

Tarago - Rail Siding Extension

Preliminary Contaminated Site Assessment

June 2015

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TARAGO RAILWAY SIDING EXTENSION PRELIMINARY CONTAMINATION INVESTIGATION

Tarago Railway Siding
Goulburn Street
Tarago, NSW 2580
June 2015

Project brief

Work was carried out to suit the scope of works as provided by Jenny Walsh of NGH Environmental in relation to the extension of the Tarago Railway siding extension. The preliminary contaminated site assessment is used as a baseline report to validate any contamination on site and assess the need for further testing of soils for material that may pose a threat to human health or the environment. All works were undertaken to the relevant NSW Environmental Protection Authority (EPA) guidelines and standards, and laboratory results were compared to the (National Environment Protection Measure) NEPM 2013 measure for the assessment of site contamination for commercial and industrial sites.

Executive Summary

The majority of soils tested were below threshold levels for all contaminants for the existing land use, however a number of samples returned above threshold level values for lead contamination. Upgrade works may be carried out on site once suitable PPE is worn and appropriate precautions are in place. The lead contamination is confined to areas of minimal disturbance along the planned siding extension. In these areas the track is planned to be lifted and new sleepers and ballast placed under the existing line. It is therefore recommended that if appropriate PPE is worn to minimise exposure to lead from site disturbance, risk to human health will be abated.

Site Identification

Address: Goulburn Street, Tarago, NSW 2580

Real property description: DP 1202608



Centre co-ordinate: E – 741773, N – 6115995, MGA 94 GDA z55

Local Government Area: Goulburn Mulwaree Council

Property size: Not known

Present use: Industrial land

Certification

Name	Signed	Date	Revision Number
James Maloney BSc (Hons) GradDip ChemEng		29/06/15	0
David McMahon BAppSc GradDip WRM ASSSI		29/06/15	0

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1.0 Characteristics of the site

A desktop review and investigation of the topography, hydrology, soil, lithology, geology and hydrogeology of the site has been undertaken and are as follows:

1.1 Topography

The Lake Bathurst 1:25,000 Topographic Map (Sheet 8827-4N) indicates that the site is located at an elevation of between 685 metres AHD and 690 metres AHD along the investigation path. At the Northern point of the investigation, a cutting has been made to the western side of the rail line into the side of a knoll which rises to 710 metres with a fall to 680 metres on the eastern side of the rail line to the Braidwood Road. The investigation site landform is classed as a flat with the slope being classed as level to very gently inclined.

1.2 Vegetation

The vegetated areas are covered with annual and perennial grass and broadleaf species with exposed patches running throughout. The investigation area is bordered by trees along the northern curve to both the east and west sides of the rail corridor. The tracks are mounted on ballast along the length of the investigation area.

1.3 Hydrology

A number (at least three) unnamed drainages run across the investigation area from the west to the Mulwaree River floodplain to the east of the investigation area. At its nearest point to the investigation area a tributary of the Mulwaree River is approximately 140 metres away.

1.4 Weather

The average rainfall is approximately 683.4 mm per annum, with the wettest months being October, November, December and January – Lake Bathurst (Somerton) 070036 (7.3km Away). Tarago is characterised by cold wet winters and hot dry summers with mean maximum temperatures ranging from 13.1 °C in July to 31.1 °C in January and mean minimum temperatures ranging from 9.1°C in July to 23.7°C in January, Goulburn Airport AWS 070330 (30.9km away), (www.bom.gov.au).

1.5 Soil & Landform

Based on the Australian Soil Classification Map the site lies within a predominantly Kandosol soil type. A kandosol soil is defined as:

*“Soils other than Hydrosols which have **all** of the following:*

- i. B2 horizons in which the major part is massive or has only a weak grade of structure.*
- ii. A maximum clay content in some part of the B2 horizon which exceeds 15% (ie. heavy sandy loam, SL+).*
- iii. Do not have a tenic B horizon.*
- iv. Do not have clear or abrupt textural B horizons.*
- v. Are not calcareous throughout the solum, or below the A1 or Ap horizon or to a depth of 0.2m if the A1 horizon is only weakly developed.”*

Based on the Great Soil Group Classification for soils in the area are described as *Yellow Earth*. The hydrological soil group description in the Tarago area are described as very slow infiltrating soils. The soil fertility for the area can be described as moderately low inherent soil fertility with very severe limitations to the land and soil capability.

The site lies within the soil mapping unit coded as MORASS 8827ms from the NSW Environment & Heritage soil and land information eSPADE. Two soil landscapes lie within the MORASS classification which are *muz* and *msy*.

MORASS *muz* (Mulwaree Chain of Ponds) soils are considered alluvial soil and can be found along the southern parts of the investigation area with the following classification: Undulating to level floodplain of the Mulwaree Chain of Ponds in the Mulwaree River Catchment physiographic region.

Landscape *Undulating to level flood plain on Quaternary Alluvium (alluvium) in the Mulwaree Plains, Braidwood Rises and Bullamalito Hills. Local relief 0-10 m; altitude 620-705 m; slopes 1-5%; rock outcrop nil. Extensively cleared grassland (tussock).*

Soils *Redoxic Hydrosols (No Suitable Group), Yellow Kurosols (Yellow Podzolic Soils/Soloths), Grey Dermosols (Grey Clays) and Yellow Kandosols (Yellow Earths).*

Vegetation *Original community a tussock grassland with isolated woodland trees. Almost completely altered with introduced pasture species and weeds. Isolated patches of trees occur including Eucalyptus pauciflora (snow gum), E. viminalis (ribbon gum) and E. rubida (candlebark). Along the creek line introduced Salix fragillis and Salix babylonica (willows) are common. Groundcover is essentially a mixture of introduced and native species including Phalaris aquatica (phalaris), Stipa sp. (spear grass), Paspalum dilatatum (paspalum), Conyza sp. (fleabane), Hypochaeris radicata (catsear), Plantago lanceolata (ribwort), Poa sp. (tussock grass), Juncus sp. (juncus), Briza major (quaking grass), Lomandra longifolia (spiny-headed mat-rush), Imperata cylindrica (blady grass) and Danthonia sp. (wallaby grass). Within the current stream channel Phragmites australis (common reed), Typha orientale (cumbungi), and Juncus sp. (rush) are common. Avena sp. (oats) and Medicago sativa (lucerne) are commonly sown as fodder crops on the backplain. Problem weeds include Salix sp. (willows), Crataegus sp. (hawthorn), Rosa rubiginosa (briar) and Rubus fruticosus (blackberry).*

MORASS *msy* soils are considered residual soils and can be found along the northern parts of the investigation area with the following classification:

Landscape *Rises on Tertiary Alluvium (sandstone-quartz) in the Lake Bathurst Basin and Butmaroo Hills. Local relief 0-30 m; altitude 667-790 m; slopes 3-10%; rock outcrop 2-10%. Extensively cleared open woodland.*

Soils *Tenosols (Lithosols), Yellow Kandosols (Yellow Earths) and Kurosols (Solodic Soils, Yellow Podzolic Soils).*

Vegetation *Cleared woodland with frost pocket communities of grassland. Species include Eucalyptus pauciflora (snow gum), Acacia dealbata (silver wattle) and Themeda triandra (kangaroo grass).*

1.6 Lithology and Geology

The site geology is distributed over one unit: Mixed Sediments and Volcanic rocks. Lithology is distributed over one unit being Paleozoic Silurian.

1.7 Hydrogeology

From the Geoscience Australia hydrogeology dataset the groundwater beneath the site is described as: fractured or fissured extensive aquifers of low to moderate productivity.

2.0 Present site use of the investigated area

The investigated area stretches approximately 2 kilometres to the north and south of Tarago Railway station along the length of existing railway track following the curve of the track around a hill to the north and south to the Goulburn Street level crossing.

The proposed project involves the extension of an existing passing loop at Tarago Railway station to allow the accommodation of a 1000 metre long train with wagons. The extended passing loop is required by Veolia who operate a nearby Woodlawn landfill which accepts waste transported by train from Sydney. Pacific National are the contracted train operators. Veolia plan to double the amount of waste they receive at the Woodlawn facility, which currently use the Crisps Creek intermodal facility 1.8 kilometres down track from Tarago Rail station, to unload the waste.

Presently one 900 metre long train per day travelling from Sydney to Crisps Creek unloads and returns on the same day. On occasion an additional shorter train of 400 to 500 metres length travels from Sydney to Crisps Creek and is stowed away at the Tarago passing loop until the initial train is unloaded and passes the Tarago yard limits in the up direction (to Sydney). In 2016 it is proposed to operate the additional train on a Monday to Friday basis with the full 900 metre length, which will need to be stowed safely while the initial train is unloaded, thereby requiring the extended passing loop.

Samples were collected on both the east and west side of the track along the length of the proposed investigation area. The area north of Tarago station past the baulk was typically natural ground on the west side of the tracks with the tracks built on ballast and sleepers. The area located between the baulk to the north and Goulburn Street level crossing to the south consists of the railway lines sitting on ballast and sleepers with a number of vegetated patches throughout. This area was typically bordered by grassland within the rail corridor. As follows is a figure of the investigation area. Photographs of the site can be seen in the attachments.



Figure 1: Map of investigation area

3.0 Historical and Environmental review of land use

Maps dating from 1894, 1913, 1933 and 1972 for the “Parish of Mulwaree, County of Argyle, Land District of Goulburn” in the Mulwaree Shire have been reviewed to establish previous land uses of the site. From the review of NSW Historical Land Records Viewer maps the existing railway line has been in place since prior to 1894, the proposed rail siding extension is to be located within this railway corridor. There has not been a change of use to the subject site in over 100 years judging from the reviewed historical maps.

The following is an excerpt of the “Parish of Mulwaree” map dated 1894 and shows the existing railway level crossing on the R844, now known as Goulburn Street, to the south of the investigation site. The Tarago railway station is clearly marked and the rail line follows an identical path to the present line, stretching north of Tarago adjacent to Braidwood Road. Provisions were in place for a rail siding within the railway corridor in 1894 as shown in the below map. The lands surrounding the subject site were previously owned by Daniel Cooper and George Moore, and land to the east of the site had been allocated to Public School grounds.

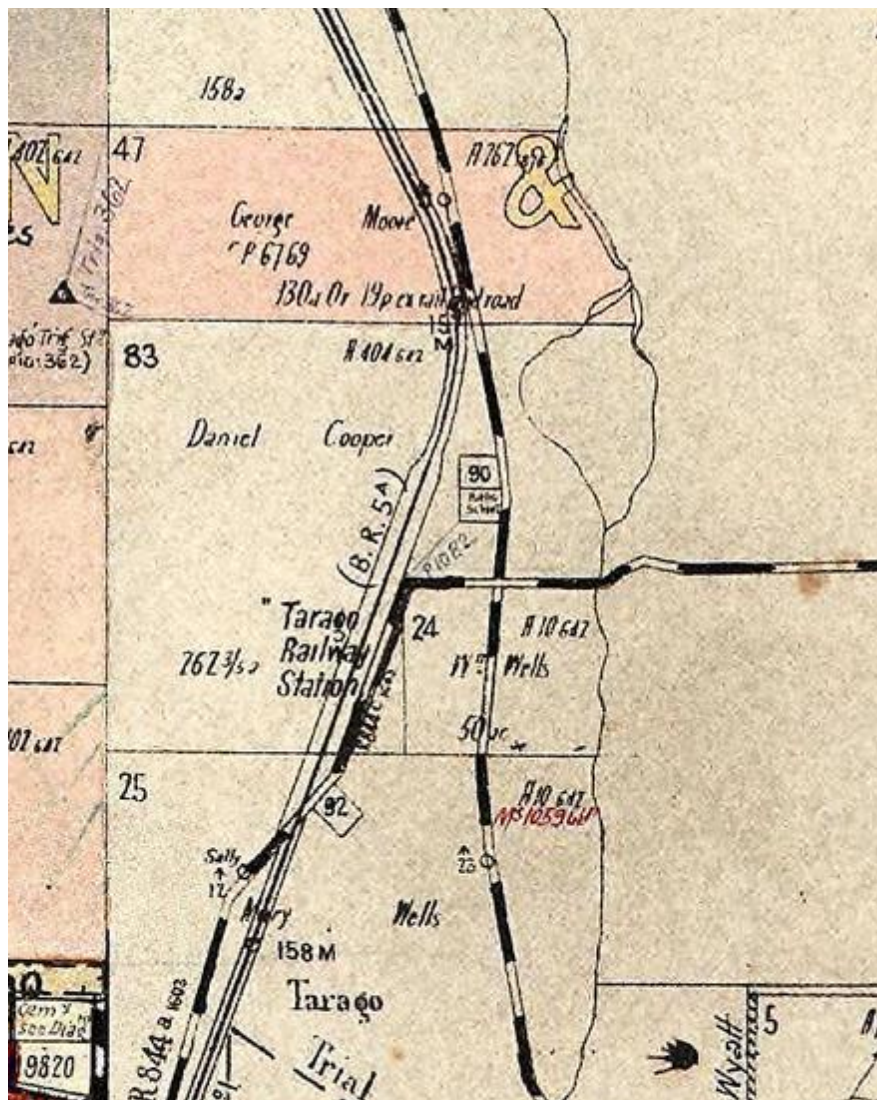


Figure 2: 1894 map

A subsequent "Parish of Mulwaree" dated July 1913 demonstrates no changes to the rail corridor or the immediate surrounding lands.

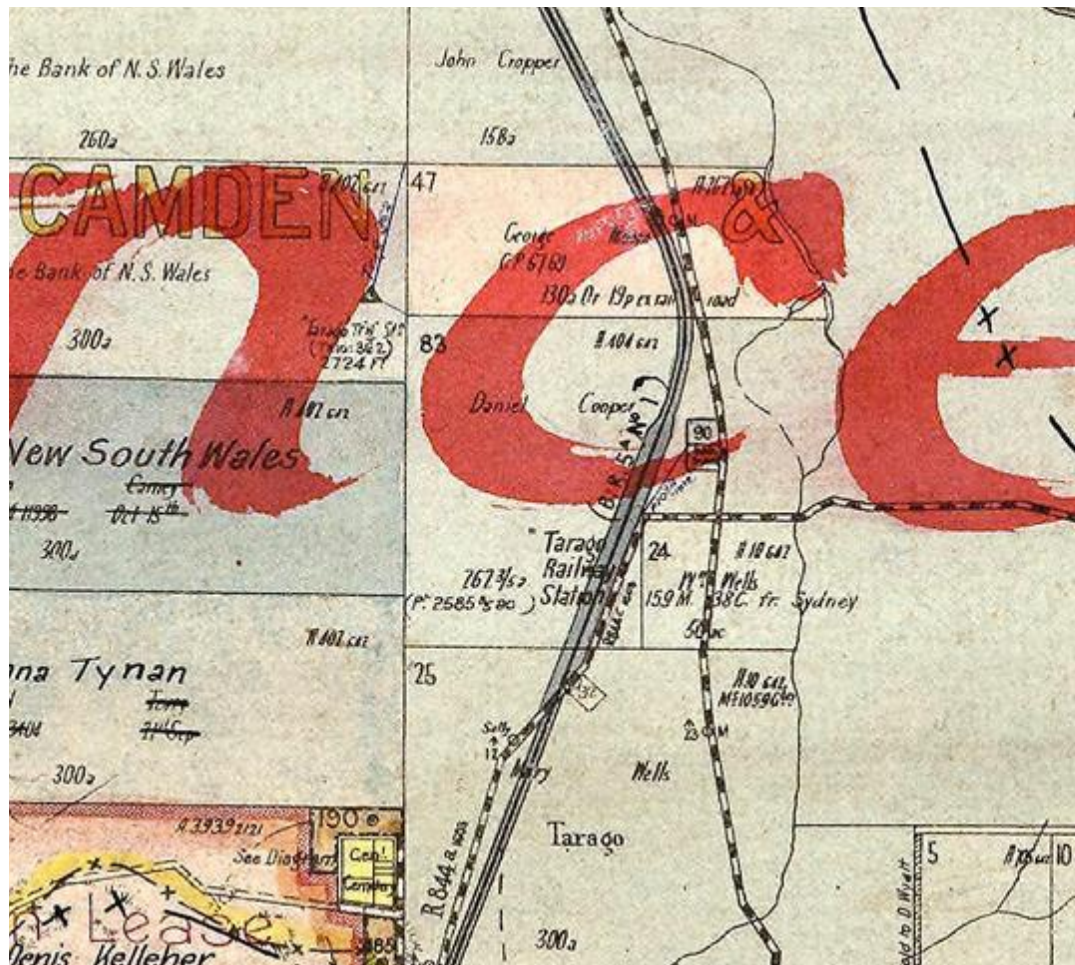


Figure 3: 1913 map

Figure 4 below, "Parish of Mulwaree" map dated 24 February 1933, shows no changes to the railway line and railway station. South of the railway level crossing the division of lands within Tarago village is evident. Also shown on the map is the lands previously owned by George Moore have been acquired by John Cropper who also owns land further north along the railway line.

Figure 5 below, shows "Parish of Mulwaree" map dated 1972 with further development of the Tarago village. The railway corridor and railway siding remain unaltered. A survey marker now known as TS4283_Tarago is also shown to the west of the railway corridor site on the crest of the hill. The trig point gives the elevation of the hill in Australian Height Datum (AHD).

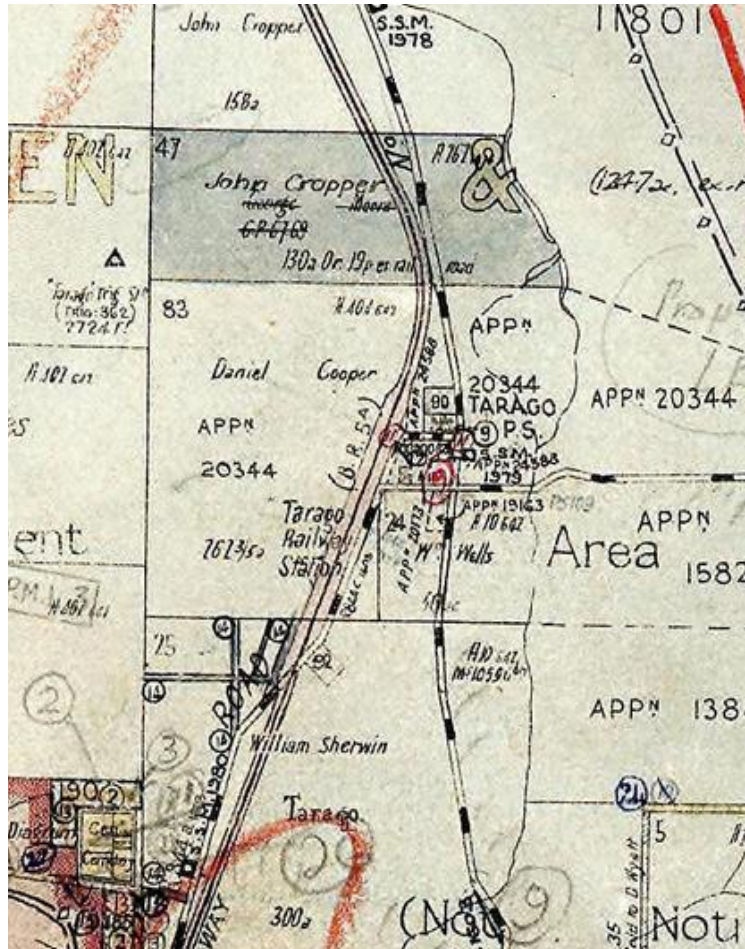


Figure 4: 1933 Map

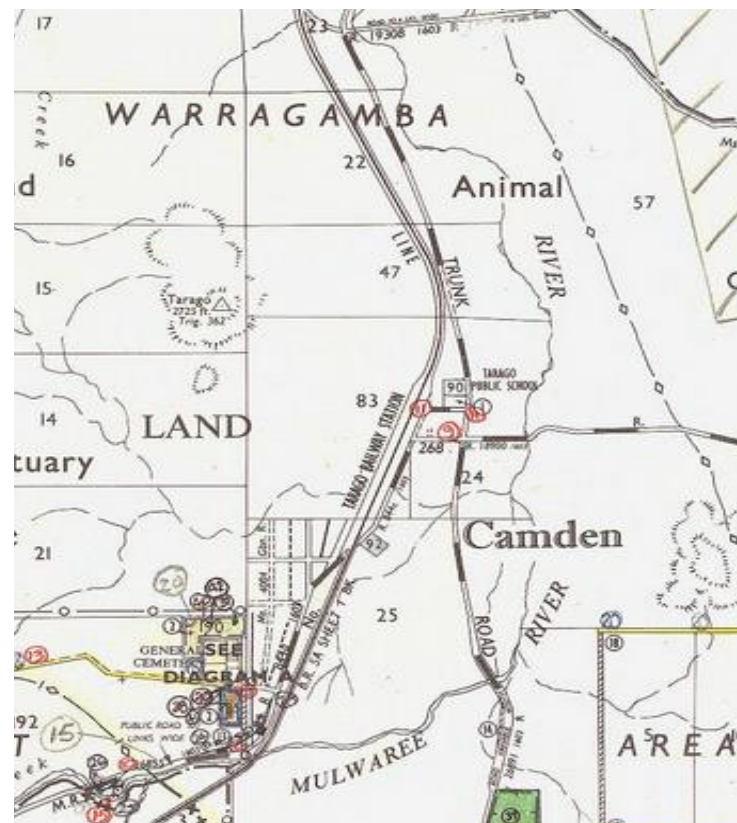


Figure 5: 1972 Map

3.1 NSW Rail Information – Tarago

The Tarago railway station is located on the Bombala line which runs from Joppa Junction to Canberra. The Bombala line lies in the south-east of NSW and it extends from near Goulburn almost to the Victorian border to a town called Bombala. The Tarago station is located approximately 262.5 kilometres from Sydney. The station was opened in January 1884 and consists of an 84 metre long platform, with a dock at the down side of the station. Opposite the station was a passing loop. At the up end of the station was a stock siding, and at the down end were a pair of goods sidings with a goods shed. In later years, another siding was added beyond the loop line, for the use of the nearby Woodlawn mine. The station remains in use.

3.2 NSW EPA database search

A search of the NSW EPA contaminated lands register and the NSW licensing, applications and notices register returned no results for the subject site in relation to licences, applications, notices, audits, pollution studies and reduction programs, Preliminary Investigation Orders, Declaration of Significantly Contaminated Land, Approved Voluntary Management Plans, Management Orders, Ongoing Maintenance Orders, Repeal Revocation or Variation Notice, Site Audit Statement, or Notice of Completion or Withdrawal of Approved VMP.

3.3 LGA database search

The following data was acquired during a contaminated land register search for the Mulwaree Shire council Area:

Mulwaree Shire Council reported six confirmed sites and five potentially contaminated sites (OCE 2000). Two of the confirmed sites are now in Upper Lachlan Shire, leaving a total of four of the confirmed contaminated sites in Goulburn Mulwaree Council Area—one at Bungonia (contaminant tyres), two at Tarago (contaminant mineral; landfill-waste) and one at Marulan (landfill-waste).

The two sites at Tarago are most likely related to the former Woodlawn mine and current landfill site, and thus the Tarago rail station and siding is not considered.

3.4 Review of Surrounding Groundwater wells and uses

There are 6 groundwater wells within a 500 metre radius of Tarago railway station. There is one well on site designated “industrial use”, 2 wells are used for “waste disposal purposes”, with the remaining wells for “domestic and stock use”. As follows are a list of the wells surrounding the railway station.

Identifying Number	GW 109655
Licence Number	10BL602632
Drilled Depth	7 metres
Standing Water Level	3.7 metres
Use	Domestic
Address	7 Wallace Street, Tarago

Identifying Number	GW 046694
Licence Number	10BL106007
Drilled Depth	60 metres
Standing Water Level	3 metres
Use	Domestic
Address	N/A

Identifying Number	GW 053976
Licence Number	10BL1191414
Drilled Depth	12 metres

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Standing Water Level	6.1 metres
Use	Industrial
Address	Tarago Rail Loading Station

Identifying Number	GW 029681
Licence Number	10BL021362
Drilled Depth	21 metres
Standing Water Level	1.5 metres
Use	Waste Disposal
Address	Tarago Public School

Identifying Number	GW 101509
Licence Number	10BL158072
Drilled Depth	15 metres
Standing Water Level	1 metre
Use	Waste Disposal
Address	Tarago Sports Ground

Identifying Number	GW 110191
Licence Number	10BL165223
Drilled Depth	74 metres
Standing Water Level	2 metre
Use	Stock, Domestic, Irrigation
Address	Wongaburra, 2011 Braidwood road, Tarago

The above data was taken from the NSW Office of Water records on 26 June 2015.

4.0 Potential contaminating activities

There are no obvious potential contamination sources on site but the site is used as a rail corridor with vehicular and machinery access and associated maintenance activities. Analysis was therefore designed to detect the above with testing for the elements outlined in the following table.

Table 1: Analysis and potential contaminating elements

Element	Analysis
Fuels and Oils	Total Petroleum Hydrocarbon (TPH) Benzene, Toluene, Ethylbenzene & Xylene (BTEX) Lead (Pb)
Creosote, tar, fungicides and detergents	Phenolic Compounds
Oils, Fire retardants, adhesives and hydraulic fluids	Polychlorinated biphenyls (PCBs)
Oil, coal, tar & diesel	Polycyclic Aromatic Hydrocarbons (PAHs)
CCA wood treatment	Copper, Chromium & Arsenic
Environmental indicators	pH & heavy metals

5.0 Procedure of work and methodology

5.1 Investigation

Work was carried out generally by reference to NSW EPA (1994, 1995 and 1997), and AS 4482.1 2005, Guide to the investigation and sampling of sites with potentially contaminated soil - Non-volatile and semi-volatile compounds. Contamination analysis and threshold comparison was carried out in accordance with NEPM (2013).

Sampling density was designed with a 95% confidence hotspot detection of 30.5 metres, (Table A, minimum sampling points required for site characterisation, NSW EPA 1995). In total 28 holes were augured or hand excavated to a depth of between zero and one metre below ground level. In total a mixture of 16 composite and exclusive samples were sent for analysis. In areas where intense excavation is expected, samples were kept exclusive to ascertain individual contamination levels for each point. The site investigation work was carried out on 11 June 2015.

In total sixteen samples were sent for analysis at a NATA accredited laboratory and results are compared against relevant guidelines within this report.

5.2 Developing a Decision Rule

As part of the review the analytical data was assessed against *National Environment Protection (Assessment of Site Contamination) Measure*, NEPM (2013); and the Health Investigation (HIL) level 'D' was used from the Measure which is a human exposure setting based on land that has been established as follows:

D. Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites.

The HIL was chosen to reflect the current use of the site which is industrial/commercial.

5.3 Chain of Custody

The Chain of Custody (CoC) details the transfer of samples from sample collection through to arrival at analytical laboratory. It contains the details of the sampling date, date of relinquishment, date received, and the laboratory assigned work order number. A copy of the CoC can be found within attachments.

5.4 Specify Limits of Decision Error

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence. Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW EPA (1994), NEPC (1999), ANZECC/ARMCANZ (2000), DEC (2007), appropriate indicators of data quality (DQIs used to assess quality assurance / quality control) and standard procedures for field sampling and handling.

AS4482.1-20054 nominates two types of errors that require assessment:

- a) Deciding that the site is acceptable when it actually is not; and
- b) Deciding that the site is unacceptable when actually it is.

As a result the above decision rules have been assessed using the relevant guidelines.

5.5 Quality Assurance / Quality Control

Quality Assurance / Quality Control (QA/QC) are the operating principles adopted to help produce data which is of known, consistent, and defensible quality. For all chemical analysis the samples are despatched to a NATA accredited laboratory.

ALS Environmental in Sydney, which have the NATA accreditation number 825, conducted the analysis on samples taken from the subject site at Tarago. As part of the analytical service they provide a Quality Control Report (QCR) where details of Relative Percent Deviation's (RPD's) for duplicates testing, Method Blank and Laboratory Control Spike, and Matrix Spike reports are supplied for each batch of samples received for analysis. ALS also provide an Interpretative Quality Control report (QCI) which details Analysis Holding Time Compliance, Quality Control Parameter Frequency Compliance, Brief Method Summaries and Summary of Outliers. The QCR and QCI are attached to this report.

From the QCI report

The QA/QC report for compliance assessment highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external auditor review. A summary of the results of the QA/QC compliance assessment is as follows:

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 Matrix Spike outliers occur.
- 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.

6.0 Contamination Assessment

Figure 6 below, details the sample point locations to be used in conjunction with the following summary of analysis. As can be seen from the table 2 the majority of samples are below the relevant threshold levels for commercial/industrial sites based on the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 2013. The results obtained for each sample analysed have been adjusted by the factor of sub samples within each composite sample. A single contaminant, lead, is over threshold at six locations, through out the investigation area. The following composite samples represented by lables 5, 7, 8, 13, 14, and 15, are above threshold. Sample results are discussed below each summary of results on the following pages.

There are two likely causes for the high lead readings. The first being inherent background readings due to the sites close proximity to the Woodlawn mine which excavated lead ore and the second owing to the use by Woodlawn mine of the Tarago station for transport and loading operations of lead ore, among others, which may have resulted in dust being dispersed throughout the site.

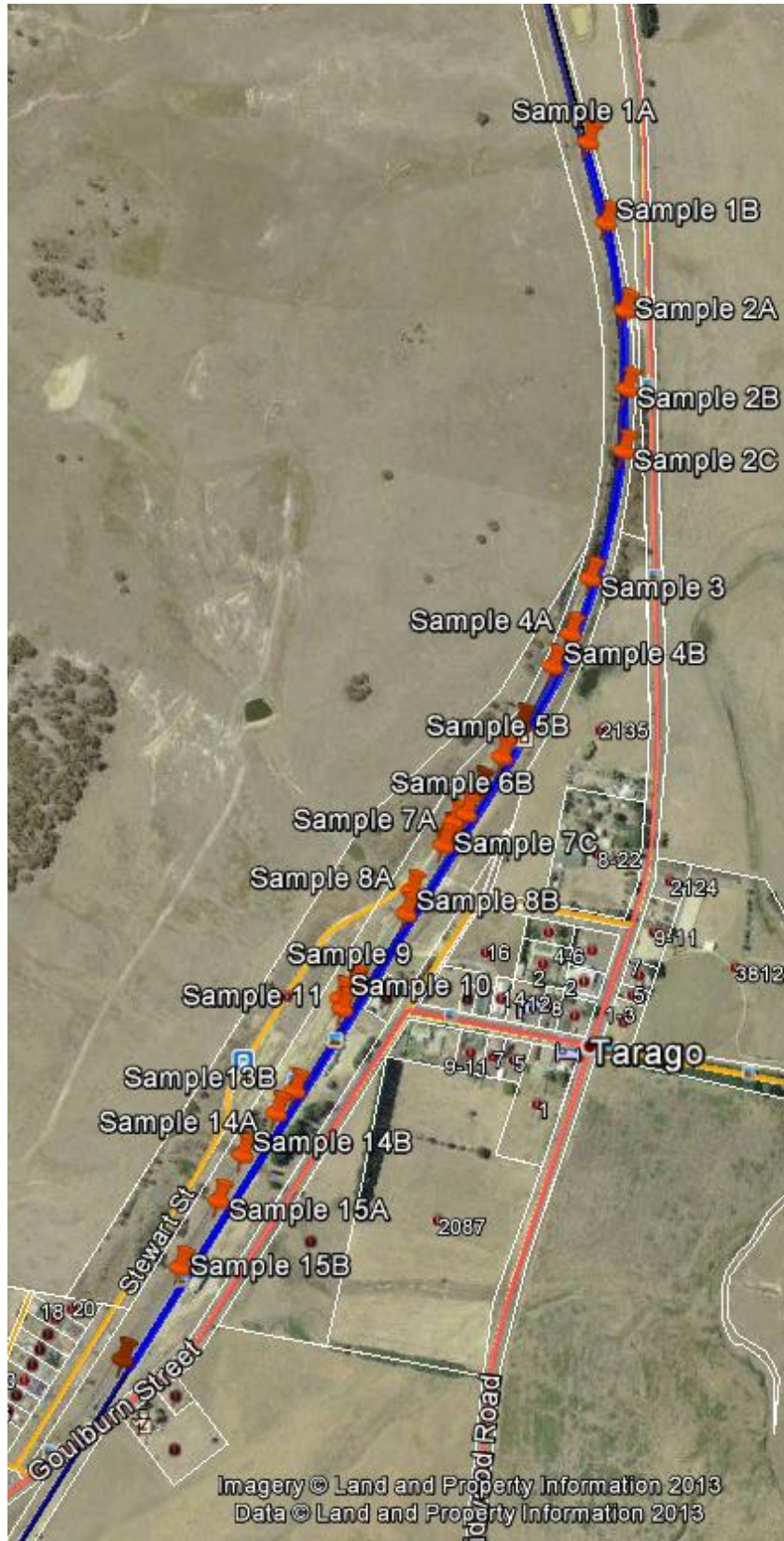


Figure 6: Sampling plan along the investigation area.

Table 2: Summary of Analysis

Sample Factor	2	3	3	2	2	
Analyte	*1	*2	*3	*4	*5	Threshold
pH	5.4	6.1	5.2	8.6	5.5	-
Conductivity	78	-	105	146	-	-
Metals/Metalloids (mg/kg)						mg/kg
Arsenic	174	18	<5	28	70	3000
Cadmium	2	<1	<1	<1	4	900
Chromium	18	18	12	8	26	3,600
Copper	104	24	45	66	650	240,000
Lead	568	51	150	112	1874	1,500
Nickel	4	<2	<2	<2	8	6,000
Zinc	442	216	390	304	1422	400,000
Mercury	0.4	<0.1	<0.1	<0.1	0.2	730
Phenols						
Phenol	<0.5	<0.5	<0.5	<0.5	<0.5	240,000
Polycyclic Aromatic Hydrocarbons						
PAHs	<0.5	<0.5	<0.5	<0.5	<0.5	4,000
Organics (mg/kg)						
TPH C6 – C10	<10	<10	<10	<10	<10	800
TPH C10 – C16	<50	<50	<50	<50	<50	1,000
TPH C16 – C34	<100	<100	<100	<100	<100	5,000
TPH C34 – C40	<100	<100	<100	<100	<100	10,000
BTEXN (mg/kg)						
Benzene	<0.2	<0.2	<0.2	<0.2	<0.2	5
Toluene	<0.5	<0.5	<0.5	<0.5	<0.5	6,500
Ethylbenzene	<0.5	<0.5	<0.5	<0.5	<0.5	1,800
Xylenes (Total)	<0.5	<0.5	<0.5	<0.5	<0.5	1,200
Naphthalene	<1	<1	<1	<1	<1	4

¹ NEPM 2013 Commercial/Industrial Sites

* Denotes composite samples with adjusted results

Sample five was prepared from two subsamples. The actual result for sample five was 937 mg/kg, which is below threshold, however as this represents two subsamples the result is doubled to 1874 mg/kg which in turn is 374 mg/kg above threshold. Sample 5a and 5b were taken from north of the railway station on the western side of the tracks between the Woodlawn loading siding and the main line.

Table 2(continued): Summary of Analysis

Sample Factor	2	3	2	1	1	
Analyte	*6	*7	*8	9	10	Threshold
pH	6.6	3	3.4	6.1	5.4	-
Conductivity	472	5490	5080	86	112	-
Metals/Metalloids (mg/kg)						mg/kg
Arsenic	16	1293	374	7	10	3000
Cadmium	4	15	24	2	5	900
Chromium	12	108	142	8	11	3,600
Copper	118	6450	4080	21	131	240,000
Lead	292	94500	21400	45	505	1,500
Nickel	<2	33	52	4	4	6,000
Zinc	496	4740	5120	3410	1060	400,000
Mercury	<0.1	4.5	0.8	<0.1	0.1	730
Phenols						
Phenol	<0.5	<0.5	<0.5	<0.5	<0.5	240,000
Polycyclic Aromatic Hydrocarbons						
PAHs	<0.5	<0.5	<0.5	<0.5	<0.5	4,000
Organics (mg/kg)						
TPH C6 – C10	<10	<10	<10	<10	<10	800
TPH C10 – C16	<50	<50	<50	<50	<50	1,000
TPH C16 – C34	<100	<100	<100	<100	<100	5,000
TPH C34 – C40	<100	<100	<100	<100	<100	10,000
BTEXN (mg/kg)						
Benzene	<0.2	<0.2	<0.2	<0.2	<0.2	5
Toluene	<0.5	<0.5	<0.5	<0.5	<0.5	6,500
Ethylbenzene	<0.5	<0.5	<0.5	<0.5	<0.5	1,800
Xylenes (Total)	<0.5	<0.5	<0.5	<0.5	<0.5	1,200
Naphthalene	<1	<1	<1	<1	<1	4

¹ NEPM 2013 Commercial/Industrial Sites

* Denotes composite samples with adjusted results

Samples seven and eight were taken from an area north of the railway station close to the end of Stewart Street, and to the west of the main line. Stewart Street seems to have been the access route for the Woodlawn mine siding, which is no longer in use. Sample seven comprises three subsamples and is over 60 times the threshold with a lead concentration of 94,500 mg/kg. The actual result of the composite sample was 31,500 mg/kg which was adjusted by the factor of subsamples.

Table 2(continued): Summary of Analysis

Sample Factor	1	1	2	2	2	1	Threshold
Analyte	11	12	*13	*14	*15	16	Threshold
pH	6.3	5.9	4.8	5.0	5.7	7.9	-
Conductivity	30	230	232	142	154	39	-
Metals/Metalloids (mg/kg)							mg/kg
Arsenic	15	14	66	142	350	30	3000
Cadmium	4	8	6	30	40	<1	900
Chromium	10	10	16	40	28	11	3,600
Copper	73	293	1108	1114	1124	70	240,000
Lead	171	671	6960	4080	3380	103	1,500
Nickel	4	6	10	28	28	4	6,000
Zinc	797	1360	1594	5040	5400	117	400,000
Mercury	<0.1	<0.1	0.4	0.4	1.4	<0.1	730
Phenols							
Phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	240,000
Polycyclic Aromatic Hydrocarbons							
PAHs	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	4,000
Organics (mg/kg)							
TPH C6 – C10	<10	<10	<10	<10	<10	<10	800
TPH C10 – C16	<50	<50	<50	<50	<50	<50	1,000
TPH C16 – C34	<100	<100	<100	<100	<100	<100	5,000
TPH C34 – C40	<100	<100	<100	<100	<100	<100	10,000
BTEXN (mg/kg)							
Benzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5
Toluene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	6,500
Ethylbenzene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1,800
Xylenes (Total)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1,200
Naphthalene	<1	<1	<1	<1	<1	<1	4

¹ NEPM 2013 Commercial/Industrial Sites

* Denotes composite samples with adjusted results

Samples 13, 14, and 15 were taken from south of the railway station past the old weighbridge, which is planned to be demolished. The samples were taken from the western side of the main track stretching a length south of the weigh bridge to a point adjacent the old depot shed.

Sample 13 comprised two subsamples with an adjusted lead concentration of 6,960 mg/kg, more than four times the threshold limit. The actual result of the composite sample was 3,480 mg/kg which was adjusted by a factor of the subsamples

taken. The samples were taken from close to the area where the removal of the cross switch will take place, while taking the sample ash was found which could be a contributing factor to the raised lead result.

Sample 14 comprised two subsamples with an adjusted lead concentration of 4,080 mg/kg, more than double the threshold limit. The actual result of the composite sample was 2,040 mg/kg which was adjusted by the factor of subsamples taken.

Sample 15 comprised two subsamples with the adjusted lead concentration of 3,380 mg/kg, more than double the threshold limit. The actual result of the composite sample was 1,690 mg/kg, slightly above threshold, however this result was adjusted to factor the number of subsamples.

6.1 Discussion of Results and Proposed Works

The proposed works will involve excavation, sleeper replacement, siding loop extension, weighbridge removal, turnpoint removal and addition, track and ballast reinforcement/underpinning and cross switch upgrade/removal.

Excavation works are planned along three sections of the track:

- 1) North of Tarago station limits following the curve of the tracks along the hill to a point ~260.3 km, from Sydney, where a new turn point installation is proposed. Samples 1, 2 and 3 were taken along here and results show there are no issues regarding contaminants.
- 2) The removal of an old weighbridge at approximately 262.3 km, from Sydney, where samples 9, 10, 11, and 12 were taken at up to 1 metres depth and demonstrate no contamination.
- 3) South of Tarago station close to the Goulburn Street level crossing, where the proposed new turn point will be located. Sample 16 represents this area, and no contaminants were above threshold levels.

Sleeper replacement and general track upgrade works are to be carried out along the length of the existing track and the existing passing loop. Generally with sleeper replacement and track upgrade little or no disturbance is caused to the underlying material (underburden), as such works surrounding the locations of the above threshold lead results discovered for samples 5, 7, 8, 13, 14 and 15 should be undertaken with minimal disturbance to the underburden. Appropriate PPE should be worn when carrying out works in the areas and exposure pathways should be considered.

The following exposure pathways, among others, should be considered when carrying out the proposed works:

- Incidental ingestion of surface soil and dust;
- Indoor and outdoor inhalation of dust; and
- Dermal contact with surface soil and dust particulates

Appropriate PPE such as dust masks, safety glasses, gloves, enclosed boots (as a minimum) and long pants and sleeves should be worn. All contractors and John Holland employees should be made aware of the contamination and risks associated with any planned upgrade works. Safe Work Method Statements (SWMS) should be updated to include information regarding lead contamination and associated risks.

Disclaimer

The information contained in this report has been extracted from field and laboratory sources believed to be reliable and accurate. DM McMahon Pty Ltd will not assume any responsibility for the misinterpretation of information supplied in this report. The accuracy and reliability of recommendations identified in this report need to be evaluated with due care according to individual circumstances.

It should be noted that findings in this report are based solely upon the said site conditions at the time of testing. The results of the said investigations undertaken are an overall representation of the conditions encountered. The properties of the soil within the location may change due to variations in ground conditions outside the tested area.

References

Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC) Guidelines for the Assessment and Management of Contaminated Sites 1992.

Australian Standard 4482.1 2005, Guide to the investigation and sampling of sites with potentially contaminated soil - Part 1: Non-volatile and semi-volatile compounds.

Bureau of Meteorology – Climate Data Online
<http://www.bom.gov.au/climate/data/>

Goulburn Mulwaree Shire Council search (Contaminated lands)

NSW Environment and Heritage - eSPADE
<http://www.environment.nsw.gov.au/eSpadeWebApp/>

National Environment Protection (Assessment of Site Contamination) Measure (NEPM), 2013

NSW EPA *Contaminated Site Sampling Design Guidelines* 1995

NSW EPA Contaminated Lands Register
<http://www.epa.nsw.gov.au/prclmapp/searchregister.aspx> data accessed 10/06/2015

NSW EPA POEO Register
<http://www.epa.nsw.gov.au/prpoeoapp/> data accessed 10/06/2015

NSW EPA *Guidelines for Consultants Reporting on Contaminated Sites* 1997

NSW EPA (DEC) *Guidelines for the NSW Site Auditor Scheme*, 2nd Edition, 2006

NSW Rail data search
<http://www.nswrail.net/locations/show.php?name=NSW:Tarago&line=NSW:0>
data accessed 26 June 2015

Attachments

Site plan & Site Sampling Plan

Site photographs

Certificate of Analysis

Chain of Custody

Quality Control Report (QCR) & Interpretive Quality Control (QCI)

Untitled Map

Write a description for your map.

Legend



Tarago NSW 2580



600 m



Google earth

© 2015 CNES / Airbus



Northern end of the investigation area



Cutting on the bend



Baulk at the end of the Woodlawn Siding



Stained Ballast on Woodlawn Siding



Weighbridge adjacent to Tarago Station



Looking North from Southern end of railway platform



The southern end of the railway platform where point lever is located



Looking South towards the level crossing

CERTIFICATE OF ANALYSIS

Work Order	: ES1523896	Page	: 1 of 14
Client	: DM MCMAHON PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR JAMES MALONEY	Contact	:
Address	: 4a Norton Street Wagga Wagga NSW, AUSTRALIA 2650	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: james@dmmcmahon.com.au	E-mail	:
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: TARAGO	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 3251	Date Samples Received	: 15-Jun-2015 09:00
C-O-C number	: ----	Date Analysis Commenced	: 15-Jun-2015
Sampler	: JAMES MALONEY	Issue Date	: 22-Jun-2015 15:40
Site	: ----		
Quote number	: ----	No. of samples received	: 16
		No. of samples analysed	: 16

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



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics



General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or 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
∅ = ALS is not NATA accredited for these tests.

- Poor spike recovery for (TEST NAME) due to matrix interferences(confirmed by re-analysis).
- 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.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/1	3251/2	3251/3	3251/4	3251/5
Client sampling date / time				[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	
Compound	CAS Number	LOR	Unit	ES1523896-001	ES1523896-002	ES1523896-003	ES1523896-004	ES1523896-005	
				Result	Result	Result	Result	Result	
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit	5.4	6.1	5.2	8.6	5.5	
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm	39	----	35	73	----	
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%	13.9	6.9	5.5	8.9	12.7	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	87	6	<5	14	35	
Cadmium	7440-43-9	1	mg/kg	1	<1	<1	<1	2	
Chromium	7440-47-3	2	mg/kg	9	6	4	4	13	
Copper	7440-50-8	5	mg/kg	52	8	15	33	325	
Lead	7439-92-1	5	mg/kg	284	17	50	56	937	
Nickel	7440-02-0	2	mg/kg	2	<2	<2	<2	4	
Zinc	7440-66-6	5	mg/kg	221	72	130	152	711	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	0.2	<0.1	<0.1	<0.1	0.1	
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	<1	<1	<1	
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	<2	<2	<2	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/1	3251/2	3251/3	3251/4	3251/5
Client sampling date / time					[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]
Compound	CAS Number	LOR	Unit		ES1523896-001	ES1523896-002	ES1523896-003	ES1523896-004	ES1523896-005
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
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
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	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



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/1	3251/2	3251/3	3251/4	3251/5
Client sampling date / time					[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]
Compound	CAS Number	LOR	Unit		ES1523896-001	ES1523896-002	ES1523896-003	ES1523896-004	ES1523896-005
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
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	%	86.1	89.4	86.7	85.4	89.3
2-Chlorophenol-D4	93951-73-6		0.5	%	82.1	87.2	84.0	86.0	83.3
2,4,6-Tribromophenol	118-79-6		0.5	%	95.0	98.0	106	97.9	106
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8		0.5	%	84.6	86.9	86.2	86.0	87.1
Anthracene-d10	1719-06-8		0.5	%	99.5	103	103	110	105
4-Terphenyl-d14	1718-51-0		0.5	%	88.7	87.2	87.7	101	86.8
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0		0.2	%	95.2	92.2	95.3	99.5	86.7
Toluene-D8	2037-26-5		0.2	%	86.1	97.1	93.2	99.8	88.8
4-Bromofluorobenzene	460-00-4		0.2	%	88.4	89.3	86.5	94.0	84.5



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/6	3251/7	3251/8	3251/9	3251/10
Client sampling date / time				[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	
Compound	CAS Number	LOR	Unit	ES1523896-006	ES1523896-007	ES1523896-008	ES1523896-009	ES1523896-010	
				Result	Result	Result	Result	Result	
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit	6.6	3.0	3.4	6.1	5.4	
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm	236	1830	2540	86	112	
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%	13.4	12.0	6.8	14.9	17.0	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	8	431	187	7	10	
Cadmium	7440-43-9	1	mg/kg	2	5	12	2	5	
Chromium	7440-47-3	2	mg/kg	6	36	71	8	11	
Copper	7440-50-8	5	mg/kg	59	2150	2040	21	131	
Lead	7439-92-1	5	mg/kg	146	31500	10700	45	505	
Nickel	7440-02-0	2	mg/kg	<2	11	26	4	4	
Zinc	7440-66-6	5	mg/kg	248	1580	2560	3410	1060	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	1.5	0.4	<0.1	<0.1	
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	<1	<1	<1	
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	<2	<2	<2	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/6	3251/7	3251/8	3251/9	3251/10
Client sampling date / time					[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]
Compound	CAS Number	LOR	Unit		ES1523896-006	ES1523896-007	ES1523896-008	ES1523896-009	ES1523896-010
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
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
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	>C10_C16	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



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/6	3251/7	3251/8	3251/9	3251/10
Client sampling date / time					[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]
Compound	CAS Number	LOR	Unit		ES1523896-006	ES1523896-007	ES1523896-008	ES1523896-009	ES1523896-010
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
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	%	80.5	89.3	83.8	84.2	83.4
2-Chlorophenol-D4	93951-73-6		0.5	%	80.2	82.1	83.7	87.5	86.6
2,4,6-Tribromophenol	118-79-6		0.5	%	101	97.7	90.7	95.3	89.1
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8		0.5	%	92.6	85.5	79.2	89.7	94.2
Anthracene-d10	1719-06-8		0.5	%	109	111	108	107	104
4-Terphenyl-d14	1718-51-0		0.5	%	88.8	88.3	109	85.6	85.2
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0		0.2	%	94.0	103	96.7	94.0	92.9
Toluene-D8	2037-26-5		0.2	%	92.6	104	102	98.7	104
4-Bromofluorobenzene	460-00-4		0.2	%	92.1	99.7	95.6	93.4	96.9



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/11	3251/12	3251/13	3251/14	3251/15
Client sampling date / time				[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	
Compound	CAS Number	LOR	Unit	ES1523896-011	ES1523896-012	ES1523896-013	ES1523896-014	ES1523896-015	
				Result	Result	Result	Result	Result	
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit	6.3	5.9	4.8	5.0	5.7	
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm	30	230	116	71	77	
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%	12.8	7.6	4.0	8.2	6.7	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	15	14	33	71	175	
Cadmium	7440-43-9	1	mg/kg	4	8	3	15	20	
Chromium	7440-47-3	2	mg/kg	10	10	8	20	14	
Copper	7440-50-8	5	mg/kg	73	293	554	557	562	
Lead	7439-92-1	5	mg/kg	171	671	3480	2040	1690	
Nickel	7440-02-0	2	mg/kg	4	6	5	14	14	
Zinc	7440-66-6	5	mg/kg	797	1360	797	2520	2700	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.2	0.2	0.7	
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	<1	<1	<1	
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	<2	<2	<2	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/11	3251/12	3251/13	3251/14	3251/15
Client sampling date / time					[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]	[11-Jun-2015]
Compound	CAS Number	LOR	Unit		ES1523896-011	ES1523896-012	ES1523896-013	ES1523896-014	ES1523896-015
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
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	%		86.9	82.3	87.7	85.1	91.4
2-Chlorophenol-D4	93951-73-6	0.5	%		90.5	85.6	89.1	81.3	84.9
2,4,6-Tribromophenol	118-79-6	0.5	%		99.6	90.2	103	94.2	105
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		81.0	99.3	92.6	85.2	88.9
Anthracene-d10	1719-06-8	0.5	%		102	104	101	99.2	106
4-Terphenyl-d14	1718-51-0	0.5	%		80.9	81.9	84.6	82.1	81.9
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		91.9	102	94.1	92.1	99.8
Toluene-D8	2037-26-5	0.2	%		90.6	104	91.5	92.3	100
4-Bromofluorobenzene	460-00-4	0.2	%		90.5	98.2	92.3	91.4	95.8



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID			3251/16	----	----	----	----
Client sampling date / time		[11-Jun-2015]			----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1523896-016	-----	-----	-----	-----	-----
				Result	Result	Result	Result	Result	Result
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit	7.9	----	----	----	----	----
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm	39	----	----	----	----	----
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%	5.5	----	----	----	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	30	----	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----	----
Chromium	7440-47-3	2	mg/kg	11	----	----	----	----	----
Copper	7440-50-8	5	mg/kg	70	----	----	----	----	----
Lead	7439-92-1	5	mg/kg	103	----	----	----	----	----
Nickel	7440-02-0	2	mg/kg	4	----	----	----	----	----
Zinc	7440-66-6	5	mg/kg	117	----	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg	<0.5	----	----	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	----	----	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	----	----	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	----	----	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	----	----	----	----	----
2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	----	----	----	----	----
2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	----	----	----	----	----
2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	----	----	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	----	----	----	----	----
2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	----	----	----	----	----
2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	----	----	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg	<2	----	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/16	----	----	----	----
Client sampling date / time				[11-Jun-2015]	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES1523896-016	-----	-----	-----	-----	
				Result	Result	Result	Result	Result	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----	
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----	
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----	
[^] Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	----	----	----	----	
[^] Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	----	----	----	----	
[^] Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	----	----	----	----	
[^] Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	----	----	----	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----	
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----	
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----	
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----	
[^] C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----	
[^] C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----	
>C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	----	----	----	----	
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	----	----	
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----	
[^] >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----	
[^] >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	----	----	----	
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----	
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	3251/16	----	----	----	----
Client sampling date / time				[11-Jun-2015]	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES1523896-016	-----	-----	-----	-----	
				Result	Result	Result	Result	Result	
EP080: BTEXN - Continued									
meta- & para-Xylene	108-38-3	106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6		0.5	mg/kg	<0.5	----	----	----	----
[^] Sum of BTEX		----	0.2	mg/kg	<0.2	----	----	----	----
[^] Total Xylenes	1330-20-7		0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3		1	mg/kg	<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3		0.5	%	92.8	----	----	----	----
2-Chlorophenol-D4	93951-73-6		0.5	%	88.9	----	----	----	----
2,4,6-Tribromophenol	118-79-6		0.5	%	103	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8		0.5	%	79.2	----	----	----	----
Anthracene-d10	1719-06-8		0.5	%	100	----	----	----	----
4-Terphenyl-d14	1718-51-0		0.5	%	101	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0		0.2	%	93.5	----	----	----	----
Toluene-D8	2037-26-5		0.2	%	94.4	----	----	----	----
4-Bromofluorobenzene	460-00-4		0.2	%	93.4	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: SOIL

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA010: Conductivity		
EA010: Electrical Conductivity @ 25°C	3251/2 - [11-Jun-2015]	23.25
EA010: Electrical Conductivity @ 25°C	3251/5 - [11-Jun-2015]	91.2

QA/QC Compliance Assessment for DQO Reporting

Work Order	: ES1523896	Page	: 1 of 6
Client	: DM MCMAHON PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR JAMES MALONEY	Telephone	: +61-2-8784 8555
Project	: TARAGO	Date Samples Received	: 15-Jun-2015
Site	: ----	Issue Date	: 22-Jun-2015
Sampler	: JAMES MALONEY	No. of samples received	: 16
Order number	: 3251	No. of samples analysed	: 16

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.**
- **NO Matrix Spike outliers occur.**
- **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.**



Analysis Holding Time Compliance

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	
EA002 : pH (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
3251/1, 3251/3, 3251/5, 3251/7, 3251/9, 3251/11, 3251/13, 3251/15,	3251/2, 3251/4, 3251/6, 3251/8, 3251/10, 3251/12, 3251/14, 3251/16	11-Jun-2015	18-Jun-2015	18-Jun-2015	✓	18-Jun-2015	18-Jun-2015	✓
EA010: Conductivity								
Soil Glass Jar - Unpreserved (EA010)								
3251/1, 3251/3, 3251/5, 3251/7, 3251/9, 3251/11, 3251/13, 3251/15,	3251/2, 3251/4, 3251/6, 3251/8, 3251/10, 3251/12, 3251/14, 3251/16	11-Jun-2015	18-Jun-2015	18-Jun-2015	✓	18-Jun-2015	16-Jul-2015	✓
EA055: Moisture Content								
Soil Glass Jar - Unpreserved (EA055-103)								
3251/1, 3251/3, 3251/5, 3251/7, 3251/9, 3251/11, 3251/13, 3251/15,	3251/2, 3251/4, 3251/6, 3251/8, 3251/10, 3251/12, 3251/14, 3251/16	11-Jun-2015	----	----	----	16-Jun-2015	25-Jun-2015	✓



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 Jar - Unpreserved (EG005T)								
3251/1, 3251/3, 3251/5, 3251/7, 3251/9, 3251/11, 3251/13, 3251/15,	3251/2, 3251/4, 3251/6, 3251/8, 3251/10, 3251/12, 3251/14, 3251/16	11-Jun-2015	18-Jun-2015	08-Dec-2015	✓	19-Jun-2015	08-Dec-2015	✓
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
3251/1, 3251/3, 3251/5, 3251/7, 3251/9, 3251/11, 3251/13, 3251/15,	3251/2, 3251/4, 3251/6, 3251/8, 3251/10, 3251/12, 3251/14, 3251/16	11-Jun-2015	18-Jun-2015	09-Jul-2015	✓	19-Jun-2015	09-Jul-2015	✓
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071)								
3251/1, 3251/3, 3251/5, 3251/7, 3251/9, 3251/11, 3251/13, 3251/15,	3251/2, 3251/4, 3251/6, 3251/8, 3251/10, 3251/12, 3251/14, 3251/16	11-Jun-2015	15-Jun-2015	25-Jun-2015	✓	17-Jun-2015	25-Jul-2015	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
3251/1, 3251/3, 3251/5, 3251/7, 3251/9, 3251/11, 3251/13, 3251/15,	3251/2, 3251/4, 3251/6, 3251/8, 3251/10, 3251/12, 3251/14, 3251/16	11-Jun-2015	15-Jun-2015	25-Jun-2015	✓	17-Jun-2015	25-Jul-2015	✓



Matrix: **SOIL**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080)								
3251/1, 3251/3, 3251/5, 3251/7, 3251/9, 3251/11, 3251/13, 3251/15,	3251/2, 3251/4, 3251/6, 3251/8, 3251/10, 3251/12, 3251/14, 3251/16	11-Jun-2015	16-Jun-2015	25-Jun-2015	✓	17-Jun-2015	25-Jun-2015	✓



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	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Analytical Methods							
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	20	10.00	10.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Moisture Content	EA055-103	2	20	10.00	10.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	2	18	11.11	10.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	2	20	10.00	10.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	2	20	10.00	10.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	2	18	11.11	10.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 104)
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).
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 ₂)(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 ₂ 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 - Semivolatle Fraction	EP071	SOIL	(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	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Preparation Methods	Method	Matrix	Method Descriptions
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	(USEPA SW 846 - 5030A) 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In-house, Mechanical agitation (tumbler). 10g of sample, Na ₂ SO ₄ 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.

QUALITY CONTROL REPORT

Work Order	: ES1523896	Page	: 1 of 10
Client	: DM MCMAHON PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR JAMES MALONEY	Contact	:
Address	: 4a Norton Street Wagga Wagga NSW, AUSTRALIA 2650	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: james@dmmcmahon.com.au	E-mail	:
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: TARAGO	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 3251	Date Samples Received	: 15-Jun-2015
C-O-C number	: ----	Date Analysis Commenced	: 15-Jun-2015
Sampler	: JAMES MALONEY	Issue Date	: 22-Jun-2015
Site	: ----	No. of samples received	: 16
Quote number	: ----	No. of samples analysed	: 16

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



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Laboratory 825

Accredited for
compliance with
ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics



General Comments

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

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or 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 (%)
EA002 : pH (Soils) (QC Lot: 129062)									
ES1523896-006	3251/6	EA002: pH Value	----	0.1	pH Unit	6.6	7.0	4.99	0% - 20%
ES1523847-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.5	7.6	0.00	0% - 20%
EA002 : pH (Soils) (QC Lot: 129064)									
ES1523896-016	3251/16	EA002: pH Value	----	0.1	pH Unit	7.9	8.0	0.00	0% - 20%
EA010: Conductivity (QC Lot: 129061)									
ES1523896-006	3251/6	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	236	226	4.07	0% - 20%
ES1523847-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	7380	7480	1.34	0% - 20%
EA010: Conductivity (QC Lot: 129065)									
ES1523896-016	3251/16	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	39	42	6.93	0% - 20%
EA055: Moisture Content (QC Lot: 127390)									
ES1523894-013	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	32.4	33.9	4.67	0% - 20%
ES1523896-009	3251/9	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	14.9	13.5	9.43	0% - 50%
EA055: Moisture Content (QC Lot: 127391)									
ES1523906-004	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	14.4	13.7	4.76	0% - 50%
ES1523932-007	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	12.0	12.6	4.97	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 130173)									
ES1523896-001	3251/1	EG005T: Cadmium	7440-43-9	1	mg/kg	1	1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	9	12	29.6	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	2	3	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	87	83	5.45	0% - 50%
		EG005T: Copper	7440-50-8	5	mg/kg	52	55	6.70	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	284	254	11.0	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	221	219	1.28	0% - 20%
ES1523896-011	3251/11	EG005T: Cadmium	7440-43-9	1	mg/kg	4	3	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	10	12	26.4	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	5	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	15	10	34.6	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	73	47	43.2	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	171	195	13.1	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	797	751	5.98	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 130174)									
ES1523896-001	3251/1	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.2	0.00	No Limit
ES1523896-011	3251/11	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 126362)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)A: Phenolic Compounds (QC Lot: 126362) - continued									
ES1523896-001	3251/1	EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.00	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.00	No Limit
ES1523896-011	3251/11	EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.00	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 126362)									
ES1523896-001	3251/1	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	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 (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 126362) - continued									
ES1523896-001	3251/1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1523896-011	3251/11	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit		
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 126354)									
ES1523896-001	3251/1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1523896-007	3251/7	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 126363)									
ES1523896-001	3251/1	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
ES1523896-011	3251/11	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 Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 126354)									
ES1523896-001	3251/1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1523896-007	3251/7	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: 126363)									
ES1523896-001	3251/1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	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 (%)
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 126363) - continued									
ES1523896-001	3251/1	EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	<50	0.00	No Limit
ES1523896-011	3251/11	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	>C10_C16	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 126354)									
ES1523896-001	3251/1	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	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: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1523896-007	3251/7	EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1523896-007	3251/7	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	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: 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



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

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

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EA010: Conductivity (QCLot: 129061)									
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.7	70	130	
EA010: Conductivity (QCLot: 129065)									
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.3	70	130	
EG005T: Total Metals by ICP-AES (QCLot: 130173)									
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	110	92	130	
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	98.5	87	121	
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	98.2	80	136	
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	111	93	127	
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	107	86	124	
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	107	93	131	
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	99.1	81	133	
EG035T: Total Recoverable Mercury by FIMS (QCLot: 130174)									
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	79.0	70	105	
EP075(SIM)A: Phenolic Compounds (QCLot: 126362)									
EP075(SIM): 2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	6 mg/kg	97.2	69	112	
EP075(SIM): 2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	6 mg/kg	88.5	57	111	
EP075(SIM): 2,4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	6 mg/kg	89.7	68	112	
EP075(SIM): 2,4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	6 mg/kg	91.4	69	117	
EP075(SIM): 2,6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	6 mg/kg	94.5	73	117	
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	6 mg/kg	91.8	74	116	
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	6 mg/kg	89.9	72	116	
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	6 mg/kg	88.9	60	117	
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	12 mg/kg	91.6	69	123	
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	6 mg/kg	92.0	76	114	
EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	12 mg/kg	35.4	10	57	
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	6 mg/kg	87.9	74	116	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 126362)									
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	88.7	79	123	
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	96.5	77	123	
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	88.0	79	123	
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	89.4	73	121	
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	89.5	76	122	
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	88.5	70	118	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report				
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 126362) - continued									
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	93.9	72	114	
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	87.7	77	123	
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	88.6	81	123	
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	88.9	72	113	
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	88.3	79	123	
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	87.9	77	123	
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	90.1	71	113	
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	89.1	80	124	
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	94.4	79	123	
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	88.5	79	125	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 126354)									
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	81.0	68	128	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 126363)									
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	109	71	131	
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	250 mg/kg	116	74	138	
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	107	64	128	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 126354)									
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	81.0	68	128	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 126363)									
EP071: >C10 - C16 Fraction	>C10_C16	50	mg/kg	<50	250 mg/kg	103	70	130	
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	119	74	138	
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	200 mg/kg	98.9	63	131	
EP080: BTEXN (QCLot: 126354)									
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	79.7	62	116	
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	76.1	58	118	
EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	2 mg/kg	79.4	60	120	
	106-42-3								
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	80.1	62	138	
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	82.8	60	120	
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	84.6	62	128	

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	SpikeRecovery(%)	Recovery Limits (%)
				Concentration	MS	Low High



Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 130173)							
ES1523896-002	3251/2	EG005T: Arsenic	7440-38-2	50 mg/kg	112	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	111	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	108	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	113	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	110	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	109	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	107	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 130174)							
ES1523896-001	3251/1	EG035T: Mercury	7439-97-6	5 mg/kg	96.2	70	130
EP075(SIM)A: Phenolic Compounds (QCLot: 126362)							
ES1523896-001	3251/1	EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	86.1	70	130
		EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	91.6	60	130
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	84.1	70	130
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	66.2	20	130
		EP075(SIM): Phenol	108-95-2	10 mg/kg	92.6	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 126362)							
ES1523896-001	3251/1	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	90.5	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	78.4	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 126354)							
ES1523896-001	3251/1	EP080: C6 - C9 Fraction	----	32.5 mg/kg	92.6	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 126363)							
ES1523896-001	3251/1	EP071: C10 - C14 Fraction	----	523 mg/kg	103	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	103	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	121	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 126354)							
ES1523896-001	3251/1	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	90.5	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 126363)							
ES1523896-001	3251/1	EP071: >C10 - C16 Fraction	>C10_C16	860 mg/kg	95.6	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	119	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	117	52	132
EP080: BTEXN (QCLot: 126354)							
ES1523896-001	3251/1	EP080: Benzene	71-43-2	2.5 mg/kg	78.1	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	79.3	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	79.7	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	84.0	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	81.4	70	130

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 Work Order : ES1523896
 Client : DM MCMAHON PTY LTD
 Project : TARAGO



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
EP080: BTEXN (QCLot: 126354) - continued							
ES1523896-001	3251/1	EP080: Toluene	108-88-3	2.5 mg/kg	84.6	70	130