMP & PDA - Block 5	600	<50	150	450	<10	600	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH200	1	BH200/1.0	7/04/2008	Fill	VMP & PDA - Block 4	14,930	520	10,200	4730	<10	15,450	2.8	1.6	<0.5	2.2	2	0.8
BH203	1.9	BH203/1.9	10/03/2008	Fill	VMP & PDA - Block 4	690	<50	330	360	<10	690	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH204S	1	BH204/1.0	18/03/2008	Fill	VMP & PDA - Block 4	12,690	2890	9620	3070	20	15,580	8.6	0.6	3.5	1.4	4.2	4.4
BH204D	1.5	BH204D/1.5	7/04/2008	Fill	VMP & PDA - Block 4	93,000	54,200	72,400	20,600	226	147,200	94.1	61	7	69.2	67.2	26.9
BH206	0.5	BH206/0.5	7/03/2008	Fill	VMP & PDA - Block 4	490	<50	310	180	<10	490	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH206	1.8	BH206/1.8	17/04/2008	Fill	VMP & PDA - Block 4	530	<50	190	340	<10	530	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH210	1.5	BH210/1.5	18/03/2008	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	

						TPH						BTEX					
						TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)
EQL						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SSTC ^{VMP}						50	100	100	100	10	100	0.15	0.2	0.2	0.2	0.2	0.2
Tar Containing Material (TCM) Criteria						54000	72000	21,000				380					
Location	Sample Depth	Field_ID	Sample Date	Matrix	Area												
MW10	1.9-2	MW10 1.9-2.0	21/02/2008	Fill	VMP & PDA - Hickson Road	830	<50	370	460	<10	830	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW15	0.4-0.5	MW15 0.4-0.5	10/04/2008	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW15	1.4-1.5	MW15 1.4-1.5	10/04/2008	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW3	0.4-0.5	MW3 0.4-0.5	23/02/2008	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW3	0.9-1	MW3 0.9-1.0	23/02/2008	Fill	VMP & PDA - Hickson Road	3270	1010	2510	760	<10	4280	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW6	0.8-0.9	MW6 0.8-0.9	20/02/2008	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<1	<0.2	<0.5	<0.5	<0.5	<0.5
MW7	1.4-1.5	MW7 1.4-1.5	25/02/2008	FILL	VMP & PDA - Hickson Road	2660	<50	1400	1260	<10	2660	<1	0.2	<0.5	<0.5	<0.5	<0.5
SV09	0.2-0.4	SV09 0.2-0.4	26/02/2010	Fill	VMP & PDA - Block 5	3160	120	1920	1240	<10	3280	<1	0.5	<0.5	<0.5	<0.5	<0.5
TBH01	0.43-0.5	TBH01 0.43-0.5	5/02/2011	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH03	1.2-1.3	TBH03 1.2-1.3	5/02/2011	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH03	1.5-1.6	TBH03 1.5-1.6	5/02/2011	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH05	0.6-0.7	TBH05 0.6-0.7	12/02/2011	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH05	1.3-1.7	TBH05 1.3-1.7	12/02/2011	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH05	1.8-2	TBH05 1.8-2.0	12/02/2011	Fill	VMP & PDA - Hickson Road	1210	<50	600	610	<10	1210	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH06	0.55-0.6	TBH06 0.55-0.6	5/02/2011	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH06	1.5-2	TBH06 1.5-2.0	12/02/2011	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<50	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH07	0.1-0.15	TBH07 0.1-0.15	4/02/2011	Fill	VMP & PDA - Hickson Road	700	<50	280	420	<10	700	<1	<0.2	<0.5	<0.5	<0.5	<0.5
TBH08	0.13-0.25	TBH08 0.13-0.25	4/02/2011	Fill	VMP & PDA - Hickson Road	370	<50	110	260	<10	370	<1	<0.2	<0.5	<0.5	<0.5	<0.5

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a)pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

Table T4
Site wide
Soil Analytical Results - Saturated

					PAHs																								
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	PAHs (Sum of total)	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	mg/kg	mg/kg
EQL							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	
SSTC ^{VMP}					67																								
Tar Containing Material (TCM) Criteria						2000									150														
Location	Depth	Sample Date	Sample Type	Area																									
BH001	4	2/05/2006	Fill	VMP & PDA - Block 5	3.531	30.7				<0.5	0.5		0.8	3.3	2.6		3.3	1	1.3	3.1	<0.5	5	<0.5	1	1.3		2.4	5.1	
BH019	2.5-3	8/05/2006	Fill	VMP & PDA - Block 4	82.897	1994.2				24.3	82		79.3	70.3	58.2		56.9	22.6	25.5	54.1	6.4	208	110	22.6	700		295	179	
BH019	3-3.45	8/05/2006	Fill	VMP & PDA - Block 4	122.038	2733.9				31.6	120		114	103	86.3		85.3	32.2	37.2	77.6	8.8	295	157	32.9	891		407	255	
BH020	1.5-2.1	9/05/2006	Fill	VMP & PDA - Block 4	6.351	50				<0.5	1.3		1.6	3.9	4.4		5	2.5	1.9	3.6	0.6	8.5	0.7	2.1	0.5		4.7	8.7	
BH028	13-13.5	12/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	12.142	470.5				6.7	38.6		20.4	13.2	8.4		9	3.1	3.2	11.1	0.8	28.2	32.3	2.6	183		76	33.9	
BH058	6-6.5	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	2.618	154.1				2.7	15.6		6.9	3.6	2		1.6	0.6	0.6	3.2	<0.5	6.6	12.3	<0.5	59.5		28.9	10	
BH059	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	3.224	27.9				<0.5	0.7		1	2.5	2.4		3	1.4	1.2	2	<0.5	4.4	0.5	1.2	<0.5		2.6	5	
BH059	8.5-9	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	10.9				<0.5	1.4		0.6	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	0.8	1.2	<0.5	2.7		3	1.2	
BH060	9.5-10	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	1.4				<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		0.9	0.5	
BH062	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	6.023	47.4				<0.5	1		1.8	3.5	4.2		5	3	1.8	3.3	0.5	7.4	0.6	2.3	<0.5		4.9	8.1	
BH065	3-3.45	1/06/2006	Fill	VMP & PDA - Block 4	11.332	176.3				7	1.4		9.7	9.5	7.7		9.4	4.5	3.5	8.7	0.9	28.3	7.8	3.6	13.9		34.6	25.8	
BH067	3-3.45	1/06/2006	Fill	VMP & PDA - Block 5	6.064	63.1				<0.5	1.1		1.8	5.1	4.5		5.7	2.1	2.4	4.3	<0.5	12.5	0.9	1.8	1.5		7.5	11.9	
BH071	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH072	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH072	9.5-10	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH073	2-2.4	2/05/2006	Fill	VMP & PDA - Block 4	21.659	383.1				4.4	24.4		18.7	19	15.3		15.6	6.3	6.2	14.6	1.5	48.8	20.8	5.7	80.5		58.3	43	
BH074	3-3.45	2/05/2006	Fill	VMP & PDA - Block 5	3.729	45.5				<0.5	1.5		2.6	3.7	2.8		3	1.1	1.2	2.8	<0.5	8.2	1.3	1	<0.5		8.6	7.7	
BH074	9.5-10	2/05/2006	Natural Sandy Clay	VMP & PDA - Block 5	45.766	1222.9				10.5	80.5		60	41.3	32.7		30.6	11.5	12.9	30.1	3.1	112	71.6	10.7	435		184	96.4	
BH075	3-3.45	6/06/2006	Fill	VMP & PDA - Block 4	1.063	9.3				<0.5	<0.5		<0.5	0.9	0.8		1.1	0.6	0.5	0.7	<0.5	1.8	<0.5	<0.5	<0.5		1	1.9	
BH087	3-3.45	8/06/2006	Fill	VMP & PDA - Block 4	113.187	2895.7				24.4	158		120	97.4	79.6		79.6	34	31.9	70.7	8.6	285	160	30.5	1030		439	247	
BH087	7-7.5	8/06/2006	Fill	VMP & PDA - Block 4	69.75	2418.5				23.7	135		104	64.5	49		45.7	20	19.9	50	5.3	163	125	17.4	1090		333	173	
BH089	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	7.99	76.8				<0.5	2.3		3.4	6.2	5.6		5.9	2.6	2.7	5.4	0.6	13.5	1.1	2.3	0.7		11.5	13	
BH090	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	4.337	41.6				<0.5	1		2	3.5	3.3		3.3	1.6	1.7	3.1	<0.5	7.1	<0.5	1.4	<0.5		6.3	7.3	
BH109	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH109	9.5-10	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH113	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	0.878	9.2				<0.5	<0.5		0.6	0.9	0.7		0.8	<0.5	<0.5	0.8	<0.5	1.8	<0.5	<0.5	<0.5		1.8	1.8	
BH114	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	
BH115	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	0.756	6.5				<0.5	<0.5		<0.5	0.7	0.6		0.8	<0.5	<0.5	0.6	<0.5	1.6	<0.5	<0.5	<0.5		0.8	1.4	
BH119	1.6-2.05	30/06/2006																											

Table T4
Site wide
Soil Analytical Results - Saturated

					PAHs																							
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	PAHs (Sum of total)	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	mg/kg
EQL							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
SSTC ^{VMP}					67																							
Tar Containing Material (TCM) Criteria						2000									150													
Location	Depth	Sample Date	Sample Type	Area																								
BH207	12	3/04/2008	Fill	VMP & PDA - Block 4	6.811	53.6				<0.5	2.2		1.9	4.4	4.8		5.2	2.5	1.7	3.6	0.6	8.8	0.7	2.2	1.2		4.3	9.5
BH207	13.1	3/04/2008	Fill	VMP & PDA - Block 4	1.525	33				<0.5	2.4		2	1.8	1.2		1.3	<0.5	<0.5	1.5	<0.5	3.5	2.4	<0.5	6.1		6.5	4.3
BH207	15	3/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	0.6				<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
BH208	2.25	4/04/2008	Fill	VMP & PDA - Block 4	<1.21	<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	<0.5
BH208	9.5	4/04/2008	Fill	VMP & PDA - Block 4	<1.21	<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	<0.5
BH208	13.5	4/04/2008	Natural Sandy Clay	VMP & PDA - Block 4	13.108	109.8				<0.5	1.8		3.2	9.4	9.3		11.4	4.9	3	8.9	0.9	20.5	0.7	3.9	0.7		8.4	22.8
BH209	2.3	22/04/2008	Fill	VMP & PDA - Block 4	23.217	168				0.7	7.5		4.8	10.8	16.5		19.8	7.7	6.4	8	2.2	20.1	1.9	6.6	2.6		7.6	44.8
BH209	4.5	22/04/2008	Natural Clay	VMP & PDA - Block 4	16.094	497				5.9	33.8		19.1	17.7	11.2		11.4	4.5	2.7	12.9	1.2	28.3	24.8	3.4	203		75.5	41.6
BH209	6.1	22/04/2008	Natural Sandstone	VMP & PDA - Block 4	12.992	814				6.8	54.9		22.3	15.4	9.1		7	3.2	2.9	11	1	24.6	27	2.2	498		86.5	42.1
BH209	9.4	23/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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
BH210	15.9	27/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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
BH211	14	26/03/2008	Fill	VMP & PDA - Block 4	<1.21	<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
BH211	15.5	26/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	0.086	17.7				<0.5	1.9		1.4	0.8	<0.5		<0.5	<0.5	<0.5	0.6	<0.5	1.2	1.2	<0.5	5.2		3.6	1.8
BH211	16.05-16.15	26/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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
BH34	1.8-2.2	25/02/2010	Fill	VMP & PDA - Block 4	<1.21	<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
BH34	6-6.2	25/02/2010	Fill	VMP & PDA - Block 4	<1.21	<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
BH34	11-11.2	25/02/2010	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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
BH35	4.9-5	22/02/2010	Fill	VMP & PDA - Block 4	<1.21	<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
BH35	9.9-10	22/02/2010	Fill	VMP & PDA - Block 4	<1.21	<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
BH4	2.3-2.4	21/02/2008	Fill	VMP & PDA - Hickson Road	17.265	139.5	<1.2	7.2	<1.2	<1.2	52.8		12.3	9.4	11.4	23		8.4		8.1	3.9	10.1	<1.2	8.6	4.6		5.3	4.6
BH4	4.2-4.3	21/02/2008	Fill	VMP & PDA - Hickson Road	<1.11	<7	<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
BH405	4-4.3	10/02/2011	Fill	VMP & PDA - Block 4	7.736	58.5				<0.5	0.9		1.2	5	5.9		8	2.6	2.4	5	<0.5	6.8	<0.5	2.2	<0.5		1.4	17.1
BH405	7-7.3	10/02/2011	Fill	VMP & PDA - Block 4	<1.21	<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
BH405	13-13.2	11/02/2011	Natural Sand	VMP & PDA - Block 4	31.691	750.2				11.2	45.2		40.9	30.2	21.6		25.7	7.5	14.3	23.6	2	72.9	46.5	7.6	208		130	63
BH405	14-14.4	11/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	129.201	3296.3				44.9	221		182	130	86.2		96.3	49.1	44.5	93	10.3	301	236	42	1040		470	250
BH408	2-2.4	14/02/2011	Fill	VMP & PDA - Block 4	9.097	74.5				<0.5	2.2		3.5	6.2	6.3		7.1	4.5	3.1	5.2	0.7	12.6	<0.5	3.6	<0.5		6.6	12.9
BH408	8-8.3	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	1.695	62.2				1.8	6.1		6.2	2.6	1.3		1.1	0.6	<0.5	1.9	<0.5	4.3	7	<0.5	13		9.4	6.9
BH408	9-9.4	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	8.162	252.6																						

Table T4
Site wide
Soil Analytical Results - Saturated

					PAHs																								
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	0.5	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							0.5	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	
SSTC ^{VMP}					67																								
Tar Containing Material (TCM) Criteria						2000									150														
Location	Depth	Sample Date	Sample Type	Area																									
BH68	2.5-2.9	2/03/2010	Fill	VMP & PDA - Block 5																									
BH68	4-4.3	2/03/2010	Fill	VMP & PDA - Block 5	<1.21	<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	<0.5	<0.5	
BH68	7-7.1	2/03/2010	Natural Silty Sand	VMP & PDA - Block 5																									
MW3	2.9-3	23/02/2008	Natural Clayey Sand	VMP & PDA - Hickson Road	14.51	312	<0.5	22.6	<0.5	3.2	20		25.3	15.8	10.9	26		4.4		10.6	1.3	35.8	20.9	5.8	55		65.8	37.2	
MW6	2.5-2.6	20/02/2008	Fill	VMP & PDA - Hickson Road	2.181	24.4	<0.5	<0.5	<0.5	<0.5	1.9		1.2	3.8	1.7	3		0.6		1.5	<0.5	5	<0.5	0.8	<0.5		2.7	5.2	
MW6	4.4-4.5	20/02/2008	Fill	VMP & PDA - Hickson Road	<1.11	<7	<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	
MW7	3.5-3.6	25/02/2008	FILL	VMP & PDA - Hickson Road	71.045	696	<0.5	92.7	<0.5	33.7	48.7		28.7	86.7	59.7	70		2.9		8.6	1.7	62.3	39.6	8.6	150		116	48.8	
MW7	4.5-4.6	25/02/2008	FILL	VMP & PDA - Hickson Road	486.608	21670	<1.2	3680	<1.2	210	3060		800	863	359	608		59.8		341	22.9	1470	1160	144	7800		3350	2030	
MW7	5-5.1	25/02/2008	FILL	VMP & PDA - Hickson Road	884.497	30782	<1.2	5130	<1.2	282	4140		1200	1240	677	1170		87.7		582	57.2	2160	1980	196	10,200		4870	3110	
MW10	4.9-5	21/02/2008	Fill	VMP & PDA - Hickson Road	386.828	7282.2	<1.2	102	<1.2	212	652		523	934	278	698		21.8		61	9.4	966	662	52	224		1740	947	
MW10	8.6-8.7	22/02/2008	Fill	VMP & PDA - Hickson Road	590.52	29653	<1.2	7650	<1.2	511	1700		2150	1470	412	968		26		771	20.3	2440	2100	32.5	10,200		5180	2640	

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

Table T4
Site wide
Soil Analytical Results - Saturated

					TPH						BTEX					
					TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene
					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						50	100	100	10	100	0.2	0.2	0.2	0.2	0.2	0.15
SSTC ^{VMP}						54000	72000	21,000			380					
Tar Containing Material (TCM) Criteria																
Location	Depth	Sample Date	Sample Type	Area												
BH001	4	2/05/2006	Fill	VMP & PDA - Block 5	160	<50	160	<100	<2	160	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH019	2.5-3	8/05/2006	Fill	VMP & PDA - Block 4	4900	2180	3840	1060	354	7080						
BH019	3-3.45	8/05/2006	Fill	VMP & PDA - Block 4	7320	3160	5450	1870	210	10,480						
BH020	1.5-2.1	9/05/2006	Fill	VMP & PDA - Block 4	620	<50	280	340	<2	620						
BH028	13-13.5	12/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	1620	780	1370	250	119	2400	8.2	2.7	14.8	15.4	6.9	22.3
BH058	6-6.5	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	510	220	510	<100	40	730	3.1	5.9	0.4	8.5	4.3	12.8
BH059	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	290	<50	170	120	<2	290	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH059	8.5-9	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH060	9.5-10	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH062	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	830	<50	420	410	<2	830	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH065	3-3.45	1/06/2006	Fill	VMP & PDA - Block 4	1760	90	1040	720	3	1850	<0.2	<0.2	<0.2	0.5	0.3	0.8
BH067	3-3.45	1/06/2006	Fill	VMP & PDA - Block 5	4510	<50	1490	3020	2	4510	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH071	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH072	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	120	<50	120	<100	<2	120	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH072	9.5-10	2/05/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH073	2-2.4	2/05/2006	Fill	VMP & PDA - Block 4	1600	260	1340	260	8	1860	<0.2	2.1	<0.2	3.4	2.1	5.5
BH074	3-3.45	2/05/2006	Fill	VMP & PDA - Block 5	260	<50	260	<100	3	260	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH074	9.5-10	2/05/2006	Natural Sandy Clay	VMP & PDA - Block 5	3350	1510	2480	870	122	4860	14.9	1.6	21.1	20.7	7.6	28.3
BH075	3-3.45	6/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH087	3-3.45	8/06/2006	Fill	VMP & PDA - Block 4	8980	4560	7310	1670	271	13,540	15	47.5	24.9	79.9	38.6	118.5
BH087	7-7.5	8/06/2006	Fill	VMP & PDA - Block 4	8270	4360	6720	1550	442	12,630	82.7	24.3	149	116	57.1	173.1
BH089	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	170	<50	170	<100	<2	170	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH090	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	140	<50	140	<100	<2	140	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH109	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	130	<50	<100	130	<2	130	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH109	9.5-10	27/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH113	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	1010	70	540	470	<2	1080	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH114	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	980	60	620	360	<2	1040	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH115	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH119	1.6-2.05	30/06/2006	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH119	7.5-8	30/06/2006	Fill	VMP & PDA - Block 4	17,690	6750	13,000	4690	1140	24,440	82.4	63	118	182	69.8	251.8
BH119	9.5-10	30/06/2006	Fill	VMP & PDA - Block 4	10,050	5320	7940	2110	1060	15,370	97.8	14.7	124	152	53	205
BH132	8-8.5	6/07/2006	Natural Clayey Sand	VMP & PDA - Block 4	4230	1870	3040	1190	1050	6100	140	44.7	232	225	120	345
BH135	3-3.45	11/07/2006	Fill	VMP & PDA - Block 4												
BH141	3-3.45	7/07/2006	Fill	VMP & PDA - Block 4	5920	1800	4490	1430	325	7720	41.8	49.1	17.3	86.5	60.3	146.8
BH145	3-3.45	11/07/2006	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH146	3-3.33	11/07/2006	Fill	VMP & PDA - Block 4												
BH146	4.1-4.6	11/07/2006	Fill	VMP & PDA - Block 4	4610	3020	3750	860	222	7630	15.2	13.9	25.3	56	31	87
BH159		14/08/2006	Fill	VMP & PDA - Block 4	1230	<50	270	960	<2	1230	<0.2	<0.2	<0.2	0.3	<0.2	0.3
BH197	11.5	9/04/2008	Natural Clayey Sand	VMP & PDA - Block 5	400	160	400	<100	<10	560	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH197	15.9	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH197	18.6	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH197	5	9/04/2008	Fill	VMP & PDA - Block 5	5300	560	3820	1480	26	5860	4.8	1.9	8	4.2	1.9	6.1
BH197	6.5	9/04/2008	Natural Sandy Clay	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	0.5	<0.5	0.8	0.6	<0.5	0.6
BH198	3	6/03/2008	Fill	VMP & PDA - Block 5	8130	1360	6690	1440	<10	9490	<0.2	<0.5	<0.5	0.7	<0.5	0.7
BH198	4.5	6/03/2008	Natural Sandy Clay	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH198	6.9	6/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH199	2.7	11/03/2008	Fill	VMP & PDA - Block 5	1120	<50	740	380	<10	1120	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH199	3.7	11/03/2008	Natural Silty Clay	VMP & PDA - Block 5	3540	950	2620	920	96	4490	6.4	16.3	2.6	22.4	22.9	45.3
BH199	5.6	11/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH199	6	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH200	2.5	7/04/2008	Fill	VMP & PDA - Block 4	1560	110	1060	500	<10	1670	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH200	6.53	7/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH201	2.4	4/03/2008	Fill	VMP & PDA - Block 5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH201	10.3	18/03/2008	Fill	VMP & PDA - Block 5	3280	<50	1930	1350	<10	3280	<0.2	0.7	<0.5			

Table T4
Site wide
Soil Analytical Results - Saturated

					TPH						BTEX					
					TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)						
					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						50	100	100	10	100	0.2	0.2	0.2	0.2	0.2	0.15
SSTC ^{VMP}						54000	72000	21,000			380					
Tar Containing Material (TCM) Criteria																
Location	Depth	Sample Date	Sample Type	Area												
BH207	12	3/04/2008	Fill	VMP & PDA - Block 4	770	<50	430	340	<10	770	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH207	13.1	3/04/2008	Fill	VMP & PDA - Block 4	140	<50	140	<100	<10	140	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH207	15	3/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH208	2.25	4/04/2008	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH208	9.5	4/04/2008	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH208	13.5	4/04/2008	Natural Sandy Clay	VMP & PDA - Block 4	5840	80	3320	2520	<10	5920	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH209	2.3	22/04/2008	Fill	VMP & PDA - Block 4	1460	<50	880	580	<10	1460	<0.2	<0.5	0.5	<0.5	<0.5	<1
BH209	4.5	22/04/2008	Natural Clay	VMP & PDA - Block 4	2410	1190	1950	460	227	3600	15.5	37.2	4.3	36	50	86
BH209	6.1	22/04/2008	Natural Sandstone	VMP & PDA - Block 4	2780	2280	2350	430	929	5060	88.2	34.8	213	165	94.8	259.8
BH209	9.4	23/04/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH210	15.9	27/03/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH211	14	26/03/2008	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH211	15.5	26/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	<200	<50	<100	<100	19	<250	3.4	0.6	5.5	3.3	1.8	5.1
BH211	16.05-16.15	26/03/2008	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH34	1.8-2.2	25/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH34	6-6.2	25/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH34	11-11.2	25/02/2010	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH35	4.9-5	22/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH35	9.9-10	22/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH4	2.3-2.4	21/02/2008	Fill	VMP & PDA - Hickson Road	8660	200	5700	2960	<10	8860	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH4	4.2-4.3	21/02/2008	Fill	VMP & PDA - Hickson Road	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH405	4-4.3	10/02/2011	Fill	VMP & PDA - Block 4	1020	<50	400	620	<10	1020	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH405	7-7.3	10/02/2011	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH405	13-13.2	11/02/2011	Natural Sand	VMP & PDA - Block 4	2320	510	1760	560	<10	2830	0.7	0.6	0.6	3	1.3	4.3
BH405	14-14.4	11/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	9030	3390	7020	2010	156	12,400 - 12,420	5.9	4	33	57.2	19.4	76.6
BH408	2-2.4	14/02/2011	Fill	VMP & PDA - Block 4	450	<50	190	260	<10	450	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH408	8-8.3	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	350	100	350	<100	<10	450	0.6	0.7	<0.5	0.7	0.6	1.3
BH408	9-9.4	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	860	360	710	150	24	1220	2.1	4.6	<0.5	5.1	3.8	8.9
BH409	3.7-4	14/02/2011	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH409	5-5.3	14/02/2011	Natural Sand	VMP & PDA - Block 4	180	150	180	<100	12	330	1.8	3.5	<0.5	1.1	1.8	2.9
BH409	6-6.4	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4		<50			<10	<50	0.3	<0.5	<0.5	<0.5	<0.5	<1
BH409	7-7.3	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	<200	<50	<100	<100	106	<50	2.8	3.5	22.3	17.8	8.9	26.7
BH42	3.2-3.3	23/02/2010	Fill	VMP & PDA - Block 4	17,350	4680	13,200	4150	234	22,000 - 22,030	1	40.8	1.5	39.9	83.6	123.5
BH42	3.5-3.6	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH44	4.9-5	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	3300	1040	2650	650	147	4340	2.1	18.1	5.4	25.7	20.9	46.6
BH45	3.2-3.4	23/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH45	7.2-7.4	23/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	12	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH49	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	2690	250	1610	1080	13	2940	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH49	6.2-6.4	22/02/2010	Fill	VMP & PDA - Block 4	600	160	450	150	<10	760	1.6	<0.5	1.8	2	0.8	2.8
BH49	8.2-8.4	22/02/2010	Fill	VMP & PDA - Block 4	3440	1160	2650	790	348	4600	49.7	5.2	74.6	61.5	22.6	84.1
BH49	10.2-10.4	22/02/2010	Fill	VMP & PDA - Block 4	1660	670	1240	420	56	2330	5.5	1.4	10.8	9.9	4.7	14.6
BH49	12.2-12.4	22/02/2010	Natural Clayey Sand	VMP & PDA - Block 4							10.2	2	16.6	21.2	7.7	28.9
BH45	13.2-13.4	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50						
BH52	2.2-2.6	22/02/2010	Fill	VMP & PDA - Block 4	<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH52	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	8970	<50	6600	2370	10	8970	1.7	1	1.1	1.4	0.7	2.1
BH53	2-2.4	6/03/2010	Fill	VMP & PDA - Hickson Road	6970	260	4540	2430	<10	7230	2.7	<0.5	1.4	0.8	<0.5	0.8
BH53	4-4.4	6/03/2010	Fill	VMP & PDA - Hickson Road	57,800	28,400	46,800	11,000	3000	86,200	678	50.7	670	470	197	667
BH54	2.8-3	23/02/2010	Natural Sand	VMP & PDA - Block 4	3980	900	2980	1000	13	4880	<0.2	0.8	<0.5	3.2	1.6	4.8
BH55	2.2-2.4	25/02/2010	Fill	VMP & PDA - Block 4	14,340	6420	10,600	3740	304	20,760 - 20,800	22.2	29.6	2.3	48.8	51.6	100.4
BH55	2.7-2.9	25/02/2010	Fill	VMP & PDA - Block 4	19,550	9150	14,800	4750	104	28,700	9.4	8.9	2	19.8	21.1	40.9
BH58	3.2-3.4	22/02/2010	Fill	VMP & PDA - Block 4	830	80	450	380	<10	910	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH58	5.2-5.4	22/02/2010	Fill	VMP & PDA - Block 4	620	<50	320	300	<10	620	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH58	8.6-8.8	22/02/2010	Fill	VMP & PDA - Block 4	1150	<50	640	510	<10	1150	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH58</																

Table T4
Site wide
Soil Analytical Results - Saturated

						TPH						BTEX					
						TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene
						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							50	100	100	10	100		0.2	0.2	0.2	0.2	0.15
SSTC ^{VMP}							54000	72000	21,000			380					
Tar Containing Material (TCM) Criteria																	
Location	Depth	Sample Date	Sample Type	Area													
BH68	2.5-2.9	2/03/2010	Fill	VMP & PDA - Block 5		770	<50	320	450	<10	770						
BH68	4-4.3	2/03/2010	Fill	VMP & PDA - Block 5		<200	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH68	7-7.1	2/03/2010	Natural Silty Sand	VMP & PDA - Block 5		<200	<50	<100	<100	<10	<50						
MW3	2.9-3	23/02/2008	Natural Clayey Sand	VMP & PDA - Hickson Road		8840	1100	6760	2080	<10	9940	0.4	0.9	<0.5	1.1	0.7	1.8
MW6	2.5-2.6	20/02/2008	Fill	VMP & PDA - Hickson Road		<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
MW6	4.4-4.5	20/02/2008	Fill	VMP & PDA - Hickson Road		<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
MW7	3.5-3.6	25/02/2008	FILL	VMP & PDA - Hickson Road		7770	2140	5680	2090	227	9910	87.7	10.3	57.5	49.8	19	68.8
MW7	4.5-4.6	25/02/2008	FILL	VMP & PDA - Hickson Road		74,600	31,500	61,000	13,600	7710	106,100	2080	147	1930	1210	502	1712
MW7	5-5.1	25/02/2008	FILL	VMP & PDA - Hickson Road		80,400	45,900	65,200	15,200	7890	126,300	1980	154	1990	1300	563	1863
MW10	4.9-5	21/02/2008	Fill	VMP & PDA - Hickson Road		55,600	4600	41,400	14,200	64	60,200	12.4	4.1	2.2	4.1	1.5	5.6
MW10	8.6-8.7	22/02/2008	Fill	VMP & PDA - Hickson Road		112,400	69,400	93,200	19,200	7590	181,800	1510	261	2650	1830	746	2576

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene;
Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and
Indeno(1,2,3-c,d)pyrene)
TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

Table T5
Block 4 and 5
Soil Analytical Results - Unsaturated

					PAHs																	TPH							
					CPAH (TEF)	PAH (Total)	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9
EQL					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			
SSTC ^{VMP}					67		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		50	100	100	10			
Tar Containing Material (TCM) Criteria						2000					150												54000	72000	21,000				
Location	Depth	Sample Date	Sample Type	Area																									
BH001	1	1/05/2006	Fill	VMP & PDA - Block 5	67.03	699.1		1.1	14.4	19.2	65.9	33.4	98.6	25.5	29.6	70.5	10.4	104	3.6	28.6	11.5		84.4	98.4	4470	2360	3280	1190	3
BH019	1.5-1.95	8/05/2006	Fill	VMP & PDA - Block 4	<1.21	38.2		<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.3	1.4	<0.5	29.3		4.1	1.1	<200	100	<100	<100	50
BH020	0.3-0.5	9/05/2006	Fill	VMP & PDA - Block 4	9.621	80.3		0.6	1.6	2.5	6.2	6.8	7.7	3.7	2.3	5.4	0.8	14.6	1.2	3.1	0.8		7.8	15.2	810	<50	460	350	<2
BH020	1.5-2.1	9/05/2006	Fill	VMP & PDA - Block 4	6.351	50		<0.5	1.3	1.6	3.9	4.4	5	2.5	1.9	3.6	0.6	8.5	0.7	2.1	0.5		4.7	8.7	620	<50	280	340	<2
BH021	0.3-0.5	9/05/2006	Fill	VMP & PDA - Block 4	3.06	27.3		<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	230	<50	130	100	<2
BH028	0.3-0.5	12/05/2006	Fill	VMP & PDA - Block 5																					340	<50	200	140	<2
BH058	1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	39.542	368.6		1.2	8.4	11.1	29	25.3	37.9	19.3	11.8	26.9	4.3	65.3	5.1	16.1	5.7		39.5	61.7	3030	120	1960	1070	8
BH059	1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	5.742	52.6		<0.5	2.1	2.1	4.3	3.9	4.6	2.5	1.9	3.7	0.5	8.5	0.6	2	1		6.4	8.5	550	<50	290	260	<2
BH060	1.7-2	31/05/2006	Fill	VMP & PDA - Block 5	6.082	44		<0.5	1.2	1.3	3.6	3.6	6.3	3.5	2.3	3.7	0.9	5.4	<0.5	2.9	0.6		3.2	5.5	140	<50	<100	140	<2
BH062	1.5-1.95	31/05/2006	Fill	VMP & PDA - Block 5	30.902	228.3		<0.5	6.6	5.1	17.1	19.9	29.7	14.4	10.1	16.8	3.6	38.2	1.1	14	4		17.1	30.6	1120	100	610	510	8
BH065	0.3-0.5	1/06/2006	Fill	VMP & PDA - Block 4	4.098	35.4		<0.5	1.1	1.2	3	3.1	3.6	2.1	1.3	2.7	<0.5	5.9	<0.5	1.6	<0.5		3.6	6.2	530	<50	180	350	<2
BH065	1.5-1.95	1/06/2006	Fill	VMP & PDA - Block 4	1.134	11.7		<0.5	<0.5	0.6	1.1	0.9	1.1	0.6	<0.5	0.8	<0.5	2.4	<0.5	<0.5	<0.5		1.9	2.3	<200	<50	<100	<100	<2
BH067	1.5-1.95	1/06/2006	Fill	VMP & PDA - Block 5	1.711	18.6		<0.5	<0.5	0.8	1.2	1.3	1.4	0.9	0.6	1.2	<0.5	3.1	0.7	0.7	0.8		2.9	3	1100	<50	480	620	<2
BH070	0.3-0.5	2/05/2006	Fill	VMP & PDA - Block 4	1.828	17.7		<0.5	0.5	0.6	1.3	1.4	1.6	0.7	0.6	1.1	<0.5	3	<0.5	0.6	0.9		2.3	3.1	810	<50	600	210	<2
BH070	1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	3.349	30		<0.5	0.7	1.2	2.5	2.5	3.1	1.5	1.2	2.4	<0.5	4.9	<0.5	1.3	<0.5		3.7	5	570	<50	230	340	<2
BH071	1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	<200	<50	<100	<100	<2
BH072	0.3-0.5	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	<200	<50	<100	<100	<2
BH073	1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 4	140.147	1451.6		20.6	87.8	77.3	107	100	99.3	44	33.5	88.7	10.7	252	56.5	41.4	14.8		190	228	830	<50	560	270	<2
BH074	1.5-1.95	2/05/2006	Fill	VMP & PDA - Block 5	1.239	11.3		<0.5	0.6	0.5	1.2	1	1.1	<0.5	<0.5	0.9	<0.5	2.4	<0.5	<0.5	<0.5		1.4	2.2	<200	<50	<100	<100	<2
BH075	0.3-0.5	6/06/2006	Fill	VMP & PDA - Block 4	27.657	242.1		0.5	8.4	7.9	19.4	19	21.2	11.3	9.4	16.4	2.4	42.7	2.2	9.8	2.8		25.7	43	1010	<50	570	440	<2
BH087	1.5-1.95	8/06/2006	Fill	VMP & PDA - Block 4	114.535	2982.2		21.6	177	136	114	78.5	83.6	34	35.2	69.5	8.6	325	182	31.2	925		496	265	7340	2230	5820	1520	20
BH089	0.3-0.5	9/06/2006	Fill	VMP & PDA - Block 4	<1.21	2.2		<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	<0.5		0.7	0.7	<200	<50	<100	<100	<2
BH089	1.5-1.95	9/06/2006	Fill	VMP & PDA - Block 4	4.367	57.4		<0.5	2.5	2.3	3.7	3.3	3.4	1.6	1.7	3.1	<0.5	7.7	2	1.4	9		8.3	7.4	610	70	440	170	<2
BH090	1.5-1.95	9/06/2006	Fill	VMP & PDA - Block 4	0.845	5.6		<0.5	<0.5	<0.5	0.6	0.7	0.8	<0.5	<0.5	0.5	<0.5	1.1	<0.5	<0.5	<0.5		0.8	1.1	<200	<50	<100	<100	<2
BH109	0.3-0.5	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	<200	<50	<100	<100	<2
BH113	1.5-1.95	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<8		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50															

Table T5
Block 4 and 5
Soil Analytical Results - Unsaturated

					PAHs																	TPH							
					CPAH (TEF)	PAH (Total)	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9
EQL					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		
SSTC ^{VMP}					67		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	50	100	100	10		
Tar Containing Material (TCM) Criteria						2000					150																		
Location	Depth	Sample Date	Sample Type	Area																									
BH44	1.9-2	23/02/2010	Fill	VMP & PDA - Block 4	<1.21	<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	<0.5	<200	<50	<100	<100	10
BH49	1.5-1.7	22/02/2010	Fill	VMP & PDA - Block 4	36.552	428.1		1.1	11	18.1	35.8	22.7	37	13.2	11.8	32	3.8	76.7	4.5	11.4	9.7		61.4	77.9	2250	80	1460	790	11
BH50	1.3-1.5	26/02/2010	Natural Sandsto	VMP & PDA - Block 4	0.06	1.1	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	0.5	<200	<50	<100	<100	<10
BH52	1-1.2	22/02/2010	Fill	VMP & PDA - Block 4																					950	<50	580	370	78
BH54	1-1.4	23/02/2010	Fill	VMP & PDA - Block 4	842.57	20,627		273	1000	1070	912	533	824	248	324	549	72.5	2130	1290	231	6370		3130	1670	15,260	4380	11,700	3560	72
BH55	1-1.2	25/02/2010	Fill	VMP & PDA - Block 4	372.05	12,143	<4	80.7	473	482	425	252	300	123	107	282	23.3	1280	460	95	4510	12,100	2030	1220	24,950	11,300	19,400	5550	109
BH58	1-1.2	22/02/2010	Fill	VMP & PDA - Block 4	19.668	205.8		0.6	8.2	8.5	16.2	12.7	19	9.8	6.9	14	1.8	36.1	1.5	7.2	2.3		23.4	37.6	1010	<50	550	460	<10



Table T5
Block 4 and 5
Soil Analytical Results - Unsaturated

VMP Remediation Extent
VMP Remediation Works Area
Barangaroo

					PAHs																	TPH							
					CPAH (TEF)	PAH (Total)	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9
EQL					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			
SSTC ^{VMP}					67		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		50	100	100	10		
Tar Containing Material (TCM) Criteria						2000						150												54000	72000	21,000			
Location	Depth	Sample Date	Sample Type	Area																									
BH59	1.9-2	22/02/2010	Fill	VMP & PDA - Block 4	40.933	1264.5		10.3	58.8	60.3	45.9	26.5	35.8	13.1	14.3	32.2	3.2	121	68.3	11.8	453		206	104	3150	980	2290	860	<10
BH62	1-1.2	26/02/2010	Fill	VMP & PDA - Block 5	0.1	4.4	<0.5	<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	0.7	4.4	0.9	0.9	<200	<50	<100	<100	<10
BH64	1-1.2	1/03/2010	Fill	VMP & PDA - Block 5	107.979	1463.6	1	7.5	51.9	70.8	95.5	69.8	104	37.2	29.4	79.7	10.8	246	31.1	33.2	76.7	1460	261	259	2970	260	1970	1000	<10
SV09	0.2-0.4	26/02/2010	Fill	VMP & PDA - Block 5	42.044	495.4	<0.5	1.4	9.9	18.5	45.3	25.4	43.7	14.5	18	33.9	4.2	97.5	3.4	12.6	5.8	495	69.1	92.2	3160	120	1920	1240	<10

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds
(Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene;
Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene;
Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

Table T5
Block 4 and 5
Soil Analytical Results - Unsaturated

				TPH+C10 - C36 (Sum of total)	BTEX					
					Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene
EQL				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SSTC ^{VMP}				50	0.2	0.2	0.2	0.2	0.2	
Tar Containing Material (TCM) Criteria										
Location	Depth	Sample Date	Sample Type							
BH001	1	1/05/2006	Fill	6830	0.5	<0.2	0.4	0.2	<0.2	0.2
BH019	1.5-1.95	8/05/2006	Fill	100						
BH020	0.3-0.5	9/05/2006	Fill	810						
BH020	1.5-2.1	9/05/2006	Fill	620						
BH021	0.3-0.5	9/05/2006	Fill	230						
BH028	0.3-0.5	12/05/2006	Fill	340	<0.2	<0.2	<0.2	<0.2	<0.2	<0.01
BH058	1.5-1.95	31/05/2006	Fill	3150	0.3	0.3	0.2	<0.2	<0.2	<0.4
BH059	1.5-1.95	31/05/2006	Fill	550	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH060	1.7-2	31/05/2006	Fill	140	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH062	1.5-1.95	31/05/2006	Fill	1220	<0.2	<0.2	0.4	0.3	<0.2	0.3
BH065	0.3-0.5	1/06/2006	Fill	530	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH065	1.5-1.95	1/06/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH067	1.5-1.95	1/06/2006	Fill	1100	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH070	0.3-0.5	2/05/2006	Fill	810	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH070	1.5-1.95	2/05/2006	Fill	570	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH071	1.5-1.95	2/05/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH072	0.3-0.5	2/05/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH073	1.5-1.95	2/05/2006	Fill	830	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH074	1.5-1.95	2/05/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH075	0.3-0.5	6/06/2006	Fill	1010	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH087	1.5-1.95	8/06/2006	Fill	9570	0.7	1.2	0.8	7.3	3.2	10.5
BH089	0.3-0.5	9/06/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH089	1.5-1.95	9/06/2006	Fill	680	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH090	1.5-1.95	9/06/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH109	0.3-0.5	27/06/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH113	1.5-1.95	27/06/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH114	0.3-0.5	28/06/2006	Fill	340	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH115	0.8-1	28/06/2006	Fill	900	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH115	1.5-1.95	28/06/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH119	1.6-2.05	30/06/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH132	1.5-1.95	6/07/2006	Fill	890	0.5	<0.2	<0.2	<0.2	<0.2	<0.4
BH133	1.5-1.95	6/07/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH133	0.3-0.5	6/07/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH135A	0.4-0.6	11/07/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH141	1.5-1.95	7/07/2006	Fill	2260	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH145	0.3-0.5	11/07/2006	Fill	3470	0.2	<0.2	0.4	0.3	<0.2	0.3
BH146	1.5-1.95	11/07/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH156	0.4-0.5	14/08/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH156	0.9-1	14/08/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH159		14/08/2006	Fill	1230	<0.2	<0.2	<0.2	0.3	<0.2	0.3
BH160	0.3-0.4	14/08/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH161	0.3-0.4	14/08/2006	Fill	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4
BH197	0.4	3/03/2008	Fill	600	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH200	1	7/04/2008	Fill	15,450	1.6	<0.5	2.2	2	0.8	2.8
BH203	1.9	10/03/2008	Fill	690	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH204S	1	18/03/2008	Fill	15,580	0.6	3.5	1.4	4.2	4.4	8.6
BH204D	1.5	7/04/2008	Fill	147,200	61	7	69.2	67.2	26.9	94.1
BH206	0.5	7/03/2008	Fill	490	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH206	1.8	17/04/2008	Fill	530	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH210	1.5	18/03/2008	Fill	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH34	1.8-2.2	25/02/2010	Fill	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH42	1-1.1	23/02/2010	Fill	110	<0.2	<0.5	<0.5	<0.5	<0.5	<1

Table T5
Block 4 and 5
Soil Analytical Results - Unsaturated

				TPH+C10 - C36 (Sum of total)	BTEX					
					Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene
EQL				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SSTC ^{VMP}				50	0.2	0.2	0.2	0.2	0.2	
Tar Containing Material (TCM) Criteria										
Location	Depth	Sample Date	Sample Type							
BH44	1.9-2	23/02/2010	Fill	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH49	1.5-1.7	22/02/2010	Fill	2330	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH50	1.3-1.5	26/02/2010	Natural Sandsto	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH52	1-1.2	22/02/2010	Fill	950	0.2	2.7	3.9	20.2	8.7	28.9
BH54	1-1.4	23/02/2010	Fill	19,600 - 19,640	2.5	3.5	7.3	25	10.5	35.5
BH55	1-1.2	25/02/2010	Fill	36,200 - 36,250	7.8	2.8	14	24.1	10.8	34.9
BH58	1-1.2	22/02/2010	Fill	1010	<0.2	<0.5	<0.5	<0.5	<0.5	<1

Table T5
Block 4 and 5
Soil Analytical Results - Unsaturated

					BTEX					
				TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene
EQL				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SSTC ^{VMP}				50	0.2	0.2	0.2	0.2	0.2	
Tar Containing Material (TCM) Criteria					380					
Location	Depth	Sample Date	Sample Type							
BH59	1.9-2	22/02/2010	Fill	4130	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH62	1-1.2	26/02/2010	Fill	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH64	1-1.2	1/03/2010	Fill	3230	0.2	<0.5	<0.5	<0.5	<0.5	<1
SV09	0.2-0.4	26/02/2010	Fill	3280	0.5	<0.5	<0.5	<0.5	<0.5	<1

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds
(Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene;
Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene;
Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
**BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) at
mg/kg) results**

Table T6
Blocks 4 and 5
Soil Analytical Results - Saturated

					PAHs																							
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	TPH C15-C36
					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	mg/kg
EQL							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	
SSTC ^{VMP}					67																							
TCM Criteria						2000									150													
Location	Depth	Sample Date	Sample Type	Area																								
BH 199	6	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<1.21	<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	<200
BH001	4	2/05/2006	Fill	VMP & PDA - Block 5	3.531	30.7	-	-	-	<0.5	0.5	-	0.8	3.3	2.6	-	3.3	1	1.3	3.1	<0.5	5	<0.5	1	1.3	2.4	5.1	160
BH019	2.5-3	8/05/2006	Fill	VMP & PDA - Block 4	82.897	1994.2	-	-	-	24.3	82	-	79.3	70.3	58.2	-	56.9	22.6	25.5	54.1	6.4	208	110	22.6	700	295	179	4900
BH019	3-3.45	8/05/2006	Fill	VMP & PDA - Block 4	122.038	2733.9	-	-	-	31.6	120	-	114	103	86.3	-	85.3	32.2	37.2	77.6	8.8	295	157	32.9	891	407	255	7320
BH028	13-13.5	12/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	12.142	470.5	-	-	-	6.7	38.6	-	20.4	13.2	8.4	-	9	3.1	3.2	11.1	0.8	28.2	32.3	2.6	183	76	33.9	1620
BH058	6-6.5	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	2.618	154.1	-	-	-	2.7	15.6	-	6.9	3.6	2	-	1.6	0.6	0.6	3.2	<0.5	6.6	12.3	<0.5	59.5	28.9	10	510
BH059	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	3.224	27.9	-	-	-	<0.5	0.7	-	1	2.5	2.4	-	3	1.4	1.2	2	<0.5	4.4	0.5	1.2	<0.5	2.6	5	290
BH059	8.5-9	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	10.9	-	-	-	<0.5	1.4	-	0.6	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	1.2	<0.5	2.7	3	1.2	<200
BH060	9.5-10	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<1.21	1.4	-	-	-	<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	0.9	0.5	<200
BH062	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	6.023	47.4	-	-	-	<0.5	1	-	1.8	3.5	4.2	-	5	3	1.8	3.3	0.5	7.4	0.6	2.3	<0.5	4.9	8.1	830
BH065	3-3.45	1/06/2006	Fill	VMP & PDA - Block 4	11.332	176.3	-	-	-	7	1.4	-	9.7	9.5	7.7	-	9.4	4.5	3.5	8.7	0.9	28.3	7.8	3.6	13.9	34.6	25.8	1760
BH067	3-3.45	1/06/2006	Fill	VMP & PDA - Block 5	6.064	63.1	-	-	-	<0.5	1.1	-	1.8	5.1	4.5	-	5.7	2.1	2.4	4.3	<0.5	12.5	0.9	1.8	1.5	7.5	11.9	4510
BH071	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	<200
BH072	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	120
BH072	9.5-10	2/05/2006	Fill	VMP & PDA - Block 4	<1.21	<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	<200
BH073	2-2.4	2/05/2006	Fill	VMP & PDA - Block 4	21.659	383.1	-	-	-	4.4	24.4	-	18.7	19	15.3	-	15.6	6.3	6.2	14.6	1.5	48.8	20.8	5.7	80.5	58.3	43	1600
BH074	3-3.45	2/05/2006	Fill	VMP & PDA - Block 5	3.729	45.5	-	-	-	<0.5	1.5	-	2.6	3.7	2.8	-	3	1.1	1.2	2.8	<0.5	8.2	1.3	1	<0.5	8.6	7.7	260
BH074	9.5-10	2/05/2006	Natural Sandy Clay	VMP & PDA - Block 5	45.766	1222.9	-	-	-	10.5	80.5	-	60	41.3	32.7	-	30.6	11.5	12.9	30.1	3.1	112	71.6	10.7	435	184	96.4	3350
BH075	3-3.45	6/06/2006	Fill	VMP & PDA - Block 4	1.063	9.3	-	-	-	<0.5	<0.5	-	<0.5	0.9	0.8	-	1.1	0.6	0.5	0.7	<0.5	1.8	<0.5	<0.5	<0.5	1	1.9	<200
BH087	3-3.45	8/06/2006	Fill	VMP & PDA - Block 4	113.187	2895.7	-	-	-	24.4	158	-	120	97.4	79.6	-	79.6	34	31.9	70.7	8.6	285	160	30.5	1030	439	247	8980
BH087	7-7.5	8/06/2006	Fill	VMP & PDA - Block 4	69.75	2418.5	-	-	-	23.7	135	-	104	64.5	49	-	45.7	20	19.9	50	5.3	163	125	17.4	1090	333	173	8270
BH089	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	7.99	76.8	-	-	-	<0.5	2.3	-	3.4	6.2	5.6	-	5.9	2.6	2.7	5.4	0.6	13.5	1.1	2.3	0.7	11.5	13	170
BH090	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	4.337	41.6	-	-	-	<0.5	1	-	2	3.5	3.3	-	3.3	1.6	1.7	3.1	<0.5	7.1	<0.5	1.4	<0.5	6.3	7.3	140
BH109	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	130
BH109	9.5-10	27/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	<200
BH113	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	0.878	9.2	-	-	-	<0.5	<0.5	-	0.6	0.9	0.7	-	0.8	<0.5	<0.5	0.8	<0.5	1.8	<0.5	<0.5	<0.5	1.8	1.8	1010
BH114	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	<1.21	<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	980
BH115	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	0.756	6.5	-	-	-	<0.5	<0.5	-																

Table T6
Blocks 4 and 5
Soil Analytical Results - Saturated

					PAHs																												
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	TPH C15-C36					
					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	mg/kg					
EQL							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					
SSTC ^{VMP}					67																												
TCM Criteria						2000									150																		
Location	Depth	Sample Date	Sample Type	Area																													
BH202	6.8	10/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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	<200					
BH201	10.3	18/03/2008	Fill	VMP & PDA - Block 5	21.747	160.4	-	-	-	1.5	6.5	-	5.5	13.1	15.6	-	16.7	6.7	4.7	11	1.9	21.9	4.3	6.2	5	16.2	23.6	3280					
BH201	11	18/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	0.72	4.4	-	-	-	<0.5	<0.5	-	<0.5	0.6	0.6	-	0.6	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5	1.5	<200					
BH203	7.3	10/03/2008	Fill	VMP & PDA - Block 4	3.394	31.5	-	-	-	<0.5	0.8	-	1.3	2.9	2.6	-	2.4	1.2	1.1	2.2	<0.5	5.5	0.6	1.2	0.7	3.4	5.6	1010					
BH204D	3	7/04/2008	Fill	VMP & PDA - Block 4	265.142	6223.3	-	-	-	85.6	234	-	283	255	195	-	210	38.2	40.4	184	13.3	655	384	40.8	1970	1090	545	25,740					
BH204D	4	7/04/2008	Fill	VMP & PDA - Block 4	305.575	7972.5	-	-	-	73.4	336	-	338	299	224	-	239	42.5	41	212	16.3	777	462	48.3	2930	1290	644	29,420					
BH205	13	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	2.566	81.5	-	-	-	1.2	3.8	-	3.9	2.9	1.9	-	2.1	0.6	0.8	2	<0.5	7.5	6	0.6	28.8	13.1	6.3	<200					
BH205	13.8	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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	<200					
BH205	19.2	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	4	-	-	-	<0.5	0.7	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	0.7	1.4	0.7	<200					
BH205	22.2	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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	<200					
BH205	7.8	27/03/2008	Natural Sandy Clay	VMP & PDA - Block 4	<1.21	1.2	-	-	-	<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	0.7	0.5	<0.5	<200					
BH205	9.3	27/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	22.484	738.1	-	-	-	11	57.6	-	30.7	25.2	15.5	-	14.3	5.6	6.7	20.8	1.6	42.4	42.9	5	291	117	50.8	3350					
BH206	4.6	17/04/2008	Fill	VMP & PDA - Block 4	1.658	18.7	-	-	-	<0.5	0.6	-	0.7	1.7	1.2	-	1.5	0.7	0.6	1.1	<0.5	4	<0.5	0.6	<0.5	2.4	3.6	460					
BH206	7.1	17/04/2008	Natural Clayey Sand	VMP & PDA - Block 4	2.862	110.1	-	-	-	1.4	10	-	5.6	4.1	2.1	-	1.9	0.7	0.7	2.5	<0.5	6.7	8.3	0.6	39.8	16.9	8.8	350					
BH206	10.7	21/04/2008	Natural Sandstone	VMP & PDA - Block 4	0.909	21.7	-	-	-	<0.5	1.9	-	1.6	1.2	0.7	-	0.8	<0.5	<0.5	0.9	<0.5	2.1	1.4	<0.5	3.5	5.1	2.5	110					
BH207	7.45	3/04/2008	Fill	VMP & PDA - Block 4	<1.21	<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	<200					
BH207	12	3/04/2008	Fill	VMP & PDA - Block 4	6.811	53.6	-	-	-	<0.5	2.2	-	1.9	4.4	4.8	-	5.2	2.5	1.7	3.6	0.6	8.8	0.7	2.2	1.2	4.3	9.5	770					
BH207	13.1	3/04/2008	Fill	VMP & PDA - Block 4	1.525	33	-	-	-	<0.5	2.4	-	2	1.8	1.2	-	1.3	<0.5	<0.5	1.5	<0.5	3.5	2.4	<0.5	6.1	6.5	4.3	140					
BH207	15	3/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	0.6	-	-	-	<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	0.6	<0.5	<0.5	<200					
BH208	2.25	4/04/2008	Fill	VMP & PDA - Block 4	<1.21	<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	<200					
BH208	9.5	4/04/2008	Fill	VMP & PDA - Block 4	<1.21	<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	<200					
BH208	13.5	4/04/2008	Natural Sandy Clay	VMP & PDA - Block 4	13.108	109.8	-	-	-	<0.5	1.8	-	3.2	9.4	9.3	-	11.4	4.9	3	8.9	0.9	20.5	0.7	3.9	0.7	8.4	22.8	5840					
BH209	2.3	22/04/2008	Fill	VMP & PDA - Block 4	23.217	168	-	-	-	0.7	7.5	-	4.8	10.8	16.5	-	19.8	7.7	6.4	8	2.2	20.1	1.9	6.6	2.6	7.6	44.8	1460					
BH209	4.5	22/04/2008	Natural Clay	VMP & PDA - Block 4	16.094	497	-	-	-	5.9	33.8	-	19.1	17.7	11.2	-	11.4	4.5	2.7	12.9	1.2	28.3	24.8	3.4	203	75.5	41.6	2410					
BH209	6.1	22/04/2008	Natural Sandstone	VMP & PDA - Block 4	12.992	814	-	-	-	6.8	54.9	-	22.3	15.4	9.1	-	7	3.2	2.9	11	1	24.6	27	2.2	498	86.5	42.1	2780					
BH209	9.4	23/04/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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	<200					
BH210	15.9	27/03/2008	Natural Sandstone	VMP & PDA - Block 4	<1.21	<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	<200					
BH211	14	26/03/2008	Fill	VMP & PDA - Block 4	<1.21	<8	-	-	-	<0.5																							

Table T6
Blocks 4 and 5
Soil Analytical Results - Saturated

					PAHs																							
					CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	TPH C15-C36
					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	mg/kg
EQL							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		
SSTC ^{VMP}					67																							
TCM Criteria						2000									150													
Location	Depth	Sample Date	Sample Type	Area																								
BH49	8.2-8.4	22/02/2010	Fill	VMP & PDA - Block 4	25.723	946.5	-	-	-	11.2	55.1	-	43.6	30.9	16.4	-	21.4	6.7	12	22.6	2	83.3	62	6	373	130	70.3	3440
BH49	10.2-10.4	22/02/2010	Fill	VMP & PDA - Block 4	17.52	813.1	-	-	-	5.3	32.6	-	25.8	23.1	11.4	-	14.8	4.7	6.5	15.3	1.1	54.6	33.4	3.8	343	191	46.7	1660
BH49	12.2-12.4	22/02/2010	Natural Clayey Sand	VMP & PDA - Block 4	45.485	1760.5	<1.2	211	<1.2	16.5	132	<1.2	59.1	48.4	35.8	45	-	8.7	-	37.8	3.4	161	125	9.8	703	283	137	-
BH52	2.2-2.6	22/02/2010	Fill	VMP & PDA - Block 4	2.288	23.3	-	-	-	<0.5	1	-	1	2.4	1.6	-	2.4	0.9	1	1.9	<0.5	4.1	<0.5	0.8	<0.5	2.3	3.9	<200
BH52	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	127.752	1994.9	-	-	-	36.1	85.7	-	115	140	82.2	-	93.8	43.2	52.9	109	11.6	306	123	37.6	55.8	412	291	8970
BH54	2.8-3	23/02/2010	Natural Sand	VMP & PDA - Block 4	27.593	678.1	<1.2	41.8	<1.2	11.1	29.3	<1.2	32.6	27.5	21.7	28	-	5.8	-	22.5	2.2	66.1	40.2	6.6	227	131	54.5	3980
BH55	2.2-2.4	25/02/2010	Fill	VMP & PDA - Block 4	102.892	3476.4	<1.2	308	<1.2	25.3	149	<1.2	119	107	84	102	-	17.2	-	87	5.4	274	151	17.5	1740	463	237	14,340
BH55	2.7-2.9	25/02/2010	Fill	VMP & PDA - Block 4	242.28	10,435	-	<4	-	67.1	386	-	341	294	160	-	187	65	117	200	14.5	783	440	53.3	4810	1840	677	19,550
BH58	3.2-3.4	22/02/2010	Fill	VMP & PDA - Block 4	2.979	50.8	-	-	-	1.6	1.1	-	2.2	2.8	2.1	-	3.6	1.4	1	2.5	<0.5	6.6	1.3	1	10.9	5.9	6.8	830
BH58	5.2-5.4	22/02/2010	Fill	VMP & PDA - Block 4	3.688	45.6	-	-	-	1.2	0.9	-	2	3.3	2.6	-	3.8	1.7	1.9	3.1	<0.5	7.5	1.3	1.4	1.3	6.2	7.4	620
BH58	8.6-8.8	22/02/2010	Fill	VMP & PDA - Block 4	6.05	47.5	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	2.2	5.6	5.3	7	-	1.4	-	4.6	<0.5	7.9	0.7	1.3	1.2	4.6	10.6	1150
BH58	10.8-11.2	22/02/2010	Fill	VMP & PDA - Block 4	3.161	39.8	-	-	-	0.8	0.9	-	1.3	3.3	2.2	-	3.2	1.3	1.7	2.8	<0.5	7.3	0.7	1	1.2	3.6	8.5	850
BH59	3.4-3.5	22/02/2010	Fill	VMP & PDA - Block 4	245.605	8362.4	<1.2	967	<1.2	104	404	<1.2	368	271	189	232	-	44.5	-	214	21.7	669	462	52.2	3560	1400	603	25,340
BH59	4.2-4.3	22/02/2010	Fill	VMP & PDA - Block 4	4.859	147.6	-	-	-	1.4	9.1	-	8.3	6.2	3.4	-	4.6	1.4	2	4.5	<0.5	14.2	8.8	1.2	46.4	23.5	12.6	510
BH62	3.4-3.8	26/02/2010	Fill	VMP & PDA - Block 5	<1.21	<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	<0.5	380
BH62	5.4-5.6	26/02/2010	Fill	VMP & PDA - Block 5	4.247	52.5	-	<0.5	-	<0.5	0.6	-	2.2	5.1	2.9	-	4.3	1.7	2.2	4	<0.5	10.8	0.5	1.3	0.5	6.1	10.3	720
BH62	11.8-12	26/02/2010	Fill	VMP & PDA - Block 5	<1.11	<7	<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	<200
BH64	2.5-2.7	1/03/2010	Fill	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1230
BH64	5.5-5.7	1/03/2010	Fill	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200
BH64	10-10.3	1/03/2010	Natural Sandstone	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200
BH65	3.4-3.6	24/02/2010	Fill	VMP & PDA - Block 5	41.546	532.8	-	-	-	5.2	13.8	-	28.1	40.6	27	-	32.3	17.4	17.2	30.2	3.7	82.9	29.1	13.6	10.1	98.8	82.8	13,260
BH65	8.2-8.6	24/02/2010	Fill	VMP & PDA - Block 5	12.071	115	-	-	-	0.8	3	-	5	9.2	7.9	-	9.5	4.7	3.9	7.4	1.4	17.1	5	3.9	2.3	15.6	18.3	1030
BH65	11.2-11.4	24/02/2010	Natural Clayey Sand	VMP & PDA - Block 5	3.415	216.8	<0.5	57.6	<0.5	3.1	24.9	<0.5	11.7	4.7	2.9	3		<0.5		4.5	<0.5	10.8	20.8	<0.5	65	51.5	16.9	1330
BH65	13.4-13.6	24/02/2010	Natural Sandy Clay	VMP & PDA - Block 5	2.755	114.4	-	-	-	2.4	7.3	-	6.6	3.8	2.1	-	1.8	0.5	0.6	3	<0.5	6.4	10.8	<0.5	34.6	25.1	9.4	380
BH66	2.3-2.4	24/02/2010	Fill	VMP & PDA - Block 5	16.292	105	-	-	-	0.8	1.5	-	3.5	8.8	10.9	-	11.9	7.3	4.2	6.9	2.2	12.4	1.5	5.6	5.3	9.2	13	810
BH66	3.2-3.6	24/02/2010	Fill	VMP & PDA - Block 5	<1.21	<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	<200
BH66	7-7.2	24/02/2010	Natural Sandstone	VMP & PDA - Block 5	<1.21	1.4	-	-	-	<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	<0.5	0.7	<200
BH68	2.5-2.9	2/03/2010	Fill	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	770
BH68	4-4.3	2/03/2010	Fill	VMP & PDA - Block 5	<1.21	<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	<0.5	<200
BH68	7-7.1	2/03/2010	Natural Silty Sand	VMP & PDA - Block 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200

Notes
mg/kg = milligrams per kilogram
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria

CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

Table T6
Blocks 4 and 5
Soil Analytical Results - Saturated

					TPH					BTEX						Inorganics
					TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene	Ammonia as N
					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					50	100	100	10	50	0.2	0.2	0.2	0.2	0.2		1
SSTC ^{VMP}					54000	72000	21,000			380						
TCM Criteria																
Location	Depth	Sample Date	Sample Type	Area												
BH 199	6	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH001	4	2/05/2006	Fill	VMP & PDA - Block 5	<50	160	<100	<2	160	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH019	2.5-3	8/05/2006	Fill	VMP & PDA - Block 4	2180	3840	1060	354	7080	-	-	-	-	-	-	-
BH019	3-3.45	8/05/2006	Fill	VMP & PDA - Block 4	3160	5450	1870	210	10,480	-	-	-	-	-	-	-
BH028	13-13.5	12/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	780	1370	250	119	2400	8.2	2.7	14.8	15.4	6.9	22.3	-
BH058	6-6.5	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	220	510	<100	40	730	3.1	5.9	0.4	8.5	4.3	12.8	-
BH059	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	<50	170	120	<2	290	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH059	8.5-9	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH060	9.5-10	31/05/2006	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH062	3-3.45	31/05/2006	Fill	VMP & PDA - Block 5	<50	420	410	<2	830	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH065	3-3.45	1/06/2006	Fill	VMP & PDA - Block 4	90	1040	720	3	1850	<0.2	<0.2	<0.2	0.5	0.3	0.8	-
BH067	3-3.45	1/06/2006	Fill	VMP & PDA - Block 5	<50	1490	3020	2	4510	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH071	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH072	3-3.45	2/05/2006	Fill	VMP & PDA - Block 4	<50	120	<100	<2	120	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH072	9.5-10	2/05/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH073	2-2.4	2/05/2006	Fill	VMP & PDA - Block 4	260	1340	260	8	1860	<0.2	2.1	<0.2	3.4	2.1	5.5	-
BH074	3-3.45	2/05/2006	Fill	VMP & PDA - Block 5	<50	260	<100	3	260	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH074	9.5-10	2/05/2006	Natural Sandy Clay	VMP & PDA - Block 5	1510	2480	870	122	4860	14.9	1.6	21.1	20.7	7.6	28.3	-
BH075	3-3.45	6/06/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH087	3-3.45	8/06/2006	Fill	VMP & PDA - Block 4	4560	7310	1670	271	13,540	15	47.5	24.9	79.9	38.6	118.5	-
BH087	7-7.5	8/06/2006	Fill	VMP & PDA - Block 4	4360	6720	1550	442	12,630	82.7	24.3	149	116	57.1	173.1	-
BH089	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	<50	170	<100	<2	170	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH090	3-3.45	9/06/2006	Fill	VMP & PDA - Block 4	<50	140	<100	<2	140	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH109	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	<50	<100	130	<2	130	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH109	9.5-10	27/06/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH113	3-3.45	27/06/2006	Fill	VMP & PDA - Block 4	70	540	470	<2	1080	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH114	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	60	620	360	<2	1040	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH115	3-3.45	28/06/2006	Fill	VMP & PDA - Block 4	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH119	7.5-8	30/06/2006	Fill	VMP & PDA - Block 4	6750	13,000	4690	1140	24,440	82.4	63	118	182	69.8	251.8	-
BH119	9.5-10	30/06/2006	Fill	VMP & PDA - Block 4	5320	7940	2110	1060	15,370	97.8	14.7	124	152	53	205	-
BH132	8-8.5	6/07/2006	Natural Clayey Sand	VMP & PDA - Block 4	1870	3040	1190	1050	6100	140	44.7	232	225	120	345	-
BH135A	3-3.45	11/07/2006	Fill	VMP & PDA - Block 4	-	-	-	-	-	-	-	-	-	-	-	-
BH141	3-3.45	7/07/2006	Fill	VMP & PDA - Block 4	1800	4490	1430	325	7720	41.8	49.1	17.3	86.5	60.3	146.8	-
BH145	3-3.45	11/07/2006	Fill	VMP & PDA - Block 5	<50	<100	<100	<2	<250	<0.2	<0.2	<0.2	<0.2	<0.2	<0.4	-
BH146	3-3.33	11/07/2006	Fill	VMP & PDA - Block 4	-	-	-	-	-	-	-	-	-	-	-	-
BH146	4.1-4.6	11/07/2006	Fill	VMP & PDA - Block 4	3020	3750	860	222	7630	15.2	13.9	25.3	56	31	87	-
BH197	5	9/04/2008	Fill	VMP & PDA - Block 5	560	3820	1480	26	5860	4.8	1.9	8	4.2	1.9	6.1	-
BH197	6.5	9/04/2008	Natural Sandy Clay	VMP & PDA - Block 5	<50	<100	<100	<10	<250	0.5	<0.5	0.8	0.6	<0.5	0.6	-
BH197	11.5	9/04/2008	Natural Clayey Sand	VMP & PDA - Block 5	160	400	<100	<10	560	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH197	15.9	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH197	18.6	10/04/2008	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH198	3	6/03/2008	Fill	VMP & PDA - Block 5	1360	6690	1440	<10	9490	<0.2	<0.5	<0.5	0.7	<0.5	0.7	-
BH198	4.5	6/03/2008	Natural Sandy Clay	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH198	6.9	6/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH199	2.7	11/03/2008	Fill	VMP & PDA - Block 5	<50	740	380	<10	1120	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH199	3.7	11/03/2008	Natural Silty Clay	VMP & PDA - Block 5	950	2620	920	96	4490	6.4	16.3	2.6	22.4	22.9	45.3	-
BH199	5.6	11/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH199	6	17/03/2008	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH200	2.5	7/04/2008	Fill	VMP & PDA - Block 4	110	1060	500	<10	1670	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH200	6.53	7/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH201	2.4	4/03/2008	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH202	2.3	10/03/2008	Fill	VMP & PDA - Block 4	<50	240	270	<10	510	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH202	4.7	10/03/2008	Fill	VMP & PDA - Block 4	<50	280	340	<10	620	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-

Table T6
Blocks 4 and 5
Soil Analytical Results - Saturated

					TPH					BTEX						Inorganics
					TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene	Ammonia as N
					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					50	100	100	10	50	0.2	0.2	0.2	0.2	0.2		1
SSTC ^{VMP}					54000	72000	21,000			380						
TCM Criteria																
Location	Depth	Sample Date	Sample Type	Area												
BH202	6.8	10/03/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH201	10.3	18/03/2008	Fill	VMP & PDA - Block 5	<50	1930	1350	<10	3280	<0.2	0.7	<0.5	<0.5	<0.5	<1	-
BH201	11	18/03/2008	Natural Clayey Sand	VMP & PDA - Block 5	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH203	7.3	10/03/2008	Fill	VMP & PDA - Block 4	<50	560	450	<10	1010	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH204D	3	7/04/2008	Fill	VMP & PDA - Block 4	11,600	19,400	6340	289	37,340	36.8	34.9	49.3	112	39.9	151.9	-
BH204D	4	7/04/2008	Fill	VMP & PDA - Block 4	12,600	22,400	7020	215	42,020	44.3	15.1	53	72.8	26.7	99.5	-
BH205	13	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	13	<250	2.5	<0.5	3.3	2.8	1.2	4	-
BH205	13.8	1/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	0.7	<0.5	0.5	<0.5	<0.5	<1	-
BH205	19.2	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	0.5	<0.5	0.5	-
BH205	22.2	2/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH205	7.8	27/03/2008	Natural Sandy Clay	VMP & PDA - Block 4	<50	<100	<100	<10	<250	1.4	<0.5	0.7	<0.5	<0.5	<1	-
BH205	9.3	27/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	1500	2710	640	138	4850	7.5	5.4	34.7	42.4	21.9	64.3	-
BH206	4.6	17/04/2008	Fill	VMP & PDA - Block 4	<50	230	230	<10	460	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH206	7.1	17/04/2008	Natural Clayey Sand	VMP & PDA - Block 4	200	350	<100	15	550	<0.2	1	<0.5	2.7	2.2	4.9	-
BH206	10.7	21/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	110	<100	<10	110	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH207	7.45	3/04/2008	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH207	12	3/04/2008	Fill	VMP & PDA - Block 4	<50	430	340	<10	770	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH207	13.1	3/04/2008	Fill	VMP & PDA - Block 4	<50	140	<100	<10	140	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH207	15	3/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH208	2.25	4/04/2008	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH208	9.5	4/04/2008	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH208	13.5	4/04/2008	Natural Sandy Clay	VMP & PDA - Block 4	80	3320	2520	<10	5920	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH209	2.3	22/04/2008	Fill	VMP & PDA - Block 4	<50	880	580	<10	1460	<0.2	<0.5	0.5	<0.5	<0.5	<1	-
BH209	4.5	22/04/2008	Natural Clay	VMP & PDA - Block 4	1190	1950	460	227	3600	15.5	37.2	4.3	36	50	86	-
BH209	6.1	22/04/2008	Natural Sandstone	VMP & PDA - Block 4	2280	2350	430	929	5060	88.2	34.8	213	165	94.8	259.8	-
BH209	9.4	23/04/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH210	15.9	27/03/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH211	14	26/03/2008	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH211	15.5	26/03/2008	Natural Clayey Sand	VMP & PDA - Block 4	<50	<100	<100	19	<250	3.4	0.6	5.5	3.3	1.8	5.1	-
BH211	16.05-16.15	26/03/2008	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH34	6-6.2	25/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH34	11-11.2	25/02/2010	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH35	4.9-5	22/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH35	9.9-10	22/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH405	4-4.3	10/02/2011	Fill	VMP & PDA - Block 4	<50	400	620	<10	1020	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH405	7-7.3	10/02/2011	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH405	13-13.2	11/02/2011	Natural Sand	VMP & PDA - Block 4	510	1760	560	<10	2830	0.7	0.6	0.6	3	1.3	4.3	-
BH405	14-14.4	11/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	3390	7020	2010	156	12420	5.9	4	33	57.2	19.4	76.6	-
BH408	2-2.4	14/02/2011	Fill	VMP & PDA - Block 4	<50	190	260	<10	450	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH408	8-8.3	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	100	350	<100	<10	450	0.6	0.7	<0.5	0.7	0.6	1.3	-
BH408	9-9.4	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	360	710	150	24	1220	2.1	4.6	<0.5	5.1	3.8	8.9	-
BH409	3.7-4	14/02/2011	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH409	5-5.3	14/02/2011	Natural Sand	VMP & PDA - Block 4	150	180	<100	12	330	1.8	3.5	<0.5	1.1	1.8	2.9	-
BH409	6-6.4	15/02/2011	Natural Sandy Clay	VMP & PDA - Block 4	<50	-	-	<10	<50	0.3	<0.5	<0.5	<0.5	<0.5	<1	<20
BH409	7-7.3	15/02/2011	Natural Clayey Sand	VMP & PDA - Block 4	<50	<100	<100	106	<50	2.8	3.5	22.3	17.8	8.9	26.7	-
BH42	3.2-3.3	23/02/2010	Fill	VMP & PDA - Block 4	4680	13,200	4150	234	22030	1	40.8	1.5	39.9	83.6	123.5	-
BH42	3.5-3.6	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH44	4.9-5	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	1040	2650	650	147	4340	2.1	18.1	5.4	25.7	20.9	46.6	-
BH45	3.2-3.4	23/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH45	7.2-7.4	23/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	12	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH45	13.2-13.4	23/02/2010	Natural Sandstone	VMP & PDA - Block 4	<50	<100	<100	<10	<50	-	-	-	-	-	-	-
BH49	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	250	1610	1080	13	2940	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH49	6.2-6.4	22/02/2010	Fill	VMP & PDA - Block 4	160	450	150	<10	760	1.6	<0.5	1.8	2	0.8	2.8	-

Table T6
Blocks 4 and 5
Soil Analytical Results - Saturated

					TPH					BTEX						Inorganics
					TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene	Ammonia as N
					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					50	100	100	10	50	0.2	0.2	0.2	0.2	0.2		1
SSTC ^{VMP}					54000	72000	21,000			380						
TCM Criteria																
Location	Depth	Sample Date	Sample Type	Area												
BH49	8.2-8.4	22/02/2010	Fill	VMP & PDA - Block 4	1160	2650	790	348	4600	49.7	5.2	74.6	61.5	22.6	84.1	-
BH49	10.2-10.4	22/02/2010	Fill	VMP & PDA - Block 4	670	1240	420	56	2330	5.5	1.4	10.8	9.9	4.7	14.6	-
BH49	12.2-12.4	22/02/2010	Natural Clayey Sand	VMP & PDA - Block 4	-	-	-	-	-	10.2	2	16.6	21.2	7.7	28.9	-
BH52	2.2-2.6	22/02/2010	Fill	VMP & PDA - Block 4	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH52	4.2-4.4	22/02/2010	Fill	VMP & PDA - Block 4	<50	6600	2370	10	8970	1.7	1	1.1	1.4	0.7	2.1	-
BH54	2.8-3	23/02/2010	Natural Sand	VMP & PDA - Block 4	900	2980	1000	13	4880	<0.2	0.8	<0.5	3.2	1.6	4.8	-
BH55	2.2-2.4	25/02/2010	Fill	VMP & PDA - Block 4	6420	10,600	3740	304	20760	22.2	29.6	2.3	48.8	51.6	100.4	-
BH55	2.7-2.9	25/02/2010	Fill	VMP & PDA - Block 4	9150	14,800	4750	104	28,700	9.4	8.9	2	19.8	21.1	40.9	-
BH58	3.2-3.4	22/02/2010	Fill	VMP & PDA - Block 4	80	450	380	<10	910	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH58	5.2-5.4	22/02/2010	Fill	VMP & PDA - Block 4	<50	320	300	<10	620	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH58	8.6-8.8	22/02/2010	Fill	VMP & PDA - Block 4	<50	640	510	<10	1150	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH58	10.8-11.2	22/02/2010	Fill	VMP & PDA - Block 4	<50	420	430	<10	850	<0.2	<0.5	<0.5	<0.5	<0.5	<1	<20
BH59	3.4-3.5	22/02/2010	Fill	VMP & PDA - Block 4	9120	19,200	6140	459	34460	82.4	88.3	32.5	103	51.2	154.2	-
BH59	4.2-4.3	22/02/2010	Fill	VMP & PDA - Block 4	140	380	130	14	650	3.4	<0.5	2.9	2.4	0.9	3.3	-
BH62	3.4-3.8	26/02/2010	Fill	VMP & PDA - Block 5	<50	140	240	<10	380	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH62	5.4-5.6	26/02/2010	Fill	VMP & PDA - Block 5	<50	390	330	<10	720	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH62	11.8-12	26/02/2010	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH64	2.5-2.7	1/03/2010	Fill	VMP & PDA - Block 5	<50	640	590	<10	1230	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH64	5.5-5.7	1/03/2010	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH64	10-10.3	1/03/2010	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH65	3.4-3.6	24/02/2010	Fill	VMP & PDA - Block 5	710	7500	5760	<10	13970	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH65	8.2-8.6	24/02/2010	Fill	VMP & PDA - Block 5	<50	560	470	<10	1030	-	-	-	-	-	-	-
BH65	11.2-11.4	24/02/2010	Natural Clayey Sand	VMP & PDA - Block 5	450	1110	220	14	1780	<0.2	0.8	<0.5	3.5	2.3	5.8	-
BH65	13.4-13.6	24/02/2010	Natural Sandy Clay	VMP & PDA - Block 5	100	380	<100	<10	480	<0.2	<0.5	<0.5	1.1	0.7	1.8	-
BH66	2.3-2.4	24/02/2010	Fill	VMP & PDA - Block 5	<50	420	390	<10	810	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH66	3.2-3.6	24/02/2010	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH66	7-7.2	24/02/2010	Natural Sandstone	VMP & PDA - Block 5	<50	<100	<100	<10	<50	-	-	-	-	-	-	-
BH68	2.5-2.9	2/03/2010	Fill	VMP & PDA - Block 5	<50	320	450	<10	770	-	-	-	-	-	-	-
BH68	4-4.3	2/03/2010	Fill	VMP & PDA - Block 5	<50	<100	<100	<10	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1	-
BH68	7-7.1	2/03/2010	Natural Silty Sand	VMP & PDA - Block 5	<50	<100	<100	<10	<50	-	-	-	-	-	-	-

Notes

mg/kg = milligrams per kilogram

EQL = Estimated Quantitation Limit

< denotes result less than EQL

SSTC^{VMP} - Site Specific Target Criteria for the VMP Area

shading denotes concentration greater than criteria

CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor

TPH - Total Petroleum Hydrocarbons

PAH - Polycyclic Aromatic Hydrocarbons (PAH)

* TPH C6-C9 aliphatic

* *TPH C10-C14 aliphatic and aromatic

note TPH in table not speciated

BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

Table T7
Block 4 and 5 Asbestos Analytical Results

Consultant	Field ID	Sampled Date	Batch	Area	Asbestos Identification in bulk solids	Type
					Asbestos fibres	
					Yes/No	
ERM	BH198/3.0	06/03/2010	-	Declaration Area - Block 5	No	-
ERM	BH198/5.2	06/03/2010	-	Declaration Area - Block 5	No	-
ERM	BH199/2.7	11/03/2008	-	Declaration Area - Block 5	No	-
ERM	BH200/1.0	07/04/2008	-	Declaration Area - Block 4	No	-
ERM	BH201/2.2	04/03/2008	-	Declaration Area - Block 5	No	-
ERM	BH201/5.5	18/03/2008	-	Declaration Area - Block 4	No	-
ERM	BH202/4.7	10/03/2008	-	Declaration Area - Block 4	No	-
ERM	BH203/1.5	10/03/2008	-	Declaration Area - Block 4	Yes	amosite and chrysotile
ERM	BH204D/1.5	07/04/2008	-	Declaration Area - Block 4	No	-
ERM	BH206/1.8	17/04/2008	-	Declaration Area - Block 4	No	-
ERM	BH207/7.45	03/04/2008	-	Declaration Area- Block 4	No	-
ERM	BH208/1.5	04/04/2008	-	Declaration Area - Block 4	No	-
AECOM	BH42 2.0-2.1	23/02/2010	ES1003672	Declaration Area - Block 4	No	-
AECOM	BH66 1.9-2.0	24/02/2010	ES1003672	Declaration Area - Block 5	No	-
AECOM	BH68 1.0-1.3	02/03/2010	ES1004018	Declaration Area - Block 5	No	-
AECOM	BH405_12.0-12.2	11/02/2011	ES1103042	Declaration Area - Block 4	Yes	chrysotile

Table T8
Hickson Road
Soil Analytical Results - Unsaturated

					Location	BH4	BH5	BH5	BH8	BH8	BH9	BH9	MW10 Coffey	MW15 Coffey	MW15 Coffey	MW15 Coffey	MW3	MW3	MW6
					Field ID	BH4 0.4-0.5	BH5 0.4-0.5	BH5 1.2-1.3	BH8 0.26-0.4	BH8 0.6-0.7	BH9 0.4-0.5	BH9 0.9-1.0	MW10 1.9-2.0	MW15 0.4-0.5	MW15 1.4-1.5	QC1A	MW3 0.4-0.5	MW3 0.9-1.0	MW6 0.8-0.9
					Sample Date	21/02/2008	23/02/2008	23/02/2008	19/02/2008	19/02/2008	21/02/2008	21/02/2008	21/02/2008	10/04/2008	10/04/2008	21/02/2008	23/02/2008	23/02/2008	20/02/2008
					Consultant	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey	Coffey
					Matrix Area	Fill	Fill	Natural Clayey Sand	Fill	Fill	Fill	Natural Sandstone	Fill	Fill	Fill	Fill	Fill	Fill	Fill
						VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road
Chemical Group	Chemical Name	output unit	EQL	Tar Containing Material (TCM) Criteria	SSTC ^{VMP}														
PAHs	CPAH (TEF)	mg/kg			67	<1.11	8.491	0.06	21.841	37.753	0.06	1.546	12.023	<1.11	<1.11		0.16	19.996	<1.11
	PAH (Total)	mg/kg		2000		<7	82.9	4.6	136.7	274.5	1.7	14.1	87.2	<7	<7		5.1	468.5	<7
	2-chloronaphthalene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
	2-methylnaphthalene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
	3-methylcholanthrene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
	Acenaphthene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	1.7	<0.5
	Acenaphthylene	mg/kg	0.5			<0.5	6.4	<0.5	7.4	17.1	<0.5	0.6	1.6	<0.5	<0.5		0.6	42.5	<0.5
	Anthracene	mg/kg	0.5			<0.5	4.4	<0.5	5.9	11.5	<0.5	0.5	2.4	<0.5	<0.5		<0.5	13.8	<0.5
	Benz(a)anthracene	mg/kg	0.5			<0.5	11.8	0.6	24	33.5	0.6	2.6	21.1	<0.5	<0.5		0.8	44.6	<0.5
	Benzo(a) pyrene	mg/kg	0.5	150		<0.5	6.9	<0.5	16.1	31.3	<0.5	1.2	8.6	<0.5	<0.5		<0.5	11.7	<0.5
	Benzo(b)&(k)fluoranthene	mg/kg	1			<1	20	<1	34	57	<1	2	14	<1	<1		1	62	<1
	Benzo(b)fluoranthene	mg/kg	0.5																
	Benzo(g,h,i)perylene	mg/kg	0.5			<0.5	2.2	<0.5	4.5	4.8	<0.5	0.6	1.2	<0.5	<0.5		1	4.2	<0.5
	Benzo(k)fluoranthene	mg/kg	0.5																
	Chrysene	mg/kg	0.5			<0.5	4.9	<0.5	7.6	10.5	<0.5	1	7.1	<0.5	<0.5		<0.5	23.4	<0.5
	Dibenz(a,h)anthracene	mg/kg	0.5			<0.5	<0.5	<0.5	2.5	2	<0.5	<0.5	1	<0.5	<0.5		<0.5	2.7	<0.5
	Fluoranthene	mg/kg	0.5			<0.5	15.9	0.8	23	62	0.5	2.6	16.8	<0.5	<0.5		0.7	91.1	<0.5
	Fluorene	mg/kg	0.5			<0.5	<0.5	<0.5	0.8	1.9	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	8.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5			<0.5	3.4	<0.5	7.2	9.5	<0.5	0.7	2.3	<0.5	<0.5		0.7	8.6	<0.5
	Naphthalene	mg/kg	0.5			<0.5	0.7	1.6	0.9	2.3	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	2.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5																
	Phenanthrene	mg/kg	0.5			<0.5	11.6	0.7	12.6	24.8	<0.5	1.6	7.6	<0.5	<0.5		0.5	120	<0.5
	Pyrene	mg/kg	0.5			<0.5	14.7	0.9	24.2	63.3	0.6	2.7	17.5	<0.5	<0.5		0.8	93.2	<0.5
TPH	TPH C15-C36	mg/kg				<200	1700	<200	510	2370	<200	<200	830	<200	<200		<200	3270	<200
	TPH C10 - C14	mg/kg	50		54000	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		<50	1010	<50
	TPH C15-C28	mg/kg	100		72000	<100	1060	<100	310	1380	<100	<100	370	<100	<100		<100	2510	<100
	TPH C29-C36	mg/kg	100		21,000	<100	640	<100	200	990	<100	<100	460	<100	<100		<100	760	<100
	TPH C6 - C9	mg/kg	10			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	<10	<10
	TPH+C10 - C36 (Sum of total)	mg/kg	50			<250	1700	<250	510	2370	<250	<250	830	<250	<250		<250	4280	<250
BTEX	Total Xylene (ESDAT)	mg/kg	0.15			<1	<1	0.8	<1	<1	<1	<1	<1	<1	<1	<1.5	<1	<1	<1
	Benzene	mg/kg	0.2		380	<0.2	<0.2	2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5			<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Xylene (m & p)	mg/kg	0.5			<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
	Xylene (o)	mg/kg	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5

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



Table T8
Hickson Road
Soil Analytical Results - Unsaturated

VMP Remediation Extent
VMP Remediation Works Area
Barangaroo

					Location	MW7	AECOM_BH51	AECOM_BH43	AECOM_BH53	AECOM_BH61	AECOM_BH67	TBH01	TBH03	TBH03	TBH05	TBH05	TBH05	TBH06	TBH06	
					Field ID	MW7 1.4-1.5	BH51_0.4-0.5	BH43_0.4-0.5	BH53_1.1-1.5	BH61_0.3-0.4	BH67_0.4-0.43	TBH01_0.43-0.5	TBH03_1.2-1.3	TBH03_1.5-1.6	TBH05_0.6-0.7	TBH05_1.3-1.7	TBH05_1.8-2.0	TBH06_0.55-0.6	TBH06_1.5-2.0	
					Sample Date	25/02/2008	6/03/2010	6/03/2010	6/03/2010	6/03/2010	6/03/2010	5/02/2011	5/02/2011	5/02/2011	12/02/2011	12/02/2011	12/02/2011	5/02/2011	12/02/2011	
					Consultant	Coffey	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	AECOM	
					Matrix Area	FILL	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	Fill	
						VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	
Chemical Group	Chemical Name	output unit	EQL	Tar Containing Material (TCM) Criteria	SSTC ^{VMP}															
PAHs	CPAH (TEF)	mg/kg			67	38.745	1.256		56.149		12.389	2.22	<1.21	<1.21	<1.21	0.85	28.753	0.967	<1.21	
	PAH (Total)	mg/kg		2000		218	10.6		668.3		131.2	16.5	<8	<8	<8	4.1	161.8	7.3	<8	
	2-chloronaphthalene	mg/kg	0.5			<0.5														
	2-methylnaphthalene	mg/kg	0.5			0.7	<0.5		<0.5		<0.5									
	3-methylcholanthrene	mg/kg	0.5			<0.5														
	Acenaphthene	mg/kg	0.5			0.7	<0.5		5.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	
	Acenaphthylene	mg/kg	0.5			7.7	<0.5		13		3.2	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	
	Anthracene	mg/kg	0.5			9.6	<0.5		25.7		3.4	0.5	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	
	Benz(a)anthracene	mg/kg	0.5			41.2	1.3		52.3		16.2	1.9	<0.5	<0.5	<0.5	<0.5	0.7	15.6	0.9	<0.5
	Benzo(a) pyrene	mg/kg	0.5	150		32.1	0.9		38.1		5.5	1.7	<0.5	<0.5	<0.5	<0.5	0.7	18.8	0.8	<0.5
	Benzo(b)&(k)fluoranthene	mg/kg	1			49														
	Benzo(b)fluoranthene	mg/kg	0.5				1.4		50.4		20.3	1.8	<0.5	<0.5	<0.5	<0.5	0.8	23.8	0.7	<0.5
	Benzo(g,h,i)perylene	mg/kg	0.5			1.4	0.5		16.8		6.3	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	15.1	<0.5	<0.5
	Benzo(k)fluoranthene	mg/kg	0.5				0.7		13.8		8.7	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	9.3	<0.5	<0.5
	Chrysene	mg/kg	0.5			16.1	1.1		36.1		17.6	1.4	<0.5	<0.5	<0.5	<0.5	<0.5	13.2	0.7	<0.5
	Dibenz(a,h)anthracene	mg/kg	0.5			1.7	<0.5		4.4		1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.4	<0.5	<0.5
	Fluoranthene	mg/kg	0.5			36.6	1.9		142		17.7	3.1	<0.5	<0.5	<0.5	<0.5	1	19.1	1.7	<0.5
	Fluorene	mg/kg	0.5			2	<0.5		15.6		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5			6.5	<0.5		14.7		5.3	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	14	<0.5	<0.5
	Naphthalene	mg/kg	0.5			1.6	<0.5		20.8		0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5				10.6		668		131									
	Phenanthrene	mg/kg	0.5			24.9	0.8		91.2		7.9	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	8.3	0.6	<0.5
	Pyrene	mg/kg	0.5			35.9	2		128		16.6	3	<0.5	<0.5	<0.5	<0.5	0.9	16	1.9	<0.5
TPH	TPH C15-C36	mg/kg				2660	<200		3250	<200	1270	<200	<200	<200	<200	<200	1210	<200	<200	
	TPH C10 - C14	mg/kg	50		54000	<50	<50		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
	TPH C15-C28	mg/kg	100		72000	1400	<100		1920	<100	700	<100	<100	<100	<100	<100	600	<100	<100	
	TPH C29-C36	mg/kg	100		21,000	1260	<100		1330	<100	570	<100	<100	<100	<100	<100	610	<100	<100	
	TPH C6 - C9	mg/kg	10			<10	<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
	TPH+C10 - C36 (Sum of total)	mg/kg	50			2660	<50		3250	<50	1270	<50	<50	<50	<50	<50	1210	<50	<50	
BTEX	Total Xylene (ESDAT)	mg/kg	0.15			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
	Benzene	mg/kg	0.2		380	0.2	<0.2		0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
	Ethylbenzene	mg/kg	0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Toluene	mg/kg	0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Xylene (m & p)	mg/kg	0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Xylene (o)	mg/kg	0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	

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

Table T8
Hickson Road
Soil Analytical Results - Unsaturated

					Location	TBH07	TBH08
					Field ID	TBH07_0.1-0.15	TBH08_0.13-0.25
					Sample Date	4/02/2011	4/02/2011
					Consultant	AECOM	AECOM
					Matrix Area	Fill	Fill
						VMP & PDA - Hickson Road	VMP & PDA - Hickson Road
Chemical Group	Chemical Name	output unit	EQL	Tar Containing Material (TCM) Criteria	SSTC ^{VMP}		
PAHs	CPAH (TEF)	mg/kg			67	10.663	1.828
	PAH (Total)	mg/kg		2000		58.6	12.3
	2-chloronaphthalene	mg/kg	0.5				
	2-methylnaphthalene	mg/kg	0.5				
	3-methylcholanthrene	mg/kg	0.5				
	Acenaphthene	mg/kg	0.5			<0.5	<0.5
	Acenaphthylene	mg/kg	0.5			1.4	<0.5
	Anthracene	mg/kg	0.5			1.4	<0.5
	Benz(a)anthracene	mg/kg	0.5			4.7	1.3
	Benzo(a) pyrene	mg/kg	0.5	150		7.8	1.5
	Benzo(b)&(k)fluoranthene	mg/kg	1				
	Benzo(b)fluoranthene	mg/kg	0.5			8	1.3
	Benzo(g,h,i)perylene	mg/kg	0.5			6.5	0.7
	Benzo(k)fluoranthene	mg/kg	0.5			2.7	0.5
	Chrysene	mg/kg	0.5			4.8	1.1
	Dibenz(a,h)anthracene	mg/kg	0.5			0.8	<0.5
	Fluoranthene	mg/kg	0.5			6.4	2.8
	Fluorene	mg/kg	0.5			<0.5	<0.5
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5			4.1	<0.5
	Naphthalene	mg/kg	0.5			<0.5	<0.5
	PAHs (Sum of total)	mg/kg	0.5				
	Phenanthrene	mg/kg	0.5			1.4	<0.5
	Pyrene	mg/kg	0.5			8.6	3.1
TPH	TPH C15-C36	mg/kg				700	370
	TPH C10 - C14	mg/kg	50		54000	<50	<50
	TPH C15-C28	mg/kg	100		72000	280	110
	TPH C29-C36	mg/kg	100		21,000	420	260
	TPH C6 - C9	mg/kg	10			<10	<10
	TPH+C10 - C36 (Sum of total)	mg/kg	50			700	370
BTEX	Total Xylene (ESDAT)	mg/kg	0.15			<1	<1
	Benzene	mg/kg	0.2		380	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5			<0.5	<0.5
	Toluene	mg/kg	0.5			<0.5	<0.5
	Xylene (m & p)	mg/kg	0.5			<0.5	<0.5
	Xylene (o)	mg/kg	0.5			<0.5	<0.5

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

						PAHs																					
						CPAH (TEF)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene
						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							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		
SSTC ^{VMP}						67																					
Tar Containing Material (TCM) Criteria														150													
Location	Field ID	Sample Depth	Sample Date	Matrix	Area																						
BH4	BH4 2.3-2.4	2.3-2.4	21/02/2008	Fill	VMP & PDA - Hickson Road	17.265	<1.2	7.2	<1.2	<1.2	52.8		12.3	9.4	11.4	23		8.4		8.1	3.9	10.1	<1.2	8.6	4.6		5.3
BH4	BH4 4.2-4.3	4.2-4.3	21/02/2008	Fill	VMP & PDA - Hickson Road	<1.11	<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	
BH53	BH53 2.0-2.4	2-2.4	6/03/2010	Fill	VMP & PDA - Hickson Road	100.803		<0.5		11.4	28.3		84.8	92.8	70.7		77.8	23.9	27.5	63.4	7.1	316	56.1	23.2	48.3	1510	302
BH53	BH53 4.0-4.4	4-4.4	6/03/2010	Fill	VMP & PDA - Hickson Road	338.605	<2.5	757	<2.5	108	657	<2.5	343	275	291	305		53.5		257	12.1	747	344	49	4330		1390
BH61	BH61 2-2.4	2-2.4	7/03/2010	Fill	VMP & PDA - Hickson Road	223.905		2		4.8	47.6		91.6	217	162		182	41.5	28	164	13.2	423	23.8	39.5	51.2	2170	267
BH61	BH61 3-3.4	3-3.4	7/03/2010	Natural Clayey Sand	VMP & PDA - Hickson Road	18.103	<1.2	81.2	<1.2	7.3	47.8	<1.2	30.1	18.9	14.3	17		4.7		14.6	1.3	60.1	38.4	4.2	318		113
MW10	MW10 4.9-5.0	4.9-5	21/02/2008	Fill	VMP & PDA - Hickson Road	386.828	<1.2	102	<1.2	212	652		523	934	278	698		21.8		61	9.4	966	662	52	224		1740
MW10	MW10 8.6-8.7	8.6-8.7	22/02/2008	Fill	VMP & PDA - Hickson Road	590.52	<1.2	7650	<1.2	511	1700		2150	1470	412	968		26		771	20.3	2440	2100	32.5	10,200		5180
MW3	MW3 2.9-3.0	2.9-3	23/02/2008	Natural Clayey Sand	VMP & PDA - Hickson Road	14.51	<0.5	22.6	<0.5	3.2	20		25.3	15.8	10.9	26		4.4		10.6	1.3	35.8	20.9	5.8	55		65.8
MW6	MW6 2.5-2.6	2.5-2.6	20/02/2008	Fill	VMP & PDA - Hickson Road	2.181	<0.5	<0.5	<0.5	<0.5	1.9		1.2	3.8	1.7	3		0.6		1.5	<0.5	5	<0.5	0.8	<0.5		2.7
MW6	MW6 4.4-4.5	4.4-4.5	20/02/2008	Fill	VMP & PDA - Hickson Road	<1.11	<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	
MW7	MW7 3.5-3.6	3.5-3.6	25/02/2008	FILL	VMP & PDA - Hickson Road	71.045	<0.5	92.7	<0.5	33.7	48.7		28.7	86.7	59.7	70		2.9		8.6	1.7	62.3	39.6	8.6	150		116
MW7	MW7 4.5-4.6	4.5-4.6	25/02/2008	FILL	VMP & PDA - Hickson Road	486.608	<1.2	3680	<1.2	210	3060		800	863	359	608		59.8		341	22.9	1470	1160	144	7800		3350
MW7	MW7 5.0-5.1	5-5.1	25/02/2008	FILL	VMP & PDA - Hickson Road	884.497	<1.2	5130	<1.2	282	4140		1200	1240	677	1170		87.7		582	57.2	2160	1980	196	10,200		4870

Notes
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EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
Shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

						TPH							BTEX					
						Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Total Xylene
						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						0.5		50	100	100	10	50	0.2	0.5	0.5	0.5	0.5	
SSTC ^{VMP}								54,000	72,000	21,000			380					
Tar Containing Material (TCM) Criteria																		
Location	Field ID	Sample Depth	Sample Date	Matrix	Area													
BH4	BH4 2.3-2.4	2.3-2.4	21/02/2008	Fill	VMP & PDA - Hickson Road	4.6	8660	200	5700	2960	<10	8860	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH4	BH4 4.2-4.3	4.2-4.3	21/02/2008	Fill	VMP & PDA - Hickson Road	<0.5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
BH53	BH53 2.0-2.4	2-2.4	6/03/2010	Fill	VMP & PDA - Hickson Road	277	6970	260	4540	2430	<10	7230	2.7	<0.5	1.4	0.8	<0.5	0.8
BH53	BH53 4.0-4.4	4-4.4	6/03/2010	Fill	VMP & PDA - Hickson Road	710	57,800	28,400	46,800	11,000	3000	86,200	678	50.7	670	470	197	667
BH61	BH61 2-2.4	2-2.4	7/03/2010	Fill	VMP & PDA - Hickson Road	412	12,790	450	8130	4660	67	13,240	32.7	<0.5	9.5	5.4	1.4	6.8
BH61	BH61 3-3.4	3-3.4	7/03/2010	Natural Clayey Sand	VMP & PDA - Hickson Road	55.7	1680	320	1220	460	75	2000	11.2	5.9	14.7	16.2	5.8	22
MW10	MW10 4.9-5.0	4.9-5	21/02/2008	Fill	VMP & PDA - Hickson Road	947	55,600	4600	41,400	14,200	64	60,200	12.4	4.1	2.2	4.1	1.5	5.6
MW10	MW10 8.6-8.7	8.6-8.7	22/02/2008	Fill	VMP & PDA - Hickson Road	2640	112,400	69,400	93,200	19,200	7590	181,800	1510	261	2650	1830	746	2576
MW3	MW3 2.9-3.0	2.9-3	23/02/2008	Natural Clayey Sand	VMP & PDA - Hickson Road	37.2	8840	1100	6760	2080	<10	9940	0.4	0.9	<0.5	1.1	0.7	1.8
MW6	MW6 2.5-2.6	2.5-2.6	20/02/2008	Fill	VMP & PDA - Hickson Road	5.2	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
MW6	MW6 4.4-4.5	4.4-4.5	20/02/2008	Fill	VMP & PDA - Hickson Road	<0.5	<200	<50	<100	<100	<10	<250	<0.2	<0.5	<0.5	<0.5	<0.5	<1
MW7	MW7 3.5-3.6	3.5-3.6	25/02/2008	FILL	VMP & PDA - Hickson Road	48.8	7770	2140	5680	2090	227	9910	87.7	10.3	57.5	49.8	19	68.8
MW7	MW7 4.5-4.6	4.5-4.6	25/02/2008	FILL	VMP & PDA - Hickson Road	2030	74,600	31,500	61,000	13,600	7710	106,100	2080	147	1930	1210	502	1712
MW7	MW7 5.0-5.1	5-5.1	25/02/2008	FILL	VMP & PDA - Hickson Road	3110	80,400	45,900	65,200	15,200	7890	126,300	1980	154	1990	1300	563	1863

Notes
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< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
* *TPH C10-C14 aliphatic and aromatic
note TPH in table not speciated
BOLD = Sample classified as TCM based on PAH (>2000 mg/kg) and Benzo(a)pyrene (>150 mg/kg) results

	PAHs																									
	CPAH (Total)	CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	
EQL	µg/L	ug/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	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
Groundwater SSTC ^{VMP}		1000		0.5	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.05	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1300		0.1	0.1

Well	Borehole	Sample Date	Screened Lithology	Area																												
Wells screened within fill material																																
IT3S	BH405	25/02/2011	Fill	VMP & PDA - Block 4	19.9	5.014	26.3				<1	<1		<1	2.2	3.8		4.8	3	2.5	1.4	<1	1.9	<1	2.2	<1		<1	4.5			
IT3M	BH405	25/02/2011	Fill	VMP & PDA - Block 4	<7.5	<1.92	1				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	1			
MW15	BH087A	15/03/2010	Fill	VMP & PDA - Block 4	<54	<19.98	8226	<9	541	<9	49	155	13	18	<9	<9	<19		<9		<9	<9	18	83	<9	7800	8230	87	16			
MW52	AECOM BH52	19/03/2010	Fill	VMP & PDA - Block 4	<12	<4.44	12	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	4	<2	<2	4	12	<2	4			
MW58	AECOM BH58	17/03/2010	Fill	VMP & PDA - Block 4	<12	<4.44	<28	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	<2	<2	<2	<2	<2	<2	<2			
MW62	AECOM BH62	24/02/2011	Fill	VMP & PDA - Block 5	<7.5	<1.92	<15.5				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1				
MW64	AECOM BH64	20/03/2010	Fill	VMP & PDA - Block 5	<12	<4.44	57	<2	5	<2	3	11	<2	2	<2	<2	<4		<2		<2	<2	2	10	<2	11	57	15	3			
Wells screened within marine sediments																																
MW198	BH198	25/02/2011	Fill + Marine Sediments	VMP & PDA - Block 5	<7.5	<1.92	1.4				<1	1.4		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1			
MW68	AECOM BH68	24/02/2011	Fill + Marine Sediments	VMP & PDA - Block 5	<7.5	<1.92	<15.5				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1			
MW206	BH206	19/03/2010	Marine Sediments	VMP & PDA - Block 4	1523	371.81	21,097	<47	4040	<47	274	1380	<47	680	592	299	362		89		462	<47	1250	1030	81	10,600	21,400	2840	1520			
MW54	AECOM BH54	19/03/2010	Marine Sediments	VMP & PDA - Block 4	5	0.32	9072	<2	294	<2	72	113	<2	19	3	<2	<4		<2		2	<2	19	92	<2	8640	9070	98	14			
IT3D	BH405	25/02/2011	Marine Sediments	VMP & PDA - Block 4	56.1	16.113	3048.8				25	158		25.7	19.6	12.8		12.4	<10	<10	11.3	<10	28.6	75.9	<10	2560		77.7	41.8			
MW45	AECOM BH45	19/03/2010	Fill + Marine Sediments + Sandstone	VMP & PDA - Block 4	<12	<4.44	8	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	<2	<2	<2	8	8	<2	<2			
MW209	BH209	28/02/2011	Fill + Marine Sediments + Sandstone	VMP & PDA - Block 4	1.8	0.9	26.6				1.8	6.2		1	1	0.8		<1	<1	<1	<1	<1	1.2	<1	<1	10.8		2	1.8			
MW200	BH200	28/02/2011	Sandstone	VMP & PDA - Block 4	<784	<237.16	5450				<98	<98		<98	<98	<98		<98	<98	<98	<98	<98	<98	<98	<98	<98	5450		<98	<98		
MW204S	BH204	25/02/2011	Sandstone	VMP & PDA - Block 4	<80	<24.2	8846.1				85.5	45.4		<10	<10	<10		<10	<10	<10	<10	<10	<10	80.6	<10	8580		54.6	<10			
MW205	BH205	17/03/2010	Sandstone	VMP & PDA - Block 4	36,188	11,556	530,568	<74	105,000	131	4480	43,200	<74	15,400	12,600	9260	9860		1910		9780	728	25,200	21,100	1910	283,000	540,000	74,100	27,900			
MW210	BH210	24/02/2011	Sandstone	VMP & PDA - Block 4	2	1.01	11.9				<1	3.1		<1	1.1	0.9		<1	<1	<1	<1	<1	2.6	<1	<1	<1		<1	4.2			

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* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated

	TPH						BTEX						Inorganics	
	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N	
EQL	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	
Groundwater SSTC ^{VMP}		50	100	50	20	50		1	2	2	10	2	0.01	
		17,000	220,000	250,000				2100					150	

Well	Borehole	Sample Date	Screened Lithology	Area													
Wells screened within fill material																	
IT3S	BH405	25/02/2011	Fill	VMP & PDA - Block 4	0.65	<50	410	240	<20	650	<4	<1	<2	<5	<2	<2	
IT3M	BH405	25/02/2011	Fill	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	
MW15	BH087A	15/03/2010	Fill	VMP & PDA - Block 4	14.87	41,000	14,400	470	46,200	55,870	6100	13,100	3010	5030	3920	2180	37.2
MW52	AECOM BH52	19/03/2010	Fill	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	<0.1
MW58	AECOM BH58	17/03/2010	Fill	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	13.6
MW62	AECOM BH62	24/02/2011	Fill	VMP & PDA - Block 5	0.39	<50	390	<50	<20	390	<4	<1	<2	<5	<2	<2	
MW64	AECOM BH64	20/03/2010	Fill	VMP & PDA - Block 5	2.39	270	1850	540	<20	2660	10	4	3	6	6	4	2.66
Wells screened within marine sediments																	
MW198	BH198	25/02/2011	Fill + Marine Sediments	VMP & PDA - Block 5	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	
MW68	AECOM BH68	24/02/2011	Fill + Marine Sediments	VMP & PDA - Block 5	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	
MW206	BH206	19/03/2010	Marine Sediments	VMP & PDA - Block 4	85.4	68,000	70,600	14,800	13,300	153,400	2770	5450	1250	101	1230	1540	
MW54	AECOM BH54	19/03/2010	Marine Sediments	VMP & PDA - Block 4	11.3	28,000	10,900	400	3730	39,300	954	621	206	502	626	328	10.8
IT3D	BH405	25/02/2011	Marine Sediments	VMP & PDA - Block 4	3.23	5590	2970	260	2120	8820	461	595	51	465	325	136	
MW45	AECOM BH45	19/03/2010	Fill + Marine Sediments + Sandstone	VMP & PDA - Block 4	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	<0.1
MW209	BH209	28/02/2011	Fill + Marine Sediments + Sandstone	VMP & PDA - Block 4	0.22	100	220	<50	100	320	18	56	15	5	8	10	
MW200	BH200	28/02/2011	Sandstone	VMP & PDA - Block 4	17.2	47,400	17,200	<50	37,600	64,600	1910	17,900	659	1660	1350	560	
MW204S	BH204	25/02/2011	Sandstone	VMP & PDA - Block 4	2.82	8430	2690	130	2380	11250	695	237	169	440	466	229	
MW205	BH205	17/03/2010	Sandstone	VMP & PDA - Block 4	1852	1,730,000	1,520,000	332,000		3,582,000							
MW210	BH210	24/02/2011	Sandstone	VMP & PDA - Block 4	0.8	80	730	70	<20	880	<4	2	3	<5	<2	<2	

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TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated

				PAHs																				TPH												
				CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene	Benzene		
EQL				ug/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	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L		
Groundwater SSTC ^{VMP}				1000		0.5	0.1	0.1	0.1	47,000	0.5	0.1	0.1	0.05	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			17,000	220,000	250,000	20	50			2100		
Well	Borehole	Sample Date	Area																																	
IT3S	BH405	25/02/2011	VMP & PDA - Block 4	5.014	26.3				<1	<1		<1	2.2	3.8		4.8	3	2.5	1.4	<1	1.9	<1	2.2	<1	<1	4.5	0.65	<50	410	240	<20	650	<4	<1		
IT3M	BH405	25/02/2011	VMP & PDA - Block 4	<1.92	1				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<0.15	<50	<100	<50	<20	<50	<4	<1			
IT3D	BH405	25/02/2011	VMP & PDA - Block 4	16.113	3048.8				25	158		25.7	19.6	12.8		12.4	<10	<10	11.3	<10	28.6	75.9	<10	2560	77.7	41.8	3.23	5590	2970	260	2120	8820	461	595		
MW15	BH087	25/07/2006	VMP & PDA - Block 4	59.106	23,350				80.1	376		94.7	54.6	41.1		27.8	12.9	29.3	47.7	4.9	135	236	13.3	21,700	367	130	20.36	46,000	19,600	760	31,500	66,360	6700	14,400		
MW15	BH087	14/08/2006	VMP & PDA - Block 4	133.678	15,287				112	696		161	145	91		118	37.5	31.3	97.3	8.4	480	491	35	11,400	932	451	24.04	50,500	22,700	1340	23,200	74,540	5510	8890		
MW15	BH087	15/08/2007	VMP & PDA - Block 4	64.95	5152.9				60.8	227		66.3	53.5	45.4		37.1	20.2	26.8	42.8	5.2	116	150	19.8	3930	242	110	25.99	48,200	23,800	2190	14,500	74,190	3140	7270		
MW15	BH087	12/05/2008	VMP & PDA - Block 4	<44.286	2525.7				<18.3	51.5		<18.3	<18.3	<18.3		<18.3	<18.3	<18.3	<18.3	<18.3	<18.3	25	<18.3	2430	19.2	<18.3	15.65	104,000	15,500	150	10,100	119,650	667	4140		
MW15	BH087	15/03/2010	VMP & PDA - Block 4	<19.98	8226	<9	541	<9	49	155	13	18	<9	<9	<19		<9	<9	<9	<9	18	83	<9	7800	87	16	14.87	41,000	14,400	470	46,200	55,870	6100	13,100		
MW198	BH198	9/05/2008	VMP & PDA - Block 5	<1.92	24.5				2.2	9.7		<1	<1	<0.5		<1	<1	<1	<1	<1	1.1	1.6	<1	6.5	2.1	1.3	1.27	550	1200	70	190	1820	11	85		
MW198	BH198	16/03/2010	VMP & PDA - Block 5	<4.44	14	<2	<2	<2	2	12	<2	<2	<2	<2	<4		<2	<2	<2	<2	<2	<2	<2	<2	<2	0.59	120	590	<50	<20	710	<4	<1			
MW198	BH198	25/02/2011	VMP & PDA - Block 5	<1.92	1.4				<1	1.4		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.15	<50	<100	<50	<20	<50	<4	<1		
MW200	BH200	13/05/2008	VMP & PDA - Block 4	<46.464	2350.9				<19.2	39.1		<19.2	<19.2	<19.2		<19.2	<19.2	<19.2	<19.2	<19.2	<19.2	21.8	<19.2	2290	<19.2	<19.2	22.12	97,200	22,000	120	28,500	119,320	1987	12,900		
MW200	BH200	16/03/2010	VMP & PDA - Block 4	<19.98	8028	<9	209	<9	15	40	<9	<9	<9	<9	<19		<9	<9	<9	<9	<9	11	<9	7950	12	<9	22.65	100,000	22,500	150	22,400	122,650	2336	16,200		
MW200	BH200	28/02/2011	VMP & PDA - Block 4	<237.16	5450				<98	<98		<98	<98	<98		<98	<98	<98	<98	<98	<98	<98	<98	<98	<98	<98	17.2	47,400	17,200	<50	37,600	64,600	1910	17,900		
MW204D	BH204D	13/05/2008	VMP & PDA - Block 4	205.028	11,241				122	334		476	254	145		185	63.8	80.9	210	<39	767	508	53	5920	1390	732	85.64	422,000	75,800	9840	27,900	507,640	2944	7700		
MW204S	BH204	15/03/2010	VMP & PDA - Block 4	<19.98	7080	<9	314	<9	96	55	<9	<9	<9	<9	<19		<9	<9	<9	<9	<9	92	<9	6740	97	<9	7.85	19,600	7400	450	890	27,450	254	92		
MW204S	BH204	25/02/2011	VMP & PDA - Block 4	<24.2	8846.1				85.5	45.4		<10	<10	<10		<10	<10	<10	<10	<10	<10	80.6	<10	8580	54.6	<10	2.82	8430	2690	130	2380	11,250	695	237		
MW205	BH205	9/05/2008	VMP & PDA - Block 4	<46.222	1656.8				<19.1	66.8		<19.1	<19.1	<19.1		<19.1	<19.1	<19.1	<19.1	<19.1	<19.1	<19.1	<19.1	<19.1	<19.1	8.18	72,800	8100	80	73,600	80,980	5140	27,800			
MW205	BH205	17/03/2010	VMP & PDA - Block 4	11,556	530,568	<74	105,000	131	4480	43,200	<74	15,400	12,600	9260	9860		1910		9780	728	25,200	21,100	1910	283,000	74,100	27,900	1852	1,730,000	1,520,000	332,000		3,582,000				
MW206	BH206	12/05/2008	VMP & PDA - Block 4	<2.32	945.1				6.3	42.6		2.2	<1	<0.9		<1	<1	<1	<1	<1	1.2	11.6	<1	870	10	1.2	1.5	6940	1500	<50	8380	8440	1419	2960		
MW206	BH206	19/03/2010	VMP & PDA - Block 4	371.81	21,097	<47	4040	<47	274	1380	<47	680	592	299	362		89	<47	462	<47	1250	1030	81	10,600	2840	1520	85.4	68,000	70,600	14,800	13,300	153,400	2770	5450		
MW209	BH209	12/05/2008	VMP & PDA - Block 4	<4.356	281.3				8.1	50		5.6	<1.8	<1.8		<1.8	<1.8	<1.8	<1.8	<1.8	3.2	18.9	<1.8	175	17	3.5	1.9	7980	1900	<50	8150	9880	655	2370		
MW209	BH209	16/03/2010	VMP & PDA - Block 4	3.2	753	<2	14	<2	7	26	<2	4	2	3	<4		<2	<2	<2	<2	4	10	<2	677	14	6	1.16	2230	1000	160	1380	3390	180	772		
MW209	BH209	28/02/2011	VMP & PDA - Block 4	0.9	26.6				1.8	6.2		1	1	0.8		<1	<1	<1	<1	<1	1.2	<1	<1	10.8	2	1.8	0.22	100	220	<50	100	320	18	56		
MW210	BH210	8/05/2008	VMP & PDA - Block 4	0.594	1589.7				24.4	156		15.4	3.5	<2		2.2	<2	<2	2.4	<2	15.6	73.8	<2	1220	63.8	12.6	4.61	14,800	4400	210	2650	19,410	619	511		
MW210	BH210	16/03/2010	VMP & PDA - Block 4	<4.44	42	<2	<2	<2	7	12	<2	2	<2	<2	<4		<2	<2	<2	<2	6	<2	<2	6	5	4	0.73	210	730	<50	30	940	6	12		
MW210	BH210	24/02/2011	VMP & PDA - Block 4	1.01	11.9				<1	3.1		<1	1.1	0.9		<1	<1	<1	<1	<1	2.6	<1	<1	<1	<1	4.2	0.8	80	730	70	<20	880	<4	2		
MW45	AECOM BH45	19/03/2010	VMP & PDA - Block 4	<4.44	8	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4		<2		<2	<2	<2	<2	<2	8	<2	<2	<0.15	<50	<100	<50	<20	<50	<4	<1		
MW52	AECOM BH52	19/03/2010																																		

Table T11
Blocks 4 and 5
Historic Groundwater Analytical Results

				BTEX				Inorganics
				Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N
				µg/L	µg/L	µg/L	µg/L	mg/L
EQL				1	1	10	1	0.01
Groundwater SSTC ^{VMP}								150

Well	Borehole	Sample Date	Area					
IT3S	BH405	25/02/2011	VMP & PDA - Block 4	<2	<5	<2	<2	
IT3M	BH405	25/02/2011	VMP & PDA - Block 4	<2	<5	<2	<2	
IT3D	BH405	25/02/2011	VMP & PDA - Block 4	51	465	325	136	
MW15	BH087	25/07/2006	VMP & PDA - Block 4	3020	5740	4490	2210	
MW15	BH087	14/08/2006	VMP & PDA - Block 4	2590	3980	3670	1840	
MW15	BH087	15/08/2007	VMP & PDA - Block 4	1470	2330	1990	1150	
MW15	BH087	12/05/2008	VMP & PDA - Block 4	68	1760	443	224	
MW15	BH087	15/03/2010	VMP & PDA - Block 4	3010	5030	3920	2180	
MW198	BH198	9/05/2008	VMP & PDA - Block 5	30	<5	3	8	
MW198	BH198	16/03/2010	VMP & PDA - Block 5	<2	<5	<2	<2	13.6
MW198	BH198	25/02/2011	VMP & PDA - Block 5	<2	<5	<2	<2	
MW200	BH200	13/05/2008	VMP & PDA - Block 4	473	1620	1380	607	
MW200	BH200	16/03/2010	VMP & PDA - Block 4	686	1820	1800	536	
MW200	BH200	28/02/2011	VMP & PDA - Block 4	659	1660	1350	560	8.47
MW204D	BH204D	13/05/2008	VMP & PDA - Block 4	411	3650	2030	914	<0.1
MW204S	BH204	15/03/2010	VMP & PDA - Block 4	60	180	172	82	10.8
MW204S	BH204	25/02/2011	VMP & PDA - Block 4	169	440	466	229	<0.1
MW205	BH205	9/05/2008	VMP & PDA - Block 4	745	17,600	3140	2000	2.66
MW205	BH205	17/03/2010	VMP & PDA - Block 4					5.46
MW206	BH206	12/05/2008	VMP & PDA - Block 4	306	430	807	612	
MW206	BH206	19/03/2010	VMP & PDA - Block 4	1250	101	1230	1540	
MW209	BH209	12/05/2008	VMP & PDA - Block 4	118	1700	380	275	6.56
MW209	BH209	16/03/2010	VMP & PDA - Block 4	149	48	76	104	110
MW209	BH209	28/02/2011	VMP & PDA - Block 4	15	5	8	10	42.8
MW210	BH210	8/05/2008	VMP & PDA - Block 4	69	617	401	218	5.72
MW210	BH210	16/03/2010	VMP & PDA - Block 4	8	<5	3	3	3.84
MW210	BH210	24/02/2011	VMP & PDA - Block 4	3	<5	<2	<2	6.7
MW45	AECOM_BH45	19/03/2010	VMP & PDA - Block 4	<2	<5	<2	<2	12
MW52	AECOM_BH52	19/03/2010	VMP & PDA - Block 4	<2	<5	<2	<2	103
MW54	AECOM_BH54	19/03/2010	VMP & PDA - Block 4	206	502	626	328	87
MW58	AECOM_BH58	17/03/2010	VMP & PDA - Block 4	<2	<5	<2	<2	37.2
MW62	AECOM_BH62	17/03/2010	VMP & PDA - Block 5	<2	<5	<2	<2	27.4
MW62	AECOM_BH62	24/02/2011	VMP & PDA - Block 5	<2	<5	<2	<2	5.36
MW64	AECOM_BH64	20/03/2010	VMP & PDA - Block 5	3	6	6	4	<0.01
MW68	AECOM_BH68	18/03/2010	VMP & PDA - Block 5	<2	<5	<2	<2	5.24
MW68	AECOM_BH68	24/02/2011	VMP & PDA - Block 5	<2	<5	<2	<2	7.48

Notes
mg/L - milligrams pre litre
µg/L - micrograms per litre
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a)pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated



Table T12
Declaration Area Boundary
Groundwater Analytical Results

VMP Remediation Extent
VMP Remediation Works Area
Barangaroo

						PAHs																				Phenols									
						CPAH (TEF)	PAH (Total)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	2,4-dimethylphenol	2-methylphenol	2-nitrophenol	3-&4-methylphenol	3-Methylphenol	4-chloro-3-methylphenol
						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	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
	EQL							0.5	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.05	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.05			
	SSTC ^{VMP}					1000						47,000											1300												
	MWQC								2.1		5.8	5.8		0.01	0.01	0.1	0.01	0.01	0.001	0.01	0.001	0.1	1	3	0.01	70		0.6	0.025	2	13		13	13	

Well	Field ID	Location_Code	Sampled Date	Screened Lithology	Area																																
Wells screened within fill material																																					
IT3S	IT3S	BH405	25/02/2011	Fill	VMP - Block 4	5.014	26.3					<1	<1		<1	2.2	3.8		4.8	3	2.5	1.4	<1	1.9	<1	2.2	<1		<1	4.5	<1	<1	<1	<2		<1	
IT3S	IT3S FILTRATE	BH405	25/02/2011	Fill	VMP - Block 4	<0.192	0.5		<0.1	<0.1	<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	0.5		<0.1	<0.1	<0.2	0.3	<0.2		0.5	<0.1		
IT3M	IT3M	BH405	25/02/2011	Fill	VMP - Block 4	<1.92	1				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	1	<1	<1	<1	<2		<1		
IT3M	IT3M FILTRATE	BH405	25/02/2011	Fill	VMP - Block 4	<0.192	0.2		<0.1	<0.1	<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	0.2		<0.1	<0.1	<0.2	<0.2	<0.2		<0.2	<0.1		
MW62	MW62	AECOM BH62	17/03/2010	Fill	VMP - Block 5	0.7	18.7	<0.9	2	<0.9	1	<0.9	<0.9	1	<0.9	0.7	<2		<0.9	<0.9		<0.9	<0.9	2	1	<0.9	7	19	<0.1	4	2	<0.9	<0.9	<0.9	<2		<0.6
MW62	MW62	AECOM BH62	24/02/2011	Fill	VMP - Block 5	<1.92	<15.5				<1	<1		<1	<1	<0.5		<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<2		<1		
MW62	MW62 FILTRATE	AECOM BH62	24/02/2011	Fill	VMP - Block 5	<0.192	0.4		<0.1	<0.1	<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	0.4		<0.1	<0.1	<0.2	0.3	<0.2		0.4	<0.1		
Wells screened within marine sediments																																					
MW40	MW40	AECOM BH40	20/03/2010	Fill + Marine Sediments	Block 4	<1.998	297	<0.9	36	<0.9	4	16	<0.9	3	<0.9	<0.9	<2		<0.9		<0.9	<0.9	2	12	<0.9	244	297	14	2	69	15	<0.9	20		<0.9		
MW69	MW69	AECOM BH69	19/03/2010	Fill + Sandstone	Block 5	7.52	2444	<2	326	<2	35	158	5	28	14	6	6		<2		12	<2	34	64	<2	1920	2450	126	47	138	20	<2	20		<2		
MW69	MW69	AECOM BH69	25/02/2011	Fill + Sandstone	Block 5	<12.1	320				11.7	37.2		8.9	<5	<5		<5	<5	<5	<5	<5	7.4	5.7	<5	202		32	15.1	<5	<5	<5	<10		<5		
MW69	MW 69 FILTRATE	AECOM BH69	25/02/2011	Fill + Sandstone	Block 5	<0.192	5		<0.1	<0.1	<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	5		<0.1	<0.1	0.3	0.3	<0.2		0.5	<0.1		
MW401	MW401	BH401	24/02/2011	Marine Sediments	Block 5	<11.858	249.2				10.5	12.8		<4.9	<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		
MW401	MW401 FILTRATE	BH401	24/02/2011	Marine Sediments	Block 5	<0.192	49.9		2.1	<0.1	1.2	1		<0.1	<0.1	<0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	47.7		<0.1	<0.1	50	27.8	<0.2		31.1	<0.1		

Notes
mg/L - milligrams pre litre
µg/L - micrograms per litre
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP}- Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated
FILTRATE = Sample analysed following double filtration in laboratory



Table T12
Declaration Area Boundary
Groundwater Analytical Results

VMP Remediation Extent
VMP Remediation Works Area
Barangaroo

						TPH								BTEX						Inorganics												
						4-methylphenol	4-nitrophenol	Phenol	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Alkalinity as CaCO3	Ammonia as N	Anions Total	Bicarbonate as CaCO3	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Carbonate	Cations Total	Chloride	Cyanide (Free)	Aluminium (Filtered)	
	EQL					µg/L	µg/L	µg/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	mg/L	mg/L	meq/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L	mg/L	
	SSTC ^{VMP}					0.1	0.1	0.1		17,000	220,000	250,000				2100		2	2	2	1	0.01	0.01	1	1	1	1	0.01	0.5	0.004	0.01	
	MWQC					13000		400		40			110			700	80	180	75	75		0.91								0.004		

Well	Field ID	Location	Code	Sampled Date	Screened Lithology	Area																											
Wells screened within fill material																																	
IT3S	IT3S	BH405		25/02/2011	Fill	VMP - Block 4			<1	0.65	<50	410	240	<20	650	<4	<1	<2	<5	<2	<2											<0.004	<0.01
IT3S	IT3S FILTRATE	BH405		25/02/2011	Fill	VMP - Block 4	<0.2	<0.2	1																								
IT3M	IT3M	BH405		25/02/2011	Fill	VMP - Block 4			<1	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2											<0.004	0.01
IT3M	IT3M FILTRATE	BH405		25/02/2011	Fill	VMP - Block 4	<0.2	<0.2	0.2																								
MW62	MW62	AECOM	BH62	17/03/2010	Fill	VMP - Block 5			<0.9	1.46	<50	1260	200	<20	1460	<4	<1	<2	<5	<2	<2	96	8.47	398	96	96	<1	<1	438	13,700	<0.004		
MW62	MW62	AECOM	BH62	24/02/2011	Fill	VMP - Block 5			<1	0.39	<50	390	<50	<20	390	<4	<1	<2	<5	<2	<2											<0.004	<0.01
MW62	MW62 FILTRATE	AECOM	BH62	24/02/2011	Fill	VMP - Block 5	<0.2	<0.2	0.3																								
Wells screened within marine sediments																																	
MW40	MW40	AECOM	BH40	20/03/2010	Fill + Marine Sediments	Block 4			2							38	52	2	46	26	12	556	9.7	434	556			<1	456	14,500			
MW69	MW69	AECOM	BH69	19/03/2010	Fill + Sandstone	Block 5			2	4.26	7200	3900	360	3400	11,460 - 11,500	384	868	77	804	240	144	761	90.4	333	761			<1	335	9520	0.004		
MW69	MW69	AECOM	BH69	25/02/2011	Fill + Sandstone	Block 5			<5	0.33	530	330	<50	210	860	26	52	16	9	13	13										<0.004	0.01	
MW69	MW 69 FILTRATE	AECOM	BH69	25/02/2011	Fill + Sandstone	Block 5	<0.2	<0.2	0.5																								
MW401	MW401	BH401		24/02/2011	Marine Sediments	Block 5			15	1.07	790	1070	<50	350	1860	42	127	<5	108	27	15										<0.004	<0.01	
MW401	MW401 FILTRATE	BH401		24/02/2011	Marine Sediments	Block 5	18.7	<0.2	6.6																								

Notes
mg/L - milligrams pre litre
µg/L - micrograms per litre
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP}- Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated
FILTRATE = Sample analysed following double filtration in laboratory

Table T12
Declaration Area Boundary
Groundwater Analytical Results

						Metals																				SVOCs		VOCs		
						Antimony (Filtered)	Arsenic (Filtered)	Barium (Filtered)	Beryllium (Filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (Filtered)	Chromium (hexavalent)	Cobalt (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Potassium (Filtered)	Selenium (Filtered)	Silver (Filtered)	Sodium (Filtered)	Vanadium (Filtered)	Zinc (Filtered)	Dibenzofuran	Pentachlorophenol	Styrene
						mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L					
	EQL					0.0005	0.5	0.001	0.1	0.2	1	0.5	0.002	0.2	1	0.05	0.2	1	0.0005	0.1	0.5	1	0.002	0.1	1	0.5	0.005	0.5	0.05	5
	SSTC ^{VMP}																													
	MWQC						2.3			0.7		27.4	0.0044	1	1.3		4.4			0.1	70					100	0.015	3.7	22	72

Well	Field ID	Location Code	Sampled Date	Screened Lithology	Area																									
Wells screened within fill material																														
IT3S	IT3S	BH405	25/02/2011	Fill	VMP - Block 4	0.0017	1.7	0.096	<0.1	0.9		<0.5		0.8	<1		0.8		0.072	<0.1	5.4		<0.002	<0.1		1.9	0.017		<2	
IT3S	IT3S FILTRATE	BH405	25/02/2011	Fill	VMP - Block 4																								<0.1	
IT3M	IT3M	BH405	25/02/2011	Fill	VMP - Block 4	0.0021	0.8	0.1	<0.1	0.4		<0.5		0.3	<1		2.4		0.0336	<0.1	1.2		<0.002	<0.1		0.9	0.046		<2	
IT3M	IT3M FILTRATE	BH405	25/02/2011	Fill	VMP - Block 4																								<0.1	
MW62	MW62	AECOM_BH62	17/03/2010	Fill	VMP - Block 5		0.6	0.492	<0.1	<0.2	936	<0.5	<0.002	0.2	<1	<0.5	<0.2	372	0.0891	<0.1	<0.5	324			8090	0.9	0.012	1	<1	<5
MW62	MW62	AECOM_BH62	24/02/2011	Fill	VMP - Block 5	<0.0005	0.7	0.433	<0.1	<0.2		<0.5		0.2	<1		<0.2		0.0725	<0.1	3		<0.002	<0.1		0.7	<0.005		<2	
MW62	MW62 FILTRATE	AECOM_BH62	24/02/2011	Fill	VMP - Block 5																								<0.1	
Wells screened within marine sediments																														
MW40	MW40	AECOM_BH40	20/03/2010	Fill + Marine Sediments	Block 4		5.2	0.468	<0.1	0.4	540	<0.5	0.016	1.9	4	14.1	0.2	995	0.437	<0.1	19.5	195			7860	1.7	0.021	9	<2	8
MW69	MW69	AECOM_BH69	19/03/2010	Fill + Sandstone	Block 5		0.9	0.104	<0.1	<0.2	249	<0.5	<0.002	6.3	<1	10.3	<0.2	574	0.69	<0.1	2	216			6200	<0.5	<0.005	11	<4	194
MW69	MW69	AECOM_BH69	25/02/2011	Fill + Sandstone	Block 5	<0.0005	0.6	0.123	<0.1	<0.2		<0.5		0.3	<1		<0.2		0.168	<0.1	<0.5		<0.002	<0.1		<0.5	0.012		<10	
MW69	MW 69 FILTRATE	AECOM_BH69	25/02/2011	Fill + Sandstone	Block 5																								<0.1	
MW401	MW401	BH401	24/02/2011	Marine Sediments	Block 5	<0.0005	2.8	5.25	<0.1	1.6		<0.5		1.6	<1		0.2		0.406	<0.1	66.4		<0.002	<0.1		0.5	0.016		<9.8	
MW401	MW401 FILTRATE	BH401	24/02/2011	Marine Sediments	Block 5																								<0.1	

Notes
mg/L - milligrams pre litre
µg/L - micrograms per litre
EQL = Estimated Quantitation Limit
< denotes result less than EQL
SSTC^{VMP} - Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated
FILTRATE = Sample analysed following double filtration in laboratory

Table T13
Hickson Road
Groundwater Analytical Results
(2008-2010)

Well	MW3	MW6	MW7	MW10_Coff	MW15_Coff	MW61
Consultant	AECOM	AECOM	Coffey	Coffey	Coffey	AECOM_BH61
Field_ID	BH3	BH6	MW7POST	MW10	MW15	MW61
Location	MW3	MW6	MW7	MW10_Coffey	MW15_Coffey	AECOM_BH61
Sample Date	20/03/2010	20/03/2010	26/03/2008	26/03/2008	1/05/2008	20/03/2010
Area	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road	VMP & PDA - Hickson Road

Chemical Group	Chemical Name	output unit	EQL	Groundwater SSTC ^{VMP}						
PAHs	CPAH (TEF)	ug/L		1000	3.88	<4.44	12.264	1054.69	11,162	10.05
	PAH (Total)	ug/L			1049	<28	5442.5	34,451	383,602	434
	2-chloronaphthalene	ug/L	2		<2	<2				<2
	2-methylnaphthalene	ug/L	2		130	<2				57
	3-methylcholanthrene	ug/L	2		<2	<2				<2
	Acenaphthene	ug/L	0.2		12	<2	38.5	369	3870	6
	Acenaphthylene	ug/L	0.2	47,000	40	<2	246	1140	18,700	21
	Acetophenone	ug/L	2		<2	<2				<2
	Anthracene	ug/L	0.2		25	<2	34.3	1680	13,700	18
	Benz(a)anthracene	ug/L	0.2		8	<2	11.2	1150	10,400	16
	Benzo(a) pyrene	ug/L	0.2		3	<2	9.3	709	7750	8
	Benzo(b)&(k)fluoranthene	ug/L	4		5	<4				12
	Benzo(b)fluoranthene	ug/L	0.2				9.2	944	8330	
	Benzo(g,h,i)perylene	ug/L	0.2		<2	<2	4.2	260	4220	3
	Benzo(k)fluoranthene	ug/L	0.2				4.2	192	2930	
	Chrysene	ug/L	0.2		8	<2	9.2	829	7630	12
	Dibenz(a,h)anthracene	ug/L	0.2		<2	<2	<1.9	80.4	822	<2
	Fluoranthene	ug/L	0.2		38	<2	39.8	2420	25,900	48
	Fluorene	ug/L	0.2		57	<2	86.5	1670	19,100	26
	Indeno(1,2,3-c,d)pyrene	ug/L	0.2		<2	<2	3.7	258	3050	3
TPH	Naphthalene	ug/L	0.2	1300	699	<2	4800	15,800	192,000	150
	Phenanthrene	ug/L	0.2		125	<2	110	4390	42,000	79
	Pyrene	ug/L	0.2		34	<2	36.4	2560	23,200	44
	TPH C15-C36	mg/L			3.04	<0.15	47.57	182.6	959	1.79
	TPH C10 - C14	ug/L	50	17,000	2900	<50	830,000	528,000	494,000	860
	TPH C15-C28	ug/L	100	220,000	2780	<100	46,900	152,000	754,000	1420
	TPH C29-C36	ug/L	50	250,000	260	<50	670	30,600	205,000	370
BTEX	TPH C6 - C9	ug/L	20		40	<20	30,300	9690	55,800	520
	TPH+C10 - C36 (Sum of total)	ug/L	50		5940	<50	877,570	710,600	1,453,000	2650
	Total Xylene (ESDAT)	ug/L			12	<4	1742	611	2841	96
	Benzene	ug/L	1	2100	11	<1	25,200	5450	40,200	16
	Ethylbenzene	ug/L	2		5	<2	159	52	<500	20
	Toluene	ug/L	2		<5	<5	6440	2140	7890	102
Inorganics	Xylene (m & p)	ug/L	2		7	<2	1150	331	2000	66
	Xylene (o)	ug/L	2		5	<2	592	280	841	30
	Ammonia as N	mg/L	0.01	150	1.81	<0.1	294	348	23.3	0.12

Notes
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SSTC^{VMP}- Site Specific Target Criteria for the VMP Area
shading denotes concentration greater than criteria
CPAH= Sum of 8 carcinogenic PAH Compounds (Benz(a)anthracene Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(g,h,i)perylene; Benzo(k)fluoranthene; Chrysene; Dibenz(a,h)anthracene and Indeno(1,2,3-c,d)pyrene)

TEF - Toxicity Equivalent Factor
TPH - Total Petroleum Hydrocarbons
PAH - Polycyclic Aromatic Hydrocarbons (PAH)
* TPH C6-C9 aliphatic
**TPH C10-C36 aliphatic and aromatic
note TPH in table not speciated

	CPAH (TEF)	PAH (ESDAT TOTAL)	PAH (total, NSW Waste 2008)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.5	0.01	0.01	0.01	0.01	0.5	0.01	0.01
SSTC ^{VMP}	67										

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date											
BH022_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH022	10/05/2006	<1.21	<8	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH023_1.5-1.95	Normal	1.5-1.95	Fill	Outside Investigation Area	BH023	10/05/2006	0.05	0.5	0.5	-	-	-	<0.5	<0.5	-	<0.5	0.5
BH025_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH025	10/05/2006	1.017	9.4	9.4	-	-	-	<0.5	<0.5	-	<0.5	0.9
BH027_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH027	12/05/2006	<1.21	<8	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH035_0.3-0.5	Normal	0.3-0.5	Fill	Block 4 - Proposed Southern Cove	BH035	18/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH042_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH042	23/05/2006	6.057	53.5	53.5	-	-	-	<0.5	1	-	1.9	4.2
BH042_1.5-1.7	Normal	1.5-1.7	Fill	Block 5	BH042	23/05/2006	2.656	20.6	20.6	-	-	-	<0.5	0.8	-	<0.5	2.6
BH044_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH044	23/05/2006	19.602	146.2	146.2	-	-	-	<0.5	3.1	-	3.8	12.7
BH045_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH045	24/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH046_1.5-1.95	Normal	1.5-1.95	Fill	Outside Investigation Area	BH046	24/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH049_0.3-0.5	Normal	0.3-0.5	Fill	ORWN - Proposed Southern Cove	BH049	25/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH050-0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH050	26/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH050-1.5-1.8	Normal	1.5-1.8	Fill	Outside Investigation Area	BH050	26/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH051-1.5-1.7	Normal	1.5-1.7	Fill	Outside Investigation Area	BH051	26/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH053-1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH053	29/05/2006	<1.21	<8	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH054-1.5-1.6	Normal	1.5-1.6	Fill	ORWN - Public Domain Blocks 4&5	BH054	29/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH055-0.8-1.0	Normal	0.8-1	Fill	Block 4	BH055	30/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH055-1.8-2.0	Normal	1.8-2	Fill	Block 4	BH055	30/05/2006	1.176	9.2	9.2	-	-	-	<0.5	<0.5	-	<0.5	0.8
BH063-1.5-1.65	Normal	1.5-1.65	Fill	ORWN - Public Domain Blocks 4&5	BH063	1/06/2006	12.731	104.9	104.9	-	-	-	1.1	1.1	-	3.2	8.1
BH064-1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH064	1/06/2006	-	-	-	-	-	-	-	-	-	-	-
BH066-0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH066	1/06/2006	1.275	9.4	9.4	-	-	-	<0.5	<0.5	-	<0.5	0.9
BH066-1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH066	1/06/2006	0.05	3.4	3.4	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH068-0.3-0.5	Normal	0.3-0.5	Fill	Block 4	BH068	1/06/2006	1.638	13.1	13.1	-	-	-	<0.5	<0.5	-	<0.5	1.4
BH076_0.3-0.5	Normal	0.3-0.5	Fill	ORWN - Public Domain Blocks 4&5	BH076	6/06/2006	<1.21	<8	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH076_1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH076	6/06/2006	0.06	2.9	2.9	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH077_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH077	6/06/2006	0.63	5	5	-	-	-	<0.5	<0.5	-	<0.5	0.6
BH078_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH078	6/06/2006	0.881	7.7	7.7	-	-	-	<0.5	<0.5	-	<0.5	0.8
BH079_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH079	6/06/2006	1.388	15.5	15.5	-	-	-	<0.5	0.8	-	0.6	1.2
BH079_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH079	6/06/2006	2.175	28.7	28.7	-	-	-	0.6	<0.5	-	1.8	2
BH116_1.5_1.95	Normal	1.5-1.95	Fill	ORWN - Proposed Southern Cove	BH116	27/06/2006	0.07	2.5	2.5	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH116_1.5_1.95	Normal	1.5-1.95	Fill	ORWN - Proposed Southern Cove	BH116	28/06/2006	-	-	-	-	-	-	-	-	-	-	-
BH128_1.5-1.7	Normal	1.5-1.7	Fill	Outside Investigation Area	BH128	3/07/2006	<1.21	<8	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH129_0.4-0.6	Normal	0.4-0.6	Fill	Outside Investigation Area	BH129	5/07/2006	0.982	7.1	7.1	-	-	-	<0.5	<0.5	-	<0.5	0.8
BH137_1.5_1.95	Normal	1.5-1.95	Fill	Block 4	BH137	6/07/2006	0.56	2.7	2.7	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH142_1.5_1.95	Normal	1.5-1.95	Fill	Block 4 - Proposed Southern Cove	BH142	10/07/2006	<1.21	<8	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH404_0.4-0.5	Normal	0.4-0.5	Fill	Block 4	BH404	8/02/2011	8.963	86.1	86.1	-	-	-	<0.5	3	-	3.7	6.4
BH41_1.0-1.4	Normal	1-1.4	Fill	Block 4 - Proposed Southern Cove	AECOM_BH41	4/03/2010	<1.21	<8	<8	-	<0.5	-	<0.5	<0.5	-	<0.5	<0.5
BH46-1.0-1.2	Normal	1-1.2	Fill	ORWN - Proposed Southern Cove	AECOM_BH46	23/02/2010	<1.21	<8	<8	-	-	-	<0.5	<0.5	-	<0.5	<0.5
BH48-1.0-1.2	Normal	1-1.2	Fill	Block 4	AECOM_BH48	22/02/2010	0.887	7.7	7.7	-	-	-	<0.5	<0.5	-	<0.5	0.9
BH517	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	-	-	-	-	-	0.1	2.1	-	2.1	7.9

Data Entry:
Data Review:
AECOM

EQL	SSTC ^{VMP}						CPAH (TEF)	PAH (ESDAT TOTAL)	PAH (total, NSW Waste 2008)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benz(a)anthracene
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
							67				0.5	0.01	0.01	0.01	0.5	0.01	0.01

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date											
BH517	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	-	-	-	-	-	0.3	3.7	-	3.6	13
BH517	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	-	-	-	-	-	0.2	2.9	-	3.2	8.7
BH518	Normal	0.1-0.2	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	<0.1	<0.1
BH518	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	-	-	-	-	-	0.4	0.7	-	1	3.4
BH518	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	-	-	-	-	-	0.8	0.8	-	3.3	6.9
BH529D	Normal	0.6	Fill	Block 5 (Non-DECC)	JBS_BH529D	14/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	<0.1	0.2
BH529D	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH529D	14/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	<0.1	0.2
BH539	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.3
BH539	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	-	-	-	-	-	<0.1	0.2	-	0.2	0.7
BH539	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	-	-	-	-	-	0.2	0.6	-	1.1	3.4
BH540D	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	<0.1	<0.1
BH540D	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	-	-	-	-	-	<0.1	0.3	-	0.3	1.2
BH540D	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	-	-	-	-	-	<0.1	0.2	-	0.2	0.6
BH540D	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	-	-	-	-	-	0.9	0.2	-	1.3	2
BH541D	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	-	-	-	-	-	0.1	0.5	-	0.6	1.3
BH541D	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	-	-	-	-	-	<0.1	0.3	-	0.5	1.5
BH541D	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	-	-	-	-	-	0.9	5.6	-	7.2	14
BH541D	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	-	-	-	-	-	3.6	1	-	6.5	12
BH542	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	-	-	-	-	-	<0.1	0.2	-	0.4	1.1
BH542	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	-	-	-	-	-	0.1	0.3	-	0.7	1.7
BH542	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	-	-	-	-	-	4.5	1.4	-	7.6	10
BH542	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	-	-	-	-	-	0.8	0.2	-	1.2	1.3
BH543	Normal	0.6-0.7	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	-	-	-	-	-	0.2	0.8	-	1.1	2.4
BH543	Normal	1.5-1.6	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	<0.1	0.1
BH543	Normal	1-1.1	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	-	-	-	-	-	0.1	0.5	-	0.8	1.5
BH544D	Normal	0.55-0.65	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.3
BH544D	Normal	0.9-1	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	-	-	-	-	-	<0.1	0.1	-	0.2	0.8
BH544D	Normal	1.4-1.5	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.4
BH544D	Normal	1.9-2	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.5
BH545	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	-	-	-	-	-	0.1	0.7	-	1.4	4.5
BH545	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	-	-	-	-	-	0.2	0.9	-	1.1	2.7
BH545	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	-	-	-	-	-	0.3	1.4	-	2	3.7
BH545	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	-	-	-	-	-	0.1	1	-	1.3	2.3
BH546	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	-	-	-	-	-	<0.1	0.1	-	0.2	0.5
BH546	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	-	-	-	-	-	<0.1	0.2	-	0.4	1
BH546	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	-	-	-	-	-	<0.1	0.1	-	0.2	0.5
BH547	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	-	-	-	-	-	0.7	5.8	-	7.3	16
BH547	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	-	-	-	-	-	1.1	8.7	-	11	24
BH547	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	-	-	-	-	-	0.6	5.7	-	7.4	17

[illegible][illegible]

							PAHs										
							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-c,d)pyrene	Naphthalene
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							0.01	0.2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
SSTC ^{VMP}																	

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date											
BH022_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH022	10/05/2006	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH023_1.5-1.95	Normal	1.5-1.95	Fill	Outside Investigation Area	BH023	10/05/2006	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH025_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH025	10/05/2006	0.7	-	1.3	0.5	0.8	1.2	<0.5	1.6	<0.5	<0.5	<0.5
BH027_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH027	12/05/2006	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH035_0.3-0.5	Normal	0.3-0.5	Fill	Block 4 - Proposed Southern Cove	BH035	18/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH042_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH042	23/05/2006	3.9	-	2.8	2.6	3.6	4.1	0.8	9.2	0.7	2.3	0.7
BH042_1.5-1.7	Normal	1.5-1.7	Fill	Block 5	BH042	23/05/2006	1.9	-	1.9	1	1.6	2.6	<0.5	2.7	<0.5	1.1	<0.5
BH044_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH044	23/05/2006	12.7	-	10.6	8.3	11.2	11.9	2.5	24	<0.5	7.5	1.4
BH045_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH045	24/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH046_1.5-1.95	Normal	1.5-1.95	Fill	Outside Investigation Area	BH046	24/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH049_0.3-0.5	Normal	0.3-0.5	Fill	ORWN - Proposed Southern Cove	BH049	25/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH050-0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH050	26/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH050-1.5-1.8	Normal	1.5-1.8	Fill	Outside Investigation Area	BH050	26/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH051-1.5-1.7	Normal	1.5-1.7	Fill	Outside Investigation Area	BH051	26/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH053-1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH053	29/05/2006	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH054-1.5-1.6	Normal	1.5-1.6	Fill	ORWN - Public Domain Blocks 4&5	BH054	29/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH055-0.8-1.0	Normal	0.8-1	Fill	Block 4	BH055	30/05/2006	-	-	-	-	-	-	-	-	-	-	-
BH055-1.8-2.0	Normal	1.8-2	Fill	Block 4	BH055	30/05/2006	0.9	-	1.2	0.8	<0.5	0.8	<0.5	1.5	<0.5	0.6	<0.5
BH063-1.5-1.65	Normal	1.5-1.65	Fill	ORWN - Public Domain Blocks 4&5	BH063	1/06/2006	8.8	-	10.4	6.3	3.6	7.8	1.1	18.3	1.6	4.8	0.7
BH064-1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH064	1/06/2006	-	-	-	-	-	-	-	-	-	-	-
BH066-0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH066	1/06/2006	1	-	1.2	0.7	<0.5	0.8	<0.5	1.6	<0.5	0.5	<0.5
BH066-1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH066	1/06/2006	<0.5	-	0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5
BH068-0.3-0.5	Normal	0.3-0.5	Fill	Block 4	BH068	1/06/2006	1.2	-	1.6	0.7	0.6	1.1	<0.5	2.5	<0.5	0.6	<0.5
BH076_0.3-0.5	Normal	0.3-0.5	Fill	ORWN - Public Domain Blocks 4&5	BH076	6/06/2006	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH076_1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH076	6/06/2006	<0.5	-	0.6	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5
BH077_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH077	6/06/2006	0.5	-	0.7	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5
BH078_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH078	6/06/2006	0.7	-	0.9	0.5	<0.5	0.6	<0.5	1.8	<0.5	<0.5	<0.5
BH079_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH079	6/06/2006	1	-	1.3	0.8	0.6	1	<0.5	2.7	<0.5	0.6	<0.5
BH079_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH079	6/06/2006	1.6	-	1.9	1	0.8	1.5	<0.5	5.4	0.7	0.8	<0.5
BH116_1.5_1.95	Normal	1.5-1.95	Fill	ORWN - Proposed Southern Cove	BH116	27/06/2006	<0.5	-	0.7	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	<0.5
BH116_1.5_1.95	Normal	1.5-1.95	Fill	ORWN - Proposed Southern Cove	BH116	28/06/2006	-	-	-	-	-	-	-	-	-	-	-
BH128_1.5-1.7	Normal	1.5-1.7	Fill	Outside Investigation Area	BH128	3/07/2006	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH129_0.4-0.6	Normal	0.4-0.6	Fill	Outside Investigation Area	BH129	5/07/2006	0.8	-	0.9	0.5	<0.5	0.7	<0.5	1.4	<0.5	<0.5	<0.5
BH137_1.5_1.95	Normal	1.5-1.95	Fill	Block 4	BH137	6/07/2006	0.5	-	0.6	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5
BH142_1.5_1.95	Normal	1.5-1.95	Fill	Block 4 - Proposed Southern Cove	BH142	10/07/2006	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH404_0.4-0.5	Normal	0.4-0.5	Fill	Block 4	BH404	8/02/2011	6.2	-	7	3.2	2.5	5.1	0.8	17.4	1.5	2.9	1.4
BH41_1.0-1.4	Normal	1-1.4	Fill	Block 4 - Proposed Southern Cove	AECOM_BH41	4/03/2010	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH46-1.0-1.2	Normal	1-1.2	Fill	ORWN - Proposed Southern Cove	AECOM_BH46	23/02/2010	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH48-1.0-1.2	Normal	1-1.2	Fill	Block 4	AECOM_BH48	22/02/2010	0.7	-	0.9	<0.5	<0.5	0.7	<0.5	1.7	<0.5	<0.5	<0.5
BH517	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	9.6	14	-	5	-	7.5	1.2	13	0.5	5	0.9

Data Entry:
Data Review:
AECOM

							PAHs										
							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-c,d)pyrene	Naphthalene
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL							0.01	0.2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
SSTC ^{VMP}																	

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date											
BH517	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	15	21	-	7.1	-	12	1.8	22	1.1	7	1.6
BH517	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	10	14	-	4.7	-	7.8	1.2	16	1	4.6	1.2
BH518	Normal	0.1-0.2	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	<0.05	<0.2	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH518	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	3.8	5.9	-	2.1	-	3.4	0.5	7	0.4	2.3	0.8
BH518	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	6.6	9.9	-	3.1	-	6.2	0.8	15	1.2	3.7	0.5
BH529D	Normal	0.6	Fill	Block 5 (Non-DECC)	JBS_BH529D	14/05/2012	0.27	0.4	-	0.1	-	0.2	<0.1	0.4	<0.1	0.1	<0.1
BH529D	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH529D	14/05/2012	0.25	0.4	-	0.1	-	0.2	<0.1	0.5	<0.1	0.1	<0.1
BH539	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	0.34	0.5	-	0.2	-	0.3	<0.1	0.6	<0.1	0.2	<0.1
BH539	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	0.66	1	-	0.4	-	0.6	<0.1	1.3	<0.1	0.4	<0.1
BH539	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	4	5.7	-	2.2	-	3.3	0.5	7.3	0.3	2.3	0.2
BH540D	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	<0.05	<0.2	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH540D	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	1.3	1.7	-	0.7	-	1.1	0.1	2.5	<0.1	0.7	<0.1
BH540D	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	0.6	0.8	-	0.3	-	0.5	<0.1	1.4	0.1	0.3	<0.1
BH540D	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	2.1	2.8	-	1.1	-	1.8	0.2	5.1	0.8	1.1	0.4
BH541D	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	1.3	1.9	-	0.4	-	1.1	0.1	2.7	0.3	0.5	0.5
BH541D	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	1.5	2.1	-	0.5	-	1.3	0.1	2.6	0.2	0.6	0.2
BH541D	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	12	18	-	3.3	-	11	1.1	31	3.5	4.6	0.8
BH541D	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	11	16	-	3.6	-	10	1.1	27	3.8	4.6	0.3
BH542	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	1.2	1.9	-	0.5	-	1.2	0.1	2.2	0.2	0.6	0.1
BH542	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	1.8	2.6	-	0.7	-	1.5	0.2	3.2	0.4	0.8	0.2
BH542	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	10	14	-	3.4	-	9	0.9	29	4.4	4	1.1
BH542	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	1.2	1.7	-	0.4	-	1.1	0.1	4	0.7	0.5	0.5
BH543	Normal	0.6-0.7	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	2.4	3.2	-	1	-	2	0.3	4.9	0.6	1.1	0.8
BH543	Normal	1.5-1.6	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	0.15	0.2	-	<0.1	-	0.1	<0.1	0.3	<0.1	<0.1	<0.1
BH543	Normal	1-1.1	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	1.4	1.8	-	0.6	-	1.2	0.1	3.4	0.4	0.6	0.8
BH544D	Normal	0.55-0.65	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	0.3	0.4	-	0.2	-	0.3	<0.1	0.6	<0.1	0.2	<0.1
BH544D	Normal	0.9-1	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	0.99	1.2	-	0.6	-	0.6	0.1	1.6	<0.1	0.5	<0.1
BH544D	Normal	1.4-1.5	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	0.42	0.6	-	0.2	-	0.4	<0.1	0.8	<0.1	0.2	<0.1
BH544D	Normal	1.9-2	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	0.57	0.8	-	0.3	-	0.4	<0.1	1	<0.1	0.3	<0.1
BH545	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	4.5	6.3	-	2.1	-	4.4	0.4	9.1	0.4	2	0.3
BH545	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	2.9	4.1	-	1.3	-	2.5	0.3	5.8	0.5	1.4	0.5
BH545	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	3.9	5.3	-	1.8	-	3.2	0.4	8.7	1.1	2	0.7
BH545	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	2.9	3.8	-	2	-	2.1	0.3	5.6	0.7	1.8	0.3
BH546	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	0.5	0.7	-	0.2	-	0.4	<0.1	0.9	<0.1	0.2	<0.1
BH546	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	1.1	1.5	-	0.4	-	1	<0.1	2.5	0.1	0.4	0.2
BH546	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	0.84	1.1	-	0.5	-	0.6	<0.1	1.1	<0.1	0.4	<0.1
BH547	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	18	26	-	7.4	-	15	2	31	3.6	8.7	2.8
BH547	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	30	37	-	10	-	22	2.8	64	5.9	12	4.2
BH547	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	19	27	-	7.5	-	16	2	31	3.6	8.7	2.8

				PAHs										
				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-c,d)pyrene	Naphthalene
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.01	0.2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
SSTC ^{VMP}														

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date											
BH548	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	1.9	2.7	-	0.9	-	1.6	0.2	3.5	0.2	1	0.3
BH548	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	0.85	1.3	-	0.5	-	0.8	0.1	1.6	0.1	0.5	0.1
BH548	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	1.1	1.6	-	0.6	-	0.9	0.1	2	0.1	0.6	0.2
BH548	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	1.3	1.8	-	0.9	-	0.9	0.1	2	<0.1	0.8	<0.1
BH549	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH549	25/05/2012	0.24	0.4	-	0.2	-	0.3	<0.1	0.4	<0.1	0.2	<0.1
BH549	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH549	25/05/2012	1.1	1.6	-	0.6	-	0.9	<0.1	1.6	0.1	0.7	<0.1
BH550	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	<0.05	<0.2	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH550	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	1.1	1.6	-	0.6	-	0.9	<0.1	2	0.1	0.6	<0.1
BH550	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	1.1	1.5	-	0.6	-	0.7	0.1	1.1	<0.1	0.6	<0.1
BH551	Normal	0.45-0.55	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	4.4	6.2	-	1.9	-	3.7	0.5	8.7	1	2.1	1
BH551	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	9.1	13	-	3.7	-	7.9	1	17	1.5	4.2	1.5
BH551	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	3.3	4.6	-	1.3	-	2.8	0.3	6.6	0.6	1.5	0.6
BH551	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	0.22	0.3	-	0.1	-	0.2	<0.1	0.5	<0.1	0.1	<0.1
BH552	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	2.1	3.1	-	0.9	-	1.9	0.1	4.2	0.2	1.1	0.1
BH552	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	1.1	1.7	-	0.5	-	1	<0.1	2	<0.1	0.6	<0.1
BH552	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	1.4	2	-	0.6	-	1.2	<0.1	2.5	0.1	0.7	<0.1
BH69_1.0-1.15	Normal	1-1.15	Fill	Block 5	AECOM_BH69	26/02/2010	3.4	-	5.8	1.9	1.7	4.8	<0.5	11.6	1.8	1.4	2.9
BH70_0.1-0.2	Normal	0.1-0.2	Fill	Block 5	AECOM_BH70	3/03/2010	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH71_0.08-0.15	Normal	0.08-0.15	Fill	Outside Investigation Area	AECOM_BH71	3/03/2010	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH72_0.15-0.25	Normal	0.15-0.25	Fill	ORWN - Public Domain Blocks 4&5	AECOM_BH72	25/02/2010	-	-	-	-	-	-	-	-	-	-	-
BH72_1.0-1.2	Normal	1-1.2	Fill	ORWN - Public Domain Blocks 4&5	AECOM_BH72	3/03/2010	<0.5	<1	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH74_1.0-1.12	Normal	1-1.12	Fill	Outside Investigation Area	AECOM_BH74	3/03/2010	2.8	4	-	1	-	3.7	<0.5	17.1	4.2	1	5.2
BH75_1.0-1.2	Normal	1-1.2	Fill	Outside Investigation Area	AECOM_BH75	25/02/2010	-	-	-	-	-	-	-	-	-	-	-

								TPH						
				PAHs (Sum of total)	Phenanthrene	Polycyclic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.5	0.01	0.5	0.01		50	100	100	10	50	50
SSIC ^{VMP}									54000	72000	21,000			

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date											
BH022_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH022	10/05/2006	-	<0.5	-	<0.5	120	<50	<100	120	<2	120	-
BH023_1.5-1.95	Normal	1.5-1.95	Fill	Outside Investigation Area	BH023	10/05/2006	-	<0.5	-	<0.5	100	<50	100	<100	<2	100	-
BH025_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH025	10/05/2006	-	0.7	-	1.7	110	<50	110	<100	<2	110	-
BH027_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH027	12/05/2006	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-
BH035_0.3-0.5	Normal	0.3-0.5	Fill	Block 4 - Proposed Southern Cove	BH035	18/05/2006	-	-	-	-	<200	<50	<100	<100	<2	<250	-
BH042_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH042	23/05/2006	-	6.8	-	8.9	150	<50	150	<100	<2	150	-
BH042_1.5-1.7	Normal	1.5-1.7	Fill	Block 5	BH042	23/05/2006	-	0.9	-	3.5	170	<50	170	<100	<2	170	-
BH044_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH044	23/05/2006	-	12.2	-	24.3	690	<50	410	280	<2	690	-
BH045_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH045	24/05/2006	-	-	-	-	360	<50	190	170	<2	360	-
BH046_1.5-1.95	Normal	1.5-1.95	Fill	Outside Investigation Area	BH046	24/05/2006	-	-	-	-	700	<50	380	320	<2	700	-
BH049_0.3-0.5	Normal	0.3-0.5	Fill	ORWN - Proposed Southern Cove	BH049	25/05/2006	-	-	-	-	<200	<50	<100	<100	<2	<250	-
BH050-0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH050	26/05/2006	-	-	-	-	<200	<50	<100	<100	<2	<250	-
BH050-1.5-1.8	Normal	1.5-1.8	Fill	Outside Investigation Area	BH050	26/05/2006	-	-	-	-	<200	<50	<100	<100	<2	<250	-
BH051-1.5-1.7	Normal	1.5-1.7	Fill	Outside Investigation Area	BH051	26/05/2006	-	-	-	-	<200	<50	<100	<100	<2	<250	-
BH053-1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH053	29/05/2006	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-
BH054-1.5-1.6	Normal	1.5-1.6	Fill	ORWN - Public Domain Blocks 4&5	BH054	29/05/2006	-	-	-	-	<200	<50	<100	<100	<2	<250	-
BH055-0.8-1.0	Normal	0.8-1	Fill	Block 4	BH055	30/05/2006	-	-	-	-	<200	<50	<100	<100	<2	<250	-
BH055-1.8-2.0	Normal	1.8-2	Fill	Block 4	BH055	30/05/2006	-	1	-	1.6	<200	<50	<100	<100	<2	<250	-
BH063-1.5-1.65	Normal	1.5-1.65	Fill	ORWN - Public Domain Blocks 4&5	BH063	1/06/2006	-	9.1	-	18.9	820	<50	420	400	<2	820	-
BH064-1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH064	1/06/2006	-	-	-	-	<200	<50	<100	<100	<2	<250	-
BH066-0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH066	1/06/2006	-	1	-	1.7	<200	<50	<100	<100	<2	<250	-
BH066-1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH066	1/06/2006	-	0.9	-	1	370	<50	160	210	<2	370	-
BH068-0.3-0.5	Normal	0.3-0.5	Fill	Block 4	BH068	1/06/2006	-	1	-	2.4	<200	<50	<100	<100	<2	<250	-
BH076_0.3-0.5	Normal	0.3-0.5	Fill	ORWN - Public Domain Blocks 4&5	BH076	6/06/2006	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-
BH076_1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH076	6/06/2006	-	0.5	-	0.9	<200	<50	<100	<100	<2	<250	-
BH077_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH077	6/06/2006	-	0.8	-	1.2	<200	<50	<100	<100	<2	<250	-
BH078_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH078	6/06/2006	-	0.7	-	1.7	<200	<50	<100	<100	<2	<250	-
BH079_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH079	6/06/2006	-	2.3	-	2.6	110	<50	110	<100	<2	110	-
BH079_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH079	6/06/2006	-	5.7	-	4.9	250	<50	150	100	<2	250	-
BH116_1.5_1.95	Normal	1.5-1.95	Fill	ORWN - Proposed Southern Cove	BH116	27/06/2006	-	<0.5	-	0.9	-	-	-	-	-	-	-
BH116_1.5_1.95	Normal	1.5-1.95	Fill	ORWN - Proposed Southern Cove	BH116	28/06/2006	-	-	-	-	760	<50	350	410	<2	760	-
BH128_1.5-1.7	Normal	1.5-1.7	Fill	Outside Investigation Area	BH128	3/07/2006	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-
BH129_0.4-0.6	Normal	0.4-0.6	Fill	Outside Investigation Area	BH129	5/07/2006	-	0.6	-	1.4	<200	<50	<100	<100	<2	<250	-
BH137_1.5_1.95	Normal	1.5-1.95	Fill	Block 4	BH137	6/07/2006	-	<0.5	-	0.8	<200	<50	<100	<100	<2	<250	-
BH142_1.5_1.95	Normal	1.5-1.95	Fill	Block 4 - Proposed Southern Cove	BH142	10/07/2006	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-
BH404_0.4-0.5	Normal	0.4-0.5	Fill	Block 4	BH404	8/02/2011	-	8	-	17	490	<50	280	210	<10	490	-
BH41_1.0-1.4	Normal	1-1.4	Fill	Block 4 - Proposed Southern Cove	AECOM_BH41	4/03/2010	<0.5	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-
BH46-1.0-1.2	Normal	1-1.2	Fill	ORWN - Proposed Southern Cove	AECOM_BH46	23/02/2010	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-
BH48-1.0-1.2	Normal	1-1.2	Fill	Block 4	AECOM_BH48	22/02/2010	-	1	-	1.8	350	<50	200	150	<10	350	-
BH517	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	5.7	-	14	-	-	-	-	-	-	-

								TPH						
				PAHs (Sum of total)	Phenanthrene	Polycyclic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.5	0.01	0.5	0.01		50	100	100	10	50	50
SSIC ^{VMP}									54000	72000	21,000			

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date											
BH517	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	11	-	24	-	-	-	-	-	-	-
BH517	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	9.5	-	17	-	-	-	-	-	-	-
BH518	Normal	0.1-0.2	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	0.1	-	<0.1	-	-	-	-	-	-	-
BH518	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	4	-	7.1	-	-	-	-	-	-	-
BH518	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	12	-	13	-	-	-	-	-	-	-
BH529D	Normal	0.6	Fill	Block 5 (Non-DECC)	JBS_BH529D	14/05/2012	-	0.3	-	0.5	-	-	-	-	-	-	-
BH529D	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH529D	14/05/2012	-	0.3	-	0.5	-	-	-	-	-	-	-
BH539	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	0.3	-	0.6	-	-	-	-	-	-	-
BH539	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	0.9	-	1.3	-	-	-	-	-	-	-
BH539	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	3.8	-	7.2	-	-	-	-	-	-	-
BH540D	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	<0.1	-	<0.1	-	-	-	-	-	-	-
BH540D	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	1.3	-	2.6	-	-	-	-	-	-	-
BH540D	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	0.9	-	1.4	-	-	-	-	-	-	-
BH540D	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	4.2	-	5.1	-	-	-	-	-	-	-
BH541D	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	1.9	-	2.6	-	-	-	-	-	-	-
BH541D	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	1.6	-	2.6	-	-	-	-	-	-	-
BH541D	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	27	-	27	-	-	-	-	-	-	-
BH541D	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	19	-	27	-	-	-	-	-	-	-
BH542	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	1.5	-	2.2	-	-	-	-	-	-	-
BH542	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	2.4	-	3.4	-	-	-	-	-	-	-
BH542	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	26	-	26	-	-	-	-	-	-	-
BH542	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	3.4	-	3.6	-	-	-	-	-	-	-
BH543	Normal	0.6-0.7	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	3.7	-	4.1	-	-	-	-	-	-	-
BH543	Normal	1.5-1.6	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	0.3	-	0.3	-	-	-	-	-	-	-
BH543	Normal	1-1.1	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	3.2	-	3.4	-	-	-	-	-	-	-
BH544D	Normal	0.55-0.65	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	0.4	-	0.6	-	-	-	-	-	-	-
BH544D	Normal	0.9-1	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	0.8	-	1.7	-	-	-	-	-	-	-
BH544D	Normal	1.4-1.5	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	0.5	-	0.9	-	-	-	-	-	-	-
BH544D	Normal	1.9-2	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	0.5	-	1.1	-	-	-	-	-	-	-
BH545	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	6.3	-	9.3	-	-	-	-	-	-	-
BH545	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	4.4	-	5.6	-	-	-	-	-	-	-
BH545	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	7.1	-	7.9	-	-	-	-	-	-	-
BH545	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	4.2	-	5.3	-	-	-	-	-	-	-
BH546	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	0.5	-	0.9	-	-	-	-	-	-	-
BH546	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	1.4	-	2.3	-	-	-	-	-	-	-
BH546	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	0.6	-	1.1	-	-	-	-	-	-	-
BH547	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	21	-	29	-	-	-	-	-	-	-
BH547	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	33	-	61	-	-	-	-	-	-	-
BH547	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	21	-	31	-	-	-	-	-	-	-

						TPH						
		PAHs (Sum of total)	Phenanthrene	Polycylic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.5	0.01	0.5	0.01		50	100	100	10	50	50
SSTC ^{VMP}							54000	72000	21,000			

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date											
BH548	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	-	2.2	-	3.4	-	-	-	-	-	-	-
BH548	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	-	1.2	-	1.6	-	-	-	-	-	-	-
BH548	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	-	1.4	-	2	-	-	-	-	-	-	-
BH548	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	-	0.9	-	2	-	-	-	-	-	-	-
BH549	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH549	25/05/2012	-	0.2	-	0.4	-	-	-	-	-	-	-
BH549	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH549	25/05/2012	-	1	-	1.6	-	-	-	-	-	-	-
BH550	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	-	<0.1	-	<0.1	-	-	-	-	-	-	-
BH550	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	-	1.1	-	2	-	-	-	-	-	-	-
BH550	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	-	0.5	-	1.5	-	-	-	-	-	-	-
BH551	Normal	0.45-0.55	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	-	5.7	-	8.2	-	-	-	-	-	-	-
BH551	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	-	12	-	16	-	-	-	-	-	-	-
BH551	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	-	4.4	-	6.3	-	-	-	-	-	-	-
BH551	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	-	0.5	-	0.5	-	-	-	-	-	-	-
BH552	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	-	2.6	-	4.2	-	-	-	-	-	-	-
BH552	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	-	1.2	-	2	-	-	-	-	-	-	-
BH552	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	-	1.3	-	2.6	-	-	-	-	-	-	-
BH69_1.0-1.15	Normal	1-1.15	Fill	Block 5	AECOM_BH69	26/02/2010	68.8	11.3	-	10.8	460	<50	260	200	<10	460	-
BH70_0.1-0.2	Normal	0.1-0.2	Fill	Block 5	AECOM_BH70	3/03/2010	<0.5	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-
BH71_0.08-0.15	Normal	0.08-0.15	Fill	Outside Investigation Area	AECOM_BH71	3/03/2010	<0.5	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-
BH72_0.15-0.25	Normal	0.15-0.25	Fill	ORWN - Public Domain Blocks 4&5	AECOM_BH72	25/02/2010	-	-	-	-	<200	<50	<100	<100	<10	<50	-
BH72_1.0-1.2	Normal	1-1.2	Fill	ORWN - Public Domain Blocks 4&5	AECOM_BH72	3/03/2010	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-
BH74_1.0-1.12	Normal	1-1.12	Fill	Outside Investigation Area	AECOM_BH74	3/03/2010	-	20.3	-	14.8	490	<50	340	150	<10	490	-
BH75_1.0-1.2	Normal	1-1.2	Fill	Outside Investigation Area	AECOM_BH75	25/02/2010	-	-	-	-	<200	<50	<100	<100	<10	<50	-

						BTEX								
						TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	
EQL						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SSIC ^{VMP}						10	0.2	0.5	0.1	0.2	0.2	0.2	0.2	0.2
									380					

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date								
BH022_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH022	10/05/2006	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH023_1.5-1.95	Normal	1.5-1.95	Fill	Outside Investigation Area	BH023	10/05/2006	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH025_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH025	10/05/2006	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH027_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH027	12/05/2006	-	-	<0.01	<0.2	<0.2	<0.2	<0.2	<0.2
BH035_0.3-0.5	Normal	0.3-0.5	Fill	Block 4 - Proposed Southern Cove	BH035	18/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH042_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH042	23/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH042_1.5-1.7	Normal	1.5-1.7	Fill	Block 5	BH042	23/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH044_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH044	23/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH045_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH045	24/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH046_1.5-1.95	Normal	1.5-1.95	Fill	Outside Investigation Area	BH046	24/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH049_0.3-0.5	Normal	0.3-0.5	Fill	ORWN - Proposed Southern Cove	BH049	25/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH050_0.3-0.5	Normal	0.3-0.5	Fill	Outside Investigation Area	BH050	26/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH050_1.5-1.8	Normal	1.5-1.8	Fill	Outside Investigation Area	BH050	26/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH051_1.5-1.7	Normal	1.5-1.7	Fill	Outside Investigation Area	BH051	26/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH053_1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH053	29/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH054_1.5-1.6	Normal	1.5-1.6	Fill	ORWN - Public Domain Blocks 4&5	BH054	29/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH055_0.8-1.0	Normal	0.8-1	Fill	Block 4	BH055	30/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH055_1.8-2.0	Normal	1.8-2	Fill	Block 4	BH055	30/05/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH063_1.5-1.65	Normal	1.5-1.65	Fill	ORWN - Public Domain Blocks 4&5	BH063	1/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH064_1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH064	1/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH066_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH066	1/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH066_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH066	1/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH068_0.3-0.5	Normal	0.3-0.5	Fill	Block 4	BH068	1/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH076_0.3-0.5	Normal	0.3-0.5	Fill	ORWN - Public Domain Blocks 4&5	BH076	6/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH076_1.5-1.95	Normal	1.5-1.95	Fill	ORWN - Public Domain Blocks 4&5	BH076	6/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH077_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH077	6/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH078_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH078	6/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH079_0.3-0.5	Normal	0.3-0.5	Fill	Block 5	BH079	6/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH079_1.5-1.95	Normal	1.5-1.95	Fill	Block 5	BH079	6/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH116_1.5_1.95	Normal	1.5-1.95	Fill	ORWN - Proposed Southern Cove	BH116	27/06/2006	-	-	-	-	-	-	-	-
BH116_1.5_1.95	Normal	1.5-1.95	Fill	ORWN - Proposed Southern Cove	BH116	28/06/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH128_1.5-1.7	Normal	1.5-1.7	Fill	Outside Investigation Area	BH128	3/07/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH129_0.4-0.6	Normal	0.4-0.6	Fill	Outside Investigation Area	BH129	5/07/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH137_1.5_1.95	Normal	1.5-1.95	Fill	Block 4	BH137	6/07/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH142_1.5_1.95	Normal	1.5-1.95	Fill	Block 4 - Proposed Southern Cove	BH142	10/07/2006	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2
BH404_0.4-0.5	Normal	0.4-0.5	Fill	Block 4	BH404	8/02/2011	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH41_1.0-1.4	Normal	1-1.4	Fill	Block 4 - Proposed Southern Cove	AECOM_BH41	4/03/2010	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH46-1.0-1.2	Normal	1-1.2	Fill	ORWN - Proposed Southern Cove	AECOM_BH46	23/02/2010	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH48-1.0-1.2	Normal	1-1.2	Fill	Block 4	AECOM_BH48	22/02/2010	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH517	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	-	-	-	-	-	-	-

	TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	BTEX				
				Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)
EQL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
10	0.2	0.5	0.1	0.2	0.2	0.2	0.2	0.2
SSTC ^{VMP}			380					

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date								
BH517	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	-	-	-	-	-	-	-
BH517	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH517	23/05/2012	-	-	-	-	-	-	-	-
BH518	Normal	0.1-0.2	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	-	-	-	-	-	-	-
BH518	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	-	-	-	-	-	-	-
BH518	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH518	18/05/2012	-	-	-	-	-	-	-	-
BH529D	Normal	0.6	Fill	Block 5 (Non-DECC)	JBS_BH529D	14/05/2012	-	-	-	-	-	-	-	-
BH529D	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH529D	14/05/2012	-	-	-	-	-	-	-	-
BH539	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	-	-	-	-	-	-	-
BH539	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	-	-	-	-	-	-	-
BH539	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH539	18/05/2012	-	-	-	-	-	-	-	-
BH540D	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	-	-	-	-	-	-	-
BH540D	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	-	-	-	-	-	-	-
BH540D	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	-	-	-	-	-	-	-
BH540D	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH540D	17/05/2012	-	-	-	-	-	-	-	-
BH541D	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	-	-	-	-	-	-	-
BH541D	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	-	-	-	-	-	-	-
BH541D	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	-	-	-	-	-	-	-
BH541D	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH541D	19/05/2012	-	-	-	-	-	-	-	-
BH542	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	-	-	-	-	-	-	-
BH542	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	-	-	-	-	-	-	-
BH542	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	-	-	-	-	-	-	-
BH542	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH542	19/05/2012	-	-	-	-	-	-	-	-
BH543	Normal	0.6-0.7	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	-	-	-	-	-	-	-
BH543	Normal	1.5-1.6	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	-	-	-	-	-	-	-
BH543	Normal	1-1.1	Fill	Block 5 (Non-DECC)	JBS_BH543	15/05/2012	-	-	-	-	-	-	-	-
BH544D	Normal	0.55-0.65	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	-	-	-	-	-	-	-
BH544D	Normal	0.9-1	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	-	-	-	-	-	-	-
BH544D	Normal	1.4-1.5	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	-	-	-	-	-	-	-
BH544D	Normal	1.9-2	Fill	ORWN - Public Domain Blocks 4&5	JBS_BH544D	16/05/2012	-	-	-	-	-	-	-	-
BH545	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	-	-	-	-	-	-	-
BH545	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	-	-	-	-	-	-	-
BH545	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	-	-	-	-	-	-	-
BH545	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH545	24/05/2012	-	-	-	-	-	-	-	-
BH546	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	-	-	-	-	-	-	-
BH546	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	-	-	-	-	-	-	-
BH546	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH546	23/05/2012	-	-	-	-	-	-	-	-
BH547	Normal	0.5	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	-	-	-	-	-	-	-
BH547	Normal	1	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	-	-	-	-	-	-	-
BH547	Normal	1.5	Fill	Block 5 (Non-DECC)	JBS_BH547	23/05/2012	-	-	-	-	-	-	-	-

	TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	BTEX				
				Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	10	0.2	0.5	0.1	0.2	0.2	0.2	0.2
SSTC ^{VMP}				380				

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Sampled Date								
BH548	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	-	-	-	-	-	-	-	-
BH548	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	-	-	-	-	-	-	-	-
BH548	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	-	-	-	-	-	-	-	-
BH548	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH548	24/05/2012	-	-	-	-	-	-	-	-
BH549	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH549	25/05/2012	-	-	-	-	-	-	-	-
BH549	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH549	25/05/2012	-	-	-	-	-	-	-	-
BH550	Normal	0.15-0.25	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	-	-	-	-	-	-	-	-
BH550	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	-	-	-	-	-	-	-	-
BH550	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH550	25/05/2012	-	-	-	-	-	-	-	-
BH551	Normal	0.45-0.55	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	-	-	-	-	-	-	-	-
BH551	Normal	0.9-1	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	-	-	-	-	-	-	-	-
BH551	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	-	-	-	-	-	-	-	-
BH551	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH551	24/05/2012	-	-	-	-	-	-	-	-
BH552	Normal	0.4-0.5	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	-	-	-	-	-	-	-	-
BH552	Normal	1.4-1.5	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	-	-	-	-	-	-	-	-
BH552	Normal	1.9-2	Fill	Block 5 (Non-DECC)	JBS_BH552	25/05/2012	-	-	-	-	-	-	-	-
BH69_1.0-1.15	Normal	1-1.15	Fill	Block 5	AECOM_BH69	26/02/2010	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH70_0.1-0.2	Normal	0.1-0.2	Fill	Block 5	AECOM_BH70	3/03/2010	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH71_0.08-0.15	Normal	0.08-0.15	Fill	Outside Investigation Area	AECOM_BH71	3/03/2010	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH72_0.15-0.25	Normal	0.15-0.25	Fill	ORWN - Public Domain Blocks 4&5	AECOM_BH72	25/02/2010	-	-	-	-	-	-	-	-
BH72_1.0-1.2	Normal	1-1.2	Fill	ORWN - Public Domain Blocks 4&5	AECOM_BH72	3/03/2010	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH74_1.0-1.12	Normal	1-1.12	Fill	Outside Investigation Area	AECOM_BH74	3/03/2010	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5
BH75_1.0-1.2	Normal	1-1.2	Fill	Outside Investigation Area	AECOM_BH75	25/02/2010	-	-	-	-	-	-	-	-

		PAHs																					
		CPAH (TEF)	PAH (ESDAT TOTAL)	PAH (total, NSW Waste 2008)	Sum of 10 PAHs	Sum of 5 PAHs	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benzo(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
		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							0.5	0.01	0.01	0.01	0.01	0.5	0.01	0.01	0.01	0.2	0.01	0.01	0.01	0.01	0.01	0.01	
Tar Containing Material (TCM) Criteria			2000												150								

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Co	Sampled Date																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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						PAHs																					
						CPAH (TEF)	PAH (ESDAT TOTAL)	PAH (total, NSW Waste 2008)	Sum of 10 PAHs	Sum of 5 PAHs	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	Anthracene	Benzo(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
						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											0.5	0.01	0.01	0.01	0.01	0.5	0.01	0.01	0.01	0.2	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Tar Containing Material (TCM) Criteria							2000												150								

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Co Sampled Date																						
BH401 10-10.4	Normal	10-10.4	SOIL	Block 5	BH401	10/02/2011	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH401 11-11.4	Normal	11-11.4	SOIL	Block 5	BH401	10/02/2011	2.147	24.8	24.8	18.6	6.2	-	-	-	<0.5	<0.5	-	1.2	1.8	1.6	-	1.8	1.2	0.7	1.5	<0.5	4.7	0.6
BH401 13-13.4	Normal	13-13.4	SOIL	Block 5	BH401	10/02/2011	3.77	41.1	41.1	30.7	10.4	-	-	-	0.6	0.7	-	1.8	3.1	2.8	-	3.7	1.5	1.3	2.5	<0.5	7.5	1
BH401 14-14.2	Normal	14-14.2	SOIL	Block 5	BH401	10/02/2011	19.378	156.4	156.4	133	23.4	-	-	-	0.8	5.4	-	5.1	14.6	13.5	-	16.7	5.8	7.6	11	1.3	27.1	1.3
BH401 14-17.4	Normal	17-17.4	SOIL	Block 5	BH401	10/02/2011	<1.21	<8	<8	<5	<3	-	-	-	<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 19.2-19.4	Normal	19.2-19.4	SOIL	Block 5	BH401	11/02/2011	12.226	370.4	370.4	107.7	262.7	-	-	-	5	30.9	-	19.5	12.9	8.5	-	10	2.8	3.5	9.8	0.7	28.4	26
BH401 20-20.15	Normal	20-20.15	SOIL	Block 5	BH401	11/02/2011	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH401 3.0-3.4	Normal	3-3.4	SOIL	Block 5	BH401	10/02/2011	<1.21	<8	<8	<5	<3	-	-	-	<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 5.0-5.4	Normal	5-5.4	SOIL	Block 5	BH401	10/02/2011	1.557	15.8	15.8	12.5	3.3	-	-	-	<0.5	<0.5	-	0.8	1.3	1.2	-	1.6	0.6	0.5	1.1	<0.5	3.2	<0.5
BH402 11.0-11.2	Normal	11-11.2	SOIL	Block 5	BH402	9/02/2011	<1.21	2.3	2.3	1.8	0.5	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5
BH402 14.0-14.5	Normal	14-14.5	SOIL	Block 5	BH402	9/02/2011	14.315	463.9	463.9	140.2	323.7	-	-	-	4.3	28.4	-	24.8	16.7	11	-	10.5	4.6	4.3	11.9	<4	43.1	28.5
BH402 15-15.5	Normal	15-15.5	SOIL	Block 5	BH402	9/02/2011	-	-	-	-	-	-	54.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH402 16-16.3	Normal	16-16.3	SOIL	Block 5	BH402	10/02/2011	-	-	-	-	-	-	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH402 17.0-17.4	Normal	17-17.4	SOIL	Block 5	BH402	10/02/2011	98.672	2865.2	2865.2	916.5	1948.7	-	-	-	27.7	220	-	158	93.3	69.6	-	65.2	30.4	23	73.8	7.4	278	169
BH402 19.1-19.4	Normal	19.1-19.4	SOIL	Block 5	BH402	10/02/2011	<9.68	70.5	70.5	14.5	56	-	-	-	<4	6.2	-	4.4	<4	<4	-	<4	<4	<4	<4	<4	7.7	5.1
BH402 9.0-9.3	Normal	9-9.3	SOIL	Block 5	BH402	9/02/2011	3.106	27.7	27.7	22.6	5.1	-	-	-	<0.5	0.6	-	1.1	2.7	2.3	-	2.6	1.5	1.2	2.1	<0.5	4.6	<0.5
BH403 10-10.4	Normal	10-10.4	SOIL	Block 5	BH403	9/02/2011	-	-	-	-	-	-	528	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH403 12-12.4	Normal	12-12.4	SOIL	Block 5	BH403	9/02/2011	95.248	3215	3215	921.6	2293.4	-	-	-	31.4	214	-	157	120	60.9	-	87.6	26.6	40	91.2	6.2	253	251
BH403 15-15.4	Normal	15-15.4	SOIL	Block 5	BH403	9/02/2011	-	-	-	-	-	-	324	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH403 16-16.4	Normal	16-16.4	SOIL	Block 5	BH403	9/02/2011	102.799	2934.8	2934.8	979.9	1954.9	-	-	-	31.9	200	-	170	115	68.4	-	93	25.5	34.2	86.4	6.8	280	192
BH403 17-17.3	Normal	17-17.3	SOIL	Block 5	BH403	9/02/2011	36.868	1174.7	1174.7	365.2	809.5	-	-	-	12	57	-	58.6	39.7	27.2	-	30.6	9.7	13.6	29.1	<4	114	80.9
BH403 2.0-2.4	Normal	2-2.4	SOIL	Block 5	BH403	9/02/2011	1.269	15.5	15.5	11.7	3.8	-	-	-	<0.5	<0.5	-	0.8	1.5	1	-	1	0.6	<0.5	1.3	<0.5	3.2	<0.5
BH403 4.0-4.4	Normal	4-4.4	SOIL	Block 5	BH403	9/02/2011	<9.68	42.4	42.4	4.9	37.5	-	-	-	6	<4	-	<4	<4	<4	-	<4	<4	<4	<4	<4	4.9	<4
BH403 8.0-8.4	Normal	8-8.4	SOIL	Block 5	BH403	9/02/2011	104.421	1543.2	1543.2	851.6	691.6	-	-	-	37.4	48.2	-	98	112	70.5	-	84.9	27.5	34.4	77.6	7.3	227	95
BH404 12-12.4	Normal	12-12.4	SOIL	Block 4	BH404	8/02/2011	<1.21	1.8	1.8	1.8	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5
BH404 14-14.4	Normal	14-14.4	SOIL	Block 4	BH404	8/02/2011	18.759	371.4	371.4	192.9	178.5	-	-	-	10.6	11.6	-	13.9	21.9	11.6	-	20	5.2	9	15.7	1.4	52.5	15.6
BH404 15-15.4	Normal	15-15.4	SOIL	Block 4	BH404	8/02/2011	<1.21	10.2	10.2	1.1	9.1	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.6
BH404 4.0-4.4	Normal	4-4.4	SOIL	Block 4	BH404	8/02/2011	3.96	47.5	47.5	35.7	11.8	-	-	-	<0.5	1.6	-	2.5	3.5	3	-	3.5	1.5	1.2	2.5	<0.5	10	1.1
BH404 7.0-7.4	Normal	7-7.4	SOIL	Block 4	BH404	8/02/2011	77.246	1415.4	1415.4	762.1	653.3	-	-	-	47.6	<4	-	93.3	75.2	52.7	-	53.5	26	28.4	68.6	5.8	212	62.4
BH406 10.0-10.3	Normal	10-10.3	SOIL	Block 4	BH406	8/02/2011	1.356	17.4	17.4	11.8	5.6	-	-	-	0.9	<0.5	-	1	1.3	1.1	-	1.1	0.5	<0.5	1.1	<0.5	3.4	0.6
BH406 14.0-14.4	Normal	14-14.4	SOIL	Block 4	BH406	8/02/2011	73.375	1132.6	1132.6	665.7	466.9	-	-	-	31.3	33.5	-	68.2	77.5	50.8	-	49	19.1	22.9	55.4	5.1	200	57.2
BH406 15.0-15.4	Normal	15-15.4	SOIL	Block 4	BH406	8/02/2011	33.071	1060	1060	322.4	737.6	-	-	-	10	65.3	-	50.3	39.8	24.2	-	24.5	9.5	12.2	28.6	<4	94.8	58
BH406 16.0-16.5	Normal	16-16.5	SOIL	Block 4	BH406	9/02/2011	112.741	3403.1	3403.1	1056.8	2346.3	-	-	-	34.3	231	-	162	114	78.1	-	92	29.4	26.5	93.7	7.5	323	220
BH406 4.0-4.2	Normal	4-4.2	SOIL	Block 4	BH406	8/02/2011	2.188	20.2	20.2	18.1	2.1	-	-	-	<0.5	<0.5	-	0.6	1.2	1.7	-	2.1	0.9	0.7	0.9	<0.5	2.7	<0.5
BH406 7.0-7.2	Normal	7-7.2	SOIL	Block 4	BH406	8/02/2011	1.109	10.4	10.4	9.4	1	-	-	-	<0.5	<0.5	-	<0.5	1.1	0.9	-	0.9	<0.5	<0.5	0.9	<0.5	2.6	<0.5
BH407 12.0-12.18	Normal	12-12.18	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<1.21	<8	<8	<5	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH407 14.0-14.5	Normal	14-14.5	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<1.21	<8	<8	<5	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH407 15.1-15.45	Normal	15.1-15.45	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH407 16.3-16.5	Normal	16.3-16.5	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<1.21	<8	<8	<5	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH407 17.4-17.6	Normal	17.4-17.6	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<1.21	<8	<8	<5	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH407 18.0-18.3	Normal	18-18.3	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<1.21	<8	<8	<5	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH407 8.0-8.1	Normal	8-8.1	SOIL	Block 4 - Proposed Southern Cove	BH40																							

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							PAHs																					
							CPAH (TEF)	PAH (ESDAT TOTAL)	PAH (total, NSW Waste 2008)	Sum of 10 PAHs	Sum of 5 PAHs	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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
							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												0.5	0.01	0.01	0.01	0.01	0.5	0.01	0.01	0.01	0.2	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Tar Containing Material (TCM) Criteria								2000												150								
Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Co	Sampled Date																					
BH541D	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH541D		19/05/2012	-	-	-	-	-	-	-	0.6	0.3	-	1.2	2.4	2.8	3.9	-	1.4	-	2.3	0.3	5.3	0.8
BH541D	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH541D		19/05/2012	-	-	-	-	-	-	-	<0.1	0.2	-	0.4	1.1	1.2	1.9	-	0.7	-	1	0.2	1.9	0.2
BH541D	Normal	6.9-7	soil	Block 5 (Non-DECC)	JBS BH541D		19/05/2012	-	-	-	-	-	-	-	10	31	-	33	43	45	55	-	15	-	37	4.3	92	33
BH541D	Normal	7.9-8	soil	Block 5 (Non-DECC)	JBS BH541D		19/05/2012	-	-	-	-	-	-	-	7.1	14	-	19	42	40	52	-	17	-	35	5.2	96	8
BH541D	Normal	8.9-9	soil	Block 5 (Non-DECC)	JBS BH541D		19/05/2012	-	-	-	-	-	-	-	18	23	-	52	77	80	100	-	31	-	65	8.8	160	28
BH541D	Normal	9.9-10	soil	Block 5 (Non-DECC)	JBS BH541D		19/05/2012	-	-	-	-	-	-	-	22	140	-	110	97	84	110	-	37	-	80	11	240	140
BH542	Normal	11.9-12	soil	Block 5 (Non-DECC)	JBS BH542		19/05/2012	-	-	-	-	-	-	-	0.7	0.2	-	0.8	1.1	1	1.5	-	0.3	-	1	0.1	2.8	0.6
BH542	Normal	12.9-13	soil	Block 5 (Non-DECC)	JBS BH542		19/05/2012	-	-	-	-	-	-	-	3	2.6	-	5.3	9.3	8.4	12	-	2.4	-	7.4	0.8	20	3.9
BH542	Normal	13.9-14	soil	Block 5 (Non-DECC)	JBS BH542		19/05/2012	-	-	-	-	-	-	-	13	22	-	34	37	31	41	-	11	-	29	3.5	87	42
BH542	Normal	14.5-14.6	soil	Block 5 (Non-DECC)	JBS BH542		19/05/2012	-	-	-	-	-	-	-	17	94	-	75	63	52	70	-	11	-	51	4.3	160	100
BH542	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH542		19/05/2012	-	-	-	-	-	-	-	2.7	0.4	-	2.7	2.9	2.4	3.5	-	0.8	-	2.4	0.2	9.1	2.5
BH542	Normal	3.9-4	soil	Block 5 (Non-DECC)	JBS BH542		19/05/2012	-	-	-	-	-	-	-	1	0.4	-	1.4	2.5	2.1	3.1	-	0.7	-	2.1	0.2	6.1	1
BH542	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH542		19/05/2012	-	-	-	-	-	-	-	0.9	0.2	-	1.1	1.5	1.3	1.9	-	0.4	-	1.3	0.1	4.2	0.9
BH542	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH542		19/05/2012	-	-	-	-	-	-	-	0.8	0.3	-	1.1	1.7	1.4	2.2	-	0.5	-	1.4	0.1	4.5	0.8
BH543	Normal	16-16.1	soil	Block 5 (Non-DECC)	JBS BH543		15/05/2012	-	-	-	-	-	-	-	<0.1	0.2	-	0.2	0.7	0.78	1.1	-	0.3	-	0.5	<0.1	1.4	<0.1
BH543	Normal	2-2.1	soil	Block 5 (Non-DECC)	JBS BH543		15/05/2012	-	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.3	0.27	0.4	-	0.1	-	0.2	<0.1	0.6	<0.1
BH543	Normal	3-3.1	soil	Block 5 (Non-DECC)	JBS BH543		15/05/2012	-	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.3	0.53	0.7	-	0.2	-	0.3	<0.1	0.6	<0.1
BH543	Normal	4-4.1	soil	Block 5 (Non-DECC)	JBS BH543		15/05/2012	-	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.3	0.4	0.5	-	0.2	-	0.2	<0.1	0.5	<0.1
BH543	Normal	5-5.1	soil	Block 5 (Non-DECC)	JBS BH543		15/05/2012	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1	0.2	0.26	0.3	-	0.1	-	0.2	<0.1	0.4	<0.1
BH543	Normal	6-6.1	soil	Block 5 (Non-DECC)	JBS BH543		15/05/2012	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1	0.1	0.16	0.2	-	<0.1	-	0.1	<0.1	0.2	<0.1
BH543	Normal	8-8.1	soil	Block 5 (Non-DECC)	JBS BH543		15/05/2012	-	-	-	-	-	-	-	<0.1	0.2	-	0.5	0.8	0.83	1.1	-	0.3	-	0.7	<0.1	1.7	0.3
BH543	Normal	9-9.1	soil	Block 5 (Non-DECC)	JBS BH543		15/05/2012	-	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.3	0.44	0.6	-	0.2	-	0.2	<0.1	0.6	<0.1
BH544D	Normal	11.9-12	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D		16/05/2012	-	-	-	-	-	-	-	0.2	0.3	-	0.6	2.2	3.8	5	-	1.7	-	2.4	0.4	4.1	0.1
BH544D	Normal	14.9-15	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D		16/05/2012	-	-	-	-	-	-	-	0.1	0.6	-	0.7	2	2.5	3.3	-	1.1	-	1.7	0.3	3.9	0.3
BH544D	Normal	2.9-3	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D		16/05/2012	-	-	-	-	-	-	-	0.3	0.3	-	0.9	2.6	4.3	5.6	-	2	-	2.4	0.4	5.3	0.2
BH544D	Normal	3.9-4	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D		16/05/2012	-	-	-	-	-	-	-	0.4	0.4	-	1.4	3.5	5.4	7.2	-	2.4	-	3.8	0.5	7.5	0.3
BH544D	Normal	4.9-5	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D		16/05/2012	-	-	-	-	-	-	-	0.4	0.3	-	1.4	3.4	5.2	6.8	-	2.2	-	3.6	0.5	7.6	0.3
BH544D	Normal	5.9-6	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D		16/05/2012	-	-	-	-	-	-	-	0.3	0.4	-	0.9	3	4.9	6.6	-	2.2	-	3.2	0.6	6.2	0.2
BH545	Normal	13.8-13.9	soil	Block 5 (Non-DECC)	JBS BH545		24/05/2012	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1	<0.1	0.07	<0.2	-	<0.1	-	<0.1	<0.1	0.2	<0.1
BH545	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH545		24/05/2012	-	-	-	-	-	-	-	<0.1	0.9	-	1.1	2.8	2.8	3.8	-	1.1	-	2.4	0.3	5.8	0.2
BH545	Normal	3.9-4	soil	Block 5 (Non-DECC)	JBS BH545		24/05/2012	-	-	-	-	-	-	-	<0.1	0.1	-	0.2	0.3	0.4	0.5	-	0.2	-	0.3	<0.1	0.8	0.1
BH546	Normal	2	soil	Block 5 (Non-DECC)	JBS BH546		23/05/2012	-	-	-	-	-	-	-	0.1	0.8	-	1.2	4.6	6	8	-	2.7	-	4.1	0.6	8.7	0.2
BH546	Normal	3	soil	Block 5 (Non-DECC)	JBS BH546		23/05/2012	-	-	-	-	-	-	-	<0.1	<0.1	-	0.1	0.4	0.5	0.7	-	0.2	-	0.3	<0.1	0.8	<0.1
BH546	Normal	4	soil	Block 5 (Non-DECC)	JBS BH546		23/05/2012	-	-	-	-	-	-	-	<0.1	0.2	-	0.3	1.1	1.5	2	-	0.6	-	1	0.1	2.1	<0.1
BH546	Normal	5	soil	Block 5 (Non-DECC)	JBS BH546		23/05/2012	-	-	-	-	-																

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							PAHs																					
							CPAH (TEF)	PAH (ESDAT TOTAL)	PAH (total, NSW Waste 2008)	Sum of 10 PAHs	Sum of 5 PAHs	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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
EQL							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	0.5	0.01	0.01	0.01	0.01	0.5	0.01	0.01	0.01	0.2	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Tar Containing Material (TCM) Criteria								2000												150								
Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location Co	Sampled Date																						
BH74 16.0-16.5	Normal	16-16.5	SOIL	Outside Investigation Area	AECOM BH7	3/03/2010	<1.21	<8	<8	<5	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
BH74 5.5-5.7	Normal	5.5-5.7	SOIL	Outside Investigation Area	AECOM BH7	3/03/2010	2.511	35.6	35.6	24.7	10.9	-	-	-	<0.5	1	-	1.9	2.8	1.8	-	2.6	0.7	0.7	2.4	<0.5	6.7	<0.5
BH74 8.5-8.8	Normal	8.5-8.8	SOIL	Outside Investigation Area	AECOM BH7	3/03/2010	0.867	8.6	8.6	7.3	1.3	-	-	-	<0.5	<0.5	-	<0.5	0.8	0.7	-	0.8	<0.5	<0.5	0.7	<0.5	1.2	<0.5
BH75 16.0-16.2	Normal	16-16.2	SOIL	Outside Investigation Area	AECOM BH7	26/02/2010	<1.21	<8	<8	<5	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
BH75 4.0-4.2	Normal	4-4.2	SOIL	Outside Investigation Area	AECOM BH7	25/02/2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH75 8.5-8.7	Normal	8.5-8.7	SOIL	Outside Investigation Area	AECOM BH7	25/02/2010	<1.21	<8	<8	<5	<3	-	-	-	<0.5	<0.5	-	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	

Table T15: Offsite (west) - Soil Analytical Results – Saturated
Barangaroo

											TPH						BTEX							Inorganics											
											Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Polycyclic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)	TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N			
											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	mg/kg	mg/kg
EQL											0.01	0.01	0.5	0.01	0.5	0.01		50	100	100	10	50	50	10	0.2	0.5	0.1	0.2	0.2	0.2	0.2	0.2	1		
Tar Containing Material (TCM) Criteria																																			

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Co Sampled Date																						
BH01 17.65-17.75	Normal	17.65-17.75	SOIL	ORWN - Proposed Southern Cove	AECOM BH01	12/03/2009	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH01 25.0-25.1	Normal	25-25.1	SOIL	ORWN - Proposed Southern Cove	AECOM BH01	12/10/2009	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH01 4.0-4.1	Normal	4-4.1	SOIL	ORWN - Proposed Southern Cove	AECOM BH01	12/02/2009	0.5	<0.5	-	5.3	-	4.4	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH01 7.0-7.1	Normal	7-7.1	SOIL	ORWN - Proposed Southern Cove	AECOM BH01	12/02/2009	<0.5	<0.5	-	2.3	-	4.2	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH021 16.0-16.5	Normal	16-16.5	SOIL	ORWN - Public Domain Blocks 4&5	BH021	9/05/2006	1.3	56.2	-	20.8	-	11.6	1590	510	1210	380	32	2100	-	-	-	-	-	-	-	-	-	-
BH025 8.5-9.0	Normal	8.5-9	SOIL	Outside Investigation Area	BH025	10/05/2006	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH035 4.0-4.5	Normal	4-4.5	SOIL	Block 4 - Proposed Southern Cove	BH035	18/05/2006	-	-	-	-	-	-	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH042 6.0-6.5	Normal	6-6.5	SOIL	Block 5	BH042	23/05/2006	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH044 2.3-2.7	Normal	2.3-2.7	SOIL	Block 5	BH044	23/05/2006	<0.5	<0.5	-	<0.5	-	0.6	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH044 4.0-4.5	Normal	4-4.5	SOIL	Block 5	BH044	23/05/2006	-	-	-	-	-	-	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH045 3.0-3.45	Normal	3-3.45	SOIL	Block 5	BH045	24/05/2006	-	-	-	-	-	-	880	<50	420	460	<2	880	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH053-3.0-3.25	Normal	3-3.25	SOIL	ORWN - Public Domain Blocks 4&5	BH053	29/05/2006	<0.5	<0.5	-	<0.5	-	0.9	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH055-3.3-3.5	Normal	3.3-3.5	SOIL	Block 4	BH055	30/05/2006	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH063-2.8-3.0	Normal	2.8-3	SOIL	ORWN - Public Domain Blocks 4&5	BH063	1/06/2006	0.5	<0.5	-	1.3	-	2.2	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH068-3.0-3.45	Normal	3-3.45	SOIL	Block 4	BH068	1/06/2006	<0.5	<0.5	-	<0.5	-	<0.5	130	<50	<100	130	<2	130	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH068-9.5-10.0	Normal	9.5-10	SOIL	Block 4	BH068	1/06/2006	<0.5	<0.5	-	0.7	-	1	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH077 3.0-3.45	Normal	3-3.45	SOIL	Block 5	BH077	6/06/2006	3.6	<0.5	-	1.2	-	30.7	1700	260	1210	490	<2	1960	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH078 3.0-3.45	Normal	3-3.45	SOIL	Block 5	BH078	6/06/2006	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH116 3.0 3.45	Normal	3-3.45	SOIL	ORWN - Proposed Southern Cove	BH116	27/06/2006	<0.5	<0.5	-	1	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH128 2.0-20.5	Normal	20-20.5	SOIL	Outside Investigation Area	BH128	3/07/2006	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH129 12.5-1.3	Normal	12.5-13	SOIL	Outside Investigation Area	BH129	3/07/2006	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH136 3.0 3.45	Normal	3-3.45	SOIL	Block 5	BH136	6/07/2006	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH136 8.0 8.5	Normal	8-8.5	SOIL	Block 5	BH136	6/07/2006	<0.5	<0.5	-	<0.5	-	0.8	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH137 3.0 3.45	Normal	3-3.45	SOIL	Block 4	BH137	6/07/2006	<0.5	<0.5	-	<0.5	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH143 3.0 3.45	Normal	3-3.45	SOIL	ORWN - Proposed Southern Cove	BH143	10/07/2006	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<2	<250	-	-	-	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	-
BH191/16.5	Normal	16.5	SOIL	ORWN - Public Domain Blocks 4&5	BH191	14/04/2008	2.9	104	-	44.7	-	22.4	990	170	680	310	14	1160	-	-	-	7.8	2.2	0.6	5.1	5.7	2.1	-
BH191/18.2	Normal	18.2	SOIL	ORWN - Public Domain Blocks 4&5	BH191	14/04/2008	<0.5	0.6	-	0.9	-	<0.5	<200	<50	<100	<100	<10	<250	-	-	-	<1	0.3	<0.5	<0.5	<0.5	<0.5	-
BH191/3.7	Normal	3.7	SOIL	ORWN - Public Domain Blocks 4&5	BH191	27/03/2008	6.6	28.5	-	38.4	-	29.4	1080	120	700	380	<10	1200	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH191/5.6	Normal	5.6	SOIL	ORWN - Public Domain Blocks 4&5	BH191	11/04/2008	<0.5	<0.5	-	0.8	-	0.9	<200	<50	<100	<100	<10	<250	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH212/12.2	Normal	12.2	SOIL	ORWN - Public Domain Blocks 4&5	BH212	28/03/2008	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<250	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH212/26.0	Normal	26	SOIL	ORWN - Public Domain Blocks 4&5	BH212	31/03/2008	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<250	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH212/4.8	Normal	4.8	SOIL	ORWN - Public Domain Blocks 4&5	BH212	25/03/2008	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<250	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH213/10.5	Normal	10.5	SOIL	Outside Investigation Area	BH213	14/04/2008	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<250	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH213/18.5	Normal	18.5	SOIL	Outside Investigation Area	BH213	17/04/2008	<0.5	<0.5	-	1	-	2.7	130	<50	130	<100	<10	130	-	-	-	<1	<0.2	<0.5	0.5	<0.5	<0.5	-
BH213/3.6	Normal	3.6	SOIL	Outside Investigation Area	BH213	14/04/2008	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<250	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH37 15.8-16.0	Normal	15.8-16	SOIL	Block 4 - Proposed Southern Cove	AECOM BH37	18/02/2010	<0.5	3.3	-	2.3	-	1.2	<200	<50	<100	<100	53	<50	-	-	-	19.1	0.6	2.6	5.7	12.2	6.9	-
BH37 20.4-20.5	Normal	20.4-20.5	SOIL	Block 4 - Proposed Southern Cove	AECOM BH37	18/02/2010	<0.5	31.1	-	5.9	-	2.6	-	-	-	-	-	-	-	-	-	15.7	3.1	2.9	12	10.2	5.5	-
BH37 22.2-AUGER	Normal	22.2	SOIL	Block 4 - Proposed Southern Cove	AECOM BH37	18/02/2010	4.6	948	-	159	-	68.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH37 5.5-5.7	Normal	5.5-5.7	SOIL	Block 4 - Proposed Southern Cove	AECOM BH37	18/02/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH37 8.3-8.5	Normal	8.3-8.5	SOIL	Block 4 - Proposed Southern Cove	AECOM BH37	18/02/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10											

							TPH								BTEX						Inorganics						
							Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Polycyclic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)	TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)
							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							0.01	0.01	0.5	0.01	0.5	0.01		50	100	100	10	50	50	10	0.2	0.5	0.1	0.2	0.2	0.2	1
Tar Containing Material (TCM) Criteria																											

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Co Sampled Date																						
BH401 10-10.4	Normal	10-10.4	SOIL	Block 5	BH401	10/02/2011	-	-	-	-	-	-	-	<50	-	-	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<20
BH401 11-11.4	Normal	11-11.4	SOIL	Block 5	BH401	10/02/2011	0.9	0.8	-	3.6	-	4.4	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH401 13-13.4	Normal	13-13.4	SOIL	Block 5	BH401	10/02/2011	1.2	<0.5	-	6.3	-	7.1	140	<50	140	<100	<10	140	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH401 14-14.2	Normal	14-14.2	SOIL	Block 5	BH401	10/02/2011	5.2	1.3	-	9.5	-	30.2	2900	<50	1720	1180	<10	2900	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH401 14-17.4	Normal	17-17.4	SOIL	Block 5	BH401	10/02/2011	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	0.2	<0.5	<0.5	<0.5	<0.5	-
BH401 19.2-19.4	Normal	19.2-19.4	SOIL	Block 5	BH401	11/02/2011	2.6	120	-	61.3	-	28.5	1180	470	970	210	22	1650	-	-	-	10.1	1.4	0.7	5.9	7.2	2.9	-
BH401 20-20.15	Normal	20-20.15	SOIL	Block 5	BH401	11/02/2011	-	-	-	-	-	-	-	<50	-	-	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<20
BH401 3.0-3.4	Normal	3-3.4	SOIL	Block 5	BH401	10/02/2011	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH401 5.0-5.4	Normal	5-5.4	SOIL	Block 5	BH401	10/02/2011	<0.5	<0.5	-	2.5	-	3	250	<50	130	120	<10	250	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH402 11.0-11.2	Normal	11-11.2	SOIL	Block 5	BH402	9/02/2011	<0.5	<0.5	-	0.5	-	0.9	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH402 14.0-14.5	Normal	14-14.5	SOIL	Block 5	BH402	9/02/2011	<4	168	-	69.7	-	38.1	2220	690	1560	660	66	2910	-	-	-	27.8	6.2	1.5	15.7	20.4	7.4	-
BH402 15-15.5	Normal	15-15.5	SOIL	Block 5	BH402	9/02/2011	-	-	-	-	-	-	-	740	-	-	67	740	-	-	-	29	3.7	2	8	19	10	<20
BH402 16-16.3	Normal	16-16.3	SOIL	Block 5	BH402	10/02/2011	-	-	-	-	-	-	-	150	-	-	35	150	-	-	-	14.9	0.8	1	6.4	10	4.9	<20
BH402 17.0-17.4	Normal	17-17.4	SOIL	Block 5	BH402	10/02/2011	24.8	957	-	417	-	251	6330	3060	4860	1470	470	9390	-	-	-	174.1	63.4	9	127	128	46.1	-
BH402 19.1-19.4	Normal	19.1-19.4	SOIL	Block 5	BH402	10/02/2011	<4	27.6	-	12.7	-	6.8	250	180	250	<100	15	430	-	-	-	3.6	2.9	<0.5	3.3	2.6	1	-
BH402 9.0-9.3	Normal	9-9.3	SOIL	Block 5	BH402	9/02/2011	1.2	<0.5	-	3.4	-	4.4	860	<50	650	210	<10	860	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH403 10-10.4	Normal	10-10.4	SOIL	Block 5	BH403	9/02/2011	-	-	-	-	-	-	-	12,300	-	-	930	12,300	-	-	-	411.3	83.7	20.6	202	318	93.3	<20
BH403 12-12.4	Normal	12-12.4	SOIL	Block 5	BH403	9/02/2011	22.1	1160	-	480	-	214	14,660	7080	11,200	3460	651	21,740	-	-	-	179.2	124	10.2	145	131	48.2	-
BH403 15-15.4	Normal	15-15.4	SOIL	Block 5	BH403	9/02/2011	-	-	-	-	-	-	-	9340	-	-	95	9340	-	-	-	50	7	2.4	29.8	38.4	11.6	<20
BH403 16-16.4	Normal	16-16.4	SOIL	Block 5	BH403	9/02/2011	22.6	941	-	420	-	248	12,640	5540	9740	2900	434	18,180	-	-	-	157.3	60	8.7	117	116	41.3	-
BH403 17-17.3	Normal	17-17.3	SOIL	Block 5	BH403	9/02/2011	8.9	441	-	160	-	92.4	4270	1800	3290	980	13	6070	-	-	-	4.4	1.5	<0.5	2.9	3.3	1.1	-
BH403 2.0-2.4	Normal	2-2.4	SOIL	Block 5	BH403	9/02/2011	<0.5	<0.5	-	3	-	3.1	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH403 4.0-4.4	Normal	4-4.4	SOIL	Block 5	BH403	9/02/2011	<4	23.7	-	7.8	-	<4	3100	220	1340	1760	<10	3320	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH403 8.0-8.4	Normal	8-8.4	SOIL	Block 5	BH403	9/02/2011	24.4	146	-	267	-	186	12,470	1300	8870	3600	31	13,770	-	-	-	10.2	4.2	4.3	5	6.6	3.6	-
BH404 12-12.4	Normal	12-12.4	SOIL	Block 4	BH404	8/02/2011	<0.5	<0.5	-	<0.5	-	0.9	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH404 14-14.4	Normal	14-14.4	SOIL	Block 4	BH404	8/02/2011	4.6	88	-	38.8	-	51	2060	<50	1280	780	125	2060	-	-	-	35.1	11.5	14.5	6.6	26.5	8.6	-
BH404 15-15.4	Normal	15-15.4	SOIL	Block 4	BH404	8/02/2011	<0.5	7.6	-	0.9	-	0.5	<200	130	<100	<100	<10	130	-	-	-	1	1.2	<0.5	1.3	1	<0.5	-
BH404 4.0-4.4	Normal	4-4.4	SOIL	Block 4	BH404	8/02/2011	1	<0.5	-	6.6	-	9.5	380	<50	230	150	<10	380	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH404 7.0-7.4	Normal	7-7.4	SOIL	Block 4	BH404	8/02/2011	20.9	127	-	323	-	219	7060	650	5240	1820	<10	7710	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH406 10.0-10.3	Normal	10-10.3	SOIL	Block 4	BH406	8/02/2011	<0.5	<0.5	-	3.1	-	3.3	150	<50	150	<100	<10	150	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH406 14.0-14.4	Normal	14-14.4	SOIL	Block 4	BH406	8/02/2011	17.9	76.7	-	200	-	168	1320	90	920	400	30	1410	-	-	-	6.7	3.8	2.6	1.6	4.4	2.3	-
BH406 15.0-15.4	Normal	15-15.4	SOIL	Block 4	BH406	8/02/2011	8.4	401	-	153	-	80.4	3490	1340	2720	770	190	4830	-	-	-	50	15.1	3.2	31	36.9	13.1	-
BH406 16.0-16.5	Normal	16-16.5	SOIL	Block 4	BH406	9/02/2011	26.6	1170	-	529	-	266	3900	1940	3000	900	861	5840	-	-	-	171.8	85	10.9	140	126	45.8	-
BH406 4.0-4.2	Normal	4-4.2	SOIL	Block 4	BH406	8/02/2011	0.7	<0.5	-	1.5	-	7.2	290	<50	110	180	<10	290	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH406 7.0-7.2	Normal	7-7.2	SOIL	Block 4	BH406	8/02/2011	<0.5	<0.5	-	1	-	3	140	<50	140	<100	<10	140	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH407 12.0-12.18	Normal	12-12.18	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH407 14.0-14.5	Normal	14-14.5	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	0.2	<0.5	<0.5	<0.5	<0.5	-
BH407 15.1-15.45	Normal	15.1-15.45	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	-	-	-	-	-	-	-	<50	-	-	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<20
BH407 16.3-16.5	Normal	16.3-16.5	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	0.4	<0.5	<0.5	<0.5	<0.5	-
BH407 17.4-17.6	Normal	17.4-17.6	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	0.4	<0.5	<0.5	<0.5	<0.5	-
BH407 18.0-18.3	Normal	18-18.3	SOIL	Block 4 - Proposed Southern Cove	BH407	14/02/2011	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	1.2	<0.5	1.1	<0.5		

							TPH										BTEX						Inorganics					
							Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Polycyclic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)	TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N
							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							0.01	0.01	0.5	0.01	0.5	0.01		50	100	100	10	50	50	10	0.2	0.5	0.1	0.2	0.2	0.2	0.2	1
Tar Containing Material (TCM) Criteria																												

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Co Sampled Date																						
BH411 26.0-26.1	Normal	26-26.1	SOIL	ORWN - Public Domain Blocks 4&5	BH411	12/04/2011	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	<0.2	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH411 3.1-3.2	Normal	3.1-3.2	SOIL	ORWN - Public Domain Blocks 4&5	BH411	12/04/2011	0.13	0.03	-	0.42	-	0.79	<200	<50	<100	<100	-	<50	-	-	-	-	-	-	-	-	<1	-
BH411 4.0-4.1	Normal	4-4.1	SOIL	ORWN - Public Domain Blocks 4&5	BH411	12/04/2011	<0.5	<0.5	-	1.3	-	2.3	<200	<50	<100	<100	<10	<50	-	-	<0.2	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH411 8.0-8.1	Normal	8-8.1	SOIL	ORWN - Public Domain Blocks 4&5	BH411	12/04/2011	<0.5	<0.5	-	2	-	1.7	<200	<50	<100	<100	<10	<50	-	-	<0.2	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH46-14.5-14.7	Normal	14.5-14.7	SOIL	ORWN - Proposed Southern Cove	AECOM BH4	23/02/2010	3.7	114	-	55.9	-	32.1	760	200	560	200	<10	960	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH46-19.0-19.2	Normal	19-19.2	SOIL	ORWN - Proposed Southern Cove	AECOM BH4	23/02/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH46-20.5-20.7	Normal	20.5-20.7	SOIL	ORWN - Proposed Southern Cove	AECOM BH4	23/02/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	<1	0.4	<0.5	<0.5	<0.5	<0.5	-	
BH46-23.5-23.7	Normal	23.5-23.7	SOIL	ORWN - Proposed Southern Cove	AECOM BH4	23/02/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH46-7.0-7.2	Normal	7-7.2	SOIL	ORWN - Proposed Southern Cove	AECOM BH4	23/02/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH47-13.0-13.2	Normal	13-13.2	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH4	22/02/2010	<0.5	<0.5	-	3.8	-	5.3	860	<50	480	380	<10	860	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH47-4.0-4.2	Normal	4-4.2	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH4	22/02/2010	1	<0.5	-	1.8	-	3.3	1750	<50	850	900	<10	1750	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH47-8.5-8.7	Normal	8.5-8.7	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH4	22/02/2010	3.9	1.1	-	20.6	-	27.8	880	<50	500	380	<10	880	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH48-14.5-14.7	Normal	14.5-14.7	SOIL	Block 4	AECOM BH4	23/02/2010	8.9	517	-	215	-	101	4650	1750	3610	1040	90	6400	-	-	-	27.1	8.9	1.6	20.8	20.1	7	-
BH48-17.0-17.2	Normal	17-17.2	SOIL	Block 4	AECOM BH4	23/02/2010	<0.5	11	-	5.2	-	2.4	110	60	110	<100	<10	170	-	-	-	0.8	0.2	<0.5	0.8	0.8	<0.5	-
BH48-8.5-8.7	Normal	8.5-8.7	SOIL	Block 4	AECOM BH4	23/02/2010	<0.5	<0.5	-	0.9	-	1.4	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH517	Normal	2	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	1.7	0.2	-	3	-	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH517	Normal	3	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	0.4	<0.1	-	0.8	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH517	Normal	4	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	0.4	0.2	-	1.3	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH517	Normal	5	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	0.5	0.2	-	1.5	-	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH517	Normal	6	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	0.3	0.1	-	1	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH517	Normal	7	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	1.1	0.6	-	4.7	-	5.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH517	Normal	8	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	0.6	0.5	-	3	-	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH517	Normal	9	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	0.6	0.2	-	1.5	-	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH517	Normal	13	soil	Block 5 (Non-DECC)	JBS BH517	23/05/2012	0.9	0.2	-	2.5	-	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH518	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH518	18/05/2012	0.4	0.2	-	0.7	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH518	Normal	3.9-4	soil	Block 5 (Non-DECC)	JBS BH518	18/05/2012	1.6	0.2	-	2.3	-	6.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH518	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH518	18/05/2012	0.7	<0.1	-	1	-	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH518	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH518	18/05/2012	0.8	0.1	-	1.2	-	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	2	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	<0.1	<0.1	-	0.1	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	3	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	<0.1	<0.1	-	0.2	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	4	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	0.1	<0.1	-	0.3	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	5	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	0.1	<0.1	-	0.2	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	6	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	<0.1	<0.1	-	<0.1	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	7	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	1.3	<0.1	-	3.9	-	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	8	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	0.4	<0.1	-	0.6	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	9	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	0.1	<0.1	-	0.2	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH529D	Normal	15	soil	Block 5 (Non-DECC)	JBS BH529D	14/05/2012	0.2	<0.1	-	0.4	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	10.9-11	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	0.9	0.2	-	3.4	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	11.9-12	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	1.6	0.2	-	5.3	-	6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	12.9-13	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	0.9	13	-	5.5	-	4.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	1.3	0.1	-	1.6	-	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	3.9-4	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	1.5	0.7	-	4.2	-	6.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	2.7	1.3	-	8.2	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	1.5	0.5	-	3.5	-	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	6.9-7	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	0.9	2.2	-	3.7	-	3.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	7.9-8	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	1	0.8	-	3.1	-	3.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	8.9-9	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	1	1.7	-	4.4	-	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH539	Normal	9.9-10	soil	Block 5 (Non-DECC)	JBS BH539	18/05/2012	0.5	0.3	-	1.4																		

							TPH										BTEX						Inorganics						
							Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Polycyclic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)	TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N	
							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							0.01	0.01	0.5	0.01	0.5	0.01			50	100	100	10	50	50	10	0.2	0.5	0.1	0.2	0.2	0.2	0.2	1
Tar Containing Material (TCM) Criteria																													

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Co Sampled Date																						
BH541D	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH541D	19/05/2012	1.5	0.2	-	3.6	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH541D	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH541D	19/05/2012	0.7	0.2	-	1.2	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH541D	Normal	6.9-7	soil	Block 5 (Non-DECC)	JBS BH541D	19/05/2012	17	200	-	79	-	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH541D	Normal	7.9-8	soil	Block 5 (Non-DECC)	JBS BH541D	19/05/2012	21	9.4	-	49	-	86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH541D	Normal	8.9-9	soil	Block 5 (Non-DECC)	JBS BH541D	19/05/2012	36	19	-	150	-	150	-	-	-	-	-	-	-	-	3	2	2	1	2	1	-	-
BH541D	Normal	9.9-10	soil	Block 5 (Non-DECC)	JBS BH541D	19/05/2012	37	1100	-	380	-	210	-	-	-	-	-	-	-	-	87	64	8	69	62	25	-	-
BH542	Normal	11.9-12	soil	Block 5 (Non-DECC)	JBS BH542	19/05/2012	0.4	1.2	-	2.8	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH542	Normal	12.9-13	soil	Block 5 (Non-DECC)	JBS BH542	19/05/2012	2.9	2.5	-	18	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH542	Normal	13.9-14	soil	Block 5 (Non-DECC)	JBS BH542	19/05/2012	13	230	-	120	-	76	-	-	-	-	-	-	-	-	27	16	7	17	19	8	-	-
BH542	Normal	14.5-14.6	soil	Block 5 (Non-DECC)	JBS BH542	19/05/2012	15	690	-	270	-	130	-	-	-	-	-	-	-	-	87	41	9	62	63	24	-	-
BH542	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH542	19/05/2012	1	1.1	-	9.9	-	8.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH542	Normal	3.9-4	soil	Block 5 (Non-DECC)	JBS BH542	19/05/2012	0.8	0.6	-	5.5	-	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH542	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH542	19/05/2012	0.5	0.6	-	3.9	-	3.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH542	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH542	19/05/2012	0.5	0.7	-	3.8	-	4.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH543	Normal	16-16.1	soil	Block 5 (Non-DECC)	JBS BH543	15/05/2012	0.4	0.2	-	0.6	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH543	Normal	2-2.1	soil	Block 5 (Non-DECC)	JBS BH543	15/05/2012	0.1	<0.1	-	0.5	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH543	Normal	3-3.1	soil	Block 5 (Non-DECC)	JBS BH543	15/05/2012	0.2	<0.1	-	0.3	-	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH543	Normal	4-4.1	soil	Block 5 (Non-DECC)	JBS BH543	15/05/2012	0.2	<0.1	-	0.3	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH543	Normal	5-5.1	soil	Block 5 (Non-DECC)	JBS BH543	15/05/2012	0.1	<0.1	-	0.3	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH543	Normal	6-6.1	soil	Block 5 (Non-DECC)	JBS BH543	15/05/2012	<0.1	<0.1	-	0.2	-	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH543	Normal	8-8.1	soil	Block 5 (Non-DECC)	JBS BH543	15/05/2012	0.3	0.2	-	1.7	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH543	Normal	9-9.1	soil	Block 5 (Non-DECC)	JBS BH543	15/05/2012	0.2	<0.1	-	0.4	-	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH544D	Normal	11.9-12	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D	16/05/2012	1.7	0.1	-	1.1	-	7.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH544D	Normal	14.9-15	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D	16/05/2012	1.1	0.4	-	1.8	-	4.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH544D	Normal	2.9-3	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D	16/05/2012	2	0.1	-	1.9	-	7.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH544D	Normal	3.9-4	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D	16/05/2012	2.5	0.2	-	3.5	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH544D	Normal	4.9-5	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D	16/05/2012	2.3	0.2	-	2.9	-	9.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH544D	Normal	5.9-6	soil	ORWN - Public Domain Blocks 4&5	JBS BH544D	16/05/2012	2.2	0.3	-	2.1	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH545	Normal	13.8-13.9	soil	Block 5 (Non-DECC)	JBS BH545	24/05/2012	<0.1	<0.1	-	<0.1	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH545	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH545	24/05/2012	1.2	0.2	-	2.8	-	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH545	Normal	3.9-4	soil	Block 5 (Non-DECC)	JBS BH545	24/05/2012	0.2	<0.1	-	0.7	-	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH546	Normal	2	soil	Block 5 (Non-DECC)	JBS BH546	23/05/2012	2.7	0.2	-	3.4	-	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH546	Normal	3	soil	Block 5 (Non-DECC)	JBS BH546	23/05/2012	0.2	<0.1	-	0.3	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH546	Normal	4	soil	Block 5 (Non-DECC)	JBS BH546	23/05/2012	0.6	<0.1	-	0.9	-	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH546	Normal	5	soil	Block 5 (Non-DECC)	JBS BH546	23/05/2012	0.4	<0.1	-	0.6	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH546	Normal	6	soil	Block 5 (Non-DECC)	JBS BH546	23/05/2012	0.3	<0.1	-	0.5	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH547	Normal	2	soil	Block 5 (Non-DECC)	JBS BH547	23/05/2012	24	9.8	-	140	-	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH547	Normal	3	soil	Block 5 (Non-DECC)	JBS BH547	23/05/2012	9.2	5.7	-	34	-	36	-	-	-	-	-	-	-	-	<3	0.3	<1	0.5	<2	<1	-	-
BH547	Normal	7	soil	Block 5 (Non-DECC)	JBS BH547	23/05/2012	0.5	0.1	-	1.2	-	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH547	Normal	8	soil	Block 5 (Non-DECC)	JBS BH547	23/05/2012	0.4	<0.1	-	0.8	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH547	Normal	9	soil	Block 5 (Non-DECC)	JBS BH547	23/05/2012	0.5	<0.1	-	1.5	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH547	Normal	12	soil	Block 5 (Non-DECC)	JBS BH547	23/05/2012	<0.1	<0.1	-	0.1	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH547	Normal	13	soil	Block 5 (Non-DECC)	JBS BH547	23/05/2012	2	35	-	18	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH548	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH548	24/05/2012	0.7	0.1	-	1.6	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH548	Normal	3.9-4	soil	Block 5 (Non-DECC)	JBS BH548	24/05/2012	0.5	0.1	-	1.4	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH548	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH548	24/05/2012	0.4	0.2	-	1.4	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH548	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH548	24/05/2012	0.5	<0.1	-	1.3	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH549	Normal	11.4-11.5	soil	Block 5 (Non-DECC)	JBS BH549	25/05/2012	0.1	<0.1	-	0.2	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH549	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH549	25/05/2012	0.9	<0.1	-	1.8	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH549	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH549	25/05/2012	0.4	0.1	-	0.6	-	1	-	-	-	-	-	-	-	-	-</							

							TPH								BTEX							Inorganics							
							Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Polycyclic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)	TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N	
							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							0.01	0.01	0.5	0.01	0.5	0.01		50	100	100	10	50	50	10	0.2	0.5	0.1	0.2	0.2	0.2	0.2	0.2	1
Tar Containing Material (TCM) Criteria																													

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location	Co Sampled Date																							
BH550	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH550	25/05/2012	0.2	<0.1	-	0.5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH550	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH550	25/05/2012	0.2	<0.1	-	0.4	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH551	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH551	24/05/2012	<0.1	<0.1	-	0.3	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH551	Normal	3.9-4	soil	Block 5 (Non-DECC)	JBS BH551	24/05/2012	0.1	<0.1	-	0.5	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH551	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH551	24/05/2012	0.1	<0.1	-	0.4	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH551	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH551	24/05/2012	0.2	<0.1	-	0.6	-	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH551	Normal	8.9-9	soil	Block 5 (Non-DECC)	JBS BH551	24/05/2012	<0.1	<0.1	-	<0.1	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH552	Normal	10.4-10.5	soil	Block 5 (Non-DECC)	JBS BH552	25/05/2012	0.2	<0.1	-	0.6	-	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH552	Normal	2.9-3	soil	Block 5 (Non-DECC)	JBS BH552	25/05/2012	1.7	0.2	-	11	-	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH552	Normal	4.9-5	soil	Block 5 (Non-DECC)	JBS BH552	25/05/2012	0.3	<0.1	-	1.5	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH552	Normal	5.9-6	soil	Block 5 (Non-DECC)	JBS BH552	25/05/2012	1.3	0.2	-	7	-	7.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BH56 11.5-11.7	Normal	11.5-11.7	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH5	4/03/2010	-	-	-	-	-	-	330	<50	200	130	<10	330	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH56 13.0-13.2	Normal	13-13.2	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH5	5/03/2010	<0.5	1.3	-	1.8	-	1.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH56 14.5-15.0	Normal	14.5-15	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH5	5/03/2010	<0.5	<0.5	-	0.9	-	0.6	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH56 17.5-17.8	Normal	17.5-17.8	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH5	5/03/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH56 2.5-2.7	Normal	2.5-2.7	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH5	4/03/2010	<0.5	<0.5	-	0.6	-	1	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH56 20.5-20.9	Normal	20.5-20.9	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH5	5/03/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH56 21.4-21.6	Normal	21.4-21.6	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH5	5/03/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH56 7.0-7.2	Normal	7-7.2	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH5	4/03/2010	1.2	4.6	-	25.2	-	18	1630	70	1090	540	<10	1700	-	-	-	<1	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH57 11.5-11.7	Normal	11.5-11.7	SOIL	Block 4	AECOM BH5	25/02/2010	<0.5	<0.5	-	<0.5	-	0.7	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH57 4.0-4.2	Normal	4-4.2	SOIL	Block 4	AECOM BH5	25/02/2010	-	-	-	-	-	-	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH57 7.0-7.2	Normal	7-7.2	SOIL	Block 4	AECOM BH5	25/02/2010	2.7	0.5	-	20.9	-	22.7	610	<50	410	200	<10	610	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH60 13.0-13.4	Normal	13-13.4	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH6	1/03/2010	-	-	-	-	-	-	440	<50	230	210	<10	440	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH60 16.0-16.4	Normal	16-16.4	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH6	1/03/2010	4.2	256	654	88.3	-	45.9	2280	760	1660	620	84	3040	-	-	-	18.2	5.8	1	15.5	13.4	4.8	-	-
BH60 17.5-17.7	Normal	17.5-17.7	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH6	2/03/2010	2.3	101	323	50.7	-	25.7	160	60	160	<100	12	220	-	-	-	3.3	0.6	<0.5	1.9	2.4	0.9	-	-
BH60 2.5-2.9	Normal	2.5-2.9	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH6	1/03/2010	2.1	1.1	82.4	12.3	-	13.7	1110	<50	430	680	<10	1110	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH60 20.5-20.9	Normal	20.5-20.9	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH6	2/03/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH60 7.0-7.2	Normal	7-7.2	SOIL	ORWN - Public Domain Blocks 4&5	AECOM BH6	1/03/2010	-	-	-	-	-	-	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH63 11.5-11.9	Normal	11.5-11.9	SOIL	Outside Investigation Area	AECOM BH6	1/03/2010	<0.5	28.9	-	13.3	-	6.6	200	<50	200	<100	<10	200	-	-	-	3.1	0.2	<0.5	<0.5	<0.5	1.7	1.4	-
BH63 13.0-13.3	Normal	13-13.3	SOIL	Outside Investigation Area	AECOM BH6	1/03/2010	<0.5	2.9	-	2	-	1	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH63 17.7-17.9	Normal	17.7-17.9	SOIL	Outside Investigation Area	AECOM BH6	1/03/2010	-	-	-	-	-	-	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH63 2.5-2.7	Normal	2.5-2.7	SOIL	Outside Investigation Area	AECOM BH6	26/02/2010	<0.5	<0.5	-	<0.5	-	1.9	1430	<50	800	630	<10	1430	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH63 20.5-20.9	Normal	20.5-20.9	SOIL	Outside Investigation Area	AECOM BH6	2/03/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH69 10.0-10.2	Normal	10-10.2	SOIL	Block 5	AECOM BH6	26/02/2010	<0.5	<0.5	-	24.4	-	12.4	420	<50	420	<100	<10	420	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH69 4.0-4.2	Normal	4-4.2	SOIL	Block 5	AECOM BH6	26/02/2010	0.7	<0.5	15.3	1.4	-	2.6	590	<50	320	270	<10	590	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH70 11.5-11.7	Normal	11.5-11.7	SOIL	Block 5	AECOM BH7	8/03/2010	<0.5	<0.5	2.6	<0.5	-	1	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH70 16.0-16.2	Normal	16-16.2	SOIL	Block 5	AECOM BH7	8/03/2010	62.4	3440	-	1000	-	554	38,740	19,400	29,500	9240	2640	58,140	-	-	-	660	300	40.1	346	481	179	-	-
BH70 2.5-2.7	Normal	2.5-2.7	SOIL	Block 5	AECOM BH7	8/03/2010	<0.5	4.3	-	<0.5	-	<0.5	1830	<50	580	1250	14	1830	-	-	-	2.9	0.6	1.4	<0.5	1.2	1.7	-	-
BH70 4.0-4.2	Normal	4-4.2	SOIL	Block 5	AECOM BH7	8/03/2010	<0.5	<0.5	<0.5	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH70 5.5-5.7	Normal	5.5-5.7	SOIL	Block 5	AECOM BH7	8/03/2010	7.5	2.3	194	21.1	-	33.1	4220	<50	1640	2580	<10	4220	-	-	-	<1	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	-
BH71 10.0-10.2	Normal	10-10.2	SOIL	Outside Investigation Area	AECOM BH7	4/03/2010	<0.5	0.7	-	1.4	-	1.3	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.			

							TPH								BTEX							Inorganics						
							Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Polycyclic aromatic hydrocarbons EPA448	Pyrene	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	C10 - C40 (Sum of total)	TPH C6-C10	Sum of BTEX	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Ammonia as N
							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							0.01	0.01	0.5	0.01	0.5	0.01		50	100	100	10	50	50	10	0.2	0.5	0.1	0.2	0.2	0.2	0.2	1
Tar Containing Material (TCM) Criteria																												

Field ID	Sample Type	Sample Depth	Matrix Type	Monitoring Zone	Location Co	Sampled Date																						
BH74 16.0-16.5	Normal	16-16.5	SOIL	Outside Investigation Area	AECOM BH7	3/03/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH74 5.5-5.7	Normal	5.5-5.7	SOIL	Outside Investigation Area	AECOM BH7	3/03/2010	0.7	0.9	-	7.1	-	6.3	200	<50	200	<100	<10	200	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH74 8.5-8.8	Normal	8.5-8.8	SOIL	Outside Investigation Area	AECOM BH7	3/03/2010	<0.5	<0.5	-	1.3	-	3.1	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH75 16.0-16.2	Normal	16-16.2	SOIL	Outside Investigation Area	AECOM BH7	26/02/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-
BH75 4.0-4.2	Normal	4-4.2	SOIL	Outside Investigation Area	AECOM BH7	25/02/2010	-	-	-	-	-	-	<200	<50	<100	<100	<10	<50	-	-	-	-	-	-	-	-	-	-
BH75 8.5-8.7	Normal	8.5-8.7	SOIL	Outside Investigation Area	AECOM BH7	25/02/2010	<0.5	<0.5	-	<0.5	-	<0.5	<200	<50	<100	<100	<10	<50	-	-	-	<1	<0.2	<0.5	<0.5	<0.5	<0.5	-

	PAHs																						
	CPAH (TEF)	PAH (ESDAT TOTAL)	PAH (total, NSW Waste 2008)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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-c,d)pyrene	Naphthalene	PAHs (Sum of total)
EQL	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
MWQC				0.5	0.1	0.1	0.1	0.1	0.5	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	0.5
GW SSTC (Human Health)	1000				2.1		5.8	5.8		0.01	0.1	0.1		0.1	0.1	0.1	0.1	0.1	1	3	0.1	70	

Well	Location Code	Area	Screened Lithology	Sampled Date																								
Wells screened within fill material																												
IT04M	IT04M	ORWN - Public Domain Blocks 4&5	Fill	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT05M	IT05M	ORWN - Public Domain Blocks 4&5	Fill	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT05S	IT05S	ORWN - Public Domain Blocks 4&5	Fill	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT1 MID	AECOM IT1	ORWN - Public Domain Blocks 4&5	Fill	24/03/2010	8	122	122	<1	4	<1	6	10	2	6	7	7	12	-	3	-	7	<1	13	11	2	16	134	
IT1 SHALLOW	AECOM IT1	ORWN - Public Domain Blocks 4&5	Fill	25/03/2010	<1.998	<12.6	<12.6	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<2	-	<0.9	-	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9
IT2 MID	AECOM IT2	ORWN - Public Domain Blocks 4&5	Fill	24/03/2010	<2.22	70	70	<1	7	<1	6	2	<1	2	<1	<1	<2	-	<1	-	<1	<1	2	5	<1	41	70	
IT2 SHALLOW	AECOM IT2	ORWN - Public Domain Blocks 4&5	Fill	24/03/2010	<2.22	2	2	<1	<1	<1	1	<1	<1	<1	<1	<1	<2	-	<1	-	<1	<1	1	<1	<1	<1	<1	2
MW02	BH009	Outside Investigation Area	Fill	14/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW02	BH009	Outside Investigation Area	Fill	17/07/2006	0.7	8.1	8.1	-	-	-	<1	<1	-	<1	<1	0.7	-	<1	<1	<1	<1	<1	2.5	<1	<1	<1	<1	-
MW02	BH009	Outside Investigation Area	Fill	14/08/2007	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW02	BH009	Outside Investigation Area	Fill	6/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW02	BH009	Outside Investigation Area	Fill	31/07/2008	-	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	-	
MW03	BH010	Outside Investigation Area	Fill	19/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW03	BH010	Outside Investigation Area	Fill	5/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW03	BH010	Outside Investigation Area	Fill	31/07/2008	-	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	-	
MW04	BH011	Outside Investigation Area	Fill	14/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW04	BH011	Outside Investigation Area	Fill	25/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW04	BH011	Outside Investigation Area	Fill	13/08/2007	0.9	6.4	6.4	-	-	-	<1	<1	-	<1	<1	0.9	-	<1	<1	<1	<1	<1	2.2	<1	<1	<1	<1	-
MW04	BH011	Outside Investigation Area	Fill	6/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW04	BH011	Outside Investigation Area	Fill	31/07/2008	-	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	-	
MW05	BH031	Outside Investigation Area	Fill	18/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW05	BH031	Outside Investigation Area	Fill	16/08/2007	<1.92	7.7	7.7	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	7.7	-
MW05	BH031	Outside Investigation Area	Fill	9/05/2008	<0.192	<1.55	<1.55	-	<0.1	<0.1	<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	-
MW05	BH031	Outside Investigation Area	Fill	31/07/2008	-	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	-	
MW06	BH031	Outside Investigation Area	Fill	18/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW06	BH031	Outside Investigation Area	Fill	16/08/2007	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW06	BH033	Outside Investigation Area	Fill	8/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW06	BH033	Outside Investigation Area	Fill	31/07/2008	-	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	-	
MW07	BH036	Outside Investigation Area	Fill	17/07/2006	1.781	12.2	12.2	-	-	-	<1	<1	-	<1	1.2	1.5	-	1.5	<1	<1	1.1	<1	2.7	<1	<1	<1	<1	-
MW07	BH036	Outside Investigation Area	Fill	15/08/2007	3.497	27.2	27.2	-	-	-	<1	<1	-	<1	2.2	2.7	-	2.7	1.6	1.3	2.1	<1	5.4	<1	1.4	<1	-	-
MW07	BH036	Outside Investigation Area	Fill	6/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW08	BH046	Outside Investigation Area	Fill	25/07/2006	38.74	446.6	446.6	-	-	-	11.7	10.8	-	18.4	25.6	25.8	-	21.9	11.6	18.3	24.4	4.9	64.5	14	11	72.1	-	-
MW08	BH046	Outside Investigation Area	Fill	14/08/2006	3.498	127.7	127.7	-	-	-	8.5	4.1	-	7.1	2.9	2.7	-	1.9	1.2	1.7	2.6	<1	9.8	7.5	1.1	51.2	-	-
MW08	BH046	Outside Investigation Area	Fill	16/08/2007	3.918	98.1	98.1	-	-	-	4.6	2	-	4.9	2.6	3.1	-	2.2	1.6	1.6	2.2	<1	6	2.9	1.4	49.5	-	-
MW08	BH046	Outside Investigation Area	Fill	7/05/2008	0.6	63.6	63.6	-	-	-	6.1	1.3	-	3.1	<1	0.6	-	<1	<1	<1	<1	<1	2.8	4.2	<1	37.6	-	-
MW08	BH046	Outside Investigation Area	Fill	16/03/2010	<1.11	23	23	<0.5	2	<0.5	2	<0.5	<0.5	1	<0.5	<0.5	<1	-	<0.5	-	<0.5	<0.5	1	2	<0.5	13	23	
MW08	BH046	Outside Investigation Area	Fill	28/02/2011	<1.92	17.2	17.2	-	-	-	2.1	<1	-	1.9	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	2.2	<1	7.9	-
MW08 FILTRATE	BH046	Outside Investigation Area	Fill	28/02/2011	<0.192	11.1	11.1	-	0.3	<0.1	0.7	0.3	-	0.4	<0.1	<0.05	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9.7	-
MW11	BH053	ORWN - Public Domain Blocks 4&5	Fill	14/08/2007	<1.92	3.9	3.9	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	1.7	<1	<1	<1	-	-
MW11	BH053	ORWN - Public Domain Blocks 4&5	Fill	14/07/2006	<1.92	10	10	-	-	-	<1	1.5	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	2.2	1.6	<1	2.8	-	-
MW11	BH053	ORWN - Public Domain Blocks 4&5	Fill	17/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW12	BH057	Outside Investigation Area	Fill	14/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW12	BH057	Outside Investigation Area	Fill	19/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW12	BH057	Outside Investigation Area	Fill	14/08/2007	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW12	BH057	Outside Investigation Area	Fill	13/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW13	BH061	Outside Investigation Area	Fill	14/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW13	BH061	Outside Investigation Area	Fill	19/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13	BH061	Outside Investigation Area	Fill	14/08/2007	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-

Well	Location Code	Area	Screened Lithology	Sampled Date																								
MW13	BH061	Outside Investigation Area	Fill	13/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW13	BH061	Outside Investigation Area	Fill	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	-	
MW14	BH076	ORWN - Public Domain Blocks 4&5	Fill	17/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW14	BH076	ORWN - Public Domain Blocks 4&5	Fill	14/08/2007	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW14	BH076	ORWN - Public Domain Blocks 4&5	Fill	7/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW14	BH076	ORWN - Public Domain Blocks 4&5	Fill	16/03/2010	<4.44	<28	<28	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	-	<2	-	<2	<2	<2	<2	<2	<2	<2	
MW19	BH106A	Outside Investigation Area	Fill	18/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW19	BH106A	Outside Investigation Area	Fill	16/08/2007	<1.92	6.6	6.6	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	6.6	
MW19	BH106A	Outside Investigation Area	Fill	9/05/2008	<0.192	<1.55	<1.55	-	<0.1	<0.1	<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	-	
MW212	BH212	ORWN - Public Domain Blocks 4&5	Fill	8/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW212	BH212	ORWN - Public Domain Blocks 4&5	Fill	12/05/2008	<0.192	<1.55	<1.55	-	<0.1	<0.1	<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	-	
MW213	BH213	Outside Investigation Area	Fill	8/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW213	BH213	Outside Investigation Area	Fill	16/03/2010	<4.44	<28	<28	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	-	<2	-	<2	<2	<2	<2	<2	<2	<2	
MW213	BH213	Outside Investigation Area	Fill	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	-	
MW214	BH214	Outside Investigation Area	Fill	8/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW214	BH214	Outside Investigation Area	Fill	12/05/2008	<0.192	0.1	0.1	-	<0.1	<0.1	<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	-	
MW214	BH214	Outside Investigation Area	Fill	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	-	
MW215	BH215	Outside Investigation Area	Fill	8/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW215	BH215	Outside Investigation Area	Fill	12/05/2008	<0.192	<1.55	<1.55	-	<0.1	<0.1	<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	-	
MW22	BH116	ORWN - Proposed Southern Cove	Fill	17/07/2006	<1.92	14.9	14.9	-	-	-	1.2	1.1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	1.4	<1	9.9	-
MW22	BH116	ORWN - Proposed Southern Cove	Fill	7/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW22	BH116	ORWN - Proposed Southern Cove	Fill	15/03/2010	<4.44	<28	<28	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	-	<2	-	<2	<2	<2	<2	<2	<2	<2	
MW24	BH129	Outside Investigation Area	Fill	25/07/2006	3.251	45	45	-	-	-	<1	<1	-	4.2	2.5	2.4	-	2.6	1.4	1.8	2.7	<1	9	<1	1.2	3.8	-	
MW24	BH129	Outside Investigation Area	Fill	15/08/2007	<1.92	7.6	7.6	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	7.6	-	
MW24	BH129	Outside Investigation Area	Fill	6/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW24	BH129	Outside Investigation Area	Fill	16/03/2010	<1.11	<7	<7	<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	
MW24	BH129	Outside Investigation Area	Fill	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	-	
MW25	BH153	Outside Investigation Area	Fill	25/07/2006	2.143	20.7	20.7	-	-	-	<1	<1	-	2.4	1.3	1.5	-	2.3	<1	2.7	1.3	<1	3.3	<1	<1	<1	-	
MW25	BH153	Outside Investigation Area	Fill	13/08/2007	3.904	31.6	31.6	-	-	-	<1	<1	-	1.1	2.4	3	-	2.8	2	1.6	2.4	<1	5.5	<1	1.8	<1	-	
MW25	BH153	Outside Investigation Area	Fill	12/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	
MW501	JBS BH501	Outside Investigation Area	Fill	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	-	
MW502	JBS BH502	Outside Investigation Area	Fill	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	-	
MW506D	JBS BH506D	Outside Investigation Area	Fill	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	-	
MW506S	JBS BH506S	Outside Investigation Area	Fill	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	-	
MW507	JBS BH507	Outside Investigation Area	Fill	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	-	
MW514	JBS BH514	Outside Investigation Area	Fill	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	-	
MW515	JBS BH515	Outside Investigation Area	Fill	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	-	
MW516	JBS BH516	Outside Investigation Area	Fill	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	-	
MW518	JBS BH518	Block 5 (Non-DECC)	Fill	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	-	
MW525D	JBS BH525D	Outside Investigation Area	Fill	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	-	
MW525S	JBS BH525S	Outside Investigation Area	Fill	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	-	
MW526	JBS BH526	Outside Investigation Area	Fill	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	-	
MW527	JBS BH527	Outside Investigation Area	Fill	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	-	
MW529D	JBS BH529D	Block 5 (Non-DECC)	Fill	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	-	
MW529S	JBS BH529S	Outside Investigation Area	Fill	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	-	
MW539	JBS BH539	Block 5 (Non-DECC)	Fill	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	-	
MW540D	JBS BH540D	Block 5 (Non-DECC)	Fill	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	-	
MW540S	JBS BH540S	Block 5 (Non-DECC)	Fill	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	-	
MW541D	JBS BH541D	Block 5 (Non-DECC)	Fill	25/05/2012	-	-	-	-	-	-	34	97	-	56	50	50	61	-	17	-	40	3.9	120	81	18	1900	-	

	PAHs																			
	CPAH (TEF)	PAH (ESDAT TOTAL)	PAH (total, NSW Waste 2008)	2-chloronaphthalene	2-methylnaphthalene	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Acetophenone	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
EQL	ug/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	µg/L	µg/L	µg/L	µg/L
MWQC				0.5	0.1	0.1	0.1	0.1	0.5	0.1	0.1	0.05	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
GW SSTC (Human Health)	1000				2.1		5.8	5.8		0.01	0.1	0.1		0.1	0.1	0.1	0.1	0.1	1	3
								47,000												
																				1300

Well	Location Code	Area	Screened Lithology	Sampled Date																							
MW541S	JBS BH541S	Block 5 (Non-DECC)	Fill	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	-
MW542	JBS BH542	Block 5 (Non-DECC)	Fill	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	-
MW543	JBS BH543	Block 5 (Non-DECC)	Fill	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	-
MW544D	JBS BH544D	ORWN - Public Domain Blocks 4&5	Fill	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	-
MW544S	JBS BH544S	ORWN - Public Domain Blocks 4&5	Fill	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	-
MW74	AECOM BH74	Outside Investigation Area	Fill	18/03/2010	0.1	18	18	<0.9	1	<0.9	1	<0.9	<0.9	1	1	<0.9	<2	-	<0.9	-	<0.9	<0.9	3	1	<0.9	4	18
Wells screened within marine sediments																											
MW01	BH008A	Outside Investigation Area	Fill + 0.1 m into Sandstone	14/07/2006	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW01	BH008A	Outside Investigation Area	Fill + 0.1 m into Sandstone	25/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	BH008A	Outside Investigation Area	Fill + 0.1 m into Sandstone	5/05/2008	<1.92	<15.5	<15.5	-	-	-	<1	<1	-	<1	<1	<0.5	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW01	BH008A	Outside Investigation Area	Fill + 0.1 m into Sandstone	31/07/2008	-	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5	-
MW179	BH179	Outside Investigation Area	Fill + Marine Sediments	6/05/2008	0.7	3.4	3.4	-	-	-	<1	<1	-	<1	<1	0.7	-	<1	<1	<1	<1	<1	1.4	<1	<1	<1	-
MW60	AECOM BH60	ORWN - Public Domain Blocks 4&5	Fill + Marine Sediments	18/03/2010	<1.998	1558	1558	<0.9	71	<0.9	5	20	<0.9	2	<0.9	<0.9	<2	-	<0.9	-	<0.9	<0.9	3	14	<0.9	1500	1560
MW40	AECOM BH40	ORWN - Proposed Southern Cove	Fill + Marine Sediments + Sandstone	20/03/2010	<1.998	297	297	<0.9	36	<0.9	4	16	<0.9	3	<0.9	<0.9	<2	-	<0.9	-	<0.9	<0.9	2	12	<0.9	244	297
MW69	AECOM BH69	Block 5	Fill + Sandstone	19/03/2010	7.52	2444	2444	<2	326	<2	35	158	5	28	14	6	6	-	<2	-	12	<2	34	64	<2	1920	2450
MW69	AECOM BH69	Block 5	Fill + Sandstone	25/02/2011	<12.1	320	320	-	-	-	11.7	37.2	-	8.9	<5	<5	-	<5	<5	<5	<5	<5	7.4	5.7	<5	202	-
MW 69 FILTRATE	AECOM BH69	Block 5	Fill + 0.1 m into Sandstone	25/02/2011	<0.192	5	5	-	<0.1	<0.1	<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	5	-
IT04D	IT04D	ORWN - Public Domain Blocks 4&5	Marine Sediments	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT05D	IT05D	ORWN - Public Domain Blocks 4&5	Marine Sediments	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT1 DEEP	AECOM IT1	ORWN - Public Domain Blocks 4&5	Marine Sediments	24/03/2010	19.41	354	354	<10	<10	<10	<10	12	<10	10	21	17	39	-	10	-	21	<10	33	10	<10	153	393
IT2 DEEP	AECOM IT2	ORWN - Public Domain Blocks 4&5	Marine Sediments	24/03/2010	<2.22	165	165	<1	4	<1	1	2	<1	<1	<1	<1	<2	-	<1	-	<1	<1	<1	1	<1	159	165
MW401	BH401	Block 5	Marine Sediments	24/02/2011	<11.858	249.2	249.2	-	-	-	10.5	12.8	-	<4.9	<4.9	<4.9	-	<4.9	<4.9	<4.9	<4.9	<4.9	<4.9	9.4	<4.9	195	-
MW401 FILTRATE	BH401	Block 5	Marine Sediments	24/02/2011	<0.192	49.9	49.9	-	2.1	<0.1	1.2	1	-	<0.1	<0.1	<0.05	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	47.7	-
MW56	AECOM BH56	ORWN - Public Domain Blocks 4&5	Marine Sediments	17/03/2010	<1.698	<12.3	<12.3	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.6	<2	-	<0.9	-	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9

Table T16: Offsite (west) - Groundwater Analytical Results (west of Block 4 and 5)
Barangaroo

	Phenanthrene	Pyrene	TPH						BTEX						Ammonia	Ammonia as N
			TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)		
EQL	0.1	0.1		50	100	50	20	50								
MWQC	0.6	0.025		40			110			700	80	180	75		0.005	0.01
GW SSTC (Human Health)				17,000	220,000	250,000				2100					150	

Well	Location Code	Area	Screened Lithology	Sampled Date															
Wells screened within fill material																			
IT04M	IT04M	ORWN - Public Domain Blocks 4&5	Fill	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.24
IT05M	IT05M	ORWN - Public Domain Blocks 4&5	Fill	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
IT05S	IT05S	ORWN - Public Domain Blocks 4&5	Fill	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
IT1 MID	AECOM IT1	ORWN - Public Domain Blocks 4&5	Fill	24/03/2010	20	14	1.35	100	900	450	<20	1450	<4	<1	<2	<5	<2	<2	<0.1
IT1 SHALLOW	AECOM IT1	ORWN - Public Domain Blocks 4&5	Fill	25/03/2010	<0.9	<0.9	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	<0.1
IT2 MID	AECOM IT2	ORWN - Public Domain Blocks 4&5	Fill	24/03/2010	10	2	3.9	210	3580	320	30	4110	<4	3	<2	<5	<2	<2	9.26
IT2 SHALLOW	AECOM IT2	ORWN - Public Domain Blocks 4&5	Fill	24/03/2010	<1	<1	0.33	<50	240	90	40	330	<4	2	<2	20	<2	<2	<0.1
MW02	BH009	Outside Investigation Area	Fill	14/07/2006	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-
MW02	BH009	Outside Investigation Area	Fill	17/07/2006	2.9	2	0.57	<50	200	370	<20	570	<4	<1	<2	<2	<2	<2	-
MW02	BH009	Outside Investigation Area	Fill	14/08/2007	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	1
MW02	BH009	Outside Investigation Area	Fill	6/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	<0.015
MW02	BH009	Outside Investigation Area	Fill	31/07/2008	-	-	<0.15	<50	<100	<50	<20	<200	<10	<5	<5	<5	<5	<5	-
MW03	BH010	Outside Investigation Area	Fill	19/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW03	BH010	Outside Investigation Area	Fill	5/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	0.13
MW03	BH010	Outside Investigation Area	Fill	31/07/2008	-	-	<0.15	<50	<100	<50	<20	<200	<10	<5	<5	<5	<5	<5	-
MW04	BH011	Outside Investigation Area	Fill	14/07/2006	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-
MW04	BH011	Outside Investigation Area	Fill	25/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW04	BH011	Outside Investigation Area	Fill	13/08/2007	1.3	2	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	<0.1
MW04	BH011	Outside Investigation Area	Fill	6/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	0.119
MW04	BH011	Outside Investigation Area	Fill	31/07/2008	-	-	<0.15	<50	<100	<50	<20	<200	<10	<5	<5	<5	<5	<5	-
MW05	BH031	Outside Investigation Area	Fill	18/07/2006	<1	<1	0.17	<50	100	70	<20	170	<4	<1	<2	<2	<2	<2	-
MW05	BH031	Outside Investigation Area	Fill	16/08/2007	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	1	<2	<2	<2	<2	<0.01
MW05	BH031	Outside Investigation Area	Fill	9/05/2008	<0.1	<0.1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	<0.015
MW05	BH031	Outside Investigation Area	Fill	31/07/2008	-	-	<0.15	<50	<100	<50	<20	<200	<10	<5	<5	<5	<5	<5	-
MW06	BH031	Outside Investigation Area	Fill	18/07/2006	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-
MW06	BH031	Outside Investigation Area	Fill	16/08/2007	<1	<1	<0.15	<50	<100	<50	<20	<200	2	<1	<2	<2	2	<2	<0.01
MW06	BH033	Outside Investigation Area	Fill	8/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	0.214
MW06	BH033	Outside Investigation Area	Fill	31/07/2008	-	-	<0.15	<50	<100	<50	<20	<200	<10	<5	<5	<5	<5	<5	-
MW07	BH036	Outside Investigation Area	Fill	17/07/2006	1.2	3	0.08	<50	<100	80	<20	80	<4	<1	<2	<2	<2	<2	-
MW07	BH036	Outside Investigation Area	Fill	15/08/2007	1.7	6.1	0.46	<50	300	160	<20	460	<4	<1	<2	<2	<2	<2	<0.1
MW07	BH036	Outside Investigation Area	Fill	6/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	0.581
MW08	BH046	Outside Investigation Area	Fill	25/07/2006	52.4	59.2	8.98	1060	6400	2580	120	10,040	24	25	10	17	14	10	-
MW08	BH046	Outside Investigation Area	Fill	14/08/2006	16.7	8.7	4.34	1180	4000	340	60	5520	10	8	4	6	5	5	-
MW08	BH046	Outside Investigation Area	Fill	16/08/2007	7.4	6.1	9.96	1490	8300	1660	<20	11,450	7	4	3	<2	4	3	16.3
MW08	BH046	Outside Investigation Area	Fill	7/05/2008	5.5	2.4	5.26	1070	4300	960	<20	6330	4	2	3	<5	2	2	12.4
MW08	BH046	Outside Investigation Area	Fill	16/03/2010	3	1	3.54	950	3190	350	20	4490	2	7	<2	<5	<2	2	-
MW08	BH046	Outside Investigation Area	Fill	28/02/2011	3.1	<1	2.27	560	2110	160	<20	2830	4	6	2	<5	2	2	-
MW08 FILTRATE	BH046	Outside Investigation Area	Fill	28/02/2011	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
MW11	BH053	ORWN - Public Domain Blocks 4&5	Fill	14/08/2007	<1	2.2	0.84	50	700	140	<20	890	<4	<1	<2	<2	<2	<2	6.05
MW11	BH053	ORWN - Public Domain Blocks 4&5	Fill	14/07/2006	<1	1.9	0.2	<50	200	<50	<20	200	<4	<1	<2	<2	<2	<2	-
MW11	BH053	ORWN - Public Domain Blocks 4&5	Fill	17/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW12	BH057	Outside Investigation Area	Fill	14/07/2006	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-
MW12	BH057	Outside Investigation Area	Fill	19/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW12	BH057	Outside Investigation Area	Fill	14/08/2007	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	0.907
MW12	BH057	Outside Investigation Area	Fill	13/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	0.017
MW13	BH061	Outside Investigation Area	Fill	14/07/2006	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-
MW13	BH061	Outside Investigation Area	Fill	19/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW13	BH061	Outside Investigation Area	Fill	14/08/2007	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	0.839

Table T16: Offsite (west) - Groundwater Analytical Results (west of Block 4 and 5)
Barangaroo

	Phenanthrene	Pyrene	TPH						BTEX						Ammonia	Ammonia as N
	µg/L	µg/L	TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)		
EQL	0.1	0.1		50	100	50	20	50		1	1	1	10	1	0.005	0.01
MWQC	0.6	0.025		40			110			700	80	180	75		0.91	
GW SSTC (Human Health)				17,000	220,000	250,000				2100					150	

Well	Location Code	Area	Screened Lithology	Sampled Date																
MW13	BH061	Outside Investigation Area	Fill	13/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	<0.015
MW13	BH061	Outside Investigation Area	Fill	28/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	-	-
MW14	BH076	ORWN - Public Domain Blocks 4&5	Fill	17/07/2006	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-	-
MW14	BH076	ORWN - Public Domain Blocks 4&5	Fill	14/08/2007	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-	1.07
MW14	BH076	ORWN - Public Domain Blocks 4&5	Fill	7/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	0.144
MW14	BH076	ORWN - Public Domain Blocks 4&5	Fill	16/03/2010	<2	<2	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	-	-
MW19	BH106A	Outside Investigation Area	Fill	18/07/2006	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-	-
MW19	BH106A	Outside Investigation Area	Fill	16/08/2007	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-	<0.1
MW19	BH106A	Outside Investigation Area	Fill	9/05/2008	<0.1	<0.1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	<0.015
MW212	BH212	ORWN - Public Domain Blocks 4&5	Fill	8/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	<0.015
MW212	BH212	ORWN - Public Domain Blocks 4&5	Fill	12/05/2008	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW213	BH213	Outside Investigation Area	Fill	8/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	<0.015
MW213	BH213	Outside Investigation Area	Fill	16/03/2010	<2	<2	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	-	-
MW213	BH213	Outside Investigation Area	Fill	25/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	<0.005	-
MW214	BH214	Outside Investigation Area	Fill	8/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	0.057
MW214	BH214	Outside Investigation Area	Fill	12/05/2008	0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW214	BH214	Outside Investigation Area	Fill	25/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.068	-
MW215	BH215	Outside Investigation Area	Fill	8/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	0.078
MW215	BH215	Outside Investigation Area	Fill	12/05/2008	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW22	BH116	ORWN - Proposed Southern Cove	Fill	17/07/2006	1.3	<1	0.4	90	400	<50	30	490	2	5	<2	4	2	<2	-	-
MW22	BH116	ORWN - Proposed Southern Cove	Fill	7/05/2008	<1	<1	0.2	100	200	<50	30	300	<4	2	<2	<5	<2	<2	-	1.24
MW22	BH116	ORWN - Proposed Southern Cove	Fill	15/03/2010	<2	<2	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	-	2.7
MW24	BH129	Outside Investigation Area	Fill	25/07/2006	6.6	6.8	0.74	<50	300	440	<20	740	<4	<1	<2	<2	<2	<2	-	-
MW24	BH129	Outside Investigation Area	Fill	15/08/2007	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-	<0.1
MW24	BH129	Outside Investigation Area	Fill	6/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	0.138
MW24	BH129	Outside Investigation Area	Fill	16/03/2010	<0.5	<0.5	<0.15	<50	<100	<50	<20	<50	<4	<1	<2	<5	<2	<2	-	-
MW24	BH129	Outside Investigation Area	Fill	25/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	<0.005	-
MW25	BH153	Outside Investigation Area	Fill	25/07/2006	2.5	3.4	0.18	<50	100	80	<20	180	<4	<1	<2	<2	<2	<2	-	-
MW25	BH153	Outside Investigation Area	Fill	13/08/2007	2.5	6.5	0.6	<50	400	200	<20	600	<4	<1	<2	<2	<2	<2	-	3.61
MW25	BH153	Outside Investigation Area	Fill	12/05/2008	<1	<1	0.1	<50	100	<50	<20	100	<4	3	<2	<5	<2	<2	-	4.32
MW501	JBS BH501	Outside Investigation Area	Fill	24/05/2012	0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	1.1	-
MW502	JBS BH502	Outside Investigation Area	Fill	28/05/2012	0.1	0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	-	-
MW506D	JBS BH506D	Outside Investigation Area	Fill	24/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	5.7	-
MW506S	JBS BH506S	Outside Investigation Area	Fill	28/05/2012	0.5	0.3	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.54	-
MW507	JBS BH507	Outside Investigation Area	Fill	24/05/2012	0.2	0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	1.5	-
MW514	JBS BH514	Outside Investigation Area	Fill	24/05/2012	1.2	0.4	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	6.7	-
MW515	JBS BH515	Outside Investigation Area	Fill	24/05/2012	0.8	0.3	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	6.8	-
MW516	JBS BH516	Outside Investigation Area	Fill	24/05/2012	1	0.5	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.056	-
MW518	JBS BH518	Block 5 (Non-DECC)	Fill	28/05/2012	0.2	0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.72	-
MW525D	JBS BH525D	Outside Investigation Area	Fill	24/05/2012	<0.1	0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.02	-
MW525S	JBS BH525S	Outside Investigation Area	Fill	28/05/2012	0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	-	-
MW526	JBS BH526	Outside Investigation Area	Fill	25/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.008	-
MW527	JBS BH527	Outside Investigation Area	Fill	25/05/2012	0.1	0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.04	-
MW529D	JBS BH529D	Block 5 (Non-DECC)	Fill	24/05/2012	<0.1	0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.27	-
MW529S	JBS BH529S	Outside Investigation Area	Fill	25/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.13	-
MW539	JBS BH539	Block 5 (Non-DECC)	Fill	25/05/2012	7	1.6	-	-	-	-	-	-	10	41	2	9	6	4	15	-
MW540D	JBS BH540D	Block 5 (Non-DECC)	Fill	25/05/2012	2	0.3	-	-	-	-	-	-	3	5	<1	4	2	1	18	-
MW540S	JBS BH540S	Block 5 (Non-DECC)	Fill	25/05/2012	9	1.3	-	-	-	-	-	-	5	38	2	1	3	2	15	-
MW541D	JBS BH541D	Block 5 (Non-DECC)	Fill	25/05/2012	170	120	-	-	-	-	-	-	760	4300	78	1900	520	240	42	-

	Phenanthrene	Pyrene	TPH						BTEX						Ammonia	Ammonia as N
			TPH C15-C36	TPH C10 - C14	TPH C15-C28	TPH C29-C36	TPH C6 - C9	TPH+C10 - C36 (Sum of total)	Total Xylene (ESDAT)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)		
EQL	0.1	0.1		50	100	50	20	50		1	1	1	10	1	0.005	0.01
MWQC	0.6	0.025		40			110			700	80	180	75		0.91	
GW SSTC (Human Health)				17,000	220,000	250,000				2100					150	

Well	Location Code	Area	Screened Lithology	Sampled Date																
MW541S	JBS BH541S	Block 5 (Non-DECC)	Fill	28/05/2012	2.3	0.4	-	-	-	-	-	-	<3	4	<1	2	<2	<1	-	-
MW542	JBS BH542	Block 5 (Non-DECC)	Fill	28/05/2012	4.4	0.5	-	-	-	-	-	-	<3	3	<1	<1	<2	<1	-	-
MW543	JBS BH543	Block 5 (Non-DECC)	Fill	24/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.03	-
MW544D	JBS BH544D	ORWN - Public Domain Blocks 4&5	Fill	24/05/2012	0.2	0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.54	-
MW544S	JBS BH544S	ORWN - Public Domain Blocks 4&5	Fill	25/05/2012	<0.1	<0.1	-	-	-	-	-	-	<3	<1	<1	<1	<2	<1	0.03	-
MW74	AECOM BH74	Outside Investigation Area	Fill	18/03/2010	4	3	0.42	<50	280	140	<20	420	<4	<1	<2	<5	<2	<2	-	-
Wells screened within marine sediments																				
MW01	BH008A	Outside Investigation Area	Fill + 0.1 m into Sandstone	14/07/2006	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<2	<2	<2	-	-
MW01	BH008A	Outside Investigation Area	Fill + 0.1 m into Sandstone	25/07/2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW01	BH008A	Outside Investigation Area	Fill + 0.1 m into Sandstone	5/05/2008	<1	<1	<0.15	<50	<100	<50	<20	<200	<4	<1	<2	<5	<2	<2	-	0.204
MW01	BH008A	Outside Investigation Area	Fill + 0.1 m into Sandstone	31/07/2008	-	-	<0.15	<50	<100	<50	<20	<200	<10	<5	<5	<5	<5	<5	-	-
MW179	BH179	Outside Investigation Area	Fill + Marine Sediments	6/05/2008	<1	1.3	1.02	<50	200	820	<20	1020	<4	<1	<2	<5	<2	<2	-	0.218
MW60	AECOM BH60	ORWN - Public Domain Blocks 4&5	Fill + Marine Sediments	18/03/2010	12	2	2.75	18,500	2630	120	4360	21,250	461	1380	34	969	313	148	-	-
MW40	AECOM BH40	ORWN - Proposed Southern Cove	Fill + Marine Sediments + Sandstone	20/03/2010	14	2	-	-	-	-	-	-	38	52	2	46	26	12	-	9.7
MW69	AECOM BH69	Block 5	Fill + Sandstone	19/03/2010	126	47	4.26	7200	3900	360	3400	11,460	384	868	77	804	240	144	-	90.4
MW69	AECOM BH69	Block 5	Fill + Sandstone	25/02/2011	32	15.1	0.33	530	330	<50	210	860	26	52	16	9	13	13	-	-
MW 69 FILTRATE	AECOM BH69	Block 5	Fill + 0.1 m into Sandstone	25/02/2011	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT04D	IT04D	ORWN - Public Domain Blocks 4&5	Marine Sediments	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.21
IT05D	IT05D	ORWN - Public Domain Blocks 4&5	Marine Sediments	19/05/2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.47
IT1 DEEP	AECOM IT1	ORWN - Public Domain Blocks 4&5	Marine Sediments	24/03/2010	29	38	4	1350	3050	950	210	5350	32	113	4	22	22	10	-	1.38
IT2 DEEP	AECOM IT2	ORWN - Public Domain Blocks 4&5	Marine Sediments	24/03/2010	2	<1	2.99	1860	2790	200	350	4850	50	265	7	65	32	18	-	5.99
MW401	BH401	Block 5	Marine Sediments	24/02/2011	16.3	5.2	1.07	790	1070	<50	350	1860	42	127	<5	108	27	15	-	-
MW401 FILTRATE	BH401	Block 5	Marine Sediments	24/02/2011	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW56	AECOM BH56	ORWN - Public Domain Blocks 4&5	Marine Sediments	17/03/2010	<0.9	<0.9	0.92	440	920	<50	1460	1360	255	378	20	473	189	66	-	-

TABLE T17 - OFFSITE FIELD OBSERVATIONS
VMP REMEDIATION EXTENT REPORT
LEND LEASE

SITE AREA	MATERIAL TYPE	BASE DEPTH	OBSERVATIONS OF GASWORK RELATED IMPACTS
BARANGAROO ORWN			
BH01	Fill	17.5	At 2m very slight hydrocarbon odour
BH01	Marine sediments	25.4	NOC
BH404	Fill	16.0	0.1m mild hydrocarbon odour, 7m hydrocarbon odour and sheen, 14m hydrocarbon odour and staining, 15m hydrocarbon odour
BH406	Fill	15.0	14m hydrocarbon odour
BH406	Marine sediments	16.8	15m very strong hydrocarbon odour and tar observed, 16m very strong hydrocarbon odour and sheen observed
BH407	Fill	13.0	NOC
BH407	Marine sediments	18.6	13 to 18m hydrocarbon odour, 18m strong hydrocarbon odour
BH017	Fill	21.0	1m faint hydrocarbon odour between 1.0m and 2.2m
BH017	Marine sediments	23.6	NOC
BH017	Bedrock	24.6	NOC
BH021	Fill	15.0	6m faint hydrocarbon odour between 6m and 20m
BH021	Marine sediments	20.8	NOC
BH035	Fill	15.5	NOC
BH035	Marine sediments	21.2	NOC
BH37	Fill	17.3	15.8m slight hydrocarbon odour,
BH37	Marine sediments	20.4	17.3m hydrocarbon odour, 21.9m strong hydrocarbon odour, 22.05m strong hydrocarbon odour and sheen
BH37	Bedrock	22.0	20.4m strong hydrocarbon odour
BH38	Fill	17.5	NOC
BH38	Marine sediments	20.7	NOC
BH39	Fill	23.5	NOC
BH39	Marine sediments	25.0	NOC
BH40	Fill	14.3	NOC
BH40	Marine sediments	20.1	16.5m black stained veins of tar with sheen, strong chemical odour,
BH40	Bedrock	20.5	NOC
BH41	Fill	15.5	NOC
BH41	Marine sediments	17.5	15.5m slight chemical odour
BH41	Bedrock	17.7	17.5m strong chemical odour
BH46	Fill	19.0	14.5m very strong chemical odour
BH46	Marine sediments	23.7	19m very strong chemical odour, 20.5m chemical odour
BH47	Fill	16.0	4 to 7m slight hydrocarbon odour, 5.5m black staining, 10 to 11m slight hydrocarbon odour, 13m moderate hy
BH47	Marine sediments	18.6	16m slight hydrocarbon odour
BH47	Bedrock	19.1	NOC
BH48	Fill	14.5	1m slight hydrocarbon odour, 13m slight hydrocarbon odour
BH48	Bedrock	17.8	14.5m crude tar (shiny, black, vesicular), strong tar odour and black staining noted
BH049	Fill	18.0	NOC
BH049	Marine sediments	27.5	NOC
BH053/MW11	Fill	15.5	3m to 3.28m faint hydrogen sulphide odour
BH053/MW11	Marine sediments	21.0	NOC
BH053/MW11	Bedrock	22.4	NOC
BH054	Fill	8.5	2.5m slight to moderate hydrocarbon odour
BH055	Fill	4.0	NOC
BH055	Marine sediments	10.5	NOC
BH56	Fill	17.5	7m tar odour
BH56	Marine sediments	21.4	19m moderate tar odour
BH56	Bedrock	21.4	NOC
BH57	Fill	15.8	NOC
BH57	Marine sediments	18.3	NOC
BH60	Fill	16.0	2.5m very slight tar odour
BH60	Marine sediments	25.0	16m strong tar odour and black staining, 17.5m strong tar odour and tar mottles, 20.5m strong tar odour, 22m slight tar odour
BH063	Fill	10.0	0.2m slight hydrocarbon odour
BH064	Fill	18.0	NOC
BH068	Fill	10.0	3m moderate hydrocarbon odour
BH72	Fill	13.0	NOC
BH72	Marine sediments	20.5	16m slight chemical odour
BH72	Bedrock	20.7	NOC
BH076/MW14	Fill	16.0	NOC
BH076/MW14	Marine sediments	25.2	NOC
BH116	Fill	26.4	NOC
BH142	Fill	10.0	NOC
BH143	Fill	16.5	NOC
BH143	Marine sediments	20.0	16.5m slight hydrocarbon odour
BH143	Bedrock	24.0	NOC

TABLE T17 - OFFSITE FIELD OBSERVATIONS
VMP REMEDIATION EXTENT REPORT
LEND LEASE

BH191	Fill	11.5	3.6m slight hydrocarbon odour and black staining, 5m strong hydrocarbon/tar odour and black staining, 7m slight hydrocarbon odour and black staining
BH191	Marine sediments	26.5	11.5m sulfurous odour, 17.95m to 18.4m dark brown tarry substance
BH212	Fill	17.5	1.4m black staining, 1.85m to 2.0m slight hydrocarbon odour and black staining, 2.5m trace black staining, 7.2m trace black staining, 12.6m slag/furnace waste, 15.5m black staining
BH212	Marine sediments	33.8	NOC
IT01	Fill	15.5	5m slight tar odour
IT01	Marine sediments	17.6	NOC
IT02	Fill	16.9	NOC
IT02	Marine sediments	17.5	NOC
BH410/IT04	Fill	17.0	NOC
BH410/IT04	Marine sediments	32.2	17m hydrocarbon odour and minor black staining
BH411/IT05	Fill	18.0	NOC
BH411/IT05	Marine sediments	27.0	NOC
SV08	Fill	2.2	0.8m slight naphthalene odour

Remediation Technology	Technology Description	Feasibility					Sustainability					Comments	Total Score
		Technical	Financial	Logistical	Timing	Community	RU	WG	MR	CO2	OGM		
		30%	15%	10%	10%	10%	5%	5%	5%	5%	5%		
Ex Situ Stabilisation or Solidification (on or off site) - disposal to landfill	Encapsulation of contaminant by ex situ blending with chemical binders to immobilise and solidify contaminants of concern. Stabilised material disposed off-site to a licensed landfill.	5	3	3	4	3	4	3	3	3	5	Immobilises contaminants within the soil matrix. Has been used for treatment of source zone soils at a number of MGP sites in North America and Australia. Difficult to mix saturated fine grained material (such as marine sediment) but use of a pug mill and potential soil conditioning prior to mixing can mitigate this. Pre-treatment (eg. screening to remove oversize and moisture reduction to improve efficiency) would be required in advance of treatment. Treated material assumed to require off-site disposal. Off-site disposal would likely require disposal to landfill - which depending on quantities may present difficulties with existing landfill licence conditions. An immobilisation approval from the EPA is required in the case of disposal to landfill. Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure and air emissions control. Excavation in Hickson Road will have significant logistical issues due to proximity to residences, and businesses and below ground services. Requires bench scale trials to design stabilisation regime.	3.85
Ex Situ Stabilisation or Solidification (on or off site) - reuse on-site	Encapsulation of contaminant by ex situ blending with chemical binders to immobilise and solidify contaminants of concern. Stabilised material reused on-site as part of the development.	3	4	2	4	3	4	5	5	3	4	Immobilises contaminants within the soil matrix. Has been used for treatment of source zone soils at a number of MGP sites in North America and Australia. Difficult to mix saturated fine grained material (such as marine sediment) but use of a pug mill and potential soil conditioning prior to mixing can mitigate this. Pre-treatment (eg. screening to remove oversize and moisture reduction to improve efficiency) would be required in advance of treatment. Treated material assumed to be re-used on-site as part of the development. Based on proposed development plan it is unlikely that a significant volume of material can be reused due to the cut fill balance of the development. Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure and air emissions control. Excavation in Hickson Road will have significant logistical issues due to proximity to residences, and businesses and below ground services. Requires bench scale trials to design stabilisation regime - the standard of treatment required for retention of material on-site may be difficult to achieve.	3.45
Surfactant-enhanced Ex Situ Chemical Oxidation (S-ESCO) off-site disposal to landfill	Strong oxidants such as hydrogen peroxide or persulphate are applied to excavated materials along with a surfactant (typically using a pugmill) to degrade a wide range of organic contaminants. Remediated material disposed of to an off-site licensed landfill.	4	4	3	4	3	4	3	3	3	5	Efficacy dependent on soil oxidant demand and contaminant type. Use of pugmill improves effectiveness of technology. Has been applied at several former MGP sites in North America with good effectiveness. Surfactant enhancement overcomes some difficulties associated with tar contamination from former MGP sites. Difficult to mix saturated fine grained material (such as marine sediment) but use of a pug mill and potential soil conditioning prior to mixing can mitigate this. Pre-treatment (eg. screening to remove oversize and moisture reduction to improve efficiency) would be required in advance of treatment. Treated material assumed to require off-site disposal. Off-site disposal would likely require disposal to landfill - which depending on quantities may present difficulties with existing landfill licence conditions. An immobilisation approval from the EPA may be required in the case of disposal to landfill (depending on the standard of treatment). Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure and air emissions control. Excavation in Hickson Road will have significant logistical issues due to proximity to residences and businesses and below ground services. Bench scale trials have been performed as part of the S-ISCO bench scale trial process.	3.70
Surfactant-enhanced Ex Situ Chemical Oxidation (S-ESCO) reuse on site	Strong oxidants such as hydrogen peroxide or persulphate are applied to excavated materials along with a surfactant (typically using a pugmill) to degrade a wide range of organic contaminants. Remediated material reused on-site as part of the development.	2	4	2	4	3	4	5	5	3	4	Efficacy dependent on soil oxidant demand and contaminant type. Use of pugmill improves effectiveness of technology. Has been applied at several former MGP sites in North America with good effectiveness. Surfactant enhancement can be used to overcome some difficulties associated with tar contamination from former MGP sites. Difficult to mix saturated fine grained material (such as marine sediment) but use of a pug mill and potential soil conditioning prior to mixing can mitigate this. Pre-treatment (eg. screening to remove oversize and moisture reduction to improve efficiency) would be required in advance of treatment. Treated material assumed to be re-used on-site as part of the development. Based on proposed development plan it is unlikely that a significant volume of material can be reused due to the cut fill balance of the development. Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure and air emissions control. Excavation in Hickson Road will have significant logistical issues due to proximity to residences and businesses and below ground services. Bench scale trails have been performed as part of the S-ISCO bench scale trial process.	3.15
Surfactant Enhanced In Situ Chemical Oxidation (S-ISCO)	Strong oxidants such as hydrogen peroxide and persulphate are injected into the subsurface along with a surfactant (to emulsify contamination) to degrade a wide range of organic contaminants.	4	5	5	4	5	5	5	5	4	4	Efficacy dependent on soil oxidant demand and contaminant type. Technology generally used for treatment of discrete source zones and not generally applied over broad acreage. Limited previous application primarily in North America, but full scale and pilot scale implementations have included former MGP sites with good effectiveness. There may be challenges with injection of oxidants into very shallow unsaturated soil. Density of injection wells would be required to be increased for treatment of fine grained materials (such as marine sediments). Surfactant enhancement is designed to overcome some difficulties associated with tar contamination from former MGP sites and sorbed or diffused contaminants. Bench scale trials have been completed. Proving Scale Pilot Trial is in progress. Proposed further Pilot Trials will also address concerns regarding potential impact to the harbour and other sensitive receptors and support the efficacy of the approach.	4.50
In Situ Chemical Oxidation (ISCO)	Strong oxidants such as hydrogen peroxide, permanganate and persulphate are injected into the subsurface to degrade a wide range of organic contaminants.	3	3	5	2	5	4	5	5	4	3	Efficacy dependent on soil oxidant demand and contaminant type. Technology generally used for treatment of discrete source zones and not generally applied over broad acreage. Has been applied at several former MGP sites in North America with good effectiveness. There may be issues with injection of oxidants into very shallow unsaturated soil. Density of injection wells would be required to be increased for treatment of fine grained materials (such as marine sediments). Not effective for sorbed or diffused contaminants. Difficulties associated with tar contamination from former MGP sites. Requires bench scale and Pilot Scale trials to demonstrate efficacy - potentially unacceptable with respect to timing.	3.60
In Situ Stabilisation or Solidification (on site)	Encapsulation of contaminant by in situ blending with chemical binders to immobilise contaminants of concern.	4	3	3	2	4	4	5	5	3	4	Immobilises contaminants and neutralises soil. Stabilisation agents added using overlapping auger holes. Has been used for treatment of source zone soils at a number of MGP sites in North America. Recently successfully implemented on a MGP Site in Albury NSW. Effective in situ mixing is difficult in fine grained soils (for example marine sediments) and where large obstructions are present as would be expected in areas of significant fill. Limited in depth to a maximum of 12 m bgl. Significant spoil (approximately 30%) produced as a result of displacement by the auger mixing and addition of stabilisation agents. Alternative management of the spoil is required. Incompatible with the number of services with Hickson Road - would require relocation of services. Requires Bench Scale and Pilot Scale trials to demonstrate efficacy - potentially unacceptable with respect to timing.	3.60

Remediation Technology	Technology Description	Feasibility					Sustainability					Comments	Total Score
		Technical	Financial	Logistical	Timing	Community	RU	WG	MR	CO2	OGM		
		30%	15%	10%	10%	10%	5%	5%	5%	5%	5%		
Excavation and Ex Situ Thermal Desorption (likely off site with disposal to landfill)	Desorption and/or destruction of organic contaminants in excavated soil by heating, usually by direct heating thermal unit.	4	3	2	4	1	2	3	3	1	4	Demonstrated PAH and organic contaminant reduction and has been widely used for the remediation of MGP residues at many sites in both North America and Australia. Based on understanding of community requirements, treatment would need to be as an off site location - which would need to be appropriately licensed by the EPA. Unlikely therefore to be practical to return the treated material to site for reuse. Identification of a suitable off-site location will be difficult. Pre-treatment (eg. screening to remove oversize and moisture reduction to improve efficiency) would be required in advance of treatment. Logistically and timing likely to be preferable where volumes are large (>20,000 m ³) may be financially more viable. Air emissions control required. Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure. Excavation in Hickson Road will have significant logistical issues due to proximity to residences and business and below ground services. Public perception of thermal treatment and regulatory licensing requirements would make establishment of a thermal treatment plant difficult and time consuming.	3.00
Thermal Conductive Heating (TCH)	Soil heating via in-well heaters or thermal blankets in the case of very shallow soil to vaporise/volatilise fluids and contaminants. Temperatures can be raised to above 450°C to remove 4 and 5 ring PAHs and other recalcitrant compounds.	4	1	2	3	4	2	5	5	1	2	Works well under wide range of soil types including clay. Removes contaminants under existing structures. Temperature increases will likely be incompatible with services within Hickson Road. Has been used for in situ remediation at former MGP sites including staged heating for removal of volatile components only. Requires closely spaced wells (<5 m) and has high electrical consumption.	3.00
Physical Containment	Containment or capping of contaminated soil to prevent or significantly reduce contaminant migration and to prevent human and environmental exposure.	2	3	3	3	4	4	5	4	4	1	Does not remove contamination sources and would require long term management and deed restriction. Will not satisfy regulatory requirements.	2.95
Excavation & Co-burning	Combustion of MGP residues with coal in utility boilers and cement kilns.	4	3	1	2	1	1	3	4	1	4	Technology has been used for remediation of several MGP sites in North America. Significantly lower cost than on-site thermal treatment. Requires the removal and transport to a large coal fired boiler. Coordination with co-burners can be problematic. Pre-treatment (eg. screening to remove oversize and moisture reduction to improve efficiency) would be required in advance of treatment / disposal. Daily throughput can be very low, making storage and staging of excavated materials difficult to manage leading to increased costs. Handling and transportation of coal tar, including associated odour could be a logistical problem. Technology has never been used in Australia and may not be acceptable to community and regulators. Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure. Excavation in Hickson Road will have significant logistical issues due to proximity to residences and businesses and below ground services.	2.70
Excavation & Cold or Hot-Mix Asphalt Batching	Encapsulation of contaminant by blending residues, wet aggregate and asphalt emulsion at ambient or high temperatures.	2	4	3	3	1	2	3	4	2	4	Viable treatment technology for coal tars. Immobilises PAHs and reuses materials. Not suitable for fine-grained materials (e.g., clays or marine sediments) and would require addition of high grade aggregate. Physical properties of final product not always appropriate for reuse in trafficable roads. May be suitable for zones where extensive tar is present, but unlikely to be suitable for all contamination. Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure. Excavation in Hickson Road will have significant logistical issues due to proximity to residences and businesses and below ground services.	2.65
In Situ Steam Stripping	Injection of steam into subsurface contaminants to volatilise and mobilise contaminants.	1	1	3	3	3	2	2	2	2	2	Technology works best in sandy permeable soils and generally not suitable for very shallow unsaturated zone soils. Temperature is limited to 100 °C and therefore suitable for removal of volatile component only. Temperature increases will likely be incompatible with services within Hickson Road. Very high initial capital cost.	1.85
Monitored Natural Attenuation (MNA)	Natural subsurface processes—such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials—are allowed to reduce contaminant concentrations to acceptable levels.	1	5	3	1	5	4	5	1	4	1	Not effective as first approach in source areas. Very long time frame - inconsistent with declaration removal requirements Will not satisfy regulatory requirements. Retain for future option as part of post-remediation.	2.70
Soil Vapour Extraction System (SVE)	Soil vapour extraction (SVE) is an in situ unsaturated (vadose) zone soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semi volatile contaminants from the soil. The extracted vapour requires treatment to recover or destroy the contaminants.	2	3	3	2	4	4	4	3	3	2	Well established proven technology will remove volatile component and reduce risks to future users of site. Has additional benefit of removing contaminants from areas where excavation is not feasible (e.g. easements). Will also promote in situ biodegradation through increased oxygen in unsaturated zone. Will not remove the higher chain TPH fraction and may not be as effective in fine grained soils. Will not address tar and tar containing material. Long time frame - inconsistent with declaration removal requirements Technology may not be suitable for use over large source zone but may be used in conjunction with other technologies for targeted source removal.	2.75
In Situ Enhanced Bioremediation (ISEB)	Destruction of organic compounds in subsurface contaminated soil by microorganisms.	1	2	3	2	4	4	5	3	3	2	Timeframe for reduction of contaminants, in particular coal tar may be very long and inconsistent with Declaration removal requirements. Treatment uniformity uncertain because of subsurface variables. Verification of destruction is sometimes difficult. Not effective for higher molecular-weight hydrocarbons. Whilst technology has been highly successful for the treatment of hydrocarbons and lower molecular weight PAHs at many sites, it has not been demonstrated for treatment of MGP coal tar.	2.35
Ex Situ Bioremediation (Landfarming / Biopiles / Bioreactor) and disposal off-site to landfill	Destruction of organic compounds in contaminated soil by microorganisms. Treatment occurs through soil amendment and stockpiling or enclosed reactor vessel.	1	4	3	3	1	4	2	3	3	5	Shorter treatment period than in situ bioremediation alternative. However, not effective for higher molecular weight hydrocarbons and will be significantly slower than alternative treatment technologies. May be suitable for impacted soil but unlikely to be feasible for residual coal tar. Requires a large amount of space and VOC and odour emissions likely to be a significant constraint in urban setting. Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure. Excavation in Hickson Road will have significant logistical issues due to proximity to residences and business and below ground services.	2.45

Remediation Technology	Technology Description	Feasibility					Sustainability					Comments	Total Score
		Technical	Financial	Logistical	Timing	Community	RU	WG	MR	CO2	OGM		
		30%	15%	10%	10%	10%	5%	5%	5%	5%	5%		
Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize, and destroy contaminants in soil and sediment. Contaminants may be either organic or inorganic.	1	4	1	1	3	4	5	3	4	2	Technology requires long timeframe for removal of contaminants which renders site unusable for other purposes. Incompatible with proposed redevelopment. Has not been demonstrated for use at MGP sites.	2.30
Electrical Resistive Heating	Similar to TCH, however electrodes are used instead of heater wells. Temperature cannot exceed 100 °C since process requires transmission of heat via pore water	3	1	3	3	3	2	5	4	1	2	Technology is suitable for most soil types and in particular low permeability clays. Technology can not exceed temperatures of 100°C and is suitable for removal of volatile compounds only. Technology requires moisture in the soil for conduction of heat between electrodes and may not be suitable for unsaturated zone soils. Temperature increases will likely be incompatible with services within Hickson Road. Requires closely spaced electrodes (<5 m) and has high electrical consumption.	2.65
Soil Washing and disposal to landfill	Physical/chemical process for scrubbing soils ex situ to remove contaminants.	1	3	3	3	2	4	2	3	3	5	High degree of uncertainty regarding treatment performance. Material handling possibly expensive. Effectiveness limited by complex waste mixtures and high humic content. Generally not suitable for fine grained soil (for example marine sediment). Excavation of soil can create significant odour issues thereby requiring negative pressure excavation enclosure. Excavation in Hickson Road will have significant logistical issues due to proximity to residences and business and below ground services.	2.40
In Situ Vitrification (ISV)	In situ vitrification (ISV) is another in situ S/S process which uses an electric current to melt soil or other earthen materials at extremely high temperatures (1,600 to 2,000 °C) and thereby immobilise most inorganics and destroy organic pollutants by pyrolysis.	2	1	1	2	1	1	4	3	1	2	Method designed for sandy soils. Prohibitively expensive.	1.70
Permeable Reactive Barrier (PRB)	A permeable reaction wall is installed across the flow path of a contaminant plume, allowing the water portion of the plume to passively move through the wall. The contaminants will either be degraded or retained in a concentrated form by the barrier material.	1	3	3	4	3	4	4	4	3	1	Technology not suitable for unsaturated zone soils.	2.55
Supercritical water oxidation	Supercritical Water Oxidation (SCWO) is a high-efficiency, thermal oxidation process capable of treating a wide variety of hazardous and non-hazardous wastes.	1	1	1	1	2	2	2	2	2	2	Technology is not suitable for treatment of soils. Typically used to treat small quantities of hazardous liquid waste/slurries in commercial reactors.	1.35
Electrokinetics	Electrokinetic remediation uses electrochemical and electrokinetic processes to desorb, and then remove, metals and polar organics	1	1	1	1	2	1	2	2	2	2	Not applicable for the contaminants of concern.	1.30

RU Resource Use
WG Waste Generation
MR Material Reusability
CO2 CO2 Generation
OGM Ongoing Management and Risk

Ranking 5 - highest (most preferred)
1 - lowest (least preferred)

Appendix C

Contaminant Mass Flux Study (AECOM, 2012b)

Memorandum

To	File	Page	1
CC			
Subject	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		
From	Brad Eismen		
File/Ref No.	60247139_MEM006	Date	14-Mar-2012

This memo provides an assessment of various lines of evidence to determine the significance of contaminant mass flux and discharge in the natural soil, marine sediments and groundwater underlying EPA Declaration Area 21122 and adjacent areas of Barangaroo South and Barangaroo Central (the site). The objective of this assessment was to confirm whether there may be a significant flux and discharge of contamination from the natural soil and marine sediments underlying the site into Darling Harbour. The following lines of evidence were assessed:

- Hydraulic Conductivity and Velocity
- Tide Effects
- Hydraulic Head Distribution
- Mass Flux and Discharge

Data reported in the following documents were used:

- AECOM. 2010a. Data Gap Investigation, Other Remediation Works (South) Area Hickson Road, Millers Point NSW. 27 May.
- AECOM. 2010b. Data Gap Investigation, EPA Declaration Area (Parts of Barangaroo Site and Hickson Road), Millers Point, NSW. 23 September.
- AECOM. 2010c. Data Gap Investigation, Other Remediation Works North, Hickson Road, Millers Point NSW. 20 October.
- AECOM. 2010d. Groundwater Discharge Study, Stage 1 Barangaroo Development, Hickson Road, Darling Harbour, New South Wales. 3 November.
- AECOM. 2012. Supplementary Data Gap Investigation, VMP Area, Hickson Road, Millers Point, NSW. March
- ERM. 2007. Environmental Site Assessment, East Darling Harbour, Sydney, NSW, Final Report. 21 June.
- ERM. 2008a. Additional Investigation Works at Barangaroo, Hickson Road, Millers Point, NSW. July.
- ERM. 2008b. Preliminary Sediment Screening Works at East Darling Harbour, Adjacent to Barangaroo, NSW, Draft, Rev 03. August.
- Coffey. 2010a. Barangaroo Stage 1 Development Geotechnical Report. 15 October.
- Coffey. 2010b. Specialist Desktop Geotechnical Report to Accompany Project Application MP 10_0026 Remediation and Landforming Works, Barangaroo. 9 December.

1.0 Scope of Work

The following scope of work was conducted:

- Review of contaminant concentrations in soil and groundwater

- Review of groundwater monitoring well/piezometer construction details
- Review of available hydraulic conductivity data
- Development of cross sections
- Estimation of mass flux and discharge on two (2) transects

2.0 Conceptual Site Model

2.1 Geology

Lithologic conditions are variable across the site, but generally comprise fill material overlying sandy clays and clays and marine sediments, which in turn overlie weathered Hawkesbury Sandstone bedrock. Sandstone bedrock is generally present underlying natural weathered bedrock soils or in some instances directly under fill materials.

The fill thickness is variable across the site, ranging from approximately 3 metres below ground surface (m bgs) in the east to greater than 23 m bgs in the west. The fill material is generally shallower in the eastern portion of the site closest to Hickson Road and deeper in the western portion of the site closest to Darling Harbour. The top of bedrock also varies across the site from approximately 3 m bgs in the east to greater than 32 m bgs in the west. The natural soil and marine sediments generally thicken from east to west.

2.2 Hydrogeology

Previous investigation results indicate that groundwater beneath the site is present as an unconfined, shallow saturated zone within the fill materials and the underlying natural soil and marine sediments. Groundwater is also likely to occur as a deeper bedrock aquifer within the underlying Hawkesbury Sandstone. Groundwater within the sandstone bedrock would occur as a fractured bedrock aquifer, potentially confined by an overlying clay unit in some areas of the site.

Due to the proximity of the site to Darling Harbour, the depth to groundwater is shallow and the overall direction of groundwater flow is expected to be towards Darling Harbour. Groundwater at the site is tidally influenced, resulting in the fluctuation of groundwater levels within the fill materials and natural sediments. The flow direction and gradients change/reverse during the flooding and ebbing tides.

Recharge to the site is limited to exposed sandstone and soil areas to the immediate east at Observatory Hill. Since the site is currently covered by hardstand areas the majority of potential recharge flows off-site as stormwater outflow as will be the case following development.

2.3 Contamination

Based on the combined ERM, Coffey and AECOM dataset the following points summarise the conceptual site model (CSM):

- Free tar and other fill materials contaminated with contaminants of potential concern have been identified in a number of locations within the former gasworks area, indicating these locations are source areas for contamination.
- Contamination has been reported in the underlying natural soil in the former gasworks area.
- Analytical results from locations outside and down gradient of the Declaration Area indicate that gasworks related contamination has migrated outside the Declaration Area boundary in both soil and groundwater.
- The deeper contamination reported in the area west of the Declaration Area and a 30 metre Remediation Buffer Zone has been confirmed as being present in the natural soil immediately underlying the fill material.
- Deep contamination associated with AECOM BH/MW60 and ERM BH191 is also present in the natural material and appears to be isolated.

The conceptual model depicted in ERM (2008) Figure 20 is generally consistent with the findings of the AECOM (2010a, 2010b and 2010c) with the exception of deep bedrock contamination (further discussed below). AECOM boreholes did not extend more than 0.5 m into bedrock and therefore the deep bedrock contamination interpreted in ERM BH205, BH206 and BH209 was not confirmed.

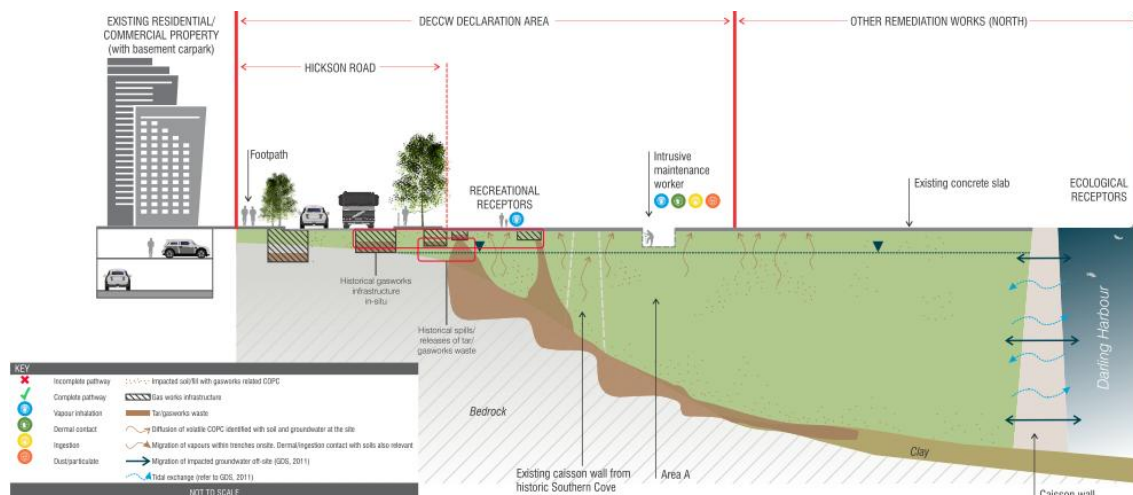
Review of the ERM borelogs and soil data indicates that the highly impacted zones of contamination appear to be in the natural soil at the bedrock interface and decrease with depth. AECOM notes that the wells installed in BH206 and BH209 are screened across the natural soil and sandstone bedrock (as indicated in the borelogs) and

that the only evidence for deep contamination in BH205 is tar in the well (which could be related to well completion issues given the difficult nature of the drilling at the Barangaroo Site). Borelogs in Coffey (2010a) indicate that there is localised bedrock impact in the Declaration Area. However, AECOM considers that the overall site dataset does not support the presence of significant deep bedrock contamination.

The combined ERM/Coffey/AECOM dataset indicates that the highly impacted zone is generally at the base of the fill material, through the natural soil and into the top of the sandstone. This would be expected at site with dense non-aqueous phase liquids (DNAPLs) present, where highly variable and permeable fill material overlies a relatively less permeable natural soil/bedrock. The DNAPL would migrate downwards and pool/adsorb on a less permeable underlying strata. It is also noted that given the high tidal connectivity of the fill material, lower contaminant concentrations in the fill material would be expected, with the higher contaminant concentrations remaining in the lower permeable material with less connectivity (supported by AECOM 2010c). It is considered that the bulk of contamination is within the base of the fill and soil along the fill/soil interface. The contamination is unlikely to have migrated significantly into the underlying sandstone because it has a significantly lower bulk hydraulic conductivity and hence lower water transmitting properties.

The following figure provides an updated CSM.

Figure 1 Updated CSM



3.0 Lines of Evidence

3.1 Hydraulic Conductivity and Velocity

The following table provides relevant hydraulic conductivity and calculated velocity data for wells screened in the natural soil/sediment at the site. It is noted that Monitoring Wells MW45 and MW60 appear to be screened across into the lower portion of the fill.

Table 1 Hydraulic Conductivity Data and Velocity Calculations

Location	K (m/s)	K (m/day)	V* (m/day)	Distance (m from harbour)	Travel Time [#] (yrs to harbour)
MW45	1.01E-06	9.50E-02	2.85E-03	124	119
MW40	2.50E-06	2.16E-01	6.48E-03	66	28
MW56	7.30E-07	6.31E-02	1.89E-03	55	80
MW60	3.40E-08	2.94E-03	8.81E-05	25	777
Geometric mean	5.11E-07	4.42E-02	1.32E-03	58	120

K – Hydraulic conductivity

V – Velocity

* – Velocity calculation assumes a gradient of 0.006 and an effective porosity of 0.2

– Travel time to harbour calculation does not include tidal effects and is not considered realistic (see discussion below)

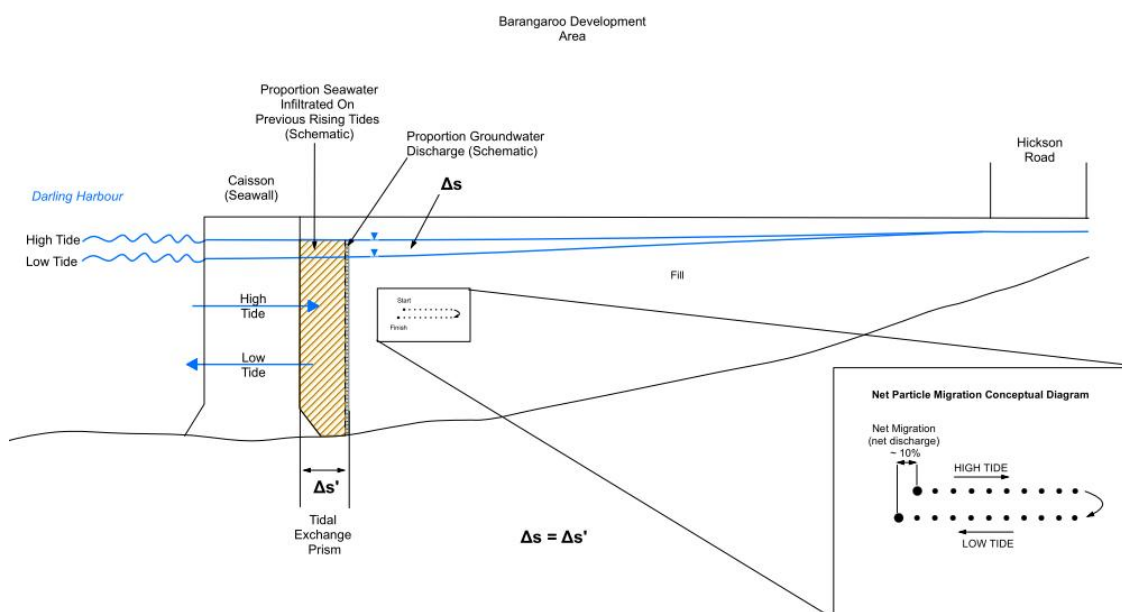
The results indicate that groundwater flow in the natural soil/marine sediments underlying the site is very low. The calculated velocities shown above do not take into account the tide effect on groundwater flow, which are discussed in Section 3.2 below.

3.2 Tidal Effects

AECOM (2010d) developed a conceptual model to estimate net groundwater migration rates based on connate water displacement, which indicated that overall migration rates were approximately one tenth of the estimated linear velocity. This is due to the tidally induced oscillation of water and particles, which can be visualised as 10 steps inland (to the east) during any given flood tide and 11 steps seaward (to the west) during any given ebb tide (see Figure 2 below).

It is noted that this concept is valid for the tidal prism, which includes that portion of the site in both the fill material and natural soil. While the hydraulic efficiency/connectivity in the fill material is orders of magnitude greater than the underlying natural soil, the overall movement of groundwater will be similar, albeit much slower. Therefore the calculated groundwater travel time will be longer by an order of magnitude when compared to the travel times presented in Table 1.

Figure 2 Simplified Conceptual Diagram, Tidal Exchange Prism (AECOM 2010d, Figure F8)



This is considered conservative as it does not fully account for the attenuation of the contaminants due to the presence of organic carbon in the natural soil/marine sediment, sorption and biodegradation processes. These processes will further reduce the velocity and transport times of the contaminants.

3.3 Hydraulic Head Distribution

The difference in hydraulic head between any given incoming and outgoing tide will also affect the ability of the groundwater and solute to migrate to Darling Harbour. The hydraulic head distributions at high and low tide (Figure 3 and Figure 4 below) indicate the relatively small difference and propagation of head into the natural soil/marine sediments over the tide cycle and confirm that the movement of harbour water into the site and groundwater off the site will be limited by the tide cycle.

Figure 3 Hydraulic Head Distribution, High Tide (AECOM 2010d, Figure F2)

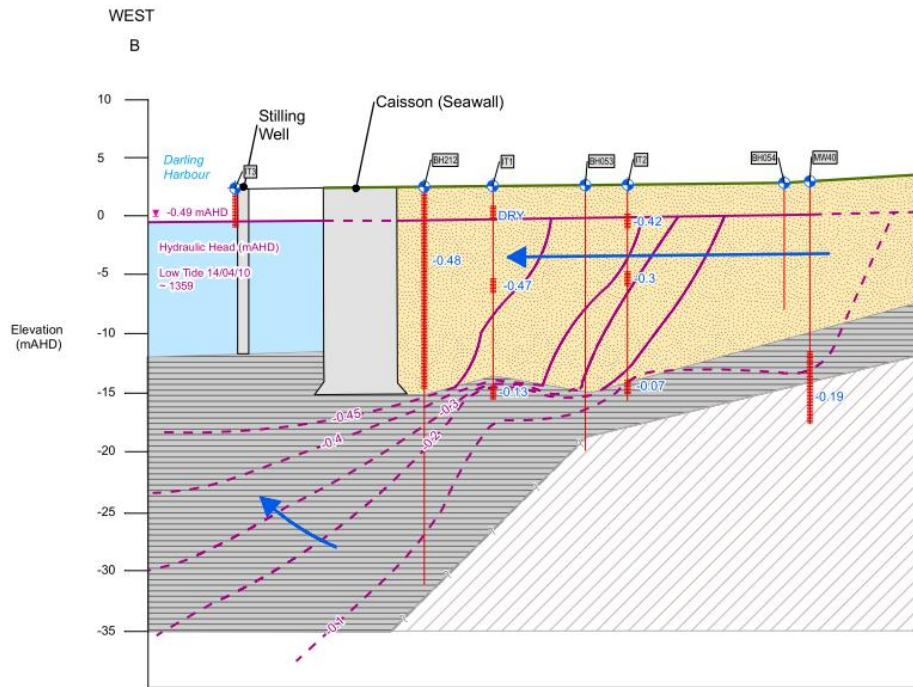
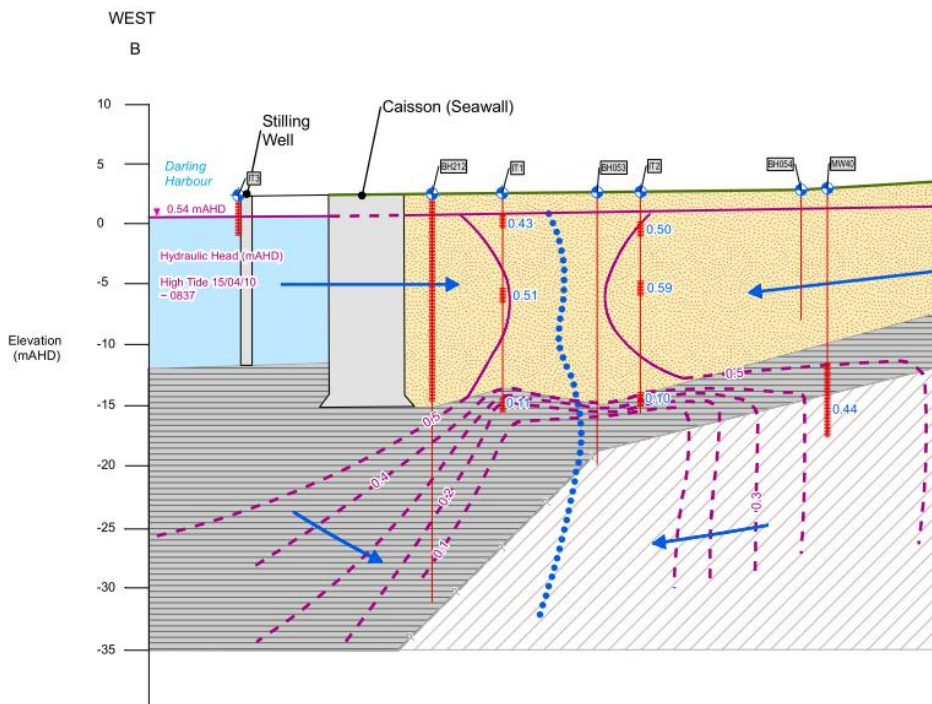


Figure 4 Hydraulic Head Distribution, Low Tide (AECOM 2010d, Figure F3)



3.4 Mass Flux and Discharge Modelling

Mass flux and discharge were evaluated using the Mass Flux Toolkit V 2.0 (August 2011), which is an Excel spreadsheet based software tool that allows the comparison of different mass flux approaches, calculates mass flux from transect data, and applies mass flux to manage groundwater plumes and impacts on receptor wells or surface water. It is noted that the term “mass flux” in the software is used to describe the mass discharge rate in a groundwater plume in units of mass per time passing across a plume transect.

Based on the CSM discussed above, the mass discharge along two transects was assessed. The transects were placed in a north-south direction across the site, with Transect 1 near and through the boundary of the Declaration Area and Transect 2 near the site boundary with Darling Harbour. Table 2 presents the groundwater monitoring wells and soil boreholes used in each transect:

Table 2 Mass Flux Toolkit Transect Summary

Transect 1	Transect 2
MW401	MW213
BH402	IT04
BH403	MW60
MW62	IT05
IT03	MW212
BH115	
BH210	

Note: MW62 and BH115 were only used to evaluate lithology and did not have relevant contaminant concentration data

Table 3 summarises data assumptions, input values and sources. The model evaluated the underlying natural soil and marine sediments only. Naphthalene and benzene were used as the key contaminants of concern.

Table 3 Mass Flux Toolkit Data Entry Summary

Type	Parameter	Value						Source
Transect	Length	200 m						Site plan
	Dist from source	25 m (T1)						Site plan
		105 m (T2)						
Hydrogeology	Hydraulic conductivity	0.0442 m/day						Aquifer test results
	Hydraulic gradient	0.006 m/m						Estimate at low tide
Concentration	Location	Distance on Transect 1	Midpoint of sample (mbgs)	top of plume (mbgs)	bottom of plume (mbgs)	Naphthalene (ug/L)	Benzene (ug/L)	Borelogs Well completion Laboratory data
	MW401	9	17.5	14	21	195	140	
	BH402	33	17	14	20	1000	595	
	BH403	67	12.5	8	17	2000	595	
	IT03	123	14	13	15	2560	595	
	BH210	185	16	14	18	1	250	
	Location	Distance on Transect 2	Midpoint of sample (mbgs)	top of plume (mbgs)	bottom of plume (mbgs)	Naphthalene (ug/L)	Benzene (ug/L)	
	MW213	5.5	26.5	18	38	1	1	
	IT04	63	24.5	17	31.5	4.3	7	
	MW60	71	20.5	16	25	1500	1380	
	IT05	115	22.5	18	27	80.2	34	
	MW212	137	25	17.5	33	1	1	
Model	Grid refine size	3 x 3						Documentation
	Concentration interpolation	Nearest Neighbor						Documentation

The following figures provide a summary of the Mass Flux Toolkit results.

Figure 5 Mass Flux Toolkit Results Summary - Naphthalene

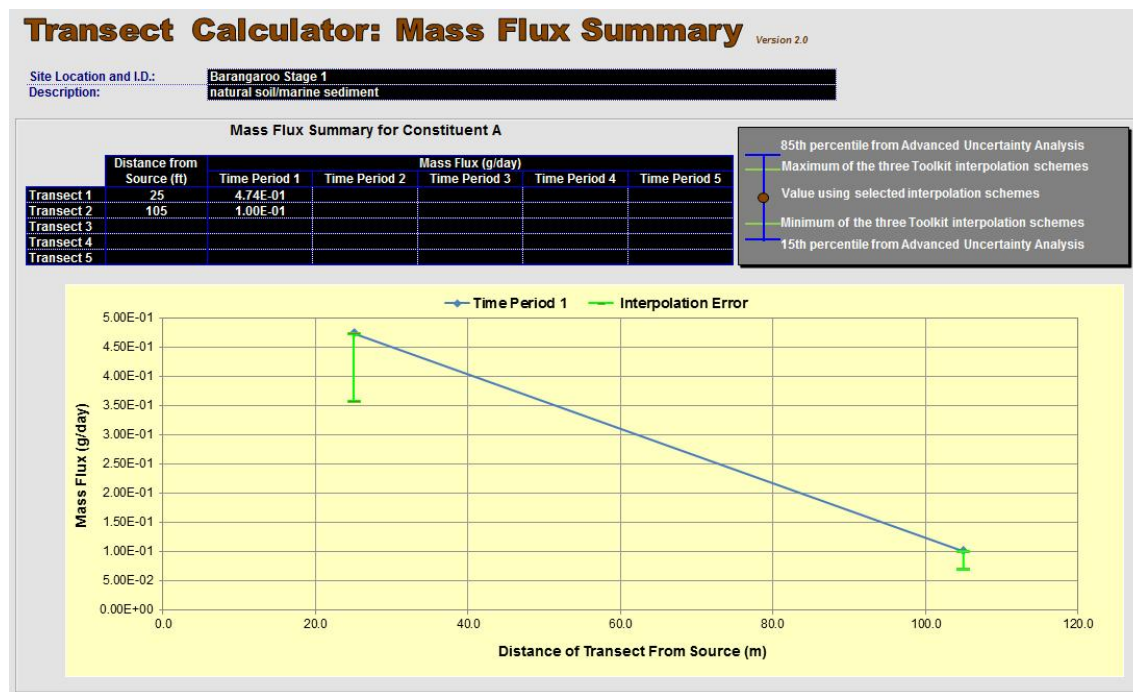
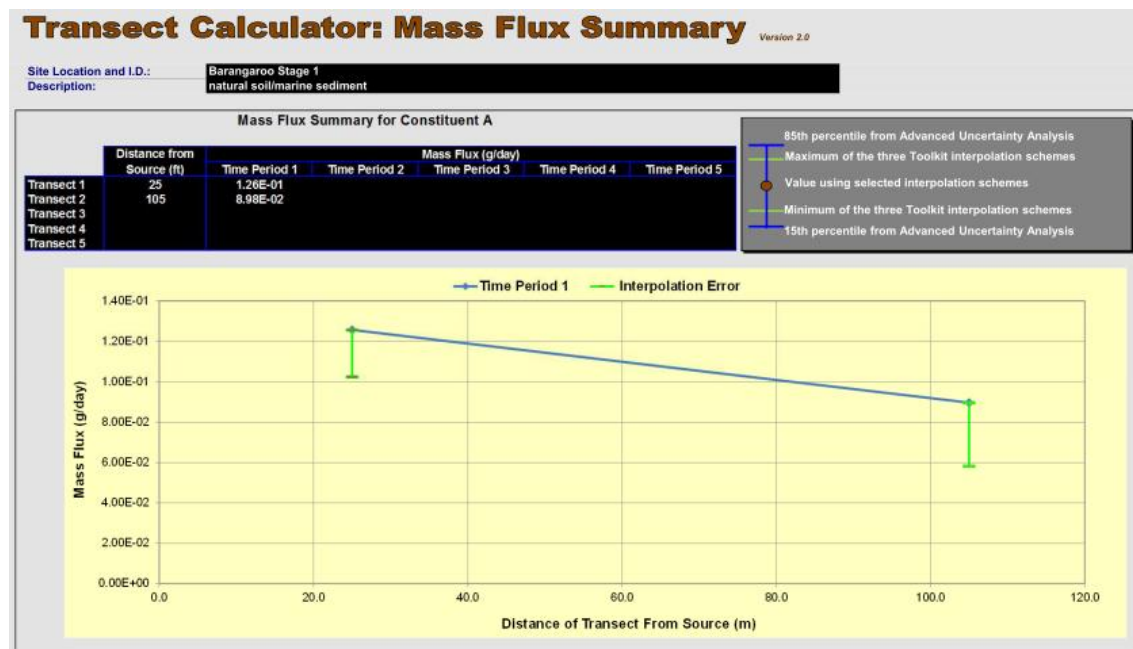


Figure 6 Mass Flux Toolkit Results Summary - Benzene



The mass flux discharge modelling results indicate that negligible mass is likely to be discharging from the natural soil and marine sediments underlying the site based on the site specific and conservative input parameters. A mass discharge of 0.1 g/day for naphthalene and 0.09 g/day for benzene over a cross sectional area of approximately 1,200 m² (Transect 2) would not be detected in the receiving water given the volume of water moving in and out of the site twice per day. Using the impact module in the Mass Flux Toolkit and assuming

discharge of the mass from Transect 2 (closest to Darling Harbour) in a 100 L/sec stream flow (considered extremely conservative based on the approximate 25 ML of tide twice per day) the maximum concentration in Darling Harbour would be in the order of 0.01 µg/L for both naphthalene and benzene.

4.0 Conclusions

Based on the CSM, collation of hydraulic parameters and mass flux/discharge modelling for the site, the following conclusions are made:

- Lithology and hydraulic conductivity data indicate that groundwater flow in the underlying natural soil and marine sediments is very low and in the order 0.4 metre per year, with contaminant velocities likely to be at least an order of magnitude lower due to attenuation (sorption, biological degradation, etc.).
- The effect of the twice daily tide provides changes in hydraulic head that further reduce the migration of groundwater and hence the contaminants.
- Mass discharge modelling indicates that both the mass and impact from the natural soil and marine sediments underlying the site to the receiving water are insignificant and could not be measured due to the low expected concentrations.
- The lines of evidences assessed do not indicate there is a significant flux and discharge of contamination from the natural soil and marine sediments underlying the site into Darling Harbour.
- Remediation of the deep natural soil and marine sediments is not warranted based on the results presented herein. The cost and potential environmental harm associated with an attempt to remove this material would outweigh any real benefit to the environment, which does not appear to be significantly impacted by the contamination present in the natural soil and marine sediments.

5.0 Limitations

This document was prepared by AECOM Australia Pty Ltd (AECOM) for the sole use of Lend Lease (Millers Point) Pty Ltd, the only intended beneficiary of our work. Any advice, opinions or recommendations contained in this document should be read and relied upon only in the context of the document as a whole and are considered current to the date of this document. Any other party should satisfy themselves that the scope of work conducted and reported herein meets their specific needs before relying on this document. AECOM cannot be held liable for any third party reliance on this document, as AECOM is not aware of the specific needs of the third party. No other party should rely on the document without the prior written consent of AECOM, and AECOM undertakes no duty to, nor accepts any responsibility to, any third party who may rely upon this document.

This document was prepared for the specific purpose described in our proposal dated 2March 2012 and as agreed to by Lend Lease (Millers Point) Pty Ltd. From a technical perspective, the subsurface environment at any site may present substantial uncertainty. It is a heterogeneous, complex environment, in which small subsurface features or changes in geologic conditions can have substantial impacts on water and chemical movement. Uncertainties may also affect source characterisation assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and remedial action performance.

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

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Appendix D

Contaminant Mass Flux and Discharge Estimates (AECOM, 2013)

Memorandum

To	Andrew Rolfe	Page	1
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Subject	Additional Groundwater Modelling to Supplement Contaminant Flux and Discharge Estimates for Natural Soils and Marine Sediments for EPA Declaration Area 21122		
From	Graham Hawkes		
File/Ref No.		Date	12-Mar-2013

1.0 Introduction

At the request of the Site Auditor supplementary contaminant mass flux discharge modelling has been undertaken within the fill, marine sediment and sandstone underlying EPA Declaration Area 21122 and adjacent areas of Barangaroo South and Barangaroo Central (the Site) to further assess the impacts to water quality in Darling Harbour. This additional groundwater modelling follows the modelling undertaken by AECOM entitled *"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"* dated 14 March 2012 (AECOM, 2012).

The basis for the mass flux discharge modelling including the conceptual model, geology, hydrogeology, extent of contamination, aquifer parameters, tidal effects and mass flux and discharge modelling are discussed in detail in AECOM, 2012.

2.0 Objectives

The auditor has requested additional groundwater modelling to supplement the 2012 modelling to provide a quantitative approach that demonstrates:

1. The flux of contamination that (based on the currently proposed extent of remediation) is proposed to remain in situ will be minimal and not represent an unacceptable impact to the environment; and
2. The improvement in groundwater quality that is expected to be realised as a result of the proposed extent of remediation.

Additional mass flux discharge modelling has been undertaken to demonstrate the above using the Mass Flux Toolkit V2.0 Excel based spread sheet software that was also used in AECOM, 2012.

3.0 Proposed remediation

The Declaration Area was formerly occupied by a gas works and contains significant hydrocarbon contamination within the fill and groundwater and tar is present in some areas. The remediation approach proposed to facilitate removal of the NSW EPA Declaration is to remediate the fill and associated contamination (either by excavation or *in situ* remediation). Drilling indicates the depth of fill is variable ranging from 2.8 m (MW200) to 13.0 m (BH405). The underlying Hawkesbury Sandstone will remain in place. For the purposes of this additional groundwater modelling, it is assumed that the remaining Hawkesbury Sandstone will be impacted by hydrocarbons to a depth of 5 metres and with limited groundwater quality data (BH200) from the sandstone available, contaminant concentrations from the overlying fill have been conservatively applied to the sandstone in the modelling.

The area west of the Declaration Area is underlain by fill varying in depth from 15.8 m (MW529a) to 19 m (MW212 and MW40). The fill is underlain by marine sediments that are predominately clay that are impacted from hydrocarbon contamination derived from the gasworks. It is conservatively assumed that the marine sediments are impacted to a depth of 5 metres. For the purpose of this additional groundwater modelling, it has been assumed that the fill in the western sector will not be removed as the majority of the contaminant mass is located within the Declaration Area.

4.0 Approach

Transect A-A' extends for 250 m through the Declaration Area and intersects the former gasworks, fill and Hawkesbury Sandstone. Transect B-B' extends for 275 m through the area west of the Declaration Area, approximately 45 m east of the foreshore and intersects fill and in-situ marine sediments. **Table 1** presents the groundwater monitoring wells and soil boreholes used in each transect. In compiling Transect B-B' the 'IT' monitoring wells are off-set and plotted at the same location as other monitoring wells, however their dissolved contaminant concentrations from the fill and marine sediments have been considered. In addition, data from the JBS monitoring wells have been reviewed but not included in the groundwater modelling. This is because none of these wells are screened within the marine sediments and the data from the fill is inconsistent because of potential variations in the sample collection methodology, laboratory LOR and laboratory analysis methodology.

Table 1 Mass Flux Toolkit Summary

Transect A-A' (East)	Transect B-B' (West)
MW69	MW529D
MW68	BH213
BH197*	MW543
MW64	MW544D
BH200	MW60 + (IT04)
MW204d	MW14 +(IT02, IT01, IT05)
MW206	MW212
MW209	MW22
	MW40

Note: BH197 was used to evaluate the lithology

5.0 Reduction in the contaminant mass flux

The mass flux toolkit has been used to calculate the contaminant mass flux along Transect A-A' located through the proposed remediation area before and after remediation. The model assumes the contaminant source within the fill will be removed and the residual contamination within the underlying Hawkesbury Sandstone to a depth of 5m will remain. Comparison of the mass flux results demonstrates the reduction in mass flux that is expected to be realised as a result of the proposed remediation works. The reduction in the mass flux will result in an improvement in groundwater quality flowing down gradient from the Declaration Area.

The calculated contaminant mass from the Mass Flux Toolkit for each lithology before remediation and the total after remediation is presented in **Table 2** below.

Table 2 Mass Flux Toolkit Transect Summary Results – Transect A-A'

Contaminant	Total Mass Flux								% change
	Fill		Sandstone		Pre Remediation		Post Remediation		
	g/day	kg/year	g/day	kg/year	g/day	kg/year	g/day	kg/year	
Naphthalene	2.1	0.77	0.80	0.29	2.9	1.1	0.80	0.29	380
TPH C ₁₀ – C ₁₄	19.3	7.0	8.16	2.98	27.5	10.0	8.16	2.98	330
Benzene	2.42	0.88	1.64	0.60	4.1	1.5	1.64	0.60	250

Post remediation the mass flux concentrations in the remediation area are lower due to an assumed 100% reduction in the contaminant mass in the fill. The contaminant mass within the underlying sandstone is expected to remain largely unchanged.

The reduction in contaminant mass of between 250 and 380% will conservatively cause an improvement in groundwater quality of the same order in groundwater within the fill flowing down gradient. The estimated groundwater quality improvement is conservative because the majority of groundwater moving across the Declaration Area boundary is flowing within the fill that has a higher hydraulic conductivity rather than the sandstone that contains the majority of the remaining (post remediation) contaminant mass.

6.0 Mass Flux entering Darling Harbour

The mass flux toolkit has been used to demonstrate that the contamination remaining *in situ* in off Site areas will not represent an unacceptable risk to the environment based on estimation of the concentrations of contaminants that will enter Darling Harbour.

Dissolved contaminant levels within the upper 5m of the marine clays have been modelled based on the highest reported contaminant concentrations results for five monitoring wells (MW60, IT01, IT02, IT04 and IT05) that are located near Darling Harbour on Transect B-B' (refer to the attached figure). A worst case scenario had been modelled using the elevated concentrations for MW60 where the well is screened across the fill material/marine sediments interface.

The calculated mass flux along Transect B-B' is outlined in **Table 3** below. The results show the majority (>99%) of contaminant mass flux is derived from the fill due to the low hydraulic conductivity and lower water transmitting properties of the marine sediments. Thus less than 1% of the contaminant mass flux is derived from the marine sediments.

A total mass discharge of 1 g/day for naphthalene, 10 g/day (TPH C₁₀-C₁₄) and 2.2 g/day (benzene) has been calculated to be discharging from Transect B-B' using the Mass flux Toolkit. This indicates that negligible mass is likely to be discharging into Darling Harbour from residual contamination remaining within the fill and natural marine sediments over a cross sectional area of (275 x 24 m) 6600 m². In addition contaminant concentrations would be expected to be further reduced by tidal activity.

By application of the impact module in the Mass Flux Toolkit and assuming discharge of the mass from Transect B-B' in a 100 L/sec stream flow (considered conservative based on the approximate 25 ML of tide twice per day) the maximum concentration of contaminants entering Darling Harbour has been calculated and is presented in **Table 3**.

The results estimate that more contamination is entering Darling Harbour than earlier modelling (AECOM, 2012) due to the conservative modelling approach which assumes the plume extends across the whole saturated zone in the fill and a further 5m depth into the underlying clay. The calculated concentrations of contaminants entering Darling Harbour for TPH, naphthalene, and benzene are significantly below MWQC by approximately 1, 2 and 4 orders of magnitude respectively.

Table 3 Mass Flux Toolkit Transect Summary Results – Transect B-B'

Contaminant	Total Mass Flux						Groundwater Concentration	
	Fill		Marine sediments		Combined mass flux		Inflow*	MWQC**
	g/day	kg/year	g/day	kg/year	g/day	kg/year	µg/L	µg/L
Naphthalene	1.0	0.37	0.03	0.001	1.0	0.37	0.17	70
TPH C ₁₀ – C ₁₄	10	3.8	0.42	0.015	10	3.8	1.2	40
Benzene	2.2	0.79	0.03	0.011	2.2	0.79	0.006	700

Note: *Modelled groundwater inflow contaminant concentration to Darling Harbour

** Marine Water Quality Criteria (MWQC) taken from Table 4 of the VMP Remediation Extent document (draft)

The modelled mass flux concentrations have demonstrated that even though the contaminant mass flux in the sandstone (Transect A-A') and marine sediments (Transect B-B') will not be significantly reduced by the proposed soil remediation program, the groundwater quality entering Darling Harbour will improve significantly because more than 99% of groundwater flow is through the fill and the proposed remediation is focused on reducing the contaminant mass flux from the fill. The modelled contaminant concentrations are small and below the MWQC and the impacts do not represent an unacceptable risk to the environment.

7.0 Assumptions

The mass flux discharge groundwater modelling was based on the following assumptions:

- The groundwater level for Transects A-A' and B-B' has been set at 2 m below ground level;
- The whole saturated zone in the fill for both Transects A-A' and B-B' contains the maximum groundwater contaminant concentration recorded at each monitoring well along each transect;
- No hydrocarbon contamination is present within the remediated soil mass;
- Hydrocarbon impacts exist within the underlying Hawkesbury Sandstone and marine sediments extend to a depth of 5 metres;
- Dissolved contaminant levels within the upper five metres of Hawkesbury Sandstone (Transect A-A') have been modelled using the same concentrations as reported for the overlying fill;
- Dissolved contaminant levels within the upper five metres of marine clay (Transect B-B') have been modelled using the worst case scenario of the highest reported contaminant concentration for the five monitoring wells screened in the clay;
- Groundwater stream flow from Transect B-B' is estimated at 100 L/sec (AECOM, 2012) based on approximate 25 ML of tide movement twice per day.
- In instances where contaminant levels are below laboratory detection limits the LOR has been applied in the modelling. In some cases for benzene concentrations were set at 1000 µg/L where the analytical result for benzene was <1000 µg/L; and
- Transect A-A' and B-B' are located 55 m and 175 m from Hickson Road respectively.

8.0 Conclusions

Review of the calculated contaminant results clearly demonstrates the reduction in contaminant mass along Transect A-A' in the Declaration Area will be in the order of 250 to 380% following the proposed soil remediation program. Consequently groundwater flowing down-gradient from the Declaration Area after remediation will be of significantly better quality post remediation.

The majority of groundwater (more than 99%) flowing from the Site (Transect B-B') into Darling Harbour will be derived from the fill due to the low hydraulic conductivity of the marine sediments and higher water transmitting properties of the fill. Thus the cumulative slow release of the mass flux within the marine sediments compared to the faster release of low concentration contaminants within the fill will result in low contaminant concentrations entering Darling Harbour.

The results of the mass flux discharge modelling demonstrates that following removal of the contaminant mass within the fill in the Declaration Area the contamination that is proposed to remain *in situ* following the remediation program confirm the groundwater released to Darling Harbour will be below the MWQC and will not represent an unacceptable risk to the environment.

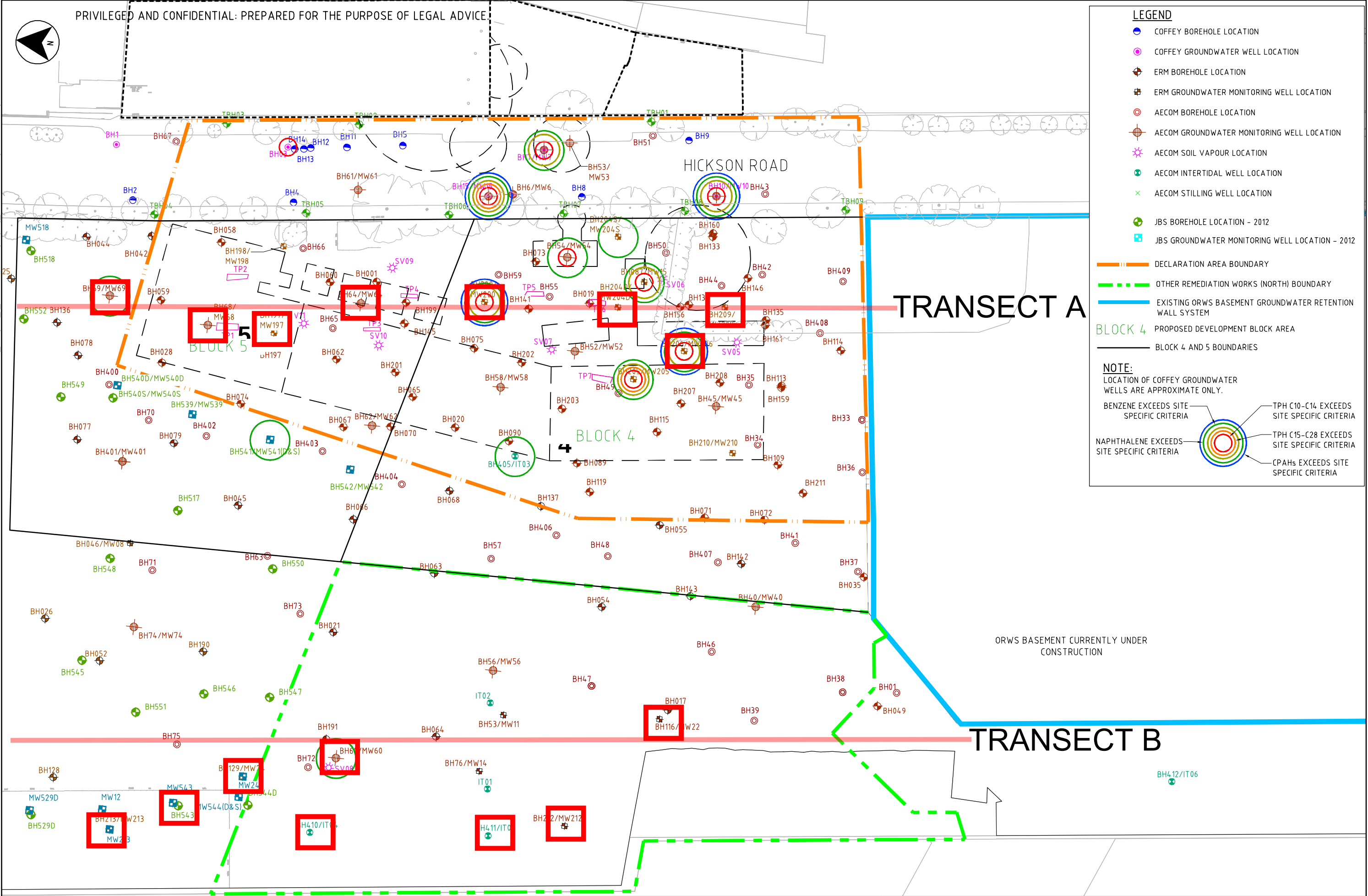


Graham Hawkes
Principal Hydrogeologist
graham.hawkes@aecom.com

Mobile: 0417 134 422
Direct Dial: +61 2 8934 1065

Attach: Site Plan showing Transects A-A' and B-B'

Card ref: P\6013531_Barangaroo_S_KLS_CADD\5.3 Working\Drwg\Drwg_60247139-DRG-10_VMPRE-F5.dwg Last modified: 06 Mar 13 - 12:26



This drawing is confidential and shall only be used for the purposes of this project.										SCALES:		THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001-2000				CONTRACTOR:		DESIGNER:		CLIENT:		VMP REMEDIATION EXTENT, BARANGAROO									
																						FIGURE F5: GROUNDWATER SSTC EXCEEDENCES									
										1:1000 A3																					

Appendix E

Site Audit Statements for 30-34, 36 and 38 Hickson Road

NSW Environment Protection Authority

SITE AUDIT STATEMENT

Schedule 1, Form 2 (Contaminated Land Management Regulation 1998)

SITE AUDITOR (accredited under the *Contaminated Land Management Act 1997*):

Name: Mr Ross McFarland  Phone: 02 9950 0200
Company: CH2M HILL Australia Pty Ltd Fax: 02 9950 0600
Address: Level 7, 9 Help Street Accred. No: 9819
CHATSWOOD NSW 2067

SITE AUDIT STATEMENT NO: R2002/17/A

SITE DETAILS:

Address: 30-34 Hickson Rd, Millers Point - see attached survey plan showing area marked

Postcode: 2000

Lot and DP number: Lot 2 in Deposited Plan 873158

Local government area: Sydney City Council

SITE AUDIT REQUESTED BY:

Name: Mark Burns
Company: Bovis Lendlease Pty Ltd
Address: Level 13, Tower Building, Australia Square
SYDNEY, NSW Postcode: 2000
Phone: 02 - 9237 6194 Fax: 02 - 9237 5744
Name of contact person (if different from above):

Consultancy(ies) who conducted the site investigation(s) and/or remediation:

URS Pty Ltd
Axis Environmental Pty Ltd
Hyder Consulting
Johnstone Environmental Technology

Title(s) of report(s) reviewed:

- URS (2003) Remediation Validation Report, 30-34 Hickson Road, Millers Point, NSW. Final Report. 14 March 2003.

Other information reviewed:

- URS (2002) Groundwater Investigation, 30-38 Hickson Road, Miller's Point, Sydney NSW. 1 February 2002.
- URS (2002) Remediation Action Plan, 30-38 Hickson Road, Miller's Point, Sydney NSW. 10 April 2002.
- URS (2002) In-Situ Material Classification and Further Delineation of the Location of the Annulus - 30-38 Hickson Road, Miller's Point, Sydney, NSW. 14 May 2002.
- URS (2002) Further Groundwater Investigations at 30-38 Hickson Road, Miller's Point, Sydney NSW. 15 May 2002.
- URS (2002) Risk Assessment, Bovis Lend Lease Hickson Road, Miller's Point. 31 May 2002.
- Axis Environmental Consultants Pty Ltd (1994) Environmental Assessment Report, Hickson Road Site for Maritime Services Board. 4 August 1994.
- Axis Environmental Consultants Pty Lt. (1994) Summary Contamination Assessment Report, Hickson Road Site for Maritime Services Board. 18 August 1994.
- Hyder Consulting (1998) Environmental Site Assessment, Hickson Road and Port Area, Millers Point, Sydney. September 1998.
- Johnstone Environmental Technology (JET) (1993) Report of Contamination Investigation at MSB Property, Hickson Road, Sydney. August 1993.

Summary Site Audit Report

Title: 30-34 Hickson Road, Millers Point, NSW, Summary Site Audit Report (SSAR 2002/17/A)

Date : March 2003

I have completed a site audit (as defined in the *Contaminated Land Management Act 1997*) and reviewed the reports and information referred to above with due regard to relevant laws and guidelines. I certify that the site (tick all appropriate boxes):

(a) is suitable for the following use(s):

- ☐ residential, including substantial vegetable garden and poultry;
- ☐ residential, including substantial vegetable garden excluding poultry;
- ☐ residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake) excluding poultry;
- ☐ residential with minimal opportunity for soil access, including units;
- ☐ daycare centre, preschool, primary school;
- ☐ secondary school;
- ☐ park, recreational open space, playing field;
- ☒ commercial/industrial use;
- ☒ other (please specify): may include the provision of a Child Care Centre within the property

subject to:

- ☐ condition(s) (please specify): _____



(b) ~~is not suitable for any beneficial use due to risk of harm from contamination.~~

☐ (comments): _____

I am accredited by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* as a Site Auditor.

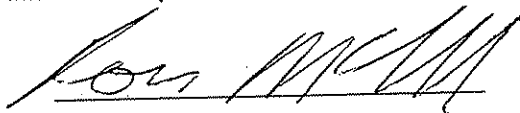
Accreditation Number: 9819

I certify that:

- (a) I have personally examined and am familiar with the information contained in this statement, including the reports and information referred to in this statement, and
- (b) this statement is, to the best of my knowledge, true, accurate and complete, and
- (c) on the basis of my inquiries made to those individuals immediately responsible for making the reports, and obtaining the information, referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties for wilfully submitting false, inaccurate or incomplete information.

Signed:



Date:

19 March 2003

FORWARD TO:

Manager, Contaminated Sites Section
NSW Environment Protection Authority
PO Box A290
SYDNEY SOUTH NSW 1232

Phone: 02 9995 5614
Fax: 02 9995 5999

Site Audit Statement – page 3

NSW Environment Protection Authority

SITE AUDIT STATEMENT

Schedule 1, Form 2 (Contaminated Land Management Regulation 1998)

SITE AUDITOR (accredited under the *Contaminated Land Management Act 1997*):

Name:	Mr Ross McFarland	Phone:	02 9950 0200
Company:	CH2M HILL Australia Pty Ltd	Fax:	02 9950 0600
Address:	Level 7, 9 Help Street	Accred. No:	9819
	CHATSWOOD NSW 2067		

SITE AUDIT STATEMENT NO: SAS 2002/17/C

SITE DETAILS:

Address: 36 Hickson Rd, Millers Point - see attached survey plan showing area marked

Postcode: 2000

Lot and DP number: On commencement of this audit the site was identified as Part of Lot 3 DP 873158. It is understood that the site has since been subdivided as part of the development, and now comprises **PT 12 and PT 5 in DP 873158** as shown on the attached survey plan showing 'Plan of Subdivision of Lots 2 & 3 in DP 873158'

Local government area: Sydney City Council (on commencement of audit) – now part of Greater City of Sydney LGA

SITE AUDIT REQUESTED BY:

Name: Mark Burns

Company: Bovis Lend Lease Pty Ltd

Address: Level 13, Tower Building, Australia Square

SYDNEY, NSW _____ **Postcode:** 2000 _____

Phone: 02 - 9237 6194 _____ **Fax:** 02 - 9237 5744 _____

Name of contact person (if different from above): Emma Malherbe (ph: 02 8297 3607) _____

Consultancy(ies) who conducted the site investigation(s) and/or remediation:

____ URS Pty Ltd _____

____ Axis Environmental Pty Ltd _____

____ Hyder Consulting _____

____ Johnstone Environmental Technology _____

Title(s) of report(s) reviewed:

- URS (2003) Remediation Validation Report, 36 Hickson Road, Millers Point, NSW. Final Report. 9 October 2003 (URS Ref: 45529/017-0907).
- URS (Oct 2003b) Site Management Plan, 36 Hickson Road, Miller's Point, Sydney NSW, Final, 9 October 2003 (URS Ref: 45529/017/HERITAGE SITE/SMP/SMP-C.DOC).

Other information reviewed:

- Classic Colour Painting Services Pty Ltd (March 2004) Letter – Lead Paint Treatment to 36 Hickson Rd, Millers Point, Building C.
- URS (July 2003) Memorandum – Preliminary Assessment of Risk Associated with Sewage Pumping Station Proposal, 10 July 2003. This was included in the abovementioned Site Management Plan (as Appendix A) and Remediation Validation Report (as Appendix B2).
- URS (June 2003) Validation Report, 38 Hickson Road, Millers Point, NSW, 25 June 2003.
- URS (March 2003) Remediation Validation Report, 30-34 Hickson Road, Millers Point, NSW, 14 March 2003.
- URS (2002) Groundwater Investigation, 30-38 Hickson Road, Miller's Point, Sydney NSW. 1 February 2002.
- URS (2002) Remediation Action Plan, 30-38 Hickson Road, Miller's Point, Sydney NSW. 10 April 2002.
- URS (2002) In-Situ Material Classification and Further Delineation of the Location of the Annulus - 30-38 Hickson Road, Miller's Point, Sydney, NSW. 14 May 2002.
- URS (2002) Further Groundwater Investigations at 30-38 Hickson Road, Miller's Point, Sydney NSW. 15 May 2002.
- URS (2002) Risk Assessment, Bovis Lend Lease Hickson Road, Miller's Point. 31 May 2002.
- Axis Environmental Consultants Pty Ltd (1994) Environmental Assessment Report, Hickson Road Site for Maritime Services Board. 4 August 1994.
- Axis Environmental Consultants Pty Lt. (1994) Summary Contamination Assessment Report, Hickson Road Site for Maritime Services Board. 18 August 1994.
- Hyder Consulting (1998) Environmental Site Assessment, Hickson Road and Port Area, Millers Point, Sydney. September 1998.
- Johnstone Environmental Technology (JET) (1993) Report of Contamination Investigation at MSB Property, Hickson Road, Sydney. August 1993.

Summary Site Audit Report

Title: ____36 Hickson Road, Millers Point, NSW, Summary Site Audit Report (SSAR 2002/17/C)

Date : ____16 March 2003

I have completed a site audit (as defined in the *Contaminated Land Management Act 1997*) and reviewed the reports and information referred to above with due regard to relevant laws and guidelines. I certify that the site (tick **all** appropriate boxes):

(a) is suitable for the following use(s):

SAS 2002/17/C

- ☐ residential, including substantial vegetable garden and poultry;
- ☐ residential, including substantial vegetable garden excluding poultry;
- ☐ residential with accessible soil, including garden (minimal home grown produce contributing less than 10% fruit and vegetable intake) excluding poultry;
- ☐ residential with minimal opportunity for soil access, including units;
- ☐ daycare centre, preschool, primary school;
- ☐ secondary school;
- ☐ park, recreational open space, playing field;
- ☒ commercial/industrial use;
- ☒ other (please specify): __ will include an 'Outdoor Plaza' within the commercial property

subject to:

- ☒ condition(s) (please specify): The above landuse suitability is subject to the following conditions:
 - 1) The Site Audit Statement is to be read in conjunction with the URS Site Management Plan, 36 Hickson Road, Millers Point, Final, dated 9 October 2003
 - 2) All works in the subject area, as defined in the attached survey plan, are to be undertaken in accordance with the attached SMP.

~~(b) is not suitable for any beneficial use due to risk of harm from contamination.~~

- ☒ (comments): This site audit statement should be read in conjunction with the associated summary site audit report number SSAR 2002/17/C

I am accredited by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* as a Site Auditor.

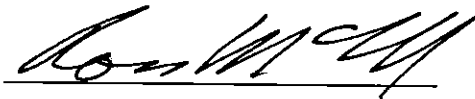
Accreditation Number: 9819

I certify that:

- (a) I have personally examined and am familiar with the information contained in this statement, including the reports and information referred to in this statement, and
- (b) this statement is, to the best of my knowledge, true, accurate and complete, and
- (c) on the basis of my inquiries made to those individuals immediately responsible for making the reports, and obtaining the information, referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties for wilfully submitting false, inaccurate or incomplete information.

Signed:



Date:

16 March 2004

FORWARD TO:

Manager, Contaminated Sites Section
NSW Environment Protection Authority
PO Box A290
SYDNEY SOUTH NSW 1232

Phone: 02 9995 5614

Fax: 02 9995 5999

DRAFT PLAN

Registered:
C.A.:
Title System
Purpose:
Ref. Map:
Last Plan:

PLAN OF PROPOSED
SUBDIVISION OF LOTS 2 & 3
IN DP 873158

Lengths are in metres. Reduction Ratio 1: 50

UGA. SYDNEY
 Locality: MILLERS POINT
 Parish: ST PHILIP
 County: CUMBERLAND

This is sheet 1 of my plan in sheets
(Delete if inapplicable).

Surveyors (Practice) Regulation 2001
TASY MORANTIS
CL5, 17 RANDEL ST, SURRY HILLS, NSW, 2010
The surveyor registered under the Surveyors Act 1929, certify
that the survey represented in this plan is accurate, has
been made in accordance with the Surveyors (Practice)
Regulation 2001 and was completed on 11/04/2011.

Survey relates to: Specify the bird actually surveyed or specify any bird shown in plan that is not the subject of the survey)

Signature _____ Date _____
 Attorney registered under the Solicitor Act 1929
 Unit Line: X¹ - Y¹

ans used in preparation of survey/compilation

LABEL FOR USE ONLY for statements of intention to dedicate public roads, to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants

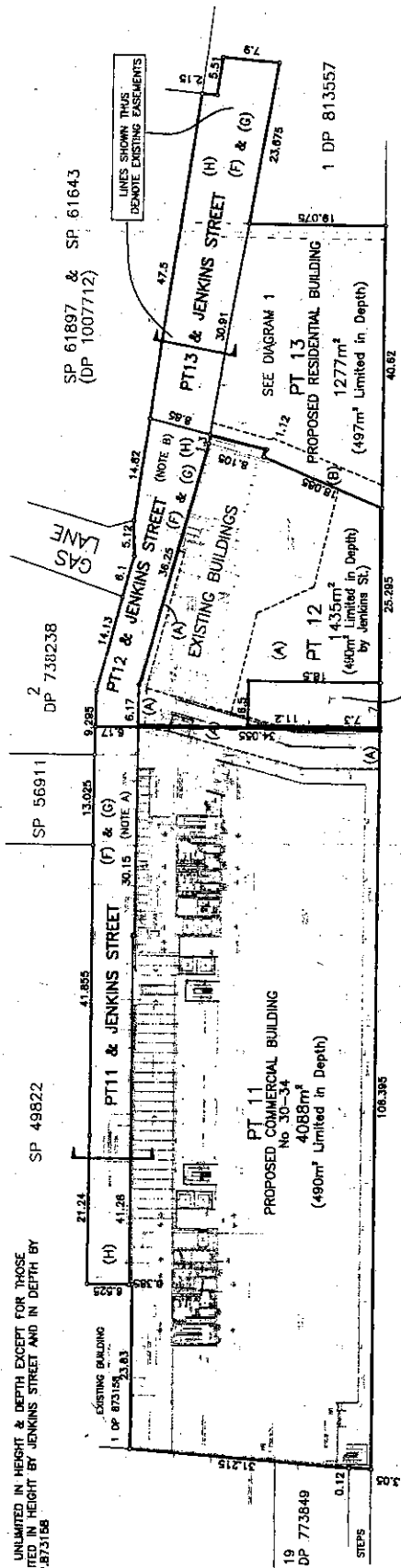
- EASEMENT FOR PUBLIC ACCESS (A)
EASEMENT FOR LIGHT & AIR &
OVERHANG (B)
EASEMENT TO PERMIT ENCRoACHING
LIFT TO REMAIN (C)
EASEMENT TO PERMIT STAIR STRUCTURE
TO REMAIN (D)
POSITIVE COVENANT FOR MAINTENANCE
& REPAIR (E)
EASEMENT FOR SUPPORT OF JENKINS
STREET (F)
EASEMENT FOR FUTURE SERVICES (G)
RESTRICTION ON THE USE OF LAND (H)

THIS INTENDED TO DEDICATE LOT 18 IN
P.773849 TO THE PUBLIC AS OPEN
SPACE

IS INTENDED TO DEDICATE JENKINS
STREET TO THE PUBLIC AS ROAD SUBJECT
THE EXISTING EASEMENTS NOTED IN
CONJUNCTION

LOT 11 & 13 ARE UNLIMITED IN HEIGHT & DEPTH EXCEPT FOR THOSE PARTS LIMITED IN HEIGHT BY JENKINS STREET.

LOT 12 IS UNLIMITED IN HEIGHT & DEPTH EXCEPT FOR THOSE PARTS LIMITED IN HEIGHT BY JENKINS STREET AND IN DEPTH BY LOT 5 D.P.873158



HICKSON ROAD

SCHEDULE OF EXISTING EASEMENTS AFFECTING PARTS OF LOTS 11, 12, 13 & JENKINS ST.

- 1 EASEMENT FOR LIGHT AND AIR (LP238693)
2 EASEMENT FOR ACCESS (LP238693)
3 EASEMENT FOR ACCESS (LP 738238)
4 EASEMENT FOR STORMWATER DRAINAGE PURPOSES 2 WIDE (DP 873158)
5 PROPOSED EASEMENT FOR LIGHT AND AIR
6 PROPOSED EASEMENT FOR SERVICES
7 EASEMENT FOR WATER SUPPLY WORKS 3 WIDE & VARIABLE (DP 873158)
8 EASEMENT FOR SEWERAGE PURPOSES OVER EXISTING LINE OF PIPES (DP 873158)
9 RIGHT OF CARRIAGEWAY VARIABLE WIDTH (DP 873158)
10 SERVICES EASEMENT VARIABLE WIDTH (DP 873158)
11 RIGHT OF CARRIAGEWAY & EASEMENT FOR ELECTRICITY
12 TRANSMISSION PURPOSES (DP 873158)
13 EASEMENT FOR DRAINAGE OVER EXISTING LINE OF PIPES (DP873158)
14 EASEMENT FOR SEWERAGE PURPOSES (DP 873158)
15 RIGHT OF CARRIAGEWAY & EASEMENT FOR LIGHT AND AIR (G446008,P238560,DP440413)
16 EASEMENT TO DRAIN WATER (DP 873158)
17 PROPOSED RIGHT OF CARRIAGEWAY (DP 639537)
18 EASEMENT FOR DRAINAGE 1.22 WIDE (J23252 & DP106510)
19 RIGHT OF CARRIAGEWAY & EASEMENT FOR LIGHT AND AIR (DP 238560 & DP 2702397)

NOTE A - PT 11 AND JENKINS STREET
BURDENED BY EXISTING EASEMENTS
1,2,3,4,5,6,7,8,9,10,11,13

NOTE B - PT 12, PT13 & JENKINS ST.
BURDENED BY EXISTING EASEMENTS
2,3,4,6,7,8,9,10,11,12,14,15,16,17,18

EASEMENT FOR SEWERAGE PURPOSES (DP 873158)
RIGHT OF CARRIAGEWAY & EASEMENT FOR LIGHT AND AIR (G446008,P238560,DP440413)

EASEMENT FOR DRAINAGE 1.22 WIDE (J2352 & DP106510)
RIGHT OF CARRIAGEWAY & EASEMENT FOR LIGHT AND AIR (DP 238560 & DP 220397)

(A) EASEMENT FOR PUBLIC ACCESS (A)
(B) EASEMENT FOR LIGHT AND AIR & OVERHANG 3 WIDE AND VARIABLE (B)
(C) EASEMENT TO PERMIT ENCROACHING LIFT TO REMAIN (C)
(D) EASEMENT TO PERMIT STAIR STRUCTURE TO REMAIN (D)
(E) POSITIVE COVENANT FOR MAINTENANCE & REPAIR OF LIFT AND STAIR STRUCTURE (E)
(F) EASEMENT FOR THE SUPPORT OF JENKINS STREET (F)
(G) EASEMENT FOR FUTURE SERVICES (G)
(H) RESTRICTION ON THE USE OF LAND (H)

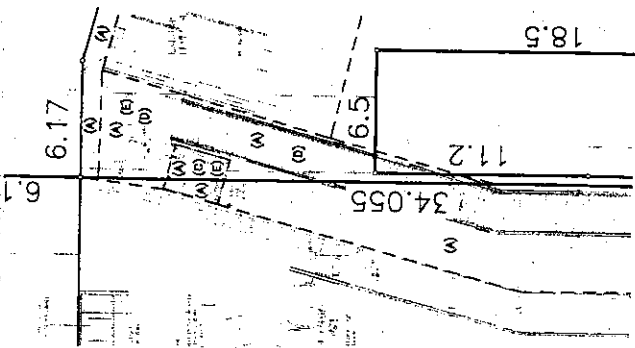


DIAGRAM 2
1:200

CONTRACT PLAN

Plan compiled from
architectural CAD data.

Plan is subject to final survey after completion of construction.

PRINTED 10-04-2003
(REVISION 1)

003/00252 CITY DEVELOPMENT DIVISION APPROVAL

Development drawings approved subject to conditions by delegation / Council / Central Sydney Planning Committee pursuant to Section 31 (1) (s) of the Environment Planning & Assessment Act 1979

dated 02 JUL 2003
signature: *Bochard*

PT 13

PROPOSED RESIDENTIAL BUILDING

1

[illegible]

62

NSW Environment Protection Authority**SITE AUDIT STATEMENT**

Schedule 1, Form 2 (Contaminated Land Management Regulation 1998)

SITE AUDITOR (accredited under the *Contaminated Land Management Act 1997*):

Name: Mr Ross McFarland  Phone: 02 9950 0200
Company: CH2M HILL Australia Pty Ltd Fax: 02 9950 0600
Address: Level 7, 9 Help Street Accred. No: 9819
CHATSWOOD NSW 2067

SITE AUDIT STATEMENT NO: 2002/17 B

SITE DETAILS:

Address: 38 Hickson Rd, Millers Point

Postcode: 2000

Lot and DP number: Part Lot 3 in Deposited Plan 873158, as shown on attached registered survey plan (Rygate and Company Pty Ltd - reference 69068) with area highlighted by bold outline in attached Architectural plan (reference Number: 64259:AD405003, Issue D)

Local government area: Sydney City Council

SITE AUDIT REQUESTED BY:

Name: Mark Burns
Company: Bovis LendLease Pty Ltd
Address: Level 13, Tower Building, Australia Square
SYDNEY, NSW Postcode: 2000
Phone: 02 - 9237 6194 Fax: 02 - 9237 5744
Name of contact person (if different from above): AS ABOVE

Consultancy(ies) who conducted the site investigation(s) and/or remediation:

URS Australia Pty Ltd

Axis Environmental Pty Ltd

Hyder Consulting

Johnstone Environmental Technology

Title(s) of report(s) reviewed:

- URS (2003) Validation Report, 38 Hickson Road, Millers Point, NSW. Final Report. 25 June 2003., URS reference Number: 45529/017-0807 – R001_Final
-

Other information reviewed:

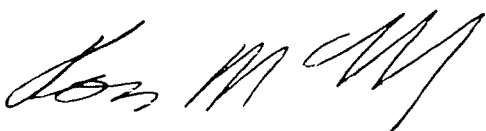
- URS (2003) 38 Hickson Road Validation Report – Response to Auditor comments on Draft Validation Report, dated 24 June 2003, (URS Reference Number 45529-021-08).
- Sydney Water Corporation (2003) Consent to Discharge groundwater from 38 Hickson Road to Sydney Water's sewer, letter confirming discharge approval, dated 5 June 2003
- URS (2003) Supplemental Human Health risk Assessment, 38 Hickson road, Millers Point, NSW, dated 14 April 2003, URS Reference Number 45529-017-0810.
- AJM Environmental Services Pty Ltd (2003) Groundwater Handling and treatment Report, 20 January 2003.
- URS (2002) Groundwater Investigation, 30-38 Hickson Road, Miller's Point, Sydney NSW. 1 February 2002.
- URS (2002) Remediation Action Plan, 30-38 Hickson Road, Miller's Point, Sydney NSW. 10 April 2002.
- URS (2002) In-Situ Material Classification and Further Delineation of the Location of the Annulus - 30-38 Hickson Road, Miller's Point, Sydney, NSW. 14 May 2002.
- URS (2002) Further Groundwater Investigations at 30-38 Hickson Road, Miller's Point, Sydney NSW. 15 May 2002.
- URS (2002) Risk Assessment, Bovis Lend Lease Hickson Road, Miller's Point. 31 May 2002.
- Axis Environmental Consultants Pty Ltd (1994) Environmental Assessment Report, Hickson Road Site for Maritime Services Board. 4 August 1994.
- Axis Environmental Consultants Pty Lt. (1994) Summary Contamination Assessment Report, Hickson Road Site for Maritime Services Board. 18 August 1994.
- Hyder Consulting (1998) Environmental Site Assessment, Hickson Road and Port Area, Millers Point, Sydney. September 1998.
- Johnstone Environmental Technology (JET) (1993) Report of Contamination Investigation at MSB Property, Hickson Road, Sydney. August 1993.

Summary Site Audit Report

Title: Residential Sector 38 Hickson Road, Millers Point, NSW, Summary Site Audit Report (SSAR 2002/17 B)

Date : June 2003

I have completed a site audit (as defined in the *Contaminated Land Management Act 1997*) and reviewed the reports and information referred to above with due regard to relevant laws and guidelines. I certify that the site (tick all appropriate boxes):



(a) is suitable for the following use(s):

- ☐ residential, including substantial vegetable garden and poultry;
- ☐ residential, including substantial vegetable garden excluding poultry;
- ☐ residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake) excluding poultry;
- ☒ residential with minimal opportunity for soil access, including units;
- ☐ daycare centre, preschool, primary school;
- ☐ secondary school;
- ☐ park, recreational open space, playing field
- ☐ commercial/industrial use;
- ☒ other (please specify): may include provision of childcare centre within the property.

subject to:

condition(s) (please specify):

(b) ~~is not suitable for any beneficial use due to risk of harm from contamination.~~

☐ (comments):

I am accredited by the NSW Environment Protection Authority under *the Contaminated Land Management Act 1997* as a Site Auditor.

Accreditation Number: 9819

I certify that:

- (a) I have personally examined and am familiar with the information contained in this statement, including the reports and information referred to in this statement, and
- (b) this statement is, to the best of my knowledge, true, accurate and complete, and
- (c) on the basis of my inquiries made to those individuals immediately responsible for making the reports, and obtaining the information, referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties for wilfully submitting false, inaccurate or incomplete information.

Signed:



Date:

30 June 2003

FORWARD TO:

Manager, Contaminated Sites Section
NSW Environment Protection Authority
PO Box A290
SYDNEY SOUTH NSW 1232

Phone: 02 9995 5614

Fax: 02 9995 5999

SP 61857 & SP 51643
(D= 1607712)



SCHEDULE OF EXISTING EASEMENTS AFFECTING PARTS OF LOTS 11, 12, 13 & JENKINS ST.

- 1) EASEMENT FOR LIGHT AND AIR (OP 873160)
- 2) EASEMENT FOR ACCESS (OP 873161)
- 3) EASEMENT FOR ACCESS (OP 873162)
- 4) EASEMENT FOR STORMWATER DRAINAGE PURPOSES 2 WIDE (OP 873168)
- 5) PROPOSED EASEMENT FOR LIGHT AND AIR
- 6) EASEMENT FOR WATER SUPPLY WORKS 3 WIDE & VARIABLE (OP 873169)
- 7) EASEMENT FOR NERPAGE PURPOSES OVER EXISTING LINE OF PIPES (OP 873158)
- 8) RIGHT OF CARREGWAY VARIABLE WIDTH (OP 873150)
- 9) SERVICES EASEMENT VARIABLE WIDTH (OP 873168)
- 10) TRANSMISSION PURPOSES (OP 873158)
- 11) EASEMENT FOR DRAINAGE OVER EXISTING LINE OF PIPES (OP 873158)
- 12) EASEMENT FOR SEWERAGE PURPOSES (OP 873158)
- 13) RIGHT OF CARREGWAY & EASEMENT FOR LIGHT AND AIR (P446008/P238569,P44C413)
- 14) PROPOSED RIGHT OF CARREGWAY (OP 873158)
- 15) PROPOSED RIGHT OF CARREGWAY (OP 873158)
- 16) RIGHT OF CARREGWAY 1.22 MILE (OP 873152)
- 17) EASEMENT FOR DRAINAGE 1.22 MILE (OP 873152)
- 18) RIGHT OF CARREGWAY & EASEMENT FOR LIGHT AND AIR (P41085/U)

NOTE A - PT 11 AND JENKINS STREET
BURDENED BY EXISTING EASEMENTS
1,2,3,4,5,6,7,8,9,10,11,13

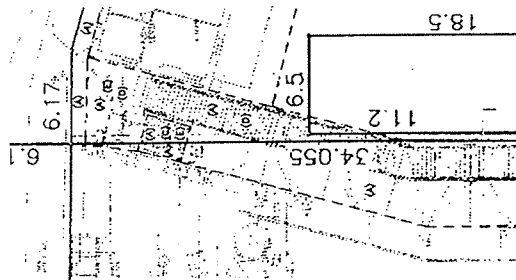


DIAGRAM 2
1:20C

Plan compiled from architectural CAD data.

Plan is subject to final
survey after completion
of construction.

PRINTED 10-04-2003
(REVISION 1)

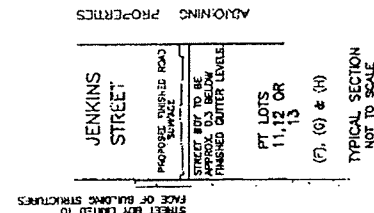
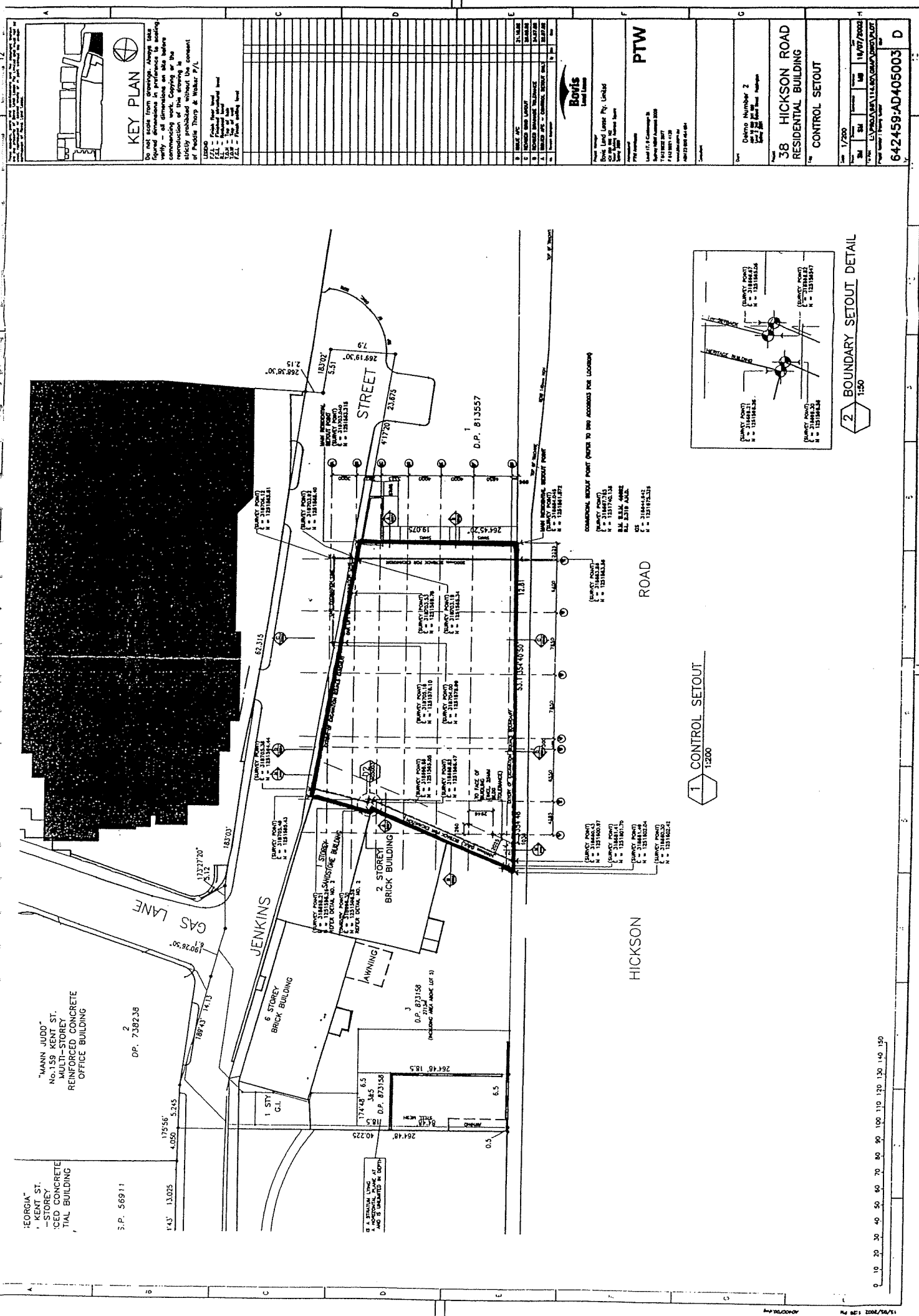


DIAGRAM 1

[illegible]

SAFETY'S REFERENCE: 020208 DRAFT DP

SP	145	153	161	169	177	185	193	201	209	217	225	233	240	250
WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION														



Appendix F

Mass Balance Calculations

TABLE F1 - CURRENT SITE CONDITIONS (ZONE 1 AND 2)

CONTAMINANT MASS CALCULATIONS

VMP REMEDIATION EXTENT

LEND LEASE

									COMPARISON OF ZONE 1 AND 2 PRE & POST REMEDIATION SITE CONDITIONS				
		CoPC	Ave conc (mg/kg)	Estimated volume (m3)	Weight (T)	Weight (kg)	Total contaminant mass (mg/kg)	Total contaminant mass (kg)	Total Unremediated Site (kg)	% Contaminant Mass currently in Zone 1	Remediated Site (kg)	Remediated Site (average mg/kg)	Site wide reduction - Post Remediation
Zone 1 - eastern fill materials to be remediated (refer to Table F3 for Zone 1 detail)	Zone 1 - Block 4 fill materials to be remediated	Naphthalene	809	43,000	86,000	86,000,000	69,574,000,000	69,574					
		TPH C10 - C14	2,621	43,000	86,000	86,000,000	225,406,000,000	225,406					
	Zone 1 - Block 5 fill materials to be remediated	Naphthalene	64	23,200	46,400	46,400,000	2,969,600,000	2,970					
		TPH C10 - C14	262	23,200	46,400	46,400,000	12,156,800,000	12,157					
	Zone 1 - Hickson Road fill materials to be remediated	Naphthalene	1,190	15,800	31,600	31,600,000	37,604,000,000	37,604					
		TPH C10 - C14	5,956	15,800	31,600	31,600,000	188,209,600,000	188,210					
	Total	Naphthalene	-	82,000	164,000	164,000,000	110,147,600,000	110,148	110,251	99.9%	4,160	14.4	96.2%
	Total	TPH C10 - C14	-	82,000	164,000	164,000,000	425,772,400,000	425,772	429,164	99.2%	23,428	80.9	94.5%
Zone 2 - western fill materials proposed to remain <i>In Situ</i>		Naphthalene	0.8	62,800	125,600	125,600,000	102,992,000	103					
		TPH C10 - C14	27.0	62,800	125,600	125,600,000	3,391,200,000	3,391					

TABLE F2 - POST REMEDIATION SITE CONDITIONS (ZONE 1 AND 2)

CONTAMINANT MASS CALCULATIONS

VMP REMEDIATION EXTENT

LEND LEASE

		% Reduction Achieved	CoPC	Ave conc (mg/kg)	Estimated volume (m3)	Weight (T)	Weight (kg)	Total contaminant mass (mg/kg)	Total contaminant mass (kg)
Zone 1 - eastern fill materials after contaminant mass reduction	Zone 1 - Block 4 fill materials to be remediated	100%	Naphthalene	0	43,000	86,000	86,000,000	0	0
		100%	TPH C10 - C14	0	43,000	86,000	86,000,000	0	0
	Zone 1 - Block 5 fill materials to be remediated	90%	Naphthalene	6.4	23,200	46,400	46,400,000	296,960,000	297
		90%	TPH C10 - C14	26.2	23,200	46,400	46,400,000	1,215,680,000	1,216
	Zone 1 - Hickson Road fill materials to be remediated	90%	Naphthalene	119.0	15,800	31,600	31,600,000	3,760,400,000	3,760
		90%	TPH C10 - C14	595.6	15,800	31,600	31,600,000	18,820,960,000	18,821
		Total	Naphthalene	-	82,000	164,000	164,000,000	4,057,360,000	4,057
		Total	TPH C10 - C14	-	82,000	164,000	164,000,000	20,036,640,000	20,037
Zone 2 - western fill materials			Naphthalene	1	62,800	125,600	125,600,000	102,992,000	103
			TPH C10 - C14	27	62,800	125,600	125,600,000	3,391,200,000	3,391

TABLE F3 - SUMMARY OF CURRENT ZONE 1 TO 4 CONDITIONS
CONTAMINANT MASS CALCULATIONS
VMP REMEDIATION EXTENT
LEND LEASE

		CoPC	Ave conc (mg/kg)	Estimated volume (m3)	Weight (T)	Weight (kg)	Total contaminant mass (mg/kg)	Total contaminant mass (kg)	% of Total mass (Zone 1 to 4)
Zone 1 - Onsite within Remediation Area	Zone 1 - Block 4 fill materials to be remediated	Naphthalene	809	43,000	86,000	86,000,000	69,574,000,000	69,574	53.5%
		TPH C10 - C14	2,621	43,000	86,000	86,000,000	225,406,000,000	225,406	42.6%
	Zone 1 - Block 5 fill materials to be remediated	Naphthalene	64	23,200	46,400	46,400,000	2,969,600,000	2,970	2.3%
		TPH C10 - C14	262	23,200	46,400	46,400,000	12,156,800,000	12,157	2.3%
	Zone 1 - Hickson Road fill materials to be remediated	Naphthalene	1,190	15,800	31,600	31,600,000	37,604,000,000	37,604	28.9%
		TPH C10 - C14	5,956	15,800	31,600	31,600,000	188,209,600,000	188,210	35.6%
	Totals	Naphthalene	801	82,000	164,000	164,000,000	131,364,000,000	110,148	84.8%
	Totals	TPH C10 - C14	3,163	82,000	164,000	164,000,000	518,732,000,000	425,772	80.5%
Zone 2 - Onsite within upper fill outside Remediation Area		Naphthalene	0.8	51,600	103,200	103,200,000	82,560,000	83	0.1%
		TPH C10 - C14	26	51,600	103,200	103,200,000	2,683,200,000	2,683	0.5%
Zone 2 - Onsite within lower fill outside Remediation Area		Naphthalene	9.3	11,200	22,400	22,400,000	208,320,000	208	0.2%
		TPH C10 - C14	79	11,200	22,400	22,400,000	1,769,600,000	1,770	0.3%
Zone 2 - Onsite within marine sediments outside Remediation Area		Naphthalene	120	10,120	20,240	20,240,000	2,428,800,000	2,429	1.9%
		TPH C10 - C14	394	10,120	20,240	20,240,000	7,974,560,000	7,975	1.5%
Zone 3 - Offsite upper fill <u>within</u> 20m of Declaration Area		Naphthalene	5.5	53,920	107,840	107,840,000	593,120,000	593	0.5%
		TPH C10 - C14	61	53,920	107,840	107,840,000	6,578,240,000	6,578	1.2%
Zone 3 - Offsite lower fill <u>within</u> 20m of Declaration Area		Naphthalene	41	8,800	17,600	17,600,000	721,600,000	722	0.6%
		TPH C10 - C14	38	8,800	17,600	17,600,000	668,800,000	669	0.1%
Zone 3 - Offsite marine sediments <u>within</u> 20m of Declaration Area		Naphthalene	474	9,960	19,920	19,920,000	9,442,080,000	9,442	7.3%
		TPH C10 - C14	2,502	9,960	19,920	19,920,000	49,839,840,000	49,840	9.4%
Zone 4 - Offsite upper fill <u>outside</u> 20m of Declaration Area		Naphthalene	1.2	309,920	619,840	619,840,000	743,808,000	744	0.6%
		TPH C10 - C14	30	309,920	619,840	619,840,000	18,595,200,000	18,595	3.5%
Zone 4 - Offsite lower fill <u>outside</u> 20m of Declaration Area		Naphthalene	22	50,400	100,800	100,800,000	2,217,600,000	2,218	1.7%
		TPH C10 - C14	25	50,400	100,800	100,800,000	2,520,000,000	2,520	0.5%
Zone 4 - Offsite marine sediments <u>outside</u> 20m of Declaration Area		Naphthalene	17.0	99,400	198,800	198,800,000	3,379,600,000	3,380	2.6%
		TPH C10 - C14	64.0	99,400	198,800	198,800,000	12,723,200,000	12,723	2.4%

Sub-total - Zone 3 & 4 mass within offsite fill materials	Naphthalene	3.3%
	TPH C10 - C14	5.4%
Sub-total - Zone 3 & 4 mass within marine sediments (max 5m)	Naphthalene	9.9%
	TPH C10 - C14	11.8%

Total Zone 1 to 4 mass (kg):	Naphthalene	129,965
In fill and marine sediments	TPH C10 - C14	529,125

Total Zone 1 to 4 mass (kg):	Naphthalene	114,715
In fill material only	TPH C10 - C14	458,587

Current mass in Zone 2 to 4 marine sediments	Naphthalene	15,250	11.7%
	TPH C10 - C14	70,538	13.3%

TABLE F4 - SUMMARY OF ZONE 1 TO 4 CONDITIONS (POST-REMEDATION)

CONTAMINANT MASS CALCULATIONS

VMP REMEDIATION EXTENT

LEND LEASE

		CoPC	Ave conc (mg/kg)	Estimated volume (m3)	Weight (T)	Weight (kg)	Total contaminant mass (mg/kg)	Total contaminant mass (kg)	% of Total mass (Zone 1 to 4)
Zone 1 - Onsite within Remediation Area	Zone 1 - Block 4 fill materials to be remediated	Naphthalene	0	0	0	0	0	0	0.0%
		TPH C10 - C14	0	0	0	0	0	0	0.0%
	Zone 1 - Block 5 fill materials to be remediated	Naphthalene	6.4	23,200	46,400	46,400,000	296,960,000	297	1.2%
		TPH C10 - C14	26.2	23,200	46,400	46,400,000	1,215,680,000	1,216	1.0%
	Zone 1 - Hickson Road fill materials to be remediated	Naphthalene	119.0	15,800	31,600	31,600,000	3,760,400,000	3,760	15.8%
		TPH C10 - C14	595.6	15,800	31,600	31,600,000	18,820,960,000	18,821	15.3%
	Totals	Naphthalene		39,000				4,057	17.0%
	Totals	TPH C10 - C14		39,000				20,037	16.2%
Zone 2 - Onsite within upper fill outside Remediation Area		Naphthalene	0.8	51,600	103,200	103,200,000	82,560,000	83	0.3%
		TPH C10 - C14	26	51,600	103,200	103,200,000	2,683,200,000	2,683	2.2%
Zone 2 - Onsite within lower fill outside Remediation Area		Naphthalene	9.3	11,200	22,400	22,400,000	208,320,000	208	0.9%
		TPH C10 - C14	79	11,200	22,400	22,400,000	1,769,600,000	1,770	1.4%
Zone 2 - Onsite within marine sediments outside Remediation Area		Naphthalene	120	10,120	20,240	20,240,000	2,428,800,000	2,429	10.2%
		TPH C10 - C14	394	10,120	20,240	20,240,000	7,974,560,000	7,975	6.5%
Zone 3 - Offsite upper fill within 20m of Declaration Area		Naphthalene	5.5	53,920	107,840	107,840,000	593,120,000	593	2.5%
		TPH C10 - C14	61	53,920	107,840	107,840,000	6,578,240,000	6,578	5.3%
Zone 3 - Offsite lower fill within 20m of Declaration Area		Naphthalene	41	8,800	17,600	17,600,000	721,600,000	722	3.0%
		TPH C10 - C14	38	8,800	17,600	17,600,000	668,800,000	669	0.5%
Zone 3 - Offsite marine sediments within 20m of Declaration Area		Naphthalene	474	9,960	19,920	19,920,000	9,442,080,000	9,442	39.5%
		TPH C10 - C14	2,502	9,960	19,920	19,920,000	49,839,840,000	49,840	40.4%
Zone 4 - Offsite upper fill outside 20m of Declaration Area		Naphthalene	1.2	309,920	619,840	619,840,000	743,808,000	744	3.1%
		TPH C10 - C14	30	309,920	619,840	619,840,000	18,595,200,000	18,595	15.1%
Zone 4 - Offsite lower fill outside 20m of Declaration Area		Naphthalene	22	50,400	100,800	100,800,000	2,217,600,000	2,218	9.3%
		TPH C10 - C14	25	50,400	100,800	100,800,000	2,520,000,000	2,520	2.0%
Zone 4 - Offsite marine sediments outside 20m of Declaration Area		Naphthalene	17.0	99,400	198,800	198,800,000	3,379,600,000	3,380	14.2%
		TPH C10 - C14	64.0	99,400	198,800	198,800,000	12,723,200,000	12,723	10.3%

Sub-total - Zone 3 & 4 mass within offsite fill materials	Naphthalene	17.9%
	TPH C10 - C14	23.0%
Sub-total - Zone 3 & 4 mass within marine sediments (max 5m)	Naphthalene	53.7%
	TPH C10 - C14	50.7%

Total Zone 1 to 4 mass (kg): In fill and marine sediments	Naphthalene	23,875
	TPH C10 - C14	123,389

Total Zone 1 to 4 mass (kg): In fill material only	Naphthalene	8,624
	TPH C10 - C14	52,852

Residual mass remaining in Zone 2 to 4 marine sediments	Naphthalene	15,250	63.9%
	TPH C10 - C14	70,538	57.2%