

# Environmental Service & Design

ABN: 97 107 517 144



15 January 2018

Carmel Parker  
Johnstone, McGee and Gandy Pty Ltd  
49-51 Elizabeth Street  
Launceston TAS 7250

Dear Carmel,

**RE: Preliminary Site Investigation, 8 Cavalry Road, Mowbray 7248**

Environmental Service and Design (ES&D) has investigated the site at 8 Cavalry Road, Mowbray 7248, in relation to any potentially contaminating activities formerly conducted thereon, including risk to potential receptors and other potential environmental issues which may arise due to development activities.

The assessment was guided by the principles and requirements contained within the National Environmental (Assessment of Site Contamination) Measure, 1999 (as amended) (NEPM) according to its status as a state policy.

The investigation comprised a Preliminary Site Investigation as defined in NEPM Schedule B2, Section 2.1:

“Preliminary site investigations (PSIs) usually include a desktop study to collect basic site information and identify the site characteristics (site location, land use, site layout, building construction, geological and hydrogeological setting, historical land uses and activities at the site), a site inspection and interviews with current and past owners, operators and occupiers of the site and nearby sites.

The preliminary investigation should be sufficient to:

- identify potential sources of contamination and determine potential contaminants of concern;
- identify areas of potential contamination;
- identify potential human and ecological receptors;
- identify feasible pathways by which contaminants and receptors may be linked;
- identify potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air)
- identify environmental issues which may arise because of development activities, or due to the change of use (increased disturbance due to increase in human activity).

With respect to contamination, if thorough preliminary investigation shows a history of non-contaminating activities and there is no other evidence or suspicion of contamination, further investigation is not required.”

Based on the site history which indicated potentially contaminating activities have occurred on the sites, the site is potentially contaminated and therefore may present a risk to potential receptors identified in the Conceptual Site Model (CSM). The CSM included potential offsite contamination.

As part of the PSI a judgmental soil sampling program was completed to determine risk as part of the development and based on the proposed usage soil sampling provided “background” conditions to the client.

Based on these results, site history and observations from two separate site visits, it is concluded the site is suitable for the proposed construction and use as a tyre storage facility.

As there is potential for dermal contact during excavation works of potentially contaminated land we need to ensure there is no adverse impact on human health or the environment, so the following development standards are applied (E2.6.2):

- (a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or
- (b) an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment; or
- (c) **a plan to manage contamination and associated risk to human health and the environment that includes:**
  - (i) an environmental site assessment;
  - (ii) any specific remediation and protection measures required to be implemented before excavation commences; and
  - (iii) a statement that the excavation does not adversely impact on human health or the environment.

The investigation is documented in the following pages

Yours sincerely,



Rod Cooper

Principal Consultant and SCPA Certified Practitioner



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# Preliminary Site Investigation

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8 Cavalry Road,  
Mowbray 7248

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Project No: 6093  
December 2017

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**PSI – 8 Cavalry Road, Mowbray 7248**

## Document Control

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Prepared For: Carmel Parker

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## Contents

<b>Preliminary Site Investigation</b> .....	<b>4</b>
<b>Document Control</b> .....	<b>5</b>
<b>1 Introduction</b> .....	<b>8</b>
<b>2 Scope of Works</b> .....	<b>9</b>
<b>3 Basis for Assessment</b> .....	<b>9</b>
<b>4 Site Details</b> .....	<b>9</b>
4.1 Ownership and Location .....	9
4.2 Zoning.....	10
<b>5 Site Description</b> .....	<b>11</b>
5.1 Surrounding Land Use .....	12
<b>6 Geology, Hydrology and Hydrogeology</b> .....	<b>12</b>
6.1 Topography .....	12
6.2 Surface Water.....	12
6.3 Regional Geology.....	12
6.4 Regional Hydrogeology .....	12
6.5 Acid Sulfate Soils .....	13
<b>7 Site History</b> .....	<b>14</b>
7.1 Aerial Photograph Review.....	14
7.2 WorkSafe Tasmania Dangerous Good Licenses .....	20
7.3 EPA Contaminated Land Register.....	20
<b>8 Site History Summary</b> .....	<b>20</b>
<b>9 Potential Site Contamination</b> .....	<b>21</b>
9.1 Storage of Vehicles.....	21
9.2 Offsite Sources .....	21
<b>10 Site Visits</b> .....	<b>22</b>
<b>11 Potential Receptors</b> .....	<b>24</b>
<b>12 Basis for Assessment</b> .....	<b>25</b>
<b>13 Analytical and Sampling Plan</b> .....	<b>28</b>
<b>14 Sampling Information</b> .....	<b>29</b>
<b>15 Sampling guidelines, standards and techniques</b> .....	<b>29</b>

15.1 QA/QC .....	30
<b>16 Results .....</b>	<b>30</b>
<b>17 Conclusions and Recommendations.....</b>	<b>32</b>
<b>18 Limitations .....</b>	<b>36</b>
<b>References .....</b>	<b>37</b>
<b>Appendices .....</b>	<b>38</b>
Appendix 1 – E-mail from WorkSafe .....	
Appendix 2 – ALS Results .....	
Appendix 3 - Sample Points.....	

## List of Tables

Table 1 Soil Assessment Criteria, Health Screening Levels / Health Investigation Levels .....	25
Table 2 Preliminary Conceptual Site Model.....	26
Table 3 Sample Information.....	28
Table 4 Soil Sampling Results.....	31
Table 5 Final Conceptual Site Model .....	34

## List of Figures

Figure 1 - Site Plan .....	10
Figure 2 - Zoning – General Industrial.....	11
Figure 3 - Inferred groundwater flow direction.....	13
Figure 4 - Aerial 1976.....	14
Figure 5 - Aerial 1984.....	15
Figure 6 - Aerial 1994.....	16
Figure 7 - Aerial 1997.....	17
Figure 8 - Aerial 2003.....	18
Figure 9 - Aerial 2006.....	19
Figure 10 – From site entrance facing north.....	22
Figure 11 – Top north-eastern corner of site with scrap yard at 59 Remount Rd.....	23
Figure 12 – Constructed bund completed on 20 <sup>th</sup> February 2017.....	24
Figure 13 – Soil sampling locations.....	29

## 1 Introduction

Environmental Service and Design (ES&D) were commissioned their client Johnstone, McGee and Gandy to undertake a Preliminary Site Investigation (PSI) on the proposed development at 8 Cavalry Road, Mowbray 7248. The aim of the PSI to establish whether activities have occurred on or near the site which may result in contamination of the land and if so, whether the level of risk will increase with the proposed development. The PSI will also outline potential environmental issues associated with the development.

The Launceston Interim Planning Scheme 2015 specifies that environmental site assessments in relation to potentially contaminating activities must be prepared by a suitably qualified person. Council indicated that suitably qualified persons include Site Contamination Practitioners Australia (SCPA) certified practitioners. Consequently, Mr Rod Cooper of Environmental Service and Design (SCPA certification no. 15020) was engaged to perform the assessment and completed a site inspection on the 14<sup>th</sup> of December 2017.

Under the Launceston Interim Planning Scheme 2015 the proposed development will need to satisfy the Contaminated Land Code E2.0. This is primarily site contamination but;

### *E2.6 Excavation:*

To ensure that works involving excavation of potentially contaminated land does not adversely impact on human health or the environment.

Excavation does not adversely impact on health and the environment, having regard to:

- (a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or
- (b) an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment; or
- (c) **a plan to manage contamination and associated risk to human health and the environment that includes:**
  - (i) **an environmental site assessment;**
  - (ii) **any specific remediation and protection measures required to be implemented before excavation commences; and**
  - (iii) **a statement that the excavation does not adversely impact on human health or the environment.**

In this circumstance this report will focus on E2.6 focusing on a plan to manage potential contamination and associated risk to human health and the environment.



## 2 Scope of Works

The scope of works included:

- examination of the site's history, including
  - oral history;
  - a search of WorkSafe Tasmania's (WST) general records management system, which holds information pertinent to potentially contaminating activities on land in Tasmania, including storage of dangerous goods (fuel storage), Environment Protection Authority (EPA) Environmentally Relevant Land Use Register, and Council database information;
- a site visit to check for any visual evidence that may indicate contamination of the site (addressed above), and an investigation of nearby properties.
- identification of potential human and ecological receptors and consideration of risks to identified receptors;
- construction of a preliminary Conceptual Site Model (CSM);
- conclusions and recommendations

## 3 Basis for Assessment

As a State Policy for the purposes of State policies and Procedures Act 1993, the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (NEPM) was the guideline used for the assessment.

The assessment included elements of a Preliminary Environmental Site Assessment as defined in NEPM Schedule B2. NEPM advises that if a thorough preliminary investigation shows a history of non-contaminating activities and there is no other evidence or suspicion of contamination, further investigation is not required (Schedule B2 and Section 2.1).

## 4 Site Details

### 4.1 Ownership and Location

Street Address	Property ID	Title Reference	Site Owner	Approximate Area (m <sup>2</sup> )
8 Cavalry Road, Mowbray	1911017	128392/1	Stephen John Orders & Vivienne Mary Orders	20460

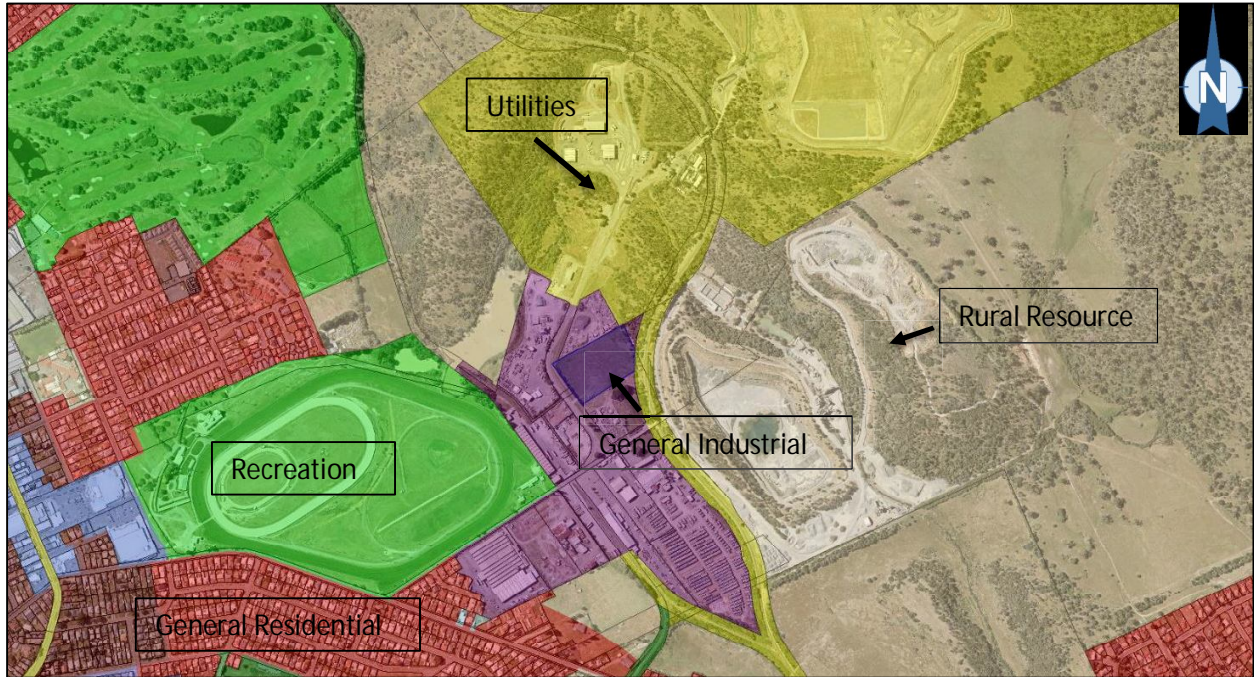


Figure 1 - Site Plan

## 4.2 Zoning

The site is currently zoned “General Industrial” (Launceston Interim Planning Scheme 2015, Figure 2) and is largely surrounded by “Rural Resource” to the east, “Utilities” to the north, “General Industrial” to the south, with “General Residential” to east.

The current zoning will not change as part of the proposed development and therefore the site has been assessed accordingly.



**Figure 2 - Zoning – General Industrial**

## 5 Site Description

8 Cavalry Road, is in a general industrial area in Mowbray. The site is predominantly cleared with a hedge remaining along Cavalry Road and some trees to the east and north on the site. The site is bound by Cavalry Road to the west, Remount Road to the East and Commercial properties to the north and south.

A DA was approved for the construction of a bund for the emergency storage of water as part of the development. Carmel Parker of Johnstone, McGee and Gandy visited the site in February 2017 as part of the DA construction and conducted PID readings. She noted that clay pockets within the soil showed black staining, however, there was no odour or VOC detected.

The land was utilised as an overflow for storage of vehicles from the adjacent wrecking yard for a short period of time between approximately 1997 and 2008. Prior to this the land was farmland, predominantly used for running horses, possibly related to the nearby racecourse usage.

The site is proposed for construction of up to twelve (12) pods of tyres, 20m long by 6m wide and 3m high, situated 20m apart. Additionally, a shed and hardstand area will be constructed along the south-west boundary.

## 5.1 Surrounding Land Use

North – Fulton Hogan offices with refuse area (inert waste) beyond

East – Railway line with Pistol Club and quarry beyond

South – Scrap yard with commercial properties beyond

West – Concrete batching plant

## 6 Geology, Hydrology and Hydrogeology

### 6.1 Topography

The site slopes gently to the west of the site. A review of Google Earth indicates elevations range from 41m AHD to 33m AHD.

### 6.2 Surface Water

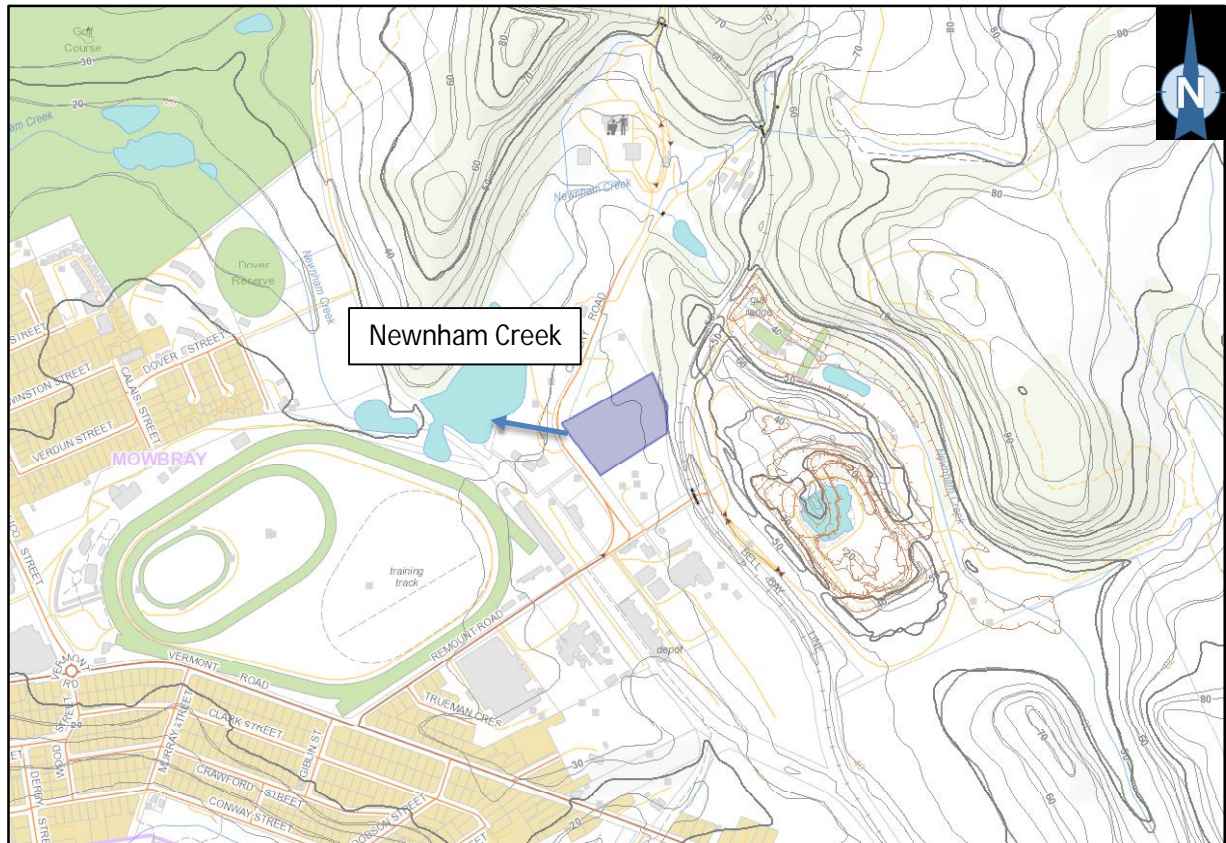
The nearest surface water body is a dam located 120m to the west of the site, which is on the course of Newnham Creek. Newnham Creek flows into the River Tamar.

### 6.3 Regional Geology

Review of the LIST (Land Information System Tasmania) indicates that the eastern section of the site is underlain with Jurassic dolerite rocks while the western portion is underlain with undifferentiated cenozoic sequences.

### 6.4 Regional Hydrogeology

Groundwater flow is likely to travel to the west towards the dam, which is on the course of Newnham Creek (Figure 3). Reference to the Department of Primary Industries, Parks, Water and Environment (DPIPWE) Groundwater Information Access Portal indicates there are no registered bores within 500m of the site. Groundwater is not extracted for drinking purposes in the area, water is supplied to the area from TasWater infrastructure.



**Figure 3 - Inferred groundwater flow direction**

## 6.5 Acid Sulfate Soils

Review of the LIST (Land Information System Tasmania) indicates that the sites has no identified potential containing acid sulfate soils based on the elevation (>5m).

## 7 Site History

The following information has been reviewed to determine the historical land uses and likelihood of contamination as a result.

### 7.1 Aerial Photograph Review

A review of aerial photographs on record on the LIST and were examined. Photos were available from 1950's, 1960's, 1979, 1990's and post 2004 on Google Earth.



Figure 4 - Aerial 1976



**Figure 5 - Aerial 1984**

**PSI – 8 Cavalry Road, Mowbray 7248**



**Figure 6 - Aerial 1994**

**PSI – 8 Cavalry Road, Mowbray 7248**





Figure 7 - Aerial 1997

PSI – 8 Cavalry Road, Mowbray 7248



**Figure 8 - Aerial 2003**

**PSI – 8 Cavalry Road, Mowbray 7248**



Figure 9 - Aerial 2006

## 7.2 WorkSafe Tasmania Dangerous Good Licenses

A search of the WorkSafe Tasmania Dangerous Goods Licenses was requested for the subject site. No licenses were identified at the site. E-mail correspondence attached as Appendix 1. Neighbouring Boral quarry to the east has a dangerous goods file only for the storage of explosives.

## 7.3 EPA Contaminated Land Register

A search of the EPA Tasmania's contaminated land register was conducted and determined the site has not been regulated, had any incidents/complaints nor been listed as potentially contaminated.

## 8 Site History Summary

Based on the review of the site, the site history is as follows

<b>Period</b>	<b>Site</b>
Prior to 1997	Vacant land
1997-2008	Scrap cars stored on site
2008-Curent	Vacant land

## 9 Potential Site Contamination

### 9.1 Storage of Vehicles

Previous environmental report and historical imagery details the site was occupied by vehicles for scrap, as an overflow from the site to the south. COPC include:

- Heavy metals (predominantly lead)
- Total Petroleum Hydrocarbons (TPH)
- Total Recoverable Hydrocarbons (TRH)
- Semi Volatile Organic Carbons (SVOC)
- Volatile Organic Carbons (VOC)
- Polyaromatic Hydrocarbons
- Glycol
- BTEXN

### 9.2 Offsite Sources

Based on the inferred groundwater flow direction, potentially contaminated groundwater may migrate from offsite sources. A dangerous goods file was requested from WorkSafe Tasmania for neighboring properties. 150 Remount Road to the east has a licence to store explosives on the site (Appendix 1), which does not impact the development. Potential impacts from scrap yard operations to the south, airborne contaminants from railway and cargo, the Boral quarry and storage of waste from council landfill operations are considered. It is considered unlikely that the groundwater would be contaminated from the landfill due to the design of the clay cells. Even so the geology in the area suggests solid rock for 15 meters and the boral quarry has groundwater in the base of the quarry at 20 meters AHD. Any groundwater contamination from the landfill would report to the quarry that is 15 meters lower than The Site. As a precaution vapour checks and soil checks did not detect landfill gas on The Site.

## 10 Site Visits

Carmel Parker of Johnstone, McGee and Gandy visited the site in February 2017 as part of the construction of an emergency bund. Clay pockets of soil showed black staining/streaks, however, no odour was noted. Volatile organic compounds were measured using a photoionization detector throughout the earthworks and no vapours were detected. No other signs of visible contamination were witnessed on the site.

Carmel again visited the site on the 4<sup>th</sup> of January 2018 to collect soil samples as part of the DA for the construction of the shed, hardstand and tyre pods. Samples were collected on a judgmental basis, focusing on potential receptors as part of the shed construction. As no visible staining was evident, or any other potential contamination, representative samples were collected across the remainder of the property.



**Figure 10 – From site entrance facing north**



**Figure 11 – Top north-eastern corner of site with scrap yard at 59 Remount Rd**



**Figure 12 – Constructed bund completed on 20<sup>th</sup> February 2017**

## **11 Potential Receptors**

A preliminary Conceptual Site Model (CSM) (Table 2) was developed after consideration of risks to potential human receptors as outlined below.

Risks to human health from storage of vehicles can arise via the inhalation route or by direct contact with contaminated soil, surface water or groundwater (e.g., ingestion, dermal contact, ocular or oral).

Future workers involved in the construction of the development were considered in the preliminary CSM, along with subsurface workers and Commercial/Industrial usage



## 12 Basis for Assessment

Health Screening Levels (HSLs) and Health Investigation Levels (HILs) provided in the *National Environmental protection (Assessment of Site Contamination) Measure 1999*, as amended April 11, 2013 (NEPM) were the designated criteria for assessing potential human health risks from contamination of soil from the storage of vehicles as applicable.

Soil screening / investigation levels considered are given in Table 1.

**Table 1 Soil Assessment Criteria, Health Screening Levels / Health Investigation Levels**

Land Use	Units – mg/kg	Commercial / Industrial
<b>HSLs - Derived from NEPM Schedule B1, Table 1A(3)</b>		HSL-D
		SAND
		0-1m
<b>Chemical</b>		
Naphthalene		NL
C <sub>6</sub> -C <sub>10</sub> (F1)		260
>C <sub>10</sub> -C <sub>16</sub> (F2)		NL
Benzene		3
Toluene		NL
Ethylbenzene		NL
Xylenes		230
<b>HILs – Derived from NEPM Schedule B1, Table 1A(1)</b>		
Arsenic		3000
Beryllium		500
Boron		300 000
Cadmium		900
Chromium		3600
Cobalt		4000
Copper		240 000
Lead		1500
Manganese		60 000
Nickel		6000
Selenium		10 000
Zinc		400 000
Mercury		730

**Table 2 Preliminary Conceptual Site Model**

Contamination Source	COPC	Pathway	Receptor
Vehicle storage	<ul style="list-style-type: none"> <li>● Heavy metals (predominantly lead)</li> <li>● Total Petroleum Hydrocarbons (TPH)</li> <li>● Total Recoverable Hydrocarbons (TRH)</li> <li>● Semi Volatile Organic Carbons (SVOC)</li> <li>● Volatile Organic Carbons (VOC)</li> <li>● Polyaromatic Hydrocarbons</li> <li>● Glycol</li> <li>● BTEXN</li> </ul>	Vapour inhalation of COPC in surface soils	<ul style="list-style-type: none"> <li>● Future site building users</li> <li>● Subsurface workers</li> <li>● Surrounding site users</li> </ul>
	<ul style="list-style-type: none"> <li>● Heavy metals (predominantly lead)</li> <li>● Total Petroleum Hydrocarbons (TPH)</li> <li>● Total Recoverable Hydrocarbons (TRH)</li> <li>● Semi Volatile Organic Carbons (SVOC)</li> <li>● Volatile Organic Carbons (VOC)</li> <li>● Polyaromatic Hydrocarbons</li> <li>● Glycol</li> </ul>	Dermal contact/ingestion of COPC in surface soils	<ul style="list-style-type: none"> <li>● Future site building users</li> <li>● Subsurface workers</li> </ul>

	<ul style="list-style-type: none"> <li>● BTEXN</li> </ul>		
	<ul style="list-style-type: none"> <li>● Heavy metals (predominantly lead)</li> <li>● Total Petroleum Hydrocarbons (TPH)</li> <li>● Total Recoverable Hydrocarbons (TRH)</li> <li>● Semi Volatile Organic Carbons (SVOC)</li> <li>● Volatile Organic Carbons (VOC)</li> <li>● Polyaromatic Hydrocarbons</li> <li>● Glycol</li> <li>● BTEXN</li> </ul>	Migration into soil and groundwater and subsequent ingestion/dermal contact or inhalation of COPC	<ul style="list-style-type: none"> <li>● Future site building users</li> <li>● Subsurface workers</li> <li>● Surrounding site users</li> <li>● Newnham Creek</li> </ul>

### 13 Analytical and Sampling Plan

Contaminants of potential concern (COPC) from the storage of vehicles that could be reasonably expected to disperse to the environment were included in the analytical plan. These comprised of Heavy metals, Petroleum Hydrocarbons, Glycol and BTEXN.

QC/QA samples included one field duplicate sample. The sampling and analytical plan is summarised in Table 3 and shown as figure 13. As per the preliminary CSM, the potential risk, albeit very minor, is from leaking oils and remnant fuels from the storage of vehicles.

**Table 3 Sample Information**

<i>Location</i>	<i>Number of samples</i>	<i>Number of duplicates</i>	<i>Total</i>	<i>TPH/TRH</i>	<i>Heavy metals</i>	<i>BTEXN</i>
Samples at proposed location of shed	2	0	2	X	X	X
Samples across site	4	1	5	X	X	X

Soil samples were collected directly from the drill auger and handled according to the documented QA/QC procedures. Samples were immediately placed into an esky with ice bricks, after collection, and were dispatched by overnight airfreight to the analytical laboratory. The analytical laboratory used for all samples was NATA certified Australian Laboratory Services (ALS), Springvale, Victoria. The sampling plan was developed and is shown in Appendix 3.

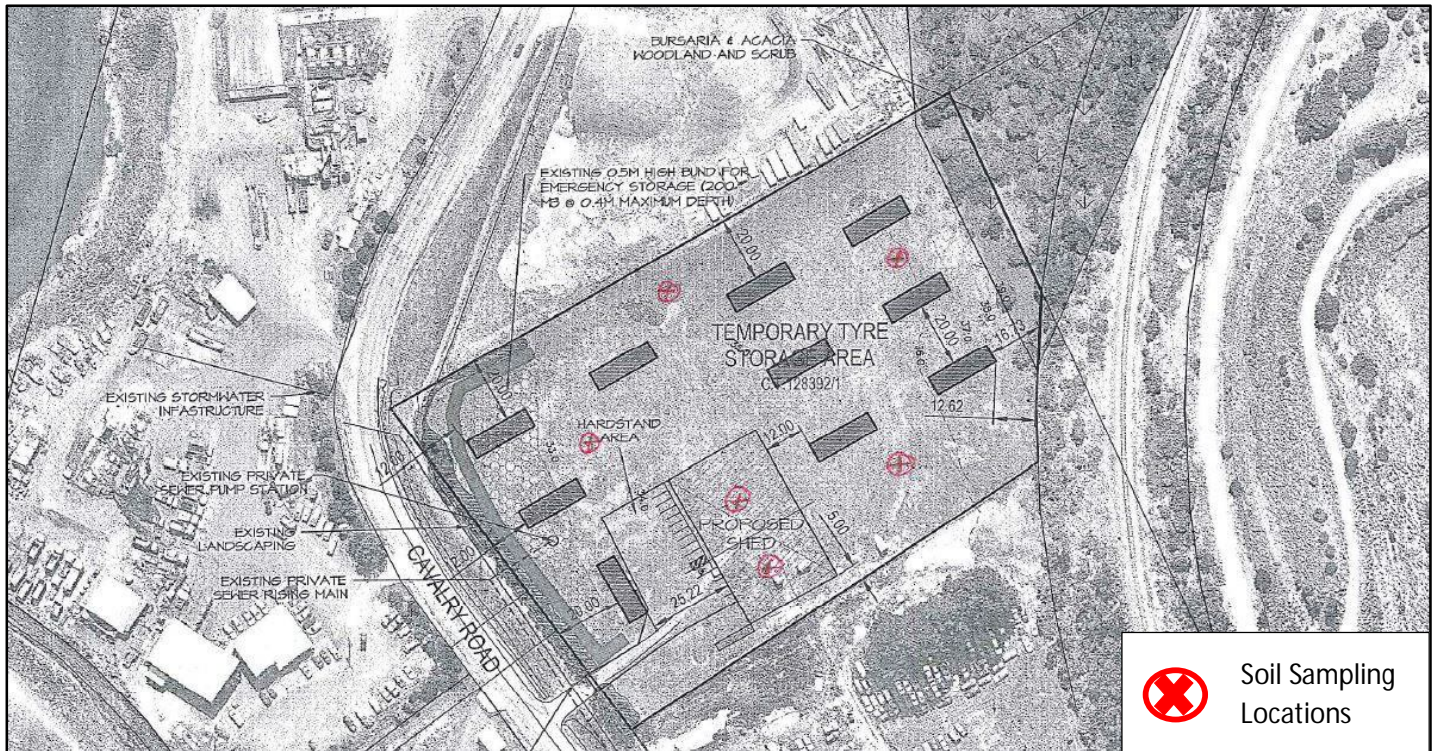


Figure 13 – Soil sampling locations

## 14 Sampling Information

Laboratory Certificates of Analysis (COA) for all samples are attached in Appendix 2. Sampling QA/QC protocols and QC results are presented below.

## 15 Sampling guidelines, standards and techniques

- NEPM Schedule B (2), *Guideline on Site Characterisation*; judgmental sampling
- AS 4482.1 (2005) Guide to the Sampling and Investigation of Potentially Contaminated Soil - Part 1: Non-Volatile and Semi Volatile Compounds
- AS 5667.1 (1998) Guidance on the design of sampling programs, sampling techniques and the preservation and handling of sampling

Soil samples were taken directly from the hand auger after digging to moist soil.

## 15.1 QA/QC

ALS Laboratory supplies a full QC report covering laboratory QA/QC activities with each COA. Field duplicates were collected as described above in Section 13.

Techniques used to prevent cross contamination of samples and ensure the integrity of samples were as follows:

- Samples were collected using a new pair of disposable gloves for each sample;
- The auger used for collection of soil samples was cleaned between samples by thoroughly rinsing with a solution of Decon 90, tap water and demineralised water; and
- All samples were immediately collected into ALS supplied analyte appropriate bottles, individually labelled, placed in an Eski with freezer packs and dispatched for overnight delivery to the Laboratory with an accompanying chain of custody document.

AS 4482.1 (2005) suggests that typical Measurable Data Quality Indicators (MDQI) should be  $\leq 50\%$  Relative Percentage Difference (RPD), and this was the adopted MDQI for all samples.

All primary and duplicate sample results and RPD calculations are “100%” as all results tested were below detection limits, so it was not deemed necessary to produce a table.

## 16 Results

The data is presented in Table 4 together with assessment criteria. Values above LORs are highlighted in bold black text; those above assessment criteria are highlighted in bold red text.

Table 4 Soil Sampling Results

Analyte	Units	SB1- 0.1m	SB2- 0.2m	SB3- 0.1m	SB4- 0.1m	SB5A- 0.2m	SB5B- 0.2m	SB6- 0.3m	SB1- 0.1m	NEPM HIL/HSL D 0-1m
Arsenic	mg/kg	5	<5	----	----	<5	----	----	<5	3000
Beryllium	mg/kg	1	<1	----	----	<1	----	----	<1	500
Boron	mg/kg	50	<50	----	----	<50	----	----	<50	300000
Cadmium	mg/kg	1	<1	----	----	<1	----	----	<1	900
Chromium	mg/kg	2	17	----	----	38	----	----	43	3600
Cobalt	mg/kg	2	2	----	----	3	----	----	20	4000
Copper	mg/kg	5	5	----	----	16	----	----	28	240000
Lead	mg/kg	5	13	----	----	8	----	----	12	1500
Manganese	mg/kg	5	168	----	----	32	----	----	655	60000
Nickel	mg/kg	2	3	----	----	6	----	----	11	6000
Selenium	mg/kg	5	<5	----	----	<5	----	----	<5	10000
Zinc	mg/kg	5	12	----	----	<5	----	----	9	400000
Mercury	mg/kg	0.1	<0.1	----	----	<0.1	----	----	<0.1	730
C6 - C10 Fraction minus BTEX (F1)	mg/kg	10	<10	<10	<10	<10	<10	<10	<10	260
>C10 - C16 Fraction	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	
>C16 - C34 Fraction	mg/kg	100	110	140	130	<100	140	150	<100	
>C34 - C40 Fraction	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	
>C10 - C40 Fraction (sum)	mg/kg	50	110	140	130	<50	140	150	<50	
>C10 - C16 Fraction minus Naphthalene (F2)	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	NL
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	3
Toluene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
ortho-Xylene	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Total Xylenes	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	230
Naphthalene	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	

## 17 Conclusions and Recommendations

The results of the preliminary site investigation, based on the site history, site assessment and desktop assessment, indicate vehicles were stored on the property in the 1990's and 2000's, which is considered a potentially contaminating activity.

A preliminary CSM (table 2) was constructed. A risk assessment was then conducted according to the principles and methodology contained within the NEPM and found risk to human health receptors may increase due to the development or previous activities on the site. The sampling plan was developed based on the CSM. Offsite sources were considered unlikely to be a source of contamination due to geology, the quarry being next door and site testing removing landfill gas as a risk.

The CSM found that there is potential risk to future workers from contact with soil, ingestion of soil. Subsurface workers and construction workers could also be exposed to the same risk in the future or during the implementation of the project.

ES&D considered the risk to residents, construction workers and subsurface workers from the proposed development and proposed a basic sampling program to determine likelihood of contamination and risk to receptors. Additionally, as the proposed DA is potentially contaminating soil samples collected prior to the development determined "background" conditions, which will enable the client to accurately assess the current levels of contamination and the influence of the activity over time.

Based on the soil sampling results, site history, neighboring operations and visual observations it is concluded that there is no vapour pathway and therefore no risk to future workers at the site.

Preliminary gas vapour assessment also determined that there were no vapours detected on site, confirming also that offsite contaminants (if any) are not impacting the groundwater or vapour on the site.

However, based on the potential for minor hydrocarbon and glycol spills to have occurred in the area proposed for the shed construction there is potential for subsurface workers to have dermal contact with contaminated soil. Therefore, specific protection measures are required to be implemented to protect subsurface workers during excavation and disposal of soil needs to be controlled:



- Protective clothing is required to prevent dermal contact – boots, gloves and disposable suits.
- Visual and odour assessment by the site supervisor should be conducted and if any odour or discolouration detected, a PID meter should be used to confirm that vapour levels are below the OH&S alarm limits (The PID will alarm if this occurs).
- All soil removed from site must be disposed of under the EPA waste tracking system.

A final CSM (table 5) was constructed. As there is potential for minor hydrocarbon contamination to be present where the shed is constructed, risk to subsurface receptors from the dermal contact pathway remains and must be managed during the construction phase. There is no ongoing risk to commercial occupants. Requirements under section (E2.6.2) of the Launceston *Interim Planning Scheme 2015* are met, ES&D propose the development proceed with the manage measures to protect the subsurface workers so the excavation can proceed. There is acceptable risk to human health and the environment with these measures in place.

It is noted that the soil sampling program is not considered a full site assessment and was only undertaken to determine the suitability of the site for its proposed use. Any additional developments or change of use will require an additional risk assessment.



A handwritten signature in black ink, appearing to read 'Rodney Cooper', written over a horizontal line.

Rod Cooper.

Certified Site Contamination Practitioner

**PSI – 8 Cavalry Road, Mowbray 7248**

**Table 5 Final Conceptual Site Model**

Contamination Source	COPC	Pathway	Receptor
Vehicle storage	<ul style="list-style-type: none"> <li>● Heavy metals (predominantly lead)</li> <li>● Total Petroleum Hydrocarbons (TPH)</li> <li>● Total Recoverable Hydrocarbons (TRH)</li> <li>● Semi Volatile Organic Carbons (SVOC)</li> <li>● Volatile Organic Carbons (VOC)</li> <li>● Polyaromatic Hydrocarbons</li> <li>● Glycol</li> <li>● BTEXIN</li> </ul>	Vapour inhalation of COPC in surface soils.	No contamination
	<ul style="list-style-type: none"> <li>● Heavy metals (predominantly lead)</li> <li>● Total Petroleum Hydrocarbons (TPH)</li> <li>● Total Recoverable Hydrocarbons (TRH)</li> <li>● Semi Volatile Organic Carbons (SVOC)</li> <li>● Volatile Organic Carbons (VOC)</li> </ul>	Dermal contact/ingestion of COPC in surface soils	Subsurface workers

	<ul style="list-style-type: none"> <li>● Polyaromatic Hydrocarbons</li> <li>● Glycol</li> <li>● BTEXN</li> </ul>		
	<ul style="list-style-type: none"> <li>● Heavy metals (predominantly lead)</li> <li>● Total Petroleum Hydrocarbons (TPH)</li> <li>● Total Recoverable Hydrocarbons (TRH)</li> <li>● Semi Volatile Organic Carbons (SVOC)</li> <li>● Volatile Organic Carbons (VOC)</li> <li>● Polyaromatic Hydrocarbons</li> <li>● Glycol</li> <li>● BTEXN</li> </ul>	<p>Migration into soil and groundwater from off site and subsequent ingestion/dermal contact or inhalation of COPC</p>	<p><b>No contamination</b></p>

## 18 Limitations

ES&D has prepared this report in accordance with the care and thoroughness of the consulting profession for Johnstone, McGee and Gandy Pty Ltd. It was based on 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.

This report was prepared during December 2017 and January 2018 and is based on the conditions encountered and information reviewed at the time of preparation. ES&D disclaims the responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for any use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice.

Subsurface conditions can vary across a site and cannot be explicitly defined by these investigations. It is unlikely therefore that the results and estimations expressed in this report will represent the extreme conditions within the site.

The information in this report is accurate at the date of issue and is in accordance with conditions at the site at the dates sampled.

This document and the information contained herein should only be regarded as validly representing the site conditions at the time of the investigation unless otherwise explicitly stated in a preceding section of the report.

No warranty or guarantee of property conditions is given or intended.

## References

Launceston City Council Interim Planning Scheme 2015

National Environmental Protection (Assessment of Site Contamination) Measure, *Guideline on the Investigation Levels for Soil and Groundwater*, Schedule B (1), (1999) as amended 2013

Land Information System Tasmania (the List): [www.thelist.tas.gov.au](http://www.thelist.tas.gov.au)

Department of Primary Industries, Parks, Water and Environment (DPIPWE) Groundwater Information Access Portal: <http://wrt.tas.gov.au/groundwater-info/>

## Appendices

## **Appendix 1 – E-mail from WorkSafe**

**PSI – 8 Cavalry Road, Mowbray 7248**

Case, Lorraine (DoJ) <Lorraine.Case@justice.tas.gov.au>

## **Dangerous goods search - 8 Cavalry Road and 59 and 150 Remount Road Mowbray**

Hi Sam

Nothing for Cavalry Road and, so far, only a DS file for 150 Remount (Boral) but at first glance of our database it seems to be only for storage of explosives.

I'll do a more thorough check tomorrow.

### ***Lorraine Case***

Administrative Officer  
Right to Information & Privacy Unit  
Department of Justice

Ph (03) 6166 4680 Fax (03) 6173 0206  
PO Box 56 Rosny Park TAS 7018  
[Lorraine.Case@justice.tas.gov.au](mailto:Lorraine.Case@justice.tas.gov.au)

Hi Sam

Confirming that WorkSafe Tasmania holds no information regarding past or present dangerous goods storage at 8 Cavalry Road, Mowbray.

I've had a look at the DG site file (9054) for Launceston Quarries (later Boral Construction Materials Group Ltd) and can confirm that only explosives were stored at the property on 150 Remount Road, Mowbray. The EPA's ERLUR database lists only an old Mines file (L2) for Remount Road - Launceston Quarries – date range 1955-59 – explosives magazine only.

Regards,  
Lorraine

### ***Lorraine Case***

Administrative Officer  
Right to Information & Privacy Unit  
Department of Justice

Ph (03) 6166 4680 Fax (03) 6173 0206  
PO Box 56 Rosny Park TAS 7018  
[Lorraine.Case@justice.tas.gov.au](mailto:Lorraine.Case@justice.tas.gov.au)



## Appendix 2 – ALS Results



**Environmental**

**CERTIFICATE OF ANALYSIS**

**Work Order** : EM1801098 **Page** : 1 of 7  
**Client** : JOHNSTONE MCGEE & GANDY PL **Laboratory** : Environmental Division Melbourne  
**Contact** : CARMEL PARKER **Contact** : Customer Services EM  
**Address** : 49-51 ELIZABETH STREET **Address** : 4 Westall Rd Springvale VIC Australia 3171  
                   LAUNCESTON TAS 7250  
**Telephone** : +61 03 6334 5548 **Telephone** : +61-3-8549 9600  
**Project** : J179003EL **Date Samples Received** : 05-Jan-2018 11:20  
**Order number** : J179003EL **Date Analysis Commenced** : 08-Jan-2018  
**C-O-C number** : ---- **Issue Date** : 09-Jan-2018 14:08  
**Sampler** : CARMEL PARKER  
**Site** : ----  
**Quote number** : EN/222/17  
**No. of samples received** : 7  
**No. of samples analysed** : 7



Accreditation No. 825  
Accredited for compliance with  
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

**Signatories**

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

Signatories	Position	Accreditation Category
Andrew Lu	VOC Section Supervisor	Melbourne Organics, Springvale, VIC
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC



Page : 2 of 7  
Work Order : EM1801098  
Client : JOHNSTONE MCGEE & GANDY PL  
Project : J179003EL

### 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

∅ = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.



**Analytical Results**

Compound	CAS Number	LOR	Client sampling date / time		Client sample ID	
			Unit	%	SB1-0.1m	SB2-0.2m
<b>EA055: Moisture Content (Dried @ 105-110°C)</b>						
Moisture Content	----	1.0	%	11.1	6.6	9.7
<b>EG005T: Total Metals by ICP-AES</b>						
Arsenic	7440-38-2	5	mg/kg	<5	---	---
Barium	7440-39-3	10	mg/kg	30	---	<5
Beryllium	7440-41-7	1	mg/kg	<1	---	20
Boron	7440-42-8	50	mg/kg	<50	---	<1
Cadmium	7440-43-9	1	mg/kg	<1	---	<50
Chromium	7440-47-3	2	mg/kg	17	---	<1
Cobalt	7440-48-4	2	mg/kg	2	---	38
Copper	7440-50-8	5	mg/kg	5	---	3
Lead	7439-92-1	5	mg/kg	13	---	16
Manganese	7439-96-5	5	mg/kg	168	---	8
Nickel	7440-02-0	2	mg/kg	3	---	32
Selenium	7782-49-2	5	mg/kg	<5	---	6
Vanadium	7440-62-2	5	mg/kg	99	---	<5
Zinc	7440-66-6	5	mg/kg	12	---	156
<b>EG035T: Total Recoverable Mercury by FIMS</b>						
Mercury	7439-97-6	0.1	mg/kg	<0.1	---	<0.1
<b>EP080/071: Total Petroleum Hydrocarbons</b>						
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	100	<50
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>						
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	110	140	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	110	140	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50



Page : 4 of 7  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

## Analytical Results

Compound	CAS Number	LOR	Unit	Client sample ID					
				Client sampling date / time	SB1-0.1m	SB2-0.2m	SB3-0.1m	SB4-0.1m	SB5A-0.2m
				04-Jan-2018 00:00	04-Jan-2018 00:00	04-Jan-2018 00:00	04-Jan-2018 00:00	04-Jan-2018 00:00	04-Jan-2018 00:00
				EM1801098-001	EM1801098-002	EM1801098-003	EM1801098-004	EM1801098-005	
				Result	Result	Result	Result	Result	Result
<b>EP080: BTEXN</b>									
Benzene	71-43-2	0.2	mg/kg	<0.2	<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	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<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	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1	<1
<b>EP080S: TPH(V)/BTEX Surrogates</b>									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	92.9	81.7	85.2	87.9	82.4	
Toluene-D8	2037-26-5	0.2	%	98.3	86.8	89.7	92.9	86.2	
4-Bromofluorobenzene	460-00-4	0.2	%	121	108	113	119	109	



### Analytical Results

Compound	CAS Number	Client sample ID		SB6-0.3m	SB6-0.2m	SB6-0.3m
		LOR	Unit			
Sub-Matrix: SOIL (Matrix: SOIL)		Client sampling date / time	Unit	04-Jan-2018 00:00	04-Jan-2018 00:00	04-Jan-2018 00:00
<b>EA055: Moisture Content (Dried @ 105-110°C)</b>						
Moisture Content	----	1.0	%	20.8	10.0	20.8
<b>EG005T: Total Metals by ICP-AES</b>						
Arsenic	7440-38-2	5	mg/kg	<5	----	----
Barium	7440-39-3	10	mg/kg	120	----	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----
Boron	7440-42-8	50	mg/kg	<50	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----
Chromium	7440-47-3	2	mg/kg	43	----	----
Cobalt	7440-48-4	2	mg/kg	20	----	----
Copper	7440-50-8	5	mg/kg	28	----	----
Lead	7439-92-1	5	mg/kg	12	----	----
Manganese	7439-96-5	5	mg/kg	655	----	----
Nickel	7440-02-0	2	mg/kg	11	----	----
Selenium	7782-49-2	5	mg/kg	<5	----	----
Vanadium	7440-62-2	5	mg/kg	182	----	----
Zinc	7440-66-6	5	mg/kg	9	----	----
<b>EG035T: Total Recoverable Mercury by FIMS</b>						
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----
<b>EP080/071: Total Petroleum Hydrocarbons</b>						
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg	<100	120	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	120	----
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>						
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg	150	<100	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	150	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----



Page : 6 of 7  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

### Analytical Results

Compound	CAS Number	LOR	Unit	Client sample ID	
				Client sampling date / time	Client sample ID
				SB6B-0.2m	SB6-0.3m
				04-Jan-2018 00:00	04-Jan-2018 00:00
				EM1801098-006	EM1801098-007
				Result	Result
<b>EP080: BTEXN</b>					
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5
meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1
<b>EP080S: TPH(V)/BTEX Surrogates</b>					
1,2-Dichloroethane-D4	17060-07-0	0.2	%	76.0	77.8
Toluene-D8	2037-26-5	0.2	%	78.9	85.2
4-Bromofluorobenzene	460-00-4	0.2	%	97.1	107



Page : 7 of 7  
Work Order : EM1801098  
Client : JOHNSTONE MCGEE & GANDY PL  
Project : J179003EL

### Surrogate Control Limits

Sub-Matrix: SOIL			
Compound	CAS Number	Recovery Limits (%)	
		Low	High
<b>EP080S: TPH(V)/BTEX Surrogates</b>			
1,2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124





**Environmental**

**QUALITY CONTROL REPORT**

Work Order : **EM1801098**

Page : 1 of 6

Client : **JOHNSTONE MCGEE & GANDY PL**

Laboratory : Environmental Division Melbourne

Contact : **CARMEL PARKER**

Contact : Customer Services EM

Address : **49-51 ELIZABETH STREET**

Address : 4 Westall Rd Springvale VIC Australia 3171

Telephone : **+61 03 6334 5548**

Telephone : +61-3-8549 9600

Project : **J179003EL**

Date Samples Received : 05-Jan-2018

Order number : **J179003EL**

Date Analysis Commenced : 08-Jan-2018

C-O-C number : **----**

Issue Date : 09-Jan-2018

Sampler : **CARMEL PARKER**

Site : **----**

Quote number : **EN/222/17**

No. of samples received : 7

No. of samples analysed : 7



Accreditation No. 825  
Accredited for compliance with  
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

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

**Signatories**

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

Signatories	Position	Accreditation Category
Andrew Lu	VOC Section Supervisor	Melbourne Organics, Springvale, VIC
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC



Page : 2 of 6  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

### 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 : Anonymus = 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 sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report			Recovery Limits (%)
						Original Result	Duplicate Result	RPD (%)	
<b>EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 1356541)</b>									
EM1801097-001	Anonymous	EA055: Moisture Content	----	1	%	6.6	7.8	17.8	No Limit
<b>EG005T: Total Metals by ICP-AES (QC Lot: 1356529)</b>									
EM1801097-001	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	350	300	16.8	0% - 20%
		EG005T: Chromium	7440-47-3	2	mg/kg	44	38	15.6	0% - 20%
		EG005T: Cobalt	7440-48-4	2	mg/kg	20	19	0.00	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	66	60	10.7	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	39	35	10.7	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	50	43	15.9	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	126	128	1.80	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	304	261	15.1	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	53	50	5.71	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	447	439	1.86	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
<b>EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1356530)</b>									
EM1801097-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.3	0.4	0.00	No Limit
<b>EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1356521)</b>									
EM1801097-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
<b>EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1356523)</b>									
EM1801097-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	270	280	4.39	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	160	170	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit



Page : 3 of 6  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

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 (%)		
<b>EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1356523) - continued</b>											
EM1801097-001	Anonymous	EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	430	450	4.54	No Limit		
<b>EP080/071: Total Recoverable Hydrocarbons - NIEPM 2013 Fractions (QC Lot: 1356521)</b>											
EM1801097-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit		
<b>EP080/071: Total Recoverable Hydrocarbons - NIEPM 2013 Fractions (QC Lot: 1356523)</b>											
EM1801097-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	380	400	4.42	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		
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	380	400	5.13	No Limit		
<b>EP080: BTEXN (QC Lot: 1356521)</b>											
EM1801097-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit		
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit		
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit		
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit		
			106-42-3								
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit		
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit		



Page : 4 of 6  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

### 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/Compound	CAS Number	LOR	Unit	Method Blank (MB) Report		Laboratory Control Spike (LCS) Report			
				Result	Concentration	Spike Recovery (%)	LCS	Low	High
<b>EG005T: Total Metals by ICP-AES (QCLot: 1356529)</b>									
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	101	79	113	
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	81.2	79	110	
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	90.2	85	120	
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	99.4	82	126	
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	94.2	85	109	
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	99.4	83	109	
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	83.0	78	112	
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	78.3	78	108	
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	95.3	78	106	
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	84.4	82	107	
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	85.5	82	111	
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	98.0	93	109	
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	83.9	80	109	
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	82.4	82	111	
<b>EG035T: Total Recoverable Mercury by FIMS (QCLot: 1356530)</b>									
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	77.3	77	104	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1356521)</b>									
EP080: C6 - C9 Fraction	---	10	mg/kg	<10	36 mg/kg	104	70	127	
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1356523)</b>									
EP071: C10 - C14 Fraction	---	50	mg/kg	<50	806 mg/kg	96.8	80	120	
EP071: C15 - C28 Fraction	---	100	mg/kg	<100	3006 mg/kg	98.2	84	115	
EP071: C29 - C36 Fraction	---	100	mg/kg	<100	1584 mg/kg	94.5	80	112	
EP071: C10 - C36 Fraction (sum)	---	50	mg/kg	<50	---	---	---	---	
<b>EP080/071: Total Recoverable Hydrocarbons - NIEPM 2013 Fractions (QCLot: 1356521)</b>									
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	104	68	125	
<b>EP080/071: Total Recoverable Hydrocarbons - NIEPM 2013 Fractions (QCLot: 1356523)</b>									
EP071: >C10 - C16 Fraction	---	50	mg/kg	<50	1160 mg/kg	96.1	83	117	
EP071: >C16 - C34 Fraction	---	100	mg/kg	<100	3978 mg/kg	99.0	82	114	
EP071: >C34 - C40 Fraction	---	100	mg/kg	<100	313 mg/kg	96.0	73	115	
EP071: >C10 - C40 Fraction (sum)	---	50	mg/kg	<50	---	---	---	---	
<b>EP080: BTEXN (QCLot: 1356521)</b>									
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	109	74	124	
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	104	77	125	



Page : 5 of 6  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

Sub-Matrix: SOIL				Method Blank (MB) Report		Laboratory Control Spike (LCS) Report			
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	Spike Recovery (%)	LCS	Low	High
<b>EP080: BTEXN (QCLot: 1356521) - continued</b>									
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	110	110	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	110	110	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	110	110	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	104	104	66	130

### 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 (DOOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL		Matrix Spike (MS) Report									
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike		Spike Recovery (%)		Recovery Limits (%)			
				Concentration	MS	Low	High				
<b>EG005T: Total Metals by ICP-AES (QCLot: 1356529)</b>											
EM1801097-002	Anonymous										
		EG005T: Arsenic	7440-38-2	50 mg/kg	90.8	78	124				
		EG005T: Barium	7440-39-3	50 mg/kg	93.9	71	135				
		EG005T: Beryllium	7440-41-7	50 mg/kg	100	85	125				
		EG005T: Cadmium	7440-43-9	50 mg/kg	92.3	84	116				
		EG005T: Chromium	7440-47-3	50 mg/kg	95.6	79	121				
		EG005T: Copper	7440-50-8	50 mg/kg	98.7	82	124				
		EG005T: Lead	7439-92-1	50 mg/kg	92.0	76	124				
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136				
		EG005T: Nickel	7440-02-0	50 mg/kg	111	78	120				
		EG005T: Selenium	7782-49-2	50 mg/kg	84.3	71	125				
		EG005T: Vanadium	7440-62-2	50 mg/kg	93.8	76	124				
		EG005T: Zinc	7440-66-6	50 mg/kg	80.9	74	128				
<b>EG035T: Total Recoverable Mercury by FIMS (QCLot: 13566530)</b>											
EM1801097-002	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	86.2	76	116				
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1356521)</b>											
EM1801097-002	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	75.2	42	131				
<b>EP080/071: Total Petroleum Hydrocarbons (QCLot: 1356523)</b>											
EM1801098-001	SB1-0.1m	EP071: C10 - C14 Fraction	----	806 mg/kg	98.2	53	123				
		EP071: C15 - C28 Fraction	----	3006 mg/kg	98.0	70	124				
		EP071: C29 - C36 Fraction	----	1584 mg/kg	94.9	64	118				
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 13566521)</b>											
EM1801097-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	79.8	39	129				



Page : 6 of 6  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report		
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1356523)</b>						
EM1801098-001	SB1-0.1m	EP071: >C10 - C16 Fraction	----	1160 mg/kg	96.7	65
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	99.0	67
		EP071: >C34 - C40 Fraction	----	313 mg/kg	98.3	44
<b>EP080: BTEXN (QCLot: 1356521)</b>						
EM1801097-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	99.0	50
		EP080: Toluene	108-88-3	2 mg/kg	106	56
						136
						139



**Environmental**

## QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1801098	Page	: 1 of 5
Client	: JOHNSTONE MCGEE & GANDY PL	Laboratory	: Environmental Division Melbourne
Contact	: CARMEL PARKER	Telephone	: +61-3-8549 9600
Project	: J179003EL	Date Samples Received	: 05-Jan-2018
Site	: ----	Issue Date	: 09-Jan-2018
Sampler	: CARMEL PARKER	No. of samples received	: 7
Order number	: J179003EL	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 expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

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

### Summary of Outliers

#### Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

#### Outliers : Analysis Holding Time Compliance

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

#### Outliers : Frequency of Quality Control Samples

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



Page : 2 of 5  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

**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
<b>Matrix Spike (MS) Recoveries</b>							
EG005T: Total Metals by ICP-AES	EM1801097-002	Anonymous	Manganese	7439-96-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

**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	Evaluated	Due for analysis	
<b>EG005T: Moisture Content (Dried @ 105-110°C)</b>							
Soil Glass Jar - Unpreserved (EA055)	SB2-0.2m, SB1-0.1m, SB3-0.1m, SB5A-0.2m, SB6-0.3m	04-Jan-2018	---	----	----	18-Jan-2018	✓
<b>EG005T: Total Metals by ICP-AES</b>							
Soil Glass Jar - Unpreserved (EG005T)	SB4-0.1m, SB6-0.3m	04-Jan-2018	08-Jan-2018	03-Jul-2018	✓	08-Jan-2018	✓
<b>EG035T: Total Recoverable Mercury by FIMS</b>							
Soil Glass Jar - Unpreserved (EG035T)	SB1-0.1m, SB6-0.3m	04-Jan-2018	08-Jan-2018	01-Feb-2018	✓	08-Jan-2018	✓
<b>EP080/071: Total Petroleum Hydrocarbons</b>							
Soil Glass Jar - Unpreserved (EP080)	SB1-0.1m, SB3-0.1m, SB5A-0.2m, SB6-0.3m	04-Jan-2018	08-Jan-2018	18-Jan-2018	✓	08-Jan-2018	✓





Page : 3 of 5  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

Matrix: SOIL Evaluation: x = Holding time breach ; ✓ = Within holding time.

Method	Container / Client Sample ID(s)	Sample Date		Extraction / Preparation		Analysis	
		Date extracted	Due for extraction	Date analysed	Due for analysis	Evaluation	Evaluation
<b>EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions</b>							
<b>Soil Glass Jar - Unpreserved (EP080)</b>							
SB1-0.1m,	SB2-0.2m,	04-Jan-2018	18-Jan-2018	08-Jan-2018	18-Jan-2018	✓	✓
SB3-0.1m,	SB4-0.1m,						
SB5A-0.2m,	SB5B-0.2m,						
SB6-0.3m							
<b>EP080: BTEXN</b>							
<b>Soil Glass Jar - Unpreserved (EP080)</b>							
SB1-0.1m,	SB2-0.2m,	04-Jan-2018	18-Jan-2018	08-Jan-2018	18-Jan-2018	✓	✓
SB3-0.1m,	SB4-0.1m,						
SB5A-0.2m,	SB5B-0.2m,						
SB6-0.3m							



## 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: x = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count			Rate (%)		Evaluation
		QC	Regular	Actual	Expected		
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
Moisture Content	EA055	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatle Fraction	EP071	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
<b>Laboratory Control Samples (LCS)</b>							
Total Mercury by FIMS	EG035T	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatle Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
<b>Method Blanks (MB)</b>							
Total Mercury by FIMS	EG035T	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatle Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
<b>Matrix Spikes (MS)</b>							
Total Mercury by FIMS	EG035T	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatle Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard



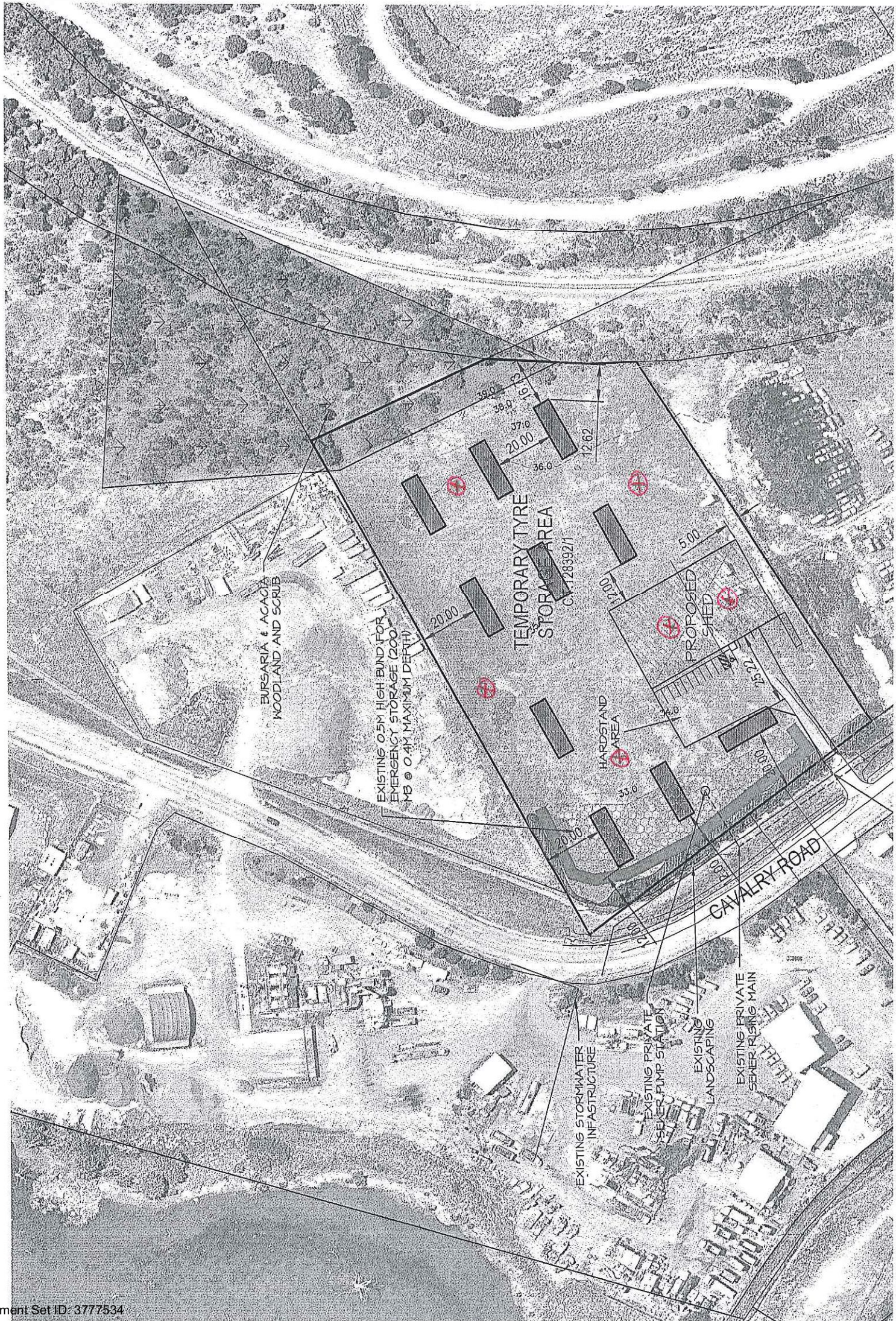
Page : 5 of 5  
 Work Order : EM1801098  
 Client : JOHNSTONE MCGEE & GANDY PL  
 Project : J179003EL

## 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	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The 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 (SnCl <sub>2</sub> ) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl <sub>2</sub> 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. Compliant with NEPM amended 2013.
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. Compliant with NEPM amended 2013.
Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na <sub>2</sub> SO <sub>4</sub> 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.

## Appendix 3 - Sample Points



BURSARIA & ACACIA  
WOODLAND AND SCRUB

EXISTING 0.5M HIGH BUND FOR  
EMERGENCY STORAGE (200  
MB @ 0.4M MAXIMUM DEPTH)

TEMPORARY TYRE  
STORAGE AREA  
CA 128892/1

PROPOSED  
SHED

HARDSTAND  
AREA

CAVALRY ROAD

EXISTING STORMWATER  
INFRASTRUCTURE

EXISTING PRIVATE  
SEWER PUMP STATION

EXISTING  
LANDSCAPING

EXISTING PRIVATE  
SEWER RISING MAIN

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38.0  
37.0  
36.0

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Photo 1 - SB2 located in vicinity of proposed shed



Photo 2 - SB3 located approx. 30 metres from the southern boundary



Photo 3 - SB4 located near the western boundary in a recently disturbed area



Photo 4 - SB5 located near the north eastern corner of the site. The ground surface had less grass coverage and signs of disturbance



Photo 5 - SB6 located in the north western corner of the site.