Appendix A*

Noise Assessment

ACOUSTICS AND AIR

CALTEX KURNELL ASBESTOS CONTAMINATED SOIL (ACS) MANAGEMENT PROJECT

CONSTRUCTION NOISE ASSESSMENT

REPORT NO. 16284
VERSION C

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PREPARED FOR

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

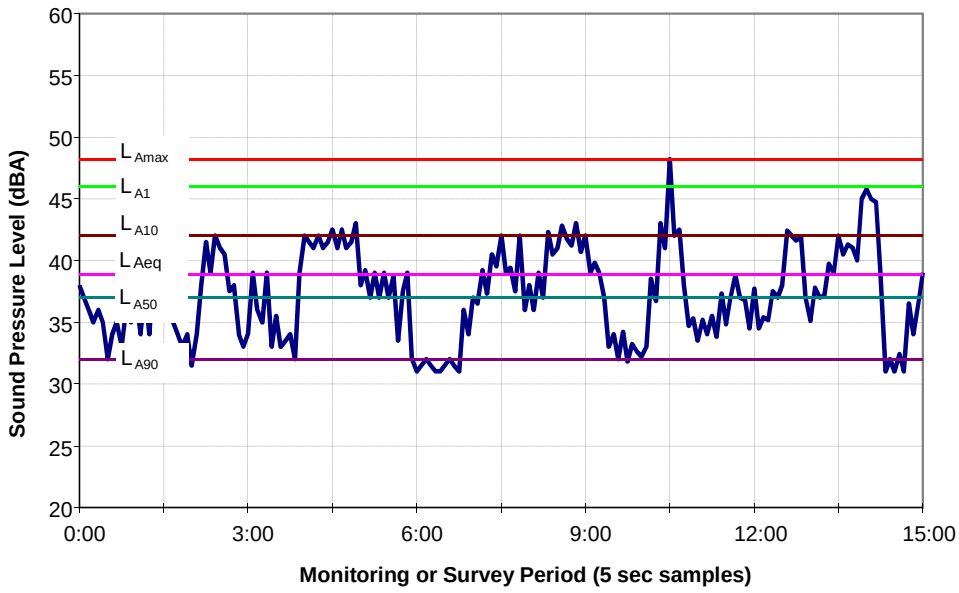
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Caltex Australia Petroleum Pty Ltd (hereafter referred to as Caltex) initiated the Asbestos Contaminated Soil (ACS) Management Project at its Kurnell site in order to resolve an ongoing hygiene issue with the pipeways. The ASC Management works (the ACS Modification works) would run broadly in parallel with the approved demolition works on site and Caltex seeks to modify its existing approval for this purpose.

Wilkinson Murray Pty Limited (WM) has previously undertaken environmental noise assessments on behalf of Caltex in relation to the on-site demolition works. WM has now been engaged to provide a desktop noise assessment for the coinciding ACS Modification works.

The ACS Modification works would broadly involve the following activities within the ACS Modification area:

- Construction of the ACS containment cell base and leachate collection system in the proposed cell location;
- Installation of ground water monitoring wells down gradient of the cell location;
- Excavation and transportation of ACSs that fall within general or restricted solid waste to the cell location;
- Excavation and transportation of ACSs that fall within hazardous solid waste to biopile location;
- Operation of the biopile remediation system to reduce the ACS hazardous solid waste to ACS restricted solid waste;
- Filling and compaction of the ACSs into the containment cell;
- Verifying the removal of ACS from the pipeways (and other areas on site as necessary);
- Closure of the containment cell; and
- Managing and monitoring the containment cell into the future.

In the event that biopiling does not effectively reduce the level of contaminants to a restricted level in the required timeframe, Special Hazardous Waste will be removed off-site for treatment and disposal at an appropriately licenced facility.

The location of the Site, the Project Area, pipelines, containment cell and noise sensitive receivers considered by this assessment are shown in Figure 1-1.

Figure 1-1 ACS Project Area

2 ASC CONSTRUCTION PROGRAM

The ACS Modification works to construct, fill and close the cell are estimated to take approximately 18 months (commencing January 2017 and concluding June 2018). The five main stages are described in Table 2-1, along with the approximate durations for each stage and locations on site. Additionally, construction equipment required for the works and corresponding sound power levels are shown in the table. Further specifics relating to the layout of the containment cells and locations of the hazardous material on the Site are provided in the SEE.

Table 2-1 Constructions Stages and Equipment

ACS Modification Works Stages	Approximate Duration	Location on Site	Construction Equipment	Equipment Quantities	Sound Power Level per Plant Item (dBA)	Activity Sound Power Level (dBA)
Cell Construction	6 months	Tank Bunds for 224, 225, 333, 334, 335	Water Truck	1	108	111
			Trucks with aggregate and liners	4 per day all week for up to 3 separate weeks over 6 months	105	
			Compactor	1	107	
			Manitou Forklift	1	95	
			Small excavator – 5 T	1	100	
			D6 Dozer	1	113	
Excavation and Transport of ACSs	6 months	Pipeways with ACS	Excavator	1	108	108
			Truck and Dog	1	105	
			Water Truck	1	108	
ACS Preparation (via biopiling) Involving three discrete stages: Homogenisation; Biopile construction / deconstruction; and Biopile Operation.	11 months	Tank Bunds T328, T353, T354, T215, T214, T327, T213 and T325	360 degree 30 tonne crawler mounted back actor-excavator	1	98	104
			Allu Screener Crusher Bucket (or similar)	1	103	
			Water bowser with spray feed	1	107	
			Trucks	2	105	110
			Whacker rammer	1	107	
			Welder tools	1	90	
			Bulldozer	1	113	
			Small Excavator	1	100	
			Tank and spray feed	1	95	
			Tank and spray feed	1	95	100
			Vacuum blower	4	100	
Cell Filling & Management	6 months	Tank Bunds for 224, 225, 333, 334, 335	D6 Dozer	1	113	102
			Water Truck	1	107	
			Compactor	1	107	
Cell Closure	6 months	Tank Bunds for 224,	D6 Dozer	1	113	111
			Water Truck	1	108	

ACS Modification Works Stages	Approximate Duration	Location on Site	Construction Equipment	Equipment Quantities	Sound Power Level per Plant Item (dBA)	Activity Sound Power Level (dBA)
		225, 333, 334, 335	Compactor	1	107	
			Manitou Forklift	1	95	
			Trucks with aggregate and liners	4 per day all week for up to 3 separate weeks over 3 months	105	
			Small excavator – 5 T	1	100	

Note: * It is unlikely that the mobile plant items identified would all concurrently operate at full capacity. The calculated total sound power level includes a -5dB correction to account for the operational on-time of the identified plant items.

2.1 Construction Hours

In accordance with the conditions of the approved demolition works:

- Construction is to be completed between 7.00 am and 10.00 pm seven days a week;
- High noise generating construction and demolition works would be confined to less sensitive times of the day, and shall not be undertaken on Sundays or public holidays or outside the hours of 7.00 am to 6.00 pm Monday to Saturday; and
- Construction outside these hours would only be undertaken in unique circumstances.

3 NOISE SENSITIVE RECEPTORS

Potentially affected noise sensitive receptors, as identified by WM's previous assessments, are as follows:

- Receiver R1 – 44-64 Cook Street (Industrial Premises). Industrial premises adjacent to the Site to the west and sharing a common boundary.
- Receiver R2 – 30D Cook Street (Residential). Residential property adjacent to the Site to the west and sharing a common boundary.
- Receiver R3 – Reserve Road (Residential). Residential properties north of the Site.
- Receiver R4 – Prince Charles Parade (Residential). Residential properties close to the eastern right of way.
- Receiver R5 – Corner of Captain Cook Drive and Silver Beach Road (Residential). Residential properties north of the Site.
- Receiver R6 – Tasman Street (Residential). Residential property west of the Site.
- Receiver R7 – 35 Cook Street (Residential). Residential property north of the Site.
- Receiver R8 – End of Chisholm Road (Industrial Premises). Industrial premises adjacent to

the Site to the west and sharing a common boundary.

- Receiver R9 – Sir Joseph Banks Drive (Industrial Premises). Industrial premises on the other side of Sir Joseph Banks Drive to the west of the Site.

Figure 1-1 shows the locations of the above receptors. It should be noted there are no residential receivers to the south of the Site that could be affected by the noise from the Project.

4 NOISE CRITERIA

Consistent with the demolition noise assessment, this assessment considers the approved noise limits set out in the existing Development Consent for Application SSD 5544, pursuant to Section 89E of the Environmental Planning and Assessment Act 1979 in 2014. This is deemed appropriate as the noise limits were established using the typical minimum background levels and are consistent with the *Interim Construction Noise Guideline (ICNG)*.

4.1 Existing Development Consent Noise Limits

Condition C16 of SSD 5544 MOD1 requires that the construction / demolition noise does not exceed the criteria in Table 4-1.

Table 4-1 Construction Noise Limits in SSD 5544

Location	Day, $L_{Aeq,15min}$	Evening , $L_{Aeq,15min}$
R2 – 30D Cook Street	46	40
At any other residence or other noise sensitive receivers	50	45

5 CONSTRUCTION NOISE ASSESSMENT

Noise levels at surrounding residential receivers have been predicted using the "CadnaA" acoustic noise prediction software implementing the ISO 9613 noise prediction algorithm with consideration to the construction noise sources identified in Table 2-1. Factors that are addressed in the noise modelling are:

- equipment sound level emissions and location;
- receiver locations / ground topography;
- noise attenuation due to geometric spreading;
- ground absorption; and
- atmospheric absorption.

The CadnaA modelling software is accepted by the EPA for use in environmental noise assessments.

Table 5-1 sets out the worst-case noise levels predicted to arise during the ACS Modification works together with the noise contributions predicted to arise from other potentially coinciding works and operations on the Kurnell site, these being:

- the refinery demolition works (as identified by the WM report prepared for the proposed modification to Development Consent SSD 5544 – Report No. 14074 Ver C dated October 2014); and
- the Sustainable Soil Regeneration Facility (SSRF) operation (as identified by the WM report prepared for the proposed works – Report No. URS14416 Ltr 100615).

The predicted cumulative noise levels that may result should all identified works and operational components occur concurrently are compared against the relevant criteria for each sensitive receptor in the table.

Table 5-1 Predicted Noise Levels – ACS Construction Works – $L_{Aeq,15min}$

#	Sensitive Receptors	Predicted $L_{Aeq,15min}$ Noise Level				Day Criteria 07:00-18:00h $L_{Aeq,15min}$ (dBA)	Eve Criteria 18:00-22:00h $L_{Aeq,15min}$ (dBA)	Complies with Criteria (Yes / No)	
		ACS Construction	Refinery Demolition	SSRF Operation	Cumulative			Day	Eve
R1	Cook Street (Industrial Premises)	38	51	26	51	75	75	Yes	Yes
R2	30D Cook Street (Residential Premises)	40	**50**	25	**50**	46	40	**No**	**No**
R3	Reserve Road (Residential Premises)	35	**50**	23	**50**	50	45	Yes	**No**
R4	Prince Charles Parade (Residential Premises)	28	40	24	40	50	45	Yes	Yes
R5	Corner of Captain Cook Drive and Silver Beach Rd (Residential Premises)	32	42	30	43	50	45	Yes	Yes
R6	Tasman Street (Residential Premises)	29	44	27	44	50	45	Yes	Yes
R7	Cook Street (Residential Premises)	33	45	28	45	50	45	Yes	Yes
R8	End of Chisholm Road (Industrial Premises)	34	45	41	47	75	75	Yes	Yes
R9	Sir Joseph Banks Drive (Industrial Premises)	37	47	44	49	75	75	Yes	Yes

As shown in Table 5-1, the ACS Modification works would not be expected to generate any exceedances of the established construction noise criteria.

The identified cumulative exceedances during the daytime and evening periods at R2 and during the evening period at R3 are wholly controlled by the proposed refinery demolition works. On

their own the ACS Modification works would not be expected to impact these receivers.

The ACS Modification works noise contribution is at least 10 dB less than the demolition noise contribution for all receivers and, as such, no cumulative noise increase would be expected over the levels predicted by the assessment prepared for the demolition works (SSD 5544 MOD1).

6 OFF-SITE TRAFFIC NOISE ASSESSMENT

6.1 Traffic Noise Criteria

Noise criteria for assessment of road traffic noise are set out in the NSW Government's *NSW Road Noise Policy (RNP)*.

Table 6-1 presents the assessment criteria for residences to be applied to particular types of project, road category and land use.

In summary, the noise level goals at the residential receivers for the demolition works based on the *RNP* are:

- $L_{Aeq,15hr}$ day 60 dBA
- $L_{Aeq,9hr}$ night 55 dBA

Table 6-1 Traffic Noise Criteria Extracted from the NSW *RNP*

Road Category	Type of Project / Land Use	Assessment Criteria – dBA	
		Day (7am-10pm)	Night (10pm-7am)
Freeway / arterial / sub-arterial roads	1. Existing residences affected by noise from **new** freeway / arterial / sub-arterial road corridors	$L_{Aeq,15hr}$ 55 (external)	$L_{Aeq,9hr}$ 50 (external)
	2. Existing residences affected by noise from **redevelopment** of existing freeway / arterial / sub-arterial roads	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)
	3. Existing residences affected by **additional traffic** on existing freeways / arterial / sub-arterial roads generated by land use developments		
Local roads	4. Existing residences affected by noise from **new** local road corridors	$L_{Aeq,1hr}$ 55 (external)	$L_{Aeq,1hr}$ 50 (external)
	5. Existing residences affected by noise from **redevelopment** of existing local roads		
	6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments		

In addition, where the above criteria are already exceeded as a result of existing traffic, the policy notes:

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

6.2 Traffic Noise Assessment

Vehicles related to the ACS Modification works would access the Site from Solander Street via Captain Cook Drive. Captain Cook Drive is the major access road to the Kurnell Peninsula on the southern shore of Botany Bay from the wider Sydney road network.

Dependent on the success of the biopiling works, up to approximately 180 truck and dog loads may be required to remove special hazardous waste from Site. It is likely that these movements would occur over a number of months. Over this period, approximately 3-4 heavy vehicle movements a day may be generated.

The existing traffic noise levels along the Captain Cook Drive already exceed the noise criteria of 60 and 55 dBA for the day and night, respectively. Captain Cook Drive east of Gannons Road has an average annual daily traffic flow of 38,810 (two-way) vehicles per day in 2012. Given these volumes, the noise contribution from traffic generated by the ACS works would be negligible at residences on Captain Cook Drive (that is, less than a 2 dB increase).

7 CONCLUSION

Caltex proposes to undertake Asbestos Contaminated Soil management on its Kurnell site. Wilkinson Murray has undertaken a desktop construction noise assessment in relation to these works.

This assessment has identified no further exceedances beyond those previously reported and therefore no further specific noise mitigation measures are warranted.

Notwithstanding this, it is recommended that relevant reasonable and feasible noise mitigation measures should be adhered to in order minimise and manage the potential noise impacts from the Site as a whole. It is understood that these measures are already being implemented during the demolition works at the Site and should be consistent where applicable.

Appendix B

Asbestos Containment Cell Concept Design Report

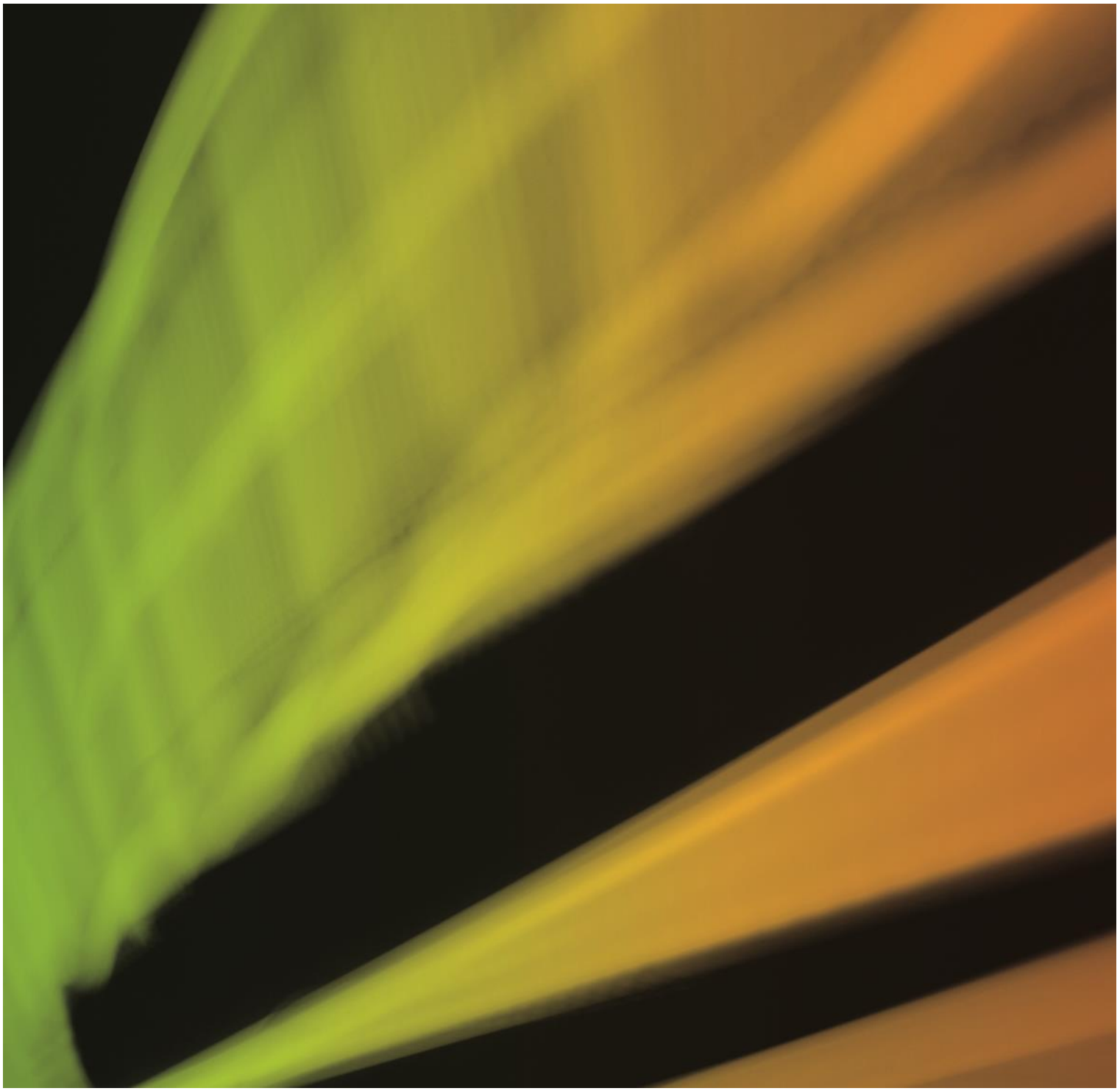
Kurnell Asbestos Contaminated Soil Management Project

Caltex Petroleum Australia Pty Ltd

29-Sep-2016

Doc No. 01

ACS Management Project - Containment Cell Concept Design



ACS Management Project - Containment Cell Concept Design

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Executive Summary

Caltex Australia Pty Ltd (Caltex) currently operates the Kurnell Terminal (the 'Site') on the southern side of Botany Bay, NSW. Between 1956 and 2014 the Site was used as both an oil refinery and a fuel terminal. In 2014 refining ceased and now the main purpose of the Site is as a fuel import terminal, although other ancillary and related operations also occur.

Caltex is aware that certain parts of the Site contain Asbestos Contaminated Soils (ACSs). This contamination is largely due to the historic use of asbestos containing materials (ACM) at the Site when it was operating as a refinery.

Investigations have shown that the ACS is predominantly located within the certain sections of the pipeways that cross the Site (the 'pipeways'). As such Caltex require an Exemption Order to Section 419 of the *Work, Health and Safety Regulation 2011* in order to complete conversion and demolition activities, routine maintenance, sampling, valve operations, weed removal etc. within the pipeways. The ongoing maintenance and operation work is required to maintain the safety of the Site, its employees, the local community and the environment. As a result of the presence of ACM, Caltex staff and contractors require special processes and equipment in order to work in these areas.

The ACSs in the pipeways are currently being managed in situ, however in order to remove the ongoing health and safety risks and to remove the operational constraints, Caltex initiated the Asbestos Contaminated Soil Management Project (the Project) to investigate whether another option would be a more appropriate long term solution and to develop and implement the preferred solution.

The *Kurnell ASC Management – Options Report* (AECOM, 2016b) identified that the best option for the long term management of the ACS, in light of the project objectives outlined below, is placement of ACS within an on-site containment cell.

The objective of the Project is to remove the hygiene risk posed by ACSs from the pipeways. Removing this risk will remove:

- the potential health risks associated with the presence of ACS;
- the operational constraints regarding work in the pipeways, and
- the additional costs associated with the operational constraints.

Therefore, removing the ACSs will in turn support the overall objective for the conversion of the Site from a refinery to a terminal which was "*to establish a viable, safe, reliable and sustainable finished product import terminal at Kurnell*".

The objectives of this study are to:

- Identify the type of waste and quantity of waste to be placed in the containment cell.
- Prepare a concept design for the containment cell.

Waste Classification

Based on review of the new and existing data provided in the *Pipeways Waste Classification Report*, the areas of soil required to be placed in the on-site containment cell, treated and disposed off-site or left in-situ have been calculated. The extent of each of these areas is shown on **Figure 2**. The calculated volumes are listed in **Table 1**.

Table 1 Kurnell Pipeways – Waste Classification and Estimated Waste Volume

Soil Category*		Area (ha)	Volume[1] (m^3)	Mass (tonnes)**
1	Remain in-situ (asbestos not detected)	3.48	6,955	-
2	On-site containment cell - Special Waste (Asbestos)/ General Solid Waste	3.57	7,960	10,600
3	On-site containment cell – Special Waste (Asbestos)/ Restricted Solid Waste	1.15	2,308	3,100
4	Special Waste (Asbestos)/ Hazardous Waste	1.44	2,880	3,850
Total volume for containment cell (2+3)		**4.72**	**10,268**	**13,700**
Total volume for containment cell (2+3+4)* **		**6.16**	**13,148**	**17,550**

**Waste Classification based on the Waste Classification Guidelines (EPA, 2014), Table 1 where TCLP was not undertaken and Table 2 where TCLP was undertaken.*

***The conversion density used for soil from m^3 to tonnes is 1.34 t/m^3 based on the average minimum dry density tests carried out for soils located at the proposed asbestos containment cell area and assuming a moisture content of 5%.*

**** Hazardous Waste will not be disposed of in the containment cell unless treated to a restricted level.*

The volume of waste was determined based on an excavation depth of 0.2 m in most instances. At three locations asbestos was detected at 0.5 m below ground. At these locations the volume of soil excavated will be to a depth of 0.5 m.

Hazardous Waste Options Analysis

Based on the waste classification undertaken approximately 3,850 tonnes (or 2,880 m^3) of soil in the pipeways has been classified as Special Hazardous Waste using the in-situ soil density. Using a 40% contingency to allow for sensitivities in soil density and volume estimating processes it has been assumed that 5,390 tonnes (or 4,032 m^3) of Special Hazardous Waste would require treatment and disposal.

The soil is contaminated with:

1. Friable asbestos;
2. Total Petroleum Hydrocarbons (TPH) (C10-C36 fraction);
3. Benzo(a)pyrene (restricted waste levels); and
4. Metals (restricted waste levels).

As per the Waste Classification Guidelines (EPA, 2014), waste classified as Hazardous Waste cannot be disposed of in NSW and must be treated prior to disposal. This requirement to not landfill un-treated Hazardous Waste has also been adopted in the recently released Landfill Guidelines (EPA, 2016), which states "*untreated hazardous wastes are not permitted to be landfilled in NSW. However some hazardous wastes can be treated to remove or lock up (immobilise) contaminants. This may enable the waste to be reclassified as restricted or general solid waste, and only then disposed of in a landfill*".

Therefore the following options for management of Special Hazardous Waste were considered:

- Option 1: Special Hazardous Waste sent off-site for pre-treatment and disposal by a licenced contractor.
- Option 2: Special Hazardous Waste treated on-site for specific contaminants to enable re-classification as Special Restricted Solid Waste as a minimum in accordance with the Waste Classification Guidelines (EPA, 2014) prior to disposal within the proposed containment cell.

The following on-site treatment methods were reviewed:

- Biopiling;
- Trommelling;

- Thermal Desorption;
- Stabilisation/solidification; and
- Soil washing.

Based upon the assessment of the Hazardous Waste treatment options (refer to **Table 2**), the potential risk to human health and the environment and the cost effectiveness of each option, the preferred option for managing Special Hazardous Waste from the pipeways, was considered to be remediation via trommelling. Biopiling and off-site disposal were ranked second and third respectively.

Table 2 Decision Matrix – Treatment of Special Hazardous Waste

Criteria	Weighting	Off-Site Disposal	Biopiling	Trommelling	Thermal Desorption	Stabilisation / Solidification	Soil Washing
(as detailed in Section 3.1)	(0-5)	Scores (0-5)					
Technical	5	4	3	2	4	0	3
Timing	3	5	3	4	4	3	4
Cost	4	2	4	5	1	3	2
Logistics	2	3	4	4	2	3	2
Sustainability	3	3	4	4	1	4	3
Final Score		**58**	**60**	**62**	**43**	**39**	**48**

The grades, ranging from 0 to 5, were attributed for each criterion-technology combination and final scores were obtained by multiplying the respective weight and score vectors.

Concept Design

The containment cell has been designed to create a maximum airspace capacity for up to 24,500 tonnes of ACS. The 24,500 tonnes has been determined based on the following:

- 10,600 tonnes of Special General Solid Waste;
- 3,100 tonnes of Special Restricted Solid Waste;
- 3,850 tonnes of Special Hazardous Waste, should treatment be conducted on-site to allow re-classification as either Special General Solid Waste or Special Restricted Solid Waste; and
- A 40% contingency[1] which allows for sensitivity in soil density and potential use of daily cover soils during waste placement if required.

Based on an average maximum wet density of 1.6 t/m^3; a 24,500 tonne capacity containment cell would require a waste containment volume of approximately 15,300 m^3. This airspace volume has been allowed between the top of the liner and leachate collection system layers and the underside of capping layers and the final height adopted during waste placement.

Provided the highest classification of waste contained within the containment cell is Special Restricted Solid Waste the containment cell has been designed in accordance with the requirements of a restricted landfill cell. The concept design of the proposed containment cell has been prepared generally in accordance with the Landfill Guidelines (EPA, 2016).

Due to the shallow groundwater level, excavation in the existing ground surface has been minimised as far as practicable to minor excavation in the sump bases.

The concept design drawings are provided in **Appendix A**. Draft technical specifications for key components of the containment cell barrier system are provided in **Appendix B**. These specifications will be finalised as part of the detailed design stage of the Project.

[1] Contingency has been allowed for based on sensitivities around soil type, soil density factors and treatment process

Recommendations

It is recommended that a small scale pilot trial should be conducted of intensive biopiling and trommelling to confirm the feasibility of treating Special Hazardous Waste using these methods to determine which option is more suitable given the contaminant concentrations in the soil.

Following acceptance of the concept design by Caltex a detailed design would be prepared including specifications and drawings suitable for inclusion in a tender package for the construction of the containment cell.

1.0 Introduction

1.1 Project Background

Caltex Australia Pty Ltd (Caltex) currently operates the Kurnell Terminal (the 'Site') on the southern side of Botany Bay, NSW. Between 1956 and 2014 the Site was used as both an oil refinery and a fuel terminal. In 2014 refining ceased and now the main purpose of the Site is as a fuel import terminal, although other ancillary and related operations also occur.

The process to convert the refinery to a terminal has involved a number of related activates including numerous upgrades and changes to operational infrastructure, as well as the removal and demolition of redundant infrastructure and waste. The objective of these conversion works was and remains as works progress "*to establish a viable, safe, reliable and sustainable finished product import terminal at Kurnell*". This includes providing a safe working environment at the terminal and also ensuring that the operation of the Site is not burdened by unnecessary costs.

Caltex is aware that certain parts of the Site contain Asbestos Contaminated Soils (ACSs). This contamination is largely due to the historic use of asbestos containing materials (ACM) at the Site when it was operating as a refinery.

Investigations have shown that the ACS is predominantly located within the certain sections of the pipeways that cross the Site (the 'pipeways'). As such Caltex require an Exemption Order to Section 419 of the *Work, Health and Safety Regulation 2011* in order to complete conversion and demolition activities, routine maintenance, sampling, valve operations, weed removal etc. within the pipeways. The ongoing maintenance and operation work is required to maintain the safety of the Site, its employees, the local community and the environment. As a result of the presence of ACM, Caltex staff and contractors require special processes and equipment in order to work in these areas.

Whilst Caltex implements a number of measures and controls to manage the risks related to working close to ACSs, their presence maintains an ongoing health and safety risk at the Site. It also creates operational constraints for working in the pipeways and in other areas should ACSs be identified as the demolition works progress. As such, Caltex would like to remove the ACSs from these areas as far as possible to reduce health and safety risks and to remove operational constraints.

The presence of ACSs at the Site was discussed in both the development application for the conversion works (SSD 5544) and the modification application for the demolition works (SSD 5544 MOD1). The risks associated with working within the pipeways and other areas that may contain ACSs were identified and assessed.

In the Statement of Environmental Effects (SEE) for SSD 5544 MOD1, Section 9.7.1 (URS, 2014) noted three potential options for managing asbestos:

1. Managing asbestos in situ;
2. Containment on site; and
3. Removal of contaminated material from the Site.

The ACSs in the pipeways are currently being managed in situ, however in order to remove the ongoing health and safety risks and to remove the operational constraints, Caltex initiated the Asbestos Contaminated Soil Management Project (the Project) to investigate whether one of the other two options would be a more appropriate long term solution and to develop and implement the preferred solution.

The *Kurnell ASC Management – Options Report* (AECOM, 2016b) identified that the best option for the long term management of the ACS, in light of the project objectives outlined below, is placement of ACS within an on-site containment cell. In order to support the conclusions in this report AECOM have also prepared the *Pipeways Asbestos Waste Classification* Report (AECOM, 2016a) which identified areas within the pipeways which contain asbestos and the *Kurnell Terminal Geotechnical / ESA* (AECOM, 2016c) which evaluated the geotechnical and environmental suitability of the proposed location.

1.2 Objectives

The objective of the Project is to remove the hygiene risk posed by ACSs from the pipeways. Removing this risk will remove:

- the potential health risks associated with the presence of ACS;
- the operational constraints regarding work in the pipeways, and
- the additional costs associated with the operational constraints.

Therefore, removing the ACSs will in turn support the overall objective for the conversion works "*to establish a viable, safe, reliable and sustainable finished product import terminal at Kurnell*".

The objectives of this study are to:

- Identify the type of waste and quantity of waste to be placed in the containment cell.
- Prepare a concept design for the containment cell.

1.3 Scope of Work

The following tasks were undertaken and documented in this report:

- Summarise the waste classification and estimated quantities of ACS identified in the *Pipeways Asbestos Waste Classification Report* (AECOM, 2016a) to determine the specifications for the concept design.
- Undertake an options assessment to identify a preferred method for treatment and disposal of Hazardous Waste contaminated with asbestos.
- Prepare a concept design for an on-site containment cell in accordance with the *NSW EPA Solid Waste Landfill Guidelines 2016* (the Landfill Guidelines).

1.4 Site Definition

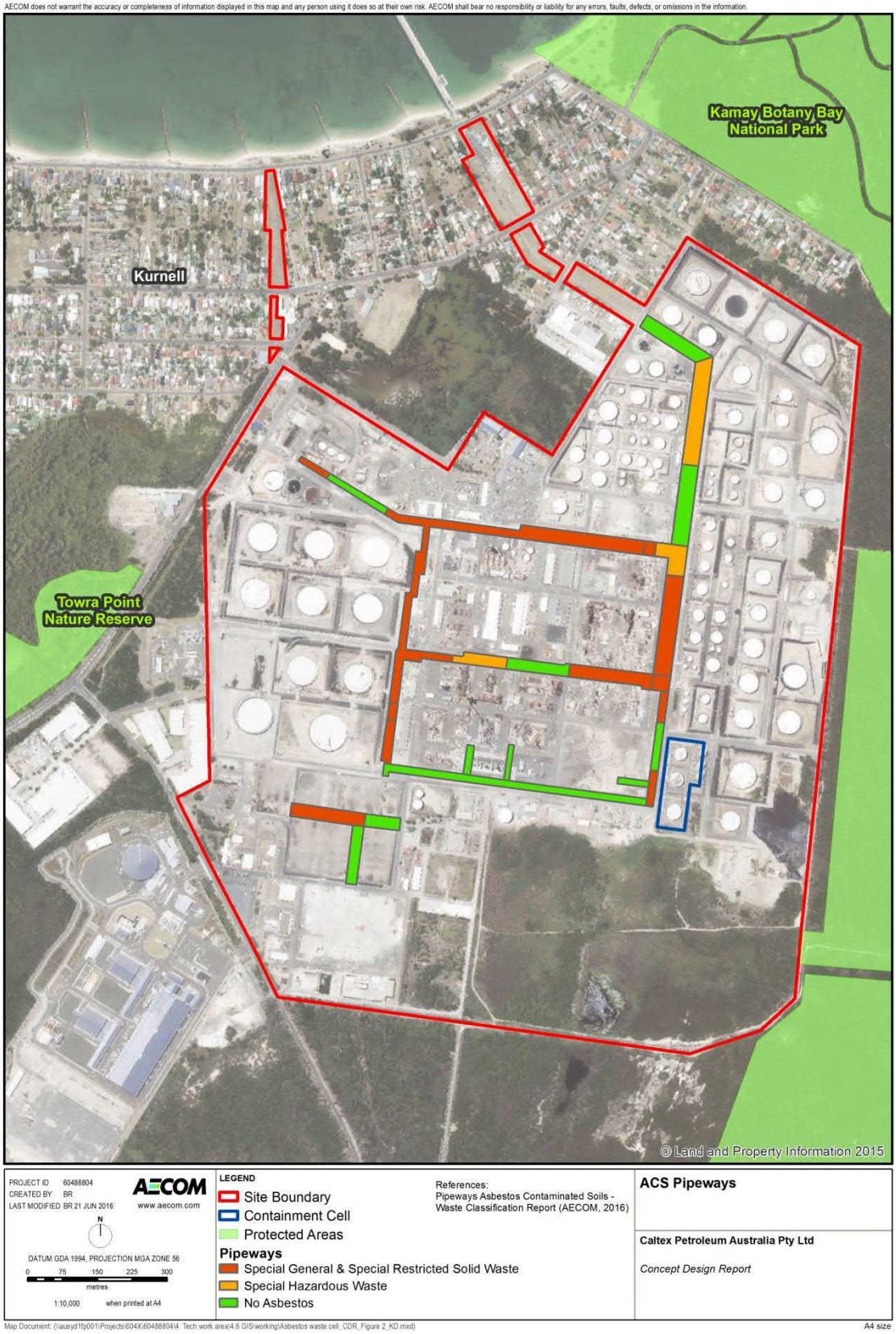
The location of the Site is shown in **Figure 1**, and the proposed location of the containment cell and pipeways with ACSs are shown in **Figure 2**.

Table 3 Site Identification Information

Items	Details
Site address	Solander Street, Kurnell, 2231, NSW, Australia
Zoning of site	Zone IN3 Heavy Industrial under the *Sutherland Shire Local Environment Plan 2015*
Current site use	Liquid Fuel Depot – specifically a finished fuel import terminal
Adjacent site uses	Adjacent land uses to the Site include: - North and North-west: Village of Kurnell and Marton Park - East and South: Kamay Botany Bay National Park - West: Quibray Bay - South-west: land zoned as general industrial, light industrial, special industrial and special development
Pipeway description	The pipeways are shown on **Figure 2** and are located across the Site. The pipeways traverse an area of approximately 96,390 m^2.
Containment cell location	The proposed location of the containment cell is shown in **Figure 2**.

Figure 1 Site Location

Figure 2 Site Features



2.0 Waste Classification

This chapter provides a summary of the findings from the *Pipeways Asbestos Waste Classification Report* (AECOM, 2016a). The report identified the waste classification for soils within the pipeways (refer to **Figure 2**) based on two investigations, one in 2013 and one in 2016.

2.1 Classification of Waste

2.1.1 Presence of Asbestos

Asbestos contaminated waste is classified as 'Special Waste', under the *NSW EPA Waste Classification Guidelines 2014* (the Waste Classification Guidelines). Special Waste has unique regulatory requirements for disposal given the need to minimise the risk of harm to the environmental and human health.

The *Pipeways Asbestos Waste Classification Report* (AECOM, 2016a) found that friable asbestos and asbestos fines exceeded the *National Environment Protection (Assessment of Contaminated Land) Measure (NEPM) 1999, National Environment Protection Council Amendment 2013. Schedule B1, Guideline on Investigation Levels for Soil and Groundwater* (ASC NEPM, 2013) health screening levels (HSL) D criteria of 0.001% in 67% of all samples analysed that had detections of asbestos in 2013 and 2016 investigation works. The results therefore confirm that soils along the pipeways where asbestos was detected require removal to reduce the risk posed to site workers and visitors. Based on these results the pipeways were delineated into areas with no detectable asbestos and where asbestos was detected.

Given the nature of the works undertaken at the Site, soil within the pipeways was also analysed for specific contaminant concentrations (SCC). Where SCC exceeded the limits provided in Table 1 and Table 2 of the Waste Classification Guidelines, ACS was also classified as General Solid, Restricted Solid or Hazardous Waste. In these instances wastes must be managed as both classifications (EPA, 2014).

Areas where no asbestos was detected, soils will be left in-situ.

2.1.2 Presence of Contaminants Other Than Asbestos

In order to classify waste as General Solid, Restricted Solid or Hazardous Waste, the maximum possible levels of contaminants in the waste must not exceed the SCC and/or toxicity characteristics leaching procedure (TCLP) test values for the classification provided in the Waste Classification Guidelines.

Of the samples analysed chromium, lead, nickel, mercury, benzo(a)pyrene and total petroleum hydrocarbons (TPH) (C10-C36 fraction) exceeded the general or restricted SCC level provided in Table 1 of the Waste Classification Guidelines. In order to determine the potential leachability of these contaminants a TCLP test was conducted on each contaminant, excluding TPH[2].

The leachability data from *Caltex Kurnell (535) Pipeways Contamination Assessment / Characterisation - Stage 2 Report* (AECOM, 2013) and the data from the *Pipeways Asbestos Waste Classification Report* (AECOM, 2016a) is summarised in **Table 4** below. Based on these results the potential for concentrations of metals and benzo(a)pyrene expected to be detected in leachate, at concentrations greater than the NSW EPA (2014) TCLP limit for general solid waste, is low and acceptable.

Table 4 2013 and 2016 Leachability (Source: AECOM 2016a, AECOM 2013)

Contaminant	Number of Results	Number of Detections Over Screening Criteria	TCLP1 Screening Criteria (mg/L)	Range of Results (mg/L)
Chromium	2	0	5	<0.1
Lead	21	3	5	<0.1 to 0.5
Nickel	7	2	2	<0.1 to 0.2
Mercury	3	0	0.2	<0.001
Benzo(a)pyrene	10	0	0.04	<0.5

[2] As per Table 2 of the Waste Classification Guidelines (EPA, 2014), petroleum hydrocarbons are assessed using the SCC1 and SCC2 criteria provided in Table 1. Therefore no TCLP analysis was conducted.

It was noted that in all cases except one the classification for metals and benz(a)pyrene was General Solid Waste. For the exception, the SCC for mercury was above the concentration threshold in Table 2 of the Waste Classification Guidelines for General Solid Waste.

2.1.3 Combined Waste Classification

Based on the review of the new and existing data provided in the Pipeways Waste Classification Report, the areas of soil required to be placed in the on-site containment cell, treated and disposed off-site or left in-situ have been calculated. The extent of each of these areas is shown on **Figure 2**. The calculated volumes are listed in **Table 5** below.

Table 5 Kurnell Pipeways – Waste Classification and Estimated Waste Volume

Soil Category*		Area (ha)	Volume[1] (m^3)	Mass (tonnes)**
1	Remain in-situ (asbestos not detected)	3.48	6,955	-
2	On-site containment cell - Special Waste (Asbestos)/ General Solid Waste	3.57	7,960	10,600
3	On-site containment cell – Special Waste (Asbestos)/ Restricted Solid Waste	1.15	2,308	3,100
4	Special Waste (Asbestos)/ Hazardous Waste	1.44	2,880	3,850
Total volume for containment cell (2+3)		**4.72**	**10,268**	**13,700**
Total volume for containment cell (2+3+4)* **		**6.16**	**13,148**	**17,550**

**Waste Classification based on the Waste Classification Guidelines (EPA, 2014), Table 1 where TCLP was not undertaken and Table 2 where TCLP was undertaken.*

***The conversion density used for soil from m^3 to tonnes is 1.34 t/m^3 based on the average minimum dry density tests carried out for soils located at the proposed asbestos containment cell area and assuming a moisture content of 5%.*

**** Hazardous Waste will not be disposed of in the containment cell unless treated to a restricted level.*

The volume of waste was determined based on an excavation depth of 0.2 m in most instances. At three locations asbestos was detected at 0.5 m below ground. At these locations the volume of soil excavated will be to a depth of 0.5 m.

Waste classified as both Special Waste and General Solid Waste will be referred to as Special Waste. Waste classified as both Special Waste and Restricted Solid Waste will be referred to as Special Restricted Solid Waste. Waste classified as both Special Waste and Hazardous Waste will be referred to as Special Hazardous Waste.

All waste classified as Special Waste and Special Restricted Solid Waste would be disposed of in an onsite containment cell. As such the minimum tonnages of soil disposed of in the proposed containment cell would be approximately 13,700 tonnes.

Management of Special Hazardous Waste is discussed in **Section 3.0**.

3.0 Options Analysis for Management of Hazardous Waste

Based on the waste classification undertaken in **Section 2.0** approximately 3,850 tonnes (or 2,880 m^3) of soil in the pipeways has been classified as Special Hazardous Waste using the in-situ soil density. Using a 40% contingency to allow for sensitivities in soil density and volume estimating processes it has been assumed that 5,390 tonnes (or 4,032 m^3) of Special Hazardous Waste would require treatment and disposal.

The soil is contaminated with:

1. Friable asbestos;
2. Total Petroleum Hydrocarbons (TPH) (C10-C36 fraction);
3. Benzo(a)pyrene (restricted waste levels); and
4. Metals (restricted waste levels).

As per the Waste Classification Guidelines, waste classified as Hazardous Waste cannot be disposed of in NSW and must be treated prior to disposal. This requirement to not landfill un-treated Hazardous Waste has also been adopted in the recently released Landfill Guidelines (EPA, 2016), which states "*untreated hazardous wastes are not permitted to be landfilled in NSW. However some hazardous wastes can be treated to remove or lock up (immobilise) contaminants. This may enable the waste to be reclassified as restricted or general solid waste, and only then disposed of in a landfill*".

Therefore the following options for management of Special Hazardous Waste have been considered:

- Option 1: Special Hazardous Waste sent off-site for pre-treatment and disposal by a licenced contractor.
- Option 2: Special Hazardous Waste treated on-site for specific contaminants to enable re-classification as Special Restricted Solid Waste as a minimum in accordance with the Waste Classification Guidelines prior to disposal within the proposed containment cell.

3.1 Assessment Criteria

The practicality of remediation technologies has been assessed based on the following criteria defined in **Table 6**. Weighting factors in **Table 6** were selected based on professional experience and client consultation from a range of 1 (lowest) to 5 (highest).

Table 6 Hazardous Soil Remediation Technology Assessment Criteria

Criteria	Considerations	Weighting
Technical	The physical ability to achieve the remediation goals. For example chemical and physical properties of the contaminant.	5
Timing	The time required to achieve the remediation goals.	3
Financial	The capital costs such as equipment and its installation / commissioning coupled with on-going costs such as maintenance and waste treatment / disposal.	4
Logistical	Access to the site, availability of materials and infrastructure and the creation and disposal of wastes.	2
Sustainability	Including environmental and social elements including efficient use of energy, use of green materials and perceived sustainability by community.	3

To determine the costs associated with each option quotes were obtained from industry suppliers. These costs were provided based on either a $/$m^3$ or $/tonne. Therefore the total cost to treat ACS classified as Hazardous Waste has been calculated based on either the cost per m^3 (4,032 m^3) or cost per tonne (5,390 tonnes).

3.2 Management Option 1 – Disposal off-site

Under this option the 5,390 tonnes of Special Hazardous Waste would be sent off-site for pre-treatment and disposal by a licenced contractor. Material recovered from the pipeways, and classified as Special Hazardous Waste would be excavated directly into trucks and taken off-site by a licensed contractor for treatment prior to disposal. In the event that the waste soil is not able to be directly placed into a truck, the waste would be stockpiled at a designated location on Site. Dust suppression measures would be implemented during stockpiling.

Assuming each truck can hold 30 tonnes of soil; this would represent an additional 180 truckloads on NSW roads.

Based on consultation with Environmental Treatment Solutions, Bingo Industries and Cleanaway, the cost for transport, treatment and disposal by a licensed contractor would range between $400 - $1,200 per tonne. The variability in cost per tonne is based on uncertainty around treatment methods which would finalised upon excavation and analysis of the Special Hazardous Waste soil. Based on this cost rate, the 5,390 tonnes of Special Hazardous Waste would cost between $2,156,000 - $6,468,000 to be treated and disposed of off-site[3].

Table 7 Estimated Cost of Off-Site Disposal of Special Hazardous Waste

Disposal Option	Cost per tonne*	Cost for 5,390 tonnes
Off-site transport, treatment and disposal by licensed contractor	$400 - $1,200	$2,156,000 - $6,468,000

**Estimated cost provided by Bingo Industries (11/05/16) and, Environmental Treatment Solutions (10/05/16) and Cleanaway (27/05/16).*

3.3 Management Option 2 – Treatment and Disposal On-Site

3.3.1 Treatment Options

In order to reduce the contaminant level of TPH in the ACS to a minimum of Restricted Solid Waste, the suitability of the following on-site treatment methods has been reviewed:

- Biopiling;
- Trommelling;
- Thermal Desorption;
- Stabilisation/solidification; and
- Soil washing.

A description of each of these methods is provided below.

3.3.1.1 Biopiling

Biopiling is a biodegradation process which uses microbes present in soil to digest hydrocarbon based contaminants, including petroleum hydrocarbons.

The process may vary depending on the hydrocarbon contaminated material (specific contaminants and the matrix material); however the following general process would be applicable:

- The impacted material is stockpiled on an impermeable film (bio-pad) in a designated treatment area;
- Additives can be mixed into the material to aid the bioremediation process. Additives may include manure, nitrogen and mulch;
- Stockpiles are then cultivated by periodically revolving them with an excavator, or by injection of air through slotted or perforated piping placed throughout the pile to allow air exchange and the conversion of hydrocarbon compounds to carbon dioxide, water and microbial cell mass;
- Stockpile testing (contaminants of concern and microbiological indicators) is undertaken on a regular basis to measure the progress of the treatment;
- The process is repeated until validation samples show that the soil has been successfully decontaminated to an acceptable level for disposal into the on-site containment cell.

The *Pipeways Asbestos Waste Classification Report* (AECOM, 2016) found that the soils classified as Hazardous Waste comprises medium to heavier hydrocarbons. Therefore, evaporation of these contaminants is not expected. These contaminants would require biodegradation processes to be broken down. Heavier hydrocarbons also require a longer period of time to degrade. It is estimated that using a biopiling method, it may take up to 18 months to remediate the soil to a restricted SCC for TPH, so that it is appropriate for placement in the on-site containment cell.

[3] These costs will depend upon laboratory analysis to be undertaken at the time of disposal.

Alternatively, intensive biopiling methods may be used, which require additives to increase the biodegradation rates and therefore reduce the required treatment time by up to 6 months.

There is a risk that lighter fractions may evaporate therefore the potential impacts of volatile organic compounds (VOCs) on local receptors would need to be considered. Controls may include capturing and treating vapours before they are emitted to the atmosphere (e.g. by passing gas emissions through activated carbon drums).

Given the presence of asbestos within the soil, the biopiles would need to be covered when not being turned. During the turning process, measures to reduce dust generation would need to be implemented in order to reduce potential impacts to air quality. Surface water management would need to be considered for runoff control. Diversion of clean stormwater reaching the biopile would be managed by bunds and channels.

For 5,390 tonnes of material, a minimum area of approximately 8,100 m^2 (for biopiles of 1.5 meters in height[4]) would be required at the Site. The height of the biopile can be increase to up to 2.5 m to reduce the area of land required. The length and width of the biopile may be restricted if aeration is to occur by manual revolving of the soils.

Advantages[4]:

- Caltex have experience with Biopiling at the Sustainable Soil Regeneration Facility (SSRF);
- Relatively simple to design and implement;
- Moderate treatment times (six months to 18 months);
- Effective on organic constituents with slow biodegradation rates;
- Can be designed as a closed system; and
- Can be engineered to be potentially effective for a combination of site conditions and petroleum products.

Limitations[4]:

- Concentration reductions >95% and constituent concentrations <0.1 ppm are very difficult to achieve;
- May not be effective for high constituent concentrations (>50,000 ppm total petroleum hydrocarbons), since these may inhibit microbial growth;
- Requires a large area of land for treatment, however the Site has a large amount of available space;
- Vapour generation during aeration may require treatment prior to discharge; and
- May require bottom liner if leaching from the biopile is a concern.

The estimated cost per cubic meters for biopiling is provided in **Table 8**.

Table 8 Estimated Cost of On-Site Biopiling Treatment of Special Hazardous Waste

Treatment Method	Cost per m^3*	Cost for 4,032 m^3
Biopiling	$55 - $60	$201,607 - $241,928
Intensive Biopiling	$167 - $172	$673,956 - $694,117

*Estimated cost per tonne provided by InSitu Remediation Services. Note: cost per tonne may vary depending on laboratory analysis/trails undertaken at the time of the biopiling and additive selected for intensive biopiling.

3.3.1.2 Trommelling

A trommel is a rotating, inclined, cylindrical device that receives and transports contaminated soil along its axis of revolution. As the material is transported, it is revolved and aerated, promoting the volatilisation of the petroleum hydrocarbons.

The same soil batch can go through the trommel many times and additives can enhance the process and accelerate volatilisation.

The whole process is enclosed, with dust and vapours being collected and/or treated.

[4] US EPA (May 2004), How to Evaluate Cleanup Technologies for Underground Storage Tank Site, A Guide for Corrective Action Plan Reviewers, EPA 510-R-04-002, page IV-19 and IV-3

Advantages:

- It is an enclosed system, therefore it could treat soils containing asbestos; and
- Short treatment time.

Limitations:

- More effective on lighter fraction hydrocarbons;
- May lead to further fragmentation of asbestos material; and
- Asbestos contamination of vapour recovery unit (VRU) would limit the future use, therefore additional maintenance costs may be incurred.

The estimated cost per cubic meters for remediation in a Trommel is provided in **Table 9**.

Table 9 Estimated Cost of On-Site Trommel Treatment of Special Hazardous Waste

Treatment Method	Cost per m^3*	Cost for 4,032 m^3	Replacement of VRU*
Trommelling	$55 - $120	$221,768 - $483,857	$7,500 - $10,000

**cost estimate provided by InSite Remediation, pers comms, 13/05/16*

3.3.1.3 Thermal Desorption

Low Temperature Thermal Desorption (LTTD), also known as low-temperature volatilisation, thermal stripping, and soil roasting is an ex-situ remedial technology that uses heat to physically separate petroleum hydrocarbons from excavated soils. Vaporised hydrocarbons are generally treated in a secondary treatment unit prior to discharge to the atmosphere. Thermal desorption units may be mobile, therefore operated directly on-site. Desorption units are available in a variety of process configurations including rotary desorbers, asphalt plant aggregate dryers, thermal screws, and conveyor furnaces. LTTD is applicable to contaminants that are volatile at temperatures as great as 650ºC.

Advantages:

- Rapid treatment time; up to 25 tonnes per hour throughput; and
- Can consistently reduce TPH to below 10 ppm and BTEX below 100 ppb.

Limitations:

- On-site treatment would require significant area (>0.25 ha) to locate LTTD unit and store processed soils;
- Soils excavated from below the groundwater table require dewatering prior to treatment because of their high moisture content;
- Regulators and community perception are not favourable towards thermal processes, often considered by many as a form of waste incineration; and
- Additional permits and community consultation may be required before commissioning a thermal treatment plant (even if small and mobile).

The estimated cost per tonne for thermal desorption is provided in **Table 10**.

Table 10 Estimated Cost of On-Site Thermal Treatment of Special Hazardous Waste

Treatment Method	Cost per tonne*	Cost for 5,390 tonnes
Low Temperature Thermal Desorption	$1,000 - $1,500	$5,390,000 - $8,085,000

**Based on costings obtained by AECOM for similar soil remediation works at a site in NSW*

3.3.1.4 Stabilisation/Solidification

In this process contaminants are physically bound or enclosed within a stabilised mass (solidification), or have their mobility chemically reduced by stabilising agents (stabilisation). These processes can be used on heavy hydrocarbons (SVOC), metals and asbestos.

They may also be conducted within an enclosed unit (e.g. using a pugmill) or by mixing the soil and the reagents in piles using excavators.

Typical reagents are cement, fly ashes and synthetic clays.

Advantages:

- Short-term treatment timeframe (6 months)[6];
- Can remediate a wide range/mix of contaminants, including heavy metals, petroleum hydrocarbons and asbestos[5];
- Ex-situ or in-situ applicable[5]; and
- Process equipment occupies a relatively small footprint[6].

Limitations:

- Site specific, requires laboratory and pilot scale testing of contaminated soils[5];
- Does not destroy or remove the contaminants[6] therefore does reduce the SCC and does not meet the requirements of the Waste Classification Guidelines, Table 1, for the classification of Restricted and General Solid Waste for TPH;
- May result in an overall increase in volume of material to be disposed of[6];
- Inhibitory substances (oils, free phase solvents, etc.) can limit efficacy[5];
- Long term performance can be difficult to demonstrate to stakeholders[5] and require long-term monitoring[6];
- Plant/mobilisation and installation cost relatively high due to the installation of the batching plant[6]; and
- If an enclosed unit is used for mixing additives, the cost associated with decontamination procedures will have to be accounted for, following completion of the works.

The estimated cost per cubic meters for remediation by stabilisation / solidification is provided in **Table 11**.

Table 11 Estimated Cost of On-Site Stabilisation/ Solidification of Special Hazardous Waste

Treatment Method	Cost per m^3*	Cost for 4,032 m^3
Stabilisation/solidification	$200-$500	$806,428 - $2,016,070

**Based on costings for soil remediation works at a site in NSW*

3.3.2 Soil Washing

Soil washing or soil scrubbing is a water based process for remediation of excavated soils. Soil washing removes contaminants from the soil by dissolving and/or transferring contaminants on soil particles into the washwater. Washwater can be dosed with chemicals to improve process characteristic (such as pH, surface tension, etc.).

Soil washing can also be achieved by concentrating contaminants into a smaller volume of soil through particle size separation and attrition scrubbing.

The majority of inorganic and organic contaminants generally bind, either physically or chemically to fine particles (clays, silts, organic matter). These silts and clays in turn are attached to sand and gravel particles in the soils. Soil washing separates the contaminated silts and clays from the "clean" sands and gravels, thereby reducing the volume of contaminated material requiring further treatment or disposal.

Generally, it is considered that if the fine content of the soil is above 25%, then soil washing will not be effective.

Advantages[6]:

- Reduction in contaminated soil volume requiring further treatment or disposal (cost savings); and
- Can treat a wide range of contaminants.

[5] http://www.vertasefli.co.uk/our-solutions/expertise/stabilisation-and-solidification, viewed 18/05/16
[6] SKM (2014), Management of Contaminated Soils in South Australia

Limitations:

- Dependent on fine grains content (it should be less than 25% by weight[7]);
- May be uneconomic to treat small volumes, due to high plant and installation costs[6];
- Produces concentrated contaminated sludge (potentially difficult to remediate or dispose)[7]; and
- Can require large volumes of washwater[7], even when regeneration and reuse is taken into account.

The estimated cost per tonne for soil washing is provided in **Table 12**.

Table 12 Estimated Cost of On-Site Soil Washing of Special Hazardous Waste

Treatment Method	Cost per tonne	Cost for 5,390 tonnes
Soil Washing	>$400 per tonne	>$2,156,000

3.4 Summary of Hazardous Waste Treatment and Disposal Options

Based on the information presented above, a decision matrix was populated. This matrix is shown in **Table 13**. On-site treatment of Hazardous Waste by trommelling was selected as the most appropriate option for treatment of Special Hazardous Waste prior to placement in the on-site containment cell. Biopiling also scored highly but may require a longer timeframe and slightly higher cost due to additives required for intensive biopiling. Disposal off-site scored highly due the short time frame and technical score, whereby it was an efficient option for removing the contaminated waste from the Site.

Table 13 Decision Matrix – Treatment of Special Hazardous Waste

Criteria	Weighting	Off-Site Disposal	Biopiling	Trommelling	Thermal Desorption	Stabilisation / Solidification	Soil Washing
(as detailed in Section 3.1)	(0-5)	Scores (0-5)					
Technical	5	4	3	2	4	0	3
Timing	3	5	3	4	4	3	4
Cost	4	2	4	5	1	3	2
Logistics	2	3	4	4	2	3	2
Sustainability	3	3	4	4	1	4	3
Final Score		**58**	**60**	**62**	**43**	**39**	**48**

The scores, ranging from 0 to 5, were attributed for each criterion-technology combination and final scores were obtained by multiplying the respective weighting and score.

A few comments on the scoring process:

- In terms of technical applicability:
  - Trommelling received a lower score due to the fact that this method is primarily for treatment of the lighter VOC compounds, trials would need to be conducted to confirm this method is appropriate;
  - Stabilisation / Solidification received a zero as this option does not reduce the SCC of TPH in the soil, therefore following treatment the soils would not meet the requirements of the Waste Classification Guidelines for classification as Restricted or General Solid Waste.
- The soil washing, off-site disposal and thermal desorption received low scores for the cost criteria, since they are not considered to be economically feasible for this application;
- Thermal desorption received low scores for the sustainability and logistics criteria, since this process requires intensive energy usage compared with other options, often has a negative community perception and may require additional permits and potential production of dewatered sludge requiring disposal off-site.

[7] http://www.vertasefli.co.uk/our-solutions/expertise/soil-washing, viewed 18/05/16

Based upon the assessment of the Hazardous Waste treatment options discussed above, the potential risk to human health and the environment and the cost effectiveness of each option, the preferred option for managing Special Hazardous Waste from the pipeways was considered to be remediation via trommelling. Biopiling and off-site disposal were ranked second and third respectively. Therefore, it is recommended that a small scale pilot trial be conducted of intensive biopiling and trommelling to confirm the most appropriate method of treating asbestos contaminated Hazardous Waste given the contaminant concentrations in the ACS.

4.0 Concept Design

4.1 Containment Cell Capacity

The containment cell has been designed to create a maximum airspace capacity for up to 24,500 tonnes of ACS. The 24,500 tonnes has been determined based on the following:

- 10,600 tonnes of Special General Solid Waste;
- 3,100 tonnes of Special Restricted Solid Waste;
- 3,850 tonnes of Special Hazardous Waste, should treatment be conducted on-site to allow re-classification as either Special General Solid Waste or Special Restricted Solid Waste (as described in **Section 3.4**); and
- A 40% contingency[8] which allows for sensitivity in soil density and potential use of daily cover soils during waste placement if required.

Based on an average maximum wet density of 1.6 t/m^3; a 24,500 tonne capacity containment cell would require a waste containment volume of approximately 15,300 m^3. This airspace volume has been allowed between the top of the leachate barrier system and the underside of the capping layer. The final height adopted following placement of the ACS is discussed further in **Section 4.9**.

The highest classification of waste to be contained within the containment cell is Special Restricted Solid Waste, and therefore the containment cell has been designed in accordance with the requirements for a restricted landfill cell. The concept design of the proposed containment cell has been prepared generally in accordance with the Landfill Guidelines (EPA, 2016).

The concept design consists of the following key components:

- Containment Cell Layout and Design
- Leachate Barrier System
- Leachate Management System
- Surface Water Management
- Groundwater Management
- Landfill Gas Management and Monitoring
- Amenity issues: Odour, Dust, Noise, Litter and Fire
- Cover, Capping and Revegetation
- Water Balance

4.2 Suitability of Site

The *Kurnell Terminal Geotechnical / ESA* (AECOM, 2016c) identified that from a geotechnical and environmental standpoint it would be possible to construct a containment cell at the proposed location. Constraints associated with the shallow groundwater and bedrock preclude a below ground containment cell being constructed. Based on these findings the concept design has been based on construction of an aboveground containment cell.

4.3 Containment Cell Layout and Design

4.3.1 General Layout

The concept design for the containment cell has utilised and is contained within the tank bunds for tanks 224 and 225 and the majority of the bunded area for tanks 333, 334 and 335. The eastern side of the cell has been restricted to ensure it does not encroach within the 250 metre buffer to the Kamay Botany Bay National Park. The existing eastern bund shall be removed to allow surface water flows from the final cap to drain to the Site's stomwater drainage system.

[8] Contingency has been allowed for based on sensitivities around soil type, soil density factors and treatment process

The lining system has been designed to extend for the full extent of the footprint area and ties in to the capping layers such that the top of cap meets the outside top of the surrounding bunds. The approximate extent of the containment cell is 80 metres in the east-west direction and 114 metres north-south. This is shown in the conceptual design drawings in **Appendix A**.

The leachate storage tank has been located within the bund for tank 226 which provides in the order of 6,000 m^3 of bund storage in case of tank failure which is far in excess of the minimum volume required of 33 m^3 as discussed in **Section 4.5**. If the area within tank bund 226 is required for other uses or required to be removed, the bunded area can be reduced as required by the construction of a bunded area in the immediate vicinity of the leachate storage tank.

4.3.2 Earthworks

Due to the shallow groundwater level, excavation in the existing ground surface has been minimised as far as practicable to minor excavation in the sump bases. The sump bases have been depressed to create a storage volume to minimise continuous pumping of leachate and/or inundation of large areas of the liner with leachate. The sump base is depressed approximately 500 mm in to the existing surface in the area of the two sumps.

4.3.3 Liner Design and Grading

The liner surface grades have been created by the placement of sub-base fill which mirrors the top of liner surface. This creates a liner subgrade which allows placement of lining layers in continuous thicknesses across the cell floor. The sub-base fill varies in thickness from zero in the valleys along the western side of the cell and grades up to the east at 2% longitudinal grades in the valleys. The transverse grades in to the valleys have been designed at 3% grades as required by the Landfill Guidelines (EPA, 2016). The liner surface grades are shown on drawing CV-003 in **Appendix A**.

The liner design, or leachate barrier system, has been designed in accordance with the Landfill Guidelines (EPA, 2016) and is described in **Section 4.4**.

4.3.4 Leachate Collection System

The primary leachate collection layer is the 300 mm depth aggregate layer above the primary liner components as described in **Section 4.4**. This layer provides a drainage pathway along the liner surface to the valleys as described in **Section 4.3.2**. The valleys have been designed with a perforated leachate collection pipe which falls at a 2% grade to the leachate collection sumps. Within the leachate collection sumps a float switch activated submersible pump transfers the collected leachate to the leachate storage tank via a rising main. The float switch would be set with a cut in and cut out level switch for the pump such that the pump cuts out at the sump floor level and cuts in when the leachate level reaches the top of the sump area to contain leachate within the sump. The system conceptual layout plan is shown in drawing CV-003 in **Appendix A**.

The secondary leachate collection system/leak detection layer comprises a geonet drain which flows along surface grades in the same manner as the primary collection system. A geonet has been adopted for this layer for ease of construction as it is problematic installing lining components above an aggregate drain layer. A separate inspection point comprising a pipe riser from the secondary leachate collection/leak detection layer would be constructed behind the primary liner and extended to the surface in the vicinity of the main collection sump. The detailed design shall ensure no cross leakage between the two collection systems to ensure that leachate collected in the secondary layer is from leakage through the liners rather than cross leakage between the collection systems.

4.3.5 Cap Design and Grading

The top of cap grading has been designed such that the top of cap meets the outer crest of the surrounding bunds except for the eastern side where the cap extent is contained outside the 250 m buffer to the National Park. This ensures that Site infrastructure such as the fire water ring main and the roadways to the west of the proposed containment cell are not affected by the cell construction. A surface grade of 20% has been adopted for the cap surface grading as required by the Landfill Guidelines and described in **Section 4.9**. This grade rises from the outer crest of the bund to a peak approximately central along the cell. The cap grading plan and cross sections are shown in **Appendix A**, drawings CV-004 and CV-005, respectively.

As noted on drawing CV-005, the final height of the cap would be determined during the waste placement and would be dependent on the final volume of waste generated from the site clean-up works. The cap grading plan as shown provides a total airspace of 24,800 m^3 which is well above the estimated 15,300 m^3 required and provides further contingency where, for instance, daily cover utilises soils rather than tarpaulins or similar methods

which do not require significant airspace. The final height of the top of waste would be determined following completion of the ACS excavation works. Where the total airspace void is not required, the waste volumes and placement should be monitored to ensure the final surface has a minimum grade of 5% fall to the outer edges as shown on drawing CV-005. This approach has been adopted to cater for a variable volume of ACS, while providing sufficient airspace for all contingencies.

The cap make up has been designed in accordance with the Landfill Guidelines (EPA, 2016) and is described in **Section 4.9**.

4.4 Leachate Barrier System

Solid Waste Landfill Guidelines Required Outcomes	Report Section
The landfill must have a leachate barrier system to contain and prevent the contamination of surface water and groundwater over the life of the landfill.	4.3.3 4.4
Pollutants with the potential to degrade the quality of groundwater must not migrate through the strata to any point beyond the boundary of the premises or beyond 150 m from the landfill footprint, whichever is smaller. If this occurs, additional engineering controls may be required to prevent further pollutant migration. It may also be necessary to remediate the existing pollution.	4.3.3 4.4

As per the Landfill Guidelines (EPA, 2016), the leachate barrier system for the Restricted Solid Waste containment cell would be a dual barrier system addressing the requirements listed in **Table 14**.

Table 14 Containment Cell Design Leachate Barrier System Requirements

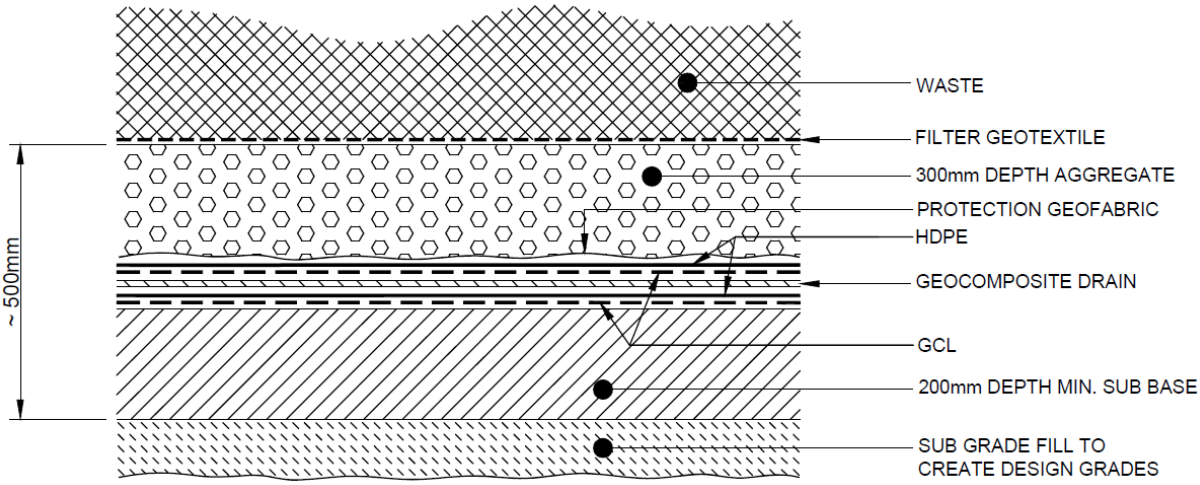
Cell Stage	Leachate Barrier System (from top to bottom)
Design / Construction	A separation geotextile would be placed above the drainage layer to reduce the ingress of fines from the overlying waste.
	Primary leachate collection layer: - 300 mm think gravel layer containing collection pipework.
	A protection or cushion geotextile to protect the flexible membrane liner from damage by construction equipment and overlying materials.
	Primary barrier: - A composite liner comprising: • an upper geomembrane liner in the form of a high density polyethylene (HDPE) liner at least 2 mm think. • a lower geosynthetic clay liner (GCL) with a hydraulic conductivity of less than 5 x 10^{-11} m/s.
	Secondary leachate collection layer: - A geonet drainage/leak detection layer.
	Secondary barrier to detect and remove any leakage through the primary barrier: - installed below or outside the primary barrier. - contain either a single compacted clay liner 1,000 mm thick with a saturated hydraulic conductivity less than 1 x 10^{-9} m/s, or a composite geomembrane/GCL.
	A compacted sub-base 200 mm thick to provide a firm, stable, smooth surface of high strength on which to install the liner.
	The leakage rate through the dual barrier system would be less than 1 L/ha/day of leachate for a maximum level of leachate of 300 mm over the upper liner.
	Material properties and specifications would be as for general solid waste landfills. Materials would be used that would not be compromised by chemicals in the restricted solid waste leachate.
	*Have a base gradient of greater than 2% in the longitudinal direction and greater than 3% in the transverse directions.

Cell Stage	Leachate Barrier System (from top to bottom)
	*The waste cells should be wholly above the highest historically recorded groundwater table at all times. Alternatively, the cell can be sited partly or wholly above ground.

**required specifically for restricted solid waste cell design as per Section 1.1 of the Solid Waste Landfill Guidelines (EPA, 2016)*

Materials used in the construction of the containment cell, for example geomembranes and gravel drainage, would be designed in accordance with the requirements provided in the Landfill Guidelines (EPA, 2016). The proposed liner system is illustrated in **Figure 3** below.

Figure 3 Proposed Containment Cell Liner



4.5 Leachate Management System

Solid Waste Landfill Guidelines Required Outcomes	Report Section
Collected leachate must be stored in appropriately sized dams or tanks and disposed of so as not to cause environmental harm.	4.3.4 4.5.1
There must be sufficient leachate disposal capacity to prevent the build-up of leachate and thereby mitigate potential impacts related to water pollution and offensive odours.	4.5.2
Untreated leachate must not be disposed to off-site water or land, used for dust suppression, or used to supply the water needs of process conducted at the landfill, such as composting.	4.5.2

The existing Oily Water Sewer System (OWSS) at the Site collects process effluent and rainfall runoff from areas of the Site where there is potential for interaction of water streams with petroleum products. Oily water is collected in the OWSS and is transferred to the wastewater treatment plant. Stormwater from within the containment cell area bunds would be directed through the OWSS, via a leachate storage tank. Following completion of final capping, only leachate would be directed to the leachate tank.

Based on the water balance model conducted and discussed in **Section 4.10** the following leachate management system is considered appropriate for the containment cell.

4.5.1 Storage

The design, construction and operation of a leachate storage system shall meet the following requirements:

- The tank must have sufficient leachate storage volume, as determined by the water balance model discussed in **Section 4.10**.
- The tank (if aboveground) and associated connection points must be surrounded by a bund with a capacity of at least 110% of the tank.

Based on the water balance model conducted in **Section 4.10**, the highest daily leachate generation is estimated to be 30 m^3. Therefore the leachate storage tank would be designed to hold a minimum of 30 kL. Leachate from the storage tank would be directed to the existing OWSS, which transports oily water to the existing on-site Waste Water Treatment Plant (WWTP) as outlined in the following section.

4.5.2 Treatment and Disposal

Sufficient leachate disposal capacity must be identified and used to prevent the build-up of leachate and an increase in the risks of water pollution and offensive odours.

Leachate from the containment cell would be treated at the Kurnell WWTP, in accordance with EPL 837. The treatment process utilises physical, chemical and biological treatment to treat the wastewater. Under the current EPL conditions, all wastewater must be treated using the biotreator in the WWTP or the oil-water separators/induced air floatation system prior to discharge at Yena Gap.

Section O6.4 of the EPL states that; "*the 'operational maximum treatment capacity' for the biotreater wastewater treatment plant is notionally 600 kL/h. It may be less than 600 kL/h depending on the number of "healthy" organisms in the biotreater wastewater treatment plant and the volume of wastewater stored in the equalisation tank*".

The Site EPL requires that treated wastewater discharge quality monitoring be conducted at Yena Gap (Disharge Point 27) to determine compliance with concentration limits. The discharge limit for Point 27, monitoring frequency and sampling method is outlined in the EPL.

Leachate generated from the proposed containment cell would have quality characteristics similar to the existing stormwater runoff from the pipeways areas of the Site, and therefore be suitable for treatment within the WWTP. As noted in **Section 4.10** the maximum leachate generation from the cell in one month is expected to be approximately 900 kL. Given the capacity of the existing WWTP (600 kL/h), the leachate generated from the containment cell should be readily accommodated within the existing WWTP. This will be confirmed during the detail design of the containment cell.

4.6 Water Management

Solid Waste Landfill Guidelines Required Outcomes	Report Section
Controls must be implemented to minimise erosion and reduce the sediment load (suspended solids) of stormwater discharge from the site.	4.6.1

4.6.1 Stormwater Management

The Site is divided into seven stormwater catchments. The proposed location of the containment cell is located in Zone F, in the south eastern corner of the Site, which predominately comprises relatively undeveloped land and a small area of tank compound, the landfarm area, a recycling area and a sludge lagoon. Stormwater from the following areas would be discharged off-site in accordance with the Site's Stormwater Management Plan:

- Areas outside the containment cell boundary, which are currently managed; and
- Areas of the containment cell which have been capped and revegetated.

Stormwater from the active areas of the containment cell would be discharged to the WWTP for treatment prior to discharge (refer to **Section 4.5**).

The Site has a Stormwater Management Plan (Caltex, 2011), which describes the existing stormwater monitoring system which would capture potential excess sediment loads and/or contamination potentially being generated by stormwater runoff from the containment cell area. Stormwater runoff from unvegetated areas of the containment cell would be managed in accordance with the requirements in *Managing Urban Stormwater: Soils and Construction Volume 1* (NSW Department of Housing, 2004), and *Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills* (NSW DECC, 2008a).

4.6.2 Flooding

Appendix D of the SEE for the Kurnell Refinery Demolition (URS, 2014) provides a full assessment of the potential impacts of flooding at the Site.

The report found that the Site is generally elevated above the surrounding low lying areas on the western and northern boundaries, and the onsite bunding around petroleum products storage areas effectively increases the flood height that would need to be present for any interaction between petroleum products and flood waters to occur. The containment cell concept design has been prepared to incorporate the existing bund walls.

SSD 5544 MOD 1, management and mitigation measures (MMM) F7 states that:

"*Caltex shall undertake a flood study, commencing within 3 months of completion of demolition works that assesses potential flood risks from the Kurnell Terminal to the Kurnell township, with a particular emphasis on the impacts from surface water entering the Site from land to the east and south of the Site and whether current diversion methods are appropriate*".

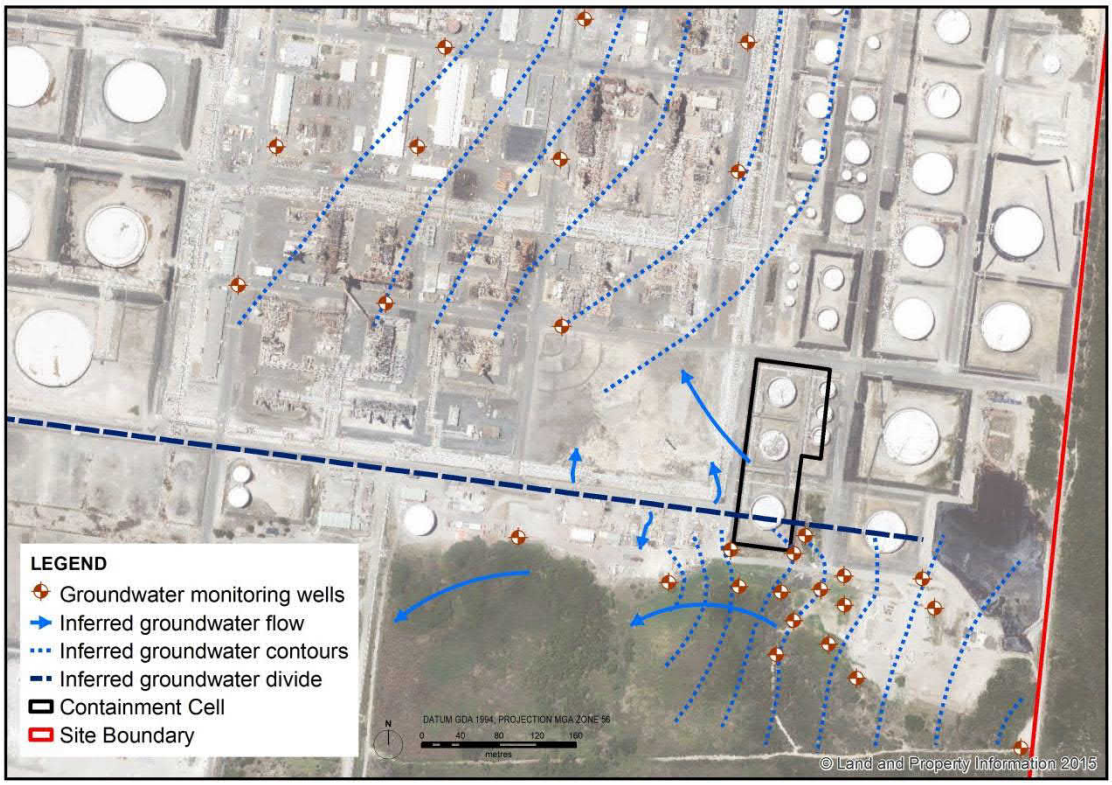
Demolition works are scheduled to be completed in late 2017.

4.6.3 Groundwater Monitoring

The Site has a quarterly groundwater monitoring program under EPL 837, which includes 39 permanent monitoring wells. Given the impact to groundwater from historical operations and activities undertaken at Site, monitoring of impacts to groundwater from the containment cell would potentially be incorporated into the existing monitoring program.

As part of the EIS a groundwater impacts assessment would be undertaken. Based on the findings of this study additional groundwater wells may be installed to monitor potential impacts to groundwater from the containment cell. **Figure 4** shows the current distribution of groundwater monitoring wells around the proposed containment cell location.

Figure 4 Kurnell Groundwater Monitoring Bores and Flow in Close Proximity to the Containment Cell (Source: Coffey (2015a), Coffey (2015b))



4.7 Landfill Gas Management and Monitoring

Solid Waste Landfill Guidelines Required Outcomes	Report Section
Landfill gas management practices must be adopted to: - Minimise emissions of untreated landfill gas to air and through sub-surface strata and services; - Minimise greenhouse gas emissions; - Minimise emission of offensive odour; - Minimise the explosive risk to humans from gas build up in confined spaces; - Ensure that, whenever feasible, landfill gas is sustainably utilised for energy recovery; and - Minimise emissions of air pollutants from the combustion of landfill gas in flaring or electricity-generating equipment.	4.7 4.8.1
A landfill gas monitoring program must be established to demonstrate the achievement of these outcomes.	4.7
Appropriate response action must be taken if the trigger limit values specified in the guidelines are exceeded.	-

The landfill gas assessment is based on the following assumptions:

- Contaminated soils are predominately sands;
- That there would be a minimum of 1.6 m minimum of capping (as per **Section 4.9**);
- TPH composition has been generated based on soil sampling provided in the Pipeways Waste Classification Report (AECOM, 2016).

Vapour from the waste, potentially affecting human receptors, will be the main source - pathway – receptor link requiring further consideration. Under the *NEPM Schedule B1, Guideline on Investigation Levels for Soil and Groundwater*, petroleum hydrocarbons have been categorised into the following groups: F1, F2, F3 and F4, as shown in **Table 15**. The potential for hydrocarbons to generate a volume of gas which may require capture is discussed in **Table 16**.

Table 15 Health Screening Levels Fractions and Corresponding Equivalent Carbon Range (source: Table 1, NEPM B2)

Fraction number	Equivalent carbon number range
F1	$C_6 – C_{10}$
F2	$>C_{10} – C_{16}$
F3	$>C_{16} – C_{34}$
F4	$>C_{34} – C_{40}$

Table 16 Gas Generation Considerations for TPH

TPH fraction	Comment
F1	$C_6 – C_{10}$ warrant further investigation, as they comprise volatile compounds BTEXN. These compounds were present in the soil; **therefore further assessment is warranted (see below).**
F2	$C_{10} – C_{16}$ also comprise volatile fractions, however, in sand at >2 m, Schedule B1 notes that that they are NL (non limiting) meaning at any concentrations, they " *...can't result in an unacceptable vapour risk …*" (p. 7). **Therefore no further assessment is warranted.**
F3	From NEPM B2, p.9: Chemicals in the $>C_{16}$-C_{34} and $>C_{34}$-C_{40} fractions are non-volatile and therefore not of concern for vapour intrusion, however, exposure can be via direct contact pathways (dermal contact and incidental ingestion and inhalation of soil particles). Direct contact HSLs for these fractions can be found in Friebel and Nadebaum (2011a). **Therefore, no further assessment warranted.**

TPH fraction	Comment
F4	From NEPM B2, p.9: Chemicals in the >C_{16}-C_{34} and >C_{34}-C_{40} fractions are non-volatile and therefore not of concern for vapour intrusion, however, exposure can be via direct contact pathways (dermal contact and incidental ingestion and inhalation of soil particles). Direct contact HSLs for these fractions can be found in Friebel and Nadebaum (2011a). **Therefore, no further assessment warranted.**

4.7.1.1 Assessment of $C_6 – C_{10}$ Fraction

Based on the depth of soil cover overlying the waste (≥1.6 m) and the composition of the contaminants, the F1 fraction and key constituents, namely benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN) were further considered.

Table 1A(3) Soil HSLs for vapour intrusion (mg/kg)

	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				
CHEMICAL	0 m to <1 m	1 m to <2 m	2 m to <4m	4 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+	Soil saturation concentration (Csat)
SAND													
Toluene	160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL	560
Ethylbenzene	55	NL	NL	NL	NL					NL	NL	NL	64
Xylenes	40	60	95	170	NL					NL	NL	NL	300
Naphthalene	3	NL	NL	NL	NL					NL	NL	NL	9
Benzene	0.5	0.5	0.5	0.5	NL					3	3	3	360
F1[a]	45	70	110	200	NL	NL	NL	NL	260	370	630	NL	950
F2[a,b]	110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL	560

Only for further consideration

The majority of C_6 - C_{10} (less BTEX) were non-detect with a peak concentration of 19 mg/kg detected. This peak detection is below the Health Screening Level (HSL) of 630 mg/kg. Therefore of C_6 - C_{10} does not warrant further consideration.

Of BTEXN, only benzene requires consideration with a HSL of 3 mg/kg. All benzene concentrations were reported at less than the reporting limit of 0.2 mg/kg. Therefore benzene, and toluene, xylene, ethylbenzenes and naphthalene do not require further consideration.

On the basis that the impacted material:

- Is mostly sands;
- Has a 1.6 m minimum fill covering the waste;
- Comprises TPH composition of F1 at less than 630 mg/kg; and
- Comprises benzene concentrations less than 3 mg/kg;

then further evaluation in relation to risks to human health associated with vapour emanating from these compounds is not considered warranted when using *NEPM B1 Guideline on Investigation Levels For Soil and Groundwater.* Consequently a landfill gas capture system to protect people from TRH vapour issues is not considered necessary.

If required, an assessment of emissions following closure of the containment cell may be undertaken to demonstrate the low emission of gas.

4.8 Amenity Issues: Odour, Dust, Noise, Litter and Fire

Solid Waste Landfill Guidelines Required Outcomes	Section
The landfill must not adversely affect amenity in the locality, in particular:	-
• Offensive odour impacts must not occur at off-site locations	4.8.1
• Emissions of nuisance dust and other particulate matter beyond the landfill boundaries must be minimised	4.8.2
• Excessive noise must not be generated by activities at the Site	4.8.3
• Local amenity must not be degraded by littler from the landfill or by mud or litter attached to vehicles leaving the landfill.	4.8.4
• The risk of fire at the site must be minimised and the site must be adequately prepared in the event of a fire.	4.8.5

4.8.1 Odour Control

Given the nature of the waste proposed to be disposed of in the containment cell, potential impacts from odour are considered unlikely.

4.8.2 Dust Emissions

The ACS will be treated in accordance with requirements of asbestos waste. Dust generation must be minimised during construction, operation and closure / rehabilitation of the containment cell. Assessment of the potential impacts of adverse air quality impacts and the appropriate mitigation measures will be addressed in an air quality assessment as part of the EIS.

To minimise emissions of dust from the containment cell the following measures may be implemented:

- Minimise the area of exposed soils
- Revegetate completed areas as soon as possible. This may be addressed through a staged approach.
- Spray water for dust suppression, particularly soils contaminated with asbestos.

4.8.3 Noise Control

Based on the location of the containment cell at the furthest point from residential and commercial receivers and the nature of the works bring consistent with demolition works currently being undertaken on Site, potential noise impacts are unlikely to be significant. Potential noise generating activities will be carried out to mitigate potential noise impacts.

4.8.4 Litter and Debris Control

Given the nature of the waste proposed to be disposed of in the containment cell impacts from litter and debris is considered unlikely.

4.8.5 Fire Prevention

The containment cell would be managed in accordance with the Site's Emergency Response Plan.

4.9 Cover, Capping and Revegetation

Solid Waste Landfill Guidelines Required Outcomes	Section
Landfilled waste must be covered regularly during operations with a suitable material to minimise odour, dust, litter, the presence of scavengers and vermin, the risk of fire, rainwater infiltration in the waste (and therefore the amount of leachate generated) and the emission of landfill gas.	4.9
All completed landfill cells must be capped and revegetated as soon as practicable after the final delivery of waste to the cell. The final capping must:	-
• Reduce rainwater infiltration into the waste and thus minimise the generation of leachate (infiltration from the base of the final cap will be less than 5% of the annual rainfall).	4.9
• Stabilise the surface of the completed part of the landfill	4.9
• Reduce suspended and contaminated runoff	4.9
• Minimise the escape of untreated landfill gas	4.9
• Minimise odour emissions, dust, litter, the presence of scavengers and vermin, fauna and flora and the risk of fire	4.8.1
• Prepare the site for its future use; this includes protecting people, flora and fauna on or near the site from exposure to pollutants still contained in, or escaping from, the landfill.	4.9
During the post-closure period, the occupier must monitor the integrity and performance of the final cap.	4.9

The requirements for cover and capping (top to bottom) of the containment cell has been provided in **Table 17**. The cover and capping design has been provided generally in accordance with the requirements of the Landfill Guidelines, for a restricted landfill cell with the exceptions as noted.

Table 17 Containment Cell Design Site Capping and Revegetation Requirements

Cell Stage	Site Capping and Revegetation Requirements
Operation	Under the Waste Regulation 2014, asbestos waste must be covered with virgin excavated natural material. The depths required covering are: - Immediate covering with 150 mm of cover - 500 mm of cover at the end of each day
	It is proposed to use temporary plastic sheeting which would be placed immediately over the ACS after it is placed in the containment cell. The use of suitably rigid plastic sheeting will minimise the generation of dust from the placement works in a similar manner to the use of VENM. Prior to placement of the next load of ACS and at the start of each day's filling works, the plastic sheeting would be stripped back to allowing filling operations to continue. At the end of each day's filling operation the plastic sheeting would be secured in place to prevent it being lifted or displaced due to wind.
Closure / Rehabilitation	Under the Protection of the Environment Operations Waste Regulation 2014 (the Waste Regulation 2014), asbestos waste must be covered with virgin excavated natural material. The depths required covering are: - Final cover of at least 3 m (in the case of friable asbestos material). **Refer discussion below for justification of alternative capping design.**
	A revegetation layer: - At least 1000 mm thick. - Clean soils and vegetation with root systems that will not penetrate into lower layers. - The upper 200 mm will be a topsoil layer, which can include compost to help with vegetative establishment and growth. - Promote water removal by evapotranspiration and runoff.

Cell Stage	Site Capping and Revegetation Requirements
	A separation geotextile will be placed above the infiltration drainage layer to prevent ingress of fines from the overlying soil. The separation geotextile will be designed as a marker layer to identify that asbestos is buried below this point to ensure the Site is prepared for potential future uses and protects people from inadvertently excavating the cell.
	An infiltration drainage layer (required for restricted solid waste landfills): - 300 mm thick and would consist of hard, strong, durable and clean gravel with a saturated hydraulic conductivity to water of greater than 1 x 10^{-4} m/s.
	A protection geotextile to protect the flexible membrane liner from damage by overlying materials.
	A sealing layer comprising: - An upper HDPE geomembrane liner overlying a geo-synthetic clay liner.
	A seal-bearing surface: - Consisting of a property designed and engineered layer of material at least 300 mm think to support the sealing layer. - The material would meet recognised specifications for engineered materials, such as QA Specification 3071: Selected Material for Formation (NSW Roads and Maritime Services, December 2011), as amended from time to time.

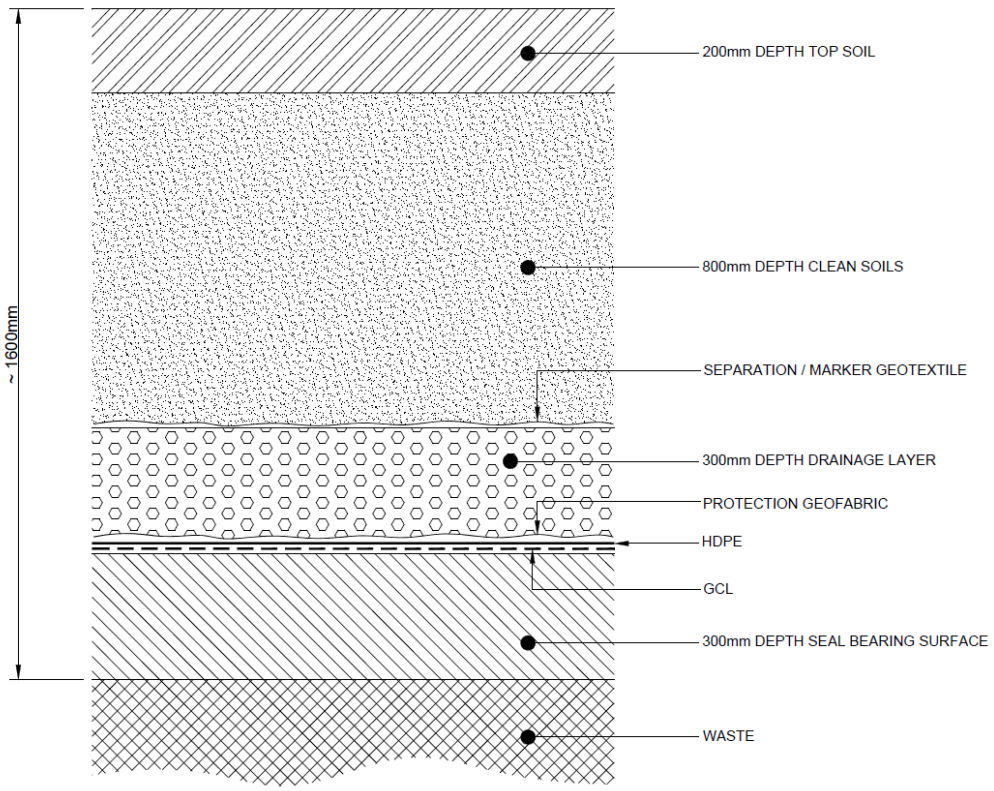
To facilitate runoff and minimise ponding of water, the cap will have a gradient of greater than 5% to defined drainage points. However, to reduce the risk of erosion, the cap has been restricted to a gradient of ≤20%.

A construction quality assurance program will be implemented during construction of final capping.

Capping will be implemented progressively throughout the active filling stage of the containment cell and will not be left to the post-closure period.

The proposed capping is illustrated in **Figure 5** below.

Figure 5 Proposed Containment Cell Cap



The Landfill Guidelines and Waste Regulations require 3 m of VENM cover over asbestos contaminated waste however they do not require a geosynthetic liner in the cap. The proposed cap design, as described above, includes 1.6 m of soil and aggregate layers and two layers of geosynthetic including a GCL and an HDPE, as shown in **Figure 5**. The detailed design will include the design of the connection between the capping and liner layers, in particular the welding of the upper and lower HDPE liners, thereby fully containing the waste within HDPE and other layers. The 3 m of VENM over asbestos containing waste is prescribed in the Waste Regulations to ensure no friable particles are released from waste. The 1.6 m of soil and aggregate and the two layers of geosynthetic are considered an appropriate alternative to 3 m of VENM to contain asbestos fragments. In addition a marker layer with be included as the separation geotextile to reduce the risk of the cap being removed.

Following closure of the containment cell, post closure monitoring would include:

- Regular inspections for deterioration of the capping's condition, including erosion, cracking, dead or stressed vegetation, ponding, differential settlement, slope stability, and damage to any pipes, drains and other works installed on the final capping.
- Repair and/or replacement of portions of the final capping found to be damaged.
- Monitoring of leachate and rainfall volumes.

4.10 Water Balance

As per Section 2.3 of the Landfill Guidelines (EPA, 2016), a water balance model should be conducted to estimate the required leachate storage capacity. The water balance model was prepared in using default rainfall infiltration percentages provided for small sites:

- 20% infiltration for final capping;
- 100% infiltration for an active area with daily covering.

No intermediate covering has been modelled as it is not expected that any waste filled areas will be left un-capped for a period greater than 90 days.

Based on this modelling the greatest leachate generated in one month was 893 m^3, with an average monthly generation of 537 m^3.

Table 18 Water Balance Model Results

	Highest Daily leachate generation	Highest leachate generated in one month	Average monthly leachate generation	Annual leachate generation post closure
Leachate (m^3)	30	893	537	3,160

4.11 Drawings and Technical Specifications

The conceptual design described in this report is depicted in the drawings included as **Appendix A**.

Draft technical specifications have been included in **Appendix B** for key components of the containment cell barrier system. These specifications will be finalised as part of the detail design stage of the project

4.12 Schedule of Quantities

Based on the Conceptual Design described in this report and on the drawings in **Appendix A**, a preliminary schedule of quantities for materials and works required to construct the containment cell has been provided in **Table 19**.

Table 19 Schedule of Quantities - Kurnell Containment Cell

ITEM	DESCRIPTION	UNIT	QUANTITY (estimate)
1	**Mobilisation**		
1.1	Establishment to site of all equipment, goods and personnel	Item	1
1.2	Demobilisation from site of all equipment, goods and personnel	Item	1
1.3	Survey, set-out and as built reporting	Item	1
2	**Lining Works**		
	Subgrade and Secondary Barrier Components		
2.1	Purchase, supply, transport to site, placement and compaction of subgrade fill to design levels and grades	m^3	11,136
2.2	Purchase, supply, transport to site and placement of GCL	m^2	9,280
2.3	Purchase, supply, transport to site and placement of HDPE	m^2	9,280
2.4	Purchase, supply, transport to site and placement of geocomposite drain/leak detection layer	m^2	9,280
	Primary Barrier Components		
2.5	Purchase, supply, transport to site and placement of GCL	m^2	9,280
2.6	Purchase, supply, transport to site and placement of HDPE	m^2	9,280
2.7	Purchase, supply, transport to site and placement of geofabric protection layer	m^2	9,280
2.8	Purchase, supply, transport to site and placement of 300 mm depth aggregate leachate drainage layer	m^3	2,784
2.9	Purchase, supply, transport to site and placement of geofabric separation layer	m^2	9,280
3	**Capping Works**		
3.1	Grading and compaction of the interim cover soils to form the 300 mm depth seal bearing surface	m^2	10,240
3.2	Purchase, supply, transport to site and placement of GCL	m^2	10,240
3.3	Purchase, supply, transport to site and placement of HDPE	m^2	10,240
3.4	Purchase, supply, transport to site and placement of geofabric protection layer	m^2	10,240
3.5	Purchase, supply, transport to site and placement of 300 mm depth aggregate drainage layer	m^3	3,072
3.6	Purchase, supply, transport to site and placement of geofabric separation layer	m^2	10,240
3.7	Purchase, supply, transport to site, placement and grading of 800 mm clean soils to design levels and grades	m^3	8,192
3.8	Purchase, supply, transport to site, placement and grading of 200 mm topsoil to design levels and grades	m^3	2,048
3.9	Supply and establishment of vegetation over capping surface	m^2	10,240
4	**Leachate Control**		
4.1	Supply and install 30 kL leachate storage tank	Item	1
4.2	Supply and install leachate collection pipework on cell floor within drainage aggregate	Linear meters (Lm)	500

ITEM	DESCRIPTION	UNIT	QUANTITY (estimate)
4.3	Supply and install a leachate collection sump, sump pump and pipework to storage tank	Item	1
4.4	Supply and install a leak detection sump, sump pump and pipework to storage tank	Item	1
4.4	Supply and install leachate transfer pipework from storage tank to WWTP	Provisional Item	1
5	**Drainage & Miscellaneous Works**		
5.1	Sediment control during construction works	Item	1
5.2	Form stormwater drains around the containment cell perimeter and outlet to current stormwater outlets	Lm	300

The following assumptions have been made during preparation of the schedule of quantities:

- This estimate is an indicative, high level estimate of the material quantities involved with the construction of a cell only. It is based on the concept design prepared and reflects the basic lining and capping components of the cell. Further works which are not included may be required following detailed design phase of the Project.
- The tanks and associated pipework and infrastructure are not included in this estimate and will be removed by others.
- The existing concrete and sand bund are considered suitable for the construction of lining systems directly over.
- The extent of the cell would be within the bunds surrounding tanks 224, 225, 333, 334 and 335. The leachate storage tank would be located within the bund surrounding tank 226 and would not need any further lining or engineering works.
- The volumes used are based on a site survey supplied by Caltex Australia Pty Ltd (email dated 05/04/16).
- The scope of pipework connection from the storage tank to the existing OWSS is not known and a provisional item only has been allowed in this estimate.
- All volumes are in-situ, placed and compacted volumes.

5.0 Conclusion and Recommendations

5.1 Management of Hazardous Waste

Based on the assessment of the Hazardous Waste treatment options discussed in **Section 3.0**, the potential risk to human health and the environment and the cost effectiveness of each option, the preferred option for managing the Special Hazardous Waste from the pipeways was considered to be remediation via trommelling. Biopiling and off-site disposal were ranked second and third respectively. Therefore, it is recommended that a small scale pilot trial be conducted of intensive biopiling and trommelling to confirm the feasibility of treating the hazardous waste using these methods and determine which option is more suitable given the contaminant concentrations in the ACS.

5.2 Concept Design

The containment cell has been designed to create a maximum airspace capacity for up to 24,500 tonnes of ACS. The 24,500 tonnes has been determined based on the following:

- 10,600 tonnes of Special General Solid Waste;
- 3,100 tonnes of Special Restricted Solid Waste;
- 3,850 tonnes of Special Hazardous Waste, should treatment be conducted on-site to allow re-classification as either Special General Solid Waste or Special Restricted Solid Waste (as described in **Section 3.4**); and
- A 40% contingency[9] which allows for daily cover soils during waste placement if required.

Based on an average maximum wet density of 1.6 t/m^3; a 24,500 tonne capacity containment cell would require a waste containment volume of approximately 15,300 m^3.

The highest classification of waste contained within the containment cell would be Special Restricted Solid Waste. As such the containment cell has been designed in accordance with the requirements of a restricted landfill cell. The concept design of the proposed containment cell has been prepared generally in accordance with the Landfill Guidelines (EPA, 2016).

Due to the shallow groundwater level, excavation in to the existing ground surface has been minimised as far as practicable to minor excavation in the sump bases.

Following acceptance of the concept design by Caltex a detailed design would be prepared including specifications and drawings suitable for inclusion in a tender package for the construction of the containment cell.

[9] Contingency has been allowed for based on sensitivities around soil type, soil density factors and treatment process.

6.0 References

AECOM (2013) Caltex Kurnell (535) Pipeways Contamination Assessment / Characterisation - Stage 2 Report

AECOM (2016a) Pipeways Asbestos Waste Classification Report

AECOM (2016b) Kurnell ASC Management – Options Report

AECOM (2016c) Kurnell Terminal Geotechnical / ESA

Caltex (2011) Kurnell Terminal Stormwater Management Plan

Coffey (2015a) Caltex Refineries (NSW) Pty Ltd: Bi-annual Groundwater Monitoring Report, Caltex Refinery Process Plant Kurnell NSW

Coffey (2015b) Caltex Refineries (NSW) Pty Ltd: Spent Phosphoric Acid Limestone Pits, Groundwater and Surface Water Assessment

EPA (2014) NSW Environment Protection Agency Waste Classification Guidelines, Part 1: Classifying Waste, November 2014

EPA (2016) NSW EPA Solid Waste Landfill Guidelines

National Environment Protection (Assessment of Contaminated Land) Measure (NEPM) 1999, National Environment Protection Council Amendment 2013. Schedule B1, Guideline on Investigation Levels for Soil and Groundwater.

NSW Department of Housing (2004) Managing Urban Stormwater: Soils and Construction Volume 1

NSW DECC (2008a) Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills

Protection of the Environment Operations Act (POEO) 1997, Schedule 1

SKM (2014), Management of Contaminated Soils in South Australia

URS (2014) Kurnell Refinery Demolition, Statement of Environmental Effects (SEE), SSD 5544 MOD1

US EPA (May 2004), How to Evaluate Cleanup Technologies for Underground Storage Tank Site, A Guide for Corrective Action Plan Reviewers, EPA 510-R-04-002, page IV-19 and IV-3

Vertasefli (2016), http://www.vertasefli.co.uk/our-solutions/expertise/stabilisation-and-solidification, viewed 18/05/16

Vertasefli (2016b), http://www.vertasefli.co.uk/our-solutions/expertise/soil-washing, viewed 18/05/16

7.0 Design Report Limitations

AECOM Services Pty Limited (AECOM) has prepared this Report in accordance with the usual care and thoroughness of the consulting profession for the use of Caltex Petroleum Australia Pty Ltd

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The report is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this Report.

It is prepared in accordance with the scope of work and for the purpose outlined in the Contract dated [19 February 2016].

This Report was prepared between April 2016 to July 2016 and is based on the conditions encountered and information reviewed at the time of preparation. AECOM disclaims responsibility for any changes that may have occurred after this time.

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It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.

Any estimates of potential costs which have been provided are presented as estimates only as at the date of the Report. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.

Appendix A

Drawings and Technical Specifications

Appendix A Drawings

ISO A1 594mm x 841mm

KURNELL ASBESTOS CONTAMINATED SOIL MANAGEMENT PROJECT

CIVIL DRAWINGS

SITE KEYPLAN

DRAWING REGISTER	
DRAWING NO.	DRAWING TITLE
CV-001	COVER SHEET AND DRAWING REGISTER INDEX
CV-002	EXISTING CONDITIONS
CV-003	PROPOSED TOP OF LINER DESIGN
CV-004	PROPOSED TOP OF CAP DESIGN
CV-005	CROSS SECTIONS
CV-006	DETAILS

NOT FOR CONSTRUCTION

AECOM

PROJECT

KURNELL ASBESTOS CONTAMINATED SOIL MANAGEMENT PROJECT CONCEPT DESIGN

KURNELL, NSW 2231

CLIENT

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ENGINEERING

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ISSUE/REVISION

I/R	DATE	DESCRIPTION
T2	13.07.16	FINAL ISSUE
T1	21.06.16	DRAFT ISSUE

SCALE

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1:5000

PROJECT NUMBER

60488804

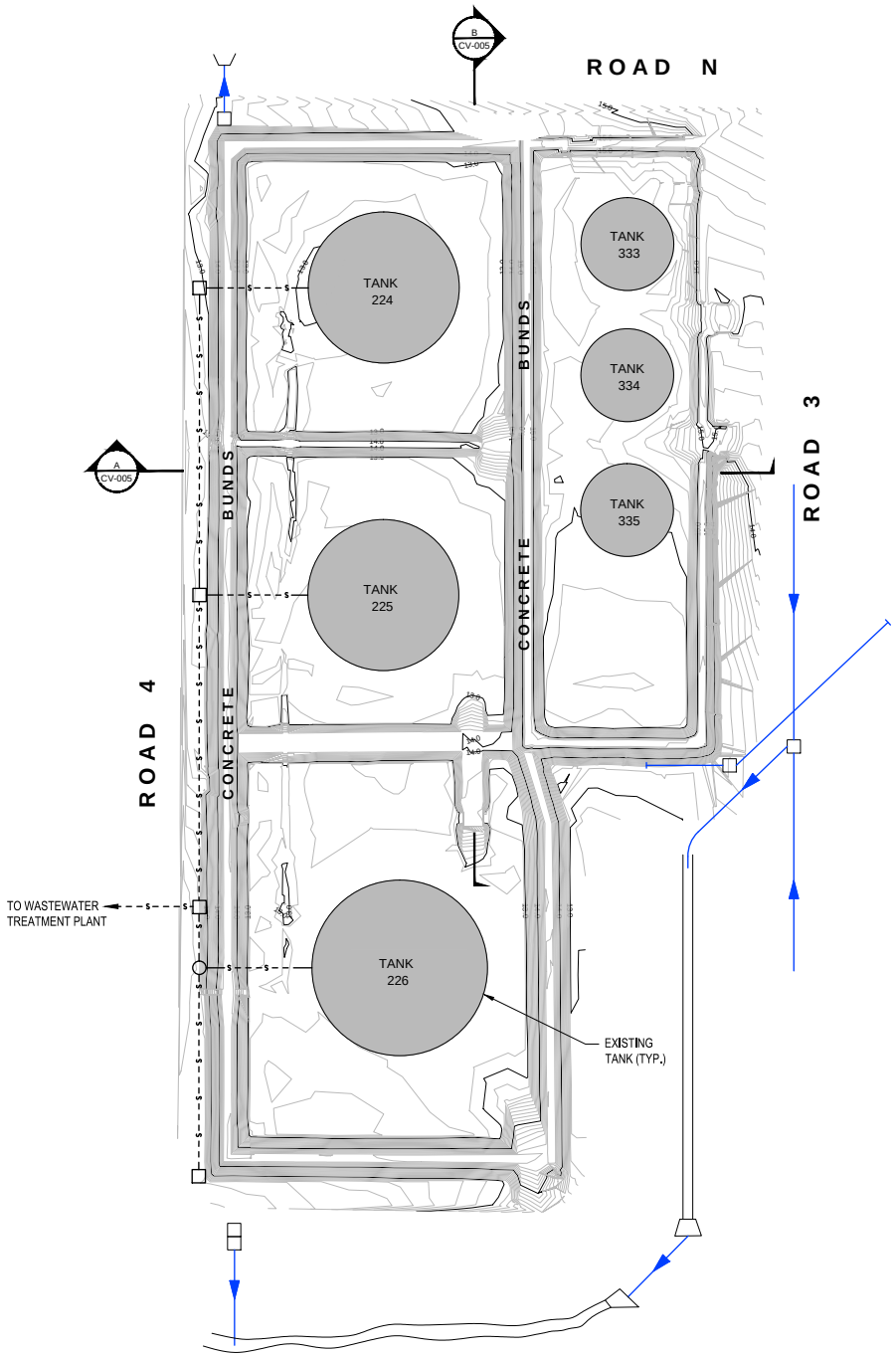
SHEET TITLE

CIVIL
COVER SHEET
AND DRAWING INDEX

SHEET NUMBER

60488804-DRG-CV-001

ISO A1 594mm x 841mm



LEGEND

- OILY WATER SEWER
- STORMWATER DRAINAGE
- PIT

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1:500

PROJECT NUMBER

60488804

SHEET TITLE

CIVIL
EXISTING CONDITIONS

SHEET NUMBER

60488804-DRG-CV-002

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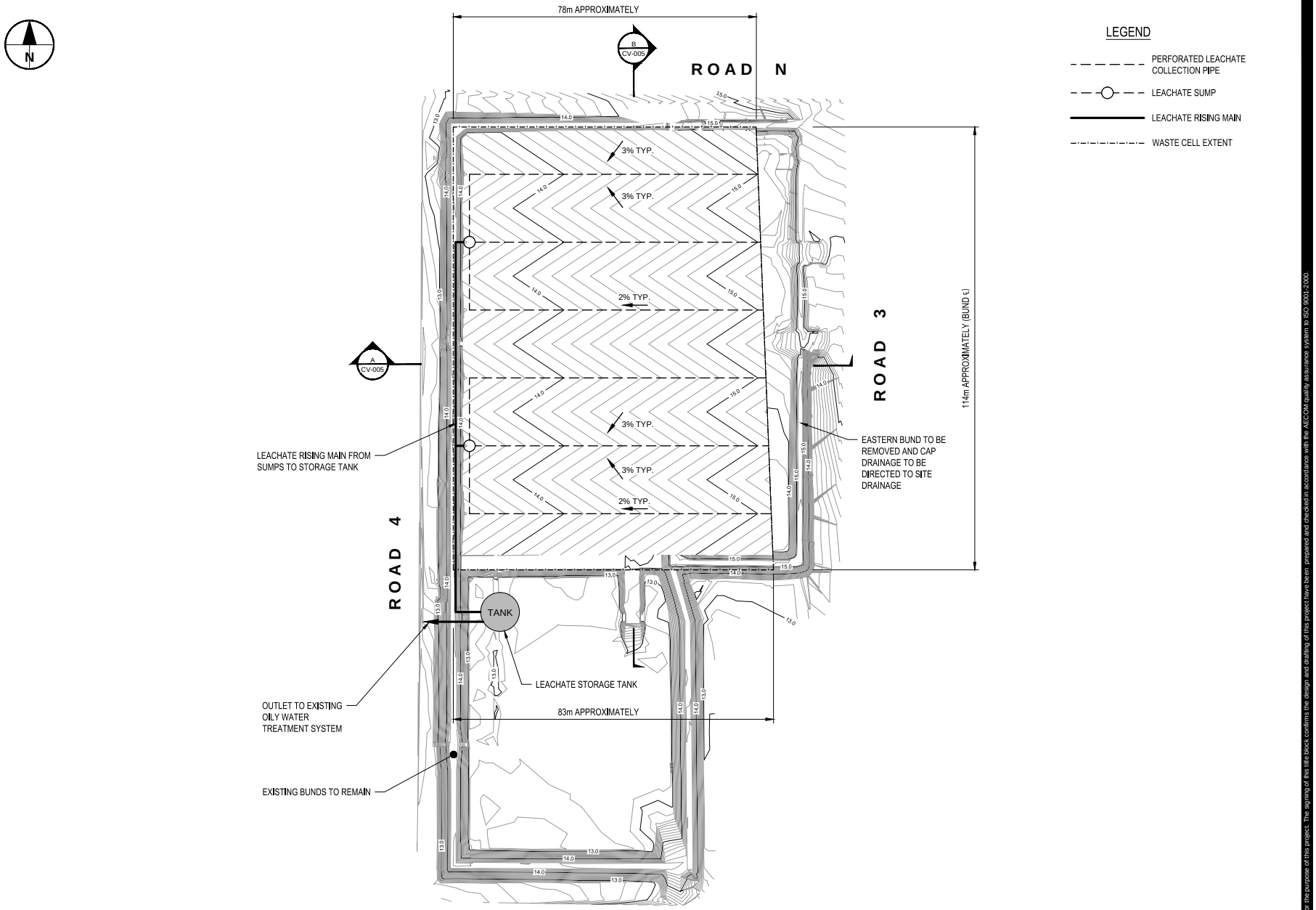

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SCALE

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1:500

PROJECT NUMBER

60488804

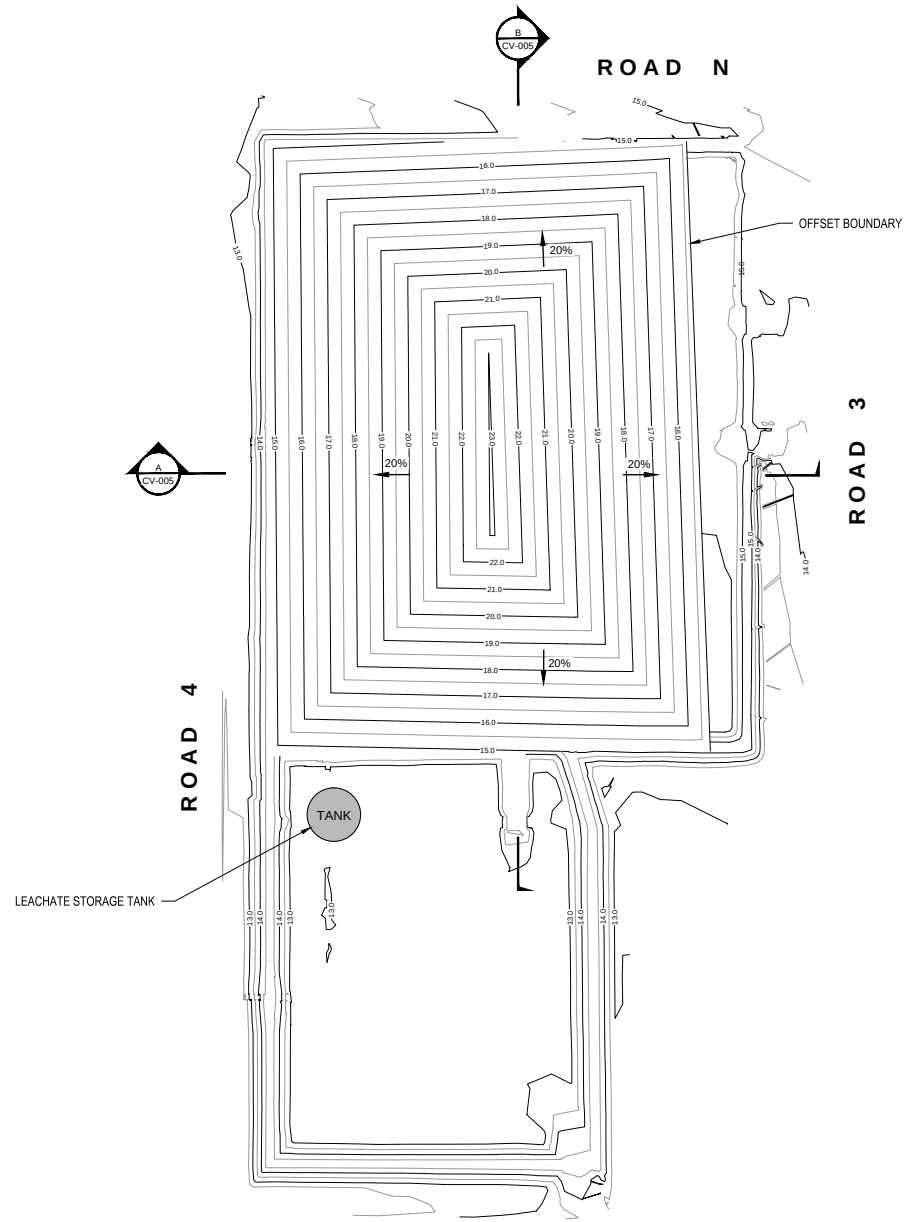
SHEET TITLE

CIVIL
PROPOSED TOP OF LINER DESIGN

SHEET NUMBER

60488804-DRG-CV-003

ISO A1 594mm x 841mm



NOTE:

1. MAXIMUM HEIGHT OF FINAL TOP OF CAP SHOWN.
2. FINAL TOP OF CAP LEVEL MAY REDUCE DEPENDING ON VOLUME OF WASTE AIRSPACE REQUIRED.
3. THE HEIGHT DATUM RL's SHOWN REFER TO AHD.

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SCALE

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PROJECT NUMBER

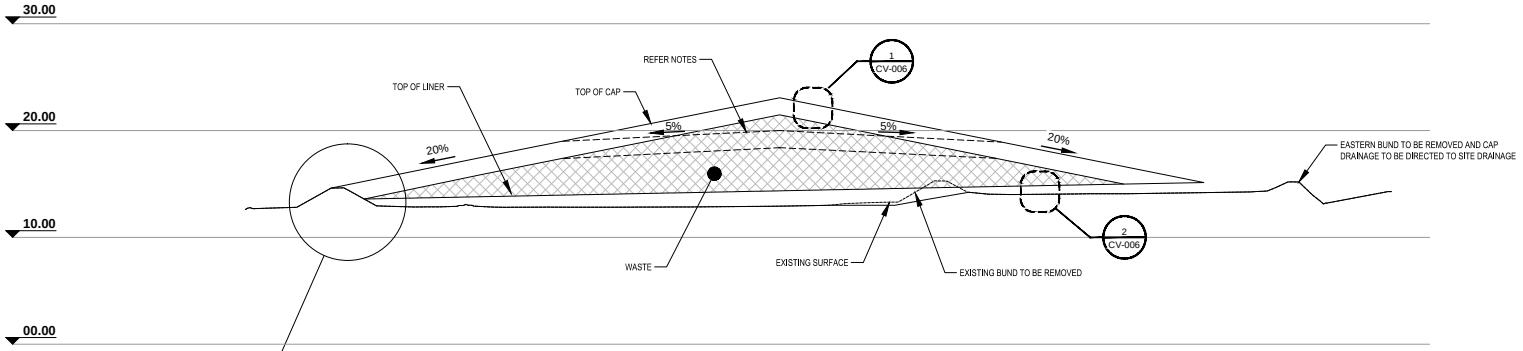
60488804

SHEET TITLE

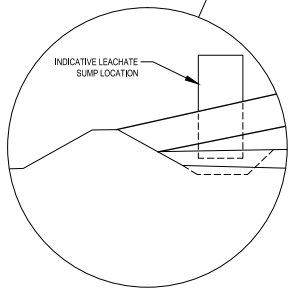
CIVIL
PROPOSED TOP OF CAP DESIGN

SHEET NUMBER

60488804-DRG-CV-004

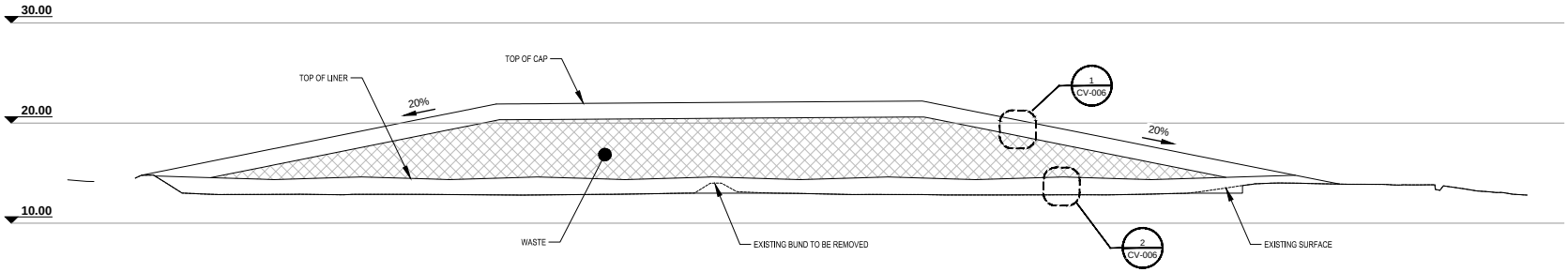


A SECTION
CV-002
CV-003
CV-004
Scale 1:250



NOTE:

1. MAXIMUM HEIGHT OF FINAL TOP OF CAP SHOWN.
2. FINAL TOP OF CAP LEVEL MAY REDUCE DEPENDING ON VOLUME OF WASTE AIRSPACE REQUIRED.
3. WHERE MAXIMUM CAP LEVELS ARE NOT REQUIRED THE FINAL CAP SURFACE MAY BE REDUCED.
4. WHERE FINAL CAP LEVELS ARE REDUCED ALL CAP SURFACES SHALL BE GRADED AT A MIN. 5% GRADE TO STORMWATER DRAINS.
5. THE HEIGHT DATUM RL's SHOWN REFER TO AHD.



B SECTION
CV-002
CV-003
CV-004
Scale 1:250

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SCALE
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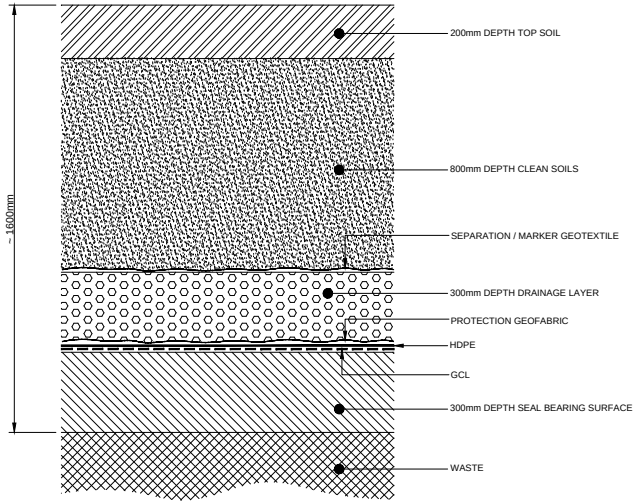
PROJECT NUMBER
60488804

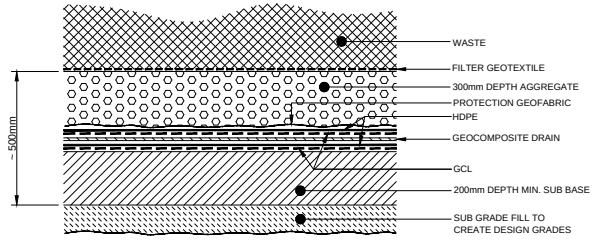
SHEET TITLE
CIVIL
CROSS SECTIONS

SHEET NUMBER
60488804-DRG-CV-005

ISO A1 594mm x 841mm



1 CAPPING LAYER DETAIL
CV-005 Scale 1:10



2 BASE LINER DETAIL
CV-005 Scale 1:10

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T2	13.07.16	FINAL ISSUE
T1	21.06.16	DRAFT ISSUE

SCALE
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1:10

PROJECT NUMBER
60488804

SHEET TITLE
CIVIL
DETAILS

SHEET NUMBER
60488804-DRG-CV-006

Appendix B

Technical Specifications

Appendix B Technical Specifications

PART 1 GENERAL

1.01 Scope of Work

The Works covered by this Specification include, but are not necessarily limited to the following:

A Control of stormwater;

B Site clearing;

C The setting out of the Works to the lines and levels shown on the Drawings;

D Removal of infrastructure in the area of works and disposal as directed by the Superintendent;

E Filling with imported soils, site grading and compaction of landfill cell base;

F Importation of suitable soils, placing and compaction of materials to form the landfill cell capping layers;

G Construction of access ramp to within the cell for waste placement; and

H Construction of surface water drains as shown on the Drawings.

1.02 Related Sections

A. AS 1470 - Health and Safety at Work - Principles and Practices

B. AS 1289 - Methods of Testing Soils for Engineering Purposes

C. AS 1141 - Methods for Sampling and Testing Aggregates

1.03 Definitions

A. Standard Density: As determined in accordance with AS 1289 E1.1.

B. Modified Density: As determined in accordance with AS 1289 E2.1.

C. Nominal Compaction: Material to be hand or machine bucket tamped, or trafficked by construction plant to prevent sloughing.

D. Rippable Rock: The words "rippable rock" material shall describe material in excavations which can be ripped and excavated with a tracked dozer in good condition with matching hydraulic single shank ripper of combined mass of 48.5 tonnes (this refers to a CAT D9H dozer or its equivalent) operated by an experienced and competent operator, at a rate in excess of 75 m^3 (solid) per hour.

E. Hard Rock: The words "hard rock" material shall describe material in excavations which cannot be ripped and excavated with a tracked dozer in good condition with matching hydraulic single shank ripper of combined mass not less than 48.5 tonnes (this refers to a CAT D9H dozer or its equivalent) operated by an experienced and competent operator, at a rate in excess of 75 cum (solid) per hour and shall include boulders greater than 0.8 cum in volume.

F. The term "unsuitable material" shall only apply to weak deposits, excessively sandy gravel and pebble deposits and organic material below foundation level which, because of their inherent nature, cannot be satisfactorily reconditioned and are not suitable as a foundation, bedding or backfill material. Unsuitable material shall not be removed without the written instruction of the

Superintendent. Unsuitable material shall be treated as overburden and removed to stockpile by the Contractor using whatever equipment is required.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 Foundation Preparation

A All standing water shall be drained or otherwise removed from the area before foundation preparation can commence.

B After the removal of all excess material from the base area, the subgrade of the landfill cell shall be graded to conform to the lines and levels shown on the Drawings.

C Prior to placement of sub-base soils the subgrade shall be compacted to 95% Standard Compaction.

D Subgrade fill compaction testing shall be undertaken at a frequency of 1 test per 2,500 m^2.

F No fill shall be placed in any area without the written approval of the Superintendent.

3.02 Sub-Base & Seal Bearing Fill Placement and Compaction

A. Surface Preparation

1 Before fill is placed in any area, the Superintendent shall be notified in writing with at least 48 hours notice so that they may inspect the material to confirm that the prior work meets the specified requirements.
2 All areas upon which fill is to be placed shall be scarified to a depth of 50 mm and rewetted prior to the placing of any fill to ensure a firm bond to the foundation. This applies to material exposed to drying for a period greater than twelve hours.
3 Soft spots shall be excavated as directed by the Superintendent and replaced with fill material and compacted in accordance with this specification. The Superintendent may require additional testing of the remediated area.

B. Fill Placement and Compaction Standards

1 Fill material shall be spread and compacted in layers of uniform quality and thickness parallel to the longitudinal axis of the work and for the full width of the cross-section.
2 All fill earthworks shall be compacted to 95% of Standard Dry Density or 95% HILF density ratio unless otherwise stated on the Drawings at a frequency of 1 test per 2,500 m^2 or 1 test per 500 m^3 fill placed. Allowances shall be made for areas on the outer 500 mm of the shoulders of fill areas where 95% of Standard Compaction may not be achievable.
3 In all cases, measured moisture contents from samples taken from the liner and embankments shall be within -1% Dry to 3% Wet of optimum moisture content.
4 Suitable material shall be used for the construction of all fill works. Material can be sourced from off site and must contain an acceptable proportion of clay and/or silt i.e. clayey sand, sandy clay, silty sand or sandy silt. Fill proposed for use must be approved by the Superintendent before placement. Any material placed into the works, not approved and considered unsuitable by the Superintendent shall be removed, replaced with suitable material and re-compacted at the Contractor's expense.
5 The thickness of the layers (loose) shall be not greater than 250mm and the required degree of compaction must be achieved for the full depth of the layer.
6 Compaction to the required standard shall be a special operation requiring the use of a machine or machines specifically approved for the purpose (typically a pad foot roller). Compaction plant shall cover the entire area of each layer of fill and give each layer a uniform degree of effort.

7 All fill compaction earthworks shall be suitably maintained during the construction period. Where the compacted fill does not meet the specified requirements it shall be excavated, dried or re-wetted and re-compacted. Any fill or cut surface which has deteriorated through excessive drying, cracking, wetting, erosion or has been weakened or rutted at a point as a result of construction traffic shall be reconditioned in accordance with the requirements of this Specification.

3.04 Capping Clean Soil & Topsoil Layers

A. The material used for the construction of vegetative layers shall comprise a clean soil, mulch and/or topsoil that can support vegetation growth on the landfill cap.

B. Vegetative layers shall be imported from offsite sources and is not available onsite. The Contractor shall provide the Superintendent a report including, at a minimum, the following items about the material to be sourced:

i. Description and location of the source of material.

ii. Testing undertaken to indicate that it meets IWRG 621 requirements. If an investigation was previously undertaken at the site to assess potential contamination, the Contractor shall provide a copy of the report.

iii. Testing undertaken on the topsoil to analyse the nutrient content of the material and if the topsoil requires additional nutrients to support vegetation establishment (3 tests per source of material).

iv. Soil Classification by a NATA accredited laboratory (3 tests per source of material).

3.08 Leachate Drainage System

1 The Leachate Drainage material shall consist of a washed coarse aggregate layer sourced from off site and have the following recommended material properties:

- Be nominal size between 20 to 50 mm and shall be free draining;
- Have fines content less than 1%;
- Should not contain limestone or other calcareous material that would be subject to chemical attack; and
- Be approved by the Superintendent prior to use.

2 Where the above criteria are not met the aggregate shall achieve a hydraulic conductivity of not less than 1×10^{-3} m/s as shown by laboratory testing.

3 Three samples shall be collected from the source prior to importation to site for testing for the criteria listed above. Test results shall be provided to the Superintendent for approval prior to importation to site.

4 A trial pad shall be constructed to confirm the aggregate placement methodology does not damage the HDPE layer. The trial pad shall be a minimum of 10m x 10m and shall be placed using the same method proposed for full scale works. The HDPE shall be uncovered at the end of the trial to confirm no damage has occurred. The CQA officer shall inspect the exposed HDPE and confirm that no damage has occurred. A WMS shall be prepared based on the trial pad and utilised for the full scale works. The proposed WMA shall be approved by the CQA officer before full scale placement commences.

5 The leachate collection pipes comprise a 160 mm PE100 PN16 HPDE pipe with 10 mm holes drilled at approximately 100 mm centres as per drawing detail.

6 The leachate collection pipes shall be handled and stored in a manner that does not compromise the integrity of the pipes.

3.06 Anchor trench (for geomembrane liner)

Anchor trenches shall be excavated on the perimeter bunds to anchor the geosynthetic liners. The anchor trench shall be located at least 1.0 m from the inside crest of the bund.

The anchor trench shall be backfilled progressively with the soil material excavated to form the trench. The material shall be adequately moisture condition prior to backfill. The soil shall be tamped into place following membrane placement and moisture controlled where required. The GITA shall observe the compaction of the anchor trench backfill and provide comment on the compaction undertaken in the Level 1 as-built report.

3.05 Excavation

A. General

1 All excavated areas to the landfill cell subgrade shall be cut to the depths, grades and lines as approved by the Superintendent. Grades and levels shall be established to minimise ponding of water in cut areas.

B. Over-excavation

1 Operations shall be directed to avoid excavating beyond the specified profiles. Any over-excavation beyond these profiles carried out without the written instruction of the Superintendent shall be made good to the directions of the Superintendent and approved fill material compacted to the requirements of this Specification at the Contractors cost.

3.06 Dimensions and Tolerances

1 The earthworks shall be constructed to the levels and dimensions as shown on the Drawings. The following tolerances in finished dimensions shall not be exceeded:

- Locations of tops and bottoms of walls and embankments in plan ±500 mm
- Base width of landfill area ±1,000 mm
- Levels of tops of embankments ±100 mm
- Maximum variation from a 4 metre long straight edge placed in any direction on any formed surface ±50 mm

3.07 Control of Water

1 During construction, all areas of earthworks shall be drained and/or pumped of water and kept free of water by temporary drains or other means. Surface water from the surrounding country shall be prevented from flowing on to the excavations or areas of fill by the construction of diversion drains as shown on the drawings before any other excavation commences. Excavation and fill areas shall always be graded to facilitate surface drainage and any loose material compacted to prevent absorption. Particular care shall be taken to ensure that surface water does not reach embankments or fill material that has yet to be compacted.

3.08 Clean-up

1 On completion of the Works, the site shall be generally cleared, any damage made good and the site restored to a neat and tidy condition. All work areas shall be smoothed and graded in a manner to conform to the natural appearance of the landscape. Where unnecessary destruction, scarring, damage or defacing has occurred as a result of the operations, the same shall be repaired, replanted, reseeded, or otherwise corrected to the satisfaction of the Superintendent.

END OF SECTION

GEOSYNTHETIC CLAY LINER (GCL) SECTION TS02650

PART 1 GENERAL

1.1 Scope of Work

A. This section covers the supply, transportation, handling and installation of the Geosynthetic Clay Liner (GCL).

B. The liner elements are to be installed in accordance with the Construction Quality Assurance (CQA) plan prepared for this project.

1.2 Related Sections

A. Section TS 02240: Earthwork

PART 2 PRODUCTS

2.1 Geosynthetic Clay Liner (GCL)

A. The Geosynthetic Clay Liner (GCL) consists of a bentonite clay layer sandwiched between two geotextile layers. The layers are then needle punched to produce a textile with high connection strength.

B. The supplier shall demonstrate by providing MQA Certificates that the GCL provided complies with the requirements outlined in GRI-GCL3 as set out below:

Material	Property	ASTM Test Method	Value	Test Frequency
GCL (as manufactured)	Mass of GCL (2)	ASTM D5993	≥ 4,000 g/m^2	4,000 m^2
	Mass of Bentonite (2)	ASTM D5993	≥ 3,700 g/m^2	4,000 m^2
	Moisture content (1)	ASTM D5993	≤ 35%	4,000 m^2
	Strip Tensile Strength	ASTM D6768	≥ 4.0 kN/m	20,000 m^2
	Peel Strength	ASTM D6496	≥ 360 N/m	4,000 m^2
	Permeability (1) "or" Flux (1)	ASTM D5887	≤ 5.0 x 10^{-11} m/sec "or" ≤ 1.0 x 10^{-8} m^3/sec-m^2	25,000 m^2
GCL Permeability	Permeability (max at 35 kPa) (1) (3)	ASTM D6766	≤ 1.0 x 10^{-8} m/sec	yearly

Material	Property	ASTM Test Method	Value	Test Frequency
	Permeability (max at 500 kPa)	ASTM D6766	≤ 5.0 x 10^{-10} m/sec	yearly

(1) These values are maximum (all others are minimum)

(2) Mass of the GCL and bentonite is measured after oven drying per the stated test method

(3) Value represents GCL permeability after permeation with a 0.1M calcium chloride solution (11.1g $CaCl_2$ in 1-liter water) for termination criterion see Section 5.6.1 of GRI-GCL3

C. The bentonite used in the manufacture of the GCL supplied for the works shall meet the following criteria;

Property	Value
Montmorillonite content	> 70 wt%
Carbonate content*	< 1–2 wt%
Bentonite form	Natural Na-bentonite or >80 wt% Sodium as activated bentonite
Particle size	Powdered (e.g. 80% passing 75 micron sieve) or Granulated (e.g. < 1% passing 75 micron)
Cation exchange capacity	≥ 70 meq/100 g (or cmol/kg)
Swell index	≥24 cm3/2g

* Carbonate here implies calcite, calcium carbonate or other soluble or partially soluble carbonate minerals.

D. The following information shall be noted on the rolls of GCL supplied to the site:

- product name, grade and name of manufacturer;
- date of manufacture, batch number;
- roll number;
- roll length;
- roll weight;
- roll width; and
- label with handling guidelines.

E. The following Materials Quality Assurance (MQA) data for the rolls of GCL supplied to the site shall be supplied to the Superintendent:

- test results to show conformance with the criteria noted above;
- date of manufacture;
- lot number, roll number, length and width;
- bentonite manufacturer quality documentation for the particular lot of clay used in the production of the rolls delivered;
- geotextile manufacturer quality control documentation for the particular lots of geotextiles used in the production of the rolls delivered;
- cross-referencing list delineating the corresponding geotextile and bentonite lots for the materials used in the production of the rolls delivered;

- QC program laboratory certified reports;
- the manufacturer's approved QA stamp; and
- technician's signature.

F. On-site Conformance Testing

Once all GCL material is received on-site, the Third Party CQA Consultant shall undertake conformance testing of the GCL to confirm compliance with the requirements outlined in the table below:

Item	Property	ASTM Test Method	Acceptance Criteria	Test Frequency
Conformance testing (upon shipment of GCL to the site)	Thickness (dry)	ASTM D5199-12	The GCL thickness shall be ≥ the thickness of the GCL sample that passes the "Mass per unit area of bentonite component of GCL" test.	Every roll
	Mass per unit area of bentonite component of GCL	ASTM D5993	≥ 4,000 g/m^2 for X1000 ≥ 3,700 g/m^2 for X2000	1 sample per 2,500m^2
	Mass per unit area of GCL		Refer Section 2.1	1 sample per 500m^2
	Montmorillonite content (X-ray diffraction method)		Refer Section 2.1	1 sample per 10,000m^2
	Cation Exchange Capacity of Bentonite (methylene blue method)		Refer Section 2.1	1 sample per 500m^2
	Mass/unit length of bentonite in overlaps (visual inspection and weighing)		Visual inspection	1 sample per 40m overlap
	Moisture content of bentonite	AS 1289.2.1.1	≤35%	1 sample per roll or 500m^2
	Swell index/free swell of clay	ASTM D5890	Refer Section 2.1	1 sample per 500m^2
	Fluid loss	ASTM D5891	Refer Section 2.1	1 sample per 500m^2

Item	Property	ASTM Test Method	Acceptance Criteria	Test Frequency
	Peel strength (for needle-punched products only	ASTM D6496	Refer Section 2.1	1 sample per 500m^2
	Tensile strength of GCL	ASTM D6768	≥ 8 kN/m for X1000 ≥ 10 kN/m for X2000	1 sample per 10,000m^2
	CBR Burst Strength of GCL	AS 3706.4	≥ 1,600 N for X1000 ≥ 2,500 N for X2000	1 sample per 25,000m^2
	Permeability “or” Index Flux	ASTM D5887	Refer Section 2.1	1 sample per 10,000m^2
Visual inspection of GCL	Colour, thickness, needle punching, presence of needles or broken needles, and sewing density or other faults in the material	-	Visual inspection	Every roll
Visual inspection of in-situ GCL	Thickness of GCL (i.e. uniformity of bentonite distribution). If thickness appears to be variable a check of the mass per unit area shall be conducted.	Visual Inspection as ASTM D5993	≥ 4,000 g/m^2 for X1000 ≥ 3,700 g/m^2 for X2000	Visual inspection of every roll
	Apparent variations in the as placed moisture distribution. If moisture content appears to be variable a check of the mass per unit area shall be conducted	Visual inspection and ASTM D5993	≥ 4,000 g/m^2 for X1000 ≥ 3,700 g/m^2 for X2000	Visual inspection of every roll

Note:

1. All conformance tests must be reviewed, accepted and reported by the Third Party CQA Consultant before deployment of the GCL.
2. All testing must be performed on samples taken from the GCL delivered to site under the Third Party CQA Consultant supervision.
3. All laboratory tests must be performed in a third party independent accredited laboratory.
4. The required testing frequencies may be revised by the Third Party CQA Consultant to conform with improvements in testing methods and/or in the state of the art practice and/or to account for the criticality of application (i.e. to account for the importance of the GCL for the safety of works). Revisions must be approved by the relevant authorities before application.

The process of sampling the GCL rolls shall not cause any damage to the GCL rolls. Sampling shall be undertaken as follows:

- Only one GCL roll shall be opened at any one time;
- Once sampling has been completed, the packaging of each GCL roll shall be fully reinstated to ensure no deterioration of the GCL; and
- Sampling shall be undertaken in the shortest period of time to avoid deterioration of the GCL.

PART 3 EXECUTION

3.1 Installation Pattern

A. All personnel involved with the installation of the GCL shall have read and fully understood this specification. If there are any matters which need clarification, these should be brought to the attention of the Superintendent prior to laying the GCL.

B. The Contractor shall prepare an installation plan for the GCL and submit the plan to the Superintendent for approval. No GCL shall be deployed until approval of the layout plan has been given.

3.2 Protection of Subgrade

A. The subgrade for the GCL shall be compacted soils free from protrusions such as stones, debris, standing water, indentations or surface cracks.

B. The moisture content of the compacted subgrade shall be kept constant during construction by watering as required.

3.3 Supervision

A. The installation of the GCL shall be supervised by an independent third party CQA officer appointed by the Principal.

B. The installation of the GCL is to be noted in the construction program provided by the Contractor at the commencement of the project.

C. The Superintendent is to be notified at least 48 hours prior to the laying of the GCL. Site inspections shall take place as required by the CQA plan.

3.4 Packaging, Transportation and Unloading on Site

A. GCL rolls shall be packed in moisture tight plastic wrapping.

B. GCL rolls shall be delivered in (closed/covered) containers on trucks, vehicles, etc. The storage space for the GCL is to be dry, even and free from debris or foreign matter. The storage space has to be accessible at least from the top. Bags of bentonite powder and the non-woven fabric strips are to be protected from the weather once delivered.

C. Should any damage occur in transit it must be immediately brought to the attention of the Superintendent who will advise on the required course of action.

D. A hard, dry free draining surface must be provided for unloading and storage. Rolls will be off-loaded using:

   1. Two > 55mm slings (wrapped around the GCL roll 1/3 of the width from the edge) fixed to an excavator bucket or a front end loader. A steel tube or similar reinforcement should be inserted into the roll to prevent excessive deformation across the roll during off-loading; or
   2. A spreader bar with steel tube insert, ensuring that the chains or belts do not damage the roll; or
   3. Using a “carpet prong” protruding from the front end of a forklift or other equipment. The prong should be at least three-fourths the length of the core and also must be capable of supporting the full weight of GCL without significant bending.

E. Under no circumstances should GCL rolls be dragged, lifted by one end only, pushed to the ground from the delivery vehicle, or otherwise unloaded in a fashion which could damage the roll.

F. After transportation and unloading the plastic wrapping is to be checked. Minor damage should be repaired with weather resistant adhesive tape. Wrapping should only be removed immediately before use. The maximum storage height is four rolls.

3.5 Storage

A. GCL rolls should be stored in their original, unopened packaging in a location away from construction traffic.

B. The designed storage area should be level, dry, well-drained, and stable and should protect the product from:

   1. precipitation
   2. standing water
   3. ultraviolet radiation
   4. chemicals
   5. excessive heat
   6. vandalism and animals

C. GCL rolls are to be stored lying flat, continuously supported, and should never be stored standing on one end. Enclosed indoor storage is preferred if GCL is to be stored for long periods.

3.6 Repairs

A. Where GCL has been damaged during installation such areas are to be repaired by covering with an overlapping piece of GCL. The overlaps are to be at least 500mm and should be done in accordance with this Specification. All damage and repairs to the GCL are to be reported to, and inspected by the CQA officer. Full documentation of repairs including location, causes, method of repair and inspection dates are to be recorded by the CQA officer.

3.7 Placement of GCL

A. Understanding of the Installation Staff

1. The quality of installation is decisive for the success of a project. Before installation, this Specification, and in particular the equipment requirements and bentonite paste mixing procedure must be thoroughly understood by all personnel responsible for the laying. Any questions arising should be referred to the Superintendent.

B. GCL Placement

1. GCL factory wrapping should only be removed immediately before installation.
2. The edges of the GCL are marked on the bottom side with a coloured line to denote the standard overlap of 300mm.
3. On site GCL is unrolled on the ground using the spreader bar. The overlap line should be visible on the top of the panel.
4. The complete area of the GCL is to be inspected by the CQA officer for damage and defects and any irregularities and repairs noted in site documentation.
5. Installed liners must not be trafficked by vehicles, and walking on the liners must be kept to an absolute minimum.
6. Rolls are to be cut to length with a carpet knife or electric cutter.
7. Rolls must be laid without folds on the subgrade with a standard overlap of 300mm in both the longitudinal and transverse direction. Longitudinally the coloured line can be used during installation to control the overlap width.

C. Overlying Clay Layer Placement

1. A layer of clay liner material of at least 300mm in depth (loose) shall be placed over the GCL by the end of each working day after the installed area has been inspected.
2. The GCL may not be trafficked on directly. The cover material should be pushed in front of the construction equipment thus creating a safe working platform. Overlaps should not be moved or squeezed during this process.
3. Seams are to be continually inspected by the CQA officer while cover material is being placed over the GCL to ensure their integrity. Seams should be checked for movement between the sheets of The GCL. If any movement is detected, covering is to halt and seams inspected to ensure their integrity and the Superintendent is to be notified prior to recommencing cover placement.

4. Generally, temporary haul roads should not go over areas where the GCL has been laid. These areas, if possible, should be sealed last to minimise traffic over the GCL. Where site traffic cannot be avoided (e.g. the delivery of cover material by trucks) additional protection measures will be required. The additional measures are to be as directed by the Superintendent.
5. For temporary roads, a minimum coverage over The GCL of at least 900mm is acceptable without any further analysis. Shallower coverage or alternative cover materials are to be directed to the CQA officer for approval.

3.8 Treatment of Seams in GCL

A. End Overlaps (Transverse Direction)

1. The treatment of end overlaps are to be inspected by the CQA officer.
2. No trafficking or walking is to occur over the overlap region. The overlap must also be free from folds and foreign matter (e.g. aggregate, soil). Any foreign matter on the laps must be swept away carefully.
3. End overlaps shall occur in a tiled layout with the direction of ground slope. End overlaps in sumps or inverts are to be avoided.
4. All end overlaps must be sealed with bentonite paste of similar bentonite specification to that in the GCL.

3.9 Weather Conditions

A. GCL should be installed in dry weather conditions and frost free weather conditions where bentonite paste is used for overlaps.

B. Sufficient plastic (in rolls) is to be stored on site to cover any GCL laid in case of rain. Any laid GCL is to be covered immediately rain commences with plastic or soil cover material.

END OF SECTION

PART 1 GENERAL

1.01 Scope of Work

A The work covered under this Specification consists of the supply and installation of the geosynthetic materials for Containment Cell as shown on the Drawings and summarised as follows:

- 2.0 mm Smooth High Density Polyethylene (HDPE) Geomembrane on the cell floor and capping.
- Cushion geotextile as protection layer over the HDPE liner.
- Separation geotextile over aggregate drainage layers.
- Geocomposite drain layer.

B Requirements for quality control and testing, including preparation of information sheets are cited in the Specification for QUALITY CONTROL REQUIREMENTS and the Construction Quality Assurance (CQA) Plan.

C The process of assessing manufacturers test results and installation works shall be supervised full time by the independent Construction Quality Assurance Officer (CQA Officer).

1.02 Related Sections

A Section TS02240: Earthworks

PART 2 PRODUCTS

2.01 Material Specification

A The HDPE Geomembrane shall not be placed into position until the Contractor has produced documentary evidence from the manufacturer to the Superintendent and CQA Inspector that the product conforms to the requirements of this specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the documentary evidence is required prior to release of the hold point. The CQA Plan also requires Auditor approval of this phase and is a **HOLD POINT** under the Audit process.

B The geomembrane liner supplied shall be a High Density Polyethylene liner. The geomembrane shall consist of single resin being 100% Virgin and of a narrow molecular distribution. Carbon black shall be added to the resin for ultra-violet resistance, the geomembrane shall be manufactured to the following approximate ratios; HDPE 97.5% - Carbon Black 2.5%.

C The geomembrane supplied shall be a 2.0mm smooth HDPE geomembrane for the cell floor and capping layers. The Contractor shall provide manufacturer information for type of resin (name and number) used to manufacture the HDPE geomembrane.

D Each roll of geomembrane shall be labelled from the manufacturer to provide the following identifying data:

1. Name of Manufacturer and material type;
2. Material Thickness;
3. Roll Number;
4. Roll Dimensions (length and width);
5. Roll Weight;
6. Cross reference numbers to raw material batch and all laboratory certified reports; and
7. The manufacturers approved QA stamp and the technician's signature.

E The supplied material shall be free from holes, blisters, folds, undispersed raw materials and any signs of contamination by foreign matter.

F The geomembrane material shall meet the requirements of the attached technical specification.

G The Contractor is responsible for handling, storage and care for the supplied geomembrane liner. The geomembrane liner shall be protected from fire, damage and UV exposure (as far as practicable) before installation. Geomembrane rolls may be stacked (up to 4 rolls in height) to provide access to the material for identification of the rolls.

H The geomembrane liner rolls shall be placed in a relatively dry and smooth subgrade (not to be placed on gravel surface) to minimise potential damage to the geomembrane.

Geotextile

I The Contractor is responsible for handling, storage and care for the supplied geotextile liner. The geotextile liner shall be protected from UV exposure (as far as practicable), inundation, mud, puncture or other damaging conditions. Geotextile rolls may be stacked to provide access to the material for identification of rolls.

J Where a significant number of defects are identified on a geofabric roll the CQA Officer shall assess the material and reserves the right to reject any damaged rolls.

2.02 Manufacturer test reporting

A It is a requirement that all geomembrane liner materials be certified for quality prior to installation. A separate Manufacturer's Quality Assurance report shall be submitted to the Superintendent by the Contractor. This report shall comprise a Raw Materials Batch Report and a Product Report.

B The geotextile (cushion and separation) supplied shall be non woven needle punched and either polyester or polypropylene.

D Table of HDPE geomembrane and geotextile properties as shown in the following tables:

Table 1 - HDPE Geomembrane Properties

Property	Units	Value	Test	Frequency of Manufacturer's QA Testing
Thickness (ave.)	mm	2.0	ASTM D5199	Every roll
Minimum Thickness	mm	1.8	ASTM D5199	Every roll
Density (min)	g/cm^3	≥ 0.94	ASTM D1505 & D792	90,000 kg
Melt Flow Index	g/10 min	< 1.0	ASTM D1238	Per batch or resin type
Tensile Properties (each direction) - Strength at break - Elongation at break - Strength at yield - Elongation at yield	 N/mm % N/mm %	 > 53 > 700 > 29 > 12	 ASTM D6693 ASTM D6693 ASTM D6693 ASTM D6693	9,000 kg
Tear Resistance (min ave.)	N	> 249	ASTM D1004	20,000 kg
Puncture Resistance (min ave.)	N	> 640	ASTM 4833	20,000 kg
Carbon Black Content	%	2 to 3	ASTM D1603	9,000 kg
Carbon Black Dispersion	Rating	1 or 2	ASTM D5596	20,000 kg
Oxidative Induction Time (OIT) - 1) Standard OIT OR - 2) High Pressure OIT	Min	1) > 100 2) > 400	1) ASTM D3895 2) ASTM D5885	90,000 kg

Property	Units	Value	Test	Frequency of Manufacturer's QA Testing
Oven aging @ 85º C 1) Standard OIT, % retained after 90 days OR 2) High pressure OIT, % retained after 90 days	%	1) > 55 2) > 80	1) ASTM D5721 & D3895 2) ASTM D5885	Per formulation
Stress Crack Resistance	hr	> 300	ASTM D5397	Per formulation
UV Resistance 1) If High pressure OIT, % retained after 1600 hours	%	50	ASTM D5885	Per formulation

Table 2 - Cushion Geotextile Properties

Property	Units	Value (MARV*)	Test	Frequency of Manufacturer's QA Testing
Thickness	mm	4.0	AS 2001-2.15	1 test per batch or truckload of material, whichever requires the greatest number of tests
Mass	g/m^2	700	AS 2001–2.13	
CBR Burst strength	N	8,950***	AS3706.4	
Trapeziodal Tear Strength (MD/Cross MD)	N	1,180/1,180	AS3706.3	
Wide Strip Tensile Strength (MD/Cross MD)	kN/m	48.0/48.0	AS3706.2	
Puncture Resistance (d_{500}) (Drop Cone Method)	mm	13.0** (MaxARV)	AS3706.5	

***** MARV denotes Minimum Average Roll Value, MD denotes Machine Direction, Flow rate is typical value.

** MaxARV denotes Maximum Average Roll Value.

*** If the cushion geotextile does not meet this test value the material may be assessed against the GRI standard requirements.

Table 3 - Separation Geotextile Properties

Property	Units	Value (MARV*)	Test	Frequency of Manufacturer's QA Testing
CBR Burst strength	N	1500**	AS3706.4	1 per batch
Trapeziodal Tear Strength (MD/Cross MD)	N	240/220	AS3706.3	
Wide Strip Tensile Strength (MD/Cross MD)	kN/m	9.0/7.7	AS3706.2	
Flow rate (at 100 mm head)	$l/m^2/s$	> 230	AS 3706.9-01	

*** MARV denotes Minimum Average Roll Value, MD denotes Machine Direction, Flow rate is typical value.**

** If the separation geotextile does not meet this test value the material may be assessed against the GRI standard requirements.

E The Batch Report for Raw Materials shall be provided for each and every raw material batch associated with the geomembrane product delivered to site and shall conform to the following or approved alternative:

1 Density Test ASTM D1505
2 Carbon Black Content ASTM D1603
3 Melt Index ASTM D1238
4 Stress Crack Resistance (Bell Test) ASTM D5397
5 Puncture Resistance ASTM D4833
6 Oxidative Induction Time (OIT) ASTM D3895
7 Oven aging (Standard OIT) ASTM D5721 & D3895

F The Product Report shall contain data compiled for each and every roll of geomembrane delivered to site in relation to the following test methods or approved alternative:

1 Tensile Properties ASTM D6693, including Strength at Yield, Elongation at Yield, Strength at Break, Elongation at Break
2 Thickness (by method of) ASTM D5199
3 Carbon Black Dispersion ASTM D5596

G The Manufacturer's Report (along with the Materials Identification) shall be submitted prior to the arrival of the material to the construction site. No materials will be accepted for delivery to site, or progress payment made, unless all necessary Manufacturer's Quality Assurance certification data, as described above, has been provided to the Superintendent. All such data must be supplied in sufficient time such that no delay shall be caused to the project programme. Failure to conform to this requirement, causing resultant delay to the progress of the works, will not be grounds for an extension in time or removal of any commercial penalties which accompany this Contract.

2.03 Independent Testing

A The geomembrane and geotextile rolls delivered to site will be assessed against the Manufacturer's Report for compliance with this specification. The roll numbers will also be assessed.

B The geomembrane delivered to site is recommended to be sampled and tested by an independent laboratory (NATA registered) as shown in the table below.

Table 4 - Geomembrane Testing

Property	**Test**	**Frequency of Independent QA testing**
Thickness (ave.)	ASTM D5994	Each roll
Density (min)	ASTM D1505 & D792	Per 5000 m^2 or one sample every 5 rolls, whichever is the greatest number of tests.
Tensile Properties (each direction) - Strength at break - Elongation at break - Strength at yield - Elongation at yield	 ASTM D6693 type IV ASTM D6693 type IV ASTM D6693 type IV ASTM D6693 type IV	
Tear Resistance (min ave.)	ASTM D1004	
Puncture Resistance (min ave.)	ASTM D4833	
Carbon Black Content	ASTM D1603	
Carbon Black Dispersion	ASTM D5596	
Oxidative Induction Time (OIT)	ASTM D3895, ASTM D5885	1 sample every 10,000m^2 or per resin type or manufacturing run.
Stress Crack Resistance	ASTM D5397	

The test results from the independent laboratory testing shall meet the requirements outlined in Section 2.02.C. The Contractor shall be responsible for the testing of the material.

C The geotextile delivered to site is recommended to be sampled and tested by an independent (NATA registered) as outlined in the relevant GRI guideline;

Table 5 – Cushion Geotextile Properties

Material Property	Units	Value (MARV*)	Test	Frequency of Independent QA Testing
Thickness	mm	4.0	AS 2001-2.15	1 sample per 2,500 m^2
Mass	g/m^2	700	AS 2001–2.13	
Puncture Resistance (d_{500}) (Drop Cone Method)	mm	13.0** (MaxARV)	AS3706.5	1 sample per 5,000 m^2
CBR Burst strength	N	8,950***	AS3706.4	
Trapeziodal Tear Strength (MD/Cross MD)	N	1,180/1,180	AS3706.3	
Wide Strip Tensile Strength (MD/Cross MD)	kN/m	48.0/48.0	AS3706.2	

* MARV denotes Mean Average Roll Value, MD denotes Machine Direction.

** MaxARV denotes Maximum Average Roll Value.

*** If the geotextile does not meet this test value the material may be assessed against the GRI standard requirements.

The Contractor shall be responsible for the testing of the material supplied for the works.

PART 3 CONSTRUCTION

3.01 Work Method Statements

At least two weeks prior to commencing construction of the HDPE geomembrane liner, the Contractor shall provide a method statement outlining the method of construction, testing (type, frequency and methods), equipment to be used, proposed panel layout plan, pro-forma sheets for recording of works undertaken etc. This action constitutes a **HOLD POINT**. The Superintendent's approval of the method statement is required prior to the release of the hold point.

3.02 Subgrade Preparation

A All subgrade surfaces over which the HDPE geomembrane shall be placed, will be prepared as follows. The area to be lined shall be smooth and free of stones, rocks, roots, sticks and any sharp objects or debris of any kind that may compromise the integrity of the geomembrane liner.

B The surface shall provide a firm, unyielding uniform base for the geomembrane. This surface shall be compacted in accordance with and met the requirements of the Specification TS 2240 - EARTHWORKS.

3.03 Geomembrane and Geotextile Installation

Geomembrane placement

A Prior to the installation of the geomembrane liner, the Contractor and the Superintendent shall together inspect the subgrade to be lined. All sudden depressions, humps, earth clods, roots, stones, sharp objects or debris of any kind which may compromise the integrity the geomembrane liner shall be removed at the Contractor's expense to the satisfaction of the Superintendent. Significantly desiccated clay liner shall also be reworked.

B A detailed panel layout plan will be prepared for the geomembrane and geotextile layers and approved by the CQA Officer prior to installation.

C The geomembrane liner shall be installed strictly in accordance with the requirements of this Specification and, where not specified, with the geomembrane liner manufacturer's requirements.

D This action constitutes a **HOLD POINT**. The Superintendent's approval to the set-out is required prior to the release of the hold point.

E The site installation of the geomembrane liner shall be carried out by personnel who have had extensive previous experience with installation works of a similar nature. The geomembrane liner shall not be installed under weather conditions where the ambient temperature is less than 5 degrees Celsius, more than 35 degrees Celsius, during rain or when rain is threatening, high winds or dusty conditions.

F Sandbags shall be used as required to hold the liner in position during installation. Sandbags shall be sufficiently close-knit to preclude fines from working through the bottom, sides or seams of the bags. Paper bags will not be permitted. Burlap bags, if used must be lined with plastic. Bags that are split, torn or otherwise losing their contents shall be immediately removed from the works area and any spills immediately cleaned up. Sandbags placement during geomembrane liner deployment shall not damage the geomembrane liner in any way.

G Placed geomembrane liners shall be ballasted by sandbags to avoid wind uplift. The geomembrane installer is responsible for assessing the number of sandbags required.

H No geomembrane liner shall be installed over areas until approval of these surfaces from the Superintendent has been received by the Contractor. Failure to comply with this condition may result in the Superintendent directing the removal of the liner in that area for the purpose of inspection. Any costs associated with the removal or any other works necessary to enable such an inspection to be undertaken shall be borne by the Contractor.

I The Contractor shall prepare and submit to the Superintendent, prior to commencement of the works, Panel and Welding Layout drawings in relation to the placement of the geomembrane liner.

J The liner sheets shall be deployed in a continuous manner down embankments or across the base and shall be lapped over adjacent sheets by a minimum of 150 mm or to a greater width as required by the weld type to be employed. The geomembrane liner and cushion Geotextile shall be deployed in a manner that eliminates any generation of cross seam on the bunds and on side slopes.

K The fusion welding of panel ends shall not form a crucifix ('+') and shall have the T-joints to have a minimum separation of 0.5m between joints.

L All T-joints, where 3 seams are joined to form a 'T', shall be considered to be a defect and shall be patched.

M Where panels are placed on bunds and base separately (that is in a different orientation), the join between the bund and base panels shall be 1.5 m away from the toe of bund.

N The entire surface area of each and every roll shall be inspected by the Contractor during unrolling and placement to ensure that there are no tears, abrasions, indentations, cracks, thin spots or other faults in the material. The Contractor shall inform the Superintendent of any such occurrence. It shall be the responsibility of the Contractor to ensure that all damage within the geomembrane liner during the works is repaired or replaced.

O The thickness of the geomembrane shall be verified onsite by the independent CQA officer at random points where the thickness of the geosynthetics, in the opinion of the CQA officer, appears less than specified or at an approximate average spacing of 20m apart. Thickness shall be measured at the edge of the sheet using a micrometer or similar instrument.

P The geomembrane liner shall be placed in a relaxed state over the prepared subgrade allowing the material to respond to thermal changes without causing excessive buckling, wrinkling or tensioning. No fish mouths or other signs of stress either will be permitted within welds made during installation of the liner. Any such occurrences being identified will be repaired or remedied by the Contractor at no cost to the Principal. The Contractor will be responsible for making any allowances considered necessary to accommodate predictable differential settlements of the surface and/or variations on it.

Q All geomembrane liner panels deployed shall be welded on the same day.

R The electric generators used for the works shall be placed on smooth base or rubber wheeled trolleys to prevent damage to the geomembrane.

S The Contractor shall not engage in any activity that may damage the integrity of the geomembrane liner during geomembrane liner deployment and welding.

Geotextile placement

T Following approval by the Superintendent after the geomembrane placement and testing, the geotextile shall be deployed over the geomembrane liner.

U Prior to geotextile deployment, the geomembrane liner surface shall be free of debris, sand bags from geomembrane liner placement and any other material that may compromise the integrity of the geomembrane liner.

V No machinery shall be allowed on to the geomembrane liner surface unless expressly allowed in the approved work method statement.

W The geotextile shall be placed in a relaxed manner and rolled out. The cushion shall cover the entire surface of the basal liner and the separation geotextile shall cover the entire extent of drainage aggregate.

X The geotextile is to be heat bonded along edges and roll ends, with a minimum overlap of 150 mm, to form a continuous layer over the geomembrane liner. The edges to be heat bonded shall be free of debris.

Y The geotextile liner shall not be installed during rain or when rain is threatening, during high winds or dusty conditions.

Z Any placed geotextile that has a defect (holes, punctures) shall be repaired with a patch with a minimum 300mm overlap in all directions from the defect.

AA No machinery shall be allowed to travel directly on to the geotextile unless expressly allowed in the approved work method statement.

BB The geotextile be covered within the timeframes recommended by the manufacturer to prevent UV degradation. If the geotextile cannot be covered within the manufacturer's timeframes, than a suitable alternative control must be implemented.

CC The separation geotextile placement method over the aggregate drainage layer shall be similar to the cushion geotextile material.

3.04 Field Welding Geomembrane Liner

A Following the placement of the geomembrane sheets, the Contractor shall weld the sheets to form a homogeneous bond between adjacent sheets. A minimum overlap of 150mm for hot wedge (fusion) welding and 150mm for extrusion welding should be used. The following two welding methods are considered appropriate for the purposes of this project:

A Primary Weld (Dual Track Fusion Welding)

1. Fusion Welding is carried out using the split head wedge weld method which will fuse, by heat, the interface components of the upper and lower overlapped sheets. The weld method will give access to a 15 mm wide void between each of the weld zones for the purpose of air pressure testing the weld.
2. All welds constructed will generally comprise Fusion Welding. In particular, the connection of the geomembrane liners to batters with base liners will be carried out using Fusion Welding. Where cross-over welds from adjacent connecting geomembrane occur, the welds must be offset a minimum of 150 mm to avoid multi-layer weld lapping.
3. The Contractor shall maintain at least one spare Fusion Welding machine for the works.

B Secondary Weld (Extrusion Welding)

1. Extrudate or hot air is cast over the upper and lower section of the weld zone to affect the Extrusion Welding. The overlap method is considered to be a secondary weld and would be used for the purposes of making repairs or gaining access to weld those areas which are inaccessible to the split head wedge weld.
2. The extrudate rod or granule shall be manufactured from the same resin type used in the manufacture of the geomembrane sheet and all physical properties shall be the same as those possessed by the sheet raw materials. The Contractor shall obtain from the manufacturer certified test data with each and every roll of extrudate rod or granule to confirm this compliance which shall be submitted to and approved by the Superintendent.
3. Extrudate granule shall be packaged and stored in a manner that will not allow the ingress of moisture. Moisture extraction methods may be used while in storage such that extrudate contamination does not occur. Prior to use, each bag of extrudate granules shall be tested for moisture content by the Contractor, who will submit a copy of the test results to the Superintendent. Where wetting has occurred, the Contractor shall be responsible for drying or replacing the material. The cost of drying or replacement shall be borne by the Contractor.
4. The Contractor shall maintain at least one spare Extrusion Welding machine for the works.

C General Site Welding

1. The Contractor shall be responsible for regularly checking, calibrating and recording the following items:
    - Preheat air flow and temperature at the nozzle;
    - Extrudate flow and temperature at the barrel outlet; and
    - Split Copper wedge temperature on both contact points.

D Weld Preparation

1. The Contractor shall ensure that the surface upon which the welding is to take place is free of surface water which could adversely affect the weld quality. The surface of the sheet material within the weld zone shall also be free from any foreign materials such as clay, sand, dust etc.
2. Welding shall be undertaken only with the operator and machine settings that were approved during trial welds.
3. All welding surfaces shall be adequately abraded (where necessary) using approved mechanical equipment, at a time no more than 30 minutes prior to the commencement of the welding operation. The Contractor shall take all necessary care to give attention to maintaining the abrasion in the immediate region of the weld and shall not cover over grind the areas thus reducing the effective thickness of the geomembrane adjacent to the weld zone. Where over grinding is observed, the Contractor shall rectify this by removing the over grind area as directed by the Superintendent.
4. Welding of any one joint should be carried out in one direction only.

PART 4 TESTING AND REPAIRS

4.01 Testing of Field Welds

1. All Welds shall be subjected to destructive and non destructive testing by the Contractor. The following procedures shall be followed in the course of this testing:

A Trial Welds (Fusion and Extrusion Weld)

1. Trial welds shall be made on fragment pieces of membrane to verify that welding machine parameters are set for optimum performance. Such trial welds shall be made prior to actual field welds and at the beginning of each weld period. A minimum of 4 samples should be tested during trials welds. The trial weld samples shall be at least 1.0 m long by 0.3 m wide with the weld centre being formed lengthways. Four 25mm wide samples shall be cut from each trial weld using a calibrated die cutter and two samples are to be tested in shear and two samples are to be tested for peel adhesion to determine the quality and strength of the weld. The shear and peel testing is to be undertaken using a tensiometer that has been calibrated within the last 12 month period prior to the start of the works. The Contractor shall supply evidence of the calibration of the tensiometer to the Superintendent.
2. Trial welds shall be performed at a maximum interval of no greater than five (5) hours or more frequently as requested by the CQA officer. This is typically undertaken in the morning prior to the start of any site welding works and approximately at mid-day when ambient temperatures has changed.
3. The Fusion Weld trial weld samples shall be tested on both tracks of the split head wedge welder for peel adhesion. The peel adhesion and shear strength shall meet the requirements outlined in Table 1(b) GRI GM19. Any other test methods will require further assessment and subject to approval by the Superintendent.
4. The Extrusion Weld shall be tested for peel and shear. The peel adhesion and shear strength shall meet the requirements outlined in Table 1(b) GRI GM19. Any other test methods will require further assessment and subject to approval by the Superintendent.
5. The trial weld is considered to have failed if the sample fails in the weld (i.e. weld does not hold and has peeled in excess of 15% of the weld) or do not meet the minimum specified in Table 1(b) GRI GM19. Trial weld samples are not to be artificially cooled (by water or ice) prior to be tested.

6. In the event that a trial weld fails, the Contractor shall repeat the entire process after making appropriate adjustments to the welding machine. No field welding should be carried out without a passing trial weld.
7. The Contractor shall refer to ASTM D6392 and note failure mode of weld (types of locus-of-break) during testing.

B Seam Testing (Fusion and Extrusion Welds)

1. Destructive seam tests shall be performed on all the welds during the installation of the geomembrane at random locations selected by the CQA Officer or from locations where questionable quality of field seams are noted during full time inspection of works. The seam testing shall be undertaken at a minimum of one sample for every 150 m of fusion seams welded.
2. A field destructive test will be carried out on every fusion and extrusion weld greater than 10 metres in length and independent laboratory destructive testing undertaken at a minimum of one sample for every 120m of extrusion seams. The purpose of these tests shall be to confirm and evaluate seam strength and continuity during the field seaming. This test shall be undertaken as field welding work progresses, not at the completion of the welding works. The extrusion weld samples, where possible, shall not be collected in the sump areas.
3. Each destructive seam sample size shall approximately be 0.3 m by 0.6 m. The sample size is to be increased if sample archiving is required. Archive samples shall have all necessary information written on the sample (i.e. sample number, seam number, date, welder speed and temperature).
4. The field destructive sample shall be cut into ten 25mm samples. Five samples shall be tested for shear and five samples tested for peel adhesion. The shear and peel samples shall be selected and tested alternately so that no two samples are tested in the same mode. The samples shall meet the peel and shear requirements set in Table 1(b) GRI GM19. If the field destructive sample does not meet specification requirements, the Contractor shall undertake remedial works outlined in Point 9 below. There will be no testing of the laboratory sample if the field sample has not met the specification requirements.
5. The laboratory destructive samples are to be tested by a NATA accredited laboratory.
6. The Superintendent may, at his discretion, request archive destructive samples be sent to an independent laboratory for additional testing.
7. The resultant void in the geomembrane seam from the destructive sample is to be treated as a defect and patched.
8. If a destructive seam sample is found to be deficient, the Contractor shall trace the seam and undertake additional samples at 5m intervals or until the Contractor is confident the destructive seam sample can pass the testing. If one or both of these samples fail the destructive seam test, the Contractor shall repeat the process until a passing test is obtained. The Contractor is required to inform the Superintendent if the tracing method requires more than two (2) samples in either direction of the initial deficient sample. The Superintendent may decide if the entire seam is to be rejected or for the Contractor to keep tracing the defective seam.
9. The CQA officer and/or the laboratory undertaking the destructive sample testing is allowed to undertake further assessment if one of the ten destructive sample tested does not meet specification requirements as some allowance may be made depending on the failure mode of the sample and the performance of the remainder samples.
10. The Contractor may elect to cap the defective seam should they decide the seam is defective. To cap a seam, the defective seam first needs to be cut from the placed geomembrane panels. The cap shall extend a minimum 150mm beyond the edge of the defective seam and be welded using the Fusion Weld method. Extrusion weld for the cap shall be kept to a minimum.

11. The Contractor shall refer to ASTM D6392 and note failure mode of weld (types of locus-of-break) during testing.

C Fusion Weld (non destructive testing)

1. The contractor shall test the complete lengths of all wedge welds by use of an air pressurisation method. The air pressure channel testing unit shall be a manometer apparatus consisting of a hollow needle attached to a pressure gauge and air fitting. Air pressure shall be provided by either manual or mechanical pumps. The testing unit shall be capable of withstanding and maintaining pressures between 160 and 300 kPa. The following procedure shall be followed for the completion of these tests:
    - Seal both ends of the seam to be tested;
    - Insert manometer into channel created by the wedge welder and pressurise the channel to 300kPa for a 15mm wide channel and 200kPa for a 25mm wide channel;
    - If loss of pressure exceeds 15kPa or does not stabilise after 5 minutes, locate the faulty area, repair with surface extrusion weld and retest the seam;
    - Cut the weld on the opposite end of the manometer and observe the drop in pressure on the gauge. If the pressure does not drop, the Contractor shall locate any and all blockages on the weld, repair and retest the seam.
    - Remove the manometer and seal with an extrusion surface weld.

D Extrusion Weld (non-destructive testing)

1. The Contractor shall test the entire length of all surface extrusion welds where possible. The vacuum box assembly unit required for the testing shall consist of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom of the rigid housing, a valve assembly and a gauge to indicate the chamber vacuum. This unit shall be designed for the sole purpose of vacuum testing and shall be a complete unit incorporating a steel vacuum tank and pump assembly equipped with a pressure controller, pipe connections and a flexible vacuum hose with appropriate fittings/connections. The procedure to be followed for the non-destructive testing shall be:
    - Energise the vacuum pump;
    - Prepare the test area with a water based foaming agent (soapy water);
    - Place the vacuum box over the wetted area and open the vacuum valve;
    - Ensure that a leak tight seal has been created;
    - Obtain a vacuum to a minimum pressure of 30 kPa for a minimum period of 15 seconds, examine the seam through the viewing window for the presence of bubbles;
    - If no bubbles appear after the 15 second period, close the vacuum valve and relocate the testing box to the next adjoining area, maintaining a minimum of 25mm overlap;
    - All areas where bubbles appear shall be marked, repaired and retested.

E Repairs – Geomembrane liner and Geotextile layer

1. The Contractor should be vigilant and continually inspect the geomembrane, during placement, for any signs of geomembrane damage, punctures, blisters and any sign of geomembrane abnormalities. These areas are to be treated as defective and shall be marked out and repaired by using patches as specified in this Specification.

2. The ends and corners of all holes shall be rounded prior to patching. This is to prevent the propagation of the hole after it has been patched. Patches shall extend a minimum of 150mm beyond the limits of the defect area.
3. The Contractor should be vigilant and continually inspect the geotextile layer, during placement, for any signs of damage, punctures, and any sign of geotextile abnormalities. These areas are to be treated as defective and shall be marked out and repaired by using patches.

4.02 Supervision

1. The Contractor shall provide a Supervisor who will provide continuous supervision and inspection of the installation and construction of the HDPE geomembrane liner. The Supervisor shall have a minimum of five (5) years continuous experience in the installation of HDPE liners. The Contractor shall provide evidence of the Supervisor's experience.
2. Prior to the commencement of work on-site, the Contractor shall provide written evidence of the ability and experience of the Supervisor for approval by the Superintendent. The Contractor shall not commence work on-site until the Contractor has complied with the requirements of this subsection and approval has been received from the Superintendent. The Contractor shall bear all costs incurred by any non-compliance with these requirements.
3. The Contractor shall be responsible for regularly checking, calibrating and recording the following items:
   - the preheat airflow and temperature at the nozzle;
   - the extrudate flow and temperature at the barrel outlet; and
   - the split copper wedge temperature on both contact points.
4. The Contractor shall be responsible for ensuring that an independently calibrated, hand held temperature measuring device is operated to confirm temperatures of each and every welding machine prior to the commencement of any test or field welds. All information regarding the results gained from the temperature device shall be recorded for each welding machine.
5. Appointed by the Principal and independent to the Contractor an independent CQA Officer is to provide full time inspection and third party construction quality assurance for the geosynthetic liner works and/or during leachate collection system installation as outlined in specifications.

4.03 QA/QC Certificates and Records

A. Certificates

1. Prior to the delivery of HDPE and geotextile to the site, the Contractor shall provide the Superintendent with the following test certificates:
   - Certification and test results for all raw materials from the supplier;
   - Certification and test results for all raw materials from the membrane manufacturer;
   - Roll test data reports for each roll of material; and
   - HDPE welding rod/granulate test reports.

B HDPE Geomembrane Placement Logs

1. The Contractor shall keep a log of every HDPE geomembrane panel placed. Information to be recorded in this log shall include the following:
   - The panel identity (including panel number and roll number);
   - Subgrade (if any) conditions;
   - Date when geomembrane panel was placed;
   - Panel conditions;
   - Seam details; and
   - Repair details.

C Seam Log

1 The Contractor shall keep a HDPE Geomembrane Seam Log which records details of every seam that is formed across the geomembrane. The information recorded on this log shall include:
   - The seam number;
   - The seam length;
   - Welding machine temperature, speed (fusion weld), pre-heat temperature (extrusion weld) and initials of welder who undertook the welding;
   - The tests performed, methods utilised and test results;
   - The location and date of tests; and
   - The name of the person who performed the tests.

2. Each form shall be filled out by the Contractor on the same day the seam is formed. The form shall be signed by the Contractor and the membrane installation subcontractor.
3. The HDPE geomembrane log shall be carefully maintained by the Contractor. The Contractor shall provide the Superintendent with two (2) copies of the forms placed in the Log within one week of their completion.

D Repair Log

1. The Contractor shall keep a HDPE Geomembrane Repair Log which records details of every repair that was undertaken on the geomembrane. The information recorded on this log shall include:
   - Repair number;
   - Type of repair;
   - Non-destructive test undertaken on the repair;
   - Date of repair undertaken; and
   - Information of welding undertaken for the repair (welder temperature, welder name).

E As Built Drawings

1 Within ONE (1) week of the completion of the HDPE installation, the Contractor shall provide completed as built drawings of the HDPE geomembrane, including roll numbers, panel layout, seam locations, penetration locations, and repair locations. The drawings shall comprise a paper and an electronic copy drawn at a scale of 1:500.

2 The cost of all surveying for the HDPE installation shall be at the Contractor's expense.

4.04 Independent Testing

A. The Superintendent, at his own discretion, may require the Contractor to extract additional random samples of sheet from each roll and from welded seams to qualify the Contractors test results (at the Contractors cost). Samples shall be kept to a minimum and the following maximum frequency of sampling would apply:

1. Up to 3 material samples from each roll; and
2. Up to 1 weld sample per 100m of seams.

B. All subsequent independent tests shall be undertaken by an approved testing authority experienced in the testing and evaluation of HDPE geomembrane liners.

END OF SECTION

Appendix C

Kurnell Pipeways Asbestos Classification Report

AECOM

Kurnell Asbestos Contaminated Soils Management Project

Caltex Petroleum Australia Pty Ltd

30-Sep-2016

Doc No. 1

Pipeways Asbestos Contaminated Soils Waste Classification Report

Caltex Kurnell (ID 535)

Pipeways Asbestos Contaminated Soils Waste Classification Report

Caltex Kurnell (ID 535)

Client: Caltex Petroleum Australia Pty Ltd

ABN: N/A

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AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

Quality Information

Document Pipeways Asbestos Contaminated Soils Waste Classification Report

Ref 60488804

Date 30-Sep-2016

Prepared by Kate McGrath, Stephen Randall

Reviewed by Scott Robinson

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	22-Mar-2016	Client review	William Miles Project Manager	

Table of Contents

Executive Summary

Introduction

AECOM Services Pty Ltd (AECOM) was engaged by Caltex Australia Pty Ltd (Caltex) for approval, environmental, geotechnical and design services associated with the Kurnell Asbestos Contaminated Soils Management Project (the Project) at the Kurnell Terminal (535), Kurnell, NSW 2231 (the Site).

The NSW Environment Protection Authority (EPA) agreed in principle with Caltex that asbestos contaminated soils from the Site, predominantly from below the former pipeways, can be disposed of within a purpose built 'containment cell' also to be located on the Site. As part of the approvals for the proposed cell and to inform the cell design, the quantity of asbestos contaminated soils that are suitable to be placed within the cell needed to be further characterised.

Objectives

The overall objectives were as follows:

- Characterise the soil for the presence of asbestos.
- Classify the soil in accordance with the ***NSW EPA Waste Classification Guidelines*** (2014).
- Estimate the volume of waste that could be placed directly in the cell, and the volume that would require treatment before being placed in the cell.

Discussion of Results

Based on the review of the new and existing data, the areas of soil required to be placed in the on-site containment cell, treated and disposed off-site or left in-situ have been calculated. The extent of each of these areas is shown on Figure 2 in Appendix A. The calculated volumes are listed below:

Soil Category		Area (m^2)	Volume[1] (m^3)
1.	Remain in-situ (asbestos not detected)	34,773	6,955
2.	On-site asbestos containment cell [Special Waste (Asbestos)/ General Solid Waste (GSW) or Restricted Waste (RSW)]	47,214	10,268
3.	Special Waste (Asbestos)/Hazardous Waste (requires treatment before being placed in containment cell)	14,401	2,880
Total volume for containment cell (2+3)		**61,614**	**13,148**

1 Bank Cubic Meters (BCM) have been provided to measure the volume of material in the ground prior to excavation

The leachate results indicated that the potential for concentrations of metals and benzo(a)pyrene to be detected in leachate at concentrations greater than the NSW EPA ***Waste Classification Guidelines*** (2014) toxicity characteristic leaching procedure (TCLP) limit for general solid waste is low.

Conclusions

The soil has been characterised to estimate:

- the extent of the asbestos contaminated soils in the pipeways
- the volumes of asbestos waste to be contained directly in the proposed asbestos containment cell
- the volume of asbestos waste requiring treatment before containment.

The material classified as special waste (asbestos)/hazardous waste will require treatment to reduce concentrations to the levels for restricted or general solid waste prior to placement in the containment cell.

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1.0 Introduction

AECOM Services Pty Ltd (AECOM) was engaged by Caltex Australia Pty Ltd (Caltex) for approval, environmental, geotechnical and design services associated with the Kurnell Asbestos Contaminated Soils Management Project (the Project) at the Kurnell Terminal (535), Kurnell, NSW 2231 (the Site). The location of the Site is shown on Figure 1 in Appendix A.

1.1 Background

The NSW Environment Protection Authority (EPA) agreed in principle with Caltex that asbestos contaminated soils from the Site, predominantly from below the former pipeways, can be disposed of within a purpose built 'containment cell' also to be located on the Site. The removal of these asbestos contaminated soils from the pipeways and other areas will remove a hygiene risk from the Site and also remove the need to renew the Safework NSW exemption for working in the pipeways.

As part of the approvals and to inform the cell design, the quantity of contaminated soils that are suitable to be placed within the cell requires further assessment. Only soil that is classified as Special Waste (Asbestos) and General Solid Waste (GSW) or Restricted Solid Waste (RSW) in accordance with the NSW EPA ***Waste Classification Guidelines*** (NSW EPA, 2014) is proposed to be placed in the cell. Soil classified as Special Waste (Asbestos) and Hazardous Waste would require treatment prior to being placed within the cell.

Previous soil characterisation works within the pipeways were undertaken by AECOM in 2013 and were reported in ***'Caltex Kurnell (535) Pipeways Contamination Assessment / Characterisation - Stage 2 Report'*** (AECOM, 2013). This work included investigating pipeway areas from the Caltex Oil Refinery (COR) and Caltex Lubricating Oil Refinery (CLOR). The report provided preliminary estimates of the quantity of asbestos contaminated waste likely to be generated from the proposed works. The AECOM 2013 report classified volumes of Special Waste (Asbestos) and then as GSW, RSW or Hazardous Waste for three areas: Area A, Area B pipeways, and Area C pipeways across the COR and CLOR.

1.2 Objectives

The overall objectives of this investigation were as follows:

- Characterise the soil for the presence of asbestos.
- Classify the soil in accordance with the ***NSW EPA Waste Classification Guidelines*** (2014).
- Estimate the volume of waste that could be placed directly in the cell, and the volume that would require treatment before being placed in the cell.

The specific objectives of the additional soil characterisation for each area based on the review of the results of the AECOM 2013 data were:

- Area A: assess the leachability of soils through TCLP analysis where higher total petroleum hydrocarbon (TPH) concentrations [exceeding the NSW EPA (2014) ***Waste Classification Guidelines***] and asbestos were reported.
- Area B: assess the absence or presence of asbestos in the southern portion of Area B and undertake further leachability testing through TCLP analysis.
- Area C: further assess the absence or presence of asbestos.

1.3 Scope of Works

AECOM and Caltex subcontractors Giovenco Industries Pty Limited (Giovenco) completed the soil sampling works in accordance with the sampling plan and recommended sampling methodologies. The following scope of works was completed:

- A Site walkover with the Giovenco field personnel to confirm the sampling plan and outline recommended sampling methodologies. Due to significant access constraints within the pipeways, Giovenco's onsite experience and technical expertise was relied on to confirm that the sampling works could be undertaken

safely and in a manner that would avoid disturbance of the pipelines and lagging materials within the pipeways.

- Marking of locations and use of a Global Positioning System (GPS) to electronically record each sampling location.
- Sampling of soil with a hand auger from a total of 27 locations along the pipeways in Area A, Area B and Area C.
- Collection of quality assurance and quality control (QAQC) samples.
- Interpretation and assessment of the results and preparation of this report.

The work was conducted with reference to relevant parts of the following guidelines:

- NSW Department of Environment and Conservation (DEC), 2006. ***Guidelines for the Site Auditor Scheme (2nd Edition).***
- National Environment Protection (Assessment of Site contamination) Measure (NEPC), 1999. ***National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (National Environment Protection Council) – considered throughout the investigation.***
- NSW OEH, 2011. ***Guidelines for Consultants Reporting on Contaminated Sites.***
- NSW Environment Protection Authority (NSW EPA), 2014. ***Waste Classification Guidelines.***

2.0 Previous Characterisation

The AECOM 2013 soil characterisation works included the collection of soil from samples from 57 locations along the length of the pipelines.

The sampling locations are shown on Figure 2 in Appendix A. All of the samples were analysed for asbestos, 18 metals, total recoverable hydrocarbons (TRH), BTEX (benzene, toluene, ethylbenzene and xylenes), polycyclic aromatic hydrocarbons (PAHs) and phenols. Selected samples were analysed for volatile organic compounds (VOCs), volatile halogenated compounds (VHCs), polychlorinated biphenyls (PCBs), organochlorine pesticides (OCP), organophosphorus pesticides (OPP) and by toxicity characteristic leaching procedure (TCLP) for lead, nickel and benzo(a)pyrene.

The sample and results for each area are summarised in Table 1 below.

Table 1 Summary of AECOM 2013 results

Area	Samples	Results
A	A001 to A019, soil samples collected at depths of 0.0-0.2 m below ground surface (bgs) and 0.4 to 0.5 m bgs.	Asbestos was detected in 10 out of 28 samples and exceeded the ASC NEPM (2013) health screening level (HSL) for commercial/industrial land use (HSL D) of 0.001% w/w of FA/AF in 8 of the 28 samples.
B	B001 to B030, soil samples collected at depths of 0.0-0.2 metres below ground surface (m bgs) and 0.4 to 0.5 m bgs	Asbestos was detected in 11 out of 33 samples and exceeded the ASC NEPM (2013) health screening level (HSL) for commercial/industrial land use (HSL D) of 0.001% w/w of FA/AF in 8 of the 28 samples.
C	C003 to C010, soils samples collected at depths of 0.0-0.2 m bgs and in some locations depths between 0.4 to 2.0 m bgs	Asbestos was detected and exceeded the ASC NEPM (2013) health screening level (HSL) for commercial/industrial land use (HSL D) of 0.001% w/w in 1 out of 23 samples.

The results were also compared to the NSW EPA (2009) ***Waste Classification Guidelines*** since revised in 2014. The tabulated analytical results from AECOM 2013 are provided in Appendix B.

3.0 Sampling Methodology

3.1 Data Quality Objectives

The Data Quality Objectives (DQOs) steps for these works are described below.

Table 2 Data Quality Objectives

DQO Steps	Details of DQO Process
1. State the Problem	Certain pipes within the Site contained friable asbestos lagging and gaskets. This asbestos contaminated the underlying soils and as such these soils require removal. It is proposed to excavate the asbestos contaminated soil and place it in an on-site containment cell. Further characterisation of the volume and extent of the asbestos contaminated soil for different waste classifications was required.
2. Identify the Decisions	Based on the objectives listed in Section 1.1 of this report, the principal decisions that need to be made are: - What is the quantity and extent of soil: • Classified as Special Waste (Asbestos) and GSW or RSW? • Classified as Special Waste (Asbestos) and Hazardous Waste? • Suitable to remain ***in situ*** (i.e. no Asbestos)? - What is the leachability of the soils to be placed within the containment cell?
3. Identify the information inputs	The primary inputs required include: - Field results/observations including previous AECOM 2013 report. - Laboratory soil and leachate analytical results. - Assessment of the suitability of the data through the assessment of data quality indicators (DQIs), namely precision, accuracy, representativeness, completeness and comparability (PARCC) parameters (see Section 2.2).
4. Define the Study Boundaries	- Lateral: the boundary of the characterisation works are shown on Figure 2 in Appendix A. - Vertical: the maximum depth of investigation was 2 m. - Temporal: Historical soil and leachate analytical data from the previous sampling conducted in October 2013.
5. Develop an Analytical Approach	Site specific data was utilised to focus on potential sources of contamination and likely chemicals of potential concern (COPC). - Sampling ratios, quality assurance/quality control (QA/QC) sampling and laboratory analysis were based on Australian Standards and National Environmental Protection Measure (NEPM) guidelines. - AECOM standard sampling methodology was followed for sample collection and preservation. - Laboratories utilised were National Association of Testing Authorities (NATA) approved for the analyses undertaken. The decision rules for the investigation was the comparison of the soil results to the NSW EPA (2014) ***Waste Classification Guidelines*** and asbestos quantification results to the ASC NEPM (2013) investigation levels.
6. Specify Limits on Decision Errors	There are two types of decision errors: - Sampling errors, which occur when samples collected are not representative of the conditions within the investigation area; and - Measurement errors, which occur during sampling collection, handling, preparation, analysis and data reduction. An assessment was made as to the likelihood of a decision error being made based on the results of a QA/QC assessment and the closeness of the data to assessment criteria. Decision criteria for QA/QC measures are defined in Appendix D. A decision on the acceptance of the analytical data was made on the basis of the data quality indicators (DQI) in the context of the precision, accuracy, representativeness, completeness and comparability (PARCC) parameters as follows. - Precision: A quantitative measure of the variability (or reproducibility) of data; - Accuracy: A quantitative measure of the closeness of reported data to the “true”

DQO Steps	Details of DQO Process
	value; - Representativeness: The confidence (expressed qualitatively) that data are representative of each media present on site; - Completeness: A measure of the amount of useable data from a data collection activity; and - Comparability: The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event. Specific limits for this project are in accordance with the appropriate guidance in NEPM (2013), appropriate indicators of data quality, and standard procedures for field sampling and handling and are summarised in Section 3.3. The step also examines the certainty of conclusive statements based on the available site data collected.
7. Optimise the Design	Based on the previous Steps 1 to 6 of the DQO process, the design (i.e. scope of works or sample and analysis quality plan) for obtaining the required data (i.e. proposed field and laboratory programs) is presented below in Section 3.2.

3.2 Sample and Analysis Quality Plan (SAQP)

The scope of works undertaken for this investigation is detailed in the following sub-sections.

3.2.1 Soil Sample Analytical Plan and Rationale

The detailed soil sample analytical plan and the rationale for the sampling locations completed are included in Table 1 in Appendix C. The following soil analyses were completed:

- 35 primary samples, 4 intra-laboratory duplicates and 3 inter-laboratory duplicates were analysed for metals (arsenic, beryllium, cadmium, chromium, lead, molybdenum, nickel, selenium, silver and mercury), BTEXN (benzene, toluene, ethylbenzene, xylenes and naphthalene), total petroleum hydrocarbons (TPH), benzo(a)pyrene (BaP) and asbestos (absence/presence).
- 14 primary samples were analysed for asbestos quantification.
- 10 primary samples were analysed by Toxicity Characteristics Leaching Procedure (TCLP) selectively for chromium, lead, nickel, mercury or benzo(a)pyrene.

3.2.2 Soil Sampling Methodology

The soil sampling methodology undertaken for the investigation is summarised in Table 3 below.

Table 3 Soil Investigation Methodology Summary

Activity/Item	Details
Field Activities	- The soil sampling was completed by Kate Pigram a qualified and experienced environmental scientist on the 14 to 16 March 2016.
Sampling Method	- Hand augers were used for the collection of samples.
Target Depth	- 24 hand augers were advanced to depths ranging between 0.2 and 0.6 m bgs
Soil Logging	- Soil logging was undertaken in general accordance with the Unified Soil Classification System and the AECOM documented standard field procedures. Samples were logged and information was recorded in the field (e.g. soil type, colour, grain size, inclusions, moisture conditions, staining and odour etc.).
Soil Screening	- Soil sub-samples were placed in snap-lock plastic bags and the vapour headspace screened in the field for volatile organic compounds (VOCs) using a calibrated photoionisation detector (PID) equipped with a 10.6 eV lamp. Calibration details are provided in Appendix D.
Soil Sampling	- Soil was collected directly from the hand auger for each sampling interval and placed into laboratory prepared glass jars with Teflon-lined lids for chemical analysis and a zip lock bag for asbestos analysis. A new pair of disposable nitrile sampling gloves was used to collect each sample.
Quality Control Sampling	- Field duplicates or triplicates were collected and analysed at a rate of 1 sample per twenty primary samples as part of the soil investigation. One rinsate sample and two

Activity/Item	Details
	soil trip blank samples were analysed.
Sample Preservation	- Soil samples were placed into insulated rigid storage containers chilled with ice. No preservatives were required to be used in the laboratory supplied sampling jars.
Decontamination Procedures	- The hand auger was cleaned between boreholes by brushing off excess soil and washing. Soil samples were collected by hand, using single use, disposable nitrile gloves. One rinsate sample was collected off the decontaminated hand auger.
Disposal of Soil Cuttings	- Excess soil cuttings from the hand auger were reinstated in the hole.

3.3 Quality Assurance / Quality Control

Quality assurance and control measures (QA /QC) were incorporated into the sampling and analysis works to ensure that the specified data quality objectives could be achieved and to demonstrate accuracy, precision, comparability, representativeness and completeness with regard to the data generated.

The Data Quality Indicators (DQIs) listed in Table 4 below are adopted based upon data validation guidance documents published by Standards Australia (SA), National Environmental Protection Council (NEPC) and United States Environmental Protection Agency (US EPA). These include ***Standard guide to the investigation and sampling of sites with potentially contaminated soil*** (AS 4482.1-2005) Schedule B2 ***Site Characterisation*** (NEPC 1999, amended 2013), Schedule B3 ***Laboratory Analysis of Potentially Contaminated Soils*** (NEPC 1999, amended 2013), the US EPA Contract Laboratory Program for Organic Data Review, October 1999; US EPA Contract Laboratory Program for Inorganic Data Review, July 2002; and the US EPA Guidance on Environmental Data Verification and Data Validation, November 2002. The process involves the checking of analytical procedure compliance and an assessment of the accuracy and precision of analytical data from a range of quality control measurements, generated from both the field sampling and analytical programs.

Table 4 DQI Program

DQI	Field	Laboratory	Acceptability Limits
Precision	- Standard Operating Procedures (SOPs) were appropriate and were complied with - Collection of blind and split duplicate samples	Analysis of: - Blind duplicate samples (1 in 20 samples) - Split duplicate samples (1 in 20 samples) - Laboratory duplicate samples	- RPD of 0 to 30% - RPD of 0 to 30% - <10x LOR = No Limit - 10-20x LOR = RPD 0% - 30% - >20x LOR = RPD 0% - 30% -
Accuracy	- SOPs appropriate and were complied with - Collection of rinsate blanks	Analysis of: - Method blanks - Matrix spikes - Matrix spike duplicates - Surrogate spikes - Laboratory control samples - Laboratory prepared spikes	- Non-detect for CoC* - 70 to 130% - 70 to 130% - 70 to 130% - Dynamic recovery limits are based on statistical evaluation of processed LCS. - 70 to 130%

DQI	Field	Laboratory	Acceptability Limits
Representativeness	- Appropriate media sampled according to SOP - All relevant media sampled	All samples analysed according to SOP	
Completeness	- All critical locations sampled - All critical samples collected - SOPs appropriate and complied with - Experienced sampler - Documentation correct	- All critical samples analysed and all analytes analysed according to SOPs - Appropriate methods - Appropriate LOR - Sample documentation complete - Sample holding times as per ASC NEPM (2013)	- As per ASC NEPM (2013) - < nominated criteria - As per ASC NEPM (2013)
Comparability	- Sample SOPs used on each occasion - Experienced sampler - Climatic conditions - Same types of samples collected	- Same analytical methods used (including clean-up) - Sample LORs - Same laboratories (NATA accredited) - Same units	- As per ASC NEPM (2013) - < nominated criteria

4.0 Assessment Criteria

The soil analytical results have been assessed against the ***Waste Classification Guidelines, Part 1: Classifying Waste*** (NSW EPA, 2014):

- Contaminant Threshold (CT) for General Solid Waste (without leaching data) (CT1) and Restricted Solid Waste (RSW) (CT2)
- Specific Contaminant Concentration (SCC) and TCLP for General Solid Waste (with leaching data) (SCC1 and TCLP1) and Restricted Solid Waste (RSW) (SCC2 and TCLP2)
- For classification of special waste (asbestos), the detection or observation of asbestos is the classification criteria.

The results of soil samples analysed for asbestos quantification were compared to the health screening levels (HSLs) for commercial/industrial land use (HSL D) from the ***National Environment Protection (Assessment of Contaminated Land) Measure (NEPM) 1999, National Environment Protection Council Amendment 2013. Schedule B1, Guideline on Investigation Levels for Soil and Groundwater*** (ASC NEPM, 2013).

5.0 Results

5.1 Field Screening and Observations

The VOC field readings from each sample are provided in Table 1 in Appendix C. The VOC readings in the majority of the samples taken were less than 20 ppm with the exception of sample A013.5_0.4-0.5 (63.8 ppm), A014.5_0.4-0.5 (47.8 ppm) and BH014_0.0-0.2 (22.2 ppm).

The soil descriptions are provided in Table 1 in Appendix C.

5.2 Analytical Results

The results are tabulated in the following tables in Appendix C and summarised on Figure 2 (Appendix A):

- Table 2: Soil Analytical Results
- Table 3: Asbestos Quantification Results
- Table 4: Soil Field QA/QC Results
- Table 5: Field Rinsate Results

Laboratory analytical reports are provided in Appendix E.

5.3 Quality of Analytical Data

A detailed review of the data is provided in the data validation summary reports in Appendix F. No QA/QC issues were identified in the field or laboratory datasets that could have a material implication to decision-making on the project.

6.0 Discussion and Conclusions

6.1 Asbestos Quantification

Friable asbestos and asbestos fines exceeded the ASC NEPM (2013) HSL D criteria of 0.001% in 67% of all samples analysed that had detections of asbestos in 2013 and 2016 (Figure 2 in Appendix A). The results therefore confirm that all areas along the pipeway where asbestos was detected require removal to reduce the risk posed to site workers and visitors.

6.2 Volume Estimates

The main objective of this report was to estimate the volume of asbestos contaminated soil that would be placed in the containment cell. The containment cell will only be able to take asbestos contaminated soil classified as Special Waste (Asbestos)/GSW or RSW. Asbestos contaminated soils classified as Hazardous Waste would require treatment to reduce concentrations to meet RSW or GSW levels or removal from the site. Soils not containing asbestos would remain ***in-situ***.

Based on the review of the new and existing data, the areas of soil required to be placed in the on-site containment cell, treated and disposed off-site or left in-situ have been calculated. The extent of each of these areas is shown on Figure 2 in Appendix A. The calculated volumes are listed in Table 5 below.

Table 5 Volume estimates

Soil Category		Area (m^2)	Volume[1] (m^3)
1.	Remain in-situ (asbestos not detected)	34,773	6,955
2.	On-site asbestos containment cell [Special Waste (Asbestos)/ General Solid Waste (GSW) or Restricted Waste (RSW)]	47,214	10,268
3.	Special Waste (Asbestos)/Hazardous Waste (requires treatment before being placed in containment cell)	14,401	2,880
Total volume for containment cell (2+3)		**61,614**	**13,148**

1 Bank Cubic Meters (BCM) have been provided to measure the volume of material in the ground prior to excavation

6.3 Leachability

The leachability data from AECOM 2013 and the latest data is summarised in Table 6 below. Detections of lead and nickel at concentrations above the laboratory LOR were detected in less than 15 to 30 % of samples analysed respectively. The maximum concentrations of lead and nickel were ten times less than the NSW EPA (2014) TCLP limit for general solid waste. Leachate concentrations of chromium, mercury and benzo(a)pyrene were not detected at concentrations above the laboratory LOR.

Based on these results the potential for concentrations of metals and benzo(a)pyrene to be detected in leachate at concentrations greater than the NSW EPA (2014) TCLP limit for general solid waste is low and acceptable.

Table 6 2013 and 2016 Leachability

Contaminant	Number of Results	Number of Detections Over Screening Criteria	TCLP1 Screening Criteria (mg/L)	Range of Results (mg/L)
Chromium	2	0	5	<0.1
Lead	21	3	5	<0.1 to 0.5
Nickel	7	2	2	<0.1 to 0.2
Mercury	3	0	0.2	<0.001
Benzo(a)pyrene	10	0	0.04	<0.5

7.0 References

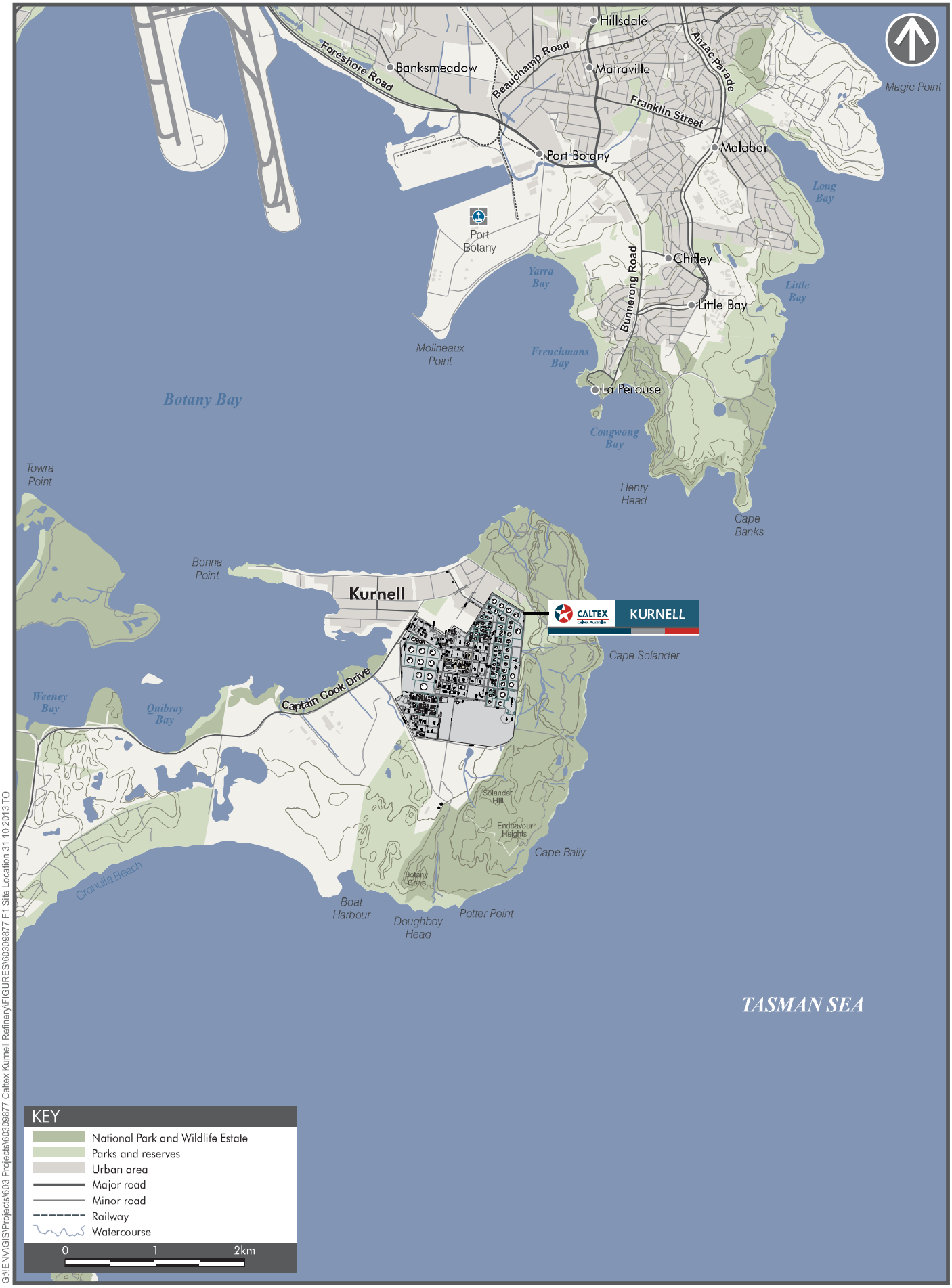
AECOM, 2013. ***Caltex Kurnell (535) Pipeways Contamination Assessment / Characterisation - Stage 2 Report.***

ASC NEPM, 2013. National Environment Protection (Assessment of Contaminated Land) Measure (NEPM) 1999, National Environment Protection Council Amendment 2013. Schedule B1, Guideline on Investigation Levels for Soil and Groundwater.

NSW Environment Protection Authority (EPA), 2014. ***Waste Classification Guidelines.***

Appendix A

Figures



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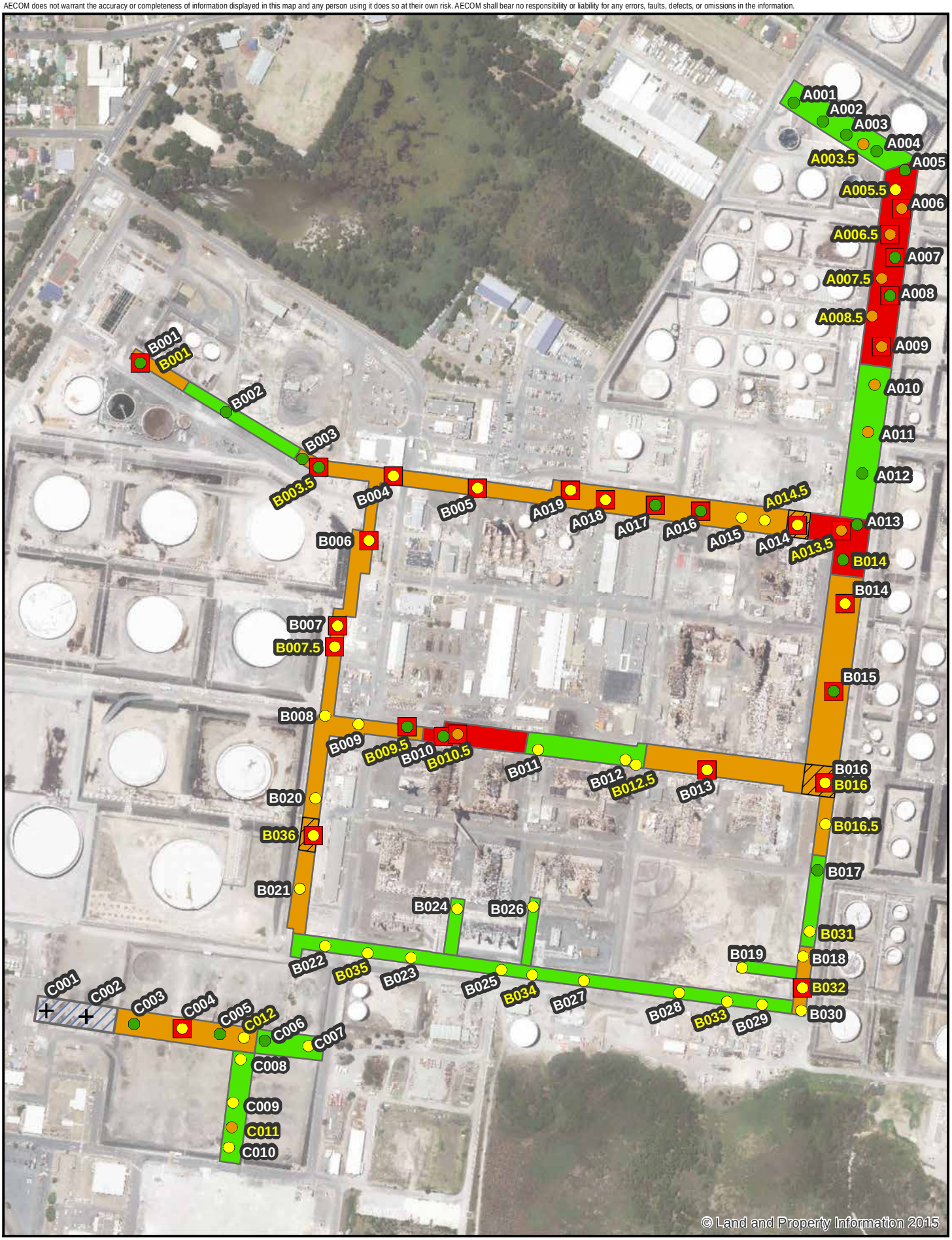
AECOM

SITE LOCATION
Caltex Refinery
Kurnell, New South Wales

FIGURE 1



PROJECT ID 60488804
CREATED BY BR
LAST MODIFIED BR 03 MAY 2016

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DATUM GDA 1994, PROJECTION MGA ZONE 56

0 40 80 120 160
metres

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LEGEND

- General solid waste
- Hazardous soild waste
- Restricted solid waste
- Not sampled
- Asbestos present
- Excavate to 0.5m
- Leave in-situ
- On-site Contaminent Cell
- Treatment and Disposal
- Concrete slab
- B001 2016 sample locations
- B001 2013 sample locations

Sampling Locations and Characterisation Extent

Caltex Petroleum Australia Pty Ltd

Caltex Kurnell Asbestos Contaminated Waste Cell

Additional Pipeway Soil Characterisation

Figure

2

Map Document: (\\ausyd1fp001\Projects\604X\60488804\4. Tech work area\4.6 GIS\working\Asbestos waste cell_figure 2.mxd)

A4 size

Appendix B

2013 Results Tables

AECOM

Table T1
Waste Classification (Non-leach)
Soil Analytical Results

Client Name: Caltex Australia Petroleum Pty Ltd
Project Name: Caltex Kurnell
Project No: 60309877

				A001		A002		A003		A004		A005		A006		A007		A008	
Field_ID				A001_0.0-0.2	A001_0.4-0.5	A002_0.0-0.2	A002_0.4-0.5	A003_0.0-0.2	A003_0.4-0.5	A004_0.0-0.2	A004_0.4-0.5	A005_0.0-0.2	A005_0.4-0.5	A006_0.0-0.2	A006_0.4-0.5	A007_0.0-0.2	A007_0.4-0.5	A008_0.0-0.2	A008_0.4-0.5
Sample_Depth_Range				0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5
Location_Code				A001	A001	A002	A002	A003	A003	A004	A004	A005	A005	A006	A006	A007	A007	A008	A008
Sampled_Date_Time				21/10/2013	23/10/2013	21/10/2013	23/10/2013	21/10/2013	23/10/2013	21/10/2013	23/10/2013	21/10/2013	23/10/2013	19/10/2013	23/10/2013	19/10/2013	23/10/2013	19/10/2013	23/10/2013
SDG				ES1322813	ES1323052	ES1322813	ES1323052	ES1322813	ES1323052	ES1322813	ES1323052	ES1322813	ES1323052	ES1322746	ES1323052	ES1322746	ES1323052	ES1322746	ES1323052
Sample_Type				Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Chem_ Group	**ChemName**	**output unit**	**LOR**	**NSW 2014 GSW (CT1)**	**NSW 2014 RSW (CT2)**														
TRH	TRH C6-C9	mg/kg	10	650	2600	<10	128	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	19
(NEPM	TRH C10-36 (Total)	mg/kg	50	10,000	40,000	5710	13,900	12,200	1090	23,000	<50	34,100	14,900	17,000	<50	42,600	<50	19,700	490	2800	5320
PAHs	Benzo(a) pyrene	mg/kg	0.05	0.8	3.2	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	1	<0.5	<0.5	<0.5	4.2	<0.5	0.5	<0.5	<0.5	<0.5
	Sum of PAHs	mg/kg	-	200	800	2.9	43.3	7.9	nc	17	nc	61.6	36.1	17	nc	72.2	nc	12.8	nc	9	6.7
Phenols	2-methylphenol	mg/kg	0.5	4000	16000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CAHs	Tetrachloroethene	mg/kg	0.5	14	56	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	Trichloroethene	mg/kg	0.5	10	40	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	Vinyl chloride	mg/kg	5	4	16	-	**<5**	-	-	-	-	-	-	-	-	-	-	<5	-	-	<5
BTEX	Benzene	mg/kg	0.2	10	40	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<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	600	2400	<0.5	<0.5	<0.5	<0.5	<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	288	1152	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	mg/kg	4	100	400	<5	<5	<5	<5	<5	<5	<5	<5	18	<5	22	<5	10	<5	9	<5
	Beryllium	mg/kg	1	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Cadmium	mg/kg	0.4	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (hexavalent)	mg/kg	0.5	100	400	<0.5	<0.5	<2.5	<0.5	2.1	<0.5	0.9	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Lead	mg/kg	1	100	400	292	<5	17	<5	55	<5	23	<5	28	<5	22	<5	243	30	151	10
	Mercury	mg/kg	0.1	4	16	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.5	<0.1
	Molybdenum	mg/kg	1	100	400	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	6	<2	<2	<2
	Nickel	mg/kg	1	40	160	8	<2	<2	<2	2	<2	6	<2	<2	<2	2	<2	12	<2	4	<2
	Selenium	mg/kg	2	20	80	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Silver	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
OCP	a-BHC	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	Aldrin	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	b-BHC	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	chlordane	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	d-BHC	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	DDT+DDE+DDD	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	Dieldrin	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	Endosulfan	mg/kg	0.05	60	240	-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	Endrin	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	Endrin aldehyde	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	g-BHC (Lindane)	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	Heptachlor	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	Heptachlor epoxide	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	<0.25	-	-	<0.25
	Sum Scheduled Chemicals	mg/kg	-	<50	<50	-	nc	-	-	-	-	-	-	-	-	-	-	nc	-	-	nc
OPP	Chlorpyrifos	mg/kg	0.05	4	16	-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.25
	Chlorpyrifos-methyl	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.25
	Diazinon	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.25
	Dichlorvos	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.25
	Dimethoate	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.25
	Ethion	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.25
	Fenthion	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.25
	Malathion	mg/kg	0.05			-	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.25
	Methyl parathion	mg/kg	0.2			-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2
SVOC	Pentachlorophenol	mg/kg	2			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Sum Moderately Harmful Pesticides	mg/kg	-	250	1000	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
PCBs	PCBs (Sum of total)	mg/kg	0.1	<50	<50	-	<0.1	-	-	-	-	-	-	-	-	-	-	<0.2	-	-	<0.1
SVOCs	2,4,5-trichlorophenol	mg/kg	0.5	8000	32000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5	40	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Methyl Ethyl Ketone	mg/kg	5	4000	16000	-	<5	-	-	-	-	-	-	-	-	-	-	<5	-	-	<5
VOCs	1,1,1,2-tetrachloroethane	mg/kg	0.5	200	800	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	1,1,1-trichloroethane	mg/kg	0.5	600	2400	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	1,1,2,2-tetrachloroethane	mg/kg	0.5	26	104	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	1,1,2-trichloroethane	mg/kg	0.5	24	96	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	1,1-dichloroethene	mg/kg	0.5	14	56	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	1,2-dichlorobenzene	mg/kg	0.5	86	344	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	1,2-dichloroethane	mg/kg	0.5	10	40	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	1,4-dichlorobenzene	mg/kg	0.5	150	600	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	Carbon tetrachloride	mg/kg	0.5	10	40	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	Chlorobenzene	mg/kg	0.5	2000	8000	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	Chloroform	mg/kg	0.5	120	480	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5
	Styrene	mg/kg	0.5	60	240	-	<0.5	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	<0.5

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelines*
TRH = Total Recoverable Hydrocarbons
CT = Contaminant Threshold
GSW = General Solid Waste
RSW = Restricted Solid Waste
mg/kg = milligrams per kilogram
PERCENT_WW = percentage weight per weight
Shading denotes exceedence of NSW EPA 2014 General Solid Waste Criteria (Contaminant Threshold 1, non-leach)
Shading dneotes exceedence of NSW 2014 Restricted Solid Waste Criteria (Contaminant Threshold 2, non-leach)
Bold LOR exceeds criteria

AECOM

Table T1
Waste Classification (Non-leach)
Soil Analytical Results

Client Name: Caltex Australia Petroleum Pty Ltd
Project Name: Caltex Kurnell
Project No: 60309877

		A009	A010	A011		A012		A013		A014		A015		A016		A017	
Field_ID		A009_0.0-0.2	A010_0.0-0.2	A011_0.0-0.2	A011_0.4-0.5	A012_0.0-0.2	A012_0.4-0.5	A013_0.0-0.2	A013_0.4-0.5	A014_0.0-0.2	A014_0.4-0.5	A015_0.0-0.2	A015_0.4-0.5	A016_0.0-0.2	A016_0.4-0.5	A017_0.0-0.2	A017_0.4-0.5
Sample_Depth_Range		0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0.4-0.5
Location_Code		A009	A010	A011	A011	A012	A012	A013	A013	A014	A014	A015	A015	A016	A016	A017	A017
Sampled_Date_Time		19/10/2013	19/10/2013	19/10/2013	22/10/2013	19/10/2013	22/10/2013	19/10/2013	22/10/2013	19/10/2013	21/10/2013	19/10/2013	21/10/2013	19/10/2013	21/10/2013	19/10/2013	21/10/2013
SDG		ES1322746	ES1322746	ES1322746	ES1323052	ES1322746	ES1323052	ES1322746	ES1323052	ES1322746	ES1322899	ES1322746	ES1322899	ES1322746	ES1322899	ES1322746	ES1322899
Sample_Type		Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Chem_ Group	**ChemName**	**output unit**	**LOR**	**NSW 2014 GSW (CT1)**	**NSW 2014 RSW (CT2)**												
TRH	TRH C6-C9	mg/kg	10	650	2600	<10	<10	<10	<10	<10	21	<10	10	<10	<10	<10	36	<10	<10
(NEPM	TRH C10-36 (Total)	mg/kg	50	10,000	40,000	144,000	132,000	29,300	<50	20,100	5270	11,200	7480	220	<50	340	3940	1680	16,600	<50	<50
PAHs	Benzo(a) pyrene	mg/kg	0.05	0.8	3.2	**<4**	51.2	31.9	<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
	Sum of PAHs	mg/kg	-	200	800	91.4	1505.3	3000.5	nc	151.7	57.9	60.5	19.2	nc	nc	nc	nc	3.9	216.2	nc	nc
Phenols	2-methylphenol	mg/kg	0.5	4000	16000	<4	<4	<4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CAHs	Tetrachloroethene	mg/kg	0.5	14	56	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	Trichloroethene	mg/kg	0.5	10	40	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	Vinyl chloride	mg/kg	5	4	16	-	-	-	-	<5	<5	<5	<5	-	-	-	-	-	<5	<5	-
BTEX	Benzene	mg/kg	0.2	10	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5	600	2400	<0.5	<0.5	<0.5	<0.5	<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	288	1152	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	mg/kg	4	100	400	9	14	<5	<5	6	<5	12	<5	13	<5	8	<5	12	<5	10	20
	Beryllium	mg/kg	1	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Cadmium	mg/kg	0.4	20	80	3	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	4	<1	<1	<1
	Chromium (hexavalent)	mg/kg	0.5	100	400	18.7	14.2	<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	<0.5
	Lead	mg/kg	1	100	400	332	131	<5	<5	<5	<5	20	<5	42	<5	<5	<5	753	<5	135	<5
	Mercury	mg/kg	0.1	4	16	0.3	0.4	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	1.2	<0.1	<0.1	<0.1	0.4	<0.1	0.2	<0.1
	Molybdenum	mg/kg	1	100	400	5	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	3	<2	3	<2
	Nickel	mg/kg	1	40	160	23	27	<2	<2	<2	<2	4	<2	10	<2	2	<2	26	<2	14	<2
	Selenium	mg/kg	2	20	80	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Silver	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
OCP	a-BHC	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	Aldrin	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	b-BHC	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	chlordane	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	d-BHC	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	DDT+DDE+DDD	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	Dieldrin	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	Endosulfan	mg/kg	0.05	60	240	-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	Endrin	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	Endrin aldehyde	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	g-BHC (Lindane)	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	Heptachlor	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	Heptachlor epoxide	mg/kg	0.05			-	-	-	-	<2.5	<0.25	<0.05	<0.05	-	-	-	-	-	<0.25	<0.05	-
	Sum Scheduled Chemicals	mg/kg	-	<50	<50	-	-	-	-	nc	nc	nc	nc	-	-	-	-	-	nc	nc	-
OPP	Chlorpyrifos	mg/kg	0.05	4	16	-	-	-	-	-	<0.25	-	<0.05	-	-	-	-	-	-	-	-
	Chlorpyrifos-methyl	mg/kg	0.05			-	-	-	-	-	<0.25	-	<0.05	-	-	-	-	-	-	-	-
	Diazinon	mg/kg	0.05			-	-	-	-	-	<0.25	-	<0.05	-	-	-	-	-	-	-	-
	Dichlorvos	mg/kg	0.05			-	-	-	-	-	<0.25	-	<0.05	-	-	-	-	-	-	-	-
	Dimethoate	mg/kg	0.05			-	-	-	-	-	<0.25	-	<0.05	-	-	-	-	-	-	-	-
	Ethion	mg/kg	0.05			-	-	-	-	-	<0.25	-	<0.05	-	-	-	-	-	-	-	-
	Fenthion	mg/kg	0.05			-	-	-	-	-	<0.25	-	<0.05	-	-	-	-	-	-	-	-
	Malathion	mg/kg	0.05			-	-	-	-	-	<0.25	-	<0.05	-	-	-	-	-	-	-	-
	Methyl parathion	mg/kg	0.2			-	-	-	-	-	<0.2	-	<0.2	-	-	-	-	-	-	-	-
SVOC	Pentachlorophenol	mg/kg	2			<8	<8	<8	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Sum Moderately Harmful Pesticides	mg/kg	-	250	1000	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
PCBs	PCBs (Sum of total)	mg/kg	0.1	<50	<50	-	-	-	-	<0.2	<0.1	<0.1	<0.1	-	-	-	-	-	<0.1	<0.1	-
SVOCs	2,4,5-trichlorophenol	mg/kg	0.5	8000	32000	<4	<4	<4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5	40	160	<4	<4	<4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Methyl Ethyl Ketone	mg/kg	5	4000	16000	-	-	-	-	<5	<5	<5	<5	-	-	-	-	-	<5	<5	-
VOCs	1,1,1,2-tetrachloroethane	mg/kg	0.5	200	800	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	1,1,1-trichloroethane	mg/kg	0.5	600	2400	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	1,1,2,2-tetrachloroethane	mg/kg	0.5	26	104	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	1,1,2-trichloroethane	mg/kg	0.5	24	96	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	1,1-dichloroethene	mg/kg	0.5	14	56	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	1,2-dichlorobenzene	mg/kg	0.5	86	344	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	1,2-dichloroethane	mg/kg	0.5	10	40	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	1,4-dichlorobenzene	mg/kg	0.5	150	600	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	Carbon tetrachloride	mg/kg	0.5	10	40	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	Chlorobenzene	mg/kg	0.5	2000	8000	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	Chloroform	mg/kg	0.5	120	480	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-
	Styrene	mg/kg	0.5	60	240	-	-	-	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	<0.5	<0.5	-

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelin*
TRH = Total Recoverable Hydrocarbons
CT = Contaminant Threshold
GSW = General Solid Waste
RSW = Restricted Solid Waste
mg/kg = milligrams per kilogram
PERCENT_WW = percentage weight per weight
Shading denotes exceedence of NSW EPA 2014 General Solid Waste Criteria (Contaminant Threshold 1, non-le
Shading dneotes exceedence of NSW 2014 Restricted Solid Waste Criteria (Contaminant Threshold 2, non-leac
Bold LOR exceeds criteria

Table T1
Waste Classification (Non-leach)
Soil Analytical Results

						A018		A019	
					Field_ID	A018 0.0-0.2	A018 0.4-0.5	A019 0.0-0.2	A019 0.4-0.5
					Sample_Depth_Range	0-0.2	0.4-0.5	0-0.2	0.4-0.5
					Location_Code	A018	A018	A019	A019
					Sampled_Date_Time	19/10/2013	21/10/2013	19/10/2013	21/10/2013
					SDG	ES1322746	ES1322899	ES1322746	ES1322899
					Sample_Type	Normal	Normal	Normal	Normal
Chem_ Group	**ChemName**	**output unit**	**LOR**	**NSW 2014 GSW (CT1)**	**NSW 2014 RSW (CT2)**				
TRH	TRH C6-C9	mg/kg	10	650	2600	<10	<10	<10	<10
(NEPM	TRH C10-36 (Total)	mg/kg	50	10,000	40,000	<50	<50	<50	<50
PAHs	Benzo(a) pyrene	mg/kg	0.05	0.8	3.2	<0.5	<0.5	<0.5	<0.5
	Sum of PAHs	mg/kg	-	200	800	nc	nc	nc	nc
Phenols	2-methylphenol	mg/kg	0.5	4000	16000	<0.5	<0.5	<0.5	<0.5
CAHs	Tetrachloroethene	mg/kg	0.5	14	56	-	-	-	-
	Trichloroethene	mg/kg	0.5	10	40	-	-	-	-
	Vinyl chloride	mg/kg	5	4	16	-	-	-	-
BTEX	Benzene	mg/kg	0.2	10	40	<0.2	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5	600	2400	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5	288	1152	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	mg/kg	4	100	400	7	<5	17	6
	Beryllium	mg/kg	1	20	80	<1	<1	<1	<1
	Cadmium	mg/kg	0.4	20	80	<1	<1	<1	<1
	Chromium (hexavalent)	mg/kg	0.5	100	400	<0.5	<0.5	<0.5	<0.5
	Lead	mg/kg	1	100	400	58	18	24	<5
	Mercury	mg/kg	0.1	4	16	<0.1	<0.1	0.1	<0.1
	Molybdenum	mg/kg	1	100	400	<2	<2	<2	<2
	Nickel	mg/kg	1	40	160	4	<2	5	<2
	Selenium	mg/kg	2	20	80	<5	<5	<5	<5
	Silver	mg/kg	1	100	400	<2	<2	<2	<2
OCP	a-BHC	mg/kg	0.05			-	-	-	-
	Aldrin	mg/kg	0.05			-	-	-	-
	b-BHC	mg/kg	0.05			-	-	-	-
	chlordane	mg/kg	0.05			-	-	-	-
	d-BHC	mg/kg	0.05			-	-	-	-
	DDT+DDE+DDD	mg/kg	0.05			-	-	-	-
	Dieldrin	mg/kg	0.05			-	-	-	-
	Endosulfan	mg/kg	0.05	60	240	-	-	-	-
	Endrin	mg/kg	0.05			-	-	-	-
	Endrin aldehyde	mg/kg	0.05			-	-	-	-
	g-BHC (Lindane)	mg/kg	0.05			-	-	-	-
	Heptachlor	mg/kg	0.05			-	-	-	-
	Heptachlor epoxide	mg/kg	0.05			-	-	-	-
	Sum Scheduled Chemicals	mg/kg	-	<50	<50	-	-	-	-
OPP	Chlorpyrifos	mg/kg	0.05	4	16	-	-	-	-
	Chlorpyrifos-methyl	mg/kg	0.05			-	-	-	-
	Diazinon	mg/kg	0.05			-	-	-	-
	Dichlorvos	mg/kg	0.05			-	-	-	-
	Dimethoate	mg/kg	0.05			-	-	-	-
	Ethion	mg/kg	0.05			-	-	-	-
	Fenthion	mg/kg	0.05			-	-	-	-
	Malathion	mg/kg	0.05			-	-	-	-
	Methyl parathion	mg/kg	0.2			-	-	-	-
SVOC	Pentachlorophenol	mg/kg	2			<2	<2	<2	<2
	Sum Moderately Harmful Pesticides	mg/kg	-	250	1000	nc	nc	nc	nc
PCBs	PCBs (Sum of total)	mg/kg	0.1	<50	<50	-	-	-	-
SVOCs	2,4,5-trichlorophenol	mg/kg	0.5	8000	32000	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5	40	160	<0.5	<0.5	<0.5	<0.5
	Methyl Ethyl Ketone	mg/kg	5	4000	16000	-	-	-	-
VOCs	1,1,1,2-tetrachloroethane	mg/kg	0.5	200	800	-	-	-	-
	1,1,1-trichloroethane	mg/kg	0.5	600	2400	-	-	-	-
	1,1,2,2-tetrachloroethane	mg/kg	0.5	26	104	-	-	-	-
	1,1,2-trichloroethane	mg/kg	0.5	24	96	-	-	-	-
	1,1-dichloroethene	mg/kg	0.5	14	56	-	-	-	-
	1,2-dichlorobenzene	mg/kg	0.5	86	344	-	-	-	-
	1,2-dichloroethane	mg/kg	0.5	10	40	-	-	-	-
	1,4-dichlorobenzene	mg/kg	0.5	150	600	-	-	-	-
	Carbon tetrachloride	mg/kg	0.5	10	40	-	-	-	-
	Chlorobenzene	mg/kg	0.5	2000	8000	-	-	-	-
	Chloroform	mg/kg	0.5	120	480	-	-	-	-
	Styrene	mg/kg	0.5	60	240	-	-	-	-

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelin*
TRH = Total Recoverable Hydrocarbons
CT = Contaminant Threshold
GSW = General Solid Waste
RSW = Restricted Solid Waste
mg/kg = milligrams per kilogram
PERCENT_WW = percentage weight per weight
Shading denotes exceedence of NSW EPA 2014 General Solid Waste Criteria (Contaminant Threshold 1, non-le
Shading dneotes exceedence of NSW 2014 Restricted Solid Waste Criteria (Contaminant Threshold 2, non-leac
Bold LOR exceeds criteria

AECOM

Table T1
Waste Classification (Non-leach)
Soil Analytical Results

Client Name: Caltex Australia Petroleum Pty Ltd
Project Name: Caltex Kurnell
Project No: 60309877

	B001		B002	B003		B004	B005	B006		B007	B008		B009	B010			B011	
Field_ID	B001_0.0-0.2	B001_0.4-0.5	B002_0.0-0.2	B003_0.0-0.2	B003_0.4-0.5	B004_0.0-0.2	B005_0.0-0.2	B006_0.0-0.2	B006_0.4-0.5	B007_0.0-0.2	B008_0.0-0.2	B008_0.4-0.5	B009_0.0-0.2	B010_0.0-0.2	B010_0.4-0.5	B011_0.0-0.2		
Sample_Depth_Range	0-0.2	0.4-0.5	0-0.2	0-0.2	0.4-0.5	0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2	0-0.2	0.4-0.5	0-0.2	0-0.2	0.4-0.5	0-0.2		
Location_Code	B001	B001	B002	B003	B003	B004	B005	B006	B006	B007	B008	B008	B009	B010	B010	B011		
Sampled_Date_Time	21/10/2013	23/10/2013	21/10/2013	21/10/2013	23/10/2013	21/10/2013	19/10/2013	21/10/2013	24/10/2013	21/10/2013	21/10/2013	24/10/2013	21/10/2013	21/10/2013	24/10/2013	21/10/2013		
SDG	ES1322813	ES1323052	ES1322813	ES1322813	ES1323052	ES1322813	ES1322746	ES1322813	ES1323080	ES1322813	ES1322813	ES1323080	ES1322813	ES1322813	ES1323080	ES1322813		
Sample_Type	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal		

Chem_ Group	**ChemName**	**output unit**	**LOR**	**NSW 2014 GSW (CT1)**	**NSW 2014 RSW (CT2)**														
TRH	TRH C6-C9	mg/kg	10	650	2600	401	<10	14	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
(NEPM	TRH C10-36 (Total)	mg/kg	50	10,000	40,000	45,200	1390	7200	<50	<50	5060	<50	<50	<50	<50	<50	<50	870	110	1170
PAHs	Benzo(a) pyrene	mg/kg	0.05	0.8	3.2	6.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Sum of PAHs	mg/kg	-	200	800	504.7	16	8.2	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Phenols	2-methylphenol	mg/kg	0.5	4000	16000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CAHs	Tetrachloroethene	mg/kg	0.5	14	56	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-
	Trichloroethene	mg/kg	0.5	10	40	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-
	Vinyl chloride	mg/kg	5	4	16	<5	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-
BTEX	Benzene	mg/kg	0.2	10	40	<0.5	<0.2	<0.2	<0.2	<0.2	<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	600	2400	3.8	<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
	Toluene	mg/kg	0.5	288	1152	7.2	<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	<0.5
Metals	Arsenic	mg/kg	4	100	400	<5	<5	<5	<5	<5	13	<5	<5	<5	<5	<5	<5	19	<5	<5
	Beryllium	mg/kg	1	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Cadmium	mg/kg	0.4	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1
	Chromium (hexavalent)	mg/kg	0.5	100	400	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Lead	mg/kg	1	100	400	55	<5	278	238	137	80	49	<5	<5	45	64	14	14	102	<5	9
	Mercury	mg/kg	0.1	4	16	0.7	<0.1	0.5	0.2	0.4	0.9	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4.7	0.1	0.2
	Molybdenum	mg/kg	1	100	400	<2	<2	<2	6	2	<2	<2	<2	<2	<2	<2	<2	<2	6	<2	26
	Nickel	mg/kg	1	40	160	5	<2	7	14	5	19	13	<2	<2	4	6	<2	12	46	<2	3
	Selenium	mg/kg	2	20	80	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Silver	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
OCP	a-BHC	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aldrin	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	b-BHC	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	chlordane	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	d-BHC	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	DDT+DDE+DDD	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dieldrin	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endosulfan	mg/kg	0.05	60	240	<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin aldehyde	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	g-BHC (Lindane)	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heptachlor	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heptachlor epoxide	mg/kg	0.05			<0.25	<0.05	<0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sum Scheduled Chemicals	mg/kg	-	<50	<50	nc	nc	nc	-	-	-	-	-	-	-	-	-	-	-	-	-
OPP	Chlorpyrifos	mg/kg	0.05	4	16	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chlorpyrifos-methyl	mg/kg	0.05			-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Diazinon	mg/kg	0.05			-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dichlorvos	mg/kg	0.05			-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dimethoate	mg/kg	0.05			-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ethion	mg/kg	0.05			-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fenthion	mg/kg	0.05			-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Malathion	mg/kg	0.05			-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Methyl parathion	mg/kg	0.2			-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Pentachlorophenol	mg/kg	2			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Sum Moderately Harmful Pesticides	mg/kg	-	250	1000	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
PCBs	PCBs (Sum of total)	mg/kg	0.1	<50	<50	<0.2	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
SVOCs	2,4,5-trichlorophenol	mg/kg	0.5	8000	32000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5	40	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Methyl Ethyl Ketone	mg/kg	5	4000	16000	<5	<5	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
VOCs	1,1,1,2-tetrachloroethane	mg/kg	0.5	200	800	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,1-trichloroethane	mg/kg	0.5	600	2400	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,2,2-tetrachloroethane	mg/kg	0.5	26	104	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,2-trichloroethane	mg/kg	0.5	24	96	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1-dichloroethene	mg/kg	0.5	14	56	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2-dichlorobenzene	mg/kg	0.5	86	344	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2-dichloroethane	mg/kg	0.5	10	40	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,4-dichlorobenzene	mg/kg	0.5	150	600	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Carbon tetrachloride	mg/kg	0.5	10	40	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chlorobenzene	mg/kg	0.5	2000	8000	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloroform	mg/kg	0.5	120	480	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Styrene	mg/kg	0.5	60	240	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelin*
TRH = Total Recoverable Hydrocarbons
CT = Contaminant Threshold
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mg/kg = milligrams per kilogram
PERCENT_WW = percentage weight per weight
Shading denotes exceedence of NSW EPA 2014 General Solid Waste Criteria (Contaminant Threshold 1, non-le
Shading dneotes exceedence of NSW 2014 Restricted Solid Waste Criteria (Contaminant Threshold 2, non-leac
Bold LOR exceeds criteria

Table T1
Waste Classification (Non-leach)
Soil Analytical Results

		B012		B013	B014		B015	B016		B017	B018		B019	B020
Field_ID		B012_0.0-0.2	B012_0.4-0.5	B013_0.0-0.2	B014_0.0-0.2	B014_0.4-0.5	B015_0.0-0.2	B016_0.0-0.2	B016_0.4-0.5	B017_0.0-0.2	B018_0.0-0.2	B018_0.4-0.5	B019_0.0-0.2	B020_0.0-0.2
Sample_Depth_Range		0-0.2	0.4-0.5	0-0.2	0-0.2	0.4-0.5	0-0.2	0-0.2	0.4-0.5	0-0.2	0-0.2	0.4-0.5	0-0.2	0-0.2
Location_Code		B012	B012	B013	B014	B014	B015	B016	B016	B017	B018	B018	B019	B020
Sampled_Date_Time		21/10/2013	24/10/2013	21/10/2013	18/10/2013	24/10/2013	18/10/2013	18/10/2013	24/10/2013	18/10/2013	18/10/2013	24/10/2013	18/10/2013	18/10/2013
SDG		ES1322813	ES1323080	ES1322813	ES1322746	ES1323080	ES1322746	ES1322746	ES1323080	ES1322746	ES1322746	ES1323080	ES1322746	ES1322746
Sample_Type		Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Chem_ Group	**ChemName**	**output unit**	**LOR**	**NSW 2014 GSW (CT1)**	**NSW 2014 RSW (CT2)**									
TRH	TRH C6-C9	mg/kg	10	650	2600	<10	<10	<10	<10	4320	<10	<10	<10	<10	<10	<10	<10
(NEPM	TRH C10-36 (Total)	mg/kg	50	10,000	40,000	<50	<50	<50	170	410	350	19,000	770	<50	<50	<50	<50	<50
PAHs	Benzo(a) pyrene	mg/kg	0.05	0.8	3.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Sum of PAHs	mg/kg	-	200	800	nc	nc	nc	nc	nc	nc	159.6	7.9	nc	nc	nc	nc	nc
Phenols	2-methylphenol	mg/kg	0.5	4000	16000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CAHs	Tetrachloroethene	mg/kg	0.5	14	56	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	Trichloroethene	mg/kg	0.5	10	40	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	Vinyl chloride	mg/kg	5	4	16	-	-	-	-	<5	-	<5	-	-	-	-	-	-
BTEX	Benzene	mg/kg	0.2	10	40	<0.2	<0.2	<0.2	<0.2	0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5	600	2400	<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
	Toluene	mg/kg	0.5	288	1152	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	mg/kg	4	100	400	<5	<5	18	7	<5	22	<5	<5	9	<5	<5	<5	<5
	Beryllium	mg/kg	1	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Cadmium	mg/kg	0.4	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (hexavalent)	mg/kg	0.5	100	400	<0.5	<0.5	0.5	<0.5	<2.5	<0.5	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Lead	mg/kg	1	100	400	32	8	50	44	<5	207	11	<5	220	45	6	11	7
	Mercury	mg/kg	0.1	4	16	0.9	0.2	0.3	0.4	<0.1	1.4	<0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1
	Molybdenum	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2	3	<2	<2	<2	7
	Nickel	mg/kg	1	40	160	5	<2	4	6	<2	24	3	<2	25	19	3	<2	4
	Selenium	mg/kg	2	20	80	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Silver	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
OCP	a-BHC	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	Aldrin	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	b-BHC	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	chlordane	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	d-BHC	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	DDT+DDE+DDD	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	Dieldrin	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	Endosulfan	mg/kg	0.05	60	240	-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	Endrin	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	Endrin aldehyde	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	g-BHC (Lindane)	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	Heptachlor	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	Heptachlor epoxide	mg/kg	0.05			-	-	-	-	<0.05	-	<0.25	-	-	-	-	-	-
	Sum Scheduled Chemicals	mg/kg	-	<50	<50	-	-	-	-	nc	-	nc	-	-	-	-	-	-
OPP	Chlorpyrifos	mg/kg	0.05	4	16	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chlorpyrifos-methyl	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-
	Diazinon	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-
	Dichlorvos	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-
	Dimethoate	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-
	Ethion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-
	Fenthion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-
	Malathion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-
	Methyl parathion	mg/kg	0.2			-	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Pentachlorophenol	mg/kg	2			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Sum Moderately Harmful Pesticides	mg/kg	-	250	1000	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
PCBs	PCBs (Sum of total)	mg/kg	0.1	<50	<50	-	-	-	-	<0.1	-	<0.1	-	-	-	-	-	-
SVOCs	2,4,5-trichlorophenol	mg/kg	0.5	8000	32000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5	40	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Methyl Ethyl Ketone	mg/kg	5	4000	16000	-	-	-	-	<5	-	<5	-	-	-	-	-	-
VOCs	1,1,1,2-tetrachloroethane	mg/kg	0.5	200	800	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	1,1,1-trichloroethane	mg/kg	0.5	600	2400	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	1,1,2,2-tetrachloroethane	mg/kg	0.5	26	104	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	1,1,2-trichloroethane	mg/kg	0.5	24	96	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	1,1-dichloroethene	mg/kg	0.5	14	56	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	1,2-dichlorobenzene	mg/kg	0.5	86	344	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	1,2-dichloroethane	mg/kg	0.5	10	40	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	1,4-dichlorobenzene	mg/kg	0.5	150	600	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	Carbon tetrachloride	mg/kg	0.5	10	40	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	Chlorobenzene	mg/kg	0.5	2000	8000	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	Chloroform	mg/kg	0.5	120	480	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-
	Styrene	mg/kg	0.5	60	240	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelin*
TRH = Total Recoverable Hydrocarbons
CT = Contaminant Threshold
GSW = General Solid Waste
RSW = Restricted Solid Waste
mg/kg = milligrams per kilogram
PERCENT_WW = percentage weight per weight
Shading denotes exceedence of NSW EPA 2014 General Solid Waste Criteria (Contaminant Threshold 1, non-le
Shading dneotes exceedence of NSW 2014 Restricted Solid Waste Criteria (Contaminant Threshold 2, non-leac
Bold LOR exceeds criteria

Table T1
Waste Classification (Non-leach)
Soil Analytical Results

			B021		B022	B023		B024	B025	B026		B027		B028	B029		B030
Field_ID			B021_0.0-0.2	B021_0.4-0.5	B022_0.0-0.2	B023_0.0-0.2	B023_0.4-0.5	B024_0.0-0.2	B025_0.0.-0.2	B026_0.0-0.2	B026_0.4-0.5	B027_0.0-0.2	B027_0.4-0.5	B028_0.0-0.2	B029_0.0-0.2	B029_0.4-0.5	B030_0.0-0.2
Sample_Depth_Range			0-0.2	0.4-0.5	0-0.2	0-0.2	0.4-0.5	0-0.2	0-0.2	0-0.2	0.4-0.5	0-0.2	0.4-0.5	0-0.2	0-0.2	0.4-0.5	0-0.2
Location_Code			B021	B021	B022	B023	B023	B024	B025	B026	B026	B027	B027	B028	B029	B029	B030
Sampled_Date_Time			18/10/2013	24/10/2013	18/10/2013	18/10/2013	24/10/2013	18/10/2013	18/10/2013	18/10/2013	24/10/2013	18/10/2013	24/10/2013	18/10/2013	18/10/2013	24/10/2013	18/10/2013
SDG			ES1322746	ES1323080	ES1322746	ES1322746	ES1323080	ES1322746	ES1322746	ES1322746	ES1323080	ES1322746	ES1323080	ES1322746	ES1322746	ES1323080	ES1322746
Sample_Type			Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Chem_ Group	**ChemName**	**output unit**	**LOR**	**NSW 2014 GSW (CT1)**	**NSW 2014 RSW (CT2)**												
TRH	TRH C6-C9	mg/kg	10	650	2600	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
(NEPM	TRH C10-36 (Total)	mg/kg	50	10,000	40,000	<50	<50	<50	<50	<50	<50	120	<50	<50	<50	<50	1620	<50	1970
PAHs	Benzo(a) pyrene	mg/kg	0.05	0.8	3.2	<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	<0.5
	Sum of PAHs	mg/kg	-	200	800	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.7
Phenols	2-methylphenol	mg/kg	0.5	4000	16000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CAHs	Tetrachloroethene	mg/kg	0.5	14	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Trichloroethene	mg/kg	0.5	10	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vinyl chloride	mg/kg	5	4	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTEX	Benzene	mg/kg	0.2	10	40	<0.2	<0.2	<0.2	<0.2	<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	600	2400	<0.5	<0.5	<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	288	1152	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	mg/kg	4	100	400	<5	<5	<5	6	<5	<5	<5	<5	<5	<5	<5	8	<5	<5
	Beryllium	mg/kg	1	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Cadmium	mg/kg	0.4	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (hexavalent)	mg/kg	0.5	100	400	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Lead	mg/kg	1	100	400	20	<5	<5	58	12	24	31	10	<5	<5	<5	21	66	9	75
	Mercury	mg/kg	0.1	4	16	<0.1	<0.1	<0.1	<0.1	<0.1	1	0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	<0.1	<0.1
	Molybdenum	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Nickel	mg/kg	1	40	160	9	<2	<2	5	2	16	9	22	<2	2	<2	5	15	4	41
	Selenium	mg/kg	2	20	80	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Silver	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
OCP	a-BHC	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aldrin	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	b-BHC	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	chlordane	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	d-BHC	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DDT+DDE+DDD	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dieldrin	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endosulfan	mg/kg	0.05	60	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin aldehyde	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	g-BHC (Lindane)	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heptachlor	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heptachlor epoxide	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sum Scheduled Chemicals	mg/kg	-	<50	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPP	Chlorpyrifos	mg/kg	0.05	4	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chlorpyrifos-methyl	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Diazinon	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dichlorvos	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dimethoate	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ethion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fenthion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Malathion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Methyl parathion	mg/kg	0.2			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Pentachlorophenol	mg/kg	2			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Sum Moderately Harmful Pesticides	mg/kg	-	250	1000	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
PCBs	PCBs (Sum of total)	mg/kg	0.1	<50	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SVOCs	2,4,5-trichlorophenol	mg/kg	0.5	8000	32000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5	40	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Methyl Ethyl Ketone	mg/kg	5	4000	16000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VOCs	1,1,1,2-tetrachloroethane	mg/kg	0.5	200	800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,1-trichloroethane	mg/kg	0.5	600	2400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,2,2-tetrachloroethane	mg/kg	0.5	26	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,2-trichloroethane	mg/kg	0.5	24	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1-dichloroethene	mg/kg	0.5	14	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2-dichlorobenzene	mg/kg	0.5	86	344	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2-dichloroethane	mg/kg	0.5	10	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,4-dichlorobenzene	mg/kg	0.5	150	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Carbon tetrachloride	mg/kg	0.5	10	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chlorobenzene	mg/kg	0.5	2000	8000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloroform	mg/kg	0.5	120	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Styrene	mg/kg	0.5	60	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelin*
TRH = Total Recoverable Hydrocarbons
CT = Contaminant Threshold
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Shading denotes exceedence of NSW EPA 2014 General Solid Waste Criteria (Contaminant Threshold 1, non-le
Shading dneotes exceedence of NSW 2014 Restricted Solid Waste Criteria (Contaminant Threshold 2, non-leac
Bold LOR exceeds criteria

AECOM

Table T1
Waste Classification (Non-leach)
Soil Analytical Results

Client Name: Caltex Australia Petroleum Pty Ltd
Project Name: Caltex Kurnell
Project No: 60309877

Field_ID						C003			C004			C005			C006			C007		
Sample_Depth_Range						0-0.2	0.4-0.5	0.9-1	0-0.2	0.4-0.5	0.9-1	0-0.2	0.4-0.5	0.8-0.9	0-0.2	0.9-0	1.2-1.3	0.4-0.5	0.7-0.8	0-0.2
Location_Code						C003	C003	C003	C004	C004	C004	C005	C005	C005	C006	C006	C006	C007	C007	C008
Sampled_Date_Time						22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013
SDG						ES1323052	ES1323052	ES1323052	ES1323052	ES1323052	ES1323052	ES1323052	ES1323052	ES1323052	ES1322899	ES1322899	ES1322899	ES1322899	ES1322899	ES1322899
Sample_Type						Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Chem_ Group	**ChemName**	**output unit**	**LOR**	**NSW 2014 GSW (CT1)**	**NSW 2014 RSW (CT2)**															
TRH	TRH C6-C9	mg/kg	10	650	2600	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
(NEPM	TRH C10-36 (Total)	mg/kg	50	10,000	40,000	29,400	20,400	590	920	<50	<50	3900	<50	2820	20,700	500	1860	310	250	290
PAHs	Benzo(a) pyrene	mg/kg	0.05	0.8	3.2	<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	<0.5	<0.5
	Sum of PAHs	mg/kg	-	200	800	nc	nc	nc	nc	nc	nc	nc	nc	nc	5	nc	nc	nc	nc	nc
Phenols	2-methylphenol	mg/kg	0.5	4000	16000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CAHs	Tetrachloroethene	mg/kg	0.5	14	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Trichloroethene	mg/kg	0.5	10	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vinyl chloride	mg/kg	5	4	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTEX	Benzene	mg/kg	0.2	10	40	<0.2	<0.2	<0.2	<0.2	<0.2	<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	600	2400	<0.5	<0.5	<0.5	<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	288	1152	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	mg/kg	4	100	400	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Beryllium	mg/kg	1	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Cadmium	mg/kg	0.4	20	80	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (hexavalent)	mg/kg	0.5	100	400	<2.5	<2.5	<2.5	<2.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Lead	mg/kg	1	100	400	55	<5	<5	40	38	<5	184	<5	42	64	6	14	6	<5	36
	Mercury	mg/kg	0.1	4	16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Molybdenum	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	2	<2	<2	10	<2	<2	<2	<2	<2
	Nickel	mg/kg	1	40	160	4	<2	<2	4	<2	<2	14	<2	13	3	4	6	<2	12	3
	Selenium	mg/kg	2	20	80	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
	Silver	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
OCP	a-BHC	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aldrin	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	b-BHC	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	chlordane	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	d-BHC	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DDT+DDE+DDD	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dieldrin	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endosulfan	mg/kg	0.05	60	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Endrin aldehyde	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	g-BHC (Lindane)	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heptachlor	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Heptachlor epoxide	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sum Scheduled Chemicals	mg/kg	-	<50	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPP	Chlorpyrifos	mg/kg	0.05	4	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chlorpyrifos-methyl	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Diazinon	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dichlorvos	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dimethoate	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ethion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fenthion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Malathion	mg/kg	0.05			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Methyl parathion	mg/kg	0.2			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Pentachlorophenol	mg/kg	2			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Sum Moderately Harmful Pesticides	mg/kg	-	250	1000	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
PCBs	PCBs (Sum of total)	mg/kg	0.1	<50	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SVOCs	2,4,5-trichlorophenol	mg/kg	0.5	8000	32000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5	40	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Methyl Ethyl Ketone	mg/kg	5	4000	16000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VOCs	1,1,1,2-tetrachloroethane	mg/kg	0.5	200	800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,1-trichloroethane	mg/kg	0.5	600	2400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,2,2-tetrachloroethane	mg/kg	0.5	26	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1,2-trichloroethane	mg/kg	0.5	24	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,1-dichloroethene	mg/kg	0.5	14	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2-dichlorobenzene	mg/kg	0.5	86	344	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,2-dichloroethane	mg/kg	0.5	10	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1,4-dichlorobenzene	mg/kg	0.5	150	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Carbon tetrachloride	mg/kg	0.5	10	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chlorobenzene	mg/kg	0.5	2000	8000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chloroform	mg/kg	0.5	120	480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Styrene	mg/kg	0.5	60	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelin*
TRH = Total Recoverable Hydrocarbons
CT = Contaminant Threshold
GSW = General Solid Waste
RSW = Restricted Solid Waste
mg/kg = milligrams per kilogram
PERCENT_WW = percentage weight per weight
Shading denotes exceedence of NSW EPA 2014 General Solid Waste Criteria (Contaminant Threshold 1, non-le
Shading dneotes exceedence of NSW 2014 Restricted Solid Waste Criteria (Contaminant Threshold 2, non-leac
Bold LOR exceeds criteria

Table T1
Waste Classification (Non-leach)
Soil Analytical Results

					C008		C009			C010			
Field_ID					C008_0.4-0.5	C008_0.9-1.0	C009_0.0-0.2	C009_0.9-1.0	C009_1.9-2.0	C010_0.0-0.2	C010_0.4-0.5	C010_0.9-1.0	
Sample_Depth_Range					0.4-0.5	0.9-1	0-0.2	0.9-1	1.9-2	0-0.2	0.4-0.5	0.9-1	
Location_Code					C008	C008	C009	C009	C009	C010	C010	C010	
Sampled_Date_Time					22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	
SDG					ES1322899	ES1322899	ES1322899	ES1322899	ES1322899	ES1322899	ES1322899	ES1322899	
Sample_Type					Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	
Chem_ Group	**ChemName**	**output unit**	**LOR**	**NSW 2014 GSW (CT1)**	**NSW 2014 RSW (CT2)**								
TRH	TRH C6-C9	mg/kg	10	650	2600	<10	<10	<10	<10	<10	<10	<10	<10
(NEPM	TRH C10-36 (Total)	mg/kg	50	10,000	40,000	<50	<50	2880	<50	<50	6660	<50	2330
PAHs	Benzo(a) pyrene	mg/kg	0.05	0.8	3.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Sum of PAHs	mg/kg	-	200	800	nc	nc	nc	nc	nc	nc	nc	nc
Phenols	2-methylphenol	mg/kg	0.5	4000	16000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CAHs	Tetrachloroethene	mg/kg	0.5	14	56	-	-	-	-	-	-	<0.5	-
	Trichloroethene	mg/kg	0.5	10	40	-	-	-	-	-	-	<0.5	-
	Vinyl chloride	mg/kg	5	4	16	-	-	-	-	-	-	**<5**	-
BTEX	Benzene	mg/kg	0.2	10	40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethylbenzene	mg/kg	0.5	600	2400	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Toluene	mg/kg	0.5	288	1152	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metals	Arsenic	mg/kg	4	100	400	<5	<5	<5	<5	<5	<5	<5	8
	Beryllium	mg/kg	1	20	80	<1	<1	<1	<1	<1	<1	<1	<1
	Cadmium	mg/kg	0.4	20	80	<1	<1	<1	<1	<1	<1	<1	<1
	Chromium (hexavalent)	mg/kg	0.5	100	400	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Lead	mg/kg	1	100	400	<5	<5	7	<5	<5	<5	<5	<5
	Mercury	mg/kg	0.1	4	16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Molybdenum	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2
	Nickel	mg/kg	1	40	160	<2	<2	<2	<2	<2	<2	<2	<2
	Selenium	mg/kg	2	20	80	<5	<5	<5	<5	<5	<5	<5	<5
	Silver	mg/kg	1	100	400	<2	<2	<2	<2	<2	<2	<2	<2
OCP	a-BHC	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	Aldrin	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	b-BHC	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	chlordane	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	d-BHC	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	DDT+DDE+DDD	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	Dieldrin	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	Endosulfan	mg/kg	0.05	60	240	-	-	-	-	-	-	<0.05	-
	Endrin	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	Endrin aldehyde	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	g-BHC (Lindane)	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	Heptachlor	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	Heptachlor epoxide	mg/kg	0.05			-	-	-	-	-	-	<0.05	-
	Sum Scheduled Chemicals	mg/kg	-	<50	<50	-	-	-	-	-	-	nc	-
OPP	Chlorpyrifos	mg/kg	0.05	4	16	-	-	-	-	-	-	-	-
	Chlorpyrifos-methyl	mg/kg	0.05			-	-	-	-	-	-	-	-
	Diazinon	mg/kg	0.05			-	-	-	-	-	-	-	-
	Dichlorvos	mg/kg	0.05			-	-	-	-	-	-	-	-
	Dimethoate	mg/kg	0.05			-	-	-	-	-	-	-	-
	Ethion	mg/kg	0.05			-	-	-	-	-	-	-	-
	Fenthion	mg/kg	0.05			-	-	-	-	-	-	-	-
	Malathion	mg/kg	0.05			-	-	-	-	-	-	-	-
	Methyl parathion	mg/kg	0.2			-	-	-	-	-	-	-	-
SVOC	Pentachlorophenol	mg/kg	2			<2	<2	<2	<2	<2	<2	<2	<2
	Sum Moderately Harmful Pesticides	mg/kg	-	250	1000	nc	nc	nc	nc	nc	nc	nc	nc
PCBs	PCBs (Sum of total)	mg/kg	0.1	<50	<50	-	-	-	-	-	-	<0.1	-
SVOCs	2,4,5-trichlorophenol	mg/kg	0.5	8000	32000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2,4,6-trichlorophenol	mg/kg	0.5	40	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Methyl Ethyl Ketone	mg/kg	5	4000	16000	-	-	-	-	-	-	<5	-
VOCs	1,1,1,2-tetrachloroethane	mg/kg	0.5	200	800	-	-	-	-	-	-	<0.5	-
	1,1,1-trichloroethane	mg/kg	0.5	600	2400	-	-	-	-	-	-	<0.5	-
	1,1,2,2-tetrachloroethane	mg/kg	0.5	26	104	-	-	-	-	-	-	<0.5	-
	1,1,2-trichloroethane	mg/kg	0.5	24	96	-	-	-	-	-	-	<0.5	-
	1,1-dichloroethene	mg/kg	0.5	14	56	-	-	-	-	-	-	<0.5	-
	1,2-dichlorobenzene	mg/kg	0.5	86	344	-	-	-	-	-	-	<0.5	-
	1,2-dichloroethane	mg/kg	0.5	10	40	-	-	-	-	-	-	<0.5	-
	1,4-dichlorobenzene	mg/kg	0.5	150	600	-	-	-	-	-	-	<0.5	-
	Carbon tetrachloride	mg/kg	0.5	10	40	-	-	-	-	-	-	<0.5	-
	Chlorobenzene	mg/kg	0.5	2000	8000	-	-	-	-	-	-	<0.5	-
	Chloroform	mg/kg	0.5	120	480	-	-	-	-	-	-	<0.5	-
	Styrene	mg/kg	0.5	60	240	-	-	-	-	-	-	<0.5	-

Notes:
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mg/kg = milligrams per kilogram
PERCENT_WW = percentage weight per weight
Shading denotes exceedence of NSW EPA 2014 General Solid Waste Criteria (Contaminant Threshold 1, non-l
Shading dneotes exceedence of NSW 2014 Restricted Solid Waste Criteria (Contaminant Threshold 2, non-leac
Bold LOR exceeds criteria

Table T2
Waste Classification (Leachable)
Soil Analytical Results

						A001		A004		A006		A007		A009	
Field_ID						A001_0.0-0.2	A001_0.0-0.2	A004_0.0-0.2	A004_0.0-0.2	A006_0.0-0.2	A006_0.0-0.2	A007_0.0-0.2	A007_0.0-0.2	A009_0.0-0.2	A009_0.0-0.2
Sample_Depth_Range						0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2
Location_Code						A001	A001	A004	A004	A006	A006	A007	A007	A009	A009
Sampled_Date_Time						21/10/2013	21/10/2013	21/10/2013	21/10/2013	19/10/2013	19/10/2013	19/10/2013	19/10/2013	19/10/2013	19/10/2013
Matrix Type						SOIL	TCLP	SOIL	TCLP	SOIL	TCLP	SOIL	TCLP	SOIL	TCLP
SDG						ES1322813	ES1322813	ES1322813	ES1322813	ES1322746	ES1322746	ES1322746	ES1322746	ES1322746	ES1322746
Sample_Type						Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
	Chemical Name	**SOIL LOR**	**TCLP LOR**	**NSW EPA 2014 GSW (SCC1) (mg/kg)**	**NSW EPA 2014 GSW (TCLP1) (µg/L)**	**NSW EPA 2014 RSW (SCC2) (mg/kg)**	**NSW EPA 2014 RSW (TCLP2) (µg/L)**								
TRH (NEPM 1999)	TRH C6-C9	10		650		2600		<10		<10		<10		<10	
	TRH C10-36 (Total)	50		10000		40000		5710		34,100		42,600		19,700		144,000	
PAHs	Benzo(a) pyrene	0.05	0.5	10	40	23	160	<0.5		1	<0.5	4.2	<0.5	0.5		<4	
	Sum of PAHs	0.5	0.5	200		800		2.9		61.6	7	72.2	1.5	12.8		91.4	
TCLP for Non & Semivolatile Analytes	pH (Final)		0.1						4.9		5.1		4.9		4.9		5
	pH (Initial)		0.1						6.1		8.8		5.7		5.6		6.7
	pH (after HCL)		0.1						1.7		1.7		1.7		1.7		1.7
	TCLP Fluid		1						1		1		1		1		1
Phenols	2-methylphenol	0.5		7200	200	28800	800	<0.5		<0.5		<0.5		<0.5		<4	
	Phenol	0.5		518	14.4	2073	57.6	<0.5		<0.5		<0.5		<0.5		<4	
CAHs	Tetrachloroethene	0.5		25.2	0.7	100.8	2.8	-		-		-		<0.5		-	
	Trichloroethene	0.5		18	0.5	72	2	-		-		-		<0.5		-	
	Vinyl chloride	5		7.2	0.2	28.8	0.8	-		-		-		<5		-	
BTEX	Total Xylene (ESDAT)	0.5		1800	50	7200	200	<0.5		0.5		<0.5		<0.5		<0.5	
	Benzene	0.2		18	0.5	72	2	<0.2		<0.2		<0.2		<0.2		<0.2	
	Ethylbenzene	0.5		1080	30	4320	120	<0.5		<0.5		<0.5		<0.5		<0.5	
	Toluene	0.5		518	1.4	2073	57.6	<0.5		<0.5		<0.5		<0.5		<0.5	
Metals	Antimony	5						<5		<5		<5		<5		<5	
	Arsenic	4		500	5	2000	20	<5		<5		22		10		9	
	Beryllium	1		100	1	400	4	<1		<1		<1		<1		<1	
	Cadmium	0.4		100	1	400	4	<1		<1		<1		<1		3	
	Chromium (hexavalent)	0.5		1900	5	7600	20	<0.5		0.9		<0.5		<0.5		18.7	
	Lead	1	100	1500	5000	6000	20,000	292	400	23		22		243	300	332	<100
	Mercury	0.1		50	0.2	200	0.8	0.2		<0.1		<0.1		0.2		0.3	
	Molybdenum	1		1000	5	4000	20	4		<2		<2		6		5	
	Nickel	1	100	1050	2000	4200	8000	8		6		2		12		23	
	Selenium	2		50	1	200	4	<5		<5		<5		<5		<5	
	Silver	1		180	5	720	20	<2		<2		<2		<2		<2	
OCPs	a-BHC	0.05						-		-		-		<0.25		-	
	Aldrin	0.05						-		-		-		<0.25		-	
	b-BHC	0.05						-		-		-		<0.25		-	
	chlordane	0.05						-		-		-		<0.25		-	
	d-BHC	0.05						-		-		-		<0.25		-	
	DDT+DDE+DDD	0.05						-		-		-		<0.25		-	
	Dieldrin	0.05						-		-		-		<0.25		-	
	Endrin	0.05						-		-		-		<0.25		-	
	Endrin aldehyde	0.05						-		-		-		<0.25		-	
	g-BHC (Lindane)	0.05						-		-		-		<0.25		-	
	Heptachlor	0.05						-		-		-		<0.25		-	
	Heptachlor epoxide	0.05						-		-		-		<0.25		-	
	Sum Scheduled Chemicals	-		<50				-		-		-		nc		-	
OPPs	Chlorpyrifos	0.05		7.5	0.2	30	0.8	-		-		-		-		-	
SVOC	Pentachlorophenol	2						<2		<2		<2		<2		<8	
	Sum Moderately Harmful Pesticides	-		250				nc		nc		nc		nc		nc	
PCBs	PCBs (Sum of total)	0.1		50	N/A	50	N/A	-		-		-		<0.2		-	
SVOCs	2,4,5-trichlorophenol	0.5		14400	400	57600	1600	<0.5		<0.5		<0.5		<0.5		<4	
	2,4,6-trichlorophenol	0.5		72	2	288	8	<0.5		<0.5		<0.5		<0.5		<4	
	Methyl Ethyl Ketone	5		7200	200	28800	800	-		-		-		<5		-	
VOCs	1,1,1,2-tetrachloroethane	0.5		360	10	1440	40	-		-		-		<0.5		-	
	1,1,1-trichloroethane	0.5		1080	30	4320	120	-		-		-		<0.5		-	
	1,1,2,2-tetrachloroethane	0.5		46.8	1.3	187.2	5.2	-		-		-		<0.5		-	
	1,1,2-trichloroethane	0.5		43.2	30	172.8	120	-		-		-		<0.5		-	
	1,1-dichloroethene	0.5		25	0.7	100	2.8	-		-		-		<0.5		-	
	1,2-dichlorobenzene	0.5		155	7.5	620	30	-		-		-		<0.5		-	
	1,2-dichloroethane	0.5		18	0.5	72	2	-		-		-		<0.5		-	
	1,4-dichlorobenzene	0.5		270	7.5	1080	30	-		-		-		<0.5		-	
	Carbon tetrachloride	0.5		18	0.5	72	2	-		-		-		<0.5		-	
	Chlorobenzene	0.5		3600	100	14400	400	-		-		-		<0.5		-	
	Chloroform	0.5		216	6	864	24	-		-		-		<0.5		-	
	Styrene	0.5		108	3	432	12	-		-		-		<0.5		-	

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelines*
TRH = Total Recoverable Hydrocarbons
TCLP = Toxicity Characteristic Leaching Procedure
GSW = General Solid Waste
RSW = Restricted Solid Waste
mg/kg = milligrams per kilogram
µg/L = micrograms per litre
PERCENT_WW = percentage weight per weight

Shading denotes exceedence of NSW 2008 General Solid Waste - Specific Contaminant Concentration 1
Shading denotes exceedence of NSW 2008 General Solid Waste - Toxicity Characteristics Leaching Procedure 1
Shading denotes exceedenc of NSW 2008 Restricted Solid Waste - Specific Contaminant Concentration 2
Shading denotes exceedence of NSW 2008 Restricted Solid Waste - Toxicity Characteristics Leaching Procedure 2

Table T2
Waste Classification (Leachable)
Soil Analytical Results

							A010		A011		A016		B001		B002		B003	
							A010 0.0-0.2	A010 0.0-0.2	A011 0.0-0.2	A011 0.0-0.2	A016 0.0-0.2	A016 0.0-0.2	B001 0.0-0.2	B001 0.0-0.2	QC016	QC016	B003 0.0-0.2	B003 0.0-0.2
							0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2
							A010	A010	A011	A011	A016	A016	B001	B001	B002	B002	B003	B003
							19/10/2013	19/10/2013	19/10/2013	19/10/2013	19/10/2013	19/10/2013	21/10/2013	21/10/2013	21/10/2013	21/10/2013	21/10/2013	21/10/2013
							SOIL	TCLP	SOIL	TCLP	SOIL	TCLP	SOIL	TCLP	SOIL	TCLP	SOIL	TCLP
							ES1322746	ES1322746	ES1322746	ES1322746	ES1322746	ES1322746	ES1322813	ES1322813	ES1322813	ES1322813	ES1322813	ES1322813
							Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D	Field_D	Normal	Normal
	Chemical Name	**SOIL LOR**	**TCLP LOR**	**NSW EPA 2014 GSW (SCC1) (mg/kg)**	**NSW EPA 2014 GSW (TCLP1) (µg/L)**	**NSW EPA 2014 RSW (SCC2) (mg/kg)**												
TRH (NEPM 1999)	TRH C6-C9	10		650		2600	<10		<10		<10		401		14		<10	
	TRH C10-36 (Total)	50		10000		40000	132,000		29,300		1680		45,200		6280		<50	
PAHs	Benzo(a) pyrene	0.05	0.5	10	40	23	51.2	<2.4	31.9	<2.2	<0.5		6.7	<2.4	<0.5		<0.5	
	Sum of PAHs	0.5	0.5	200		800	1500	48.1	3000	262	3.9		473	116	8		<0.5	
TCLP for Non & Semivolatile Analytes	pH (Final)		0.1					5		4.9		5		5.4		5.2		5
	pH (Initial)		0.1					6.2		6.4		8.2		8.9		8.8		8.4
	pH (after HCL)		0.1					1.7		1.6		1.7		1.8		1.7		1.7
	TCLP Fluid		1					1		1		1		1		1		1
Phenols	2-methylphenol	0.5		7200	200	28800	<4		<4		<0.5		<0.5		<0.5		<0.5	
	Phenol	0.5		518	14.4	2073	<4		<4		<0.5		<0.5		<0.5		<0.5	
CAHs	Tetrachloroethene	0.5		25.2	0.7	100.8	-		-		-		<0.5		<0.5		-	
	Trichloroethene	0.5		18	0.5	72	-		-		-		<0.5		<0.5		-	
	Vinyl chloride	5		7.2	0.2	28.8	-		-		-		<5		<5		-	
BTEX	Total Xylene (ESDAT)	0.5		1800	50	7200	<0.5		<0.5		<0.5		66.1		<0.5		<0.5	
	Benzene	0.2		18	0.5	72	<0.2		<0.2		<0.2		<0.5		<0.2		<0.2	
	Ethylbenzene	0.5		1080	30	4320	<0.5		<0.5		<0.5		3.8		<0.5		<0.5	
	Toluene	0.5		518	1.4	2073	<0.5		<0.5		<0.5		7.2		<0.5		<0.5	
Metals	Antimony	5					<5		<5		8		<5		<5		<5	
	Arsenic	4		500	5	2000	14		<5		12		<5		<5		<5	
	Beryllium	1		100	1	400	<1		<1		<1		<1		<1		<1	
	Cadmium	0.4		100	1	400	1		<1		4		<1		<1		<1	
	Chromium (hexavalent)	0.5		1900	5	7600	14.2		<0.5		<0.5		<2.5		<0.5		<0.5	
	Lead	1	100	1500	5000	6000	131		<5		753	<100	55		250	<100	238	<100
	Mercury	0.1		50	0.2	200	0.4		<0.1		0.4		0.7		0.3		0.2	
	Molybdenum	1		1000	5	4000	4		<2		3		<2		2		6	
	Nickel	1	100	1050	2000	4200	27		<2		26		5		8		14	
	Selenium	2		50	1	200	<5		<5		<5		<5		<5		<5	
	Silver	1		180	5	720	<2		<2		<2		<2		<2		<2	
OCPs	a-BHC	0.05					-		-		-		<0.25		<0.25		-	
	Aldrin	0.05					-		-		-		<0.25		<0.25		-	
	b-BHC	0.05					-		-		-		<0.25		<0.25		-	
	chlordane	0.05					-		-		-		<0.25		<0.25		-	
	d-BHC	0.05					-		-		-		<0.25		<0.25		-	
	DDT+DDE+DDD	0.05					-		-		-		<0.25		<0.25		-	
	Dieldrin	0.05					-		-		-		<0.25		<0.25		-	
	Endrin	0.05					-		-		-		<0.25		<0.25		-	
	Endrin aldehyde	0.05					-		-		-		<0.25		<0.25		-	
	g-BHC (Lindane)	0.05					-		-		-		<0.25		<0.25		-	
	Heptachlor	0.05					-		-		-		<0.25		<0.25		-	
	Heptachlor epoxide	0.05					-		-		-		<0.25		<0.25		-	
	Sum Scheduled Chemicals	-		<50			-		-		-		nc		nc		-	
OPPs	Chlorpyrifos	0.05		7.5	0.2	30	-		-		-		-		-		-	
SVOC	Pentachlorophenol	2					<8		<8		<2		<2		<2		<2	
	Sum Moderately Harmful Pesticides	-		250			nc		nc		nc		nc		nc		nc	
PCBs	PCBs (Sum of total)	0.1		50	N/A	50	-		-		-		<0.2		<0.1		-	
SVOCs	2,4,5-trichlorophenol	0.5		14400	400	57600	<4		<4		<0.5		<0.5		<0.5		<0.5	
	2,4,6-trichlorophenol	0.5		72	2	288	<4		<4		<0.5		<0.5		<0.5		<0.5	
	Methyl Ethyl Ketone	5		7200	200	28800	-		-		-		<5		<5		-	
VOCs	1,1,1,2-tetrachloroethane	0.5		360	10	1440	-		-		-		<0.5		<0.5		-	
	1,1,1-trichloroethane	0.5		1080	30	4320	-		-		-		<0.5		<0.5		-	
	1,1,2,2-tetrachloroethane	0.5		46.8	1.3	187.2	-		-		-		<0.5		<0.5		-	
	1,1,2-trichloroethane	0.5		43.2	30	172.8	-		-		-		<0.5		<0.5		-	
	1,1-dichloroethene	0.5		25	0.7	100	-		-		-		<0.5		<0.5		-	
	1,2-dichlorobenzene	0.5		155	7.5	620	-		-		-		<0.5		<0.5		-	
	1,2-dichloroethane	0.5		18	0.5	72	-		-		-		<0.5		<0.5		-	
	1,4-dichlorobenzene	0.5		270	7.5	1080	-		-		-		<0.5		<0.5		-	
	Carbon tetrachloride	0.5		18	0.5	72	-		-		-		<0.5		<0.5		-	
	Chlorobenzene	0.5		3600	100	14400	-		-		-		<0.5		<0.5		-	
	Chloroform	0.5		216	6	864	-		-		-		<0.5		<0.5		-	
	Styrene	0.5		108	3	432	-		-		-		<0.5		<0.5		-	

Notes:
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TRH = Total Recoverable Hydrocarbons
TCLP = Toxicity Characteristic Leaching Procedure
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mg/kg = milligrams per kilogram
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	Shading denotes exceedence of NSW 2008 General Solid Waste - Specific Contaminant Concentration 1
	Shading denotes exceedence of NSW 2008 General Solid Waste - Toxicity Characteristics Leaching Procedure 1
	Shading denotes exceedenc of NSW 2008 Restricted Solid Waste - Specific Contaminant Concentration 2
	Shading denotes exceedence of NSW 2008 Restricted Solid Waste - Toxicity Characteristics Leaching Procedure 2

AECOM

Table T2
Waste Classification (Leachable)
Soil Analytical Results

Client Name: Caltex Asutralia Petroleum Pty Ltd
Project Name: Caltex Kurnell
Project No: 60309877

						B010		B015		B016		B017		B025		B030	
						B010_0.0-0.2	B010_0.0-0.2	B015_0.0-0.2	B015_0.0-0.2	B016_0.0-0.2	B016_0.0-0.2	B017_0.0-0.2	B017_0.0-0.2	B025_0.4-0.5	B025_0.4-0.5	B030_0.0-0.2	B030_0.0-0.2
						0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0.4-0.5	0.4-0.5	0-0.2	0-0.2
						B010	B010	B015	B015	B016	B016	B017	B017	B025	B025	B030	B030
						21/10/2013	21/10/2013	18/10/2013	18/10/2013	18/10/2013	18/10/2013	18/10/2013	18/10/2013	24/10/2013	24/10/2013	18/10/2013	18/10/2013
						SOIL	TCLP	SOIL	TCLP	SOIL	TCLP	SOIL	TCLP	SOIL	TCLP	SOIL	TCLP
						ES1322813	ES1322813	ES1322746	ES1322746	ES1322746	ES1322746	ES1322746	ES1322746	ES1323080	ES1323295	ES1322746	ES1322746
						Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
	Chemical Name	**SOIL LOR**	**TCLP LOR**	**NSW EPA 2014 GSW (SCC1) (mg/kg)**	**NSW EPA 2014 GSW (TCLP1) (µg/L)**	**NSW EPA 2014 RSW (SCC2) (mg/kg)**											
TRH (NEPM 1999)	TRH C6-C9	10		650		2600	<10		<10		<10		<10		<10		<10	
	TRH C10-36 (Total)	50		10000		40000	870		350		19,000		<50		1520		1970	
PAHs	Benzo(a) pyrene	0.05	0.5	10	40	23	<0.5		<0.5		8.1	<0.5	<0.5		1.1	<0.5	<0.5	
	Sum of PAHs	0.5	0.5	200		800	<0.5		<0.5		160	2	<0.5		8.1	nc	0.7	
TCLP for Non & Semivolatile Analytes	pH (Final)		0.1					5.5		4.9		5		4.9		6.3		5.7
	pH (Initial)		0.1					9		7.8		8.5		8		1.6		9.1
	pH (after HCL)		0.1					1.8		1.7		1.8		1.7		1		4.4
	TCLP Fluid		1					1		1		1		1		4.9		1
Phenols	2-methylphenol	0.5		7200	200	28800	<0.5		<0.5		<0.5		<0.5		<0.5		<0.5	
	Phenol	0.5		518	14.4	2073	<0.5		<0.5		<0.5		<0.5				<0.5	
CAHs	Tetrachloroethene	0.5		25.2	0.7	100.8	-		-		<0.5		-				-	
	Trichloroethene	0.5		18	0.5	72	-		-		<0.5		-				-	
	Vinyl chloride	5		7.2	0.2	28.8	-		-		<5		-				-	
BTEX	Total Xylene (ESDAT)	0.5		1800	50	7200	<0.5		<0.5		<0.5		<0.5				<0.5	
	Benzene	0.2		18	0.5	72	<0.2		<0.2		<0.2		<0.2		<0.2		<0.2	
	Ethylbenzene	0.5		1080	30	4320	<0.5		<0.5		<0.5		<0.5		<0.5		<0.5	
	Toluene	0.5		518	1.4	2073	<0.5		<0.5		<0.5		<0.5		<0.5		<0.5	
Metals	Antimony	5					<5		<5		<5		<5				<5	
	Arsenic	4		500	5	2000	19		22		<5		9		<5		<5	
	Beryllium	1		100	1	400	<1		<1		<1		<1		<1		<1	
	Cadmium	0.4		100	1	400	1		<1		<1		<1		<1		<1	
	Chromium (hexavalent)	0.5		1900	5	7600	<0.5		<0.5		<0.5		<0.5		<0.5		<0.5	
	Lead	1	100	1500	5000	6000	102	<100	207	<100	11		220	<100	27		75	
	Mercury	0.1		50	0.2	200	4.7		1.4		<0.1		0.2		<0.1		<0.1	
	Molybdenum	1		1000	5	4000	6		<2		<2		3		<2		<2	
	Nickel	1	100	1050	2000	4200	46	200	24		3		25		5		41	<100
	Selenium	2		50	1	200	<5		<5		<5		<5		<5		<5	
	Silver	1		180	5	720	<2		<2		<2		<2		<2		<2	
OCPs	a-BHC	0.05					-		-		<0.25		-		-		-	
	Aldrin	0.05					-		-		<0.25		-		-		-	
	b-BHC	0.05					-		-		<0.25		-		-		-	
	chlordane	0.05					-		-		<0.25		-		-		-	
	d-BHC	0.05					-		-		<0.25		-		-		-	
	DDT+DDE+DDD	0.05					-		-		<0.25		-		-		-	
	Dieldrin	0.05					-		-		<0.25		-		-		-	
	Endrin	0.05					-		-		<0.25		-		-		-	
	Endrin aldehyde	0.05					-		-		<0.25		-		-		-	
	g-BHC (Lindane)	0.05					-		-		<0.25		-		-		-	
	Heptachlor	0.05					-		-		<0.25		-		-		-	
	Heptachlor epoxide	0.05					-		-		<0.25		-		-		-	
	Sum Scheduled Chemicals	-		<50			-		-		nc		-		-		-	
OPPs	Chlorpyrifos	0.05		7.5	0.2	30	-		-		-		-		-		-	
SVOC	Pentachlorophenol	2					<2		<2		<2		<2		<2		<2	
	Sum Moderately Harmful Pesticides	-		250			nc		nc		nc		nc		nc		nc	
PCBs	PCBs (Sum of total)	0.1		50	N/A	50	-		-		<0.1		-		-		-	
SVOCs	2,4,5-trichlorophenol	0.5		14400	400	57600	<0.5		<0.5		<0.5		<0.5		<0.5		<0.5	
	2,4,6-trichlorophenol	0.5		72	2	288	<0.5		<0.5		<0.5		<0.5		<0.5		<0.5	
	Methyl Ethyl Ketone	5		7200	200	28800	-		-		<5		-		-		-	
VOCs	1,1,1,2-tetrachloroethane	0.5		360	10	1440	-		-		<0.5		-		-		-	
	1,1,1-trichloroethane	0.5		1080	30	4320	-		-		<0.5		-		-		-	
	1,1,2,2-tetrachloroethane	0.5		46.8	1.3	187.2	-		-		<0.5		-		-		-	
	1,1,2-trichloroethane	0.5		43.2	30	172.8	-		-		<0.5		-		-		-	
	1,1-dichloroethene	0.5		25	0.7	100	-		-		<0.5		-		-		-	
	1,2-dichlorobenzene	0.5		155	7.5	620	-		-		<0.5		-		-		-	
	1,2-dichloroethane	0.5		18	0.5	72	-		-		<0.5		-		-		-	
	1,4-dichlorobenzene	0.5		270	7.5	1080	-		-		<0.5		-		-		-	
	Carbon tetrachloride	0.5		18	0.5	72	-		-		<0.5		-		-		-	
	Chlorobenzene	0.5		3600	100	14400	-		-		<0.5		-		-		-	
	Chloroform	0.5		216	6	864	-		-		<0.5		-		-		-	
	Styrene	0.5		108	3	432	-		-		<0.5		-		-		-	

Notes:
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Shading denotes exceedence of NSW 2008 General Solid Waste - Specific Contaminant Concentration 1
Shading denotes exceedence of NSW 2008 General Solid Waste - Toxicity Characteristics Leaching Procedure 1
Shading denotes exceedenc of NSW 2008 Restricted Solid Waste - Specific Contaminant Concentration 2
Shading denotes exceedence of NSW 2008 Restricted Solid Waste - Toxicity Characteristics Leaching Procedure 2

Table T2
Waste Classification (Leachable)
Soil Analytical Results

							C003		C005		C007	
							C003 0.4-0.5	C003 0.4-0.5	C005 0.0-0.2	C005 0.0-0.2	C007 0.0-0.2	C007 0.0-0.2
							0.4-0.5	0.4-0.5	0-0.2	0-0.2	0-0.2	0-0.2
							C003	C003	C005	C005	C005	C005
							22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013	22/10/2013
							SOIL	TCLP	SOIL	TCLP	SOIL	TCLP
							ES1323052	ES1323325	ES1323052	ES1323325		
							Normal	Normal	Normal	Normal	Normal	Normal
	Chemical Name	**SOIL LOR**	**TCLP LOR**	**NSW EPA 2014 GSW (SCC1) (mg/kg)**	**NSW EPA 2014 GSW (TCLP1) (µg/L)**	**NSW EPA 2014 RSW (SCC2) (mg/kg)**						
TRH (NEPM 1999)	TRH C6-C9	10		650		2600	<10		<10		<10	
	TRH C10-36 (Total)	50		10000		40000	20,400		3900		9170	
PAHs	Benzo(a) pyrene	0.05	0.5	10	40	23	<0.5		<0.5		<0.5	
	Sum of PAHs	0.5	0.5	200		800	<0.5		<0.5		nc	
TCLP for Non & Semivolatile Analytes	pH (Final)		0.1					4.9		4.9		7.3
	pH (Initial)		0.1					7.5		7.7		1.6
	pH (after HCL)		0.1					1.6		1.6		1
	TCLP Fluid		1					1		1		4.9
Phenols	2-methylphenol	0.5		7200	200	28800	<0.5		<0.5		<0.5	
	Phenol	0.5		518	14.4	2073	<0.5		<0.5		<0.5	
CAHs	Tetrachloroethene	0.5		25.2	0.7	100.8	-		-		-	
	Trichloroethene	0.5		18	0.5	72	-		-		-	
	Vinyl chloride	5		7.2	0.2	28.8	-		-		-	
BTEX	Total Xylene (ESDAT)	0.5		1800	50	7200	<0.5		<0.5		<0.5	
	Benzene	0.2		18	0.5	72	<0.2		<0.2		<0.2	
	Ethylbenzene	0.5		1080	30	4320	<0.5		<0.5		<0.5	
	Toluene	0.5		518	1.4	2073	<0.5		<0.5		<0.5	
Metals	Antimony	5					<5		8		8	
	Arsenic	4		500	5	2000	<5		<5		<5	
	Beryllium	1		100	1	400	<1		<1		<1	
	Cadmium	0.4		100	1	400	<1		<1		<1	
	Chromium (hexavalent)	0.5		1900	5	7600	<2.5		<0.5		<0.5	
	Lead	1	100	1500	5000	6000	<5	<100	184	<100	102	<100
	Mercury	0.1		50	0.2	200	<0.1		<0.1		<0.1	
	Molybdenum	1		1000	5	4000	<2		2		17	
	Nickel	1	100	1050	2000	4200	<2		14		8	
	Selenium	2		50	1	200	<5		<5		<5	
	Silver	1		180	5	720	<2		<2		<2	
OCPs	a-BHC	0.05					-		-		-	
	Aldrin	0.05					-		-		-	
	b-BHC	0.05					-		-		-	
	chlordane	0.05					-		-		-	
	d-BHC	0.05					-		-		-	
	DDT+DDE+DDD	0.05					-		-		-	
	Dieldrin	0.05					-		-		-	
	Endrin	0.05					-		-		-	
	Endrin aldehyde	0.05					-		-		-	
	g-BHC (Lindane)	0.05					-		-		-	
	Heptachlor	0.05					-		-		-	
	Heptachlor epoxide	0.05					-		-		-	
	Sum Scheduled Chemicals	-		<50			-		-		-	
OPPs	Chlorpyrifos	0.05		7.5	0.2	30	-		-		-	
SVOC	Pentachlorophenol	2					<2		<2		<2	
	Sum Moderately Harmful Pesticides	-		250			nc		nc		nc	
PCBs	PCBs (Sum of total)	0.1		50	N/A	50	-		-		-	
SVOCs	2,4,5-trichlorophenol	0.5		14400	400	57600	<0.5		<0.5		<0.5	
	2,4,6-trichlorophenol	0.5		72	2	288	<0.5		<0.5		<0.5	
	Methyl Ethyl Ketone	5		7200	200	28800	-		-		-	
VOCs	1,1,1,2-tetrachloroethane	0.5		360	10	1440	-		-		-	
	1,1,1-trichloroethane	0.5		1080	30	4320	-		-		-	
	1,1,2,2-tetrachloroethane	0.5		46.8	1.3	187.2	-		-		-	
	1,1,2-trichloroethane	0.5		43.2	30	172.8	-		-		-	
	1,1-dichloroethene	0.5		25	0.7	100	-		-		-	
	1,2-dichlorobenzene	0.5		155	7.5	620	-		-		-	
	1,2-dichloroethane	0.5		18	0.5	72	-		-		-	
	1,4-dichlorobenzene	0.5		270	7.5	1080	-		-		-	
	Carbon tetrachloride	0.5		18	0.5	72	-		-		-	
	Chlorobenzene	0.5		3600	100	14400	-		-		-	
	Chloroform	0.5		216	6	864	-		-		-	
	Styrene	0.5		108	3	432	-		-		-	

Notes:
NSW DECCW (2008 and 2009) - New South Wales Department of Climate Change and Water *Waste Classification Guidelines*
TRH = Total Recoverable Hydrocarbons
TCLP = Toxicity Characteristic Leaching Procedure
GSW = General Solid Waste
RSW = Restricted Solid Waste
mg/kg = milligrams per kilogram
µg/L = micrograms per litre
PERCENT_WW = percentage weight per weight

	Shading denotes exceedence of NSW 2008 General Solid Waste - Specific Contaminant Concentration 1
	Shading denotes exceedence of NSW 2008 General Solid Waste - Toxicity Characteristics Leaching Procedure 1
	Shading denotes exceedenc of NSW 2008 Restricted Solid Waste - Specific Contaminant Concentration 2
	Shading denotes exceedence of NSW 2008 Restricted Solid Waste - Toxicity Characteristics Leaching Procedure 2

Table T3
Asbestos in Soil Analytical Results

Area	Field_ID	Sample Depth Range (m bgs)	Approximate Sample Volume Collected	Sample Weight Analysed (g)	Sampled Date	Asbestos in Soil Analysis Results	
						Absence/Presence Asbestos Type if Detected	Concentration of asbestos in Soil (% w/w)
Area A	A001_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A001_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A002_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A002_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A003_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A003_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A004_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A004_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A005_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A005_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A006_0.0-0.2	0.0-0.2	1 x 500ml	946	19/10/2013	Amosite asbestos detected	0.023
	A006_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A007_0.0-0.2	0.0-0.2	1 x 500ml	912	19/10/2013	Amosite asbestos detected	0.002
	A007_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A008_0.0-0.2	0.0-0.2	1 x 500ml	NA	19/10/2013	No asbestos detected	NA
	A008_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A009_0.0-0.2	0.0-0.2	1 x 500ml	853	19/10/2013	Amosite asbestos detected	0.023
	A010_0.0-0.2	0.0-0.2	1 x 500ml	NA	19/10/2013	No asbestos detected	NA
	A011_0.0-0.2	0.0-0.2	1 x 500ml	NA	19/10/2013	No asbestos detected	NA
	A011_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A012_0.0-0.2	0.0-0.2	1 x 500ml	NA	19/10/2013	No asbestos detected	NA
	A012_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A013_0.0-0.2	0.0-0.2	1 x 500ml	NA	19/10/2013	No asbestos detected	NA
	A013_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	A014_0.0-0.2	0.0-0.2	1 x 500ml	988	19/10/2013	Amosite asbestos detected	0.01
	A014_0.4-0.5	0.4-0.5	1 x 500ml	1220	21/10/2013	Amosite asbestos detected	0.0011
	A015_0.0-0.2	0.0-0.2	1 x 500ml	NA	19/10/2013	No asbestos detected	NA
	A015_0.4-0.5	0.4-0.5	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A016_0.0-0.2	0.0-0.2	1 x 500ml	924	19/10/2013	Amosite asbestos detected	0.12
	A016_0.4-0.5	0.4-0.5	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A017_0.0-0.2	0.0-0.2	1 x 500ml	958	19/10/2013	Amosite asbestos detected	0.004
	A017_0.4-0.5	0.4-0.5	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A018_0.0-0.2	0.0-0.2	1 x 500ml	946	19/10/2013	Amosite asbestos detected	0.0007
	A018_0.4-0.5	0.4-0.5	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	A019_0.0-0.2	0.0-0.2	1 x 500ml	948	19/10/2013	Amosite asbestos detected	0.004
	A019_0.4-0.5	0.4-0.5	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
Area B	B001_0.0-0.2	0.0-0.2	1 x 500ml	562	21/10/2013	Amosite asbestos detected	0.0008
	B001_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	B002_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	B003_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	B003_0.4-0.5	0.4-0.5	1 x 500ml	NA	23/10/2013	No asbestos detected	NA
	B004_0.0-0.2	0.0-0.2	1 x 500ml	946	21/10/2013	Amosite asbestos detected	0.75
	B005_0.0-0.2	0.0-0.2	1 x 500ml	986	19/10/2013	Amosite asbestos detected	0.018
	B006_0.0-0.2	0.0-0.2	1 x 500ml	1405	21/10/2013	Amosite asbestos detected	0.01
	B006_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B007_0.0-0.2	0.0-0.2	1 x 500ml	1221	21/10/2013	Amosite asbestos detected	0.04
	B008_0.0-0.2	0.0-0.2	1 x 500ml	1119	21/10/2013	Amosite asbestos detected	0.0005
	B008_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B009_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	B010_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	Amosite asbestos detected	0.005
	B010_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B011_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	B012_0.0-0.2	0.0-0.2	1 x 500ml	NA	21/10/2013	No asbestos detected	NA
	B012_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B013_0.0-0.2	0.0-0.2	1 x 500ml	1285	21/10/2013	Amosite asbestos detected	0.005
	B014_0.0-0.2	0.0-0.2	1 x 500ml	1094	18/10/2013	Amosite asbestos detected	0.0008
	B014_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B015_0.0-0.2	0.0-0.2	1 x 500ml	872	18/10/2013	Amosite asbestos detected	0.0008

Table T3
Asbestos in Soil Analytical Results

Area	Field_ID	Sample Depth Range (m bgs)	Approximate Sample Volume Collected	Sample Weight Analysed (g)	Sampled Date	Asbestos in Soil Analysis Results	
						Absence/Presence Asbestos Type if Detected	Concentration of asbestos in Soil (% w/w)
	B016_0.0-0.2	0.0-0.2	1 x 500ml	857	18/10/2013	Amosite asbestos detected	0.0035
Area B	B016_0.4-0.5	0.4-0.5	1 x 500ml	936	24/10/2013	Chrysotile and Amosite asbestos detected	0.044
	B017_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B018_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B018_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B019_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B020_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B021_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B021_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B022_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B023_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B023_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B024_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B025_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B025_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B026_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B026_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B027_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B027_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B028_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B029_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
	B029_0.4-0.5	0.4-0.5	1 x 500ml	NA	24/10/2013	No asbestos detected	NA
	B030_0.0-0.2	0.0-0.2	1 x 500ml	NA	18/10/2013	No asbestos detected	NA
Area C	C003_0.0-0.2	0.0-0.2	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C003_0.4-0.5	0.4-0.5	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C003_0.9-1.0	0.9-1.0	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C004_0.0-0.2	0.0-0.2	1 x 500ml	1092	22/10/2013	Amosite asbestos detected	0.008
	C004_0.4-0.5	0.4-0.5	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C004_0.9-1.0	0.9-1.0	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C005_0.0-0.2	0.0-0.2	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C005_0.4-0.5	0.4-0.5	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C005_0.8-0.9	0.8-0.9	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C006_0.0-0.2	0.0-0.2	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C006_0.9-1.0	0.9-1.0	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C006_1.2-1.3	1.2-1.3	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C007_0.0-0.2	0.0-0.2	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C007_0.4-0.5	0.4-0.5	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C007_0.7-0.8	0.7-0.8	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C008_0.0-0.2	0.0-0.2	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C008_0.4-0.5	0.4-0.5	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C008_0.9-1.0	0.9-1.0	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C009_0.0-0.2	0.0-0.2	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C009_0.9-1.0	0.9-1.0	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C009_1.9-2.0	1.9-2.0	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C010_0.0-0.2	0.0-0.2	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C010_0.4-0.5	0.4-0.5	1 x 500ml	NA	22/10/2013	No asbestos detected	NA
	C010_0.9-1.0	0.9-1.0	1 x 500ml	NA	22/10/2013	No asbestos detected	NA

Notes:

% w/w = percentage weight per weight

ml = millilitres

m bgs = metres below ground surface

Shading indicates % w/w of asbestos detected is greater than NEPM (2013) criteria for fibrous asbestos (FA) and asbestos fibres (AF) at sites for all proposed uses 0.001% w/w

Appendix C

2016 Results Tables

Primary ID	Duplicate	Triplicate	PID (ppm)	Sample Description	Rationale	Analytical Suite						
						Metals	TPH	BTEXN	B(a)P	Asbestos (presence)	Asbestos (quantification)	TCLP
Area A												
A003.5_0.0-0.2	-	-	1.3	Silty SAND (Fill), dark brown, slightly moist, loose, fine-medium grained.	Location between A003 and A004 to confirm historical results of no asbestos	1	1	1	1	1	-	1
A005.5_0.0-0.2	-	QC155	0.3	Silty SAND (Fill), brown, dry, loose, fine-medium grained.	Location between A005 and A006. Asbestos was found at location A006 but not at A005. This sample should confirm delineation of asbestos and TCLP analysed to determine whether historical results at A006 (hazardous waste) may receive a lower classification	1	1	1	1	1	-	1
A006.5_0.0-0.2	-	-	3.3	Silty SAND (Fill), dark brown, slightly moist, loose, fine-medium grained.	Location between A006 and A007 sampled for confirmation of asbestos presence and TCLP to potentially reduce historical classification	1	1	1	1	1	1	1
A007.5_0.0-0.2	-	-	2.2	Silty SAND (Fill), dark brown, slightly moist, loose, fine-medium grained, tace gravels.	Location between A007 and A008 sampled for confirmation of asbestos presence and TCLP to potentially reduce historical classification	1	1	1	1	1	-	-
A008.5_0.0-0.2	-	-	16.6	Silty SAND (Fill), dark brown, slightly moist, loose, fine-medium grained, tace gravels.	Location between A008 and A009 sampled for confirmation of asbestos presence and TCLP to potentially reduce historical classification	1	1	1	1	1	-	-
A009.5_0.0-0.2	-	-	-	No sample collected due to concrete slab.	Location between A009 and A010 sampled to confirm delineation of asbestos (A010 has no asbestos) and TCLP to potentially reduce historical classification	-	-	-	-	-	-	-
A013.5_0.0-0.2	QC157	-	2	Silty SAND (Fill), dark brown to black, slightly moist to moist, loose to medium dense, minor clay.	Sampled between A013 and A014 to delineate asbestos (found in A014 and not A013)	1	1	1	1	1	1	-
A013.5_0.4-0.5	-	-	63.8	Silty SAND (Fill), dark brown to black, wet, loose to medium dense, minor clay.	Sampled to confirm delineation of asbestos at depth form A014	1	1	1	1	1	1	-
A014.5_0.4-0.5	-	QC158	47.8	Silty SAND (Fill), dark brown, loose, wet, fine to medium grained.	Sampled between A014 and A015 to delineate asbestos at depth historically found at A014	1	1	1	1	1	1	-
Area B												
B001_0.0-0.2	-	-	4.6	Silty SAND (Fill), dark brown, dry, loose, fine-medium grained, inlcusions of organic matter and paint chips.	Sampled to confirm historical results and TCLP to potentially lower classification if possible	1	1	1	1	1	1	-
B003.5_0.0-0.2	-	-	2.2	Silty SAND (Fill), dark brown, dry, loose, fine-medium grained, minor clay, inlcusions of organic matter and paint chips.	Sampled between B003 and B004 to delineate asbestos located at B004	1	1	1	1	1	1	-
B007.5_0.0-0.2	-	-	1.8	Silty SAND (Fill), dark brown, dry, loose, fine-medium grained, trace clay, inlcusions of organic matter and paint chips.	Sampled between B007 and B008 to delineate asbestos in B007	1	1	1	1	1	1	-
B009.5_0.0-0.2	-	-	3.6	Silty SAND (Fill), dark brown, dry, loose, fine-medium grained, trace clay, inlcusions of organic matter and paint chips.	Sampled between B009 and B010 to delineate asbestos in B010	1	1	1	1	1	1	-
B010.5_0.0-0.2	QC150	-	3.6	Sandy CLAY (Fill), black, slightly moist, medium stiff, low to medium plasticity, inclusions of organic matter.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	1	1
B012.5_0.0-0.2	-	-	4.5	Silty SAND (Fill), dark brown, dry, loose, fine-medium grained, trace clay, inlcusions of organic matter.	Sampled Between B012 and B013 to delineate asbestos presence in B013	1	1	1	1	1	-	1
BH014_0.0-0.2	-	-	22.2	Silty SAND (Fill), dark brown, wet, loose, fine-medium grained.	Sampled between B014 and A013 to delineate asbestos at B014	1	1	1	1	1	-	1
BH014_0.5-0.6	QC154	-	5.5	Silty SAND (Fill), dark brown, wet, loose, fine-medium grained.	Sampled to confirm historical concentration. TCLP to potentially lower classification	1	1	1	1	1	-	-
BH015.5_0.5-0.6	-	-	6.6	Silty SAND (Fill), dark brown, wet, loose, fine-medium grained.	Sampled to delineate asbestos located in B016 at depth	1	1	1	1	1	-	-
BH016_0.0-0.2	-	-	3.7	Silty SAND (Fill), dark brown, wet, loose, fine-medium grained, trace shells and ironstone gravels.	Sampled to delineate asbestos located in B016 at depth	1	1	1	1	1	1	1
BH016.5_0.4-0.5	-	-	4.1	Silty SAND (Fill), dark brown, wet, loose, fine-medium grained, trace silt.	Sampled to delineate asbestos located in B016 at depth	1	1	1	1	1	-	-
B016.5_0.0-0.2	-	-	7	SAND (Fill), grey brown,wet, loose, fine to coarse grained, trace silt.	Sampled to delineate asbestos located in B016 at depth	1	1	1	1	1	-	-
B031_0.0-0.2	-	-	3.9	Silty SAND (Fill), dark brown, moist, loose, fine-medium grained, trace silt.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	-	-
B031_0.5-0.6	-	-	2.1	SAND (Fill), white with grey, moist, loose, fine to coarse grained, trace silt.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	-	-
B032_0.0-0.2	QC152	-	4	Silty Clayey SAND(Fill), dark brown, wet, loose, fine to medium grained.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	1	1
B032_0.5-0.6	-	-	4.6	SAND (Fill), grey brown, wet, loose, fine to medium grained, trace silt.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	-	-

Data Entry: KM
Data Review:

Primary ID	Duplicate	Triplicate	PID (ppm)	Sample Description	Rationale	Analytical Suite						
						Metals	TPH	BTEXN	B(a)P	Asbestos (presence)	Asbestos (quantification)	TCLP
B033_0.0-0.2	-	-	-	Sandy CLAY (Fill), grey brown, moist, low to medium plasticity, inclusions of organic matter.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	1	-
B033_0.5-0.6	-	-	4	Sandy CLAY (Fill), grey brown, moist, low to medium plasticity, inclusions of organic matter, black mottling possible hydrocarbon staining.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	-	-
B034_0.0-0.2	-	-	4.9	Sand (Fill), grey brown, moist, loose, fine to medium grained, trace silt, minor organic matter.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	-	-
B034_0.5-0.6	-	-	5	Sand (Fill), grey brown, moist, loose, fine to medium grained, trace silt, minor organic matter, black mottling possible hydrocarbon staining.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	-	-
B035_0.0-0.2	-	-	2.8	Sandy CLAY (Fill), grey brown, moist, low to medium plasticity, inclusions of organic matter.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	-	1
B035_0.5-0.6	-	QC151	3.6	Sandy CLAY (Fill), dark grey brown, moist, low to medium plasticity, inclusions of organic matter.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	-	-
B036_0.0-0.2	-	-	3.1	Silty SAND (Fill), grey brown, wet, loose, fine-medium grained, trace clay, inlcusions of organic matter.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	1	1
B036_0.5-0.6	-	-	0.7	Silty Clayey SAND (Fill), grey brown, wet, loose, fine-medium grained, trace clay, minor inlcusions of organic matter.	Sampled in southern portion of site to confirm historical results of no asbestos	1	1	1	1	1	1	-
Area C												
C011_0.0-0.2	-	-	0.9	Silty SAND (Fill), dark brown, loose, slightly moist, fine to medium grained.	Confirm / delineate the asbestos detection from TP30 sampled by PB	1	1	1	1	1	-	-
C012_0.0-0.2	-	-	1	Gravelly Silty SAND (Fill), dark brown, loose, slightly moist, fine to medium grained, fine ironstone and concrete gravels.	Confirm / delineate the asbestos detection from TP30 sampled by PB	1	1	1	1	1	-	-
C013_0.0-0.2	-	-	-	Not sampled due to 0.5m of pooled water within bund.	Not sampled previously due to concrete slab. If slab is removed sample to be taken	-	-	-	-	-	-	-
C013_0.4-0.5	-	-	-	Not sampled due to 0.5m of pooled water within bund.	Not sampled previously due to concrete slab. If slab is removed sample to be taken	-	-	-	-	-	-	-
					Total	35	35	35	35	35	14	10

Notes:
PID = Photoionisation Detector (PID) volatile organic compound (VOC) reading in parts per million (ppm).
Metals = arsenic, beryllium, cadmium, chromium, lead, molybdenum, nickel, selenium, silver and mercury.
BTEXN = benzene, toluene, ethylbenzene, xylenes and naphthalene
TPH = total petroleum hydrocarbons
B(a)P = benzo(a)pyrene
TCLP = toxicity characteristic leaching procedure

Parameter	LOR	NSW EPA (2014) WASTE CLASSIFICATION GUIDELINES						Sample ID	Area A A003.5_0.0-0.2	Area A A005.5_0.0-0.2	Area A QC155	Area A A006.5_0.0-0.2	Area A A007.5_0.0-0.2	Area A A008.5_0.0-0.2	Area A A013.5_0.0-0.2	Area A QC157	Area A A013.5_0.4-0.5	Area A A014.5_0.4-0.5
								Sample Date	16/03/2016	16/03/2016	16/03/2016	16/03/2016	16/03/2016	16/03/2016	16/03/2016	16/03/2016	16/03/2016	16/03/2016
								Sample Type	P	P	FD	P	P	P	P	FD	P	P
		CT1	SCC1	TCLP1	CT2	SCC2	TCLP2	Lab. Sample Ref.	ES1606083025	ES1606083026	S16-Ma18367	ES1606083027	ES1606083028	ES1606083029	ES1606083031	ES1606083041	ES1606083032	ES1606083033
								Sample Classification	Hazardous	GSW	GSW	SW(A)/Hazardous	Hazardous	Hazardous	SW(A)/Hazardous	SW(A)/Hazardous	SW(A)/GSW	SW(A)/GSW
		mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/L	Units										
Moisture Content	1	--			--			%	20.3	<1.0	< 1	3.2	10.4	7.9	27.5	43.1	19.1	19.6
Asbestos Detected	0.1	--			--			g/kg	No	No	--	Yes	No	No	Yes	--	Yes	Yes
Asbestos Type		--			--			--	-	-	--	Am	-	-	Am	--	Am	Am + Cr
Sample weight (dry)	0	--			--			g	501	684	--	553	510	387	287	--	761	832
Arsenic	5	100			400			mg/kg	7	6	6	6	8	<5	9	11	<5	<5
Barium	10	--			--			mg/kg	20	<10		20	20	30	20	40	<10	<10
Beryllium	1	20			80			mg/kg	<1	<1	< 2	<1	<1	<1	<1	<1	<1	<1
Boron	50	--			--			mg/kg	<50	<50	< 10	<50	<50	<50	<50	<50	<50	<50
Cadmium	1	20			80			mg/kg	<1	<1	< 0.4	<1	<1	<1	<1	<1	<1	<1
Chromium	2	100			400			mg/kg	31	36	< 1	98	40	32	45	53	2	4
Chromium (TCLP)			**1900**	***5***		**7600**	***20***	***mg/L***	--	--	--	--	--	--	--	--	--	--
Cobalt	2	--			--			mg/kg	4	4	< 5	4	<2	5	3	5	<2	<2
Copper	5	--			--			mg/kg	69	94	84	95	40	47	34	46	<5	<5
Lead	5	100	**1500**		400	**6000**		mg/kg	99	160	140	348	85	95	47	58	<5	6
Lead (TCLP)				***5***			***20***	***mg/L***	--	***0.1***	--	***0.5***	--	--	--	--	--	--
Manganese	5	--			--			mg/kg	55	29	28	44	24	96	70	132	11	6
Nickel	2	40	**1050**		160	**4200**		mg/kg	11	5	5.6	8	7	13	12	24	<2	<2
Nickel (TCLP)				***2***			***8***	***mg/L***	--	--	--	--	--	--	--	--	--	--
Selenium	5	20			80			mg/kg	<5	<5	< 2	<5	0	<5	<5	<5	<5	<5
Vanadium	5	--			--			mg/kg	9	<5		6	8	13	10	14	<5	<5
Zinc	5	--			--			mg/kg	407	713	700	932	206	911	415	581	<5	35
Mercury	0.1	4	**50**		16	**200**		mg/kg	0.2	<0.1	0.13	0.1	0.2	0.3	0.5	0.7	<0.1	0.1
Mercury (TCLP)				***0.2***			***0.8***	***mg/L***	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	0.5	0.8	**10**		3.2	**23**		mg/kg	<0.5	<0.5	< 0.5	17.2	<4.0	<0.5	<4.0	<4.0	<0.5	<0.5
Benzo(a)pyrene (TCLP)				***0.04***			***0.16***	***mg/L***	--	--	--	***<0.0005***	--	--	--	--	--	--
C6 - C9 Fraction	10	**650**			**2600**			mg/kg	<10	<10	< 20	<10	12	<10	<10	<10	<10	<10
C10 - C14 Fraction	50	--			--			mg/kg	<50	<50	< 20	870	2740	1090	630	<50	<50	<50
C15 - C28 Fraction	100	--			--			mg/kg	65000	2480	2900	41000	98300	67800	61000	120000	230	750
C29 - C36 Fraction	100	--			--			mg/kg	6740	260	390	13300	4760	4940	15800	28400	<100	<100
C10 - C36 Fraction (sum)*	50	**10000**			**40000**			mg/kg	**71700**	2740	3300	**55200**	**106000**	**73800**	**77400**	**148000**	230	750
C10 - C36 Fraction (sum)**		**10000**			**40000**			mg/kg	**71790**	2790	3310	**55170**	**105800**	**73830**	**77430**	**148450**	380	900
C6 - C10 Fraction	10	--			--			mg/kg	<10	<10	< 20	<10	20	<10	<10	<10	<10	<10
F1	10	--			--			mg/kg	<10	<10	< 20	<10	19	<10	<10	<10	<10	<10
>C10 - C16 Fraction	50	--			--			mg/kg	5390	100	< 50	2910	18100	7900	2440	3200	70	280
>C16 - C34 Fraction	100	--			--			mg/kg	65800	2590	3300	49400	86600	64600	72100	140000	200	530
>C34 - C40 Fraction	100	--			--			mg/kg	3840	<100	200	6830	2960	2830	9120	16400	<100	<100
>C10 - C40 Fraction (sum)	50	--			--			mg/kg	75000	2690	3500	59100	108000	75300	83700	160000	270	810
F2	50	--			--			mg/kg	5390	100	< 50	2910	18100	7900	2440	3200	70	280
Benzene	0.2	10			40			mg/kg	<0.2	<0.2	< 0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	0.5	288			1152			mg/kg	<0.5	<0.5	< 0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5	600			2400			mg/kg	<0.5	<0.5	< 0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	0.5	--			--			mg/kg	<0.5	<0.5	< 0.2	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	0.5	--			--			mg/kg	<0.5	<0.5	< 0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	0.5	1000			4000			mg/kg	<0.5	<0.5	< 0.3	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of BTEX	0.2	--			--			mg/kg	<0.2	<0.2	--	<0.2	1.6	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	1	--			--			mg/kg	<1	<1	--	<1	<1	<1	<1	<1	<1	<1

Notes:

CT - Contaminant Threshold
SCC - Specific Contamaintant Concentration
TCLP - Toxicity Characteristic Leaching Procedure
GSW - General Solid Waste
SW(A) - Special Waste Asbestos
RSW - Restricted Solid Waste
F1 C6 - C10 Fraction minus BTEX
F2 >C10 - C16 Fraction minus Naphthalene
P = Primary Sample
* 0 X LOR in sum of fractions
** 1 x LOR in sum of fractions

CT1 - CT for General Solid Waste (with no TCLP)
CT2 - CT for Restricted Solid Waste (with no TCLP)
SCC1 - SCC for General Solid Waste SCC (with TCLP analysis)
SCC2 - SCC for Restricted Solid Waste SCC (with TCLP analysis)
TCLP1 - TCLP for General Solid Waste
TCLP2 - TCLP for Restricted Solid Waste
< = less than laboratory limit of reporting (LOR)
Am - amosite Ch - chrysotile
FD = Field duplicate

Parameter	LOR	NSW EPA (2014) WASTE CLASSIFICATION GUIDELINES						Sample ID	Area A	Area B	Area B	Area B	Area B	Area B	Area B	Area B	Area B
								Sample Date	QC158	B001_0.0-0.2	B003.5_0.0-0.2	B007.5_0.0-0.2	B009.5_0.0-0.2	B010.5_0.0-0.2	QC150	B012.5_0.0-0.2	B014_0.0-0.2	B014_0.5-0.6
									16/03/2016	14/03/2016	14/03/2016	14/03/2016	14/03/2016	14/03/2016	14/03/2016	14/03/2016	15/03/2016	15/03/2016
								Sample Type	FD	P	P	P	P	P	FD	P	P	P
								Lab. Sample Ref.	S16-Ma18368	ES1606083001	ES1606083002	ES1606083003	ES1606083004	ES1606083005	ES1606083036	ES1606083006	ES1606083023	ES1606083024
								Sample Classification	SW(A)/GSW	SW(A)/RW	SW(A)/RW	SW(A)/GSW	SW(A)/RW	SW(A)/Hazardous	SW(A)/Hazardous	GSW	Hazardous	GSW
		CT1	SCC1	TCLP1	CT2	SCC2	TCLP2	Units										
		mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/L											
Moisture Content	1	--			--			%	21	2.8	4.1	<1.0	46.4	23.9	24.3	27.8	24.4	19.3
Asbestos Detected	0.1	--			--			g/kg	--	Yes	Yes	Yes	Yes	Yes	--	No	No	No
Asbestos Type		--			--			--	--	Am	Am	Am	Am + (Trace-Am)	Am	--	-	-	-
Sample weight (dry)	0	--			--			g	--	331	238	614	141	185	--	240	410	679
Arsenic	5	100			400			mg/kg	8.8	6	14	5	24	10	8	18	7	<5
Barium	10	--			--			mg/kg		130	110	30	490	70	90	80	10	<10
Beryllium	1	20			80			mg/kg	< 2	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron	50	--			--			mg/kg	< 10	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	1	20			80			mg/kg	< 0.4	<1	<1	<1	3	1	<1	<1	<1	<1
Chromium	2	100			400			mg/kg	< 1	24	107	61	152	73	70	36	8	<2
Chromium (TCLP)			**1900**	***5***		**7600**	***20***	***mg/L***	**--**	**--**	***<0.1***	**--**	***<0.1***	**--**	**--**	**--**	**--**	**--**
Cobalt	2	--			--			mg/kg	< 5	8	15	18	46	14	11	7	<2	<2
Copper	5	--			--			mg/kg	8.3	141	117	473	735	230	157	151	17	<5
Lead	5	100	**1500**		400	**6000**		mg/kg	15	50	144	621	393	249	124	204	16	<5
Lead (TCLP)				***5***			***20***	***mg/L***	**--**	**--**	***<0.1***	***<0.1***	***<0.1***	***0.1***		***<0.1***	**--**	**--**
Manganese	5	--			--			mg/kg	12	277	447	129	1220	172	164	123	28	<5
Nickel	2	40	**1050**		160	**4200**		mg/kg	< 5	20	41	30	153	53	40	22	5	<2
Nickel (TCLP)				***2***			***8***	***mg/L***	**--**	**--**	***<0.1***	**--**	***0.1***	***<0.1***	**--**	**--**	**--**	**--**
Selenium	5	20			80			mg/kg	< 2	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vanadium	5	--			--			mg/kg		37	60	10	112	27	29	13	5	<5
Zinc	5	--			--			mg/kg	130	1530	1710	6560	9100	4080	2580	2240	510	10
Mercury	0.1	4	**50**		16	**200**		mg/kg	0.3	5.2	2.1	0.3	61.7	17.6	14.7	3.7	0.2	<0.1
Mercury (TCLP)				***0.2***			***0.8***	***mg/L***	**--**	***<0.001***	**--**	**--**	***<0.001***	***<0.001***	**--**	**--**	**--**	**--**
Benzo(a)pyrene	0.5	0.8	**10**		3.2	**23**		mg/kg	< 0.5	1.4	<0.5	<0.5	<0.5	<0.5	<4.0	<0.5	1.2	<0.5
Benzo(a)pyrene (TCLP)				***0.04***			***0.16***	***mg/L***	**--**	***<0.0005***	**--**	**--**	**--**	**--**	**--**	**--**	***<0.0005***	**--**
C6 - C9 Fraction	10	**650**			**2600**			mg/kg	< 20	<10	<10	<10	<10	<10	<10	<10	13	<10
C10 - C14 Fraction	50	--			--			mg/kg	65	<50	<50	<50	<50	1660	<50	<50	<50	<50
C15 - C28 Fraction	100	--			--			mg/kg	1200	15200	11600	<100	1090	66700	107000	<100	4720	670
C29 - C36 Fraction	100	--			--			mg/kg	< 50	9350	8160	<100	1350	35300	41300	<100	12100	1480
C10 - C36 Fraction (sum)*	50	**10000**			**40000**			mg/kg	1300	**24600**	**19800**	<50	2440	**104000**	**148000**	<50	**16800**	2150
C10 - C36 Fraction (sum)**		**10000**			**40000**			mg/kg	1265	**24600**	**19810**	250	2490	**103660**	**148350**	<250	**16870**	2200
C6 - C10 Fraction	10	--			--			mg/kg	< 20	<10	<10	<10	<10	<10	<10	<10	<10	<10
F1	10	--			--			mg/kg	< 20	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C10 - C16 Fraction	50	--			--			mg/kg	240	290	<50	<50	<50	5750	14200	<50	140	50
>C16 - C34 Fraction	100	--			--			mg/kg	1000	22500	17900	<100	2040	91700	129000	<100	13000	1660
>C34 - C40 Fraction	100	--			--			mg/kg	< 100	6160	4230	<100	940	16000	19800	<100	16400	1970
>C10 - C40 Fraction (sum)	50	--			--			mg/kg	--	29000	22100	<50	2980	113000	163000	<50	29500	3680
F2	50	--			--			mg/kg	240	290	<50	<50	<50	5750	14200	<50	140	50
Benzene	0.2	10			40			mg/kg	< 0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	0.5	288			1152			mg/kg	< 0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5	600			2400			mg/kg	< 0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	0.5	--			--			mg/kg	< 0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.7
ortho-Xylene	0.5	--			--			mg/kg	< 0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	0.5	1000			4000			mg/kg	< 0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	0.7
Sum of BTEX	0.2	--			--			mg/kg	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	0.7
Naphthalene	1	--			--			mg/kg	--	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes:

CT - Contaminant Threshold
SCC - Specific Contamaintant Concentration
TCLP - Toxicity Characteristic Leaching Procedure
GSW - General Solid Waste
SW(A) - Special Waste Asbestos
RSW - Restricted Solid Waste
F1 C6 - C10 Fraction minus BTEX
F2 >C10 - C16 Fraction minus Naphthalene
P = Primary Sample
* 0 X LOR in sum of fractions
** 1 x LOR in sum of fractions

CT1 - CT for General Solid Waste (with no TCLP)
CT2 - CT for Restricted Solid Waste (with no TCLP)
SCC1 - SCC for General Solid Waste SCC (with TCLP analysis)
SCC2 - SCC for Restricted Solid Waste SCC (with TCLP analysis)
TCLP1 - TCLP for General Solid Waste
TCLP2 - TCLP for Restricted Solid Waste
< = less than laboratory limit of reporting (LOR)
Am - amosite Ch - chrysotile
FD = Field duplicate

Parameter	LOR	NSW EPA (2014) WASTE CLASSIFICATION GUIDELINES						Sample ID	Area B QC154	Area B B015.5_0.5-0.6	Area B B016_0.0-0.2	Area B B016.5_0.0-0.2	Area B B016.5_0.5-0.6	Area B B031_0.0-0.2	Area B B031_0.5-0.6	Area B B032_0.0-0.2	Area B QC152	Area B B032_0.5-0.6
								Sample Date	15/03/2016	15/03/2016	15/03/2016	15/03/2016	15/03/2016	15/03/2016	15/03/2016	15/03/2016	15/03/2016	15/03/2016
								Sample Type	FD	P	P	P	P	P	P	P	FD	P
		CT1	SCC1	TCLP1	CT2	SCC2	TCLP2	Lab. Sample Ref.	ES1606083039	ES1606083022	ES1606083021	ES1606083019	ES1606083020	ES1606083017	ES1606083018	ES1606083015	ES1606083038	ES1606083016
								Sample Classification	GSW	GSW	SW(A)/RW	GSW	GSW	GSW	GSW	SW(A)/GSW	SW(A)/GSW	GSW
		mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/L	Units										
Moisture Content	1	--			--			%	19.3	19.6	40.2	24.7	18.6	22.3	14.9	48.5	45.9	19.4
Asbestos Detected	0.1	--			--			g/kg	--	No	Yes	No	No	No	No	Yes	----	No
Asbestos Type		--			--			--	--	-	Am	-	-	-	-	Am	----	-
Sample weight (dry)	0	--			--			g	--	886	367	422	274	469	438	292	----	440
Arsenic	5	100			400			mg/kg	<5	<5	9	<5	<5	<5	<5	7	5	<5
Barium	10	--			--			mg/kg	<10	<10	80	<10	<10	30	<10	90	50	<10
Beryllium	1	20			80			mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Boron	50	--			--			mg/kg	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	1	20			80			mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium	2	100			400			mg/kg	<2	<2	24	4	19	23	6	45	37	7
Chromium (TCLP)			**1900**	***5***		**7600**	***20***	***mg/L***	--	--	--	--	--	--	--	--	--	--
Cobalt	2	--			--			mg/kg	<2	<2	7	<2	<2	11	<2	11	10	<2
Copper	5	--			--			mg/kg	<5	<5	500	14	<5	110	<5	72	58	<5
Lead	5	100	**1500**		400	**6000**		mg/kg	<5	<5	109	16	<5	87	50	82	68	<5
Lead (TCLP)				***5***			***20***	***mg/L***	--	--	***<0.1***	--	--	--	--	--	--	--
Manganese	5	--			--			mg/kg	<5	<5	589	15	<5	192	<5	276	219	<5
Nickel	2	40	**1050**		160	**4200**		mg/kg	<2	<2	25	3	9	34	3	51	47	5
Nickel (TCLP)				***2***			***8***	***mg/L***	--	--	--	--	--	--	--	***<0.1***	--	--
Selenium	5	20			80			mg/kg	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vanadium	5	--			--			mg/kg	<5	<5	32	<5	<5	19	<5	34	26	7
Zinc	5	--			--			mg/kg	62	<5	811	134	10	930	10	1930	1530	<5
Mercury	0.1	4	**50**		16	**200**		mg/kg	<0.1	<0.1	1.6	0.1	<0.1	0.3	<0.1	0.4	0.4	<0.1
Mercury (TCLP)				***0.2***			***0.8***	***mg/L***	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	0.5	0.8	**10**		3.2	**23**		mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene (TCLP)				***0.04***			***0.16***	***mg/L***	--	--	--	--	--	--	--	--	--	--
C6 - C9 Fraction	10	**650**			**2600**			mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
C10 - C14 Fraction	50	--			--			mg/kg	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	100	--			--			mg/kg	1950	<100	470	<100	<100	2550	<100	4780	4610	<100
C29 - C36 Fraction	100	--			--			mg/kg	4290	<100	860	<100	<100	3020	160	2990	2940	<100
C10 - C36 Fraction (sum)*	50	**10000**			**40000**			mg/kg	6240	<50	1330	<50	<50	5570	160	7770	7550	<50
C10 - C36 Fraction (sum)**		**10000**			**40000**			mg/kg	6290	<250	1380	<250	<250	5620	310	7820	7600	<250
C6 - C10 Fraction	10	--			--			mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F1	10	--			--			mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C10 - C16 Fraction	50	--			--			mg/kg	110	<50	<50	<50	<50	<50	<50	190	210	<50
>C16 - C34 Fraction	100	--			--			mg/kg	4860	<100	1090	<100	<100	4820	140	6860	6610	<100
>C34 - C40 Fraction	100	--			--			mg/kg	5660	<100	580	<100	<100	1720	180	1720	1760	<100
>C10 - C40 Fraction (sum)	50	--			--			mg/kg	10600	<50	1670	<50	<50	6540	320	8770	8580	<50
F2	50	--			--			mg/kg	110	<50	<50	<50	<50	<50	<50	190	210	<50
Benzene	0.2	10			40			mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	0.5	288			1152			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5	600			2400			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	0.5	--			--			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	0.5	--			--			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	0.5	1000			4000			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of BTEX	0.2	--			--			mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	1	--			--			mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes:

CT - Contaminant Threshold
SCC - Specific Contamaintant Concentration
TCLP - Toxicity Characteristic Leaching Procedure
GSW - General Solid Waste
SW(A) - Special Waste Asbestos
RSW - Restricted Solid Waste
F1 C6 - C10 Fraction minus BTEX
F2 >C10 - C16 Fraction minus Naphthalene
P = Primary Sample
* 0 X LOR in sum of fractions
** 1 x LOR in sum of fractions

CT1 - CT for General Solid Waste (with no TCLP)
CT2 - CT for Restricted Solid Waste (with no TCLP)
SCC1 - SCC for General Solid Waste SCC (with TCLP analysis)
SCC2 - SCC for Restricted Solid Waste SCC (with TCLP analysis)
TCLP1 - TCLP for General Solid Waste
TCLP2 - TCLP for Restricted Solid Waste
< = less than laboratory limit of reporting (LOR)
Am - amosite Ch - chrysotile
FD = Field duplicate

Parameter	LOR	NSW EPA (2014) WASTE CLASSIFICATION GUIDELINES						Sample ID	Area B B033_0.0-0.2	Area B B033_0.5-0.6	Area B B034_0.0-0.2	Area B B034_0.5-0.6	Area B B035_0.0-0.2	Area B B035_0.5-0.6	Area B QC151	Area B B036_0.0-0.2	Area B B036_0.5-0.6	Area C C011_0.0-0.2
								Sample Date	15/03/2016	15/03/2016	15/03/2016	15/03/2016	15/03/2016	15/03/2016	16/03/2016	15/03/2016	15/03/2016	16/03/2016
								Sample Type	P	P	P	P	P	P	FD	P	P	P
		CT1	SCC1	TCLP1	CT2	SCC2	TCLP2	Lab. Sample Ref.	ES1606083013	ES1606083014	ES1606083011	ES1606083012	ES1606083009	ES1606083010	S16-Ma18366	ES1606083007	ES1606083008	ES1606083034
								Sample Classification	GSW	GSW	GSW	GSW	GSW	GSW	GSW	SW(A)/GSW	SW(A)/GSW	Hazardous
		mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/L	Units										
Moisture Content	1	--			--			%	22.9	18.9	12.2	16	13.5	8.6	23	30	20.8	<1.0
Asbestos Detected	0.1	--			--			g/kg	No	No	No	No	No	No	--	Yes	Yes	No
Asbestos Type		--			--			--	-	-	-	-	-	-	--	Am	Am	--
Sample weight (dry)	0	--			--			g	437	655	368	445	558	421	--	507	546	555
Arsenic	5	100			400			mg/kg	<5	<5	<5	<5	<5	<5	< 2	6	<5	<5
Barium	10	--			--			mg/kg	10	<10	20	<10	20	<10		70	<10	60
Beryllium	1	20			80			mg/kg	<1	<1	<1	<1	<1	<1	< 2	<1	<1	<1
Boron	50	--			--			mg/kg	<50	<50	<50	<50	<50	<50	< 10	<50	<50	<50
Cadmium	1	20			80			mg/kg	<1	<1	<1	<1	<1	<1	< 0.4	<1	<1	<1
Chromium	2	100			400			mg/kg	9	<2	12	6	20	<2	< 1	26	4	54
Chromium (TCLP)			**1900**	***5***		**7600**	***20***	***mg/L***	--	--	--	--	--	--	--	--	--	--
Cobalt	2	--			--			mg/kg	<2	<2	3	<2	7	<2	< 5	22	<2	9
Copper	5	--			--			mg/kg	34	<5	29	<5	118	<5	< 5	92	11	230
Lead	5	100	**1500**		400	**6000**		mg/kg	37	<5	47	<5	234	<5	< 5	83	13	220
Lead (TCLP)				***5***			***20***	***mg/L***	--	--	--	--	***<0.1***	--	--	--	--	--
Manganese	5	--			--			mg/kg	48	<5	83	<5	138	<5	< 5	365	31	66
Nickel	2	40	**1050**		160	**4200**		mg/kg	10	<2	12	<2	19	<2	< 5	58	5	14
Nickel (TCLP)				***2***			***8***	***mg/L***	--	--	--	--	--	--	--	***<0.1***	--	--
Selenium	5	20			80			mg/kg	<5	<5	<5	<5	<5	<5	< 2	<5	<5	<5
Vanadium	5	--			--			mg/kg	10	<5	9	<5	17	<5		38	6	9
Zinc	5	--			--			mg/kg	155	14	772	32	1930	<5	< 5	1830	148	1800
Mercury	0.1	4	**50**		16	**200**		mg/kg	0.2	<0.1	0.2	<0.1	0.3	<0.1	< 0.05	0.6	<0.1	<0.1
Mercury (TCLP)				***0.2***			***0.8***	***mg/L***	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	0.5	0.8	**10**		3.2	**23**		mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	< 0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene (TCLP)				***0.04***			***0.16***	***mg/L***	--	--	--	--	--	--	--	--	--	--
C6 - C9 Fraction	10	**650**			**2600**			mg/kg	<10	<10	<10	<10	<10	<10	< 20	<10	<10	<10
C10 - C14 Fraction	50	--			--			mg/kg	<50	<50	<50	<50	<50	<50	< 20	<50	<50	<50
C15 - C28 Fraction	100	--			--			mg/kg	<100	<100	<100	240	<100	<100	< 50	<100	<100	30800
C29 - C36 Fraction	100	--			--			mg/kg	<100	<100	<100	260	<100	<100	58	<100	<100	35000
C10 - C36 Fraction (sum)*	50	**10000**			**40000**			mg/kg	<50	<50	<50	500	<50	<50	58	<50	<50	**65800**
C10 - C36 Fraction (sum)**		**10000**			**40000**			mg/kg	250	250	<250	550	<250	<250	58	<250	<250	**65850**
C6 - C10 Fraction	10	--			--			mg/kg	<10	<10	<10	<10	<10	<10	< 20	<10	<10	<10
F1	10	--			--			mg/kg	<10	<10	<10	<10	<10	<10	< 20	<10	<10	<10
>C10 - C16 Fraction	50	--			--			mg/kg	<50	<50	<50	240	<50	<50	< 50	<50	<50	270
>C16 - C34 Fraction	100	--			--			mg/kg	<100	<100	<100	320	<100	<100	< 100	<100	<100	59300
>C34 - C40 Fraction	100	--			--			mg/kg	<100	<100	<100	380	<100	<100	170	<100	<100	19600
>C10 - C40 Fraction (sum)	50	--			--			mg/kg	<50	<50	<50	940	<50	<50	--	<50	<50	79200
F2	50	--			--			mg/kg	<50	<50	<50	240	<50	<50	< 50	<50	<50	270
Benzene	0.2	10			40			mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	< 0.1	<0.2	<0.2	<0.2
Toluene	0.5	288			1152			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	< 0.1	<0.5	<0.5	<0.5
Ethylbenzene	0.5	600			2400			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	< 0.1	<0.5	<0.5	<0.5
meta- & para-Xylene	0.5	--			--			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	< 0.2	<0.5	<0.5	<0.5
ortho-Xylene	0.5	--			--			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	< 0.1	<0.5	<0.5	<0.5
Total Xylenes	0.5	1000			4000			mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	< 0.3	<0.5	<0.5	<0.5
Sum of BTEX	0.2	--			--			mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.2	<0.2	<0.2
Naphthalene	1	--			--			mg/kg	<1	<1	<1	<1	<1	<1	--	<1	<1	<1

Notes:

CT - Contaminant Threshold
SCC - Specific Contamaintant Concentration
TCLP - Toxicity Characteristic Leaching Procedure
GSW - General Solid Waste
SW(A) - Special Waste Asbestos
RSW - Restricted Solid Waste
F1 C6 - C10 Fraction minus BTEX
F2 >C10 - C16 Fraction minus Naphthalene
P = Primary Sample
* 0 X LOR in sum of fractions
** 1 x LOR in sum of fractions

CT1 - CT for General Solid Waste (with no TCLP)
CT2 - CT for Restricted Solid Waste (with no TCLP)
SCC1 - SCC for General Solid Waste SCC (with TCLP analysis)
SCC2 - SCC for Restricted Solid Waste SCC (with TCLP analysis)
TCLP1 - TCLP for General Solid Waste
TCLP2 - TCLP for Restricted Solid Waste
< = less than laboratory limit of reporting (LOR)
Am - amosite Ch - chrysotile
FD = Field duplicate

Parameter	LOR	NSW EPA (2014) WASTE CLASSIFICATION GUIDELINES						Sample ID	Area C
								Sample Date	C012_0.0-0.2
								Sample Type	16/03/2016
		CT1	SCC1	TCLP1	CT2	SCC2	TCLP2	Lab. Sample Ref.	P
								Sample	ES1606083035
								Classification	
		mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/L	Units	GSW
Moisture Content	1	--			--			%	17.1
Asbestos Detected	0.1	--			--			g/kg	No
Asbestos Type		--			--			--	--
Sample weight (dry)	0	--			--			g	532
Arsenic	5	100			400			mg/kg	<5
Barium	10	--			--			mg/kg	10
Beryllium	1	20			80			mg/kg	<1
Boron	50	--			--			mg/kg	<50
Cadmium	1	20			80			mg/kg	<1
Chromium	2	100			400			mg/kg	11
Chromium (TCLP)			**1900**	***5***		**7600**	***20***	***mg/L***	**--**
Cobalt	2	--			--			mg/kg	2
Copper	5	--			--			mg/kg	23
Lead	5	100	**1500**		400	**6000**		mg/kg	27
Lead (TCLP)				***5***			***20***	***mg/L***	**--**
Manganese	5	--			--			mg/kg	40
Nickel	2	40	**1050**		160	**4200**		mg/kg	4
Nickel (TCLP)				***2***			***8***	***mg/L***	**--**
Selenium	5	20			80			mg/kg	<5
Vanadium	5	--			--			mg/kg	<5
Zinc	5	--			--			mg/kg	303
Mercury	0.1	4	**50**		16	**200**		mg/kg	<0.1
Mercury (TCLP)				***0.2***			***0.8***	***mg/L***	**--**
Benzo(a)pyrene	0.5	0.8	**10**		3.2	**23**		mg/kg	<0.5
Benzo(a)pyrene (TCLP)				***0.04***			***0.16***	***mg/L***	**--**
C6 - C9 Fraction	10	**650**			**2600**			mg/kg	<10
C10 - C14 Fraction	50	--			--			mg/kg	<50
C15 - C28 Fraction	100	--			--			mg/kg	1960
C29 - C36 Fraction	100	--			--			mg/kg	3260
C10 - C36 Fraction (sum)*	50	**10000**			**40000**			mg/kg	5220
C10 - C36 Fraction (sum)**		**10000**			**40000**			mg/kg	5270
C6 - C10 Fraction	10	--			--			mg/kg	<10
F1	10	--			--			mg/kg	<10
>C10 - C16 Fraction	50	--			--			mg/kg	<50
>C16 - C34 Fraction	100	--			--			mg/kg	4430
>C34 - C40 Fraction	100	--			--			mg/kg	1700
>C10 - C40 Fraction (sum)	50	--			--			mg/kg	6130
F2	50	--			--			mg/kg	<50
Benzene	0.2	10			40			mg/kg	<0.2
Toluene	0.5	288			1152			mg/kg	<0.5
Ethylbenzene	0.5	600			2400			mg/kg	<0.5
meta- & para-Xylene	0.5	--			--			mg/kg	<0.5
ortho-Xylene	0.5	--			--			mg/kg	<0.5
Total Xylenes	0.5	1000			4000			mg/kg	<0.5
Sum of BTEX	0.2	--			--			mg/kg	<0.2
Naphthalene	1	--			--			mg/kg	<1

Notes:

CT - Contaminant Threshold
SCC - Specific Contamaintant Concentration
TCLP - Toxicity Characteristic Leaching Procedure
GSW - General Solid Waste
SW(A) - Special Waste Asbestos
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F1 C6 - C10 Fraction minus BTEX
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P = Primary Sample
* 0 X LOR in sum of fractions
** 1 x LOR in sum of fractions

CT1 - CT for General Solid Waste (with no TCLP)
CT2 - CT for Restricted Solid Waste (with no TCLP)
SCC1 - SCC for General Solid Waste SCC (with TCLP analysis)
SCC2 - SCC for Restricted Solid Waste SCC (with TCLP analysis)
TCLP1 - TCLP for General Solid Waste
TCLP2 - TCLP for Restricted Solid Waste
< = less than laboratory limit of reporting (LOR)
Am - amosite Ch - chrysotile
FD = Field duplicate

Data Entry: SR
Data Review: KM

Parameter	LOR	Sample ID	ASC NEPM (2013) HSL D	ES1607647010	ES1607647001	ES1607647002	ES1607647003	ES1607647004	ES1607647005
		Sample Date		7/04/2016	7/04/2016	7/04/2016	7/04/2016	7/04/2016	7/04/2016
		Lab. Sample Ref.		A006.5_0-0.2	B001_0.0-0.2	B003.5_0.0-0.2	B007.5_0-0.2	B009.5_0-0.2	B010.5_0-0.2
		Unit		Result	Result	Result	Result	Result	Result
Asbestos Detected	0.1	g/kg		Yes	Yes	Yes	Yes	No	No
Asbestos Type	--	--		Am	Am	Ch	Am	-	-
Sample weight (dry)	0.01	g		2470	2100	2760	2850	2000	3240
Asbestos Containing Material (as 15% Asbestos in ACM >7mm)	0.01	% (w/w)	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Friable Asbestos	0.0004	g		0.21	<0.0004	0.144	<0.0004	<0.0004	<0.0004
Friable Asbestos (as Asbestos in Soil)	0.001	% (w/w)	0.001	0.008	<0.001	0.005	<0.001	<0.001	<0.001
Weight Used for % Calculation	0.0001	kg		2.47	2.1	2.76	2.85	2	3.24
Free Fibres	5	Fibres		No	No	No	No	No	No
Asbestos Containing Material	0.1	g		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Description	--	--		Mid brown sandy soil with several pieces of friable asbestos insulation material approx 5 x 4 x 2 mm with several loose bundles of friable asbestos fibres approx 2 x 1 x 0.5 mm.	Mid brown sandy soil with one loose bundle of friable asbestos fibres approx 2 x 1 x 0.5 mm.	Mid brown sandy soil with one piece of friable asbestos fibre board approx 25 x 15 x 1 mm.	Mid brown sandy soil with two bundles of friable asbestos fibres approx 3 x 1 x 1 mm.	Mid brown clay soil.	Mid brown clay soil.

Notes:

AM - amosite asbestos

Ch - crysotile asbestos

LOR - laboratory limit of reporting

ASC NEPM (2013) - National Environment Protection (Assessment of Contaminated Land) Measure (NEPM) 1999, National Environment Protection Council Amendment 2013. Schedule B1, Guideline on Investigation Levels for Soil and Groundwater.

HSL D - Health Screening Level for Commerical/Industrial land use

Data Entry: SR
Data Review: KM

Parameter	LOR	Sample ID	ES1607647011	ES1607647012	ES1607647013	ES1607647009	ES1607647008	ES1607647006	ES1607647007
		Sample Date	7/04/2016	7/04/2016	7/04/2016	7/04/2016	7/04/2016	7/04/2016	7/04/2016
		Lab. Sample Ref.	A013.5_0-0.2	A013.5_0.4-0.5	A014.5_0.4-0.5	B016_0-0.2	B032_0-0.2	B036_0-0.2	B036-0.5-0.6
		Unit	Result	Result	Result	Result	Result	Result	Result
Asbestos Detected	0.1	g/kg	Yes	No	Yes	No	No	Yes	Yes
Asbestos Type	--	--	Ch + Am	-	Am	-	-	Am	Ch + Am
Sample weight (dry)	0.01	g	2330	2940	3280	2450	1910	2690	2400
Asbestos Containing Material (as 15% Asbestos in ACM >7mm)	0.01	% (w/w)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.11
Friable Asbestos	0.0004	g	0.284	<0.0004	0.0033	<0.0004	<0.0004	<0.0004	0.0035
Friable Asbestos (as Asbestos in Soil)	0.001	% (w/w)	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Weight Used for % Calculation	0.0001	kg	2.33	2.94	3.28	2.45	1.91	2.69	2.4
Free Fibres	5	Fibres	No	No	No	No	No	No	No
Asbestos Containing Material	0.1	g	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	17.8
Description	--	--	Mid brown sandy soil with several pieces of friable asbestos insulation approx 25 x 20 x 2 mm plus several bundles of friable asbestos fibres approx 3 x 1 x 1 mm.	Mid brown sandy soil.	Pale brown sandy soil with one loose bundle of friable asbestos fibres approx 3 x 2 x 1 mm.	Mid brown sandy soil.	Mid brown sandy soil with grey rocks.	Mid brown sandy soil with one bundle of friable asbestos fibres approx 3 x 1 x 1 mm.	Mid brown sandy soil with two pieces of bonded asbestos cement sheeting approx 60 x 30 x 5 mm plus several loose bundles of friable asbestos fibres approx 3 x 1 x 0.5 mm.

Notes:

AM - amosite asbestos

Ch - crysotile asbestos

LOR - laboratory limit of reporting

ASC NEPM (2013) - National Environment Protection (Assessment of Contaminated Land) Measure (N

National Environment Protection Council Amendment 2013. Schedule B1, Guideline on Investigation Le

Groundwater.

HSL D - Health Screening Level for Commerical/Industrial land use

Data Entry: SR
Data Review: KM

Table T4
Soil Field Quality Assurance and Qualtiy Control Results

Parameter	LOR	Sample ID	A005.5_0.0-0.2	QC155	RPD	A013.5_0.0-0.2	QC157	RPD	A014.5_0.4-0.5	QC158	RPD	B010.5_0.0-0.2	QC150	RPD
		Sample Date	16/03/2016	16/03/2016		16/03/2016	16/03/2016		16/03/2016	16/03/2016		14/03/2016	14/03/2016	
		Sample Type	Inter-laboratory Duplicate			Intra-laboratory Duplicate			Inter-laboratory Duplicate			Intra-laboratory Duplicate		
		Lab. Sample Ref.	ES1606083026	S16-Ma18367		ES1606083031	ES1606083041		ES1606083033	S16-Ma18368		ES1606083005	ES1606083036	
		Unit	Result	Result		Result	Result		Result	Result		Result	Result	
Moisture Content (dried @ 103°C)	1	%	<1.0	< 1	0	27.5	43.1	44	19.6	21	7	23.9	24.3	2
Asbestos Detected	0.1	g/kg	No	--	--	Yes	--	--	Yes	--	--	Yes	--	--
Asbestos Type		--	-	--	--	Am	--	--	Am + Cr	--	--	Am	--	--
Sample weight (dry)	0.01	g	684	--	--	287	--	--	832	--	--	185	--	--
Arsenic	5	mg/kg	6	6	0	9	11	20	<5	8.8	55	10	8	22
Barium	10	mg/kg	<10	--	--	20	40	67	<10	--	--	70	90	25
Beryllium	1	mg/kg	<1	< 2	67	<1	<1	0	<1	< 2	--	<1	<1	0
Boron	50	mg/kg	<50	< 10	133	<50	<50	0	<50	< 10	--	<50	<50	0
Cadmium	1	mg/kg	<1	< 0.4	86	<1	<1	0	<1	< 0.4	--	1	<1	0
Chromium	2	mg/kg	36	< 1	189	45	53	16	4	< 1	--	73	70	4
Chromium (TCLP)		mg/L	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	2	mg/kg	4	< 5	22	3	5	50	<2	< 5	86	14	11	24
Copper	5	mg/kg	94	84	11	34	46	30	<5	8.3	50	230	157	38
Lead	5	mg/kg	**160**	**140**	13	47	58	21	6	15	86	**249**	**124**	67
Lead (TCLP)		mg/L	**0.1**	--	--	--	--	--	--	--	--	0.1	--	--
Manganese	5	mg/kg	29	28	4	70	132	61	6	12	67	172	164	5
Nickel	2	mg/kg	5	5.6	11	12	24	67	<2	< 5	86	**53**	40	28
Nickel (TCLP)		mg/L	--	--	--	--	--	--	--	--	--	<0.1	--	--
Selenium	5	mg/kg	<5	< 2	86	<5	<5	0	<5	< 2	86	<5	<5	0
Vanadium	5	mg/kg	<5	--	--	10	14	33	<5	--	--	27	29	7
Zinc	5	mg/kg	713	700	2	415	581	33	35	130	115	4080	2580	45
Mercury	0.1	mg/kg	<0.1	0.13	26	0.5	0.7	33	0.1	0.3	100	**17.6**	**14.7**	18
Mercury (TCLP)		mg/L	--	--	--	--	--	--	--	--	--	<0.001	--	--
Benzo(a)pyrene	0.5	mg/kg	<0.5	< 0.5	0	<4.0	<4.0	--	<0.5	< 0.5	0	<0.5	<4.0	--
Benzo(a)pyrene (TCLP)		mg/L	--	--	--	--	--	--	--	--	--	--	--	--
C6 - C9 Fraction	10	mg/kg	<10	< 20	--	<10	<10	0	<10	< 20	67	<10	<10	0
C10 - C14 Fraction	50	mg/kg	<50	< 20	--	630	<50	171	<50	65	26	1660	<50	188
C15 - C28 Fraction	100	mg/kg	2480	2900	16	61000	120000	65	750	1200	46	66700	107000	46
C29 - C36 Fraction	100	mg/kg	260	390	40	15800	28400	57	<100	< 50	67	35300	41300	16
C10 - C36 Fraction (sum)	50	mg/kg	2740	3300	19	*77400*	*148000*	63	750	1300	54	*104000*	*148000*	35
C6 - C10 Fraction	10	mg/kg	<10	< 20	--	<10	<10	0	<10	< 20	67	<10	<10	0
C6 - C10 Fraction minus BTEX (F1)	10	mg/kg	<10	< 20	--	<10	<10	0	<10	< 20	67	<10	<10	0
>C10 - C16 Fraction	50	mg/kg	100	< 50	67	2440	3200	27	280	240	15	5750	14200	85
>C16 - C34 Fraction	100	mg/kg	2590	3300	24	72100	140000	64	530	1000	61	91700	129000	34
>C34 - C40 Fraction	100	mg/kg	<100	200	67	9120	16400	57	<100	< 100	0	16000	19800	21
>C10 - C40 Fraction (sum)	50	mg/kg	2690	--	--	83700	160000	63	810	--	--	113000	163000	36
>C10 - C16 Fraction minus Naphthalene (F2)	50	mg/kg	100	< 50	67	2440	3200	27	280	240	15	5750	14200	85
Benzene	0.2	mg/kg	<0.2	< 0.1	--	<0.2	<0.2	0	<0.2	< 0.1	--	<0.2	<0.2	0
Toluene	0.5	mg/kg	<0.5	< 0.1	--	<0.5	<0.5	0	<0.5	< 0.1	--	<0.5	<0.5	0
Ethylbenzene	0.5	mg/kg	<0.5	< 0.1	--	<0.5	<0.5	0	<0.5	< 0.1	--	<0.5	<0.5	0
meta- & para-Xylene	0.5	mg/kg	<0.5	< 0.2	--	<0.5	<0.5	0	<0.5	< 0.2	--	<0.5	<0.5	0
ortho-Xylene	0.5	mg/kg	<0.5	< 0.1	--	<0.5	<0.5	0	<0.5	< 0.1	--	<0.5	<0.5	0
Total Xylenes	0.5	mg/kg	<0.5	< 0.3	--	<0.5	<0.5	0	<0.5	< 0.3	--	<0.5	<0.5	0
Sum of BTEX	0.2	mg/kg	<0.2	--	--	<0.2	<0.2	0	<0.2	--	--	<0.2	<0.2	0
Naphthalene	1	mg/kg	<1	--	--	<1	<1	0	<1	--	--	<1	<1	0

Notes:
RPD - relative percent difference
TCLP - toxicity characteristic leaching procedure
< result less than laboratory limit of reporting (LOR)

Parameter	LOR	Sample ID	B014_0.5-0.6	QC154	RPD	B032_0.0-0.2	QC152	RPD	B035_0.5-0.6	QC151	RPD	QC153
		Sample Date	15/03/2016	15/03/2016		15/03/2016	15/03/2016		15/03/2016	16/03/2016		14/03/2016
		Sample Type	Intra-laboratory Duplicate			Intra-laboratory Duplicate			Inter-laboratory Duplicate			Trip Blank
		Lab. Sample Ref.	ES1606083024	ES1606083039		ES1606083015	ES1606083038		ES1606083010	S16-Ma18366		ES1606083037
		Unit	Result	Result		Result	Result		Result	Result		Result
Moisture Content (dried @ 103°C)	1	%	19.3	19.3	0	48.5	45.9	6	8.6	23	91	--
Asbestos Detected	0.1	g/kg	No	--	--	Yes	----	--	No	--	--	--
Asbestos Type		--	-	--	--	Am	----	--	-	--	--	--
Sample weight (dry)	0.01	g	679	--	--	292	----	--	421	--	--	--
Arsenic	5	mg/kg	<5	<5	0	7	5	33	<5	< 2	--	--
Barium	10	mg/kg	<10	<10	0	90	50	57	<10	--	--	--
Beryllium	1	mg/kg	<1	<1	0	<1	<1	0	<1	< 2	--	--
Boron	50	mg/kg	<50	<50	0	<50	<50	0	<50	< 10	--	--
Cadmium	1	mg/kg	<1	<1	0	<1	<1	0	<1	< 0.4	--	--
Chromium	2	mg/kg	<2	<2	0	45	37	20	<2	< 1	--	--
Chromium (TCLP)		mg/L	--	--	--	--	--	--	--	--	--	--
Cobalt	2	mg/kg	<2	<2	0	11	10	10	<2	< 5	--	--
Copper	5	mg/kg	<5	<5	0	72	58	22	<5	< 5	0	--
Lead	5	mg/kg	<5	<5	0	82	68	19	<5	< 5	0	--
Lead (TCLP)		mg/L	--	--	--	--	--	--	--	--	--	--
Manganese	5	mg/kg	<5	<5	0	276	219	23	<5	< 5	0	--
Nickel	2	mg/kg	<2	<2	0	**51**	**47**	8	<2	< 5	--	--
Nickel (TCLP)		mg/L	--	--	--	<0.1	--	--	--	--	--	--
Selenium	5	mg/kg	<5	<5	0	<5	<5	0	<5	< 2	86	--
Vanadium	5	mg/kg	<5	<5	0	34	26	27	<5	--	--	--
Zinc	5	mg/kg	10	62	144	1930	1530	23	<5	< 5	0	--
Mercury	0.1	mg/kg	<0.1	<0.1	0	0.4	0.4	0	<0.1	< 0.05	--	--
Mercury (TCLP)		mg/L	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	0.5	mg/kg	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	< 0.5	0	--
Benzo(a)pyrene (TCLP)		mg/L	--	--	--	--	--	--	--	--	--	--
C6 - C9 Fraction	10	mg/kg	<10	<10	0	<10	<10	0	<10	< 20	--	<10
C10 - C14 Fraction	50	mg/kg	<50	<50	0	<50	<50	0	<50	< 20	--	--
C15 - C28 Fraction	100	mg/kg	670	1950	98	4780	4610	4	<100	< 50	--	--
C29 - C36 Fraction	100	mg/kg	1480	4290	97	2990	2940	2	<100	58	--	--
C10 - C36 Fraction (sum)	50	mg/kg	2150	6240	97	7770	7550	3	<50	58	--	--
C6 - C10 Fraction	10	mg/kg	<10	<10	0	<10	<10	0	<10	< 20	--	<10
C6 - C10 Fraction minus BTEX (F1)	10	mg/kg	<10	<10	0	<10	<10	0	<10	< 20	--	<10
>C10 - C16 Fraction	50	mg/kg	50	110	75	190	210	10	<50	< 50	0	--
>C16 - C34 Fraction	100	mg/kg	1660	4860	98	6860	6610	4	<100	< 100	0	--
>C34 - C40 Fraction	100	mg/kg	1970	5660	97	1720	1760	2	<100	170	52	--
>C10 - C40 Fraction (sum)	50	mg/kg	3680	10600	97	8770	8580	2	<50	--	--	--
>C10 - C16 Fraction minus Naphthalene (F2)	50	mg/kg	50	110	75	190	210	10	<50	< 50	0	--
Benzene	0.2	mg/kg	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	< 0.1	--	<0.2
Toluene	0.5	mg/kg	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	< 0.1	--	<0.5
Ethylbenzene	0.5	mg/kg	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	< 0.1	--	<0.5
meta- & para-Xylene	0.5	mg/kg	0.7	<0.5	--	<0.5	<0.5	0	<0.5	< 0.2	--	<0.5
ortho-Xylene	0.5	mg/kg	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	< 0.1	--	<0.5
Total Xylenes	0.5	mg/kg	0.7	<0.5	--	<0.5	<0.5	0	<0.5	< 0.3	--	<0.5
Sum of BTEX	0.2	mg/kg	0.7	<0.2	--	<0.2	<0.2	0	<0.2	--	--	<0.2
Naphthalene	1	mg/kg	<1	<1	0	<1	<1	0	<1	--	--	<1

Notes:
RPD - relative percent difference
TCLP - toxicity characteristic leaching procedure
< result less than laboratory limit of reporting (LOR)

Parameter	LOR	Sample ID	QC156	QC161	QC162
		Sample Date	15/03/2016	16/03/2016	16/03/2016
		Lab.Sample Ref.	ES1606083040	ES1606083042	ES1606083043
		Unit	Result	Result	Result
Arsenic	0.001	mg/L	<0.001	<0.001	--
Beryllium	0.001	mg/L	<0.001	<0.001	--
Barium	0.001	mg/L	<0.001	<0.001	--
Cadmium	0.0001	mg/L	<0.0001	<0.0001	--
Chromium	0.001	mg/L	<0.001	<0.001	--
Cobalt	0.001	mg/L	<0.001	<0.001	--
Copper	0.001	mg/L	<0.001	<0.001	--
Lead	0.001	mg/L	<0.001	<0.001	--
Manganese	0.001	mg/L	<0.001	<0.001	--
Nickel	0.001	mg/L	<0.001	<0.001	--
Selenium	0.01	mg/L	<0.01	<0.01	--
Vanadium	0.01	mg/L	<0.01	<0.01	--
Zinc	0.005	mg/L	<0.005	<0.005	--
Boron	0.05	mg/L	<0.05	<0.05	--
Mercury	0.0001	mg/L	<0.0001	<0.0001	--
Benzo(a)pyrene	0.5	µg/L	<0.5	<0.5	--
C6 - C9 Fraction	20	µg/L	<20	<20	<20
C10 - C14 Fraction	50	µg/L	<50	<50	--
C15 - C28 Fraction	100	µg/L	<100	<100	--
C29 - C36 Fraction	50	µg/L	<50	<50	--
C10 - C36 Fraction (sum)	50	µg/L	<50	<50	--
C6 - C10 Fraction	20	µg/L	<20	<20	<20
>C10 - C16 Fraction	100	µg/L	<100	<100	--
>C16 - C34 Fraction	100	µg/L	<100	<100	--
>C34 - C40 Fraction	100	µg/L	<100	<100	--
>C10 - C40 Fraction (sum)	100	µg/L	<100	<100	--
Benzene	1	µg/L	<1	<1	<1
Toluene	2	µg/L	<2	<2	<2
Ethylbenzene	2	µg/L	<2	<2	<2
meta- & para-Xylene	2	µg/L	<2	<2	<2
ortho-Xylene	2	µg/L	<2	<2	<2
Total Xylenes	2	µg/L	<2	<2	<2
Sum of BTEX	1	µg/L	<1	<1	<1
Naphthalene	5	µg/L	<5	<5	<5

Notes:
< result less than laboratory limit of reporting (LOR)

Appendix D

Calibration Records

Daily Calibration Sheet

CALTEX KURNELL

Date 15/3/16 **Job Name:** 60488804 **Job Number:** 60488804

Field Staff: KATE PIGRAM **Project Manager:** STEVE LANDALL

Weather: RAIN, OVERCAST

ITEM	PID	Explosimeter	Acidity		Conductivity	Redox	DO	
Units	ppm	% LEL	pH	pH	uS/cm	mV	ppm	
Model	MINIRAE 3000							
Serial Number	PID3000-14							
Calibration Standard	Isobutylene							
Concentration	100							
Calibration Time	0730							
Calibration Reading	99.3							
Comments								

Checks

Time								
Reading								
Comment								
Reading								
Comment								
Time								
Reading								
Comment								

Notes

Field Staff Signature: K Pigram

Daily Calibration Sheet

Date: 16/3/16 Job Name: 60458804 Job Number: CAITEX KILNELL 0100

Field Staff: KATE PICKLAM Project Manager: STEVE LANDALL

Weather:

ITEM	PID	Explosimeter	Acidity		Conductivity	Redox	DO	
Units	ppm	% LEL	pH	pH	uS/cm	mV	ppm	
Model	MINIRAE 3000							
Serial Number	PID3000-14							
Calibration Standard	100butylene							
Concentration	100ppm							
Calibration Time	0720							
Calibration Reading	98.7							
Comments								

Checks

Time								
Reading								
Comment								
Reading								
Comment								
Time								
Reading								
Comment								

Notes

Field Staff Signature: KPickam

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RENTALS

Equipment Report – SOIL AUGER KIT

This soil auger kit has been cleaned and checked:

Date: 01/03/2016 Checked by: MP

Signed:

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

Sent	Received	Returned	Item
☑	☐	☐	1 Regular Auger Head
☑	☐	☐	1 Clay Auger Head
☑	☐	☐	1 Sand Auger Head
☑	☐	☐	1 Tee Handle / Ratchet Handle
☑	☐	☐	Extension rods Qty: 4
☑	☐	☐	1 Finger Ring for disconnecting extensions
☑	☐	☐	Canvas carry bag
☑	☐	☐	Optional – straps for canvas carry bag
☐	☐	☐	
☐	☐	☐	
☐	☐	☐	

Processors Signature/ Initials

Quote Reference	CS0043O3	Condition on return
Customer Ref		
Equipment ID	AMS505A	
Equipment serial no.		
Return Date	/ /	
Return Time		

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RENTALS

Equipment Report - MiniRAE 3000 PID

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

Lamp	Compound	Concentration	Zero	Span	Traceability Lot #	Pass?
10.6 eV	Isobutylene	100 ppm	0.0 ppm	100.0 ppm	1808481 Cyl 2	☑

Alarm Limits

High	100 ppm
Low	50 ppm

Bump Test

Date	Target Gas	Reading	Pass?
10/03/2016	100 ppm	99.7 ppm	☑

☑ Battery Status 100%
☑ 10 minutes test complete
☑ Spare battery status (Min 5.5 volts)
☐ Electrical Safety Tag attached (AS/NZS 3760)

Tag No: 000496

Valid to: 19/05/2016

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

Date: 10/03/2016

Signed: [signature]

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

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

Date: 11/03/2016

Signed: [signature]

TFS Reference	CS004303	Return Date:	/ /
Customer Reference		Return Time:	
Equipment ID	PID3000-14	Condition on return:	
Equipment Serial No.	592913297		

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RENTALS

Equipment Certification Report - Impact Pro Multi-Gas Detector

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

- ✓ Fresh Air Calibration for all Sensors
- ✓ CH4 (combustibles)
- ✓ O2 00.0% volume check only within +/- 2%
- ✓ Charged
- 10 minute test complete
- ✓ Electrical Safety Tag attached (AS/NZS 3760)
- ✓ CO 100ppm Span
- ✓ 50% LEL (2.5%vol = 25,000ppm) Span
- ✓ H2S 40ppm Span n
- ✓ Spare Battery min 4.2v Volts

Tag no: 000478

Valid to: 08/06/2016

* Calibration Gas traceability information available upon request

Date: 11/03/2016 Checked by: MILENKO

Signed:

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

Sent	Received	Returned	Item
✓			Impact Pro Gas Detector
✓			Monitor / Performance check / Bat % 100%
✓			Monitor setup for METHANE
✓			Power supply 240/12v with base station
✓			Flow adaptor [Grey] for calibration with hose
✓			Pump adaptor [Black] with hose and Inline filter
✓			Battery Cases with 4 Alkaline Batteries
✓			Allen Key located back of Instrument to open battery
✓			Spare inline filters /
✓			Instruction Manual behind foam on the lid of case
✓			Quick Use Guide behind foam on the lid of case
✓			Carry Case
			Regulator included:
			Cal Gas

Processors Signature/ Initials MS

Quote Reference	CS004303	Condition on return
Customer Ref		
Equipment ID	IMPSO	
Equipment serial no.	ZEC1007672	
Return Date	/ /	
Return Time		

Appendix E

Laboratory Reports

AECOM

Chain of Custody

AECOM - Sydney
Level 21, 420 George Street,
Sydney, NSW 2000
Tel: (02) 8934 0000
Fax: (02) 8934 0001
E-mail: Stephen.Randall@aecom.com

Laboratory Details
Lab. Name: ALS
Lab. Address:
Contact Name:
Lab. Ref:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram | AECOM Project No: 60488804/1.2 | Project Name: Caltex Kurnell | PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.1?	
5. Special storage requirements? (details: _____)	
6. Shell Quality Partnership:	
7. Report Format: Fax Hardcopy Email : _____	

Analysis Request

Lab. ID	Sample ID	Sampling Date	Matrix: soil	water	other	Preservation: filt'ed	acid	ice	other	Container (No. & type)	Asbestos (Absence/presence)	TRH BTEXN B(a)P	Metals (NEPM 13)	Other
1	B001_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
2	B003.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
3	B007.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
4	B009.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
5	B010.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
6	B012.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
7	B036_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
8	B036_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
9	B035_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
10	B035_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
11	B034_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
12	B034_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	

Environmental Division
Sydney
Work Order Reference
ES1606083

Telephone : +61-2-8784 8555

Forward Lab / Split WO Newcastle: Asbestos
Lab / Analysis: EA055: QC15, QC15, QC15
Organised by Date: Frank
Relinquished by / Date:
Courier:
WO No: ES1606083
Attach By PO Internal Sheet:

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No. | Esky ID

Relinquished by:	Kate Pigram	Signed:	Kate Pigram	Date: 17/03/2016	
Recieved by:	Frank	Signed:		Date: 17-3-16 1500	
Relinquished by:		Signed:		Date:	
Recieved by:		Signed:		Date:	

Chain of Custody

AECOM

AECOM - Sydney
Level 21, 420 George Street,
Sydney, NSW 2000
Tel: (02) 8934 0000
Fax: (02) 8934 0001
E-mail: Stephen.Randall@aecom.com

Laboratory Details

Lab. Name: ALS
Lab. Address:
Contact Name:
Lab. Ref:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram | AECOM Project No: 60488804/1.2 | Project Name: Caltex Kurnell | PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.1?	
5. Special storage requirements? (details: _____)	
6. Shell Quality Partnership:	
7. Report Format: Fax Hardcopy Email : _____	

Analysis Request

Lab. ID	Sample ID	Sampling Date	Matrix: soil	water	other	Preservation: filt'ed	acid	ice	other	Container (No. & type)	Asbestos (Absence/presence)	TRH BTEXN B(a)P	Metals (NEPM 13)	Other
13	B033_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
14	B033_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
15	B032_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
16	B032_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
17	B031_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
18	B031_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
19	B016.5_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
20	B016.5_0.4-0.5	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
21	B016_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
22	B015.5_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
23	B014_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
24	B014_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No.

Esky ID

Relinquished by:	Kate Pigram	Signed:	Kate Pigram	Date: 17/03/2016	
Recieved by:	Frank	Signed:		Date: 17-3-16 1500	
Relinquished by:		Signed:		Date:	
Recieved by:		Signed:		Date:	

AECOM

Chain of Custody

AECOM - Sydney
Level 21, 420 George Street,
Sydney, NSW 2000
Tel: (02) 8934 0000
Fax: (02) 8934 0001
E-mail: Stephen.Randall@aecom.com

Laboratory Details

Lab. Name: ALS
Lab. Address:
Contact Name:
Lab. Ref:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram | AECOM Project No: 60488804/1.2 | Project Name: Caltex Kurnell | PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.1?	
5. Special storage requirements? (details: _____)	
6. Shell Quality Partnership:	
7. Report Format: Fax Hardcopy Email :	

Lab. ID	Sample ID	Sampling Date	Matrix: soil	Matrix: water	Matrix: other	Preservation: filt'ed	Preservation: acid	Preservation: ice	Preservation: other	Container (No. & type)	Analysis Request: Asbestos (Absence/presence)	Analysis Request: TRH BTEXN B(a)P	Analysis Request: Metals (NEPM 13)	Other
25	A003.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
26	A005.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
27	A006.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
28	A007.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
29	A008.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
N.R 30	A009.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
31	A013.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
32	A013.5_0.4-0.5	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
33	A014.5_0.4-0.5	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
34	C011_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
35	C012_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
36	QC150	14/03/2016	X					X		1 x 125 mL jar		X	X	

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No.

Esky ID

Relinquished by:	Kate Pigram	Signed:	Kate Pigram	Date: 17/03/2016	
Recieved by:	Frank	Signed:		Date: 17-3-16 1500	
Relinquished by:		Signed:		Date:	
Recieved by:		Signed:		Date:	

AECOM

Chain of Custody

AECOM - Sydney
Level 21, 420 George Street,
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Tel: (02) 8934 0000
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Laboratory Details

Lab. Name: ALS
Lab. Address:
Contact Name:
Lab. Ref:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram | AECOM Project No: 60488804/1.2 | Project Name: Caltex Kurnell | PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.1?	
5. Special storage requirements? (details: _____)	
6. Shell Quality Partnership:	
7. Report Format: Fax Hardcopy Email : _____	

Analysis Request

Lab. ID	Sample ID	Sampling Date	Matrix: soil	water	other	Preservation: filt'ed	acid	ice	other	Container (No. & type)	Asbestos (Absence/presence)	TRH BTEXN B(a)P	Metals (NEPM 13)	TRH C6-C10 & BTEXN	Other
37	QC153	14/03/2016	X					X		1 x 125 mL jar				X	
~~X~~	QC151	15/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
38	QC152	15/03/2016	X					X		1 x 125 mL jar		X	X		
39	QC154	15/03/2016	X					X		1 x 125 mL jar		X	X		
40	QC156	15/03/2016		X				X		2 x vials; 1 x 100 mL plastic; 1 x amber		X	X		
~~X~~	QC155	16/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
41	QC157	16/03/2016	X					X		1 x 125 mL jar		X	X		
~~X~~	QC158	16/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
42	QC161	16/03/2016		X				X		2 x vials; 1 x 100 mL plastic; 1 x amber		X	X		
43	QC162	16/03/2016		X				X		2 x vials				X	

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No.

Esky ID

Relinquished by:	Kate Pigram	Signed:	Kate Pigram	Date: 17/03/2016	Relinquished by: Signed: Date:
Recieved by:	Frank	Signed:		Date: 17-3-16 1500	Recieved by: Signed: Date:

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES1606083**

Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: LEVEL 21, 420 GEORGE STREET SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: Stephen.Randall aecom.com	E-mail	: loren.schiavon alsglobal.com
Telephone	: 02 8934 0000	Telephone	: +61 2 8784 8503
Facsimile	: 02 8934 0001	Facsimile	: +61-2-8784 8500
Project	: 60488804/1.2 Caltex Kurnell	Page	: 1 of 4
Order number	: 60488804/1.2	Quote number	: EB2015AECOMAU0580 (EN/004/15)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: KATE PIGRAM		

Dates

Date Samples Received	: 17-Mar-2016 3:00 PM	Issue Date	: 17-Mar-2016
Client Requested Due Date	: 24-Mar-2016	Scheduled Reporting Date	: **24-Mar-2016**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 5	Temperature	: 4.6'c
Receipt Detail	:	No. of samples received / analysed	: 42 / 42

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Samples QC151, QC155 and QC158 will be sent to Eurofins as per coc re uest.**
- **Sample A009.5_0.0-0.2 was not received.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis re uested.**
- **Sample(s) re uiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Asbestos analysis will be conducted by ALS Newcastle.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

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

No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default to 15:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory for processing purposes and will be shown bracketed without a time component.

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils -	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-04 TRH/BTEXN	SOIL - S-18 (NO MOIST) TRH(C6-C9)/BTEXN with No Moisture for TBs
ES1606083-001	[14-Mar-2016]	B001_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-002	[14-Mar-2016]	B003.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-003	[14-Mar-2016]	B007.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-004	[14-Mar-2016]	B009.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-005	[14-Mar-2016]	B010.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-006	[14-Mar-2016]	B012.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-007	[15-Mar-2016]	B036_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-008	[15-Mar-2016]	B036_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-009	[15-Mar-2016]	B035_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-010	[15-Mar-2016]	B035_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-011	[15-Mar-2016]	B034_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-012	[15-Mar-2016]	B034_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-013	[15-Mar-2016]	B033_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-014	[15-Mar-2016]	B033_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-015	[15-Mar-2016]	B032_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-016	[15-Mar-2016]	B032_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-017	[15-Mar-2016]	B031_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-018	[15-Mar-2016]	B031_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-019	[15-Mar-2016]	B016.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-020	[15-Mar-2016]	B016.5_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-021	[15-Mar-2016]	B016_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-022	[15-Mar-2016]	B015.5_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-023	[15-Mar-2016]	B014_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-024	[15-Mar-2016]	B014_0.5-0.6	▯	▯	▯	▯	▯	
ES1606083-025	[16-Mar-2016]	A003.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-026	[16-Mar-2016]	A005.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-027	[16-Mar-2016]	A006.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-028	[16-Mar-2016]	A007.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-029	[16-Mar-2016]	A008.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-031	[16-Mar-2016]	A013.5_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-032	[16-Mar-2016]	A013.5_0.4-0.5	▯	▯	▯	▯	▯	
ES1606083-033	[16-Mar-2016]	A014.5_0.4-0.5	▯	▯	▯	▯	▯	
ES1606083-034	[16-Mar-2016]	C011_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-035	[16-Mar-2016]	C012_0.0-0.2	▯	▯	▯	▯	▯	
ES1606083-036	[14-Mar-2016]	QC150	▯		▯	▯	▯	

			SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils -	SOIL - EP075 SIM PAH only SIM - PAH only	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-04 TRH/BTEXN	SOIL - S-18 (NO MOIST) TRH(C6-C9)/BTEXN with No Moisture for TBs
ES1606083-037	[14-Mar-2016]	QC153						☐
ES1606083-038	[15-Mar-2016]	QC152	☐		☐	☐	☐	
ES1606083-039	[15-Mar-2016]	QC154	☐		☐	☐	☐	
ES1606083-041	[16-Mar-2016]	QC157	☐		☐	☐	☐	

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-03 15 Metals (NEPM Suite)
ES1606083-040	[15-Mar-2016]	QC156	☐
ES1606083-042	[16-Mar-2016]	QC161	☐

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP075 SIM PAH only SIM - PAH only	WATER - W-04 TRH/BTEXN	WATER - W-18 TRH(C6 - C9)/BTEXN
ES1606083-040	[15-Mar-2016]	QC156	☐	☐	
ES1606083-042	[16-Mar-2016]	QC161	☐	☐	
ES1606083-043	[16-Mar-2016]	QC162			☐

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

AP_C□STOMER SERVICE ANZ

- A4 - AU Tax Invoice (INV)	Email	ap_customerservice.anz□ aecom.com

STEPHEN RANDALL

- □AU Certificate of Analysis - NATA (COA)	Email	Stephen.Randall□ aecom.com
- □AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Stephen.Randall□ aecom.com
- □AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Stephen.Randall□ aecom.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Stephen.Randall□ aecom.com
- A4 - AU Tax Invoice (INV)	Email	Stephen.Randall□ aecom.com
- Chain of Custody (CoC) (COC)	Email	Stephen.Randall□ aecom.com
- EDI Format - ENMRG (ENMRG)	Email	Stephen.Randall□ aecom.com
- EDI Format - EQUIS V5 URS (EQUIS_V5_URS)	Email	Stephen.Randall□ aecom.com
- EDI Format - ESDAT (ESDAT)	Email	Stephen.Randall□ aecom.com
- EDI Format - XTab (XTAB)	Email	Stephen.Randall□ aecom.com
- Electronic SRN for EQuIS (ESRN_EQUIS)	Email	Stephen.Randall□ aecom.com

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1606083**	Page	: 1 of 22
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: LEVEL 21, 420 GEORGE STREET SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 8934 0000	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 17-Mar-2016 15:00
Order number	: 60488804/1.2	Date Analysis Commenced	: 18-Mar-2016
C-O-C number	: ----	Issue Date	: 30-Mar-2016 16:07
Sampler	: KATE PIGRAM		
Site	: ----		
Quote number	: ----		
No. of samples received	: 42		
No. of samples analysed	: 42		

NATA Accredited Laboratory 825
Accredited for compliance with ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- EG035: Poor matrix spike recovery was obtained for Mercury on sample EP1602288-1 due to high matrix interference. Confirmed by re-analysis.
- EG035: Positive Hg results have been confirmed by reanalysis.
- EP075(SIM) :Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B001_0.0-0.2	B003.5_0.0-0.2	B007.5_0.0-0.2	B009.5_0.0-0.2	B010.5_0.0-0.2
				Client sampling date / time	[14-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-001	ES1606083-002	ES1606083-003	ES1606083-004	ES1606083-005
					Result	Result	Result	Result	Result
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		2.8	4.1	<1.0	46.4	23.9
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg		Yes	Yes	Yes	Yes	Yes
Asbestos Type	1332-21-4	-	--		Am	Am	Am	Am + (Trace-Am)	Am
Sample weight (dry)	----	0.01	g		331	238	614	141	185
APPROVED IDENTIFIER:	----	-	--		C.OWLER	C.OWLER	G.MORGAN	G.MORGAN	C.OWLER
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		6	14	5	24	10
Barium	7440-39-3	10	mg/kg		130	110	30	490	70
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	3	1
Chromium	7440-47-3	2	mg/kg		24	107	61	152	73
Cobalt	7440-48-4	2	mg/kg		8	15	18	46	14
Copper	7440-50-8	5	mg/kg		141	117	473	735	230
Lead	7439-92-1	5	mg/kg		50	144	621	393	249
Manganese	7439-96-5	5	mg/kg		277	447	129	1220	172
Nickel	7440-02-0	2	mg/kg		20	41	30	153	53
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		37	60	10	112	27
Zinc	7440-66-6	5	mg/kg		1530	1710	6560	9100	4080
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		5.2	2.1	0.3	61.7	17.6
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		1.4	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	1660
C15 - C28 Fraction	----	100	mg/kg		15200	11600	<100	1090	66700
C29 - C36 Fraction	----	100	mg/kg		9350	8160	<100	1350	35300
^ C10 - C36 Fraction (sum)	----	50	mg/kg		24600	19800	<50	2440	104000
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B001_0.0-0.2	B003.5_0.0-0.2	B007.5_0.0-0.2	B009.5_0.0-0.2	B010.5_0.0-0.2
				Client sampling date / time	[14-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-001	ES1606083-002	ES1606083-003	ES1606083-004	ES1606083-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		**290**	<50	<50	<50	**5750**
>C16 - C34 Fraction	----	100	mg/kg		**22500**	**17900**	<100	**2040**	**91700**
>C34 - C40 Fraction	----	100	mg/kg		**6160**	**4230**	<100	**940**	**16000**
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		**29000**	**22100**	<50	**2980**	**113000**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		**290**	<50	<50	<50	**5750**
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**92.6**	**88.0**	**94.9**	**100**	**93.0**
2-Chlorophenol-D4	93951-73-6	0.5	%		**89.5**	**90.6**	**98.3**	**99.6**	**91.5**
2.4.6-Tribromophenol	118-79-6	0.5	%		**103**	**107**	**114**	**119**	**123**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**98.0**	**75.1**	**99.3**	**106**	**88.9**
Anthracene-d10	1719-06-8	0.5	%		**102**	**99.2**	**107**	**111**	**108**
4-Terphenyl-d14	1718-51-0	0.5	%		**105**	**99.6**	**95.4**	**102**	**112**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**96.1**	**103**	**98.9**	**89.6**	**97.0**
Toluene-D8	2037-26-5	0.2	%		**109**	**116**	**106**	**94.6**	**103**
4-Bromofluorobenzene	460-00-4	0.2	%		**105**	**110**	**105**	**94.5**	**98.6**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B012.5_0.0-0.2	B036_0.0-0.2	B036_0.5-0.6	B035_0.0-0.2	B035_0.5-0.6
			Client sampling date / time	[14-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit	ES1606083-006	ES1606083-007	ES1606083-008	ES1606083-009	ES1606083-010
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	27.8	30.0	20.8	13.5	8.6
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	Yes	Yes	No	No
Asbestos Type	1332-21-4	-	--	-	Am	Am	-	-
Sample weight (dry)	----	0.01	g	240	507	546	558	421
APPROVED IDENTIFIER:	----	-	--	S.SPOONER	S.SPOONER	G.MORGAN	G.MORGAN	S.SPOONER
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	18	6	<5	<5	<5
Barium	7440-39-3	10	mg/kg	80	70	<10	20	<10
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	36	26	4	20	<2
Cobalt	7440-48-4	2	mg/kg	7	22	<2	7	<2
Copper	7440-50-8	5	mg/kg	151	92	11	118	<5
Lead	7439-92-1	5	mg/kg	204	83	13	234	<5
Manganese	7439-96-5	5	mg/kg	123	365	31	138	<5
Nickel	7440-02-0	2	mg/kg	22	58	5	19	<2
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	13	38	6	17	<5
Zinc	7440-66-6	5	mg/kg	2240	1830	148	1930	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	3.7	0.6	<0.1	0.3	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B012.5_0.0-0.2	B036_0.0-0.2	B036_0.5-0.6	B035_0.0-0.2	B035_0.5-0.6
				Client sampling date / time	[14-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-006	ES1606083-007	ES1606083-008	ES1606083-009	ES1606083-010
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**93.7**	**92.5**	**97.2**	**96.6**	**91.9**
2-Chlorophenol-D4	93951-73-6	0.5	%		**97.6**	**94.6**	**98.8**	**97.4**	**93.1**
2.4.6-Tribromophenol	118-79-6	0.5	%		**114**	**117**	**118**	**117**	**102**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**102**	**99.2**	**103**	**102**	**96.3**
Anthracene-d10	1719-06-8	0.5	%		**112**	**108**	**112**	**114**	**103**
4-Terphenyl-d14	1718-51-0	0.5	%		**101**	**100**	**104**	**108**	**99.2**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**88.7**	**88.8**	**88.6**	**87.2**	**91.2**
Toluene-D8	2037-26-5	0.2	%		**96.5**	**95.8**	**94.0**	**92.6**	**93.9**
4-Bromofluorobenzene	460-00-4	0.2	%		**96.7**	**96.5**	**93.1**	**91.6**	**94.9**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B034_0.0-0.2	B034_0.5-0.6	B033_0.0-0.2	B033_0.5-0.6	B032_0.0-0.2
				Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-011	ES1606083-012	ES1606083-013	ES1606083-014	ES1606083-015
					Result	Result	Result	Result	Result
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		12.2	16.0	22.9	18.9	48.5
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg		No	No	No	No	Yes
Asbestos Type	1332-21-4	-	--		-	-	-	-	Am
Sample weight (dry)	----	0.01	g		368	445	437	655	292
APPROVED IDENTIFIER:	----	-	--		S.SPOONER	C.OWLER	C.OWLER	G.MORGAN	G.MORGAN
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	7
Barium	7440-39-3	10	mg/kg		20	<10	10	<10	90
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		12	6	9	<2	45
Cobalt	7440-48-4	2	mg/kg		3	<2	<2	<2	11
Copper	7440-50-8	5	mg/kg		29	<5	34	<5	72
Lead	7439-92-1	5	mg/kg		47	<5	37	<5	82
Manganese	7439-96-5	5	mg/kg		83	<5	48	<5	276
Nickel	7440-02-0	2	mg/kg		12	<2	10	<2	51
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		9	<5	10	<5	34
Zinc	7440-66-6	5	mg/kg		772	32	155	14	1930
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		0.2	<0.1	0.2	<0.1	0.4
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	240	<100	<100	4780
C29 - C36 Fraction	----	100	mg/kg		<100	260	<100	<100	2990
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	500	<50	<50	7770
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B034_0.0-0.2	B034_0.5-0.6	B033_0.0-0.2	B033_0.5-0.6	B032_0.0-0.2
				Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-011	ES1606083-012	ES1606083-013	ES1606083-014	ES1606083-015
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	**240**	<50	<50	**190**
>C16 - C34 Fraction	----	100	mg/kg		<100	**320**	<100	<100	**6860**
>C34 - C40 Fraction	----	100	mg/kg		<100	**380**	<100	<100	**1720**
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	**940**	<50	<50	**8770**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	**240**	<50	<50	**190**
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**96.3**	**101**	**96.1**	**95.9**	**103**
2-Chlorophenol-D4	93951-73-6	0.5	%		**96.1**	**102**	**98.1**	**98.7**	**100**
2.4.6-Tribromophenol	118-79-6	0.5	%		**107**	**106**	**100**	**97.6**	**108**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**103**	**101**	**102**	**103**	**103**
Anthracene-d10	1719-06-8	0.5	%		**112**	**109**	**111**	**112**	**115**
4-Terphenyl-d14	1718-51-0	0.5	%		**107**	**105**	**107**	**109**	**115**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**97.9**	**97.6**	**96.6**	**94.8**	**85.7**
Toluene-D8	2037-26-5	0.2	%		**102**	**90.9**	**98.7**	**96.8**	**89.3**
4-Bromofluorobenzene	460-00-4	0.2	%		**103**	**93.0**	**96.9**	**96.4**	**87.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B032_0.5-0.6	B031_0.0-0.2	B031_0.5-0.6	B016.5_0.0-0.2	B016.5_0.5-0.6
				Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-016	ES1606083-017	ES1606083-018	ES1606083-019	ES1606083-020
					Result	Result	Result	Result	Result
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		19.4	22.3	14.9	24.7	18.6
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg		No	No	No	No	No
Asbestos Type	1332-21-4	-	--		-	-	-	-	-
Sample weight (dry)	----	0.01	g		440	469	438	422	274
APPROVED IDENTIFIER:	----	-	--		S.SPOONER	S.SPOONER	G.MORGAN	G.MORGAN	C.OWLER
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg		<10	30	<10	<10	<10
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		7	23	6	4	19
Cobalt	7440-48-4	2	mg/kg		<2	11	<2	<2	<2
Copper	7440-50-8	5	mg/kg		<5	110	<5	14	<5
Lead	7439-92-1	5	mg/kg		<5	87	50	16	<5
Manganese	7439-96-5	5	mg/kg		<5	192	<5	15	<5
Nickel	7440-02-0	2	mg/kg		5	34	3	3	9
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		7	19	<5	<5	<5
Zinc	7440-66-6	5	mg/kg		<5	930	10	134	10
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	0.3	<0.1	0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	2550	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	3020	160	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	5570	160	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B032_0.5-0.6	B031_0.0-0.2	B031_0.5-0.6	B016.5_0.0-0.2	B016.5_0.5-0.6
				Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-016	ES1606083-017	ES1606083-018	ES1606083-019	ES1606083-020
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	**4820**	**140**	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	**1720**	**180**	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	**6540**	**320**	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**101**	**91.2**	**88.1**	**99.0**	**92.0**
2-Chlorophenol-D4	93951-73-6	0.5	%		**105**	**90.6**	**90.3**	**102**	**95.3**
2.4.6-Tribromophenol	118-79-6	0.5	%		**107**	**127**	**131**	**142**	**128**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**104**	**90.0**	**90.0**	**100**	**93.6**
Anthracene-d10	1719-06-8	0.5	%		**113**	**102**	**105**	**117**	**108**
4-Terphenyl-d14	1718-51-0	0.5	%		**109**	**97.0**	**99.6**	**113**	**105**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**88.3**	**95.0**	**97.1**	**100**	**93.6**
Toluene-D8	2037-26-5	0.2	%		**96.9**	**98.9**	**97.6**	**102**	**95.8**
4-Bromofluorobenzene	460-00-4	0.2	%		**93.2**	**96.9**	**97.4**	**101**	**96.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B016_0.0-0.2	B015.5_0.5-0.6	B014_0.0-0.2	B014_0.5-0.6	A003.5_0.0-0.2
				Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[16-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-021	ES1606083-022	ES1606083-023	ES1606083-024	ES1606083-025
					Result	Result	Result	Result	Result
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		40.2	19.6	24.4	19.3	20.3
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg		Yes	No	No	No	No
Asbestos Type	1332-21-4	-	--		Am	-	-	-	-
Sample weight (dry)	----	0.01	g		367	886	410	679	501
APPROVED IDENTIFIER:	----	-	--		C.OWLER	S.SPOONER	G.MORGAN	C.OWLER	G.MORGAN
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		9	<5	7	<5	7
Barium	7440-39-3	10	mg/kg		80	<10	10	<10	20
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		24	<2	8	<2	31
Cobalt	7440-48-4	2	mg/kg		7	<2	<2	<2	4
Copper	7440-50-8	5	mg/kg		500	<5	17	<5	69
Lead	7439-92-1	5	mg/kg		109	<5	16	<5	99
Manganese	7439-96-5	5	mg/kg		589	<5	28	<5	55
Nickel	7440-02-0	2	mg/kg		25	<2	5	<2	11
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		32	<5	5	<5	9
Zinc	7440-66-6	5	mg/kg		811	<5	510	10	407
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		1.6	<0.1	0.2	<0.1	0.2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	1.2	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	13	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		470	<100	4720	670	65000
C29 - C36 Fraction	----	100	mg/kg		860	<100	12100	1480	6740
^ C10 - C36 Fraction (sum)	----	50	mg/kg		1330	<50	16800	2150	71700
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	B016_0.0-0.2	B015.5_0.5-0.6	B014_0.0-0.2	B014_0.5-0.6	A003.5_0.0-0.2
				Client sampling date / time	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[16-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-021	ES1606083-022	ES1606083-023	ES1606083-024	ES1606083-025
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	**140**	**50**	**5390**
>C16 - C34 Fraction	----	100	mg/kg		**1090**	<100	**13000**	**1660**	**65800**
>C34 - C40 Fraction	----	100	mg/kg		**580**	<100	**16400**	**1970**	**3840**
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**1670**	<50	**29500**	**3680**	**75000**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	**140**	**50**	**5390**
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	**0.5**	**0.7**	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	**0.5**	**0.7**	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	**0.5**	**0.7**	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**92.5**	**91.6**	**86.2**	**92.6**	**94.0**
2-Chlorophenol-D4	93951-73-6	0.5	%		**93.1**	**93.9**	**88.1**	**95.9**	**100**
2.4.6-Tribromophenol	118-79-6	0.5	%		**96.6**	**112**	**118**	**129**	**130**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**96.2**	**95.6**	**88.1**	**98.0**	**87.6**
Anthracene-d10	1719-06-8	0.5	%		**109**	**114**	**100**	**112**	**98.1**
4-Terphenyl-d14	1718-51-0	0.5	%		**91.7**	**93.3**	**97.5**	**92.4**	**78.6**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**99.4**	**108**	**83.7**	**98.9**	**74.1**
Toluene-D8	2037-26-5	0.2	%		**108**	**110**	**81.7**	**106**	**89.2**
4-Bromofluorobenzene	460-00-4	0.2	%		**106**	**111**	**79.0**	**104**	**78.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	A005.5_0.0-0.2	A006.5_0.0-0.2	A007.5_0.0-0.2	A008.5_0.0-0.2	A013.5_0.0-0.2
				Client sampling date / time	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-026	ES1606083-027	ES1606083-028	ES1606083-029	ES1606083-031
					Result	Result	Result	Result	Result
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		<1.0	3.2	10.4	7.9	27.5
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg		No	Yes	No	No	Yes
Asbestos Type	1332-21-4	-	--		-	Am	-	-	Am
Sample weight (dry)	----	0.01	g		684	553	510	387	287
APPROVED IDENTIFIER:	----	-	--		S.SPOONER	G.MORGAN	C.OWLER	G.MORGAN	C.OWLER
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		6	6	8	<5	9
Barium	7440-39-3	10	mg/kg		<10	20	20	30	20
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		36	98	40	32	45
Cobalt	7440-48-4	2	mg/kg		4	4	<2	5	3
Copper	7440-50-8	5	mg/kg		94	95	40	47	34
Lead	7439-92-1	5	mg/kg		160	348	85	95	47
Manganese	7439-96-5	5	mg/kg		29	44	24	96	70
Nickel	7440-02-0	2	mg/kg		5	8	7	13	12
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		<5	6	8	13	10
Zinc	7440-66-6	5	mg/kg		713	932	206	911	415
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	0.1	0.2	0.3	0.5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	17.2	<4.0	<0.5	<4.0
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	12	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	870	2740	1090	630
C15 - C28 Fraction	----	100	mg/kg		2480	41000	98300	67800	61000
C29 - C36 Fraction	----	100	mg/kg		260	13300	4760	4940	15800
^ C10 - C36 Fraction (sum)	----	50	mg/kg		2740	55200	106000	73800	77400
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	20	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	A005.5_0.0-0.2	A006.5_0.0-0.2	A007.5_0.0-0.2	A008.5_0.0-0.2	A013.5_0.0-0.2
				Client sampling date / time	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-026	ES1606083-027	ES1606083-028	ES1606083-029	ES1606083-031
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	**19**	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		**100**	**2910**	**18100**	**7900**	**2440**
>C16 - C34 Fraction	----	100	mg/kg		**2590**	**49400**	**86600**	**64600**	**72100**
>C34 - C40 Fraction	----	100	mg/kg		<100	**6830**	**2960**	**2830**	**9120**
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**2690**	**59100**	**108000**	**75300**	**83700**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		**100**	**2910**	**18100**	**7900**	**2440**
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	**1.6**	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	**1.6**	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	**1.6**	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**90.0**	**88.6**	**77.8**	**82.2**	**73.5**
2-Chlorophenol-D4	93951-73-6	0.5	%		**92.8**	**94.0**	**76.8**	**89.9**	**75.6**
2.4.6-Tribromophenol	118-79-6	0.5	%		**127**	**130**	**74.1**	**107**	**82.3**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**93.5**	**85.7**	**75.2**	**85.6**	**69.5**
Anthracene-d10	1719-06-8	0.5	%		**106**	**104**	**73.2**	**96.7**	**93.5**
4-Terphenyl-d14	1718-51-0	0.5	%		**90.1**	**115**	**87.7**	**80.9**	**115**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**100**	**94.1**	**93.8**	**87.7**	**76.1**
Toluene-D8	2037-26-5	0.2	%		**116**	**120**	**115**	**130**	**96.4**
4-Bromofluorobenzene	460-00-4	0.2	%		**108**	**106**	**103**	**106**	**80.1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	A013.5_0.4-0.5	A014.5_0.4-0.5	C011_0.0-0.2	C012_0.0-0.2	QC150
				Client sampling date / time	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	[14-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-032	ES1606083-033	ES1606083-034	ES1606083-035	ES1606083-036
					Result	Result	Result	Result	Result
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		19.1	19.6	<1.0	17.1	24.3
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg		Yes	Yes	No	No	----
Asbestos Type	1332-21-4	-	--		Am	Am + Cr	-	-	----
Sample weight (dry)	----	0.01	g		761	832	555	532	----
APPROVED IDENTIFIER:	----	-	--		G.MORGAN	G.MORGAN	C.OWLER	G.MORGAN	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	8
Barium	7440-39-3	10	mg/kg		<10	<10	60	10	90
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		2	4	54	11	70
Cobalt	7440-48-4	2	mg/kg		<2	<2	9	2	11
Copper	7440-50-8	5	mg/kg		<5	<5	230	23	157
Lead	7439-92-1	5	mg/kg		<5	6	220	27	124
Manganese	7439-96-5	5	mg/kg		11	6	66	40	164
Nickel	7440-02-0	2	mg/kg		<2	<2	14	4	40
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		<5	<5	9	<5	29
Zinc	7440-66-6	5	mg/kg		<5	35	1800	303	2580
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	0.1	<0.1	<0.1	14.7
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<4.0
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		230	750	30800	1960	107000
C29 - C36 Fraction	----	100	mg/kg		<100	<100	35000	3260	41300
^ C10 - C36 Fraction (sum)	----	50	mg/kg		230	750	65800	5220	148000
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	A013.5_0.4-0.5	A014.5_0.4-0.5	C011_0.0-0.2	C012_0.0-0.2	QC150
				Client sampling date / time	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	[14-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1606083-032	ES1606083-033	ES1606083-034	ES1606083-035	ES1606083-036
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		70	280	270	<50	14200
>C16 - C34 Fraction	----	100	mg/kg		200	530	59300	4430	129000
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	19600	1700	19800
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		270	810	79200	6130	163000
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		70	280	270	<50	14200
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		85.9	92.5	93.9	107	73.7
2-Chlorophenol-D4	93951-73-6	0.5	%		95.0	99.7	99.1	89.4	70.8
2.4.6-Tribromophenol	118-79-6	0.5	%		126	124	132	126	83.0
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		93.3	95.3	88.8	95.0	66.4
Anthracene-d10	1719-06-8	0.5	%		109	112	106	111	83.8
4-Terphenyl-d14	1718-51-0	0.5	%		112	116	125	114	70.3
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		77.8	96.2	102	93.0	86.6
Toluene-D8	2037-26-5	0.2	%		100	117	128	112	101
4-Bromofluorobenzene	460-00-4	0.2	%		87.9	116	120	110	88.3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	QC153	QC152	QC154	QC157	----
			Client sampling date / time	[14-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[16-Mar-2016]	----
Compound	CAS Number	LOR	Unit	ES1606083-037	ES1606083-038	ES1606083-039	ES1606083-041	--------
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	----	45.9	19.3	43.1	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	----	----	----	----
Asbestos Type	1332-21-4	-	--	----	----	----	----	----
Sample weight (dry)	----	0.01	g	----	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	----	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	5	<5	11	----
Barium	7440-39-3	10	mg/kg	----	50	<10	40	----
Beryllium	7440-41-7	1	mg/kg	----	<1	<1	<1	----
Boron	7440-42-8	50	mg/kg	----	<50	<50	<50	----
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg	----	37	<2	53	----
Cobalt	7440-48-4	2	mg/kg	----	10	<2	5	----
Copper	7440-50-8	5	mg/kg	----	58	<5	46	----
Lead	7439-92-1	5	mg/kg	----	68	<5	58	----
Manganese	7439-96-5	5	mg/kg	----	219	<5	132	----
Nickel	7440-02-0	2	mg/kg	----	47	<2	24	----
Selenium	7782-49-2	5	mg/kg	----	<5	<5	<5	----
Vanadium	7440-62-2	5	mg/kg	----	26	<5	14	----
Zinc	7440-66-6	5	mg/kg	----	1530	62	581	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	0.4	<0.1	0.7	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	<0.5	<4.0	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	----	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	----	4610	1950	120000	----
C29 - C36 Fraction	----	100	mg/kg	----	2940	4290	28400	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	7550	6240	148000	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	QC153	QC152	QC154	QC157	----
				Client sampling date / time	[14-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[16-Mar-2016]	----
Compound	CAS Number	LOR	Unit		ES1606083-037	ES1606083-038	ES1606083-039	ES1606083-041	--------
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		----	210	110	3200	----
>C16 - C34 Fraction	----	100	mg/kg		----	6610	4860	140000	----
>C34 - C40 Fraction	----	100	mg/kg		----	1760	5660	16400	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	8580	10600	160000	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	210	110	3200	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	82.4	85.9	90.2	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	89.7	91.8	89.6	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	135	126	87.3	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	94.3	83.8	62.6	----
Anthracene-d10	1719-06-8	0.5	%		----	111	111	80.1	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	129	133	91.4	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		92.4	73.6	93.9	84.6	----
Toluene-D8	2037-26-5	0.2	%		109	89.8	119	106	----
4-Bromofluorobenzene	460-00-4	0.2	%		110	88.0	115	91.6	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	QC156	QC161	QC162	----	----
			Client sampling date / time	[15-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	----	----
Compound	CAS Number	LOR	Unit	ES1606083-040	ES1606083-042	ES1606083-043	--------	--------
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QC156	QC161	QC162	----	----
				Client sampling date / time	[15-Mar-2016]	[16-Mar-2016]	[16-Mar-2016]	----	----
Compound	CAS Number	LOR	Unit		ES1606083-040	ES1606083-042	ES1606083-043	--------	--------
					Result	Result	Result	Result	Result
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	----	----
^ **Total Xylenes**	1330-20-7	2	µg/L		<2	<2	<2	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1	%		**24.8**	**21.5**	----	----	----
2-Chlorophenol-D4	93951-73-6	1	%		**45.0**	**40.8**	----	----	----
2.4.6-Tribromophenol	118-79-6	1	%		**23.8**	**21.9**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1	%		**77.4**	**71.1**	----	----	----
Anthracene-d10	1719-06-8	1	%		**82.9**	**78.5**	----	----	----
4-Terphenyl-d14	1718-51-0	1	%		**82.3**	**73.0**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**101**	**103**	**106**	----	----
Toluene-D8	2037-26-5	2	%		**100**	**101**	**106**	----	----
4-Bromofluorobenzene	460-00-4	2	%		**95.7**	**98.3**	**100**	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	B001_0.0-0.2 - [14-Mar-2016]	Mid grey clay soil with several friable asbestos fibre bundles approx 3 x 1 x 1mm
EA200: Description	B003.5_0.0-0.2 - [14-Mar-2016]	Mid grey clay soil with several friable asbestos fibre bundles approx 3 x 1 x 0.5mm
EA200: Description	B007.5_0.0-0.2 - [14-Mar-2016]	Dark brown sandy soil with several pieces of friable asbestos insulation material approx 35 x 25 x 3mm
EA200: Description	B009.5_0.0-0.2 - [14-Mar-2016]	Mid brown clay soil containing trace asbestos fibres plus several pieces of friable asbestos insulation material approx 4 x 3 x 2mm
EA200: Description	B010.5_0.0-0.2 - [14-Mar-2016]	Mid grey soil with several friable asbestos fibre bundles approx 1 x 0.5 x 0.5mm
EA200: Description	B012.5_0.0-0.2 - [14-Mar-2016]	Mid brown sandy soil with grey rocks
EA200: Description	B036_0.0-0.2 - [15-Mar-2016]	Mid brown clay soil with one loose bundle of friable asbestos fibres approx 2 x 1 x 0.5mm
EA200: Description	B036_0.5-0.6 - [15-Mar-2016]	Pale brown sandy soil with several bundles of friable asbestos fibres approx 2 x 1 x 1mm
EA200: Description	B035_0.0-0.2 - [15-Mar-2016]	Mid brown sandy soil
EA200: Description	B035_0.5-0.6 - [15-Mar-2016]	Mid grey sandy soil with grey rocks
EA200: Description	B034_0.0-0.2 - [15-Mar-2016]	Mid brown sandy soil with grey rocks
EA200: Description	B034_0.5-0.6 - [15-Mar-2016]	Pale brown sandy soil with tar like grains
EA200: Description	B033_0.0-0.2 - [15-Mar-2016]	Pale brown sandy soil
EA200: Description	B033_0.5-0.6 - [15-Mar-2016]	Mid brown sandy soil
EA200: Description	B032_0.0-0.2 - [15-Mar-2016]	Mid brown clay soil with several pieces of friable asbestos insulation material approx 4 x 4 x 2mm
EA200: Description	B032_0.5-0.6 - [15-Mar-2016]	Mid brown sandy soil with grey rocks
EA200: Description	B031_0.0-0.2 - [15-Mar-2016]	Mid brown sandy soil with grey rocks
EA200: Description	B031_0.5-0.6 - [15-Mar-2016]	Cream sandy soil
EA200: Description	B016.5_0.0-0.2 - [15-Mar-2016]	Pale grey sandy soil
EA200: Description	B016.5_0.5-0.6 - [15-Mar-2016]	Mid grey sandy soil with grey rocks
EA200: Description	B016_0.0-0.2 - [15-Mar-2016]	Pale brown sandy soil with grey rocks plus two friable asbestos fibre bundles approx 3 x 1 x 0.5mm
EA200: Description	B015.5_0.5-0.6 - [15-Mar-2016]	Mid grey sandy soil with grey rocks
EA200: Description	B014_0.0-0.2 - [15-Mar-2016]	Mid brown sandy soil coated in tar like material
EA200: Description	B014_0.5-0.6 - [15-Mar-2016]	Mid grey sandy soil
EA200: Description	A003.5_0.0-0.2 - [16-Mar-2016]	Mid brown sandy soil
EA200: Description	A005.5_0.0-0.2 - [16-Mar-2016]	Mid brown sandy soil with grey rocks
EA200: Description	A006.5_0.0-0.2 - [16-Mar-2016]	Mid brown sandy soil with several bundles of friable asbestos fibres approx 3 x 1 x 1mm
EA200: Description	A007.5_0.0-0.2 - [16-Mar-2016]	Mid grey sandy soil coated with tar like residue
EA200: Description	A008.5_0.0-0.2 - [16-Mar-2016]	Mid brown sandy soil coated in tar like material
EA200: Description	A013.5_0.0-0.2 - [16-Mar-2016]	Mid grey sandy soil with several friable asbestos fibre bundles approx 4 x 1 x 1mm
EA200: Description	A013.5_0.4-0.5 - [16-Mar-2016]	Mid grey-brown sandy soil with several bundles of friable asbestos fibres approx 3 x 1 x 1mm
EA200: Description	A014.5_0.4-0.5 - [16-Mar-2016]	Mid brown sandy soil with several pieces of friable asbestos insulation material approx 30 x 30 x 3mm plus several bundles of friable asbestos fibres approx 3 x 1 x 1mm
EA200: Description	C011_0.0-0.2 - [16-Mar-2016]	Mid brown sandy soil
EA200: Description	C012_0.0-0.2 - [16-Mar-2016]	Mid brown sandy soil

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1606083**	Page	: 1 of 15
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: LEVEL 21, 420 GEORGE STREET SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 8934 0000	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 17-Mar-2016
Order number	: 60488804/1.2	Date Analysis Commenced	: 18-Mar-2016
C-O-C number	: ----	Issue Date	: 30-Mar-2016
Sampler	: KATE PIGRAM		
Site	: ----		
Quote number	: ----		
No. of samples received	: 42		
No. of samples analysed	: 42		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 400211)									
ES1606073-004	Anonymous	EA055-103: Moisture Content (dried □ 103□C)	----	1	%	21.4	22.2	3.58	0% - 20%
ES1606083-004	B009.5_0.0-0.2	EA055-103: Moisture Content (dried □ 103□C)	----	1	%	46.4	48.2	3.76	0% - 20%
EA055: Moisture Content (QC Lot: 400212)									
ES1606083-013	B033_0.0-0.2	EA055-103: Moisture Content (dried □ 103□C)	----	1	%	22.9	26.0	12.7	0% - 20%
ES1606083-024	B014_0.5-0.6	EA055-103: Moisture Content (dried □ 103□C)	----	1	%	19.3	19.6	1.23	0% - 50%
EA055: Moisture Content (QC Lot: 400213)									
ES1606083-034	C011_0.0-0.2	EA055-103: Moisture Content (dried □ 103□C)	----	1	%	<1.0	<1.0	0.00	No Limit
ES1606101-004	Anonymous	EA055-103: Moisture Content (dried □ 103□C)	----	1	%	16.1	19.5	19.2	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 402100)									
ES1606016-003	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	20	20	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	11	13	22.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	173	178	2.80	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	8	10	24.6	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
ES1606083-009	B035_0.0-0.2	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 402100) - continued									
ES1606083-009	B035_0.0-0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	20	20	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	20	19	7.75	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	7	6	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	19	17	7.36	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	118	138	15.4	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	234	209	11.4	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	138	125	10.4	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	17	15	9.39	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	1930	1670	14.5	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 402103)									
ES1606083-019	B016.5_0.0-0.2	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	<10	<10	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	4	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	3	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	14	12	13.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	16	14	11.3	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	15	16	0.00	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	134	116	14.3	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
ES1606083-029	A008.5_0.0-0.2	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	30	20	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	32	23	31.7	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	5	4	24.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	13	11	16.6	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	47	44	6.49	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	95	68	33.7	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	96	71	30.4	0% - 50%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	13	10	22.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 402103) - continued									
ES1606083-029	A008.5_0.0-0.2	EG005T: Zinc	7440-66-6	5	mg/kg	911	1040	13.6	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 402101)									
ES1606016-003	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1606083-009	B035_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.3	0.4	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 402102)									
ES1606083-019	B016.5_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.1	0.4	108	No Limit
ES1606083-029	A008.5_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.3	0.4	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 399047)									
ES1606083-001	B001_0.0-0.2	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.4	1.2	22.2	No Limit
ES1606083-011	B034_0.0-0.2	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 399051)									
ES1606083-021	B016_0.0-0.2	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1606083-032	A013.5_0.4-0.5	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 398899)									
ES1606083-001	B001_0.0-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1606083-011	B034_0.0-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 398905)									
ES1606083-021	B016_0.0-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1606083-032	A013.5_0.4-0.5	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 399046)									
ES1606083-001	B001_0.0-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	15200	16700	9.76	0% - 20%
		EP071: C29 - C36 Fraction	----	100	mg/kg	9350	10100	7.50	0% - 20%
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1606083-011	B034_0.0-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 399050)									
ES1606083-021	B016_0.0-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	470	400	18.2	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	860	860	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1606083-032	A013.5_0.4-0.5	EP071: C15 - C28 Fraction	----	100	mg/kg	230	250	7.38	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 398899)									
ES1606083-001	B001_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1606083-011	B034_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 398905)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 398905) - continued									
ES1606083-021	B016_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1606083-032	A013.5_0.4-0.5	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 399046)									
ES1606083-001	B001_0.0-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	22500	24200	7.05	0% - 20%
		EP071: >C34 - C40 Fraction	----	100	mg/kg	6160	5940	3.67	0% - 20%
		EP071: >C10 - C16 Fraction	----	50	mg/kg	290	240	17.3	No Limit
ES1606083-011	B034_0.0-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 399050)									
ES1606083-021	B016_0.0-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	1090	1110	1.88	0% - 50%
		EP071: >C34 - C40 Fraction	----	100	mg/kg	580	560	4.67	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1606083-032	A013.5_0.4-0.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	200	240	18.3	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	70	50	25.3	No Limit
EP080: BTEXN (QC Lot: 398899)									
ES1606083-001	B001_0.0-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1606083-011	B034_0.0-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP080: BTEXN (QC Lot: 398905)									
ES1606083-021	B016_0.0-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1606083-032	A013.5_0.4-0.5	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 398905) - continued									
ES1606083-032	A013.5_0.4-0.5	EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 401847)									
ES1605762-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.011	0.012	0.00	0% - 50%
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.023	0.023	0.00	0% - 20%
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.027	0.026	0.00	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.013	0.012	8.83	0% - 50%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.040	0.043	5.03	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.06	0.06	0.00	No Limit
ES1606003-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.019	0.019	0.00	0% - 50%
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.433	0.425	1.93	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.005	0.006	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	7.86	7.95	1.11	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.20	0.19	0.00	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 401851)									
ES1606083-042	QC161	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 401851) - continued									
ES1606083-042	QC161	EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EW1601094-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.012	0.013	8.63	0% - 50%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.001	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.060	0.064	5.61	0% - 50%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 401848)									
ES1605714-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
ES1606003-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 399248)									
ES1605867-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES1606007-003	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 399248)									
ES1605867-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES1606007-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 399248)									
ES1605867-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 399248) - continued									
ES1605867-001	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES1606007-003	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 402100)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	94.2	86	126
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	103	85	115
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	108	90	112628
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	95.1	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	100	76	128
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	102	88	120
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	97.7	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	96.5	80	114
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	99.1	85	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	99.7	87	123
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	101	75	131
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	104	92	122
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	97.1	80	122
EG005T: Total Metals by ICP-AES (QCLot: 402103)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	103	86	126
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	103	85	115
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	110	90	112628
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	96.1	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	108	76	128
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	105	88	120
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	100.0	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	98.2	80	114
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	104	85	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	100	87	123
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	95.8	75	131
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	105	92	122
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	112	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 402101)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	78.5	70	105
EG035T: Total Recoverable Mercury by FIMS (QCLot: 402102)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	78.4	70	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 399047)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 399047) - continued								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	106	70	126
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 399051)								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	96.4	70	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 398899)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	111	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 398905)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	106	68	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 399046)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	103	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	111	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	104	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 399050)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	103	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	114	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	104	71	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 398899)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	112	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 398905)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	107	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 399046)								
EP071: □C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	101	77	125
EP071: □C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	110	74	138
EP071: □C34 - C40 Fraction	----	100	mg/kg	<100	150 mg/kg	98.7	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 399050)								
EP071: □C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	106	77	125
EP071: □C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	111	74	138
EP071: □C34 - C40 Fraction	----	100	mg/kg	<100	150 mg/kg	96.8	63	131
EP080: BTEXN (QCLot: 398899)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	106	62	116
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	105	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	106	66	118
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	105	63	119
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	107	68	120
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	104	67	121
EP080: BTEXN (QCLot: 398905)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	101	62	116

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080: BTEXN (QCLot: 398905) - continued								
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	109	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	110	66	118
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	103	63	119
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	109	68	120
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	99.8	67	121

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 401847)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	85	114
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	96.1	82	110
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	97.8	85	115
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	91.1	85	115
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.9	84	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	94.2	85	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	98.6	82	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	98.4	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	92.9	83	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	96.7	82	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	93.0	82	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	97.8	85	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	95.8	83	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	98.1	81	117
EG020F: Dissolved Metals by ICP-MS (QCLot: 401851)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	99.7	85	114
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	96.3	82	110
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	97.5	85	115
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	95.9	85	115
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	94.3	84	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	91.5	85	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	95.4	82	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	92.9	81	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	92.1	83	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	91.5	82	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	92.7	82	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	95.2	85	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	91.8	83	109

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 401851) - continued								
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.0	81	117
EG035F: Dissolved Mercury by FIMS (QCLot: 401848)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	92.0	83	105
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 398889)								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	81.5	63	117
EP080/071: Total Petroleum Hydrocarbons (QCLot: 398890)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	2000 µg/L	101	76	116
EP071: C15 - C28 Fraction	----	100	µg/L	<100	3000 µg/L	98.2	83	109
EP071: C29 - C36 Fraction	----	50	µg/L	<50	2000 µg/L	101	75	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 399248)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	86.6	75	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 398890)								
EP071: □C10 - C16 Fraction	----	100	µg/L	<100	2500 µg/L	100	76	114
EP071: □C16 - C34 Fraction	----	100	µg/L	<100	3500 µg/L	103	81	111
EP071: □C34 - C40 Fraction	----	100	µg/L	<100	1500 µg/L	106	77	119
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 399248)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	90.6	75	127
EP080: BTEXN (QCLot: 399248)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	94.7	70	122
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	95.9	70	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	95.0	69	121
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	88.5	70	120
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	98.4	72	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	91.3	69	123

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 402100)							
ES1606016-003	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	96.3	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	95.8	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	96.0	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 402100) - continued							
ES1606016-003	Anonymous	EG005T: Copper	7440-50-8	250 mg/kg	96.2	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	96.0	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	96.7	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	95.0	70	130
EG005T: Total Metals by ICP-AES (QCLot: 402103)							
ES1606083-019	B016.5_0.0-0.2	EG005T: Arsenic	7440-38-2	50 mg/kg	97.3	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	98.3	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	98.0	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	97.0	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	97.9	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	98.8	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	88.2	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 402101)							
ES1606016-003	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	91.1	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 402102)							
ES1606083-019	B016.5_0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	88.7	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 398899)							
ES1606083-001	B001_0.0-0.2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	120	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 398905)							
ES1606083-021	B016_0.0-0.2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	117	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 399046)							
ES1606083-001	B001_0.0-0.2	EP071: C10 - C14 Fraction	----	523 mg/kg	109	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	□ Not Determined	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	□ Not Determined	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 399050)							
ES1606083-021	B016_0.0-0.2	EP071: C10 - C14 Fraction	----	523 mg/kg	93.3	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	103	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	122	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 398899)							
ES1606083-001	B001_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	110	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 398905)							
ES1606083-021	B016_0.0-0.2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	112	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 399046)							
ES1606083-001	B001_0.0-0.2	EP071: □C10 - C16 Fraction	----	860 mg/kg	101	73	137

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 399046) - continued							
ES1606083-001	B001_0.0-0.2	EP071: C16 - C34 Fraction	----	3223 mg/kg	Not Determined	53	131
		EP071: C34 - C40 Fraction	----	1058 mg/kg	Not Determined	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 399050)							
ES1606083-021	B016_0.0-0.2	EP071: C10 - C16 Fraction	----	860 mg/kg	99.2	73	137
		EP071: C16 - C34 Fraction	----	3223 mg/kg	114	53	131
		EP071: C34 - C40 Fraction	----	1058 mg/kg	119	52	132
EP080: BTEXN (QCLot: 398899)							
ES1606083-001	B001_0.0-0.2	EP080: Benzene	71-43-2	2.5 mg/kg	116	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	122	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	118	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	110	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	118	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	115	70	130
EP080: BTEXN (QCLot: 398905)							
ES1606083-021	B016_0.0-0.2	EP080: Benzene	71-43-2	2.5 mg/kg	106	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	112	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	112	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	102	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	112	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	107	70	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 401847)							
ES1605714-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	104	70	130
		EG020A-F: Barium	7440-39-3	1 mg/L	101	70	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	98.7	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	98.9	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	94.6	70	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	102	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	101	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	95.0	70	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	95.3	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	98.9	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 401847) - continued							
ES1605714-001	Anonymous	EG020A-F: Vanadium	7440-62-2	1 mg/L	96.3	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	102	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 401851)							
ES1606098-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	99.3	70	130
		EG020A-F: Barium	7440-39-3	1 mg/L	95.9	70	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	98.9	70	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	95.2	70	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	94.0	70	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	97.6	70	130
		EG020A-F: Copper	7440-50-8	1 mg/L	97.1	70	130
		EG020A-F: Lead	7439-92-1	1 mg/L	91.5	70	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	95.4	70	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	94.9	70	130
		EG020A-F: Vanadium	7440-62-2	1 mg/L	95.9	70	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	96.8	70	130
EG035F: Dissolved Mercury by FIMS (QCLot: 401848)							
EP1602288-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	56.1	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 399248)							
ES1605867-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	88.1	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 399248)							
ES1605867-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	85.8	70	130
EP080: BTEXN (QCLot: 399248)							
ES1605867-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	70.0	70	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	81.4	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	81.1	70	130
		EP080: Naphthalene	91-20-3	25 µg/L	95.2	70	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	81.9	70	130
		EP080: Toluene	108-88-3	25 µg/L	73.5	70	130

Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1606083**	Page	: 1 of 14
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 17-Mar-2016
Site	: ----	Issue Date	: 30-Mar-2016
Sampler	: KATE PIGRAM	No. of samples received	: 42
Order number	: 60488804/1.2	No. of samples analysed	: 42

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal e□pert and e□ternal Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matri□ Spike outliers e□ist - please see following pages for full details.**
- **Surrogate recovery outliers e□ist for all regular sample matrices - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers e□ist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Fre□uency Outliers e□ist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matri Spike (MS) Recoveries							
EP080/071: Total Petroleum Hydrocarbons	ES1606083--001	B001_0.0-0.2	**C15 - C28 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or e ual to 4 spike level.**
EP080/071: Total Petroleum Hydrocarbons	ES1606083--001	B001_0.0-0.2	**C29 - C36 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or e ual to 4 spike level.**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	ES1606083--001	B001_0.0-0.2	**>C16 - C34 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or e ual to 4 spike level.**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	ES1606083--001	B001_0.0-0.2	**>C34 - C40 Fraction**	----	Not Determined	----	**MS recovery not determined, background level greater than or e ual to 4 spike level.**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matri Spike (MS) Recoveries							
EG035F: Dissolved Mercury by FIMS	EP1602288--001	Anonymous	**Mercury**	7439-97-6	56.1 %	70-130%	**Recovery less than lower data uality ob ective**

Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP075(SIM)S: Phenolic Compound Surrogates	ES1606083-019	B016.5_0.0-0.2	**2.4.6-Tribromophenol**	118-79-6	142 %	40-138 %	**Recovery greater than upper data uality ob ective**
EP075(SIM)T: PAH Surrogates	ES1606083-031	A013.5_0.0-0.2	**2-Fluorobiphenyl**	321-60-8	69.5 %	70-122 %	**Recovery less than lower data uality ob ective**
EP075(SIM)T: PAH Surrogates	ES1606083-036	QC150	**2-Fluorobiphenyl**	321-60-8	66.4 %	70-122 %	**Recovery less than lower data uality ob ective**
EP075(SIM)T: PAH Surrogates	ES1606083-041	QC157	**2-Fluorobiphenyl**	321-60-8	62.6 %	70-122 %	**Recovery less than lower data uality ob ective**
EP075(SIM)T: PAH Surrogates	ES1606083-039	QC154	**4-Terphenyl-d14**	1718-51-0	133 %	65-129 %	**Recovery greater than upper data uality ob ective**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	11	0.00	10.00	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	7	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	11	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days□ others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / *Container* / Client Sample ID(s)	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA055: Moisture Content							
Soil Glass □ar - □npreserved (EA055-103)							
B001_0.0-0.2, B003.5_0.0-0.2, B007.5_0.0-0.2, B009.5_0.0-0.2, B010.5_0.0-0.2, B012.5_0.0-0.2, QC150	**14-Mar-2016**	**----**	----	----	**20-Mar-2016**	28-Mar-2016	Π
Soil Glass □ar - □npreserved (EA055-103)							
B036_0.0-0.2, B036_0.5-0.6, B035_0.0-0.2, B035_0.5-0.6, B034_0.0-0.2, B034_0.5-0.6, B033_0.0-0.2, B033_0.5-0.6, B032_0.0-0.2, B032_0.5-0.6, B031_0.0-0.2, B031_0.5-0.6, B016.5_0.0-0.2, B016.5_0.5-0.6, B016_0.0-0.2, B015.5_0.5-0.6, B014_0.0-0.2, QC152, B014_0.5-0.6, QC154	**15-Mar-2016**	**----**	----	----	**20-Mar-2016**	29-Mar-2016	Π
Soil Glass □ar - □npreserved (EA055-103)							
A003.5_0.0-0.2, A005.5_0.0-0.2, A006.5_0.0-0.2, A007.5_0.0-0.2, A008.5_0.0-0.2, A013.5_0.0-0.2, A013.5_0.4-0.5, A014.5_0.4-0.5, C011_0.0-0.2, C012_0.0-0.2, QC157	**16-Mar-2016**	**----**	----	----	**20-Mar-2016**	30-Mar-2016	Π

Matrix: **SOIL**

Evaluation: ▯ = Holding time breach ▯▯ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Snap Lock Bag: Separate bag received (EA200)								
B001_0.0-0.2,	B003.5_0.0-0.2,	**14-Mar-2016**	**----**	----	----	**22-Mar-2016**	10-Sep-2016	▯
B007.5_0.0-0.2,	B009.5_0.0-0.2,							
B010.5_0.0-0.2,	B012.5_0.0-0.2							
Snap Lock Bag: Separate bag received (EA200)								
B036_0.0-0.2,	B036_0.5-0.6,	**15-Mar-2016**	**----**	----	----	**22-Mar-2016**	11-Sep-2016	▯
B035_0.0-0.2,	B035_0.5-0.6,							
B034_0.0-0.2,	B034_0.5-0.6,							
B033_0.0-0.2,	B033_0.5-0.6,							
B032_0.0-0.2,	B032_0.5-0.6,							
B031_0.0-0.2,	B031_0.5-0.6,							
B016.5_0.0-0.2,	B016.5_0.5-0.6,							
B016_0.0-0.2,	B015.5_0.5-0.6,							
B014_0.0-0.2,	B014_0.5-0.6							
Snap Lock Bag: Separate bag received (EA200)								
A003.5_0.0-0.2,	A005.5_0.0-0.2,	**16-Mar-2016**	**----**	----	----	**22-Mar-2016**	12-Sep-2016	▯
A006.5_0.0-0.2,	A007.5_0.0-0.2,							
A008.5_0.0-0.2,	A013.5_0.0-0.2,							
A013.5_0.4-0.5,	A014.5_0.4-0.5,							
C011_0.0-0.2,	C012_0.0-0.2							

Matrix: **SOIL**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES								
Soil Glass □ar - □npreserved (EG005T)								
B001_0.0-0.2,	B003.5_0.0-0.2,	**14-Mar-2016**	**22-Mar-2016**	10-Sep-2016	Π	**23-Mar-2016**	10-Sep-2016	Π
B007.5_0.0-0.2,	B009.5_0.0-0.2,							
B010.5_0.0-0.2,	B012.5_0.0-0.2,							
QC150								
Soil Glass □ar - □npreserved (EG005T)								
B036_0.0-0.2,	B036_0.5-0.6,	**15-Mar-2016**	**22-Mar-2016**	11-Sep-2016	Π	**23-Mar-2016**	11-Sep-2016	Π
B035_0.0-0.2,	B035_0.5-0.6,							
B034_0.0-0.2,	B034_0.5-0.6,							
B033_0.0-0.2,	B033_0.5-0.6,							
B032_0.0-0.2,	B032_0.5-0.6,							
B031_0.0-0.2,	B031_0.5-0.6,							
B016.5_0.0-0.2,	B016.5_0.5-0.6,							
B016_0.0-0.2,	B015.5_0.5-0.6,							
B014_0.0-0.2,	QC152, B014_0.5-0.6,							
QC154								
Soil Glass □ar - □npreserved (EG005T)								
A003.5_0.0-0.2,	A005.5_0.0-0.2,	**16-Mar-2016**	**22-Mar-2016**	12-Sep-2016	Π	**23-Mar-2016**	12-Sep-2016	Π
A006.5_0.0-0.2,	A007.5_0.0-0.2,							
A008.5_0.0-0.2,	A013.5_0.0-0.2,							
A013.5_0.4-0.5,	A014.5_0.4-0.5,							
C011_0.0-0.2,	C012_0.0-0.2,							
QC157								

Matrix: **SOIL**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass □ar - □npreserved (EG035T)							
B001_0.0-0.2, B003.5_0.0-0.2, B007.5_0.0-0.2, B009.5_0.0-0.2, B010.5_0.0-0.2, B012.5_0.0-0.2, QC150	**14-Mar-2016**	**22-Mar-2016**	11-Apr-2016	Π	**23-Mar-2016**	11-Apr-2016	Π
Soil Glass □ar - □npreserved (EG035T)							
B036_0.0-0.2, B036_0.5-0.6, B035_0.0-0.2, B035_0.5-0.6, B034_0.0-0.2, B034_0.5-0.6, B033_0.0-0.2, B033_0.5-0.6, B032_0.0-0.2, B032_0.5-0.6, B031_0.0-0.2, B031_0.5-0.6, B016.5_0.0-0.2, B016.5_0.5-0.6, B016_0.0-0.2, B015.5_0.5-0.6, B014_0.0-0.2, QC152, B014_0.5-0.6, QC154	**15-Mar-2016**	**22-Mar-2016**	12-Apr-2016	Π	**23-Mar-2016**	12-Apr-2016	Π
Soil Glass □ar - □npreserved (EG035T)							
A003.5_0.0-0.2, A005.5_0.0-0.2, A006.5_0.0-0.2, A007.5_0.0-0.2, A008.5_0.0-0.2, A013.5_0.0-0.2, A013.5_0.4-0.5, A014.5_0.4-0.5, C011_0.0-0.2, C012_0.0-0.2, QC157	**16-Mar-2016**	**22-Mar-2016**	13-Apr-2016	Π	**23-Mar-2016**	13-Apr-2016	Π

Matrix: **SOIL**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass □ar - □npreserved (EP071)								
B001_0.0-0.2,	B003.5_0.0-0.2,	**14-Mar-2016**	**21-Mar-2016**	28-Mar-2016	Π	**23-Mar-2016**	30-Apr-2016	Π
B007.5_0.0-0.2,	B009.5_0.0-0.2,							
B010.5_0.0-0.2,	B012.5_0.0-0.2,							
QC150								
Soil Glass □ar - □npreserved (EP071)								
B036_0.0-0.2,	B036_0.5-0.6,	**15-Mar-2016**	**21-Mar-2016**	29-Mar-2016	Π	**23-Mar-2016**	30-Apr-2016	Π
B035_0.0-0.2,	B035_0.5-0.6,							
B034_0.0-0.2,	B034_0.5-0.6,							
B033_0.0-0.2,	B033_0.5-0.6,							
B032_0.0-0.2,	B032_0.5-0.6,							
B031_0.0-0.2,	B031_0.5-0.6,							
B016.5_0.0-0.2,	B016.5_0.5-0.6,							
B016_0.0-0.2,	B015.5_0.5-0.6,							
B014_0.0-0.2,	QC152, B014_0.5-0.6,							
QC154								
Soil Glass □ar - □npreserved (EP071)								
A003.5_0.0-0.2,	A005.5_0.0-0.2,	**16-Mar-2016**	**21-Mar-2016**	30-Mar-2016	Π	**23-Mar-2016**	30-Apr-2016	Π
A006.5_0.0-0.2,	A007.5_0.0-0.2,							
A008.5_0.0-0.2,	A013.5_0.0-0.2,							
A013.5_0.4-0.5,	A014.5_0.4-0.5,							
C011_0.0-0.2,	C012_0.0-0.2,							
QC157								

Matrix: **SOIL**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass □ar - □npreserved (EP075(SIM))							
B001_0.0-0.2, B003.5_0.0-0.2, B007.5_0.0-0.2, B009.5_0.0-0.2, B010.5_0.0-0.2, B012.5_0.0-0.2, QC150	**14-Mar-2016**	**21-Mar-2016**	28-Mar-2016	Π	**22-Mar-2016**	30-Apr-2016	Π
Soil Glass □ar - □npreserved (EP075(SIM))							
B036_0.0-0.2, B036_0.5-0.6, B035_0.0-0.2, B035_0.5-0.6, B034_0.0-0.2, B034_0.5-0.6, B033_0.0-0.2, B033_0.5-0.6, B032_0.0-0.2, B032_0.5-0.6, B031_0.0-0.2, B031_0.5-0.6, B016.5_0.0-0.2, B016.5_0.5-0.6, B016_0.0-0.2, B015.5_0.5-0.6, B014_0.0-0.2, QC152, B014_0.5-0.6, QC154	**15-Mar-2016**	**21-Mar-2016**	29-Mar-2016	Π	**22-Mar-2016**	30-Apr-2016	Π
Soil Glass □ar - □npreserved (EP075(SIM))							
A003.5_0.0-0.2, A005.5_0.0-0.2, A006.5_0.0-0.2, A007.5_0.0-0.2, A008.5_0.0-0.2, A013.5_0.0-0.2, A013.5_0.4-0.5, A014.5_0.4-0.5, C011_0.0-0.2, C012_0.0-0.2, QC157	**16-Mar-2016**	**21-Mar-2016**	30-Mar-2016	Π	**22-Mar-2016**	30-Apr-2016	Π

Matrix: **SOIL**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass □ar - □npreserved (EP080)							
B001_0.0-0.2, B003.5_0.0-0.2, B007.5_0.0-0.2, B009.5_0.0-0.2, B010.5_0.0-0.2, B012.5_0.0-0.2	**14-Mar-2016**	**18-Mar-2016**	28-Mar-2016	Π	**19-Mar-2016**	28-Mar-2016	Π
Soil Glass □ar - □npreserved (EP080)							
QC150, QC153	**14-Mar-2016**	**18-Mar-2016**	28-Mar-2016	Π	**21-Mar-2016**	28-Mar-2016	Π
Soil Glass □ar - □npreserved (EP080)							
B036_0.0-0.2, B036_0.5-0.6, B035_0.0-0.2, B035_0.5-0.6, B034_0.0-0.2, B034_0.5-0.6, B033_0.0-0.2, B033_0.5-0.6, B032_0.0-0.2, B032_0.5-0.6, B031_0.0-0.2, B031_0.5-0.6, B016.5_0.0-0.2, B016.5_0.5-0.6	**15-Mar-2016**	**18-Mar-2016**	29-Mar-2016	Π	**19-Mar-2016**	29-Mar-2016	Π
Soil Glass □ar - □npreserved (EP080)							
B016_0.0-0.2, B015.5_0.5-0.6, B014_0.0-0.2, B014_0.5-0.6, QC152, QC154	**15-Mar-2016**	**18-Mar-2016**	29-Mar-2016	Π	**21-Mar-2016**	29-Mar-2016	Π
Soil Glass □ar - □npreserved (EP080)							
A003.5_0.0-0.2, A005.5_0.0-0.2, A006.5_0.0-0.2, A007.5_0.0-0.2, A008.5_0.0-0.2, A013.5_0.0-0.2, A013.5_0.4-0.5, A014.5_0.4-0.5, C011_0.0-0.2, C012_0.0-0.2, QC157	**16-Mar-2016**	**18-Mar-2016**	30-Mar-2016	Π	**21-Mar-2016**	30-Mar-2016	Π

Matrix: **WATER**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid□Filtered (EG020A-F)							
QC156	**15-Mar-2016**	**----**	----	----	**22-Mar-2016**	11-Sep-2016	Π
Clear Plastic Bottle - Nitric Acid□Filtered (EG020A-F)							
QC161	**16-Mar-2016**	**----**	----	----	**22-Mar-2016**	12-Sep-2016	Π
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid□Filtered (EG035F)							
QC156	**15-Mar-2016**	**----**	----	----	**23-Mar-2016**	12-Apr-2016	Π
Clear Plastic Bottle - Nitric Acid□Filtered (EG035F)							
QC161	**16-Mar-2016**	**----**	----	----	**23-Mar-2016**	13-Apr-2016	Π

Matrix: **WATER**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - □npreserved (EP071)							
QC156	**15-Mar-2016**	**18-Mar-2016**	22-Mar-2016	Π	**18-Mar-2016**	27-Apr-2016	Π
Amber Glass Bottle - □npreserved (EP071)							
QC161	**16-Mar-2016**	**18-Mar-2016**	23-Mar-2016	Π	**18-Mar-2016**	27-Apr-2016	Π
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - □npreserved (EP075(SIM))							
QC156	**15-Mar-2016**	**18-Mar-2016**	22-Mar-2016	Π	**18-Mar-2016**	27-Apr-2016	Π
Amber Glass Bottle - □npreserved (EP075(SIM))							
QC161	**16-Mar-2016**	**18-Mar-2016**	23-Mar-2016	Π	**18-Mar-2016**	27-Apr-2016	Π
EP080/071: Total Petroleum Hydrocarbons							
Amber VOC Vial - Sulfuric Acid (EP080)							
QC156	**15-Mar-2016**	**18-Mar-2016**	29-Mar-2016	Π	**18-Mar-2016**	29-Mar-2016	Π
Amber VOC Vial - Sulfuric Acid (EP080)							
QC161, QC162	**16-Mar-2016**	**18-Mar-2016**	30-Mar-2016	Π	**18-Mar-2016**	30-Mar-2016	Π

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	6	60	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	38	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	29	**13.79**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	**0.00**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	11	**0.00**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ▯ = Quality Control frequency not within specification ▯▯ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	29	**6.90**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	11	**9.09**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	16	**6.25**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	29	**6.90**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	11	**9.09**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	16	**6.25**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	29	**6.90**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	**0.00**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	11	**0.00**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	▯	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120 USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125 USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

56-51

Frank ans 31-3-16 17:15

Frank Ferraro

From: Loren Schiavon
Sent: Thursday, 31 March 2016 5:09 PM
To: Fadi Soro; Frank Ferraro; Dianne Blane
Subject: FW: Additional Analysis on Work order ES1606083

Hi Guys,

Can you please arrange the TCLP re-batch requested below?

Dianne – can you confirm what size bags were received for the asbestos and if a quant post reporting for abs/pres is possible at all?

Thanks.

Kind regards

Loren Schiavon

CLIENT SERVICES CO-ORDINATOR
ALS | Environmental Division

277-289 Woodpark Road
Smithfield NSW 2164 Australia

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F +61 2 8784 8500

Environmental Division
Sydney
Work Order Reference
ES1607003

Telephone : +61-2-8784 8555

From: Randall, Stephen [mailto:stephen.randall@aecom.com]
Sent: Thursday, 31 March 2016 2:46 PM
To: Loren Schiavon
Cc: Robinson, Scott (Sydney)
Subject: Additional Analysis on Work order ES1606083

Hi Loren,

Can I please request the following additional analyses for the above work order?

Asbestos Quantification:

- B001_0.0-0.2
- B003.5_0.0-0.2
- B007.5_0.0-0.2
- B009.5_0.0-0.2
- B010.5_0.0-0.2
- B036_0.0-0.2
- B036_0.5-0.6
- B032_0.0-0.2
- B016_0.0-0.2
- A006.5_0.0-0.2

A CANCELLED

- A013.5_0.0-0.2
- A013.5_0.4-0.5
- A014.5_0.4-0.5

TCLP analysis:

1 • A005.5_0.0-0.2 on lead
2 • B007.5_0.0-0.2 on lead
3 • B035_0.0-0.2 on lead
4 • B009.5_0.0-0.2 on mercury and lead
5 • B012.5_0.0-0.2 on lead
6 • B016_0.0-0.2 on lead

Please place these on normal TAT. If there are any issues with this please give me a call.

Thanks

Steve

Stephen Randall
Senior Environmental Scientist
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ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1607003**	Page	: 1 of 6
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: LEVEL 21, 420 GEORGE STREET SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 8934 0000	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 31-Mar-2016 17:15
Order number	: 60488804/1.2	Date Analysis Commenced	: 01-Apr-2016
C-O-C number	: ----	Issue Date	: 22-Apr-2016 11:09
Sampler	: KATE PIGRAM		
Site	: ----		
Quote number	: ----		
No. of samples received	: 6		
No. of samples analysed	: 6		

NATA Accredited Laboratory 825
Accredited for compliance with ISO/IEC 17025.

NATA WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

 This report has been amended and re-released to allow the reporting of additional analytical data.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	A005.5_0.0-0.2	B007.5_0.0-0.2	B035_0.0-0.2	B009.5_0.0-0.2	B012.5_0.0-0.2
			Client sampling date / time	[16-Mar-2016]	[14-Mar-2016]	[15-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]
Compound	CAS Number	LOR	Unit	ES1607003-001	ES1607003-002	ES1607003-003	ES1607003-004	ES1607003-005
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	**6.1**	**8.1**	**7.4**	**7.6**	**9.7**
After HCl pH	----	0.1	pH Unit	**1.5**	**1.7**	**1.6**	**1.7**	**2.7**
Extraction Fluid Number	----	1	-	**1**	**1**	**1**	**1**	**1**
Final pH	----	0.1	pH Unit	**4.9**	**5.0**	**4.8**	**5.0**	**6.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B016_0.0-0.2	----	----	----	----
			Client sampling date / time	[15-Mar-2016]	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1607003-006	--------	--------	--------	--------
				Result	----	----	----	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	**8.8**	----	----	----	----
After HCl pH	----	0.1	pH Unit	**1.7**	----	----	----	----
Extraction Fluid Number	----	1	-	**1**	----	----	----	----
Final pH	----	0.1	pH Unit	**5.2**	----	----	----	----

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	A005.5_0.0-0.2	B007.5_0.0-0.2	B035_0.0-0.2	B009.5_0.0-0.2	B012.5_0.0-0.2
				Client sampling date / time	[16-Mar-2016]	[14-Mar-2016]	[15-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]
					ES1607003-001	ES1607003-002	ES1607003-003	ES1607003-004	ES1607003-005
					Result	Result	Result	Result	Result
EG005C: Leachable Metals by ICPAES									
Chromium	7440-47-3	0.1	mg/L		----	----	----	<0.1	----
Lead	7439-92-1	0.1	mg/L		**0.1**	<0.1	<0.1	<0.1	<0.1
Nickel	7440-02-0	0.1	mg/L		----	----	----	**0.1**	----
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.001	mg/L		----	----	----	<0.0010	----

Analytical Results

Sub-Matrix: **TCLP LEACHATE** (Matrix: **WATER**)			Client sample ID	**B016_0.0-0.2**	**----**	**----**	**----**	**----**
			Client sampling date / time	[15-Mar-2016]	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES1607003-006**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EG005C: Leachable Metals by ICPAES								
Chromium	7440-47-3	0.1	mg/L	**----**	**----**	**----**	**----**	**----**
Lead	7439-92-1	0.1	mg/L	<0.1	**----**	**----**	**----**	**----**
Nickel	7440-02-0	0.1	mg/L	**----**	**----**	**----**	**----**	**----**
EG035C: Leachable Mercury by FIMS								
Mercury	7439-97-6	0.001	mg/L	**----**	**----**	**----**	**----**	**----**

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1607003**	Page	: 1 of 3
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: LEVEL 21, 420 GEORGE STREET SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 8934 0000	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 31-Mar-2016
Order number	: 60488804/1.2	Date Analysis Commenced	: 01-Apr-2016
C-O-C number	: ----	Issue Date	: 22-Apr-2016
Sampler	: KATE PIGRAM		
Site	: ----		
Quote number	: ----		
No. of samples received	: 6		
No. of samples analysed	: 6		

NATA Accredited Laboratory 825
Accredited for compliance with ISO/IEC 17025.

NATA WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005C: Leachable Metals by ICPAES (QC Lot: 412377)									
ES1606988-001	Anonymous	EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.00	No Limit
		EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.00	No Limit
		EG005C: Nickel	7440-02-0	0.1	mg/L	<0.1	<0.1	0.00	No Limit
ES1606993-004	Anonymous	EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.00	No Limit
		EG005C: Lead	7439-92-1	0.1	mg/L	0.4	0.4	0.00	No Limit
		EG005C: Nickel	7440-02-0	0.1	mg/L	<0.1	<0.1	0.00	No Limit
EG035C: Leachable Mercury by FIMS (QC Lot: 412347)									
ES1606988-001	Anonymous	EG035C: Mercury	7439-97-6	0.0001	mg/L	<0.0010	<0.0010	0.00	No Limit
ES1607018-014	Anonymous	EG035C: Mercury	7439-97-6	0.0001	mg/L	<0.0010	<0.0010	0.00	No Limit

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EN33: TCLP Leach (QCLot: 411456)								
EN33a: After HCl pH	----	0.1	pH Unit	1.0	----	----	----	----
EN33a: Final pH	----	0.1	pH Unit	1.0	----	----	----	----
EN33a: Initial pH	----	0.1	pH Unit	1.0	----	----	----	----

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005C: Leachable Metals by ICPAES (QCLot: 412377)								
EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	0.1 mg/L	104	88	114
EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	0.1 mg/L	100	80	118
EG005C: Nickel	7440-02-0	0.1	mg/L	<0.1	0.1 mg/L	102	83	115
EG035C: Leachable Mercury by FIMS (QCLot: 412347)								
EG035C: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	91.9	79	109

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005C: Leachable Metals by ICPAES (QCLot: 412377)							
ES1606988-002	Anonymous	EG005C: Chromium	7440-47-3	1 mg/L	103	70	130
		EG005C: Lead	7439-92-1	1 mg/L	104	70	130
		EG005C: Nickel	7440-02-0	1 mg/L	102	70	130
EG035C: Leachable Mercury by FIMS (QCLot: 412347)							
ES1606988-002	Anonymous	EG035C: Mercury	7439-97-6	0.01 mg/L	89.8	70	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1607003**	Page	: 1 of 4
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 31-Mar-2016
Site	: ----	Issue Date	: 22-Apr-2016
Sampler	: KATE PIGRAM	No. of samples received	: 6
Order number	: 60488804/1.2	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal e□pert and e□ternal Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matri□ Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers e□ist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Fre□uency Outliers e□ist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days□ others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005C: Leachable Metals by ICPAES							
Clear Plastic Bottle - Nitric Acid□□nfiltered (EG005C)							
A005.5_0.0-0.2, B007.5_0.0-0.2, B035_0.0-0.2, B009.5_0.0-0.2, B012.5_0.0-0.2, B016_0.0-0.2	**01-Apr-2016**	**04-Apr-2016**	28-Sep-2016	Π	**04-Apr-2016**	28-Sep-2016	Π
EG035C: Leachable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid□□nfiltered (EG035C)							
B009.5_0.0-0.2	**01-Apr-2016**	**----**	----	----	**04-Apr-2016**	29-Apr-2016	Π

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

Evaluation: ▯ = Quality Control frequency not within specification ▯▯ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB)							
TCLP for Non & Semivolatile Analytes	EN33a	1	11	**9.09**	**9.09**	Π	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ▯ = Quality Control frequency not within specification ▯▯ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Leachable Mercury by FIMS	EG035C	2	11	**18.18**	**10.00**	Π	NEPM 2013 B3 & ALS QC Standard
Leachable Metals by ICPAES	EG005C	2	20	**10.00**	**10.00**	Π	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Leachable Mercury by FIMS	EG035C	1	11	**9.09**	**5.00**	Π	NEPM 2013 B3 & ALS QC Standard
Leachable Metals by ICPAES	EG005C	1	20	**5.00**	**5.00**	Π	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Leachable Mercury by FIMS	EG035C	1	11	**9.09**	**5.00**	Π	NEPM 2013 B3 & ALS QC Standard
Leachable Metals by ICPAES	EG005C	1	20	**5.00**	**5.00**	Π	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Leachable Mercury by FIMS	EG035C	1	11	**9.09**	**5.00**	Π	NEPM 2013 B3 & ALS QC Standard
Leachable Metals by ICPAES	EG005C	1	20	**5.00**	**5.00**	Π	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Leachable Metals by ICPAES	EG005C	SOIL	In house: referenced to APHA 3120 USEPA SW 846 - 6010: The ICPAES technique ionises leachate sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (2013) Schedule B(3)
Leachable Mercury by FIMS	EG035C	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the TCLP solution. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals in TCLP Leachate	EN25C	SOIL	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
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☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townesville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: [redacted] AECOM Services	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: 420 george st, sydney		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: 60488804 Kurnell	PROJECT NO.: Task 13	ALS QUOTE NO.: SY/026/16	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: 60488804	PURCHASE ORDER NO.: 1.3	COUNTRY OF ORIGIN: Australia	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
PROJECT MANAGER: S. Randall	CONTACT PH: 0413074243		OF: 1 2 3 4 5 6 7
SAMPLER: Nik Walker	SAMPLER MOBILE: 0404775677		Random Sample Temperature on Receipt: 21.7 °C
COC Emailed to ALS? (YES / (NO)	EDD FORMAT (or default): EQuIS		Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 8/4/16	DATE/TIME: Frank ALS 8-4-16 1435	DATE/TIME:	DATE/TIME:

Email Reports to (will default to PM if no other addresses are listed): NSW.Geoscience.Analytical@urs.com + Project Manager

Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (MATRIX: Solid(S) Water(W))			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price). Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Asbestos ID Quantification	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	B001_0.0-0.2	7/4/16	S	1x500g bag	1	✓	
2	B003.5_0.0-0.2					✓	
3	B007.5_0-0.2					✓	
4	B009.5_0-0.2					✓	
5	B010.5_0-0.2					✓	
6	B036_0.5-0.6 →	0-0.2 SAC				✓	
7	B036_0.5-0.6					✓	
8	B032_0-0.2					✓	
9	B016_0-0.2					✓	
10	A006.5_0-0.2					✓	
11	A013.5_0-0.2					✓	
12	A013.5_0.4-0.9					✓	
17	A014.5_0.4-0.5			TOTAL		✓	

Environmental Division
Sydney
Work Order Reference
ES1607647

Telephone : +61-2-8784 8555

Subcon / Forward Lab / Split WO
Lab / Analysis: Newcastle: Asbestos
Organised By / Date: Frank
Relinquished By / Date:
Courier / Courier:
WO No: ES1607647
Attach PO / Internal Sheet:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1607647**	Page	: 1 of 5
Client	: **AECOM SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: Supplier ID number - 1179447 Level 8, 420 GEORGE STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 8925 5500	Telephone	: +61 2 8784 8503
Project	: 60488804 Kurnell Task 1.3	Date Samples Received	: 08-Apr-2016 14:35
Order number	: 60488804 1.3	Date Analysis Commenced	: 12-Apr-2016
C-O-C number	: ----	Issue Date	: 15-Apr-2016 10:32
Sampler	: NICHOLAS WALKER		
Site	: ----		
Quote number	: ----		
No. of samples received	: 13		
No. of samples analysed	: 13		

NATA Accredited Laboratory 825
Accredited for compliance with ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

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

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

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

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- EA200N: Asbestos weights and percentages are not covered under the Scope of NATA Accreditation.
  Weights of Asbestos are based on extracted bulk asbestos, fibre bundles, and/or ACM and do not include respirable fibres (if present)
  The Friable Asbestos weight is calculated from the extracted Fibrous Asbestos and Asbestos Fines as an equivalent weight of 100% Asbestos
  Percentages for Asbestos content in ACM are based on the 2013 NEPM default values.
  All calculations of percentage Asbestos under this method are approximate and should be used as a guide only.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- EA200N: ALS laboratory procedures and methods used for the identification and quantitation of asbestos are consistent with AS4964-2004 and the requirements of the 2013 NEPM for Assessment of Site Contamination
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B001_0.0-0.2	B003.5_0.0-0.2	B007.5_0-0.2	B009.5_0-0.2	B010.5_0-0.2
			Client sampling date / time	[07-Apr-2016]	[07-Apr-2016]	[07-Apr-2016]	[07-Apr-2016]	[07-Apr-2016]
Compound	CAS Number	LOR	Unit	ES1607647-001	ES1607647-002	ES1607647-003	ES1607647-004	ES1607647-005
				Result	Result	Result	Result	Result
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	Yes	Yes	Yes	No	No
Asbestos Type	1332-21-4	-	--	Am	Ch	Am	-	-
Sample weight (dry)	----	0.01	g	2100	2760	2850	2000	3240
APPROVED IDENTIFIER:	----	-	--	S.SPOONER	G.MORGAN	G.MORGAN	C.OWLER	C.OWLER
EA200N: Asbestos Quantification (non-NATA)								
ø Free Fibres	----	5	Fibres	No	No	No	No	No
ø Friable Asbestos	1332-21-4	0.0004	g	<0.0004	0.144	<0.0004	<0.0004	<0.0004
ø Friable Asbestos (as Asbestos in Soil)	1332-21-4	0.001	% (w/w)	<0.001	0.005	<0.001	<0.001	<0.001
ø Asbestos Containing Material	1332-21-4	0.1	g	<0.1	<0.1	<0.1	<0.1	<0.1
ø Asbestos Containing Material (as 15□ Asbestos in ACM >7mm)	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	<0.01	<0.01
ø Weight □sed for □ Calculation	----	0.0001	kg	2.10	2.76	2.85	2.00	3.24

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B036_0-0.2	B036-0.5-0.6	B032_0-0.2	B016_0-0.2	A006.5_0-0.2
			Client sampling date / time	[07-Apr-2016]	[07-Apr-2016]	[07-Apr-2016]	[07-Apr-2016]	[07-Apr-2016]
Compound	CAS Number	LOR	Unit	ES1607647-006	ES1607647-007	ES1607647-008	ES1607647-009	ES1607647-010
				Result	Result	Result	Result	Result
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**Yes**	**Yes**	**No**	**No**	**Yes**
Asbestos Type	1332-21-4	-	--	**Am**	**Ch + Am**	**-**	**-**	**Am**
Sample weight (dry)	----	0.01	g	**2690**	**2400**	**1910**	**2450**	**2470**
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**S.SPOONER**	**S.SPOONER**	**G.MORGAN**	**S.SPOONER**
EA200N: Asbestos Quantification (non-NATA)								
ø **Free Fibres**	----	5	Fibres	**No**	**No**	**No**	**No**	**No**
ø **Friable Asbestos**	1332-21-4	0.0004	g	<0.0004	**0.0035**	<0.0004	<0.0004	**0.210**
ø **Friable Asbestos (as Asbestos in Soil)**	1332-21-4	0.001	% (w/w)	<0.001	<0.001	<0.001	<0.001	**0.008**
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	**17.8**	<0.1	<0.1	<0.1
ø **Asbestos Containing Material (as 15□ Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	**0.11**	<0.01	<0.01	<0.01
ø **Weight □sed for □ Calculation**	----	0.0001	kg	**2.69**	**2.40**	**1.91**	**2.45**	**2.47**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	A013.5_0-0.2	A013.5_0.4-0.5	A014.5_0.4-0.5	----	----
			Client sampling date / time	[07-Apr-2016]	[07-Apr-2016]	[07-Apr-2016]	----	----
Compound	CAS Number	LOR	Unit	ES1607647-011	ES1607647-012	ES1607647-013	--------	--------
				Result	Result	Result	Result	Result
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	**Yes**	**No**	**Yes**	----	----
Asbestos Type	1332-21-4	-	--	**Ch + Am**	**-**	**Am**	----	----
Sample weight (dry)	----	0.01	g	**2330**	**2940**	**3280**	----	----
APPROVED IDENTIFIER:	----	-	--	**G.MORGAN**	**G.MORGAN**	**S.SPOONER**	----	----
EA200N: Asbestos Quantification (non-NATA)								
ø **Free Fibres**	----	5	Fibres	**No**	**No**	**No**	----	----
ø **Friable Asbestos**	1332-21-4	0.0004	g	**0.284**	<0.0004	**0.0033**	----	----
ø **Friable Asbestos (as Asbestos in Soil)**	1332-21-4	0.001	% (w/w)	**0.012**	<0.001	<0.001	----	----
ø **Asbestos Containing Material**	1332-21-4	0.1	g	<0.1	<0.1	<0.1	----	----
ø **Asbestos Containing Material (as 15□ Asbestos in ACM >7mm)**	1332-21-4	0.01	% (w/w)	<0.01	<0.01	<0.01	----	----
ø **Weight □sed for □ Calculation**	----	0.0001	kg	**2.33**	**2.94**	**3.28**	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	B001_0.0-0.2 - [07-Apr-2016]	Mid brown sandy soil with one loose bundle of friable asbestos fibres approx 2 x 1 x 0.5 mm.
EA200: Description	B003.5_0.0-0.2 - [07-Apr-2016]	Mid brown sandy soil with one piece of friable asbestos fibre board approx 25 x 15 x 1 mm.
EA200: Description	B007.5_0-0.2 - [07-Apr-2016]	Mid brown sandy soil with two bundles of friable asbestos fibres approx 3 x 1 x 1 mm.
EA200: Description	B009.5_0-0.2 - [07-Apr-2016]	Mid brown clay soil.
EA200: Description	B010.5_0-0.2 - [07-Apr-2016]	Mid brown clay soil.
EA200: Description	B036_0-0.2 - [07-Apr-2016]	Mid brown sandy soil with one bundle of friable asbestos fibres approx 3 x 1 x 1 mm.
EA200: Description	B036-0.5-0.6 - [07-Apr-2016]	Mid brown sandy soil with two pieces of bonded asbestos cement sheeting approx 60 x 30 x 5 mm plus several loose bundles of friable asbestos fibres approx 3 x 1 x 0.5 mm.
EA200: Description	B032_0-0.2 - [07-Apr-2016]	Mid brown sandy soil with grey rocks.
EA200: Description	B016_0-0.2 - [07-Apr-2016]	Mid brown sandy soil.
EA200: Description	A006.5_0-0.2 - [07-Apr-2016]	Mid brown sandy soil with several pieces of friable asbestos insulation material approx 5 x 4 x 2 mm with several loose bundles of friable asbestos fibres approx 2 x 1 x 0.5 mm.
EA200: Description	A013.5_0-0.2 - [07-Apr-2016]	Mid brown sandy soil with several pieces of friable asbestos insulation approx 25 x 20 x 2 mm plus several bundles of friable asbestos fibres approx 3 x 1 x 1 mm.
EA200: Description	A013.5_0.4-0.5 - [07-Apr-2016]	Mid brown sandy soil.
EA200: Description	A014.5_0.4-0.5 - [07-Apr-2016]	Pale brown sandy soil with one loose bundle of friable asbestos fibres approx 3 x 2 x 1 mm.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1607647**	Page	: 1 of 3
Client	: **AECOM SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: Supplier ID number - 1179447 Level 8, 420 GEORGE STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 8925 5500	Telephone	: +61 2 8784 8503
Project	: 60488804 Kurnell Task 1.3	Date Samples Received	: 08-Apr-2016
Order number	: 60488804 1.3	Date Analysis Commenced	: 12-Apr-2016
C-O-C number	: ----	Issue Date	: 15-Apr-2016
Sampler	: NICHOLAS WALKER		
Site	: ----		
Quote number	: ----		
No. of samples received	: 13		
No. of samples analysed	: 13		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

□ **No Laboratory Duplicate (D□P) Results are re□uired to be reported.**

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

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

- **No Method Blank (MB) or Laboratory Control Spike (LCS) Results are re□uired to be reported.**

Matrix Spike (MS) Report

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

- **No Matri□ Spike (MS) or Matri□ Spike Duplicate (MSD) Results are re□uired to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1607647**	Page	: 1 of 4
Client	: **AECOM SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Telephone	: +61 2 8784 8503
Project	: 60488804 Kurnell Task 1.3	Date Samples Received	: 08-Apr-2016
Site	: ----	Issue Date	: 15-Apr-2016
Sampler	: NICHOLAS WALKER	No. of samples received	: 13
Order number	: 60488804 1.3	No. of samples analysed	: 13

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal e□pert and e□ternal Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matri□ Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers e□ist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Fre□uency Outliers e□ist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days□ others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: □ = Holding time breach □□ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag: Separate bag received (EA200)							
B001_0.0-0.2, B003.5_0.0-0.2, B007.5_0-0.2, B009.5_0-0.2, B010.5_0-0.2, B036_0-0.2, B036-0.5-0.6, B032_0-0.2, B016_0-0.2, A006.5_0-0.2, A013.5_0-0.2, A013.5_0.4-0.5, A014.5_0.4-0.5	**07-Apr-2016**	**----**	----	----	**12-Apr-2016**	04-Oct-2016	Π
EA200N: Asbestos Quantification (non-NATA)							
Snap Lock Bag: Separate bag received (EA200N)							
B001_0.0-0.2, B003.5_0.0-0.2, B007.5_0-0.2, B009.5_0-0.2, B010.5_0-0.2, B036_0-0.2, B036-0.5-0.6, B032_0-0.2, B016_0-0.2, A006.5_0-0.2, A013.5_0-0.2, A013.5_0.4-0.5, A014.5_0.4-0.5	**07-Apr-2016**	**----**	----	----	**12-Apr-2016**	04-Oct-2016	Π

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Asbestos Classification and Quantitation per NEPM 2013	EA200N	SOIL	Asbestos Classification and Quantitation per NEPM 2013 with Confirmation of Identification by AS 4964 - 2004 Gravimetric determination of Asbestos Containing Material, Friable Asbestos and sample weight and calculation of percentage concentrations per NEPM protocols. Friable Asbestos is reported as the equivalent weight in the sample received after accounting for sub-sampling (where applicable for the <7mm and/or <2mm fractions).

SS0-S1
#1,7,15,4,5,2,23,27.

Frank ms 2016-16 1730

Loren Schiavon

From: Robinson, Scott (Sydney) <scott.e.robinson@aecom.com>
Sent: Wednesday, 20 April 2016 5:27 PM
To: Loren Schiavon; Randall, Stephen
Cc: Dodd, Katherine; Lokuge, Chani
Subject: RE: Additional Analysis on Work order ES1606083 - Caltex Kurnell

Loren:

Can you add the following in green to Steve's request below:

TCLP analysis:

1 B001_0.0-0.2 – Mercury and Benzo(a)pyrene
2 B036_0.0-0.2 on Nickel
3 B032_0.0-0.2 on Nickel
6 B009.5_0.0-0.2 on Nickel, Chromium - INSUFFICIENT VOLUME REMAINING.
4 B010.5_0.0-0.2 on Nickel, Mercury, Lead
5 B003.5_0.0-0.2 on Nickel, Chromium, Lead
8 B014_0.0-0.2 - Benzo(a)pyrene
7 A006.5_0.0-0.2 – Lead and Benzo(a)pyrene

Environmental Division
Sydney
Work Order Reference
ES1608579

Telephone : +61-2-8784 8555

Scott Robinson
Technical Director - Environment
D +61 2 8934 0785 M +61 400 770 026
scott.e.robinson@aecom.com

AECOM
Level 21, 420 George Street, Sydney, NSW 2000
PO Box Q410, QVB PO, Sydney, NSW, 1230
T +61 2 8934 0000 F +61 2 8934 0001
aecom.com

From: Loren Schiavon [mailto:loren.schiavon@alsglobal.com]
Sent: Wednesday, 20 April 2016 4:53 PM
To: Randall, Stephen
Cc: Robinson, Scott (Sydney)
Subject: RE: Additional Analysis on Work order ES1606083

Hi Steve,

I'll arrange this re-batch for you now.

Cheers.

Kind regards

Loren Schiavon

CLIENT SERVICES CO-ORDINATOR
ALS | Environmental Division

277-289 Woodpark Road
Smithfield NSW 2164 Australia

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1608579**	Page	: 1 of 7
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: LEVEL 21, 420 GEORGE STREET SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 8934 0000	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 20-Apr-2016 17:30
Order number	: 60488804/1.2	Date Analysis Commenced	: 21-Apr-2016
C-O-C number	: ----	Issue Date	: 28-Apr-2016 14:50
Sampler	: KATE PIGRAM		
Site	: ----		
Quote number	: ----		
No. of samples received	: 7		
No. of samples analysed	: 7		

NATA Accredited Laboratory 825
Accredited for compliance with ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

 Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B001_0.0-0.2	B036_0.0-0.2	B032_0.0-0.2	B010.5_0.0-0.2	B003.5_0.0-0.2
			Client sampling date / time	[14-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]
Compound	CAS Number	LOR	Unit	ES1608579-001	ES1608579-002	ES1608579-003	ES1608579-004	ES1608579-005
				Result	Result	Result	Result	Result
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	**6.7**	**8.1**	**8.3**	**7.5**	**7.3**
After HCl pH	----	0.1	pH Unit	**2.0**	**1.7**	**2.0**	**1.8**	**1.8**
Extraction Fluid Number	----	1	-	**1**	**1**	**1**	**1**	**1**
Final pH	----	0.1	pH Unit	**6.6**	**5.0**	**5.3**	**5.0**	**5.1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	B014_0.0-0.2	A006.5_0.0-0.2	----	----	----
			Client sampling date / time	[15-Mar-2016]	[16-Mar-2016]	----	----	----
Compound	CAS Number	LOR	Unit	ES1608579-006	ES1608579-007	--------	--------	--------
				Result	Result	----	----	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	**7.1**	**5.2**	**----**	**----**	**----**
After HCl pH	----	0.1	pH Unit	**1.6**	**1.6**	**----**	**----**	**----**
Extraction Fluid Number	----	1	-	**1**	**1**	**----**	**----**	**----**
Final pH	----	0.1	pH Unit	**4.9**	**4.9**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	B001_0.0-0.2	B036_0.0-0.2	B032_0.0-0.2	B010.5_0.0-0.2	B003.5_0.0-0.2
				Client sampling date / time	[14-Mar-2016]	[15-Mar-2016]	[15-Mar-2016]	[14-Mar-2016]	[14-Mar-2016]
Compound	CAS Number	LOR	Unit		ES1608579-001	ES1608579-002	ES1608579-003	ES1608579-004	ES1608579-005
					Result	Result	Result	Result	Result
EG005C: Leachable Metals by ICPAES									
Chromium	7440-47-3	0.1	mg/L		----	----	----	----	<0.1
Lead	7439-92-1	0.1	mg/L		----	----	----	**0.1**	<0.1
Nickel	7440-02-0	0.1	mg/L		----	<0.1	<0.1	<0.1	<0.1
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.001	mg/L		<0.0010	----	----	<0.0010	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1	%		**29.8**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1	%		**60.2**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1	%		**64.8**	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1	%		**67.3**	----	----	----	----
Anthracene-d10	1719-06-8	1	%		**78.3**	----	----	----	----
4-Terphenyl-d14	1718-51-0	1	%		**71.6**	----	----	----	----

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	B014_0.0-0.2	A006.5_0.0-0.2	----	----	----
				Client sampling date / time	[15-Mar-2016]	[16-Mar-2016]	----	----	----
Compound	CAS Number	LOR	Unit		ES1608579-006	ES1608579-007	--------	--------	--------
					Result	Result	----	----	----
EG005C: Leachable Metals by ICPAES									
Chromium	7440-47-3	0.1	mg/L		----	----	----	----	----
Lead	7439-92-1	0.1	mg/L		----	**0.5**	----	----	----
Nickel	7440-02-0	0.1	mg/L		----	----	----	----	----
EG035C: Leachable Mercury by FIMS									
Mercury	7439-97-6	0.001	mg/L		----	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1	%		**28.9**	**32.3**	----	----	----
2-Chlorophenol-D4	93951-73-6	1	%		**62.5**	**64.7**	----	----	----
2.4.6-Tribromophenol	118-79-6	1	%		**56.0**	**81.0**	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1	%		**69.4**	**78.7**	----	----	----
Anthracene-d10	1719-06-8	1	%		**71.8**	**85.2**	----	----	----
4-Terphenyl-d14	1718-51-0	1	%		**72.7**	**83.7**	----	----	----

Surrogate Control Limits

Sub-Matrix: **TCLP LEACHATE**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1608579**	Page	: 1 of 3
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Contact	: Loren Schiavon
Address	: LEVEL 21, 420 GEORGE STREET SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 8934 0000	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 20-Apr-2016
Order number	: 60488804/1.2	Date Analysis Commenced	: 21-Apr-2016
C-O-C number	: ----	Issue Date	: 28-Apr-2016
Sampler	: KATE PIGRAM		
Site	: ----		
Quote number	: ----		
No. of samples received	: 7		
No. of samples analysed	: 7		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005C: Leachable Metals by ICPAES (QC Lot: 432774)									
ES1608493-001	Anonymous	EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.00	No Limit
		EG005C: Lead	7439-92-1	0.1	mg/L	0.4	0.4	0.00	No Limit
		EG005C: Nickel	7440-02-0	0.1	mg/L	<0.1	<0.1	0.00	No Limit
ES1608587-001	Anonymous	EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	<0.1	0.00	No Limit
		EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	<0.1	0.00	No Limit
		EG005C: Nickel	7440-02-0	0.1	mg/L	<0.1	<0.1	0.00	No Limit
EG035C: Leachable Mercury by FIMS (QC Lot: 433666)									
ES1608579-001	B001_0.0-0.2	EG035C: Mercury	7439-97-6	0.0001	mg/L	<0.0010	<0.0010	0.00	No Limit

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EN33: TCLP Leach (QCLot: 431221)								
EN33a: Initial pH	----	0.1	pH Unit	1.0	----	----	----	----
EN33a: After HCl pH	----	0.1	pH Unit	1.0	----	----	----	----
EN33a: Final pH	----	0.1	pH Unit	1.0	----	----	----	----

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005C: Leachable Metals by ICPAES (QCLot: 432774)								
EG005C: Chromium	7440-47-3	0.1	mg/L	<0.1	0.1 mg/L	102	88	114
EG005C: Lead	7439-92-1	0.1	mg/L	<0.1	0.1 mg/L	108	80	118
EG005C: Nickel	7440-02-0	0.1	mg/L	<0.1	0.1 mg/L	101	83	115
EG035C: Leachable Mercury by FIMS (QCLot: 433666)								
EG035C: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	100	79	109
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 432768)								
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	97.5	63	117

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005C: Leachable Metals by ICPAES (QCLot: 432774)							
ES1608539-001	Anonymous	EG005C: Chromium	7440-47-3	1 mg/L	103	70	130
		EG005C: Lead	7439-92-1	1 mg/L	101	70	130
		EG005C: Nickel	7440-02-0	1 mg/L	97.8	70	130
EG035C: Leachable Mercury by FIMS (QCLot: 433666)							
ES1608579-004	B010.5_0.0-0.2	EG035C: Mercury	7439-97-6	0.01 mg/L	102	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1608579**	Page	: 1 of 4
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: MR STEPHEN RANDALL	Telephone	: +61 2 8784 8503
Project	: 60488804/1.2 Caltex Kurnell	Date Samples Received	: 20-Apr-2016
Site	: ----	Issue Date	: 28-Apr-2016
Sampler	: KATE PIGRAM	No. of samples received	: 7
Order number	: 60488804/1.2	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal e□pert and e□ternal Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matri□ Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers e□ist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Fre□uency Outliers e□ist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	8	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	8	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days□ others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER** Evaluation: × = Holding time breach □✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EG005C: Leachable Metals by ICPAES							
Clear Plastic Bottle - Nitric Acid□□nfiltered (EG005C)							
B036_0.0-0.2, B032_0.0-0.2, B010.5_0.0-0.2, B003.5_0.0-0.2, A006.5_0.0-0.2	**21-Apr-2016**	**22-Apr-2016**	18-Oct-2016	✓	**22-Apr-2016**	18-Oct-2016	✓
EG035C: Leachable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid□□nfiltered (EG035C)							
B001_0.0-0.2, B010.5_0.0-0.2	**21-Apr-2016**	**----**	----	----	**26-Apr-2016**	19-May-2016	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - □npreserved (EP075(SIM))							
B001_0.0-0.2, B014_0.0-0.2, A006.5_0.0-0.2	**21-Apr-2016**	**22-Apr-2016**	28-Apr-2016	✓	**22-Apr-2016**	01-Jun-2016	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB)							
TCLP for Non & Semivolatile Analytes	EN33a	1	11	**9.09**	**9.09**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Leachable Mercury by FIMS	EG035C	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Leachable Metals by ICPAES	EG005C	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	8	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Leachable Mercury by FIMS	EG035C	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Leachable Metals by ICPAES	EG005C	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Leachable Mercury by FIMS	EG035C	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Leachable Metals by ICPAES	EG005C	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Leachable Mercury by FIMS	EG035C	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Leachable Metals by ICPAES	EG005C	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	8	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Leachable Metals by ICPAES	EG005C	SOIL	In house: referenced to APHA 3120 USEPA SW 846 - 6010: The ICPAES technique ionises leachate sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (2013) Schedule B(3)
Leachable Mercury by FIMS	EG035C	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the TCLP solution. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals in TCLP Leachate	EN25C	SOIL	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.
Separatory Funnel Extraction of Liquids	ORG14	SOIL	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

Eurofins

443555

AECOM

Chain of Custody

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E-mail: Stephen.Randall@aecom.com

Laboratory Details

Lab. Name: ALS
Lab. Address:
Contact Name:
Lab. Ref:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram
AECOM Project No: 60488804/1.2
Project Name: Caltex Kurnell
PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr ______days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5 1.1?	
5. Special storage requirements? (details: ______)	
6. Shell Quality Partnership:	
7. Report Format: Fax Hardcopy Email	

Analysis Request

Lab. ID	Sample ID	Sampling Date	Matrix: soil	Matrix: water	Matrix: other	Preservation: filt'ed	Preservation: acid	Preservation: ice	Preservation: other	Container (No. & type)	Asbestos (Absence/presence)	TRH BTEXN B(a)P	Metals (NEPM 13)	Other
1	B001_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
2	B003.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
3	B007.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
4	B009.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
5	B010.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
6	B012.5_0.0-0.2	14/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
7	B036_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
8	B036_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
9	B035_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
10	B035_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
11	B034_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
12	B034_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	

Environmental Division
Sydney
Work Order Reference
ES1606083
Telephone : + 61-2-8784 8555

Forward Lab / Split WO: Newcastle: Asbestos
Lab / Analysis: Eurofins: QC151, QC155, QC158
Organised By / Date: Frank
Relinquished By / Date:
Connote / Courier:
WO No: ES1606083
Attach By PO / Internal Sheet:

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No.
Esky ID

Relinquished by: Kate Pigram	Signed: Kate Pigram	Date: 17/03/2016		
Recieved by: Frank	Signed: [signature]	Date: 17-3-16 1500		
Relinquished by:	Signed:	Date:		
Recieved by: ElenaGEHingt	Signed: [signature]	Date: 18/03/16 14:00		

Printed copies of this document are uncontrolled

BMS-PM-DV-F046

Chain of Custody

AECOM

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Sydney, NSW 2000
Tel: (02) 8934 0000
Fax: (02) 8934 0001
E-mail: Stephen.Randall@aecom.com

Laboratory Details

Lab. Name: ALS
Lab. Address:
Contact Name:
Lab. Ref:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram
AECOM Project No: 60488804/1.2
Project Name: Caltex Kurnell
PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.1?	
5. Special storage requirements? (details: _____)	
6. Shell Quality Partnership:	
7. Report Format. Fax Hardcopy Email	

Lab. ID	Sample ID	Sampling Date	Matrix			Preservation				Container	Analysis Request: Asbestos (Absence/presence)	TRH BTEXN B(a)P	Metals (NEPM 13)	Other
			soil	water	other	filt'ed	acid	ice	other	(No. & type)				
13	B033_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
14	B033_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
15	B032_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
16	B032_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
17	B031_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
18	B031_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
19	B016.5_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
20	B016.5_0.4-0.5	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
21	B016_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
22	B015.5_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
23	B014_0.0-0.2	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
24	B014_0.5-0.6	15/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No.

Esky ID

Relinquished by:	Kate Pigram	Signed:	Kate Pigram	Date: 17/03/2016	
Recieved by:	Frank	Signed:		Date: 17-3-16	1500
Relinquished by:		Signed:		Date:	
Recieved by:		Signed:		Date:	

Chain of Custody

AECOM

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Fax: (02) 8934 0001
E-mail: Stephen.Randall@aecom.com

Laboratory Details

Lab. Name: ALS
Lab. Address:
Contact Name:
Lab. Ref:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram | AECOM Project No: 60488804/1.2 | Project Name: Caltex Kurnell | PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.1?	
5. Special storage requirements? (details: _____)	
6. Shell Quality Partnership:	
7. Report Format: Fax Hardcopy Email :	

Lab. ID	Sample ID	Sampling Date	Matrix			Preservation				Container (No. & type)	Analysis Request: Asbestos (Absence/presence)	TRH BTEXN B(a)P	Metals (NEPM 13)	Other
			soil	water	other	fil'ed	acid	ice	other					
25	A003.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
26	A005.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
27	A006.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
28	A007.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
29	A008.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
30	A009.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
31	A013.5_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
32	A013.5_0.4-0.5	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
33	A014.5_0.4-0.5	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
34	C011_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
35	C012_0.0-0.2	16/03/2016	X					X		1 x 125 mL jar; 1 x 500 mL bag	X	X	X	
36	QC150	14/03/2016	X					X		1 x 125 mL jar		X	X	

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No.

Esky ID

Relinquished by:	Kate Pigram	Signed:	Kate Pigram	Date: 17/03/2016	
Recieved by:	Frank	Signed:		Date: 17-3-16 1:00	
Relinquished by:		Signed:		Date:	
Recieved by:		Signed:		Date:	

AECOM

Chain of Custody

AECOM - Sydney
Level 21, 420 George Street,
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E-mail: Stephen.Randall@aecom.com

Laboratory Details

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Contact Name:
Lab. Ref:
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Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram | AECOM Project No: 60488804/1.2 | Project Name: Caltex Kurnell | PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr ____days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.17	
5. Special storage requirements? (details ____)	
6. Shell Quality Partnership:	
7. Report Format: Fax Hardcopy Email	

Analysis Request

Lab. ID	Sample ID	Sampling Date	Matrix: soil	Matrix: water	Matrix: other	Preservation: filtered	Preservation: acid	Preservation: ice	Preservation: other	Container (No. & type)	Asbestos (Absence/presence)	TRH BTEXN B(a)P	Metals (NEPM 13)	TRH C6-C10 & BTEXN	Other
37	QC153	14/03/2016	X					X		1 x 125 mL jar				X	
38	QC151	15/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
39	QC152	15/03/2016	X					X		1 x 125 mL jar		X	X		
40	QC154	15/03/2016	X					X		1 x 125 mL jar		X	X		
41	QC156	15/03/2016		X				X		2 x vials; 1 x 100 mL plastic; 1 x amber		X	X		
42	QC155	16/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
43	QC157	16/03/2016	X					X		1 x 125 mL jar		X	X		
44	QC158	16/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
45	QC161	16/03/2016		X				X		2 x vials; 1 x 100 mL plastic; 1 x amber		X	X		
46	QC162	16/03/2016		X				X		2 x vials				X	

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No.: Esky ID:

Relinquished by: Kate Pigram | Signed: | Kate Pigram | Date: 17/03/2016

Recieved by: Frank | Signed: | Date: 17-3-16 1500

Relinquished by: | Signed: | Date:

Recieved by: Elkin Ng Ellmgt | Signed: | Date: 18/3/16 1400

AECOM

ES60863

Chain of Custody

AECOM - Sydney
Level 21, 420 George Street,
Sydney, NSW 2000
Tel: (02) 8934 0000
Fax: (02) 8934 0001
E-mail: Stephen.Randall@aecom.com

Laboratory Details

Lab. Name: ALS
Lab. Address:
Contact Name:
Lab. Ref:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Kate Pigram
AECOM Project No: 60488804/1.2
Project Name: Caltex Kurnell
PO No.

Specifications:

	Yes (tick)
1. Urgent TAT required? (please circle: 24hr 48hr _____days)	
2. Fast TAT Guarantee Required?	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.1?	
5. Special storage requirements? (details: _____)	
6. Shell Quality Partnership:	
7. Report Format: Fax Hardcopy Email :	

Lab. ID	Sample ID	Sampling Date	Matrix: soil	Matrix: water	Matrix: other	Preservation: frit'ed	Preservation: acid	Preservation: ice	Preservation: other	Container (No. & type)	Analysis Request: Asbestos (Absence/presence)	TRH BTEXN B(a)P	Metals (NEPM 13)	TRH C6-C10 & BTEXN	Other
37	QC153	14/03/2016	X					X		1 x 125 mL jar				X	
✓	QC151	15/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
38	QC152	15/03/2016	X					X		1 x 125 mL jar		X	X		
39	QC154	15/03/2016	X					X		1 x 125 mL jar		X	X		
40	QC156	15/03/2016		X				X		2 x vials; 1 x 100 mL plastic; 1 x amber		X	X		
✓	QC155	16/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
41	QC157	16/03/2016	X					X		1 x 125 mL jar		X	X		
✓	QC158	16/03/2016	X					X		1 x 125 mL jar		X	X		PLEASE FORWARD SAMPLE AND COC TO EUROFINS
42	QC161	16/03/2016		X				X		2 x vials; 1 x 100 mL plastic; 1 x amber		X	X		
43	QC162	16/03/2016		X				X		2 x vials				X	

* Metals Required (Delete elements not required): As Cd Cr Cu Ni Pb Zn Hg

Comments:

Lab Report No:
Esky ID:

Relinquished by:	Kate Pigram	Signed:	Kate Pigram	Date: 17/03/2016	
Recieved by:	Frank	Signed:		Date: 17-3-16 1500	
Relinquished by:		Signed:		Date:	
Recieved by:		Signed:		Date:	

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com.au web : www.eurofins.com.au

Melbourne
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Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Sample Receipt Advice

Company name:	**AECOM Aust Pty Ltd Sydney**
Contact name:	Stephen Randall
Project name:	CALTEX KURNELL
Project ID:	60488804/1.2
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Mar 18, 2016 2:00 PM
Eurofins | mgt reference:	**493555**

Sample information

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

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : .1 degrees Celsius.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

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

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

Results will be delivered electronically via e.mail to Stephen Randall - Stephen.Randall@aecom.com.

eurofins | mgt

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com.au web : www.eurofins.com.au

Melbourne
3-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

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NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Company Name: AECOM Aust Pty Ltd Sydney
Address: Level 21, 420 George St
Sydney
NSW 2000

Project Name: CALTEX KURNELL
Project ID: 60488804/1.2

Order No.:
Report #: 493555
Phone: 02 8934 0000
Fax: 02 8934 0001

Received: Mar 18, 2016 2:00 PM
Due: Mar 29, 2016
Priority: 5 Day
Contact Name: Stephen Randall

Eurofins | mgt Client Manager: Nibha Vaidya

Sample Detail					BTEX	Benzo[a]pyrene	NEPM 2013 Metals : Metals M13	Moisture Set	Total Recoverable Hydrocarbons
Laboratory where analysis is conducted									
Melbourne Laboratory - NATA Site # 1254 & 14271									
Sydney Laboratory - NATA Site # 18217					X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794									
External Laboratory									
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
QC151	Mar 15, 2016		Soil	S16-Ma18366	X	X	X	X	X
QC155	Mar 16, 2016		Soil	S16-Ma18367	X	X	X	X	X
QC158	Mar 16, 2016		Soil	S16-Ma18368	X	X	X	X	X

eurofins | mgt

Certificate of Analysis

AECOM Aust Pty Ltd Sydney
Level 21, 420 George St
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention: **Stephen Randall**

Report **493555-S**
Project name CALTEX KURNELL
Project ID 60488804/1.2
Received Date Mar 18, 2016

Client Sample ID			**QC151**	**QC155**	**QC158**
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S16-Ma18366**	**S16-Ma18367**	**S16-Ma18368**
Date Sampled			**Mar 15, 2016**	**Mar 16, 2016**	**Mar 16, 2016**
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					
TRH C6-C9	20	mg/kg	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	65
TRH C15-C28	50	mg/kg	< 50	2900	1200
TRH C29-C36	50	mg/kg	58	390	< 50
TRH C10-36 (Total)	50	mg/kg	58	3300	1300
BTEX					
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	89	73	75
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	240
Benzo[a]pyrene					
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
p-Terphenyl-d14 (surr.)	1	%	106	100	110
2-Fluorobiphenyl (surr.)	1	%	87	71	86
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
TRH >C10-C16	50	mg/kg	< 50	< 50	240
TRH >C16-C34	100	mg/kg	< 100	3300	1000
TRH >C34-C40	100	mg/kg	170	200	< 100
Chromium (hexavalent)	1	mg/kg	< 1	< 1	< 1
% Moisture	1	%	23	< 1	21
Heavy Metals					
Arsenic	2	mg/kg	< 2	6.0	8.8
Beryllium	2	mg/kg	< 2	< 2	< 2
Boron	10	mg/kg	< 10	< 10	< 10
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4
Cobalt	5	mg/kg	< 5	< 5	< 5

Client Sample ID			QC151	QC155	QC158
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S16-Ma18366**	**S16-Ma18367**	**S16-Ma18368**
Date Sampled			**Mar 15, 2016**	**Mar 16, 2016**	**Mar 16, 2016**
Test/Reference	LOR	Unit			
Heavy Metals					
Copper	5	mg/kg	< 5	84	8.3
Lead	5	mg/kg	< 5	140	15
Manganese	5	mg/kg	< 5	28	12
Mercury	0.05	mg/kg	< 0.05	0.13	0.30
Nickel	5	mg/kg	< 5	5.6	< 5
Selenium	2	mg/kg	< 2	< 2	< 2
Zinc	5	mg/kg	< 5	700	130

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Mar 24, 2016	14 Day
- Method: TRH C6-C36 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Mar 24, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Mar 24, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
BTEX	Sydney	Mar 24, 2016	14 Day
- Method: TRH C6-C40 - LTM-ORG-2010			
Benzo[a]pyrene	Sydney	Mar 24, 2016	14 Day
- Method: E007 Benzo[a]pyrene			
Chromium (hexavalent)	Sydney	Mar 24, 2016	28 Day
- Method: E043 /E057 Total Speciated Chromium			
Heavy Metals	Sydney	Mar 24, 2016	180 Day
- Method: LTM-MET-3030 by ICP-OES (hydride ICP-OES for Mercury)			
% Moisture	Sydney	Mar 18, 2016	14 Day
- Method: LTM-GEN-7080 Moisture			

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Company Name:	AECOM Aust Pty Ltd Sydney	**Order No.:**		**Received:**	Mar 18, 2016 2:00 PM
Address:	Level 21, 420 George St Sydney NSW 2000	**Report #:**	493555	**Due:**	Mar 29, 2016
		Phone:	02 8934 0000	**Priority:**	5 Day
		Fax:	02 8934 0001	**Contact Name:**	Stephen Randall
Project Name:	CALTEX KURNELL				
Project ID:	60488804/1.2				

Eurofins | mgt Client Manager: Nibha Vaidya

Sample Detail					BTEX	Benzo[a]pyrene	NEPM 2013 Metals : Metals M13	Moisture Set	Total Recoverable Hydrocarbons
Laboratory where analysis is conducted									
Melbourne Laboratory - NATA Site # 1254 & 14271									
Sydney Laboratory - NATA Site # 18217					X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794									
External Laboratory									
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
QC151	Mar 15, 2016		Soil	S16-Ma18366	X	X	X	X	X
QC155	Mar 16, 2016		Soil	S16-Ma18367	X	X	X	X	X
QC158	Mar 16, 2016		Soil	S16-Ma18368	X	X	X	X	X

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

mg/kg: milligrams per Kilogram

mg/l: milligrams per litre

ug/l: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100ml: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (Eurofins | mgt uses NATA accredited in-house method LTM-GEN-7010)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
Method Blank							
Benzo[a]pyrene							
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Chromium (hexavalent)	mg/kg	< 1			1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Beryllium	mg/kg	< 2			2	Pass	
Boron	mg/kg	< 10			10	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Cobalt	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Manganese	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.05			0.05	Pass	
Nickel	mg/kg	< 5			5	Pass	
Selenium	mg/kg	< 2			2	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	81			70-130	Pass	
TRH C10-C14	%	94			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	110			70-130	Pass	
Toluene	%	93			70-130	Pass	
Ethylbenzene	%	102			70-130	Pass	
m&p-Xylenes	%	111			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
o-Xylene	%	109			70-130	Pass	
Xylenes - Total	%	110			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	124			70-130	Pass	
TRH C6-C10	%	90			70-130	Pass	
LCS - % Recovery							
Benzo[a]pyrene							
Benzo(a)pyrene	%	104			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
TRH >C10-C16	%	95			70-130	Pass	
LCS - % Recovery							
Chromium (hexavalent)	%	88			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	89			70-130	Pass	
Beryllium	%	92			70-130	Pass	
Boron	%	92			70-130	Pass	
Cadmium	%	91			70-130	Pass	
Cobalt	%	90			70-130	Pass	
Copper	%	92			70-130	Pass	
Lead	%	93			70-130	Pass	
Manganese	%	94			70-130	Pass	
Mercury	%	98			70-130	Pass	
Nickel	%	93			70-130	Pass	
Selenium	%	94			70-130	Pass	
Zinc	%	90			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S16-Ma22656	NCP	%	82			70-130	Pass	
TRH C10-C14	S16-Ma17913	NCP	%	75			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S16-Ma22656	NCP	%	102			70-130	Pass	
Toluene	S16-Ma22656	NCP	%	92			70-130	Pass	
Ethylbenzene	S16-Ma22656	NCP	%	109			70-130	Pass	
m&p-Xylenes	S16-Ma22656	NCP	%	126			70-130	Pass	
o-Xylene	S16-Ma22656	NCP	%	120			70-130	Pass	
Xylenes - Total	S16-Ma22656	NCP	%	124			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S16-Ma22656	NCP	%	107			70-130	Pass	
TRH C6-C10	S16-Ma22656	NCP	%	92			70-130	Pass	
Spike - % Recovery									
Benzo[a]pyrene				Result 1					
Benzo(a)pyrene	S16-Ma17655	NCP	%	92			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S16-Ma17913	NCP	%	75			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S16-Ma21052	NCP	%	84			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Beryllium	S16-Ma21052	NCP	%	88			70-130	Pass	
Boron	S16-Ma21052	NCP	%	77			70-130	Pass	
Cadmium	S16-Ma21052	NCP	%	92			70-130	Pass	
Cobalt	S16-Ma18474	NCP	%	82			70-130	Pass	
Copper	S16-Ma18474	NCP	%	83			70-130	Pass	
Lead	S16-Ma18474	NCP	%	85			70-130	Pass	
Manganese	S16-Ma18474	NCP	%	83			70-130	Pass	
Mercury	S16-Ma18474	NCP	%	89			70-130	Pass	
Nickel	S16-Ma18474	NCP	%	83			70-130	Pass	
Selenium	S16-Ma18474	NCP	%	95			70-130	Pass	
Zinc	S16-Ma18474	NCP	%	83			70-130	Pass	
Spike - % Recovery									
				Result 1					
Chromium (hexavalent)	S16-Ma18367	CP	%	122			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S16-Ma22655	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S16-Ma21449	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S16-Ma21449	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S16-Ma21449	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S16-Ma22655	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S16-Ma22655	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S16-Ma22655	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S16-Ma22655	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S16-Ma22655	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S16-Ma22655	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S16-Ma22655	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S16-Ma22655	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Benzo[a]pyrene				Result 1	Result 2	RPD			
Benzo(a)pyrene	S16-Ma21449	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S16-Ma21449	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S16-Ma21449	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S16-Ma21449	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chromium (hexavalent)	S16-Ma18366	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S16-Ma18368	CP	%	21	17	17	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S16-Ma18368	CP	mg/kg	8.8	6.7	26	30%	Pass	
Beryllium	S16-Ma18368	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	S16-Ma18368	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	S16-Ma18368	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Cobalt	S16-Ma18368	CP	mg/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Copper	S16-Ma18368	CP	mg/kg	8.3	9.4	12	30%	Pass	
Lead	S16-Ma18368	CP	mg/kg	15	20	28	30%	Pass	
Manganese	S16-Ma18368	CP	mg/kg	12	9.9	21	30%	Pass	
Mercury	S16-Ma18368	CP	mg/kg	0.30	0.30	<1	30%	Pass	
Nickel	S16-Ma18368	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Selenium	S16-Ma18368	CP	mg/kg	< 2	< 2	<1	30%	Pass	
Zinc	S16-Ma18368	CP	mg/kg	130	130	5.0	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Nibha Vaidya	Analytical Services Manager
Bob Symons	Senior Analyst-Inorganic (NSW)
Ivan Taylor	Senior Analyst-Metal (NSW)
Ryan Hamilton	Senior Analyst-Organic (NSW)
Ryan Hamilton	Senior Analyst-Volatile (NSW)

Glenn Jackson
National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Uncertainty data is available on request

Appendix F

Data Validation

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 03/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	QC151, QC155, QC158		
Laboratory:	Eurofins (Secondary),		
Project Manager:	Stephen Randall	**Lab report reference:**	493555

Key Issues:	No QA/QC issues were identified in the field or laboratory datasets that could have a material implication to decision-making on the project.
Field Quality Assurance and Quality Control	
Sampling personnel	All sampling was conducted by Kate Pigram on the 14,15 and 16 March 2016.
Sampling Methodology	Samples were collected directly from the hand auger or solid stem auger.
Chain of Custody (COC)	Chain of custody documents completed by Kate Pigram
Field Blank	No field blanks were utilised.
Rinsate Blank	No rinsate blanks were analysed.
Trip Blank/Spike	No trip spikes or blanks were taken.
Frequency of field QC	Inter-laboratory samples from ES160683
Handling and preservation	Samples were received preserved and chilled (1℃) at the laboratory. All samples were received at the laboratory in appropriate sample containers.
Laboratory QA/QC	
Tests requested/reported	Samples were analysed and reported as requested on the Chain Of Custody (COC).
Holding time compliance	Samples were extracted and analysed within recommended holding times.
Laboratory Accreditation	The laboratory analysis was conducted by Eurofins Pty Ltd (Sydney), which is a National Association of Testing Authorities (NATA) accredited laboratories.
Frequency of laboratory QC	The laboratory reported an insufficient frequency of quality control samples to assess whether the results have been reported to an acceptable accuracy and precision.
Method Blank	Method blank concentrations were not detected above the LOR for all analytes
Laboratory duplicate RPDs	Laboratory duplicates were reported on anonymous samples and the Relative Percentage Differences (RPD) were within control limits.
Laboratory control spike recovery	Laboratory Control Spike (LCS) recoveries were within control limits.
Matrix spike recovery	Matrix spikes (MS) were conducted on anonymous samples and within control limits.
Surrogate spike recovery	Surrogates were not reported.
QA/QC Data Evaluation	
Comparison of Field Observations and Laboratory Results	No anomalous results between field observations and analysis results were noted.

DATA VALIDATION REPORT

Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 03/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	QC151, QC155, QC158		
Laboratory:	Eurofins (Secondary),		
Project Manager:	Stephen Randall	**Lab report reference:**	493555

Comparison of the data and Laboratory Results	No anomalous results between data input and laboratory analysis results were noted.
Limits of reporting	Limits of Reporting (LORs) were sufficiently low to enable assessment against adopted guideline criteria.
Intra-laboratory duplicate RPDs	Not applicable.
Inter-laboratory duplicate RPDs	Not applicable.
Trip Spike Recoveries	Not applicable.

Chromatograms

Not applicable.

Other

Comments:

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 03/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	35 (refer to lab report)		
Laboratory:	ALS (primary), Eurofins (secondary)		
Project Manager:	Stephen Randall	**Lab report reference:**	ES1606083
Key Issues:	No QA/QC issues were identified in the field or laboratory datasets that could have a material implication to decision-making on the project.		

Field Quality Assurance and Quality Control	
Sampling personnel	All sampling was conducted by Kate Pigram on the 14,15 and 16 March 2016.
Sampling Methodology	Samples were collected directly from the hand auger or solid stem auger.
Chain of Custody (COC)	Chain of custody documents completed by Kate Pigram.
Field Blank (QC162)	One field blanks were utilised.
Rinsate Blank (QC153 & QC160)	Two rinsate blanks were analysed.
Trip Blank/Spike (QC153)	One trip blank was utilised.
Frequency of field QC	Three inter-laboratory (QC151, QC155 & QC158) and 4 intra-laboratory duplicates (QC150, QC152, QC154 & QC157) were analysed.
Handling and preservation	Samples were received preserved and chilled (4.6℃) at the laboratory. All samples were received at the laboratory in appropriate sample containers.

Laboratory QA/QC	
Tests requested/reported	Samples were analysed and reported as requested on the Chain Of Custody (COC).
Holding time compliance	Samples were extracted and analysed within recommended holding times.
Laboratory Accreditation	The laboratory analysis was conducted by ALS Environmental Pty Ltd (Sydney), which is a National Association of Testing Authorities (NATA) accredited laboratories.
Frequency of laboratory QC	The laboratory reported a sufficient frequency of quality control samples to assess whether the results have been reported to an acceptable accuracy and precision.
Method Blank	Method blank concentrations were not detected above the LOR for all analytes
Laboratory duplicate RPDs	Laboratory duplicates (LD) were conducted on AECOM and anonymous samples. LD Relative Percentage Differences (RPD) were within control limits. Laboratory duplicates were also conducted for water on AECOM sample QC161 and anonymous samples. The laboratory duplicate RPDs are presented in the laboratory Quality Control Report.
Laboratory control spike recovery	Laboratory Control Spike (LCS) recoveries were within control limits.

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 03/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	35 (refer to lab report)		
Laboratory:	ALS (primary), Eurofins (secondary)		
Project Manager:	Stephen Randall	**Lab report reference:**	ES1606083

Matrix spike recovery	Matrix spikes (MS) were conducted on AECOM samples. All MS recoveries (where reported) were within control limits with the exception of B001_0.0-0.2 where MS recovery was not determined for C15-28, C29-36, C16-34 and >C34-40.
Surrogate spike recovery	Surrogates were conducted on AECOM Samples. All surrogate recoveries were within control limits with the following exceptions: B016_0.0-0.2 – 2,4,6-Tribromophenol (142%), A013_0.0-0.2 – 2-Fluorobiphenyl (69.5%), QC150 – 2-Fluorobiphenyl (66.4%), QC157 – 2-Fluorobiphenyl (62.6%) and QC154 – 4-Terphenyl-d14 (133%)
QA/QC Data Evaluation	
Comparison of Field Observations and Laboratory Results	No anomalous results between field observations and analysis results were noted.
Comparison of the data and Laboratory Results	No anomalous results between data input and laboratory analysis results were noted.
Limits of reporting	Limits of Reporting (LORs) were sufficiently low to enable assessment against adopted guideline criteria.
Intra-laboratory duplicate RPDs	Three intra-laboratory duplicates were analysed and RPDs were within acceptable control limits, with the exception of the results listed in the comments below.
Inter-laboratory duplicate RPDs	Four inter-laboratory duplicates were analysed and RPDs were within acceptable control limits, with the exception of the results listed in the comments below.
Trip Spike Recoveries	The trip spike recoveries were within the acceptable range.
Chromatograms	
Not required.	
Other	

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 03/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	35 (refer to lab report)		
Laboratory:	ALS (primary), Eurofins (secondary)		
Project Manager:	Stephen Randall	**Lab report reference:**	ES1606083

Comments:
The following high RPDs are likely attributed to sample heterogeneity and do not affect the assessment of the results:

- Inter-laboratory duplicate A014.5_0.4-0.5/QC158: RPD for zinc 130%
- Intra-laboratory duplicate A013.5_0.0-0.2/QC157: RPD for TRH C10-C40 fractions 57 to 171%
- Intra-laboratory duplicate B010.5_0.4-0.5/QC150: RPD for zinc 45% and TRH C10-C14 fractions 188%

As mentioned by ALS:

- Poor matric spike recovery was obtained for Mercury on samples EP1602288-1 due to high matrix interface.
- Matrix spike recovery was not determined in the aforementioned analytes due to high concentrations.
- Particular samples required sample matrix dilution.
- Surrogate spike recoveries outside of recovery limits should not influence data integrity as all are outside of the range by <10%.

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 3/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	A005.5_0.0-0.2 B007.5_0.0-0.2 B035_0.0-0.3	B009.5_0.0-0.2 B012.5_0.0-0.2 B016_0.0-0.2	
Laboratory:	ALS (primary)		
Project Manager:	Stephen Randell	**Lab report reference:**	ES1607003

Key Issues:	No QA/QC issues were identified in the field or laboratory datasets that could have a material implication to decision-making on the project.

Field Quality Assurance and Quality Control	
Sampling personnel	All sampling was conducted by Kate Pigram on the 14,15 and 16 March 2016.
Sampling Methodology	Samples were collected directly from the hand auger or solid stem auger.
Chain of Custody (COC)	Chain of custody documents completed by Kate Pigram on original order. This additional analysis was requested by Stephen Randall.
Field Blank	Not applicable as re-batch of ES1606083.
Rinsate Blank	Not applicable as re-batch of ES1606083.
Trip Blank/Spike	Not applicable as re-batch of ES1606083.
Frequency of field QC	Not applicable as re-batch of ES1606083.
Handling and preservation	Samples were received preserved and chilled (3.5℃) at the laboratory. All samples were received at the laboratory in appropriate sample containers.

Laboratory QA/QC	
Tests requested/reported	Samples were analysed and reported as requested on the Chain Of Custody (COC).
Holding time compliance	Samples were extracted and analysed within recommended holding times.
Laboratory Accreditation	The laboratory analysis was conducted by ALS Environmental Pty Ltd (Sydney), which is a National Association of Testing Authorities (NATA) accredited laboratories.
Frequency of laboratory QC	The laboratory reported an insufficient frequency of quality control samples to assess whether the results have been reported to an acceptable accuracy and precision.
Method Blank	Method blank concentrations were not detected above the LOR for all analytes
Laboratory duplicate RPDs	Laboratory duplicates (LD) were conducted on anonymous samples. LD Relative Percentage Differences (RPD) was within control limits. The laboratory duplicate RPDs are presented in the laboratory Quality Control Report.
Laboratory control spike recovery	Laboratory Control Spike (LCS) recoveries were within control limits.
Matrix spike recovery	Matrix spikes (MS) were conducted on anonymous samples. All MS recoveries (where reported) were within control limits.
Surrogate spike recovery	Surrogates were conducted on anonymous Samples. All surrogate recoveries were within control limits

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 3/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	A005.5_0.0-0.2 B007.5_0.0-0.2 B035_0.0-0.3	B009.5_0.0-0.2 B012.5_0.0-0.2 B016_0.0-0.2	
Laboratory:	ALS (primary)		
Project Manager:	Stephen Randell	**Lab report reference:**	ES1607003

QA/QC Data Evaluation	
Comparison of Field Observations and Laboratory Results	No anomalous results between field observations and analysis results were noted.
Comparison of the data and Laboratory Results	No anomalous results between data input and laboratory analysis results were noted.
Limits of reporting	Limits of Reporting (LORs) were sufficiently low to enable assessment against adopted guideline criteria.
Intra-laboratory duplicate RPDs	Not applicable as re-batch of ES1606083.
Inter-laboratory duplicate RPDs	Not applicable as re-batch of ES1606083.
Trip Spike Recoveries	Not applicable as re-batch of ES1606083.

Chromatograms
Not applicable

Other
Comments:

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 03/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	13 Primary Samples (refer to lab reports)		
Laboratory:	ALS (primary)		
Project Manager:	Stephen Randall	**Lab report reference:**	ES1607647

Key Issues:	No QA/QC issues were identified in the field or laboratory datasets that could have a material implication to decision-making on the project.

Field Quality Assurance and Quality Control	
Sampling personnel	All sampling was conducted by Kate Pigram on the 14,15 and 16 March 2016.
Sampling Methodology	Samples were collected directly from the hand auger or solid stem auger.
Chain of Custody (COC)	Chain of custody documents completed by Kate Pigram.
Field Blank	No field blanks were utilised.
Rinsate Blank	Not applicable.
Trip Blank/Spike	Not applicable.
Frequency of field QC	No inter-laboratory or intra-laboratory duplicates were analysed.
Handling and preservation	All samples were received at the laboratory in appropriate sample containers.

Laboratory QA/QC	
Tests requested/reported	Samples were analysed and reported as requested on the Chain Of Custody (COC).
Holding time compliance	Not applicable.
Laboratory Accreditation	The laboratory analysis was conducted by ALS Environmental Pty Ltd (Sydney), which is a National Association of Testing Authorities (NATA) accredited laboratories.
Frequency of laboratory QC	The laboratory reported an insufficient frequency of quality control samples to assess whether the results have been reported to an acceptable accuracy and precision.
Method Blank	Method blank concentrations were not detected above the LOR for all analytes
Laboratory duplicate RPDs	Not applicable.
Laboratory control spike recovery	Not applicable.
Matrix spike recovery	Not applicable.
Surrogate spike recovery	Not applicable.

QA/QC Data Evaluation

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:** Kate McGrath	**Date:** 03/05/2016
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	13 Primary Samples (refer to lab reports)		
Laboratory:	ALS (primary)		
Project Manager:	Stephen Randall	**Lab report reference:**	ES1607647

Comparison of Field Observations and Laboratory Results	No anomalous results between field observations and analysis results were noted.
Comparison of the data and Laboratory Results	No anomalous results between data input and laboratory analysis results were noted.
Limits of reporting	Limits of Reporting (LORs) were sufficiently low to enable assessment against adopted guideline criteria.
Intra-laboratory duplicate RPDs	No intra-laboratory duplicates were analysed.
Inter-laboratory duplicate RPDs	No inter-laboratory duplicates were analysed.
Trip Spike Recoveries	Not applicable.

Chromatograms

Not applicable

Other

Comments:

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:**	**Date:**
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	B001_0.0-0.2, B036_0.0-0.2, B032_0.0-0.2, B009.5_0.0-0.2, B010.5_0.0-0.2, B003.5_0.0-0.2, B014_0.0-0.2, A006.5_0.0-0.2		
Laboratory:	ALS (primary),		
Project Manager:	Stephen Randall	**Lab report reference:**	ES1608579

Key Issues:	No QA/QC issues were identified in the field or laboratory datasets that could have a material implication to decision-making on the project.
Field Quality Assurance and Quality Control	
Sampling personnel	All sampling was conducted by Kate Pigram on the 14,15 and 16 March 2016.
Sampling Methodology	Samples were collected directly from the hand auger or solid stem auger.
Chain of Custody (COC)	Chain of custody documents completed by Kate Pigram on original order. This additional analysis was requested by Scott Robinson.
Field Blank	No field blanks were utilised.
Rinsate Blank	No rinsate blanks were analysed.
Trip Blank/Spike	No trip spikes were taken.
Frequency of field QC	No inter-laboratory or intra-laboratory duplicates were analysed.
Handling and preservation	Samples were received preserved and chilled at the laboratory. All samples were received at the laboratory in appropriate sample containers.
Laboratory QA/QC	
Tests requested/reported	Samples were analysed and reported as requested on the Chain Of Custody (COC).
Holding time compliance	Samples were extracted and analysed within recommended holding times.
Laboratory Accreditation	The laboratory analysis was conducted by ALS Environmental Pty Ltd (Sydney), which is a National Association of Testing Authorities (NATA) accredited laboratories.
Frequency of laboratory QC	The laboratory reported an insufficient frequency of quality control samples to assess whether the results have been reported to an acceptable accuracy and precision.
Method Blank	Method blank concentrations were not detected above the LOR for all analytes
Laboratory duplicate RPDs	Laboratory duplicates (LD) were conducted on anonymous and AECOM samples. LD Relative Percentage Differences (RPD) was within control limits. The laboratory duplicate RPDs are presented in the laboratory Quality Control Report.
Laboratory control spike recovery	Laboratory Control Spike (LCS) recoveries were within control limits.

DATA VALIDATION REPORT			
Project number:	60488804	**Validation by:** Hamish Watkins	**Date:** 02/05/2016
Client:	Caltex	**Data verified by:**	**Date:**
Site:	Kurnell		
Matrix type:	Soil		
Primary samples:	B001_0.0-0.2, B036_0.0-0.2, B032_0.0-0.2, B009.5_0.0-0.2, B010.5_0.0-0.2, B003.5_0.0-0.2, B014_0.0-0.2, A006.5_0.0-0.2		
Laboratory:	ALS (primary),		
Project Manager:	Stephen Randall	**Lab report reference:**	ES1608579

Matrix spike recovery	Matrix spikes (MS) were conducted on anonymous and AECOM samples. All MS recoveries (where reported) were within control limits.
Surrogate spike recovery	Surrogates were conducted on anonymous Samples. All surrogate recoveries were within control limits
QA/QC Data Evaluation	
Comparison of Field Observations and Laboratory Results	No anomalous results between field observations and analysis results were noted.
Comparison of the data and Laboratory Results	No anomalous results between data input and laboratory analysis results were noted.
Limits of reporting	Limits of Reporting (LORs) were sufficiently low to enable assessment against adopted guideline criteria.
Intra-laboratory duplicate RPDs	No intra-laboratory duplicates were analysed.
Inter-laboratory duplicate RPDs	No inter-laboratory duplicates were analysed.
Trip Spike Recoveries	No trip spike recoveries were analysed.
Chromatograms	
Other	
Comments:	