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# Environmental Management Plan

## Proposed Temporary Car Park
## North Street, Penrith, NSW

Prepared for
**Penrith City Council**
**PO Box 60**
**PENRITH NSW 2751**

**JC17302A-r3**
**January 2017**

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## 1. INTRODUCTION

This Environmental Management Plan (EMP) is prepared for the proposed burial and encapsulation of asbestos impacted material encountered in the proposed temporary car park to be constructed on the southern side of North Street in Penrith as shown on Drawing No 1.

We understand that the proposed temporary car park will have an approximate 325m frontage to North Street and approximately 55m wide. Total site area is about 9825m$^2$.

GeoEnviro Consultancy was involved in the preparation of a Fill Contamination Assessment in August 2017 (Reference 1) and an Additional Contamination Assessment in November 2017 (Reference 2).

## 2. BACKGROUND INFORMATION AND PREVIOUS STUDIES

### 2.1 Site Locality and Geology

The site is situated on the southern side of North Street in Penrith as shown on the attached Drawing No 1.

The site is situated on low lying gently undulating terrain with ground surface sloping down in a general direction to the south at angles of less than 3 degrees.

The 1:100,000 Soil Landscape Map indicates the site to consist of Residual soil belonging to the Blacktown soil landscape. The soil is typically shallow to moderately deep hardsetting mottled texture contrast soils. Typical characteristics of this soil are moderate reactivity, highly plastic subsoil, low fertility and poor soil drainage.

Based on the 1:100,000 Geological Map of Penrith, the site is underlain by Bringelly Shale (Rwb) of the Wianamatta Group comprising of shale, carbonaceous claystone, claystone, laminate, fine to medium grained lithic sandstone, rare coal and tuff.

### 2.3 Previous Contamination Studies

GeoEnviro Consultancy Pty Ltd previously carried out a Fill Contamination Assessment (Reference 1) and an Additional Contamination Assessment (Reference 2) for the site. Test pit investigation included excavation of thirty-three locations (TP 1 to 33) using a mini excavator. Selected soil samples were sent for laboratory analyses to detect the presence or otherwise of the contaminants of concern including Heavy metals [Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Mercury (Hg), Lead (Pb), Nickel (Ni) and Zinc (Zn)], Organochlorine Pesticides (OCP), Polychlorinated biphenyl's (PCB), Total Recoverable Hydrocarbon (TRH), Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAH) and Asbestos.

The reports concluded the site was found to be impacted by ACM (Asbestos Containing Material) contaminated topsoil/fill with an approximate volume of about 2000m$^3$.

## 3. ENVIRONMENTAL POLICY

The environmental policy on the site adopted by GeoEnviro as part of the EMP is as follows;

- To ensure the remedial works are carried out within the objectives and framework adopted by NSW EPA.
- To ensure the site is adequately remediated so that the site is suitable for the intended landuse.
- To ensure adequate documentation and monitoring works are in place and appropriate management practices are adopted.

## 4. PLANNING AND OBJECTIVES

### 4.1 Environmental Impacts

The site was found to be impacted by ACM (Asbestos Containing Material) contaminated topsoil/fill. The topsoil/fill was generally found to consist of Clayey Silt and Gravelly Sandy Silt with thickness ranging from 0.15m to 1.2m.

Fragments of bonded asbestos pieces (ACM) when exposed on the surface through the natural process (ie weathering and erosion) or human activities (ie excavation and mechanical disturbance) may disintegrate and this may result in freeing of asbestos fibres into the air causing harm to human health.

### 4.2 Contaminated Land Legislation

The DEC has introduced significant reforms in 1997 to the identification and management of contaminated sites within NSW. The following documents outline the reforms undertaken;

- The Contaminated Land Management Act 1997 (CLMA) establishes a process for investigating and remediating land where contamination presents a significant risk of harm to human health or the environment. The main objectives of CLMA are;

    i. To set out accountabilities for managing contaminated land, if a significant risk of harm is identified.

    ii. To set out the role of the DEC in the supervision of contaminated site investigations and/or remediation.

    iii. To provide for the accreditation of site auditors of contaminated land to ensure appropriate standards of auditing in the management of contaminated land, and

    iv. To ensure that contaminated land is managed with regard to the principals of ecologically sustainable development.

- The DEC's Guidelines on the Significant Risk of Harm from Contaminated Land and the Duty to Report, 1999 provide guidelines on the following;

    i. Assessing whether site contamination presents a significant risk of harm under the CLMA.

    ii. The duty to report to the DEC of a site is known of suspected to present a significant risk of harm under the CLMA.

- The State Environmental Planning Policy (SEPP) No 55. – Remediation of Land 1998, prepared by the Department of Urbans Affairs and Planning (DUAP) is an environmental planning instrument that sets out matters which must be considered by local councils and other planning authorities when determining development application, or making zoning or rezoning decisions. The Managing Land Contamination: Planning Guidelines 1998, prepared by DUAP and the DEC, have been developed to further provide guidance to consent authorities on their responsibilities under SEPP55 and the Environmental Planning and Assessment Act 1979.

### 4.3 Environmental Objectives

The objectives of this EMP are in line with the objectives set out by CLMA and are as follows;

- To set our accountabilities and responsibilities for managing contaminated land.

- To ensure that the contaminated land is investigated and adequately remediated to comply with the requirements of DEC and relevant environmental legislation.

- To ensure that the contaminated land is adequately managed and controlled.

# 5. IMPLEMENTATION AND OPERATIONS

## 5.1 Implementation of Works

Remediation works for the ACM contaminated topsoil/fill should include isolation and encapsulation, and capping with 1m thick of clean fill. This will involve;

- Nominate a suitable location for the encapsulation cell and this designated cell area should be located away from future building or development area. For a 2000m$^3$ cell, indicative cell dimensions of 20m wide by 70m long by 2.5m deep, allowing for 1.0m of capping layer should be adequate. The cell location and depth should be surveyed and documented for future reference. Some battering of the cell walls up to 45 degrees would be required for safety.
- Excavation of all topsoil/fill from the site to expose the underlying natural clean clay noting that the insitu topsoil/fill is generally considered not suitable for reuse without treatment or improvement. Prior to excavation, the grass and vegetation should be stripped from the surface and the exposed area should be noted for concentration of asbestos. Areas with asbestos concentration if identifiable should be delineated and excavated at increment depth of 150mm and the excavated surface be reassessed for presence of asbestos until the all topsoil/fill is removed. Care should be taken during excavation to isolate clean topsoil/fill from contaminated topsoil/fill as much as possible. The excavated topsoil/fill should be placed neatly in 15 to 20m$^3$ stockpiles and each stockpile should be identified and labelled for assessment.
- The base should be inspected by environmental consultant to ensure adequate removal of asbestos impacted material and some validation testing by sampling and laboratory analysis may be carried out.

- The stockpiles should be sampled and assessed for presence of asbestos in accordance to the NEPM 2013 procedure (Reference 8). The NEPM provides a guideline on health screening levels for asbestos in soil which may be classified in three types of asbestos; Bonded asbestos-containing-material (ACM), Fibrous asbestos (FA) and Asbestos fines (AF). This procedure includes;
    - Bulk sampling of representative stockpile samples and sieving the samples through 7mm aperture sieve.
    - Measuring the weight of retained asbestos fragments classified as Asbestos Cement Material (ACM),
    - Analysing the sieved samples for Asbestos Fibre (AF) and Fibre Asbestos (FA) material by Envirolab Services
    - Comparing the results with the NEPM 2013 acceptable threshold levels
- Stockpiles with bonded fibreboard (ACM), Fibrous Asbestos or Asbestos Fibres (FA/AF) within the allowable limits may be reused on site in landscaping areas within the site or on Council's parklands. The topsoil/fill material may be reused on site as general fill beneath pavement subject to further assessment by a geotechnical engineer. Topsoil/fill improvement may include mixing of this material with good quality fill such as ripped sandstone based on an initial mix proportion of 1 topsoil/fill to 2 ripped sandstone. The final mix proportion should be determined by the geotechnical engineer.
- Stockpiles with bonded fibreboard (ACM), Fibrous Asbestos or Asbestos Fibres (FA/AF) above the allowable limits should be placed into the excavated encapsulation cell within the site. Some adjustments to the size of the cell will be required to accommodate the final fill volume as determined during excavation. A layer of geofabric (eg Bidim A34) in accordance to the "Guidelines for the Assessment, Remediation and Management of Australia" (Reference 13) should be placed on top of the cell in order to enable future identification and this should be surveyed and documented. A capping material consisting of clean and validated fill (Virgin Excavated Natural Material – VENM) should be placed on top of the cell to design level of the proposed car park.

- All fill material (ie cell material, capping material and general fill ) should be placed in layers not exceeding 250mm thickness and compacted to a minimum 95% Standard Maximum Dry Density (SMDD) at within 2% Optimum Moisture Content (OMC).
- The surface should be turfed and vegetated to control erosion and scouring of barrier which may eventually lead to exposure of asbestos fragments

All works should be undertaken in accordance with licensed contractor in accordance with Workcover and other regulatory requirements.

## 5.2 Supervision and Control

Supervision and control should include the following;

Excavation

An appropriate risk assessment and SWMS should be undertaken by the contractor to ensure excavation of the ACM impacted soil does not create a health risk. Excavation should ensure minimal visible dust emission is created during excavation and this can be done by ensuring the soil is dampened before excavation.

Encapsulation Cells

The excavation sides should be battered to about 1 Horizontal to 1 Vertical to ensure safety and to allow compaction of backfill material. Care should be taken to ensure excavation works will not undermine adjoining properties, nearby buildings or trees.

Backfill Compaction and Testing

Fill stockpile, capping and pavement subgrade material should be placed in thin layers of not exceeding 250mm thickness and compacted to a minimum 95% Standard Maximum Dry Density (SMDD) at within 2% Optimum Moisture Content (OMC).

Density tests should be conducted during backfill placement to ensure the above compaction specifications are achieved. Such works should be carried out by a NATA accredited laboratory in accordance with AS 3798 (Reference 9).

Stockpiling

Stockpiling of soil if required should be carried out at locations away from construction activities, drainage easement or watercourse. Silt fence should be placed around the stockpile.

Surplus Fill Landfill Disposal

Surplus fill to be disposed to a NSW EPA approved landfill should be characterised in accordance with DEC guidelines (Reference 7). Such works include sampling and laboratory analysis for contaminants of concern including Heavy Metals, pesticides and hydrocarbons. Total concentrations and leachable concentrations should be obtained.

Capping Material

Fill capping material should comprise of natural soil (Virgin Natural Excavated Material – VENM) such as Clay, Silty Clay and Sandy Clay and be free of putrescible material. The clayey soil should be of low permeability and low reactivity with the following properties;

| | | |
|---|---|---|
| Maximum Particle Size | = | 75mm |
| Liquid Limit | = | Less than 45% |
| Plasticity Index | = | Less than 15% |

## 5.3 Environmental Management

The following environmental management should include;

Airborne Asbestos Fibre Control

Airborne asbestos fibre control during excavation works should include the following;

- Ensure no visible dust leaves the site during excavation. This may include covering excavated stockpiles which may remain for a prolonged period of time with hessian or similar material.
- If possible, keep the excavated surface damp to minimise visible dust emission.
- If deemed necessary, conduct airborne asbestos monitoring by an occupational hygienist. The airborne asbestos fibre measurements are to be conducted by a NATA accredited laboratory.

Erosion and Sediment Control

Erosion and sediment control measures should include but not be limited to the following;

- Installation of silt fences at regular intervals in appropriate locations to prevent migration of silt into waterways.
- Haybales should be placed near all stormwater inlets in the vicinity of the work area.
- No wastewater should be allowed to run into the stormwater drains.
- Hose tyres of vehicles before they leave site.

Dust Control

There is a potential for fugitive dust generated during the excavation and earthworks. The site superintendent should arrange the following dust control measures;

- Hosing with a fine spray of water on exposed surfaces particularly during the hot summer days.
- Covering all stockpiles which will be left for an extended period of time.
- Hosing vehicles and covering loads prior to movement of vehicles on site and especially prior to leaving the site.

Noise Control

All noise producing equipment should meet the requirements of the Noise Control Act (1975). All contractors must ensure that the Work Timing are adhered to and any work approved to be performed outside of schedule hours is carried out without a contravention of the Act.

### 5.4 Health and Safety

Subcontractors performing work activities are expected to meet all Workcover's and other applicable Commonwealth and State/Territory requirements for employee's health and safety. Appropriate personal protective equipment and clothings and on-site monitoring during fieldwork should be observed.

### 5.5 Records and Documentations

The entire process of the remedial works should be sufficiently recorded and documented. This should include a survey of the encapsulation cell to ensure future identification is possible. Such information should be systematically stored.

The Planning Certificates under Section 149 Environmental Planning and Assessment Act 1979 should be updated to include the burial and encapsulation area.

## 5.6 Responsibilities and Accountabilities

The above following is a summary list of task and parties responsible;

| Section | Description | Responsibilities | Accountabilities |
|---|---|---|---|
| 5.1 | Implementation of works | Contractor | Organisation and planning of works |
| | | | Works are fully implemented per instruction |
| | | | Various parties have be informed and communicated. |
| 5.2 | Supervision and Control | Contractor | Ensure smooth running of daily works. |
| | | | Organising site inspections |
| | | Consultant | Test results are conveyed to the contractor. |
| | | | Site instructions are provided to the contractor promptly. |
| | | Council | Overall project is carried out according to the EMP. |
| 5.3 | Health and Safety | Contractor | Ensure all workers are fully trained with appropriated licenses and approvals. |
| | | | Appropriate site induction is provided to all employees and visitors |
| | | | Ensure site is safe. |
| | | Consultant | All accidents/incidents are documented and stored |
| | | Council | Ensure appropriate permits and approvals have been complied to. |
| 5.4 | Records and Documentations | Contractor | Daily records of work progress |
| | | | Acquiring appropriate dockets (landfill) and certificates |
| | | Consultant | Ensure all documentations held by contractors are up to date and compliance. |
| | | Council | The Planning Certificates under Section 149 Environmental Planning and Assessment Act 1979 are updated. |

# 6. MONITORING AND CORRECTIVE ACTIONS

## 6.1 Monitoring

An environmental management plan should be in place to ensure;

- The asbestos impacted topsoil/fill are not unknowingly disturbed in the future
- The barrier is maintained and not breached.
- No subsurface water is introduced into the ground resulting in weathering/disintegration of bonded asbestos and potential migration asbestos off site.
- All future redevelopment of the site do not pose an occupation health hazard to workers.
- All future redevelopment to include cleanup of asbestos impacted soil.

## 6.2 Contingency Plan

In the event where the encapsulated cells are breached during excavation works or service trenching without obtaining the appropriate permits from Council, the following remedial actions should be taken;

- All works should be halted and details of the offender taken.
- The excavated material containing bonded asbestos fragments should be temporarily covered with an impervious membrane and the area barricaded. Silt fencing should be erected around the area and appropriate signs should be erected warning the public to keep out from the area.
- Council's Property and Open Space branch and Environmental Health and Safety branch should be notified immediately.

## 6.2 Unexpected Asbestos Finds

In the event where bonded asbestos fragments are encountered on the site other the designated burial area and/or encapsulation cells, an unexpected asbestos finds protocol as detailed in Appendix B should be initiated.

## 6.3 Compliance

The following measures should be taken to ensure the environmental policies in above Section 3 are met and the works comply with the current regulations and practices.

- Ensure that the environmental performance is regularly monitored;
- Periodically evaluate compliance with the relevant legal and other requirements.
- Regularly perform audit of the environmental management system
- Record, investigate and analysis accidents/incidents

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***References***

1. *"Pavement Investigation and Fill Contamination Assessment – North Street Penrith", GeoEnviro Consultancy Pty Ltd reference JC17302A-r1 dated August 2017*
2. *"Additional Contamination (Asbestos) Assessment and RAP – North Street Penrith", GeoEnviro Consultancy reference JC17302A-r2 dated November 2017*
3. *Australian & New Zealand Guidelines for the Assessment and Management of Contaminated Sites, Australian and New Zealand Conservation Council and National Health and Medical Research Council, 1992.*
4. *Health Based Soil Investigation Levels, National Environmental Health Forum Monographs Soil Series No. 1 – 1996*
5. *Assessment of Site Contamination- Measure 1999 – National Environment Protection*
6. *Guidelines for Assessment Service Station Sites – NSW EPA 1994*
7. *Guidelines for the NSW Auditor Scheme, NSW EPA*
8. *Part 1- Classifying Waste –NSW DECC 2008*
9. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 – ANZECC.*
10. *AS 3798 -1996 "Guidelines on earthworks for commercial and residential developments"*

Appendix A

*Extracts of Previous Contamination Reports*


**Legend**

- TP 1 — Test Pits (24/07/2017)
- TP 18 — Test Pits (17/10/2017)

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| | | |
|---|---|---|
| Drawn By: SG | Date: 31/10/2017 | Penrith City Council |
| Checked By: SL | Date: 31/10/2017 | North Street, Penrith |
| Revision By: | Date: | Test Pit Location Plan |
| Scale: Not to Scale | A3 | Project No: JC17302A-r2 / Drawing No: 1 |


**Legend**

TP 1 — Test Pits with asbestos Impacted topsoil/fill

GeoEnviro Consultancy
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| | | |
|---|---|---|
| Drawn By: SG | Date: 31/10/2017 | Penrith City Council |
| Checked By: SL | Date: 31/10/2017 | North Street, Penrith |
| Revision By: | Date: | Plan Indicating Test Pits with Asbestos |
| Scale: Not to Scale | A3 | Project No: JC17302A-r2 / Drawing No: 2 |

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Form No. R012/Ver02/06/07

**GeoEnviro Consultancy Pty Ltd**
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## Table 1 : Summary of Test Pit Profile



Client: Penrith City Council | Job Number: JC17302A-r2

Project: Proposed Temporary Car Park | Logged By: SG

Location: North Street, Penrith | Date: 31/10/2017

| Test Pit Number | Depth (m) From | Depth (m) To | Material Description |
|---|---|---|---|
| 1 | 0.00 | 0.40 | Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, minor plastic and 1x cobble, dry |
| | 0.40 | 0.70 | (CH) Silty Clay: high plasticity, red brown, dry to moist |
| 2 | 0.00 | 0.40 | Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, 1x brick fragment and trace of sand, dry |
| | 0.40 | 1.10 | (CH) Silty Clay: high plasticity, red brown, dry to moist, PP=360kPa, very stiff |
| | 1.10 | 1.60 | (CI) Silty Clay: medium plasticity, red and grey with fine grained gravel, dry to moist |
| 3 | 0.00 | 0.50 | Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, and concrete, porcelain and glass fragments, dry to moist |
| | 0.50 | 0.80 | (CH) Silty Clay: high plasticity, red brown, moist, PP=310kPa, very stiff |
| 4 | 0.00 | 0.30 | Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, 1x brick and asbestos fragment, dry |
| | 0.30 | 0.50 | (CH) Silty Clay: high plasticity, red brown, dry to moist |
| 5 | 0.00 | 0.50 | Topsoil/Fill: Gravelly Silty Clay/Gravelly Clayey Silt: low liquid limit/low plasticity, brown with fine grained gravel, dry to moist |
| | 0.50 | 0.70 | (CI) Silty Clay: medium plasticity, grey brown, moist, PP=300, very stiff |
| 6 | 0.00 | 0.40 | Topsoil/Fill: Clayey Silt: low liquid limit, brown with brick and glass fragments, dry to moist |
| | 0.40 | 0.60 | (CH) Silty Clay: high plasticity, red brown, dry to moist |
| 7 | 0.00 | 0.20 | Fill: Crushed Sandstone |
| | 0.20 | 0.45 | Topsoil/Fill: Clayey Silt: low liquid limit, brown with gravel and 1 asbestos piece, dry |
| | 0.45 | 0.70 | (CH) Silty Clay: high plasticity, red brown, dry to moist |
| 8 | 0.00 | 0.40 | Topsoil/Fill: Clayey Silt: low liquid limit, brown with gravel, metal pipe, and 2x asbestos fragments, dry |
| | 0.40 | 0.60 | (CH) Silty Clay: high plasticity, red brown, dry to moist |
| 9 | 0.00 | 0.20 | Fill: Crushed Sandstone |
| | 0.20 | 0.35 | Topsoil/Fill: Clayey Silt: low liquid limit, brown with glass fragments, dry |
| | 0.35 | 0.60 | (CH) Silty Clay: high plasticity, red brown, dry to moist |
| 10 | 0.00 | 0.50 | Topsoil: Clayey Silt: low liquid limit, brown with river gravel, dry to moist |
| | 0.50 | 0.70 | (CH) Silty Clay: high plasticity, brown, dry to moist |
| 11 | 0.00 | 0.30 | Topsoil/Fill: Clayey Silt: low liquid limit, brown with abundant bricks, dry |
| | 0.30 | 0.70 | (CH) Silty Clay: high plasticity, brown red, dry, PP=410-450kPa, hard |
| 12 | 0.00 | 0.35 | Topsoil/Fill: Gravelly Clayey Silt: low liquid limit, brown with 3x asbestos fragments, dry |
| | 0.35 | 0.60 | (CH) Silty Clay: high plasticity, brown, dry to moist |
| | | | Notes: |
| | | | MC = Moisture Content. |
| | | | PL = Plastic Limit. |
| | | | PP = Pocket Penetrometer. |

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Client: Penrith City Council | Job Number: JC17302A-r2

Project: Proposed Temporary Car Park | Logged By: SG

Location: North Street, Penrith | Date: 31/10/2017

| Test Pit Number | Depth (m) From | Depth (m) To | Material Description |
|---|---|---|---|
| 13 | 0.00 | 0.25 | Topsoil/Fill: Sandy Silt: low liquid limit, brown with concrete fragments and gravel, dry |
| | 0.25 | 0.35 | Fill: Gravelly Silty Clay: medium plasticity, brown with concrete, tile and porcelain fragments, dry |
| | 0.35 | 0.60 | (CH) Silty Clay: high plasticity, brown, dry, PP=450kPa, hard |
| 14 | 0.00 | 0.40 | Topsoil/Fill: Clayey Silt: low liquid limit, brown with tile and brick fragments, glass, timber, PVC and concrete pieces, dry |
| | 0.40 | 0.70 | (CH) Silty Clay: high plasticity, brown, dry |
| 15 | 0.00 | 0.45 | Topsoil/Fill: Gravelly Clayey Silt: low liquid limit, brown with fine to coarse grained gravel, brick fragments and 1x asbestos piece, dry |
| | 0.45 | 0.90 | (CI-CH) Silty Clay: medium to high plasticity, brown, dry to moist, PP=310-330kPa, very stiff |
| | 0.90 | 1.60 | (CI) Silty Clay: medium plasticity, brown with fine grained gravel, dry |
| 16 | 0.00 | 0.40 | Topsoil/Fill: Gravelly Sandy Silt: low liquid limit, brown with fine to coarse grained gravel and brick fragments, dry |
| | 0.40 | 0.70 | Topsoil: Clayey Silt, low liquid limit, dark brown, moist |
| | 0.70 | 1.10 | (CI-CH) Silty Clay: medium to high plasticity, brown, dry to moist, PP=300kPa, very stiff |
| 17 | 0.00 | 0.60 | Topsoil/Fill: Gravelly Clayey Silt: low liquid limit, brown with brick fragments, glass, tile, asphalt, river gravel and asbestos |
| | 0.60 | 0.90 | (CI-CH) Silty Clay: medium to high plasticity, brown, dry |
| 18 | 0.00 | 0.80 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, PVC pipe, sandstone gravel, brick fragment, glass, concrete fragment, dry |
| | 0.80 | 1.10 | Topsoil: Clayey Silt: Low liquid limit, brown, dry |
| | 1.10 | 1.30 | (CI-CH) Silty Clay: Medium to high plasticity, brown, dry |
| 19 | 0.00 | 0.90 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with brick fragments, rusty metal, plastic bottle, orange conduit, Asbestos fragment at 0.5m, sandstone gravel, porceline and glass fragments, dry |
| | 0.90 | 1.20 | Topsoil: Clayey Silt: Low liquid limit, brown, dry |
| | 1.20 | 2.00 | (CI-CH) Silty Clay: Medium to high plasticity, brown, dry |
| 20 | 0.00 | 0.35 | Tospoil/Fill: Clayey Silt: Low liquid limit, brown, with porceline, asbestos at 0.1m, brick fragments, river gravel, dry |
| | 0.35 | 0.70 | (CH) Silty Clay: High plasticity, red brown, dry |
| 21 | 0.00 | 0.35 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with brick, glass and wood fragments, dry |
| | 0.35 | 0.50 | (CH) Silty Clay: High plasticity, red brown, dry |
| 22 | 0.00 | 0.50 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with shale cobbles, roots, minor fabric and porceline fragments, dry |
| | 0.50 | 0.70 | (CH) Silty Clay: High plasticity, red brown, dry |
| 23 | 0.00 | 0.40 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with brick fragments, masonite board, Silty Clay inclusions, dry |
| | 0.40 | 0.60 | (CH) Silty Clay: High plasticity, red brown, dry |
| 24 | 0.00 | 0.30 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with river gravel and porceline, dry |
| | 0.30 | 0.50 | (CH) Silty Clay: High plasticity, red brown, dry |
| | | | Notes: |
| | | | MC = Moisture Content. |
| | | | PL = Plastic Limit. |
| | | | PP = Pocket Penetrometer. |

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Client: Penrith City Council | Job Number: JC17302A-r2

Project: Proposed Temporary Car Park | Logged By: SG

Location: North Street, Penrith | Date: 31/10/2017

| Test Pit Number | Depth (m) From | Depth (m) To | Material Description |
|---|---|---|---|
| 25 | 0.00 | 0.35 | Topsoil/Fill: Silty Clay/Clayey Silt: Low plasticity, brown, gravel, dry |
| | 0.35 | 0.60 | (CH) Silty Clay: High plasticity, red brown, dry to moist |
| 26 | 0.00 | 0.50 | Topsoil/Fill: Silty Clay/Clayey Silt: Low liquid limit, brown, with asbestos at 0.3m, brick and porceline fragments, ash, gravel, dry |
| | 0.50 | 0.80 | (CH) Silty Clay: High plasticity, red brown, dry |
| 27 | 0.00 | 0.60 | Topsoil/Fill: Clayey Silt/Silty Clay: Low plasticity, brown, with brick fragments, car axle, river pebble, shale gravel, glass, dry |
| | 0.60 | 0.90 | (CI-CH) Silty Clay: Medium to high plasticity, brown, dry |
| 28 | 0.00 | 0.55 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with concrete gravel, asbestos at 0.3m, plastic, wire, porceline, glass, and brick fragments, dry |
| | 0.55 | 0.70 | (CH) Silty Clay: High plasticity, red brown, dry |
| 29 | 0.00 | 0.30 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with concrete gravel, glass and concrete gravel, dry |
| | 0.30 | 0.60 | (CH) Silty Clay: High plasticity, red brown, dry |
| 30 | 0.00 | 0.30 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with concrete gravel, asbestos fragment at 0.1m, dry |
| | 0.30 | 0.60 | (CH) Silty Clay: High plasticity, red brown, dry |
| 31 | 0.00 | 0.40 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with concrete and brick fragments, wire, glass and asbestos at 0.2m |
| | 0.40 | 0.60 | (CH) Silty Clay: High plasticity, red brown, dry |
| 32 | 0.00 | 0.20 | Topsoil/Fill: Silty Clay/Clayey Silt: Low plasticity, red brown, with gravel, dry |
| | 0.20 | 0.50 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with ash, brick fragments, asbestos at 0.3m, dry |
| | 0.50 | 0.80 | Topsoil: Clayey Silt: Low liquid limit, brown, dry |
| | 0.80 | 1.80 | (CH) Silty Clay: High plasticity, red brown, dry |
| 33 | 0.00 | 0.50 | Topsoil/Fill: Clayey Silt/Silty Clay: Low plasticity. Brown, with brick, tile, glass fragments, river gravel, dry |
| | 0.50 | 0.70 | (CH) Silty Clay: High plasticity, red brown, dry |
| 34 | 0.00 | 0.40 | Topsoil/Fill: Clayey Silt/Silty Clay: Low liquid limit, brown, with brick, concrete, sandstone and terracotta fragments, dry |
| | 0.40 | 0.60 | (CH) Silty Clay: High plasticity, red brown, dry |
| 35 | 0.00 | 0.30 | Topsoil/Fill: Clayey Silt: Low liquid limit, brown, with river gravel, dry |
| | 0.30 | 0.50 | (CH) Silty Clay: High plasticity, red brown, dry |

Notes:
MC = Moisture Content.
PL = Plastic Limit.
PP = Pocket Penetrometer.

| Sample | Depths (m) | Sample Date | Sample Type | Analysis | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | pH | Heavy Metals | | | | | | | | OCP | PCB | TRH | BTEX | PAH | Asbestos | TCLP (Heavy Metals + PAH) |
| | | | | | As | Cd | Cr | Cu | Pb | Hg | Ni | Zn | | | | | | | |
| TP4 | 0.0-0.1 | 24/07/2017 | Soil/ACM | o | o | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| TP7 | Fragments | 24/07/2017 | ACM | | | | | | | | | | | | | | | o | |
| TP8 | Fragments | 24/07/2017 | ACM | | | | | | | | | | | | | | | o | |
| TP12 | Fragments | 24/07/2017 | Soil/ACM | | | | | | | | | | | | | | | o | |
| TP15 | Fragments | 24/07/2017 | ACM | | | | | | | | | | | | | | | o | |
| TP17 | 0.2-0.3 | 24/07/2017 | Soil | o | o | o | o | o | o | o | o | o | o | o | o | o | o | o | o |

Note: O denotes tested

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# TABLE 2

## Analytical Program

Penrith City Council
Proposed Temporary Car Park
North Street Penrith

| Sample | Depths (m) | pH | Arsenic | Cadmium | Chromium | Copper | Lead | Mercury | Nickel | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|
| TP 4 | 0.00-0.10 | 6.6 | 7 | 0.6 | 15 | 37 | 320 | 0.1 | 9 | 580 |
| TP17 | 0.2-0.3 | 5.4 | 15 | <0.4 | 15 | 100 | 330 | 1 | 8 | 120 |
| HBILs 'A' Criteria | | | 100 | 20 | 100 (VI) | 600 | 300 | 40 | 400 | 7400 |
| HBILs 'C' Criteria | | | 300 | 90 | 300 (VI) | 17000 | 600 | 80 | 1200 | 30000 |

Notes

1) All results are expressed as mg/kg and pH (units).

2) Figures in bold italics exceed the EIL Criteria

3) Figures in bold italics exceed the HBIL 'A' Criteria

4) Ambient Background Concentrations

5) Added Contaminant Limits

* EIL = ABC+ACL

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# TABLE 3

## Summary of Analytical Results - Heavy Metals

Penrith City Council

Proposed Temporary Car Park

North Street Penrith



Prepared By: SL Date: 27/11/2017
Checked By:__SG___Date:27/11/2017

| Sample | Depths (m) | HCB | alpha-BHC | gamma-BHC | beta-BHC | Heptachlor | delta-BHC | Aldrin | Heptachlor Epoxide | gamma-Chlordane | alpha-chlordane | Endosulfan I | pp-DDE | Dieldrin | Endrin | pp-DDD | Endosulfan II | pp-DDT | Endrin Aldehyde | Endosulfan Sulphate | Methoxychlor | Total OCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP 4 | 0.00-0.10 | <0.1 | <0.1 | <0.1 | <0.1 | 0.2 | <0.1 | <0.1 | 0.2 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | ND |
| TP17 | 0.2-0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | ND |
| HBILs 'A' Criteria | | 10 | | | | 6 | | 6 | | 50 | | 270 | 240 | 6 | 10 | 240 | | 240 | | | 300 | |
| HBILs 'C' Criteria | | 10 | | | | 10 | | 10 | | 70 | | 340 | 400 | 10 | 20 | 400 | | 400 | | | 400 | |

Notes

1) All results are expressed as mg/kg and pH (units).

2) Figures in bold italics exceed the HBILs 'A' Criteria

3) Figures in bold italics and underlined exceed the HBILs 'C' Criteria

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# TABLE 4
## Summary of Analytical Results - OCP

Penrith City Council

Proposed Temporary Car Park

North Street Penrith



Prepared by: SL Date: 27/11/2017
Checked By:__SG___Date:27/11/2017

| Sample | Depths (m) | Arochlor 1016 | Arochlor 1221 | Arochlor 1232 | Arochlor 1242 | Arochlor 1248 | Arochlor 1254 | Arochlor 1260 | Total PCB |
|---|---|---|---|---|---|---|---|---|---|
| TP 4 | 0.00-0.10 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | ND |
| TP17 | 0.2-0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | ND |
| HBILs 'A' Criteria | | | | | | | | | 1 |
| HBILs 'C' Criteria | | | | | | | | | 1 |

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# TABLE 5
## Summary of Analytical Results - PCB

Penrith City Council
Proposed Temporary Car Park
North Street Penrith

Notes

1) All results are expressed as mg/kg and pH (units).
2) Figures in bold italics exceed the HBILs 'A' Criteria
3) Figures in bold italics and underlined exceed the HBILs 'C' Criteria

| Sample | Depths (m) | $C_6$-$C_9$ | $C_{10}$-$C_{14}$ | $C_{15}$-$C_{28}$ | $C_{29}$-$C_{36}$ | $C_{10}$-$C_{36}$ | F1 [4] $C_6$-$C_{10}$ | F2 [5] $>C_{10}$-$C_{16}$ | F3 $C_{16}$-$C_{34}$ | F4 $C_{34}$-$C_{40}$ | Volatile Organic Compounds (VOC) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Benzene | Toluene | Ethylbenzene | m+p-xylene | o-Xylene | Naphthalene |
| TP 4 | 0.00-0.10 | <25 | <50 | <100 | <100 | <250 | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <2 | <1 | <1 |
| TP17 | 0.2-0.3 | <25 | <50 | <100 | <100 | <250 | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <2 | <1 | <1 |
| NSW DEC (1994) | | 65 | | | | 1000 | | | | | 1 | 1.4 | 3.1 | 14 | | |
| HSLs 'A and B' Criteria (CLAY) | 0m to <1m | | | | | | 50 | 280 | | | 0.7 | 480 | 480 | 110 | | 5 |
| | 1m to <2m | | | | | | 90 | | | | 1 | | | 310 | | |
| | 2m to < 4m | | | | | | 150 | | | | 2 | | | | | |
| | 4m+ | | | | | | 290 | | | | 3 | | | | | |
| ESL Criteria | | | | | | | 180 | 120 | 1300 | 5600 | 65 | 105 | 125 | 45 | | |

Notes

1) All results are expressed as mg/kg unless otherwise specified

2) Figures in bold exceed the NSW DEC criteria

3) ND Not detected

4) F1 is $C_6$-$C_{10}$ minus the sum of the BTEX concentrations

5) F2 is $>C_{10}$-$C_{16}$ Minus Napthalene

6) Figures in bold italics exceed the ESL Criteria

7) Figures in bold italics that have been underlined exceed the HSLs 'A and B' Criteria

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# TABLE 6

## Summary of Analytical Results - TRH and VOC

Penrith City Council
Proposed Temporary Car Park
North Street Penrith

| Sample | Depths (m) | Naphthalene | Acenaphthylene | Acenaphthene | Fluorene | Phenanthrene | Anthracene | Fluoranthene | Pyrene | Benzo(a)anthracene | Chrysene | Benzo(b+k)fluoranthene | Benzo(a)pyrene | Indeno(1,2,3-c,d)pyrene | Dibenzo(a,h)anthracene | Benzo(g,h,i)perylene | Benzo(a)pyrene TEQ | Total PAHs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP 4 | 0.00-0.10 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | 0.2 | 0.2 | <0.1 | 0.1 | <0.2 | 0.1 | 0.1 | <0.1 | 0.1 | <0.5 | 1 |
| TP17 | 0.2-0.3 | <0.1 | 0.2 | <0.1 | 0.1 | 2.4 | 0.5 | 6.5 | 5.8 | 2.2 | 2.1 | 3.8 | 2.4 | 2 | 0.5 | 1.9 | 3.8 | 31 |
| HBILs 'A' Criteria | | 3 | | | | | | | | | | | | | | | 3* | 300 |
| HBILs 'C' Criteria | | | | | | | | | | | | | | | | | 3* | 300 |
| ESL Criteria | | | | | | | | | | | | | 0.7 | | | | | |

Notes

1) All results are expressed as mg/kg

2) Figures in bold italics exceed the HBILs 'A' Criteria

3) Figures in bold italics and underlined exceed the HBILs 'C' Criteria

4) Figures in bold italics that have been underlined and shaded exceed the ESL Criteria

* B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products

| PAH Species | TEF |
|---|---|
| Benzo(a)anthracene | 0.1 |
| Benzo(a)pyrene | 1 |
| Benzo(b+j)fluoranthene | 0.1 |
| Benzo(k)fluoranthene | 0.1 |
| Benzo(g,h,i)perylene | 0.01 |
| Chrysene | 0.01 |
| Dibenzo(a,h)anthracene | 1 |
| Indeno(1,2,3-c,d)pyrene | 0.1 |

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# TABLE 7
## Summary of Analytical Results - PAH

Penrith City Council
Proposed Temporary Car Park
North Street Penrith

| Sample | Depths (m) | Asbestos |
|---|---|---|
| TP4 | 0.0-0.1 | ACM - Chrysotile and Amosite/No Friable |
| TP7 | Fragments | ACM - Chrysotile, Amosite and Crocidolite |
| TP8 | Fragments | ACM - Chrysotile and Amosite |
| TP12 | Fragments | ACM - Chrysotile, Amosite and Crocidolite |
| TP15 | Fragments | ACM - Chrysotile, Amosite and Crocidolite |
| TP17 | 0.2-0.3 | ACM - Chrysotile and Amosite/No Friable |
| HBILs 'A' Criteria | | 0.01% / 0.001% [1] |
| HBILs 'C' Criteria | | 0.02% / 0.001% [1] |

Note: ND = Not detected

Measured in %w/w

1) Bonded Asbestos Contaminaint Material / Fiberous Asbestos and Asbestos Fines

2) Figures in bold italics exceed the HBILs 'A' Criteria

3) Figures in bold italics and underlined exceed the HBILs 'A' Criteria

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# TABLE 8

## Summary of Analytical Results - Asbestos

Penrith City Council

Proposed Temporary Car Park

North Street Penrith

| Sample | Depths (m) | Arsenic | Cadmium | Chromium | Lead | Mercury | Nickel | PAH |
|---|---|---|---|---|---|---|---|---|
| TP 4 | 0.00-0.10 | <0.05 | <0.01 | <0.01 | 0.07 | <0.0005 | <0.02 | 0.001 |
| TP17 | 0.2-0.3 | <0.05 | <0.01 | <0.01 | 0.1 | <0.0005 | <0.02 | ND |

Notes

1) All results are expressed as mg/L

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# TABLE 9

## Summary of Analytical Results - (TCLP) Heavy Metals and PAH

Penrith City Council

Proposed Temporary Car Park

North Street Penrith

**Envirolab Services Pty Ltd**
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

# CERTIFICATE OF ANALYSIS 172091

## Client Details

| | |
|---|---|
| **Client** | Geoenviro Consultancy Pty Ltd |
| **Attention** | Solern Liew |
| **Address** | PO Box 1543, Macquarie Centre, North Ryde, NSW, 2113 |

## Sample Details

| | |
|---|---|
| **Your Reference** | **JC17302A, Penrith** |
| **Number of Samples** | 2 soils 5 materials |
| **Date samples received** | 25/07/2017 |
| **Date completed instructions received** | 25/07/2017 |

## Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

## Report Details

| | |
|---|---|
| **Date results requested by** | 03/08/2017 |
| **Date of Issue** | 03/08/2017 |

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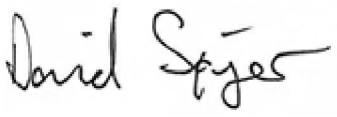
## Report Comments

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 172091-1 & 7 were sub-sampled from jars provided by the client.

**Asbestos Approved By**
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Lulu Scott

**Results Approved By**
Dragana Tomas, Senior Chemist
Long Pham, Team Leader, Metals
Lulu Scott, Asbestos Supervisor
Steven Luong, Chemist

**Authorised By**



David Springer, General Manager

| vTRH(C6-C10)/BTEXN in Soil | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date extracted | - | 27/07/2017 | 27/07/2017 |
| Date analysed | - | 27/07/2017 | 27/07/2017 |
| TRH $C_6$ - $C_9$ | mg/kg | <25 | <25 |
| TRH $C_6$ - $C_{10}$ | mg/kg | <25 | <25 |
| vTPH $C_6$ - $C_{10}$ less BTEX (F1) | mg/kg | <25 | <25 |
| Benzene | mg/kg | <0.2 | <0.2 |
| Toluene | mg/kg | <0.5 | <0.5 |
| Ethylbenzene | mg/kg | <1 | <1 |
| m+p-xylene | mg/kg | <2 | <2 |
| o-Xylene | mg/kg | <1 | <1 |
| Total +ve Xylenes | mg/kg | <1 | <1 |
| naphthalene | mg/kg | <1 | <1 |
| *Surrogate* aaa-Trifluorotoluene | % | 101 | 107 |

| svTRH (C10-C40) in Soil | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date extracted | - | 27/07/2017 | 27/07/2017 |
| Date analysed | - | 28/07/2017 | 28/07/2017 |
| TRH $C_{10}$ - $C_{14}$ | mg/kg | <50 | <50 |
| TRH $C_{15}$ - $C_{28}$ | mg/kg | <100 | <100 |
| TRH $C_{29}$ - $C_{36}$ | mg/kg | <100 | <100 |
| TRH >$C_{10}$ -$C_{16}$ | mg/kg | <50 | <50 |
| TRH >$C_{10}$ - $C_{16}$ less Naphthalene (F2) | mg/kg | <50 | <50 |
| TRH >$C_{16}$ -$C_{34}$ | mg/kg | <100 | <100 |
| TRH >$C_{34}$ -$C_{40}$ | mg/kg | <100 | <100 |
| Total +ve TRH (>C10-C40) | mg/kg | <50 | <50 |
| *Surrogate* o-Terphenyl | % | 90 | 92 |

| PAHs in Soil | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date extracted | - | 27/07/2017 | 27/07/2017 |
| Date analysed | - | 28/07/2017 | 28/07/2017 |
| Naphthalene | mg/kg | <0.1 | <0.1 |
| Acenaphthylene | mg/kg | <0.1 | 0.2 |
| Acenaphthene | mg/kg | <0.1 | <0.1 |
| Fluorene | mg/kg | <0.1 | 0.1 |
| Phenanthrene | mg/kg | 0.1 | 2.4 |
| Anthracene | mg/kg | <0.1 | 0.5 |
| Fluoranthene | mg/kg | 0.2 | 6.5 |
| Pyrene | mg/kg | 0.2 | 5.8 |
| Benzo(a)anthracene | mg/kg | <0.1 | 2.2 |
| Chrysene | mg/kg | 0.1 | 2.1 |
| Benzo(b,j+k)fluoranthene | mg/kg | <0.2 | 3.8 |
| Benzo(a)pyrene | mg/kg | 0.1 | 2.4 |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | 2.0 |
| Dibenzo(a,h)anthracene | mg/kg | <0.1 | 0.5 |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | 1.9 |
| Benzo(a)pyrene TEQ calc (zero) | mg/kg | <0.5 | 3.8 |
| Benzo(a)pyrene TEQ calc(half) | mg/kg | <0.5 | 3.8 |
| Benzo(a)pyrene TEQ calc(PQL) | mg/kg | <0.5 | 3.8 |
| Total +ve PAH's | mg/kg | 1.0 | 31 |
| *Surrogate p*-Terphenyl-d14 | % | 91 | 100 |

| Organochlorine Pesticides in soil | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date extracted | - | 27/07/2017 | 27/07/2017 |
| Date analysed | - | 27/07/2017 | 27/07/2017 |
| HCB | mg/kg | <0.1 | <0.1 |
| alpha-BHC | mg/kg | <0.1 | <0.1 |
| gamma-BHC | mg/kg | <0.1 | <0.1 |
| beta-BHC | mg/kg | <0.1 | <0.1 |
| Heptachlor | mg/kg | 0.2 | <0.1 |
| delta-BHC | mg/kg | <0.1 | <0.1 |
| Aldrin | mg/kg | <0.1 | <0.1 |
| Heptachlor Epoxide | mg/kg | 0.2 | <0.1 |
| gamma-Chlordane | mg/kg | 0.3 | <0.1 |
| alpha-chlordane | mg/kg | <0.1 | <0.1 |
| Endosulfan I | mg/kg | <0.1 | <0.1 |
| pp-DDE | mg/kg | <0.1 | <0.1 |
| Dieldrin | mg/kg | <0.1 | <0.1 |
| Endrin | mg/kg | <0.1 | <0.1 |
| pp-DDD | mg/kg | <0.1 | <0.1 |
| Endosulfan II | mg/kg | <0.1 | <0.1 |
| pp-DDT | mg/kg | <0.1 | <0.1 |
| Endrin Aldehyde | mg/kg | <0.1 | <0.1 |
| Endosulfan Sulphate | mg/kg | <0.1 | <0.1 |
| Methoxychlor | mg/kg | <0.1 | <0.1 |
| Total +ve DDT+DDD+DDE | mg/kg | <0.1 | <0.1 |
| *Surrogate* TCMX | % | 94 | 94 |

| PCBs in Soil | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date extracted | - | 27/07/2017 | 27/07/2017 |
| Date analysed | - | 27/07/2017 | 27/07/2017 |
| Aroclor 1016 | mg/kg | <0.1 | <0.1 |
| Aroclor 1221 | mg/kg | <0.1 | <0.1 |
| Aroclor 1232 | mg/kg | <0.1 | <0.1 |
| Aroclor 1242 | mg/kg | <0.1 | <0.1 |
| Aroclor 1248 | mg/kg | <0.1 | <0.1 |
| Aroclor 1254 | mg/kg | <0.1 | <0.1 |
| Aroclor 1260 | mg/kg | <0.1 | <0.1 |
| Total +ve PCBs (1016-1260) | mg/kg | <0.1 | <0.1 |
| *Surrogate* TCLMX | % | 94 | 94 |

| Acid Extractable metals in soil | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date prepared | - | 27/07/2017 | 27/07/2017 |
| Date analysed | - | 27/07/2017 | 27/07/2017 |
| Arsenic | mg/kg | 7 | 15 |
| Cadmium | mg/kg | 0.6 | <0.4 |
| Chromium | mg/kg | 15 | 15 |
| Copper | mg/kg | 37 | 100 |
| Lead | mg/kg | 320 | 330 |
| Mercury | mg/kg | 0.1 | 1.0 |
| Nickel | mg/kg | 9 | 8 |
| Zinc | mg/kg | 580 | 120 |

| Moisture | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date prepared | - | 27/07/2017 | 27/07/2017 |
| Date analysed | - | 28/07/2017 | 28/07/2017 |
| Moisture | % | 7.8 | 11 |

| Metals in TCLP USEPA1311 | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date extracted | - | 27/07/2017 | 27/07/2017 |
| Date analysed | - | 27/07/2017 | 27/07/2017 |
| pH of soil for fluid# determ. | pH units | 9.4 | 8.4 |
| pH of soil TCLP (after HCl) | pH units | 1.5 | 1.5 |
| Extraction fluid used | - | 1 | 1 |
| pH of final Leachate | pH units | 5.0 | 4.9 |
| Arsenic in TCLP | mg/L | <0.05 | <0.05 |
| Cadmium in TCLP | mg/L | <0.01 | <0.01 |
| Chromium in TCLP | mg/L | <0.01 | <0.01 |
| Lead in TCLP | mg/L | 0.07 | 0.1 |
| Mercury in TCLP | mg/L | <0.0005 | <0.0005 |
| Nickel in TCLP | mg/L | <0.02 | <0.02 |

| PAHs in TCLP (USEPA 1311) | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date extracted | - | 28/07/2017 | 28/07/2017 |
| Date analysed | - | 28/07/2017 | 28/07/2017 |
| Naphthalene in TCLP | mg/L | <0.001 | <0.001 |
| Acenaphthylene in TCLP | mg/L | <0.001 | <0.001 |
| Acenaphthene in TCLP | mg/L | <0.001 | <0.001 |
| Fluorene in TCLP | mg/L | <0.001 | <0.001 |
| Phenanthrene in TCLP | mg/L | 0.001 | <0.001 |
| Anthracene in TCLP | mg/L | <0.001 | <0.001 |
| Fluoranthene in TCLP | mg/L | <0.001 | <0.001 |
| Pyrene in TCLP | mg/L | <0.001 | <0.001 |
| Benzo(a)anthracene in TCLP | mg/L | <0.001 | <0.001 |
| Chrysene in TCLP | mg/L | <0.001 | <0.001 |
| Benzo(bjk)fluoranthene in TCLP | mg/L | <0.002 | <0.002 |
| Benzo(a)pyrene in TCLP | mg/L | <0.001 | <0.001 |
| Indeno(1,2,3-c,d)pyrene - TCLP | mg/L | <0.001 | <0.001 |
| Dibenzo(a,h)anthracene in TCLP | mg/L | <0.001 | <0.001 |
| Benzo(g,h,i)perylene in TCLP | mg/L | <0.001 | <0.001 |
| Total +ve PAH's | mg/L | 0.001 | NIL (+)VE |
| *Surrogate p*-Terphenyl-d14 | % | 74 | 82 |

| Asbestos ID - soils | | | |
|---|---|---|---|
| Our Reference | | 172091-1 | 172091-7 |
| Your Reference | UNITS | TP4 | YP 17 |
| Depth | | 0.0-0.1 | 0.2-0.3 |
| Date Sampled | | 24/07/2017 | 24/07/2017 |
| Type of sample | | Soil | Soil |
| Date analysed | - | 3/08/2017 | 3/08/2017 |
| Sample mass tested | g | Approx. 40g | Approx. 45g |
| Sample Description | - | Brown coarse-grained soil & rocks | Brown coarse-grained soil & rocks |
| Asbestos ID in soil | - | No asbestos detected at reporting limit of 0.1g/kg<br><br>Organic fibres detected | No asbestos detected at reporting limit of 0.1g/kg<br><br>Organic fibres detected |
| Trace Analysis | - | No asbestos detected | No asbestos detected |

| Asbestos ID - materials | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 172091-2 | 172091-3 | 172091-4 | 172091-5 | 172091-6 |
| Your Reference | UNITS | TP4 ACM | TP7 ACM | TP8 ACM | TP12 Fibro and ACM | TP15 ACM |
| Depth | | - | 0.2-0.21 | - | - | - |
| Date Sampled | | 24/07/2017 | 24/07/2017 | 24/07/2017 | 24/07/2017 | 24/07/2017 |
| Type of sample | | material | material | material | material | material |
| Date analysed | - | 1/08/2017 | 1/08/2017 | 1/08/2017 | 1/08/2017 | 1/08/2017 |
| Mass / Dimension of Sample | - | 48x35x5mm | 33x20x5mm | 60x50x5mm | 90x80x5mm | 80x55x5mm |
| Sample Description | - | Grey compressed fibre cement material | Grey fibrous sheet material | Grey compressed fibre cement material | Grey compressed fibre cement material | Grey compressed fibre cement material |
| Asbestos ID in materials | - | Chrysotile asbestos detected<br>Amosite asbestos detected | Chrysotile asbestos detected<br>Amosite asbestos detected<br>Crocidolite asbestos detected | Chrysotile asbestos detected<br>Amosite asbestos detected | Chrysotile asbestos detected<br>Amosite asbestos detected<br>Crocidolite asbestos detected | Chrysotile asbestos detected<br>Amosite asbestos detected<br>Crocidolite asbestos detected |

| Method ID | Methodology Summary |
|---|---|
| **ASB-001** | Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004. |
| **EXTRACT.7** | Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311. |
| **Inorg-001** | pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times. |
| **Inorg-004** | Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004. |
| **Inorg-008** | Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours. |
| **Metals-020** | Determination of various metals by ICP-AES. |
| **Metals-020 ICP-AES** | Determination of various metals by ICP-AES. |
| **Metals-021** | Determination of Mercury by Cold Vapour AAS. |
| **Metals-021 CV-AAS** | Determination of Mercury by Cold Vapour AAS. |
| **Org-003** | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.<br>F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. |
| **Org-003** | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.<br><br>F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.<br><br>Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40). |
| **Org-005** | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. |
| **Org-005** | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.<br>Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT. |
| **Org-006** | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. |
| **Org-006** | Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.<br>Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs. |
| **Org-012** | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. |
| **Org-012** | Leachates are extracted with Dichloromethane and analysed by GC-MS. |
| **Org-012** | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. |
| **Org-012** | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.<br>For soil results:-<br>1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present.<br>2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL.<br>3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above.<br>Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs. |
| **Org-014** | Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. |
| **Org-016** | Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. |
| **Org-016** | Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.<br>Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes. |

| QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-6 | [NT] |
| Date extracted | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Date analysed | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| TRH $C_6$ - $C_9$ | mg/kg | 25 | Org-016 | <25 | [NT] | [NT] | [NT] | [NT] | 94 | [NT] |
| TRH $C_6$ - $C_{10}$ | mg/kg | 25 | Org-016 | <25 | [NT] | [NT] | [NT] | [NT] | 94 | [NT] |
| Benzene | mg/kg | 0.2 | Org-016 | <0.2 | [NT] | [NT] | [NT] | [NT] | 104 | [NT] |
| Toluene | mg/kg | 0.5 | Org-016 | <0.5 | [NT] | [NT] | [NT] | [NT] | 94 | [NT] |
| Ethylbenzene | mg/kg | 1 | Org-016 | <1 | [NT] | [NT] | [NT] | [NT] | 88 | [NT] |
| m+p-xylene | mg/kg | 2 | Org-016 | <2 | [NT] | [NT] | [NT] | [NT] | 92 | [NT] |
| o-Xylene | mg/kg | 1 | Org-016 | <1 | [NT] | [NT] | [NT] | [NT] | 90 | [NT] |
| naphthalene | mg/kg | 1 | Org-014 | <1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| *Surrogate* aaa-Trifluorotoluene | % | | Org-016 | 110 | [NT] | [NT] | [NT] | [NT] | 104 | [NT] |

| QUALITY CONTROL: svTRH (C10-C40) in Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-6 | [NT] |
| Date extracted | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Date analysed | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| TRH $C_{10}$ - $C_{14}$ | mg/kg | 50 | Org-003 | <50 | [NT] | [NT] | [NT] | [NT] | 105 | [NT] |
| TRH $C_{15}$ - $C_{28}$ | mg/kg | 100 | Org-003 | <100 | [NT] | [NT] | [NT] | [NT] | 106 | [NT] |
| TRH $C_{29}$ - $C_{36}$ | mg/kg | 100 | Org-003 | <100 | [NT] | [NT] | [NT] | [NT] | 91 | [NT] |
| TRH >$C_{10}$ -$C_{16}$ | mg/kg | 50 | Org-003 | <50 | [NT] | [NT] | [NT] | [NT] | 105 | [NT] |
| TRH >$C_{16}$ -$C_{34}$ | mg/kg | 100 | Org-003 | <100 | [NT] | [NT] | [NT] | [NT] | 106 | [NT] |
| TRH >$C_{34}$ -$C_{40}$ | mg/kg | 100 | Org-003 | <100 | [NT] | [NT] | [NT] | [NT] | 91 | [NT] |
| *Surrogate* o-Terphenyl | % | | Org-003 | 90 | [NT] | [NT] | [NT] | [NT] | 91 | [NT] |

| QUALITY CONTROL: PAHs in Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-6 | [NT] |
| Date extracted | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Date analysed | - | | | 28/07/2017 | [NT] | [NT] | [NT] | [NT] | 28/07/2017 | [NT] |
| Naphthalene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | 80 | [NT] |
| Acenaphthylene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Acenaphthene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Fluorene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | 91 | [NT] |
| Phenanthrene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | 84 | [NT] |
| Anthracene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Fluoranthene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | 83 | [NT] |
| Pyrene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | 85 | [NT] |
| Benzo(a)anthracene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Chrysene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | 90 | [NT] |
| Benzo(b,j+k)fluoranthene | mg/kg | 0.2 | Org-012 | <0.2 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Benzo(a)pyrene | mg/kg | 0.05 | Org-012 | <0.05 | [NT] | [NT] | [NT] | [NT] | 83 | [NT] |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Dibenzo(a,h)anthracene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | Org-012 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| *Surrogate p*-Terphenyl-d14 | % | | Org-012 | 99 | [NT] | [NT] | [NT] | [NT] | 118 | [NT] |

| QUALITY CONTROL: Organochlorine Pesticides in soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-6 | [NT] |
| Date extracted | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Date analysed | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| HCB | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| alpha-BHC | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 86 | [NT] |
| gamma-BHC | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| beta-BHC | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 101 | [NT] |
| Heptachlor | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 89 | [NT] |
| delta-BHC | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Aldrin | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 99 | [NT] |
| Heptachlor Epoxide | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 91 | [NT] |
| gamma-Chlordane | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| alpha-chlordane | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Endosulfan I | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| pp-DDE | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 97 | [NT] |
| Dieldrin | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 97 | [NT] |
| Endrin | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 78 | [NT] |
| pp-DDD | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 93 | [NT] |
| Endosulfan II | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| pp-DDT | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Endrin Aldehyde | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Endosulfan Sulphate | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | 86 | [NT] |
| Methoxychlor | mg/kg | 0.1 | Org-005 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| *Surrogate* TCMX | % | | Org-005 | 92 | [NT] | [NT] | [NT] | [NT] | 120 | [NT] |

| QUALITY CONTROL: PCBs in Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-6 | [NT] |
| Date extracted | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Date analysed | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Aroclor 1016 | mg/kg | 0.1 | Org-006 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Aroclor 1221 | mg/kg | 0.1 | Org-006 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Aroclor 1232 | mg/kg | 0.1 | Org-006 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Aroclor 1242 | mg/kg | 0.1 | Org-006 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Aroclor 1248 | mg/kg | 0.1 | Org-006 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Aroclor 1254 | mg/kg | 0.1 | Org-006 | <0.1 | [NT] | [NT] | [NT] | [NT] | 100 | [NT] |
| Aroclor 1260 | mg/kg | 0.1 | Org-006 | <0.1 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| *Surrogate* TCLMX | % | | Org-006 | 92 | [NT] | [NT] | [NT] | [NT] | 93 | [NT] |

| QUALITY CONTROL: Acid Extractable metals in soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-6 | [NT] |
| Date prepared | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Date analysed | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Arsenic | mg/kg | 4 | Metals-020 | <4 | [NT] | [NT] | [NT] | [NT] | 114 | [NT] |
| Cadmium | mg/kg | 0.4 | Metals-020 | <0.4 | [NT] | [NT] | [NT] | [NT] | 109 | [NT] |
| Chromium | mg/kg | 1 | Metals-020 | <1 | [NT] | [NT] | [NT] | [NT] | 111 | [NT] |
| Copper | mg/kg | 1 | Metals-020 | <1 | [NT] | [NT] | [NT] | [NT] | 112 | [NT] |
| Lead | mg/kg | 1 | Metals-020 | <1 | [NT] | [NT] | [NT] | [NT] | 105 | [NT] |
| Mercury | mg/kg | 0.1 | Metals-021 | <0.1 | [NT] | [NT] | [NT] | [NT] | 104 | [NT] |
| Nickel | mg/kg | 1 | Metals-020 | <1 | [NT] | [NT] | [NT] | [NT] | 106 | [NT] |
| Zinc | mg/kg | 1 | Metals-020 | <1 | [NT] | [NT] | [NT] | [NT] | 108 | [NT] |

| QUALITY CONTROL: Metals in TCLP USEPA1311 | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-W1 | [NT] |
| Date extracted | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Date analysed | - | | | 27/07/2017 | [NT] | [NT] | [NT] | [NT] | 27/07/2017 | [NT] |
| Arsenic in TCLP | mg/L | 0.05 | Metals-020 ICP-AES | <0.05 | [NT] | [NT] | [NT] | [NT] | 116 | [NT] |
| Cadmium in TCLP | mg/L | 0.01 | Metals-020 ICP-AES | <0.01 | [NT] | [NT] | [NT] | [NT] | 120 | [NT] |
| Chromium in TCLP | mg/L | 0.01 | Metals-020 ICP-AES | <0.01 | [NT] | [NT] | [NT] | [NT] | 114 | [NT] |
| Lead in TCLP | mg/L | 0.03 | Metals-020 ICP-AES | <0.03 | [NT] | [NT] | [NT] | [NT] | 99 | [NT] |
| Mercury in TCLP | mg/L | 0.0005 | Metals-021 CV-AAS | <0.0005 | [NT] | [NT] | [NT] | [NT] | 96 | [NT] |
| Nickel in TCLP | mg/L | 0.02 | Metals-020 ICP-AES | <0.02 | [NT] | [NT] | [NT] | [NT] | 113 | [NT] |

| QUALITY CONTROL: PAHs in TCLP (USEPA 1311) | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-W1 | [NT] |
| Date extracted | - | | | 28/07/2017 | [NT] | [NT] | [NT] | [NT] | 28/07/2017 | [NT] |
| Date analysed | - | | | 28/07/2017 | [NT] | [NT] | [NT] | [NT] | 28/07/2017 | [NT] |
| Naphthalene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | 76 | [NT] |
| Acenaphthylene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Acenaphthene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Fluorene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | 74 | [NT] |
| Phenanthrene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | 71 | [NT] |
| Anthracene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Fluoranthene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | 70 | [NT] |
| Pyrene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | 71 | [NT] |
| Benzo(a)anthracene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Chrysene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | 73 | [NT] |
| Benzo(bjk)fluoranthene in TCLP | mg/L | 0.002 | Org-012 | <0.002 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Benzo(a)pyrene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | 74 | [NT] |
| Indeno(1,2,3-c,d)pyrene - TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Dibenzo(a,h)anthracene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| Benzo(g,h,i)perylene in TCLP | mg/L | 0.001 | Org-012 | <0.001 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] |
| *Surrogate p*-Terphenyl-d14 | % | | Org-012 | 92 | [NT] | [NT] | [NT] | [NT] | 78 | [NT] |

## Result Definitions

| | |
|---|---|
| **NT** | Not tested |
| **NA** | Test not required |
| **INS** | Insufficient sample for this test |
| **PQL** | Practical Quantitation Limit |
| **<** | Less than |
| **>** | Greater than |
| **RPD** | Relative Percent Difference |
| **LCS** | Laboratory Control Sample |
| **NS** | Not specified |
| **NEPM** | National Environmental Protection Measure |
| **NR** | Not Reported |

## Quality Control Definitions

| | |
|---|---|
| **Blank** | This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples. |
| **Duplicate** | This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable. |
| **Matrix Spike** | A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist. |
| **LCS (Laboratory Control Sample)** | This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample. |
| **Surrogate Spike** | Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples. |

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

## Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

# SAMPLE RECEIPT ADVICE

| Client Details | |
|---|---|
| **Client** | Geoenviro Consultancy Pty Ltd |
| **Attention** | Solern Liew |

| Sample Login Details | |
|---|---|
| **Your Reference** | JC17302A, Penrith |
| **Envirolab Reference** | **172091** |
| **Date Sample Received** | 25/07/2017 |
| **Date Instructions Received** | 25/07/2017 |
| **Date Results Expected to be Reported** | **03/08/2017** |

| Sample Condition | |
|---|---|
| **Samples received in appropriate condition for analysis** | YES |
| **No. of Samples Provided** | 2 soils 5 materials |
| **Turnaround Time Requested** | Standard |
| **Temperature on receipt (°C)** | 15.5 |
| **Cooling Method** | Ice Pack |
| **Sampling Date Provided** | YES |

| Comments |
|---|
| **Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples** |
| |

Please direct any queries to:

| Aileen Hie | Jacinta Hurst |
|---|---|
| Phone: 02 9910 6200 | Phone: 02 9910 6200 |
| Fax: 02 9910 6201 | Fax: 02 9910 6201 |
| Email: ahie@envirolabservices.com.au | Email: jhurst@envirolabservices.com.au |

***Sample and Testing Details on following page***

**Envirolab Services Pty Ltd**
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| *Sample Id* | *vTRH(C6-C10)/BTEXN in Soil* | *svTRH (C10-C40) in Soil* | *PAHs in Soil* | *Organochlorine Pesticides in soil* | *PCBs in Soil* | *Acid Extractable metals in soil* | *Metals in TCLP USEPA1311* | *PAHs in TCLP (USEPA 1311)* | *Asbestos ID - soils* | *Asbestos ID - materials* |
|---|---|---|---|---|---|---|---|---|---|---|
| TP4-0.0-0.1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| TP4 ACM | | | | | | | | | | ✓ |
| TP7ACM-0.2-0.21 | | | | | | | | | | ✓ |
| TP8ACM | | | | | | | | | | ✓ |
| TP12 Fibro and ACM | | | | | | | | | | ✓ |
| TP15 ACM | | | | | | | | | | ✓ |
| YP 17-0.2-0.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |

**GeoEnviro Consultancy Pty Ltd**
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

# Laboratory Test Request/Chain of Custody Record

**Job Details**
Job Number: JC17302A
Client:
Project: Proposed Pavement Design
Location: North Street, Penrith

Sample Date: 24/07/2017
Sampled By: SG
Project Manager: SL
Store Location:

**External Laboratory Details:**
Laboratory name: Envirolab Services Pty Ltd
Address: 12 Ashley Street
Chatswood
Contact: Tania Notaris

| Sampling Details | | | Sample Type | | Test Required (\) / Test Performed(X) | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | | Soil | Water | Metals (As Cd Cr Cu Pb Zn Ni Hg) | OCP / PCB | Combination 12a | Combination 5a | Combination 5 | Asbestos | | pH | EC | CEC/ESP | Cl / SO4 | Resistivity | | | | | | | | | | | | Keep Sample |
| | From | To | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 TP 4 | 0.00 | 0.10 | DG | | | | / | | | | | | | | | | | | | | | | | | | | | |
| 2 TP 4 ACM | - | - | DG | | | | | | | / | | | | | | | | | | | | | | | | | | |
| 3 TP 7 ACM | 0.20 | 0.21 | DG | | | | | | | / | | | | | | | | | | | | | | | | | | |
| 4 TP 8 ACM | - | - | DG | | | | | | | / | | | | | | | | | | | | | | | | | | |
| 5 TP 12 Fibro and ACM | - | - | DG | | | | | | | / | | | | | | | | | | | | | | | | | | |
| 6 TP 15 ACM | - | - | DG | | | | | | | / | | | | | | | | | | | | | | | | | | |
| 7 YP 17 | 0.20 | 0.30 | DG | | | | / | | | | | | | | | | | | | | | | | | | | | |

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 172091
Date Received: 25.7.17
Time Received: 16.10
Received by: JE
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

| Relinquished by | | | | Received By | | | |
|---|---|---|---|---|---|---|---|
| Laboratory | Name | Signature | Date | Laboratory | Name | Signature | Date |
| GeoEnviro Consultancy | Steven Goss | SMGoss | 25/07/2017 | ELS | JE | | 25.7.17 |

Legend

DB Disturbed Sample (Bulk, Plastic bag)
DS Disturbed Sample (Small, Plastic bag)
DG Disturbed Sample (Glass Jar)
STP Standard Penetration Test Sample
U50 Undisturbed Sample, 50mm Tube
U75 Undisturbed Sample, 75mm Tube
WG Water Sample, Amber Glass Jar
WP Water Sample, Plastic Bottle
Y Keep Sample
N Discard Sample

# Appendix B

*Unexpected Asbestos Finds Protocol*

# Unexpected Asbestos Finds

If asbestos is detected in area not identified as containing asbestos prior to, or during, bulk excavation works the following 'Unexpected Finds Protocol' will apply:

- Upon discovery of suspected asbestos containing material, the Council officer is to be notified and the affected area closed off by the use of barrier tape and warning signs. Warning signs shall be specific to Asbestos Hazards and shall comply with the Australian Standard 1319-1994 – Safety Signs for the Occupational Environment;
- Work shall comply with WorkCover requirements including *Working with Asbestos, 2008*;
- An OHS consultant or a hygienist is to be notified to inspect the area and confirm the presence of asbestos and determine whether the asbestos is classified as friable or bonded asbestos and determine the extent of remediation works to be undertaken. A report detailing this information will be compiled by the OHS consultant and provided to the Council officer (or his representative);
- The impacted soil will be classified and disposed of, as a minimum, as Special Waste (Asbestos) at an appropriately licensed facility. In dry and windy conditions the stockpile will be kept lightly wetted and may be covered with plastic sheet whilst awaiting disposal;
- All work associated with asbestos in soil will be undertaken by a contractor holding a class AS-1 Licence (friable) or AS2 Licence for bonded asbestos, as appropriate. WorkCover must be notified 7 days in advance of any asbestos works;
- Monitoring for airborne asbestos fibres is to be carried out during the soil excavation in asbestos contaminated materials;
- Documentary evidence (weighbridge dockets) of correct disposal is to be provided to the Council officer (or their representative);
- At the completion of the excavation, a clearance inspection is to be carried out, soil samples taken and analysed for asbestos fibres followed by written certification provided by an OHS Consultant that the area is safe to be accessed and worked (with respect to asbestos impact). If required, the filling material remaining in the inspected area can be covered/ sealed by an appropriate physical barrier layer of non-asbestos containing material prior to sign–off;
- Details are to be recorded in The site record system;