



RailCorp Environmental Projects  
Unit

**Macdonaldtown Triangle (Former  
Cleaning Sheds)**

Delineation and Classification Sampling

Report





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## List of Abbreviations

Lists of the common abbreviations used in this report are provided below.

- ▶ ANZECC – Australian and New Zealand Environment and Conservation Council
- ▶ ASS – Acid Sulfate Soil
- ▶ B(a)P – Benzo (a) pyrene
- ▶ BTEX – Benzene, Toluene, Ethyl-benzene and Xylene
- ▶ DEC – NSW Department of Environment & Conservation
- ▶ DIPNR – NSW Department of Infrastructure Planning and Natural Resources
- ▶ DLWC – NSW Department of Land and Water Conservation, now incorporated into the Department of Infrastructure Planning and Natural Resources DIPNR
- ▶ DPWS – NSW Department of Public Works and Services
- ▶ DQOs – Data Quality Objectives
- ▶ EPA – NSW Environment Protection Authority, now incorporated into the Department of Environment and Conservation (DEC)
- ▶ HIL – Health Based Soil Investigation Level
- ▶ NSW EPA – New South Wales Environmental Protection Agency
- ▶ OCP – Organochlorine Pesticide
- ▶ PAH - Polycyclic Aromatic Hydrocarbon
- ▶ PBIL – (Provisional) Phytotoxicity-Based Investigation Levels
- ▶ PCB – Polychlorinated Biphenyl
- ▶ PQL - Practical Quantitation Limit
- ▶ QA/QC - Quality Assurance/Quality Control
- ▶ RPD - Relative Percentage Difference
- ▶ TCLP – Toxicity Characteristic Leaching Procedure
- ▶ TPH - Total Petroleum Hydrocarbons



## Executive Summary

### Introduction & Objectives

GHD was commissioned by RailCorp in August 2005 to undertake further environmental (contamination) investigations over part of the RailCorp property known as the 'Macdonaldtown Triangle', located on Burren Street, Macdonaldtown.

The Macdonaldtown Triangle is separated into two areas as defined by their historical uses; 1) former Cleaning Shed area, and 2) former Gasworks area. These two areas are currently separated by a chain wire fence that runs approximately south west to north east across the site.

It is understood that RailCorp wish to redevelop the Cleaning Shed area for rail related purposes. Previous environmental investigations have identified elevated hydrocarbon concentrations in soils, which RailCorp propose to remediate by excavation and offsite disposal. Prior to this, additional sampling works were required to delineate the vertical and lateral extent of the contamination and to classify the soils for offsite disposal.

### Scope of Work

The current commission comprised the following key elements:

- ▶ Excavation of eleven (11) test pits in the vicinity of a former CH2M-Hill Test Location (TP44), at which substantial contamination had been reported;
- ▶ Laboratory analysis of selected soil samples for a range of organic contaminants, metals and asbestos;
- ▶ Toxicity Characteristic Leachate Procedure (TCLP) tests on a number of soil samples; and
- ▶ Determination of a waste classification for soils in the subject area (in accordance with NSW EPA guidelines).

### Results & Conclusions

Surveying of the location of the former CH2M Hill test pit TP44 indicated that the pit was located on the former Gasworks area and not in the Cleaning Sheds area. Hence, most (8) of the pits completed as part of the current study were excavated north of TP44 (on the Cleaning Sheds area). The remaining 3 pits were excavated east and west of TP44 (on the Gasworks area). The 'site' as described in the report therefore relates to the delineation area, including part of the Cleaning Sheds area and the Gasworks area, north and south of the dividing fenceline.

Concentrations of contaminants of concern (chiefly BTEX) were not detected at significant concentrations in pits excavated by GHD on the former Cleaning Sheds area. BTEX was detected in samples collected from one test pit (TP4), with concentrations of BTEX in the remaining test pit samples below the level of reporting of the laboratory. The subsurface conditions observed at the Cleaning Sheds area did not indicate a large degree of filling from ash or other by-products of the gasworks.



Filling at the Cleaning Sheds area comprised rail ballast, back fill clay and some ash / coal.

Based on the results of the current study, ashy fill material from the Cleaning Sheds area would nominally classify as **solid waste** for off-site (landfill) disposal purposes.

However, contaminants of concern including BTEX, PAH and TPH were reported at high concentrations in ashy material in two of the three test pits excavated east and west of CH2M Hill Pit TP44 (i.e., on the former Gasworks area). This material would nominally classify as hazardous waste for off-site disposal purposes due to high PAH concentrations. However, the high PAH concentrations appear to be associated with ash, and therefore the *NSW EPA General Approval of the Immobilisation of Contaminants in Waste (1999/05)* can be applied. The nominal classification of the ashy material in the Gasworks area of the site (south of the fenceline) would then revert to **industrial waste** (due to TPH concentrations). Large amounts of fill comprising ash, slag, coal and coke were detected in the pits east and west of TP44. Observations of the filling in the test pits also indicated that the use of ashy fill material increased towards the south, abutting against the brick retaining wall.

It is considered likely that a different type of fill (or fill from a different origin) was used on the Gasworks area to fill up against the brick retaining wall. On the Cleaning Sheds area, clay, rail ballast and some ash / coal was used to backfill in and around former site infrastructure including building footings and walls.

Given that contaminants of concern were only detected at elevated concentrations on the Gasworks site, it appears likely that 'gross' contamination is restricted to the southern side of the chain wire fence (in the strip of land between the fence and the brick retaining wall).

GHD consider that whilst ash was detected north of the fenceline (within the Cleaning Sheds area), concentrations of contaminants, including BTEX, were not at a level that would warrant further investigation or remediation given the nature of the proposed rail landuse for the site. In addition, given the minor concentration of BTEX at TP4 and that BTEX was not detected in the other test pits at the cleaning sheds site, the likelihood of potential vapours being generated from low levels of BTEX in ash is considered to be low.

Several fragments of fibre cement sheeting containing chrysotile asbestos were detected in TP11 on the Cleaning Sheds area. As this material was found at depth and based on GHD's understanding that the Cleaning Sheds area will receive up to 2m of imported fill material as part of the site redevelopment, the presence of fibre cement sheeting at depth is not considered an issue that would affect the redevelopment of the cleaning sheds site into rail infrastructure. Depending on construction that is proposed for that part of the Cleaning Sheds area, caution should be exercised when excavating into soils. Given the random filling history of the area, further detections of asbestos fibre cement cannot be precluded.

As such, general caution should be maintained by the construction contractor for construction works at the site. The construction contractor should make contingencies for 'unexpected occurrences' in their project safety plan.



While remediation of the Cleaning Sheds area, aside from the filling proposed during redevelopment, is not considered necessary, management will be required to ameliorate potential risks during redevelopment, and on an ongoing basis. GHD recommend that an Environmental Management Plan (EMP) is prepared and implemented for the proposed redevelopment works. The EMP should identify potential environmental impacts associated with the works and document measures to be taken to manage these.

In addition, a long-term Site Management Plan (SMP) for the Cleaning Sheds area, post-development, should be prepared in due course. The SMP should address issues associated with the retention of potentially contaminated fill material under the proposed imported soils, and include controls to prevent future exposure to the fill.

If soil material needs to be excavated and removed from the site during construction, materials should be classified, in accordance with the NSW EPA (1999) Guidelines for the *Assessment, Classification and Management of Liquid and Non-liquid Wastes*". It should be noted that the waste classification contained in this report was specifically for the ashy fill material at the site (delineation area) that was understood to potentially require remediation during redevelopment. Topsoil and general clay fill material that is located at the site, and materials in the wider Macdonaldtown Triangle have not been classified.



# 1. Introduction and Objectives

## 1.1 Introduction

The Rail Corporation of New South Wales (RailCorp), Environmental Projects Unit commissioned GHD Pty Ltd (GHD), to undertake delineation and waste classification sampling of part of a RailCorp property known as the 'Macdonaldtown Triangle', located on Burren Street, Macdonaldtown, New South Wales.

The Macdonaldtown Triangle is identified as Lot 50 in DP 1001467 and is divided into two areas, namely the former Cleaning Sheds area, and the former Gasworks area (see **Figure 2**). RailCorp wish to redevelop the Cleaning Sheds area and the works described in this report were designed to delineate an area of contamination previously identified in the Cleaning Sheds area.

The investigation was commissioned in response to RailCorp's tender brief (ERE-098/0058) and GHD's subsequent proposal dated July 2005 (GHD's reference: 21/0904181/69).

This report details investigations undertaken by GHD in August 2005.

## 1.2 Background

Previous environmental investigations (conducted by CH2M Hill in 2000) identified elevated concentrations of hydrocarbons in soils throughout the Gasworks area and some hotspots of hydrocarbon impact in the Cleaning Sheds area. A subsequent risk assessment performed on the Cleaning Sheds area by Sinclair Knight Merz (SKM) in 2005 found that risks to potential receptors from soil contamination were acceptable and there was no specific requirement for remediation. However, it was recommended that precautionary remediation excavations be undertaken in the vicinity of a hotspot previously identified at TP44 (with elevated concentrations of benzene, toluene and PAHs), where the footprint of the former Gasworks retort house was believed to extend onto the Cleaning Sheds area.

GHD understands that the Site Auditor requested the clean up of the benzene and toluene contamination identified at TP44, due to the potential for vapour release or leaching to groundwater. It is further understood that clean up of PAH contamination was not required, as the majority of the Cleaning Sheds area is proposed to be capped by 1m to 2m of clean fill during redevelopment, which will provide a barrier against exposure. In accordance with the recommendations of the risk assessment and the Auditor's requirements, RailCorp planned to delineate the impact around TP44, and perform remediation prior to the redevelopment of the Cleaning Sheds area.

However, upon commencement of the delineation works, GHD found that TP44 was actually located in the Gasworks area, south of a fence dividing the Cleaning Sheds area and the Gasworks area. Nevertheless, delineation sampling was performed to determine whether the hotspot extended onto the Cleaning Sheds area.



The term "site" in this report therefore refers to the delineation area surrounding TP44, on both the Gasworks area and the Cleaning Sheds area (see **Figure 2 and 3**).



## 2. Project Objectives and Scope of Works

The objectives of the project are to:

- ▶ Delineate the area (vertically and laterally) of soil contamination around sample location TP44;
- ▶ Confirm the nature of soil contamination in the area around TP44; and
- ▶ Classify the soils to be excavated around TP44 for offsite disposal in accordance with applicable NSW EPA guidelines.

To establish the nature and extent of contamination requiring remediation in the vicinity of TP44, GHD undertook the following scope of works:

- ▶ A review of available reports, including those already provided with the tender brief, detailing previous investigations undertaken at the site;
- ▶ Preparation of an appropriate Site Specific Safety and Environmental Plan (SSSEP), including a pro forma checklist provided by RailCorp;
- ▶ Appropriate underground services searches for rail and non-rail infrastructure;
- ▶ A site inspection;
- ▶ Field investigations including:
  - Location of former test pit TP44 using a registered surveyor;
  - Excavation of delineation test pits in the vicinity of TP44 using a backhoe;
  - Survey of test pit locations by a registered surveyor.
- ▶ Analysis of selected soil samples for contaminants of concern; and
- ▶ Production of a stand alone report presenting a summary of previous investigations, the results of the current investigations, and waste classifications for soils to be excavated as part of planned remediation works.



## 3. Site Information

### 3.1 Site Identification

The delineation area is part of the RailCorp owned property known as the Macdonaldtown Triangle, which is located to the south of Macdonaldtown Railway Station on the corner of Burren and Albert Streets, Erskineville, NSW (**Figure 1**).

The Macdonaldtown Triangle is separated into two areas as defined by their historical uses;

- ▶ Former Cleaning Shed area in the north; and
- ▶ Former Gasworks area in the south.

Both areas are shown on **Figure 2**.

These two areas are currently separated by a chain wire fence that runs approximately south west to north east across the Macdonaldtown Triangle. Previous investigations detected contamination in both the Cleaning Shed area and Gasworks area. However, as RailCorp is currently focused on redeveloping the Cleaning Sheds area for rail purposes, the current investigation was only focused on assessing the nature and extent of contamination at the Cleaning Sheds area that may require remediation to ensure its suitability for the proposed landuse.

Further investigation including delineation sampling and remediation of the former Gas Works area will be undertaken by RailCorp as a separate exercise at a later date.

It should be noted that previous investigations (see **Section 3** below) were conducted over a larger area of the greater Macdonaldtown Triangle comprising 23,000m<sup>2</sup> (**Figure 2**). The focus of the current investigation, the 'delineation area' (hereinafter referred to as the 'site'), occupies an area of approximately 900 m<sup>2</sup>. The site is part of Lot 50 in Deposited Plan (DP) 1001467 and is currently used by RailCorp for railway purposes.

The site occupies part of the former Cleaning Sheds area and part of the former Gasworks area, with the chain wire fence that separates Cleaning Sheds and Gasworks areas running through the southern portion of the site. At the time of the investigation, the site was vacant and covered with grass and weeds. A timber post and rail fence is located about 5m to the north of the site, with an access gate in the chain wire fence located to the east of the site. A 1.5m brick retaining wall runs approximately south west to north east along the site's southern boundary.

Previous investigations reported the presence of a large concrete slab to the north of location TP44, immediately beneath the site area at an anticipated depth of approximately 0.5m below ground level. It had also been reported that part of the former Retort House of the Gas Works extended north onto the Cleaning Shed area in the vicinity of location TP44.



Surrounding landuses include Macdonaldtown Railway Station and the Main Western railway line to the north, railway lines to the east, the Illawarra railway line to the south and residential properties to the west.

### **3.2 Topography**

The site is generally flat with a slight slope towards the south. At the southern boundary of the site, in the Gasworks area approximately 4m south of the Cleaning Sheds / Gasworks boundary, a brick retaining wall is present running approximately south west to north east. The ground level drops away by approximately 1.5m on the southern side of the wall.

### **3.3 Geology and Soils**

The geology of the area is described in the Geology of the Sydney 1:100 000 Sheet (Ed. 1, Sheet 9130, 1983) as Ashfield Shale comprising black to dark-grey shale, siltstone, laminite, calcareous claystone and coal.

Soils in the vicinity of the site are classified in the Soil Landscapes of Sydney 1:100 000 Sheet (Chapman and Murphy, 1989) as part of the Blacktown group. The Blacktown group is a residual landscape described as consisting of shallow to moderately deep red and brown podzolic soils on crests, upper slopes and well drained areas. Deep yellow podzolic soils are found on lower slopes and in areas of poor drainage. Dominant soil materials include loose, olive brown loamy sand, earthy, yellow clayey sand and yellow, earthy sandy clay loam.

### **3.4 Hydrogeology**

A search of the Department of Land and Water Conservation (DLWC) registered groundwater bores data base conducted by CH2M Hill (2000) identified 35 within a three kilometer radius of the Macdonaldtown Triangle. CH2M Hill (2000) noted that identified groundwater bores were located within quaternary sediments consisting of medium to fine grained marine sands (Geology of the Sydney 1:100 000 Sheet). It is anticipated that interaction between these geological units is likely to consist of groundwater flow from the overlying quaternary sediments to the Ashfield Shale.

### **3.5 Hydrology**

Given that the site is generally flat with a gentle gradient to the south, the likely flow path for surface run off would be to the south. Surface water not available for infiltration would be channelled towards the stormwater drainage system located on Burren Street to the west.



## 4. Summary of Previous Investigations

The following reports document previous environmental investigations conducted on the Macdonaldtown Triangle:

- ▶ CH2M Hill (2000) *Macdonaldtown Triangle, Erskineville, Phase I and II Environmental Site Assessments*
- ▶ CH2M Hill (2001) *Macdonaldtown Triangle, Erskineville, Soil & Groundwater Investigations of the former Gasworks Area & Offsite*
- ▶ Banksia Heritage + Architecture (2004) *Macdonaldtown Station Works Archaeological Assessment (Draft)*
- ▶ SKM (2005) *Macdonaldtown Triangle (former Cleaning Shed Site), Human Health & Ecological Risk Assessment (Revised Draft)*

### 4.1 CH2M Hill (2000) Macdonaldtown Triangle, Erskineville, Phase I and II ESA

The Phase I and II ESA conducted by CH2M Hill in 2000 involved the collection and analysis of soil and groundwater samples at both the former Gasworks area and the Cleaning Sheds area.

At the Cleaning Sheds area, results of analysis were generally below the site criteria, however analysis identified isolated areas ('hotspots') of soil contaminated by polycyclic aromatic hydrocarbons (PAHs) (including benzo (a) pyrene - BaP), benzene and toluene.

Test pit logs for location TP44 and nearby TP43 indicate subsurface conditions comprising 0.3-0.4m of fill, overlying natural clay. At location TP44, the fill extends to 0.3m and is described as black to grey ash. An ash layer is noted in fill at TP43, from a depth of 0.3m to 0.4m. Contaminants detected above the site criteria in TP44 (0.2-0.3m) included benzene (15mg/kg), toluene (16mg/kg), BaP (150mg/kg) and PAHs (2472mg/kg).

From the available information, CH2M Hill concluded that the Gasworks area may pose a "Significant Risk Of Harm" (SROH) as defined by Clause 9 of the Contaminated Lands Management (CLM) Act, 1997 and recommended that the NSW EPA be notified of the site under the Act. RailCorp duly notified the NSW EPA, who subsequently declared the **Gasworks area** to pose a SROH under the CLM Act.

Other recommendations of CH2M Hill's investigation included community consultation, development of a Remedial Action Plan (RAP) for the Gasworks area, further assessment of the quality of groundwater and additional delineation sampling on the Cleaning Sheds area.



#### **4.2 CH2M Hill (2001) Macdonaldtown Triangle, Soil & Groundwater Investigations of the Former Gasworks Area and Offsite**

CH2M Hill conducted targeted environmental soil and groundwater investigations at the former Gasworks area and the area towards Burren Street with the aim of assessing and delineating the status of groundwater quality and soil contamination within the western portion of the former Gasworks area together with selected properties immediately west of the gasworks, adjacent to Burren Street and the eastern side of Burren Street.

Results of the analysis indicated that groundwater towards residential properties along Burren Street had not been impacted by operations of the former gasworks, but groundwater beneath the actual Gasworks area had been significantly impacted from former site operations.

CH2M Hill recommended that additional rounds of groundwater monitoring be conducted at the Gasworks area and that an RAP be developed and implemented prior to site redevelopment.

#### **4.3 Banksia Heritage + Architecture (2004) *Archaeological Assessment***

The heritage assessment conducted by Banksia Heritage stated that the Macdonaldtown Triangle is listed on the NSW State Heritage Register as the Everleigh Railway Workshops complex. Due to the former use of part of the Triangle as a gasworks, the surviving elements of the gas plant are noted as being of historical significance to the site. As such, it was recommended that the gasholder be retained and that recording should take place of other associated gas works items should they be impacted by the site's redevelopment.

Banksia Heritage concluded that the majority of the Macdonaldtown Triangle is no longer of archaeological significance due to its earlier demolition for the construction of the original rail infrastructure.

#### **4.4 SKM (2005) Macdonaldtown Triangle (former Cleaning Shed Site) Human Health & Ecological Risk Assessment**

The risk assessment conducted by Sinclair Knight Merz (SKM) in 2005 found that risks to potential receptors from soil contamination at the Cleaning Sheds area were acceptable and there was no specific requirement for remediation. However, it was recommended that precautionary remediation excavations be undertaken where the footprint of the former gasworks retort house extended onto the site. This area corresponded to CH2M Hill's investigation location TP44, where benzene, toluene and PAH contamination were identified.



## 5. Field and Laboratory Investigations

### 5.1 Analytical Data Quality Objectives

The purpose of establishing data quality objectives (DQOs) is to ensure the field investigations and analyses are undertaken in a way that enables the collection and reporting of reliable data on which to base the site assessment. The DQOs for this investigations are summarised below:

1. Sufficient data was required for sound statistical analysis (if required) in order to appropriately characterise the suspected heterogenous fill material or contaminant horizon; and
2. The data collected was required to be precise, accurate and representative of site conditions in order to provide recommendations based on interpretation of the data.

The DQOs were assessed by reference to data quality indicators as follows:

- **Data Representativeness** –expresses the degree to which sample data accurately and precisely represents a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a systematic basis across the site. Supplementary (targeted) sampling was undertaken in areas of known or potential contamination (such as the ash bands). An adequate number of sample locations were chosen to characterise the site to the required accuracy in accordance with the stated objectives. Consistent and repeatable sampling techniques and methods were utilised throughout the sampling.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study. This includes adjusting sample density and number in order to sufficiently delineate between fill and natural material on site. If there is insufficient valid data, as determined by the other data quality objectives, then additional data are required to be collected.
- **Comparability** - is a qualitative parameter expressing the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples, ensuring analysing laboratories use consistent analysis techniques and reporting methods. Reporting of results was done in consistent units and nomenclatures, and comparability was achieved by ensuring that precision and accuracy objectives are met.
- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples. The criteria used for the assessment of RPDs are based on guidelines given in AS4482.1, 1997. If duplicate results are not within the acceptable RPDs, investigation into the cause is initiated. If a cause cannot be determined, the validity of the data is questioned.



- ▶ **Accuracy** - measures the bias in a measurement system. Accuracy can be undermined by such factors as field contamination of samples, poor preservation of samples, poor sample preparation techniques and inappropriate selection of analytical techniques by the testing laboratory. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards. Accuracy of field works is checked by ensuring no contamination is detected in equipment blanks. The accuracy of the laboratory data that is generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. For reference laboratory methods (eg, USEPA methods) the following levels of accuracy should generally be achievable within  $\pm 15\%$  of:
  - the expected value of a certified reference material of similar matrix; or
  - the value obtained by a separately validated and recognised quantitative method for the sample matrix.

## 5.2 Rationale for Sampling Quality and Analysis Plan

The *NSW EPA (1995) Sampling Design Guidelines* nominally recommends a minimum number of sampling locations to characterise contamination within a site of a certain area. Minimum number of sampling locations are based on the detection of circular hotspots with a 95% degree of confidence.

As the objective of the current investigation is to delineate the vertical and horizontal extent of contamination in the vicinity of the hotspot located at TP44, GHD considered that a targeted sampling strategy would be the most effective method of delineating contamination around TP44.

The sampling strategy was based on the principal of first locating TP44 and then stepping out from TP44 on a 5m and 10m grid spacing (i.e. to the north, south, west and east). Note sampling was not conducted to the south of TP44 as that area is located on the Gasworks area, which is not part of the current redevelopment area. Instead, three test pits that would nominally have been excavated south of TP44 were instead excavated immediately adjacent to TP44.

Execution of the sampling strategy resulted in the excavation of 11 test pits with three pits (TP1 to TP3) located on the southern side of the chain wire fence in the immediate vicinity of TP44, and the remaining eight test pits (TP4 – TP11) located on the northern side of the chain wire fence in the Cleaning Sheds area.

## 5.3 Pre-Excavation Site Works

### 5.3.1 Site Inspection

A GHD Senior Environmental Scientist undertook a site inspection prior to test pitting on Wednesday 17 August 2005. A summary of the relevant information includes:

- ▶ At the time of the works, the site was vacant and covered with grass and weeds;



- ▶ A chain wire fence was located across the southern portion of the site and is the demarcation line between the former Cleaning Sheds area and the former Gasworks area to the south;
- ▶ A timber post and rail was located north of the site adjacent to the main access road;
- ▶ A brick retaining wall was located about 4m to the south of the chain wire fence in the Gasworks area, and formed the southern boundary of the site investigation area. The ground level is approximately 1.5m lower on the southern side of the retaining wall;
- ▶ A thin grass cover, over railway ballast formed the ground surface in the majority of the site;
- ▶ Physical evidence of gross contamination or other potential sources of contamination were not observed in the delineation sampling area during the site walk over.

Based on the observations made during the site walkover, the sampling and analysis strategy presented in the tender did not require alteration or addition.

### **5.3.2 Services Clearance**

Prior to commencement of investigation works, GHD cleared test pit locations of underground services by completing the following:

- ▶ Review of site plans and service clearance certificates provided by RailCorp/RIC for all rail-related utilities, including electrical, signal, civil, building and communications;
- ▶ Review of all available Dial-before-You Dig services plans for all non rail related underground utilities; and
- ▶ Clearance of each test pit location by a professional cable locator (Dags Locating Services).

### **5.3.3 Surveying**

Prior to field investigations, former test pit TP44 was located on the ground so that delineation test pits could be correctly positioned on 5m and 10m grid spacings out from TP44. GHD employed the services of registered surveyor (Simon Berrisford from SPB Surveying) to set up on site and locate the position of TP44 based on the ISG coordinates provided by CH2M Hill on the TP44 soil log.

The surveyor located TP44 on the southern side of the chain wire fence approximately 1m into the Gasworks area on the thin raised patch of land between the brick retaining wall and the chain wire fence. This position correlates to that of TP44 on CH2M Hill's report figures that place TP44 approximately 2m to the north of the retaining wall.

Following the correct positioning of TP44, the location of the delineation test pits were marked out using a survey tape. Following actual test pitting, two points on the pits (north and south of pit) were surveyed.



## 5.4 Soil Investigation

Soil investigations were undertaken on the 17 August 2005. Sampling was undertaken by excavating test pits with the aid of a backhoe. Test pit locations are shown on **Figure 3**.

Test pits were continued to depths ranging from 0.7m to 2.0m. Test pits were terminated either due to refusal on man made objects (such as former building footings) or at a designated depth in residual soils. Test pits were backfilled with pit spoil cuttings with nominal compaction.

Soils encountered during the investigations were described in general accordance with the Unified Soil Classification System (USCS) and GHD's standard logging procedures, with features such as constituents of debris, discolouration, staining, odours and other indications of contamination being noted. This information was recorded on the field log, completed for each of the sampling locations. Test pit logs are provided in **Appendix A**.

Soil samples were collected from test pit locations generally at the surface (0-0.2m), and then at different geological horizons (such as fill / topsoil; ash; clay) to assess the vertical extent of contamination. Additional samples were collected from soil horizons or fill that exhibited staining, odours, elevated PID<sup>1</sup> readings, or other physical evidence of potential contamination.

Where possible, samples were collected from the centre of the backhoe bucket or from the sides of the exposed test pit walls. Samples were field screened using a PID (calibration certificates are provided in **Appendix B**).

Soil samples were immediately transferred to sample containers that had been pre-treated in a manner appropriate for the laboratory analysis. The sample containers were transferred to a "chilled" esky for sample preservation before and during shipment to the testing laboratory. A chain-of-custody form was completed, and was forwarded with the samples to the testing laboratory. Disposable latex gloves were used to collect each sample. Sample jars were Teflon lined with the Teflon side of the septum facing the sample.

## 5.5 Soil Laboratory Program

The laboratory program is presented in **Table 5.1**. Samples suitable for laboratory analysis, but not selected for analysis, were stored at the laboratory for future testing if required. The primary laboratory used for analyses was Envirolab Services Pty Ltd which is NATA accredited for the analyses undertaken. All samples collected were handled under chain of custody conditions.

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<sup>1</sup> The photoionisation detector (PID) is a hand held device used to measure volatile organic concentrations in ambient air. It can therefore be used as a preliminary "check" for the possible presence of volatile contaminants such as BTEX, and light fraction TPH species.



**Table 5.1 Analytical Schedule**

Analyte	Number of Soil Samples For Analysis	QA/QC samples <sup>(1)</sup>
Metals (arsenic, cadmium, chromium, lead, copper, nickel, zinc)	4	1
Total Petroleum Hydrocarbons (TPH)	4	1
Benzene, Toluene, Ethyl Benzene and Xylene (BTEX)	21	5 <sup>(2)</sup>
Polycyclic Aromatic Hydrocarbons (PAH)	4	1
Asbestos	2	-
TCLP Metals	3	-
TCLP PAH (BaP)	3	-
TCLP BTEX	7	-

(1) Field duplicates.

(2) Including one trip blank and one trip spike.

## 5.6 Waste Classification

Waste classification undertaken as part of the current investigation was focused on correctly classifying the ashy fill material that was considered to be contaminated and which would require off site disposal as part of the remediation program at the site. As such, samples selected for toxicity characteristic leaching procedures (TCLP) analysis were biased to the upper ash horizons.

Other material at the site such as backfill clay material and topsoil / rail ballast containing fill material has not been considered as part of this waste classification.

To classify the fill / ashy material at the site, selected samples were subject to toxicity characteristic leaching procedures (TCLP). The leachate produced by the TCLP tests were analysed for BTEX, PAH and metals.

The procedures for classifying waste are detailed in the NSW EPA Environmental Guidelines: *Assessment, Classification & Management of Liquid & Non-Liquid Wastes* (1999). Non-virgin excavated material and material that has been excavated from a contaminated area must be classified using the procedures in Technical Appendix 1 of the guidelines.

Site material is classified by comparing analytical results from the material to threshold criteria provided in the guidelines. The guidelines provide threshold concentrations for three different waste categories, namely; inert waste; solid waste; and industrial waste. The wastes which fail to meet the criteria for industrial waste classify as hazardous waste. Hazardous waste cannot be landfilled without prior remediation or stabilisation.

The guidelines provide threshold values for total concentrations and leachable concentrations (based on TCLP tests) for a list of about 50 contaminants and groups of contaminants. For a waste to be classified under a given category, both total and



leachable concentrations of the waste should meet the respective threshold concentrations. The waste may be classified solely based on total concentrations (i.e. without undertaking leachability testing), but the applicable threshold concentrations when leachability testing is not undertaken are significantly lower (i.e. more stringent) than would apply when leachability testing is undertaken.

Guidelines from the NSW EPA (1999) do not provide any specific density of sampling and analysis for waste classification. A suitable sampling frequency for waste classification should be based on the quantity of material involved and the variability of the concentrations and different contamination sources involved. Depending on the origin of the material undergoing classification, a sampling frequency of approximately one sample per 50m<sup>3</sup> is often considered adequate for waste classification.

In this instance, sampling was biased to select samples from the suspected contaminated horizon (ashy fill unit) that previous investigations have shown to contain BTEX contamination at concentrations that would require remediation.



## 6. Quality Assurance & Quality Control

### 6.1 Field Program

#### 6.1.1 Field Quality Assurance

Fieldwork was conducted in general accordance with GHD's Standard Field Operating Procedures, which ensured environmental samples were collected by a set of uniform and systematic methods, as required by GHD's Quality Assurance (QA) system. Key requirements of these procedures are listed below:

- ▶ Decontamination procedures – including the use of new disposable gloves for the collection of each sample, decontamination of the sampling equipment between each sampling location if required (using DECON 90 – a phosphate free detergent) and the use of dedicated sampling containers provided by the laboratory;
- ▶ Sample identification procedures - collected soil samples were transferred to appropriately preserved and pre-treated sample containers. All sample containers were clearly labelled with a sample number, sample location, sample depth, sample date and sampler's initials;
- ▶ Chain of custody information requirements - a chain-of-custody form was completed and forwarded to the testing laboratory; and
- ▶ Sample duplicate frequency – (10%).

#### 6.1.2 Field Quality Control

The soil sampling program comprised the collection and analysis of the following field QC soil samples:

- ▶ Intra-laboratory (blind) duplicates;
- ▶ Trip spike; and
- ▶ Trip blank;

##### Blind Duplicates

Comprise a single sample that is 'split' into 2 separate sample containers. Both samples are sent anonymously to the project laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory, but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity.

The following blind duplicates were submitted to the primary laboratory for analysis:

- ▶ DUP1 of TP1 – 0.1-0.3;
- ▶ DUP2 of TP7 – 0.4-0.6; and
- ▶ DUP3 of TP8 – 0.4-0.6.

Duplicates were assessed by calculating the Relative Percentage Difference (RPD) between the primary and duplicate samples.



$$RPD(\%) = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where  $C_o$  = Analyte concentration of the original sample  
 $C_d$  = Analyte concentration of the duplicate sample

GHD adopts a nominal acceptance criteria of:

- 30% RPD for field duplicates and splits for inorganics; and
- 50% RPD for field duplicates and splits for organics.

However it is noted that this will not always be achieved, particularly in heterogenous soil materials, or at low analyte concentrations (where the concentration detected is within 10 times the PQL).

#### Trip Spike

Samples prepared by the laboratory containing known quantities of volatile contaminants. The trip spike accompanies the samples between the site and laboratory. The trip spike is analysed for BTEX compounds, and results are used to assess the loss of volatile contaminants during transportation of samples.

One trip spike (labelled TS 17/8/05) was analysed for this project.

#### Trip Blank

A sample with contaminant concentrations below detection limits accompanied the other samples over the course of the fieldworks and submitted to the laboratory for analyses. Trip blanks provide an indication of contamination introduced during sample transport and handling.

One trip blank (labelled TB 17/8/05) was analysed for this project.

## **6.2 Laboratory Program**

### **6.2.1 Laboratory Quality Assurance**

The project laboratory (Envirolab) used their internal procedures and NATA accredited methods in accordance with their quality assurance system.

### **6.2.2 Laboratory Quality Control**

Laboratory quality control procedures used during the project included the following:

#### Laboratory Duplicate Samples

The analytical laboratory collected duplicate sub samples from one sample submitted for analytical testing at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result.



### Spiked Samples

A submitted field sample was spiked by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples were analysed for each batch where samples were analysed for organic chemicals of concern.

### Certified Reference Standards

A reference standard of known (certified) concentration was analysed along with a batch of samples. The Certified Reference Standard (CRS) or Laboratory Control Spike provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.

### Surrogate Standard/Spikes

These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are spiked into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques before sample extraction. Surrogate Standard/Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.

### Laboratory Blank

Usually an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.

The testing laboratory conducted an assessment of the laboratory QC program, internally, however the results were also independently reviewed and assessed by GHD.

Laboratory duplicate samples should return RPD's within the NEPM acceptance criteria of  $\pm 30\%$ . Percent recovery is used to assess spiked samples and surrogate standards. Percent recovery; although dependent on the type of analyte tested, concentrations of analytes and sample matrix; should normally range from about 70-130%. Method (laboratory) blanks should return analyte concentrations as 'not detected'.



## 7. Basis for Contamination Assessment

### 7.1 Relevant Guidelines

The framework for the contamination assessment made by GHD was constructed on guidelines, "made or approved", by the NSW EPA (now the Department of Environment and Conservation (DEC)) under Section 105 of the *Contaminated Land Management Act 1997*. These include the following.

- ▶ NSW EPA (1994), "*Contaminated Sites: Guidelines for Assessing Service Station Sites*", December 1994, NSW EPA.
- ▶ NSW EPA (1995), "*Contaminated Sites: Sampling Design Guidelines*", September 1995, NSW EPA.
- ▶ NSW EPA (1997), "*Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*", November 1997, NSW EPA.
- ▶ NSW EPA (1998), "*Contaminated Sites: Guidelines for NSW Site Auditor Scheme*", June 1998, NSW EPA.
- ▶ NSW EPA (1999), "*Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report*", April 1999, NSW EPA.
- ▶ NSW EPA (1999), "*Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes*", May 1999, NSW EPA.
- ▶ NEPM (1999), "*National Environment Protection (Assessment of Site Contamination) Measure*", National Environment Protection Council (NEPC).
- ▶ ANZECC (2000), "*National Water Quality Management Strategy, Paper No. 4, Australian and New Zealand Guidelines for Fresh and Marine Water Quality*", October 2000, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

### 7.2 Soil Assessment Criteria

The assessment criteria (thresholds) against which the project analytical data is compared have been taken from those guidelines made or approved by the NSW EPA (above).

#### 7.2.1 Health-based Criteria

Health-based soil investigation levels (HILs) are provided for a range of different exposure settings, which are based on the nature of the use(s) for which the land is currently used and/or its approved use(s). The majority of the site is currently vacant and will be developed for rail purposes therefore the site will be assessed against exposure setting F (HIL F) as published in NSW EPA (1998) Guidelines for the NSW Site Auditor Scheme - commercial / industrial.



For some contaminants (including TPH) for which no HIL is presented in NSW EPA (1998), "*Guidelines for the NSW Site Auditor Scheme*", reference is made to the sensitive land use threshold provided in the NSW EPA (1994), "*Guidelines for Assessing Service Station Sites*".

There are currently no national or NSW guidelines for asbestos in soil. Enhealth (who were previously known as NEHF) are currently considering guidelines for asbestos in a non-occupational environment, including asbestos in soil. The NSW EPA has advised that asbestos is a human health issue and not an environmental issue. On the advice of the NSW Department of Health, the NSW EPA (now DEC) has advised NSW Site Auditors (Site Auditors Meeting 1 March 2000) that "no asbestos in the soil at the surface is permitted". Therefore the threshold criteria for asbestos will be the detection of any asbestos in soils.

### **7.2.2 Provisional Phytotoxicity Based Investigation Levels**

Consideration of the Phytotoxicity Based Investigation Levels (PBILs) presented in the guidelines is generally not required for commercial and industrial properties.

### **7.2.3 Application of Guidelines**

When comparing specific layers or bodies of material against the HIL criteria, the data set is separated to ensure that only materials of similar composition are included for comparison. For example, when calculating the 95%UCL<sub>avg</sub> (Upper Confidence Limit of the arithmetic average contaminant concentration) for a particular contaminant concentration in a given volume of material for the purposes of comparison against the relevant site criteria, only the data for the samples collected for that particular material is used in the calculation. This is known as a homogenous sample population.

It is important to note that the 95% UCL<sub>avg</sub> concentration is only calculated on soil material within the same strata and described as material of similar composition.

**Table 7.1** provides a summary of the investigation levels used to assess soil contamination levels at the site.



**Table 7.1 Soil Investigation Criteria**

Parameter	Health-Based Criteria (HIL F <sup>(A)</sup> ) mg/kg
Arsenic	500
Cadmium	100
Chromium (III)	60%
Chromium (VI)	500
Copper	5,000
Lead	1,500
Nickel	3,000
Zinc	35,000
Mercury (inorganic)	75
TPH C <sub>6</sub> -C <sub>9</sub>	65 <sup>(B)</sup>
TPH C <sub>10</sub> -C <sub>36</sub>	1,000 <sup>(B)</sup>
Benzene	1 <sup>(B)</sup>
Toluene	130 <sup>(B)</sup>
Ethyl Benzene	50 <sup>(B)</sup>
Total Xylenes	25 <sup>(B)</sup>
PAHs (total)	100
Benzo(a)pyrene	5
PCBs (Total)	50

Note: All units in mg/kg unless otherwise noted.

(A) Health-based Investigation Levels HIL (F) – Commercial / Industrial - Guidelines for the NSW Site Auditor Scheme (NSW EPA, 1998).

(B) Threshold Concentrations for Sensitive Land Use – in the "Guidelines for Assessing Service Station Sites" (NSW EPA, 1994).



## 8. Investigation Results

### 8.1 Field Observations

#### 8.1.1 Surface Observations

At the time of the current investigation works, the site (delineation area) was vacant and covered with weeds and grass. A timber post and rail is located about 5m to the north of the site, with an access gate way in the chain wire fence located to the east of the site. A significant amount of rail ballast comprising large (up to 150mm) fragments of basalt was observed on the near surface of the site.

#### 8.1.2 Subsurface Observations

Sub surface investigations indicated that fill material underlies the majority of the site to depths of between 0.4 – 2.0m. Based on observation made during the excavation of the test pits, the following observations of the soil profile were noted:

##### South side of the fence (Gasworks area - TP1 to TP3)

- ▶ FILL – topsoil and sandy gravel with some rail ballast (fragments of basalt up to 100mm). Large fragments of coke and slag up to 200mm were observed at TP1, TP2 and TP3. Large amount of man made debris including full size bricks. Thickness of unit is generally 0.3-0.5m below ground surface;
- ▶ FILL – ashy gravel band comprising sand and ash. Where encountered, the unit was typically 0.2-0.4m thick. Ash was usually coloured black and comprised fragments of coal, coke and slag;
- ▶ FILL – gravelly sand with fine grey ash. Unit was typically 0.1-0.4m thick;
- ▶ CLAY – moderate plasticity, stiff, red with iron cementation along fracture plains. From approximately 0.7m below ground level.

##### North side of fence (Cleaning Sheds area – TP4 to TP11)

- ▶ FILL – topsoil and sandy gravel with significant amounts of rail ballast (fragments of basalt up to 150mm) comprising approximately 50% of the fill. Thickness of unit is generally in the order of 0.1-0.3m;
- ▶ FILL – ashy gravel. Unlike the ash bands encountered on the southern side of the fence (Gasworks area), ash encountered on the subject site was mixed in with the sandy gravel. Definitive horizons between the black and grey ash were not discernable. Where encountered, the unit was typically 0.2-0.4m thick and was situated above brick walls and a concrete slab encountered beneath;
- ▶ Towards the base of this fill unit, test pitting encountered the remains of former site infrastructure such as brick walls, footings and a concrete slab. The orientation of the brick walls trended approximately north-east to south-west. Backfill material such as ashy gravel, rail ballast and clay was used to backfill between the walls;



- ▶ FILL – ash and clay, low to moderate plasticity, grey with orange and red mottling. Some remnant of the ash / coal / coke backfill of the upper horizons are mixed in with the backfill clay. Numerous underground pipes were also located within the backfill clays.
- ▶ FILL – clay, low plasticity, soft (this unit was observed only beneath the concrete slab in TP9 and TP10).

Test pit logs for all soils penetrated during the current investigation area presented in **Appendix A**.

### 8.1.3 PID Results

Elevated PID readings (>40ppm) recorded during site works were as follows:

- ▶ TP1 – 0.1-0.3 = 55.9ppm;
- ▶ TP1 – 0.5-0.6 = 47.6ppm;
- ▶ TP4 – 1.5-1.7 = 99.3ppm;
- ▶ TP6 – 0.7-0.8 = 60.2ppm;
- ▶ TP8 – 0.4-0.6 = 68.7ppm.

Generally, PID readings across the delineation area were in the order of 10-20ppm, which would likely represent 'background' levels at the site.

A mild hydrocarbon odour was noted at TP1 in the black ash / gravel band in the upper 0.5m of the profile. Hydrocarbon odours were not observed in any other pits excavated. Of the elevated PID readings noted above, all were analysed for BTEX within the exception of TP4 1.5-1.7m, and concentrations of BTEX compounds were all below laboratory detection limits.

Sample TP4 1.5-1.7m was a sample of clay fill and exhibited no odours, staining or other indication of contamination. A sample from the same test pit at a depth of 0.3-0.4m recorded low (below threshold criteria) concentrations of BTEX, however, that sample was taken in a layer of ashy fill. In addition, the TP6 0.7-0.8m sample was analysed for BTEX with all concentrations were below laboratory detection limits, it was also clay fill and recorded an elevated PID reading of 60.2ppm. Therefore, GHD do not consider the lack of BTEX analysis on sample TP4 1.5-1.7m an issue for the delineation of the TP44 impact (which the findings of previous investigations associated with ashy fill within the surface 0.5m).

It is noted that PID readings were not recorded for natural soils in TP1, and all soils in TP2 due to a malfunctioning instrument. However, this is not deemed to impact on the project outcomes due to the following reasons:

- ▶ Both samples of fill in TP1 and three (two fill and one natural) of the four samples in TP2 were analysed for BTEX, with all results below laboratory detection limits; and
- ▶ Both TP1 and TP2 are located in the former Gasworks area, which will be the subject of separate investigation and remediation works at a later date.



PID readings are presented on the test pit logs in **Appendix A**. PID calibration records are presented in **Appendix B**. Only one day of fieldworks was conducted, therefore the PID was not recalibrated in the field, rather it was used as calibrated by the equipment supplier (and confirmed by the calibration record in **Appendix B**). 'Spot checks' for PID accuracy were completed in the field by placing the tip of the PID in the opening of an isobutylene cylinder. These checks indicated that the PID was functioning correctly, with readings between 99 and 101ppm recorded.

## 8.2 Soil Sample Results

Soil samples were collected from eleven test pits and analysed for a range of parameters, principally BTEX and also heavy metals, PAHs, TPH and asbestos.

Summarised laboratory results for all analytes are presented in **Summary Tables, Table A** at the rear of the text. Exceedances listed below are presented in **Figure 4**.

NATA certified laboratory results and associated chain of custody documents are presented in **Appendix C**.

### 8.2.1 Metals

The metal parameters analysed were arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn respectively).

Metal concentrations detected in the four samples analysed were either below the limit of reporting of the laboratory or detected at concentrations well below the HIL(F).

### 8.2.2 BTEX

BTEX concentrations detected in the 21 samples analysed were either below the limit of reporting of the laboratory or detected at low concentrations below the NSW EPA Sensitive Land Use Threshold ('threshold'), with the exception of the following exceedances:

#### Sample TP3 – 0.2-0.3m

- ▶ benzene @ 3.2mg/kg (threshold - 1mg/kg); and
- ▶ total xylenes @ 179mg/kg (threshold – 25mg/kg).

BTEX compounds were detected above the limit of reporting of the laboratory but below the thresholds in the following samples:

- ▶ TP3 – 0.2-0.3
- ▶ TP3 – 0.4-0.6
- ▶ TP4 – 0.3-0.4; and
- ▶ TP5 – 0.3-0.4.

### 8.2.3 TPH

TPH was detected above the threshold in two of the four samples:



#### Sample TP1 -0.1-0.3m

- ▶ Total TPH @ 9390mg/kg (threshold – 1000mg/kg); and

#### Sample TP3 – 0.2-0.3m

- ▶ TPH C<sub>6</sub>-C<sub>9</sub> @ 150mg/kg (threshold – 65mg/kg); and
- ▶ Total TPH @ 1250mg/kg (threshold – 10mg/kg).

TPH was not detected above the limit of reporting of the laboratory in the other two samples analysed.

### **8.2.4 PAHs**

Total PAHs including B(a)P were detected at various concentrations above the limit of reporting of the laboratory in all four samples analysed. In addition, one sample had the following exceedance of the HIL by an order of magnitude:

#### Sample TP1 0.1-0.3m

- ▶ B(a)P @ 67mg/kg (threshold – 5mg/kg); and
- ▶ total PAH @ 898mg/kg (threshold – 100mg/kg).

### **8.2.5 Asbestos**

Two samples were submitted for laboratory analysis of asbestos. Results of analysis included:

- ▶ TP7 – 0.4-0.6m: sample comprised soil and rock fragments = no asbestos detected; and
- ▶ ASB1 – sample comprised a fragment of fibre cement sheeting approx 50x50x5mm in size = chrysotile asbestos detected.

## **8.3 Waste Classification**

Results of the analysis of selected samples for TCLP analysis indicate that concentrations of contaminants in the fill / ash bands did not leach under test conditions at concentrations in excess of the TCLP assessment criteria for inert waste. Results of the TCLP analysis are presented in **Summary Tables, Table B** at the rear of this report.

Concentrations of BTEX compounds and metals were detected at levels less than the upper threshold level for inert waste as listed under columns CT1 in Table A3 and SCC1 in Table A4.

However, total PAH, BaP and TPH were detected above the inert waste criteria of the NSW EPA (1999) guidelines in the following samples:

- ▶ TP1 0.1-0.3m (fill and black ash): total PAH @ 898.1mg/kg, BaP @ 67mg/kg and TPH C<sub>10</sub> – C<sub>36</sub> @ 9390mg/kg;
- ▶ TP1 0.5-0.6 (fill and grey ash): BaP @ 1.3mg/kg; and



- ▶ TP3 0.2-0.3 (fill and black ash): BaP @ 1.4mg/kg.

It is noted that the TP1 0.1-0.3m sample recorded total PAH and B(a)P at concentrations in excess of the SCC industrial waste criteria of 800mg/kg and 23mg/kg respectively. As such, this material would nominally classify as hazardous waste in accordance with the NSW EPA (1999) Environmental Guidelines and would require remediation and / or treatment before offsite disposal. However, due to the presence of significant quantities of ash in the fill it is considered appropriate to apply the *NSW EPA General Approval of Immobilisation, No. 1999/05*. Therefore, the total concentration (SCC) limits for total PAH and BaP do not apply and the material can be classified according to the concentrations of other contaminants and the TCLP concentration of BaP, which would result in a solid waste classification. However, the duplicate of sample TP1 0.1-0.3m recorded a TPH C<sub>10</sub> – C<sub>36</sub> concentration of 18510mg/kg, in excess of the SCC solid waste criteria. Therefore GHD consider it prudent to nominally classify this material as **industrial waste** (alternatively, additional sampling after the material has been excavated and stockpiled could be conducted to confirm this).

Based on the leachable and total concentrations of contaminants detected in samples of ashy fill from the site, it is concluded that the majority of the material classifies as **solid waste** on the basis of the B(a)P data with the exception of material near TP1 that may have to be treated as a 'hot spot' of **industrial waste**.

## 8.4 Assessment of Quality Control Results

### 8.4.1 Field Program

Relative Percentage Differences (RPD) are an established method of comparing primary and duplicate results. Analytical data for all blind duplicate samples collected during sampling are provided in **Summary Tables, Table C** at the rear of this report.

Duplicate pairs analysed in the program included:

- ▶ TP1 0.1-0.3 = DUP1
- ▶ TP7 0.4-0.6 = DUP2
- ▶ TP8 0.4-0.6 = DUP3

The nominal criteria used for the assessment of RPDs are +/- 30% for inorganic parameters and +/- 50% for organic parameters as provided in Australian Standard AS4482.1 (1997). However, variations from these RPD criteria can be expected in heterogeneous material or where low concentrations of analytes are detected.

The collection of duplicate samples during the field investigation exceeded the 10% frequency target (3 duplicates for 21 samples analysed), and thus complies with the data quality objectives for the project.

The RPDs could not be calculated for BTEX in the three duplicate pairs analysed as duplicate pairs reported concentrations below the PQL.



The majority of RPDs for metals were below the acceptable RPD of +/-30 (inorganic). However, RPD exceedances were noted for arsenic, chromium and zinc. Where the RPD's in the duplicate samples exceeded the acceptable criteria of +/-30%, concentrations were generally low or close to the PQL. However, zinc in duplicate pair TP1 0.1-0.3 / DUP1 was detected at elevated concentrations above the PQL and hence the RPD in this instance demonstrates a lack of reproducibility between the primary and duplicate sample.

In addition, RPD's for total TPHs and several of the PAH compounds demonstrate poor reproducibility in duplicate pair TP1 0.1-0.3 / DUP1. In most instances, concentrations of contaminants in DUP1 were approximately double that of the primary sample. It is considered likely that the poor reproducibility may be due to heterogeneity of the fill material and its ashy constituents.

The poor reproducibility of the data should be taken into account when interpreting the overall data set.

Overall, however, the assessment of the field QA/QC results indicate that the precision of the data is of generally acceptable quality upon which to draw conclusions regarding the environmental condition of the site at the time of this investigation.

#### **8.4.2 Laboratory Program**

Envirolab Services, a NATA certified laboratory, undertook internal quality assurance and quality control including the analysis of laboratory control spikes, method blanks, single and duplicate control spikes, surrogate spikes, matrix spikes and matrix duplicate control spikes. The results of these analyses indicated that the laboratory analysis of samples and the methods used were precise, accurate, reliable and reproducible for the sample matrix, and that the laboratory was obtaining results within their control limits for the period during which the samples were analysed.

It should be noted that TPH surrogate and matrix spike recoveries fell below the laboratory acceptance limit of 70%, with several TPH surrogates and matrix spikes consistently <70%. This exceedance of the control limits suggests that the laboratory is under extracting some compounds during analysis and hence potentially 'under' reporting concentrations. When this outcome is applied to the data set, the true concentration of TPH compounds may be higher than what is reported. This should be taken into account when interpreting the data for areas where TPH was detected in soil (namely around TP1).

The meeting of the DQOs for the project in terms of frequency of duplicate sampling and acceptance of laboratory data indicates that the data set generated for the current investigation, with the exception of the above exceedances of the control limit, is generally suitable for use.



## 9. Discussion

### 9.1 Observations Made on the Filling History of the Site

As previous investigations have noted (CH2M Hill 2000), a subsurface concrete slab is located in the north of the site (delineation area). Test pits TP5 and TP6 intersected the southern edge of the slab and TP9 and TP10 found the slab at the base of the test pits at approximately 1.0m below ground level. The slab is approximately 100mm thick with an additional 100mm layer of road base material beneath it (in some locations).

A schematic cross section of the investigation area is presented in **Figure 5**.

As evidenced in test pits TP4, TP7, TP8 and TP11, old footings, brick walls and foundations of former site infrastructure are located approximately 0.4m below ground level in the vicinity of the site. Based on observations made during test pitting, it is considered likely that fill material observed in the pits, including man made debris, rail ballast, ash, coal and clay (of varying composition) was used to backfill over the top of former site infrastructure. In addition, based on the inferred geometry and layout of the remnant brick walls (**Figure 4**), it appears that fill material has been placed down in between the brick walls on top of the concrete slab up to the level of the top of the brick walls (approximately 0.4m below ground level). Rail ballast and other fill material was imported to fill from the top of the walls to surface level. The distance between the observed brick walls varies from 0.5-1.0m. It is not clear how many brick walls there are located beneath the site, nor the length and exact layout of the former infrastructure. The brick walls appear to run parallel to the chain wire fence that is currently located on site.

On the southern side of the chain wire fence, observations made at depth in TP1, TP2 and TP3 indicate that filling (namely fill and ash bands) appears to have increased in depth from north to south abutting against the brick retaining wall that is located about 4m south of the chain wire fence in the Gasworks area. The filling is consistent with the lay of the land, although it should be kept in mind that both sites have a highly modified topography. However, given that the former Gasworks area south of the retaining wall is lower than the site by approximately 1.5m, it is considered likely that more fill material was needed towards the south of the site and immediately adjacent to the brick retaining wall.

### 9.2 Soil Investigations

Previous investigations at the site by CH2M Hill indicated that PAH and BTEX contamination was located in the vicinity of CH2M Hill Test Pit TP44 at concentrations that would warrant further investigation, delineation and / or remediation.

Delineation sampling around TP44 in the current investigation involved:

- ▶ Locating the position of TP44 by a registered surveyor;
- ▶ Where practical, positioning delineation test pits in a 5m and 10m radius from TP44; and



- Collection and analysis of samples for BTEX and other contaminants of concern.

It should be noted that, although the former Cleaning Sheds area is bounded by the chain wire fence to the south, surveying of the original position of TP44 located this pit on the southern side of the fence and hence in the former Gasworks area.

Three test pits (TP1 to TP3) were excavated in the former Gasworks area in the immediate vicinity of TP44. The remaining test pits (TP4 to TP11) were located on the northern side of the chain wire fence on a 5m and 10m spacing stepping away (to the north, east and west) from TP44.

Sub surface investigations indicated that fill material underlies the majority of the site to depths of between 0.3 – 1.0m. The fill material comprised a coarse-grained sandy gravel predominantly comprising ash / coal / coke and rail ballast with large fragments up to 150mm. The proportion of rail ballast in the fill material was greater on the northern side of the fence (Cleaning Sheds area) than on the southern side of the fence (former Gasworks area). The proportion of ash and coke fill material was greater on the Gasworks area than the Cleaning Sheds area.

A summary of the geology of both sides of the chain wire fence and the associated chemicals of concern detected in samples analysed is presented in the following **Table 9.1**.

**Table 9.1: Summary of Geology and Soil Results**

Former Gas Works Area (TP1 – TP3) (South side of fence)					Former Cleaning Sheds Area (TP4 – TP11) (North side of fence)					
Soil Type	Depth	BTEX	PAH	TPH	Soil Type	Depth	BTEX	PAH	TPH	Asbestos
Fill + black ash	0.0-0.4	ND - 179	ND - 898	ND - 9390	Fill + rail ballast	0.0-0.4	ND	NA	NA	NA
Fill + grey ash	0.4-0.7	ND - 1.6	ND - 15.6	ND	Fill / clay / ash	0.4-1.0	ND - 2.4	NA	NA	Fragments containing chrysotile
Clay	>0.7	ND	ND	ND	Fill / clay	>1.0	ND	NA	NA	NA

ND – Not Detected above PQL

NA – Not analysed

All soil results are in mg/kg.

Depth ranges are averaged between test pits at that site.

TPH, BTEX and total PAHs were reported at concentrations exceeding the relevant guideline in the upper geological horizon (0.0-0.4m) at TP1 and TP3 situated adjacent to TP44. This geological horizon corresponds to having significant amounts of black ash, coal and coke mixed in with the fill material. Deeper samples analysed from the same locations indicate that the concentrations of BTEX, TPH and PAH decreases



with depth, indicating that the source of contamination is likely to be the constituents of the black ashy fill layer.

Concentrations of contaminants on the northern side of the fence are significantly less, with BTEX not detected above the laboratory limit of reporting in most of the samples analysed at several depth intervals. The only sample in which BTEX was reported as a 'substantial concentration' was in TP4 (immediately to the north of CH2M Hill Pit TP44), in which BTEX compounds were reported to be above the laboratory limit of reporting, but below the applicable thresholds.

Several fragments of fibre cement sheeting were located in TP11 to the eastern side of the delineation area. Analysis of one fragment of sheeting from this location indicated the presence of chrysotile asbestos. The fibre cement sheeting appeared to be limited to fragments located within the fill material at a depth of approximately 0.5m. The analysis of one soil sample from the same location did not detect asbestos within the soil matrix. It is considered likely that the source of the asbestos was general fill debris imported to site when the Cleaning Sheds area was filled to the current grade. Fragments of fibre cement sheeting were not observed in the remaining test pits.

### **9.3 Area Requiring Remediation**

From the results presented above, it is considered that the contamination on the southern side of the fence (ie, in the Gasworks area) may be widespread. PAH, TPH and BTEX contamination was detected in two delineation pits on both sides of TP44 which suggests that the lateral (east to west) extent of contamination on the former Gasworks side of the site has not been defined.

However, the extent of contamination on the former Cleaning Sheds area (north of the fenceline) has been characterised during the current round of sampling with eight test pits excavated on 5m and 10m spacing stepped out from the location of TP44.

With the exception of minor BTEX detection (below the applicable thresholds) in TP4, samples analysed did not detect BTEX at concentration above the laboratory limit of reporting.

The concentrations of TPH, PAH and BTEX detected in the current investigation above the site investigation levels on the former Gasworks area were found to be associated with fill material, comprising predominantly black ash, coal, coke and slag.

As such, it is considered that the contamination reported in CH2M Hill Pit TP44, plus GHD Pits TP1 and TP3 is associated with the filling of the Gasworks area adjacent to the brick retaining wall. Based on analytical results obtained from test pits from the Cleaning Sheds area, it is considered that 'gross' contamination is unlikely to extend to the Cleaning Sheds area and appears restricted to the southern side of the fence within the bounds of the Gasworks area. However, the western and eastern extent of contamination detected along the line of the brick retaining wall within the Gasworks area has not been defined.

GHD consider that whilst ash was detected north of the fenceline (within the Cleaning Sheds area), concentrations of contaminants, including BTEX, were not at a level that



would warrant further investigation or remediation given the nature of the proposed rail landuse for the site. In addition, given the minor concentration of BTEX at TP4 and that BTEX was not detected in the other test pits at the cleaning sheds site, the likelihood of potential vapours being generated from low levels of BTEX in ash is considered to be low.

Further investigation and remediation would however be required on the Gasworks area when RailCorp assess this area at a later date.

#### **9.4 Waste Classification**

Results of the TCLP testing of selected samples of ashy fill material at the site indicate that contaminants do not leach at appreciable concentrations. However, total concentrations of B(a)P were found to be in excess of the inert waste criteria.

As such, the majority of the ashy fill material would be classified as **solid waste** in accordance with the NSW EPA Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-Liquid Wastes (1999).

A small amount of material in the vicinity of TP1 would nominally be classified as **industrial waste** due to high total concentrations of TPH in surface soils. This material could be considered as a 'hotspot' for the purposes of waste classification and treated separately when offsite disposal is required. Alternately, the material may be re-classified upon excavation.

It should be noted that the waste classification contained in this report was specifically for the ashy fill material at the site (delineation area) that was understood to potentially require remediation during redevelopment. Topsoil and general clay fill material that is located at the site, and materials in the wider Macdonaldtown Triangle have not been classified.



## 10. Conclusions and Recommendations

GHD was commissioned by RailCorp in August 2005 to undertake delineation and waste classification sampling of part of the RailCorp property known as the 'Macdonaldtown Triangle', located on Burren Street, Macdonaldtown.

The investigation was required following previous environmental investigations at the site where elevated levels of BTEX and PAH were detected from the property's former use as a gas works and rail infrastructure facility.

The Macdonaldtown Triangle is separated into two areas as defined by their historical uses; 1) Former Cleaning Shed Area, and 2) Former Gasworks Area. These two areas are currently separated by a chain wire fence that runs approximately south west to north east across the site. Previous investigations detected contamination at both sites. However, as RailCorp is currently redeveloping the cleaning sheds site for rail purposes, the current investigation was only focused on assessing the nature and extent of contamination at the Cleaning Sheds area that may require remediation for the area to be suitable for the proposed landuse.

Surveying of the location of the former test pit TP44 indicated that the pit was located on the adjacent former Gasworks area and not in the Cleaning Sheds area. As such, contamination detected on the adjacent Gasworks area was not considered for the purposes of this report. It is understood that remediation and validation of the former Gasworks area will take place independently of the former Cleaning Sheds area and at a later date.

Concentrations of contaminants of concern (chiefly BTEX) were not detected at significant concentrations on the former Cleaning Sheds area. BTEX was detected in samples collected from one test pit (TP4) with concentrations of BTEX in the remaining test pit samples below the level of reporting of the laboratory. The subsurface conditions observed at the Cleaning Sheds area did not indicate a large degree of filling from ash or other by-products of the gasworks. Filling at the Cleaning Sheds area comprised rail ballast, back fill clay and some ash / coal.

Ashy fill material from the Cleaning Sheds area of the site (north of the fenceline) would nominally classify as **solid waste** for off-site (landfill) disposal purposes.

However, contaminants of concern including BTEX, PAH and TPH were reported at high concentrations in ashy material in two of the three test pits excavated east and west of CH2M Hill Pit TP44 (i.e., on the former Gasworks area). This material would nominally classify as hazardous waste for off-site disposal purposes due to high PAH concentrations. However, the high PAH concentrations appear to be associated with ash, and therefore the *NSW EPA General Approval of the Immobilisation of Contaminants in Waste (1999/05)* can be applied. The nominal classification of the ashy material in the Gasworks area of the site (south of the fenceline) would then revert to **industrial waste** (due to TPH concentrations). Large amounts of fill comprising ash, slag, coal and coke were detected in the pits east and west of TP44.



Observations of the filling in the test pits also indicated that the use of ashy fill material increased towards the south, abutting against the brick retaining wall.

It is considered likely that a different type of fill (or fill from a different origin) was used on the Gasworks area to fill up against the brick retaining wall. On the Cleaning Sheds area, clay, rail ballast and some ash / coal was used to backfill in and around former site infrastructure including building footings and walls.

Given that contaminants of concern were only detected at elevated concentrations on the Gasworks site, it appears likely that 'gross' contamination is restricted to the southern side of the chain wire fence (in the strip of land between the fence and the brick retaining wall).

GHD consider that whilst ash was detected north of the fenceline (within the Cleaning Sheds area), concentrations of contaminants, including BTEX, were not at a level that would warrant further investigation or remediation given the nature of the proposed rail landuse for the site. In addition, given the minor concentration of BTEX at TP4 and that BTEX was not detected in the other test pits at the cleaning sheds site, the likelihood of potential vapours being generated from low levels of BTEX in ash is considered to be low.

Test pitting on the Cleaning Sheds area revealed the presence of several brick walls approximately 0.4m below ground level on top of the concrete slab that was located in previous investigations. GHD understand that the area of the current investigation will receive up to 2m of imported fill material as part of the site redevelopment. Notwithstanding this, depending on the type of rail infrastructure construction that is proposed for the area of the current sampling, it is recommended that advice be sought from a suitably qualified geotechnical engineer for the foundations of the new infrastructure.

Several fragments of fibre cement sheeting containing chrysotile asbestos were detected in TP11 on the cleaning sheds site. As this material was found at depth and based on GHD's understanding that the Cleaning Sheds area will receive up to 2m of imported fill material as part of the site redevelopment, the presence of fibre cement sheeting at depth is not considered an issue that would affect the redevelopment of the cleaning sheds site into rail infrastructure. Depending on construction that is proposed for that part of the Cleaning Sheds area, caution should be exercised when excavating into soils. Given the random filling history of the area, further detections of asbestos fibre cement cannot be precluded.

As such, general caution should be maintained by the construction contractor for construction works at the Cleaning Sheds area. The construction contractor should make contingencies for 'unexpected occurrences' in their project safety plan.

For example, to account for the possible presence of fibre cement sheeting fragments:

- ▶ Any works that involve significant soil disturbance should be undertaken in a manner that minimises potential dust generation. Soils should be dampened during any such works, and workers involved should be fitted with appropriate health & safety equipment. If fragments of fibre cement sheeting are observed



during works, activities should immediately cease and advice be sought from a suitably qualified Environmental Consultant.

While remediation of the Cleaning Sheds area, aside from the filling proposed during redevelopment, is not considered necessary, management will be required to ameliorate potential risks during redevelopment, and on an ongoing basis. GHD recommend that an Environmental Management Plan (EMP) is prepared and implemented for the proposed redevelopment works. The EMP should identify potential environmental impacts associated with the works and document measures to be taken to manage these.

In addition, a long-term Site Management Plan (SMP) for the Cleaning Sheds area, post-development, should be prepared in due course. The SMP should address issues associated with the retention of potentially contaminated fill material under the proposed imported soils, and include controls to prevent future exposure to the fill.

If soil material needs to be excavated and removed from the site during construction, materials should be classified, in accordance with the NSW EPA (1999) Guidelines for the *Assessment, Classification and Management of Liquid and Non-liquid Wastes*". It should be noted that the waste classification contained in this report was specifically for the ashy fill material at the site (delineation area) that was understood to potentially require remediation during redevelopment. Topsoil and general clay fill material that is located at the site, and materials in the wider Macdonaldtown Triangle have not been classified.



## 11. Limitation of this Report

This report has been prepared for use by RailCorp, who has commissioned the works. The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent and experienced person with experience in environmental investigations, before being used for any other purpose. GHD accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced, or amended in any way without prior approval by the client or GHD, and should not be relied upon by any other party, who should make their own independent inquiries.

The extent of sampling of soils and subsequent analysis has been necessarily limited. The soil samples were collected from test pits and therefore may not identify contamination that occurs in unexpected locations or from unexpected sources.

The extent of sampling of soils and subsequent analysis and has been necessarily limited, and has been targeted towards areas where contamination is considered to be most likely. This approach maximises the probability of identifying contaminants; however, it may not identify contamination that occurs in unexpected locations or from unexpected sources.

Further, soil, rock and aquifer conditions are often variable, resulting in non-homogenous contaminant distributions across a site. Contaminant concentrations have been identified at chosen sample locations; however, conditions between sample locations can only be inferred on the basis of the estimated geological and hydrogeological conditions and the nature and extent of identified contamination. Boundaries between zones of variable contamination are often indistinct, and have been interpreted based on available information and the application of professional judgement. The accuracy with which the sub-surface conditions have been characterised depends on the frequency and methods of sampling and the uniformity of sub-surface conditions and is therefore limited by the scope of works undertaken.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, GHD reserves the right to review the report in the context of the additional information.



## **Summary Tables of Analytical and Field Results**

Table A Summary of Analytical Results

Table B Summary of TCLP Waste Classification Data

Table C Summary of Analytical Results - Relative Percentage Difference Calculations

**Table A - SOIL**  
**Summary Analytical Results**  
**MacDonaldtown Triangle**



Sample ID	Depth (m)	Date Sampled	Arsenic		Cadmium	Chromium	Copper	Lead	Mercury		Nickel	Zinc
			(total)	mg/kg					(inorganic)	mg/kg		
	PCL <sup>(1)</sup>											
	HIL(F) <sup>(2)</sup>											
TP1	0.1-0.3	17/08/05	500	100	1.0	0.5	5000	1500	75	0.10	3000	35000
TP1	0.5-0.6	17/08/05	9	<1	<1	5.3	130	230	0.17	18	170	170
TP2	0.0-0.2	17/08/05	9	<1	<1	5.3	81	100	<0.1	16	350	350
TP2	0.4-0.5	17/08/05	-	-	-	-	-	-	-	-	-	-
TP2	0.8-1.0	17/08/05	-	-	-	-	-	-	-	-	-	-
TP3	0.2-0.3	17/08/05	<4	<1	<1	1.6	62	66	<0.1	15	120	120
TP3	0.4-0.6	17/08/05	<4	<1	<1	6.2	43	120	<0.1	22	410	410
TP4	0.8-0.9	17/08/05	-	-	-	-	-	-	-	-	-	-
TP4	0.1-0.2	17/08/05	-	-	-	-	-	-	-	-	-	-
TP4	0.3-0.4	17/08/05	-	-	-	-	-	-	-	-	-	-
TP4 - Pipe	-	17/08/05	-	-	-	-	-	-	-	-	-	-
TP5	0.4-0.5	17/08/05	-	-	-	-	-	-	-	-	-	-
TP6	0.7-0.8	17/08/05	-	-	-	-	-	-	-	-	-	-
TP6	1.3-1.5	17/08/05	-	-	-	-	-	-	-	-	-	-
TP7	0.1-0.2	17/08/05	-	-	-	-	-	-	-	-	-	-
TP7	0.4-0.6	17/08/05	-	-	-	-	-	-	-	-	-	-
TP7 Asb-1	-	17/08/05	-	-	-	-	-	-	-	-	-	-
TP8	0.4-0.6	17/08/05	-	-	-	-	-	-	-	-	-	-
TP9	0.7-0.9	17/08/05	-	-	-	-	-	-	-	-	-	-
TP10	0.1-0.3	17/08/05	-	-	-	-	-	-	-	-	-	-
TP10	1.6-1.8	17/08/05	-	-	-	-	-	-	-	-	-	-
TP11	0.5-0.6	17/08/05	-	-	-	-	-	-	-	-	-	-
DUP 1	-	17/08/05	20	<1	<1	7.5	160	260	0.19	16	270	270
DUP 2	-	17/08/05	-	-	-	-	-	-	-	-	-	-
DUP 3	-	17/08/05	-	-	-	-	-	-	-	-	-	-

<sup>(1)</sup> Practical Quantitation Limit

<sup>(2)</sup> Sensitive Land Use Threshold Concentration. *Guidelines for Assessing Service Station Sites* (NSW EPA, 1994)

<sup>(3)</sup> Health Investigation Level 'F' - Commercial and Industrial - *National Environment Protection Measure (NEPC, 19)*

<sup>(4)</sup> NSW DEC document that no asbestos fibres are to be detected in soil.

- Sample not analysed

ND Not detected (concentration below practical quantitation limit of testing laboratory)

N/A Not Available (no threshold available)

24000 Exceeds HIL (F) Investigation Level

**Table A - SOIL**  
**Summary Analytical Results**  
**MacDonaldtown Triangle**



Sample ID	Depth (m)	Date Sampled	Total Petroleum Hydrocarbons				Total Petroleum		Benzene mg/kg	Toluene mg/kg	Ethyl Benzene mg/kg	Total Xylenes mg/kg	Asbestos
			C6 - C9 mg/kg	C10 - C14 mg/kg	C15 - C28 mg/kg	C29 - C36 mg/kg	C10-C36 mg/kg	Asbestos					
	PQL <sup>(1)</sup>		25.0	100.0	100.0	100.0	N/A	1 <sup>(2)</sup>	1 <sup>(2)</sup>	1	3	None <sup>(4)</sup>	
	HL(F) <sup>(3)</sup>		65 <sup>(4)</sup>	N/A	N/A	N/A	1000 <sup>(4)</sup>	1 <sup>(2)</sup>	130 <sup>(4)</sup>	50 <sup>(4)</sup>	25 <sup>(4)</sup>		
TP1	0.1-0.3	17/08/05	<25	190	6200	3000	9390	<1	<1	<1	<3	-	
TP1	0.5-0.6	17/08/05	<25	<50	<100	<100	ND	<1	<1	<1	<3	-	
TP2	0.0-0.2	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP2	0.4-0.5	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP2	0.8-1.0	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP3	0.2-0.3	17/08/05	150	130	760	210	1100	3.2	10	2.8	179	-	
TP3	0.4-0.6	17/08/05	<25	<50	<100	<100	ND	<1	1.8	<1	<3	-	
TP3	0.8-0.9	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP4	0.1-0.2	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP4	0.3-0.4	17/08/05	<25	-	-	-	-	<1	2.4	1.3	<3	-	
TP4 - Pipe	-	-	-	-	-	-	-	<1	<1	<1	<3	-	
TP5	0.4-0.5	17/08/05	-	-	-	-	-	<1	1.4	1	<3	-	
TP6	0.7-0.8	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP6	1.3-1.5	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP7	0.1-0.2	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP7	0.4-0.6	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP7 Asb-1	-	-	-	-	-	-	-	-	-	-	-	Chrysotile detected	
TP8	0.4-0.6	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP9	0.7-0.9	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP10	0.1-0.3	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP10	1.6-1.8	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
TP11	0.5-0.6	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
DUP 1	-	17/08/05	<25	210	12000	6300	18510	<1	<1	<1	<3	-	
DUP 2	-	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	
DUP 3	-	17/08/05	-	-	-	-	-	<1	<1	<1	<3	-	

<sup>(1)</sup> PQL for check lab may differ for some analytes

<sup>(2)</sup> Sensitive Land Use Threshold Concentration. <sup>(3)</sup> Guidelines for Assessing Service Station Sites (NSW EPA, 1994)

<sup>(3)</sup> Health Investigation Level 'F' - Commercial and Industrial - National Environment Protection Measure (NEPC, 1999).

<sup>(4)</sup> NSW DEC document that no asbestos fibres are to be detected in soil.

- Sample not analysed  
 ND Not detected (concentration below practical quantitation limit of testing laboratory)  
 N/A Not Available (no threshold available)  
 24000 Exceeds HL (F) Investigation Level





**Table B**  
**Waste Classification Data**  
**MacDonaltdown Triangle**

All Units in mg/kg (SCC), mg/L (TCLP)

Sample ID	Benzopyrene		Total PAH		Benzene		Toluene		Ethylbenzene		Total Xylenes		TPH C9-C9		TPH C10-C36		Arsenic		Cadmium		Chromium		Lead		Mercury		Nickel	
	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>	SCC <sup>(1)</sup>	TCLP <sup>(2)</sup>
Waste Class Without TCLP																												
inert Waste		0.08		NA		1		28.8		60		100		NA		NA		10		2		10		10		0.4		4
Solid Waste		0.8		NA		10		288		600		1000		NA		NA		100		20		100		100		4		40
Industrial Waste		3.2		NA		40		1152		2400		4000		NA		NA		400		80		400		400		16		160
Waste Class With TCLP																												
inert Waste	1	0.004	200	NA	18	0.05	518	1.44	1050	3	1800	5	650	NA	5000	NA	500	0.50	100	0.10	1900	0.50	1500	0.5	50	0.02	1050	0.20
Solid Waste	10	0.04	200	NA	18	0.50	518	14.40	1080	30	1800	50	650	NA	10000	NA	500	5	100	1	1900	5	1500	5	50	0.20	1050	2
Industrial Waste	23	0.16	800	NA	72	2	2073	57.60	4320	120	7200	200	2600	NA	40000	NA	2000	20	400	4	7600	20	6000	20	200	0.80	4200	8
TP1/0.1-0.3		<0.001	988.1	-	<1	-	<1	-	<1	-	<3	-	<25	-	9350.19	-	9.0	<0.15	<1	<0.02	5.3	<0.02	236.0	0.2	0.2	<0.0005	16.0	<0.03
TP1/0.5-0.6		<0.001	15.6	-	<1	-	<1	-	<1	-	<3	-	<25	-	ND	-	9.0	<0.15	<1	<0.02	5.3	<0.02	100.0	0.05	<0.1	<0.0005	16.0	0.03
TP2/0.2-0.3		<0.001	14.3	-	3.2	0.015	10.0	0.013	2.8	<0.001	179.0	0.005	150	-	1100	-	<4	<0.15	<1	<0.02	1.6	<0.02	86.0	<0.03	<0.1	<0.0005	15.0	<0.03
TP2/0.4-0.6		<0.001	4.3	-	<1	<0.001	1.6	<0.001	<1	<0.001	<3	<0.003	<25	-	ND	-	<4	<0.15	<1	<0.02	6.2	<0.02	120.0	0.07	<0.1	<0.0005	22.0	0.07
TP4/0.3-0.4		-	-	-	-	0.008	2.4	0.005	1.3	<0.001	<3	<0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

<sup>(1)</sup> Maximum total concentration listed in Table A4 of the NSW EPA Environmental Guidelines Assessment, Classification and Management of Liquid and Non-liquid Wastes  
<sup>(2)</sup> Maximum leachable concentration listed in Table A4 of the NSW EPA Environmental Guidelines Assessment, Classification and Management of Liquid and Non-liquid Wastes.  
<sup>(3)</sup> It is noted that the duplicate of this sample (DUP1) recorded a TPH C10-C36 concentration of 19510 mg/kg, which exceeds the solid waste criteria

ND Not Detected (concentration below practical quantitation limit of testing laboratory)  
 NA Not Applicable (no threshold available)  
 - Sample not analysed  
 Exceeds inert waste classification with TCLP  
 Exceeds Solid waste classification with TCLP  
 Exceeds industrial waste classification with TCLP





## Figures

- Figure 1 Site Location
- Figure 2 Site Layout
- Figure 3 Site Plan Showing Location of Delineation Test Pits
- Figure 4 Site Plan Showing Exceedances of Soil Investigation Criteria
- Figure 5 Schematic Cross Section of Investigation Area

# SITE LOCATION

RAILCORP - MACDONALDTOWN TRIANGLE, DELINEATION & WASTE CLASSIFICATION SAMPLING OF FORMER CLEANING SHEDS AREA



Source: Map reproduced with permission of UBD. Copyright Universal Publishers Pty Ltd DG08/03.

Date : 8 September 2005

File Name : 2114037\_LTN\_01.cdr



Figure 1

# SITE LAYOUT

RAILCORP - MACDONALDTOWN TRIANGLE, DELINEATION & WASTE CLASSIFICATION SAMPLING OF FORMER CLEANING SHEDS AREA



Source: CH2M Hill

Date : 8 September 2005

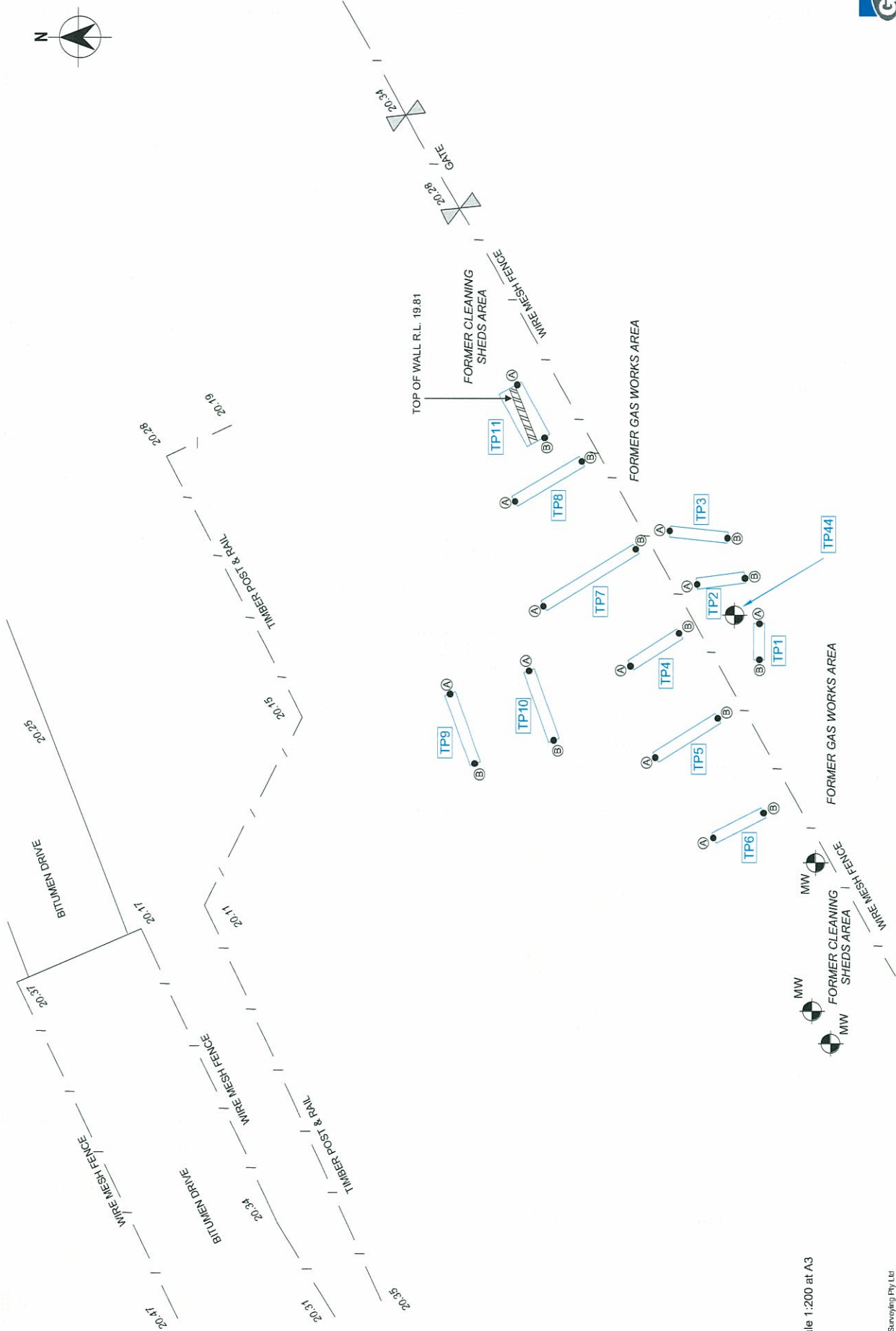
File Name : 2114037\_LTN\_02.cdr



Figure 2

# SITE SURVEY SHOWING LOCATION OF DELINEATION TEST PITS

RAILCORP - MACDONALDTOWN TRIANGLE, DELINEATION & WASTE CLASSIFICATION SAMPLING OF FORMER CLEANING SHEDS AREA



Scale 1:200 at A3

Source: SPB Surveying Pty Ltd

Date : 8 September 2005

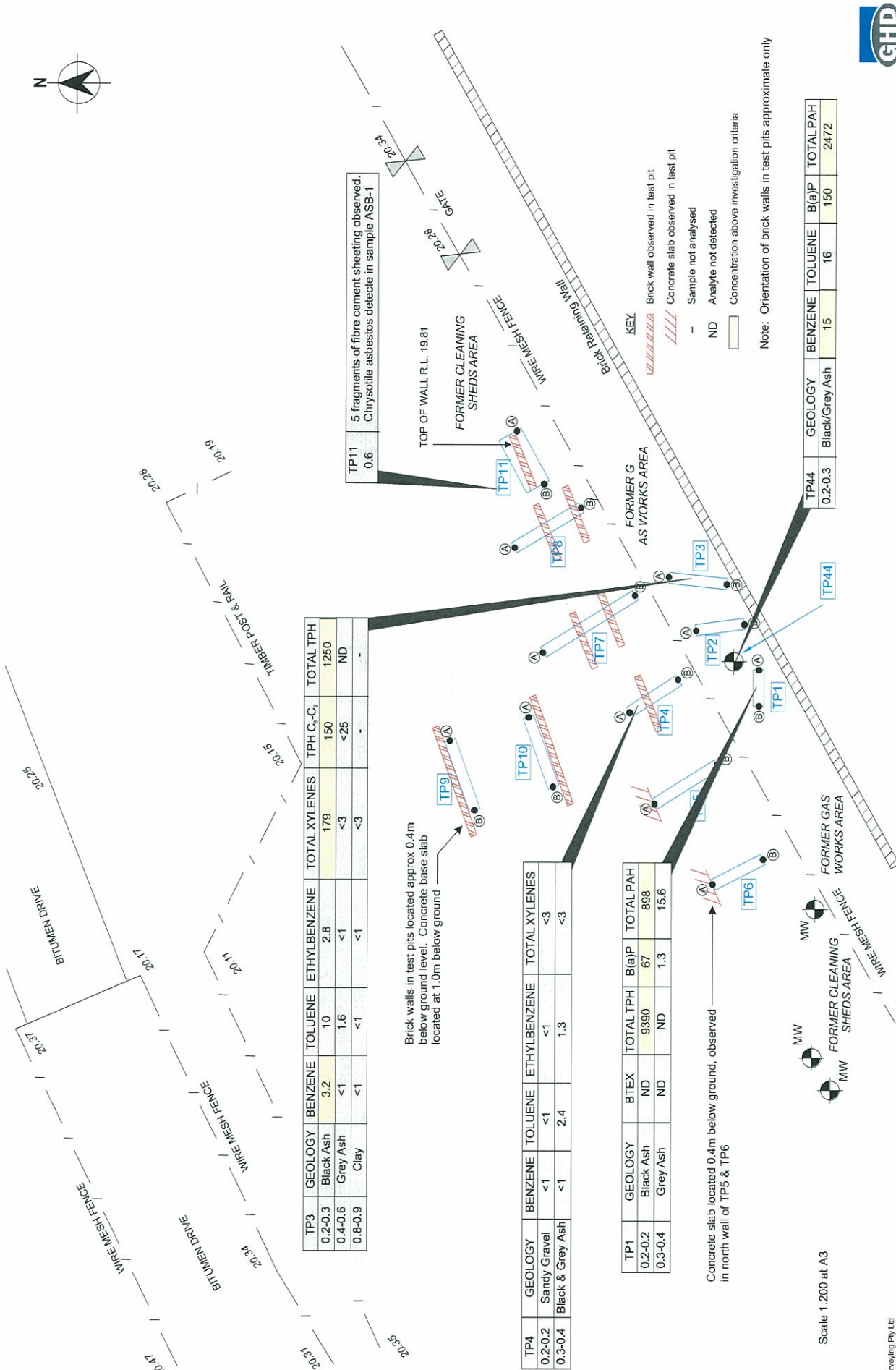
File Name : 2114037\_LTN\_03.cdr



Figure 3

# SITE SURVEY SHOWING LOCATION OF TEST PITS, EXCEEDANCES OF SOIL INVESTIGATION LEVELS & LOCATION OF FORMER SITE INFRASTRUCTURE

RAILCORP - MACDONALDTOWN TRIANGLE, DELINEATION & WASTE CLASSIFICATION SAMPLING OF FORMER CLEANING SHEDS AREA



Source: SPB Surveying Pty Ltd

Date : 9 September 2005

File Name : 2114037\_LTN\_04.cdr



Figure 4

# SCHEMATIC CROSS SECTION SHOWING GEOLOGICAL HORIZONS AND FORMER SITE INFRASTRUCTURE

RAILCORP - MACDONALDTOWN TRIANGLE, DELINEATION & WASTE CLASSIFICATION SAMPLING OF FORMER CLEANING SHEDS AREA

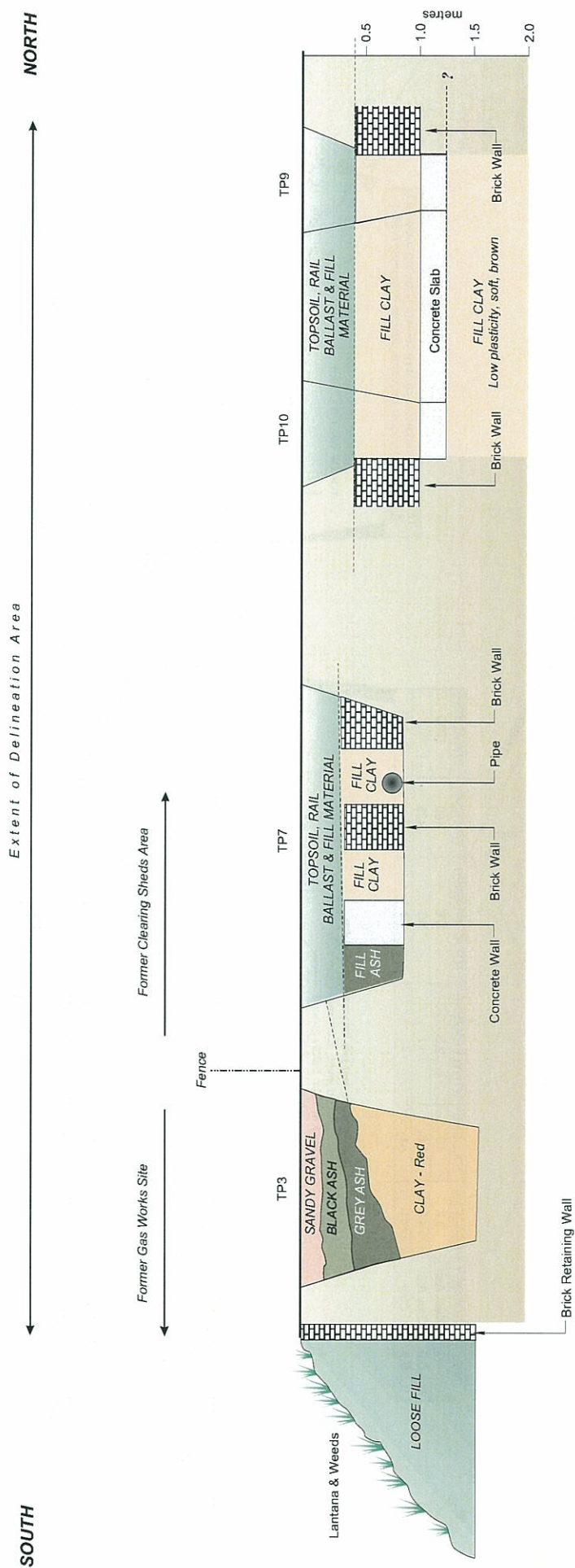


Figure 5



Appendix A  
Test Pit Logs



# SOIL TEST PIT LOG

**TEST PIT No.: TP1**

Page: 1 of 1

CLIENT: Rail Corporation NSW	JOB No.: 21/14037	COMMENCED: 17 August 2005
PROJECT: Macdonaldtown Triangle Delineation Sampling		COMPLETED: 17 August 2005
LOCATION: Burren Street, Erskinville, NSW		LOGGED BY: A. Barwick
CONTRACTOR: Bill Paul Excavations	EQUIPMENT: Backhoe	CHECKED BY: L. Clements
VERTICAL DATUM: AHD - RL20.01	HORIZONTAL DATUM: MGA	TOTAL DEPTH (m): 1.9
X-COORDINATE: 332302.67	Y-COORDINATE: 6247740.31	

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0						Ground Surface			0
	B	GS	TP1/0.1-0.3, DUP1	55.9	0.00	<b>FILL</b> Sandy Gravel and topsoil	Grass and roots at surface.		
					0.10	<b>FILL</b> Gravel, ash, coal, coke. Black coloured ash / coal fragments. Some clay, moderate plasticity, brown-red.	Full size bricks. Some glass and wire. Mild ash and hydrocarbon odour. Large fragments of coke up to 100mm.		
	B	GS	TP1/0.5-0.6	47.6	0.40	<b>FILL</b> Gravelly sand with fine grey ash. Sand is medium to coarse grained, white-brown. Gravel comprises rail ballast.	Fragments of glass, wire and coke. Fine powdery grey ash. Many full size bricks.		
	B	GS	TP1/0.8-0.9	--	0.70	<b>CLAY</b> CH - moderate plasticity. Stiff. Red and grey mottling with iron cementation along fracture plains.			
1									
	B	GS	TP1/1.6-1.8	--			Duplicate sample DUP1 collected		
2					1.90	<b>End of Test Pit at 1.9m at designated depth.</b>			2
3									3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

TEST PIT No.: TP2

Page: 1 of 1

CLIENT: Rail Corporation NSW

JOB No.: 21/14037

COMMENCED: 17 August 2005

PROJECT: Macdonaldtown Triangle Delineation Sampling

COMPLETED: 17 August 2005

LOCATION: Burren Street, Erskinville, NSW

LOGGED BY: A. Barwick

CONTRACTOR: Bill Paul Excavations

EQUIPMENT: Backhoe

CHECKED BY: L. Clements

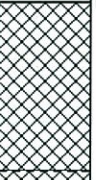


VERTICAL DATUM: AHD - RL20.09

HORIZONTAL DATUM: MGA

TOTAL DEPTH (m): 1.7

X-COORDINATE: 332304.83

Y-COORDINATE: 6247743.68

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0						Ground Surface			0
	B	GS	TP2/0.0-0.2	--	0.00	<b>FILL</b> Sandy, ashy gravel. Black, grey and brown. Some coal, coke and grey ash.	Large (>100mm) fragments of coke and coal. Full size bricks, some wire, steel and glass.		
	B	GS	TP2/0.4-0.5	--	0.40	<b>FILL</b> Ash. Grey, powdery occurring in a thin 100mm band.	Powdery grey ash band.		
					0.50	<b>CLAY</b> CH - moderate plasticity clay. Stiff. Red and grey mottling with iron cementation along fracture plains.			
	B	GS	TP2/0.8-0.9	--					
	B	GS	TP2/1.3-1.5	--			Note - PID not working at this location.		
					1.70	End of Test Pit at 1.7m at designated depth.			

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

**TEST PIT No.: TP3**

Page: 1 of 1

CLIENT: Rail Corporation NSW	JOB No.: 21/14037	COMMENCED: 17 August 2005
PROJECT: Macdonaldtown Triangle Delineation Sampling		COMPLETED: 17 August 2005
LOCATION: Burren Street, Erskinville, NSW		LOGGED BY: A. Barwick
CONTRACTOR: Bill Paul Excavations	EQUIPMENT: Backhoe	CHECKED BY: L. Clements
VERTICAL DATUM: AHD - RL20.06	HORIZONTAL DATUM: MGA	TOTAL DEPTH (m): 1.5
X-COORDINATE: 332307.71	Y-COORDINATE: 6247745.13	

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0						Ground Surface			0
	B	GS	TP3/0.0-0.1	4.5	0.00	<b>FILL</b> Sandy gravel. Coarse grained, brown to black. Gravel comprises blue metal aggregate up to 100mm.	Coke, coal and ash, black and white with high proportion of void spaces in coke fragments.  Grey ash band.	▨	
	B	GS	TP3/0.2-0.3	7.9	0.20	<b>FILL</b> Ash and coal. Black and with some grey ash. coke includes black and white coke.		▨	
	B	GS	TP3/0.4-0.6	7.7	0.40	<b>FILL</b> Ash. Fine grey powdery ash band.		▨	
	B	GS	TP3/0.8-0.9	3.4	0.70	<b>CLAY</b> CH - moderate plasticity clay. Stiff. Red and grey mottling with iron cementation along fracture plains.		▨	
					1.50	Test pit terminated at 1.5m at designated depth.			3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

**TEST PIT No.: TP4**

Page: 1 of 1

CLIENT: Rail Corporation NSW

JOB No.: 21/14037

COMMENCED: 17 August 2005

PROJECT: Macdonaldtown Triangle Delineation Sampling

COMPLETED: 17 August 2005

LOCATION: Burren Street, Erskinville, NSW

LOGGED BY: A. Barwick

CONTRACTOR: Bill Paul Excavations

EQUIPMENT: Backhoe

CHECKED BY: L. Clements









VERTICAL DATUM: AHD - RL20.21

HORIZONTAL DATUM: MGA

TOTAL DEPTH (m): 2.0

X-COORDINATE: 332300.36

Y-COORDINATE: 6247747.30

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0					0.00	Ground Surface			0
	B	GS	TP4/0.1-0.2	3.5		<b>FILL</b> Sandy gravel. Coarse grained, brown to black. Gravel comprises rail ballast up to 100mm.	Coke, coal and ash, black and white.		
	B	GS	TP4/0.3-0.4	3.6	0.30	<b>FILL</b> Ash and coal. Black. Large fragments of coal and coke up to 150mm. Thin(50mm) grey ash band at base of unit.	Grey ash band for 50mm.		
					0.50	<b>FILL</b> Clay, moderate plasticity clay. Stiff. Orange to brown.	@0.6m Pipe located (100mm diameter).		
1	B	GS	TP4/1.0-1.2	7.7					1
	B	GS	TP4/PIPE	12.4			@1.2m Pipe located (100mm) containing a wet black residue. No odour or indication of contamination. Sample collected.		
	B	GS	TP4/1.5-1.7	99.3					
2					2.00	Test pit terminated at 2.0m at designated depth.			2
3									3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

**TEST PIT No.: TP5**

Page: 1 of 1

CLIENT: Rail Corporation NSW

JOB No.: 21/14037

COMMENCED: 17 August 2005

PROJECT: Macdonaldtown Triangle Delineation Sampling

COMPLETED: 17 August 2005

LOCATION: Burren Street, Erskinville, NSW

LOGGED BY: A. Barwick

CONTRACTOR: Bill Paul Excavations

EQUIPMENT: Backhoe

CHECKED BY: L. Clements

VERTICAL DATUM: AHD - RL20.28

HORIZONTAL DATUM: MGA

TOTAL DEPTH (m): 1.6

X-COORDINATE: 332295.42

Y-COORDINATE: 6247745.92

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0	B	GS	TP5/0.0-0.1	8.3	0.00	Ground Surface <b>FILL</b> Sandy gravel. Coarse grained, brown to black. Gravel comprises rail ballast up to 100mm. Grass and rootlets at surface.	Coke, coal and ash, black and white.  @0.6m Pipe located (100mm diameter).		0
	B	GS	TP5/0.4-0.5	28.5	0.40	<b>FILL</b> Ash, coal and coke. Powdery grey ash mixed up with coke.			0.60
	B	GS	TP5/1.3-1.5	31.7	0.60	<b>FILL</b> Clay, moderate plasticity clay. Stiff. Orange to brown			1.60
					1.60	Test pit terminated at 1.6m at designated depth.			3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

**TEST PIT No.: TP6**

Page: 1 of 1

CLIENT: Rail Corporation NSW

JOB No.: 21/14037

COMMENCED: 17 August 2005

PROJECT: Macdonaldtown Triangle Delineation Sampling

COMPLETED: 17 August 2005

LOCATION: Burren Street, Erskinville, NSW

LOGGED BY: A. Barwick

CONTRACTOR: Bill Paul Excavations

EQUIPMENT: Backhoe

CHECKED BY: L. Clements

VERTICAL DATUM: AHD - RL20.23

HORIZONTAL DATUM: MGA

TOTAL DEPTH (m): 1.5

X-COORDINATE: 332291.04

Y-COORDINATE: 6247742.71

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0					0.00	Ground Surface			0
	B	GS	TP6/0.1-0.3	6.5	0.00	<b>FILL</b> Sandy gravel. Coarse grained, brown to black. Gravel comprises rail ballast up to 100mm. Grass and rootlets at surface. Some orange/grey stiff backfill clay mixed in.			
	B	GS	TP6/0.7-0.8	60.2	0.40	<b>FILL</b> Clay and ash. Clay is mod plasticity, red/orange/grey. Ash is fine, grey and powdery mixed up with backfill clays and coke / coal material.	@0.7m 3xPipes located (1200mm diameter).		
	B	GS	TP6/1.3-1.5	24.2	24.2		Another pipe located at 1.5m.		
					1.50	Pit terminated at 1.5m refusal on cast iron pipe.			3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

TEST PIT No.: TP7

Page: 1 of 1

CLIENT: Rail Corporation NSW

JOB No.: 21/14037

COMMENCED: 17 August 2005

PROJECT: Macdonaldtown Triangle Delineation Sampling

COMPLETED: 17 August 2005

LOCATION: Burren Street, Erskinville, NSW

LOGGED BY: A. Barwick

CONTRACTOR: Bill Paul Excavations

EQUIPMENT: Backhoe

CHECKED BY: L. Clements

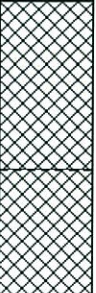
VERTICAL DATUM: AHD - RL20.14

HORIZONTAL DATUM: MGA

TOTAL DEPTH (m): 0.7

X-COORDINATE: 332303.62

Y-COORDINATE: 6247751.97

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0					0.00	Ground Surface			0
	B	GS	TP7/0.1-0.2	42.1		<b>FILL</b> Sandy gravel. Sand is medium grained, brown to black. Gravel comprises rail ballast up to 150mm. Grass and rootlets at surface. Some orange/grey stiff backfill clay mixed in.	Full size bricks and large (>100mm) fragments of concrete.		
	B	GS	0.4-0.6 DUP2 ASB1	20.9	0.40	<b>FILL</b> Gravel, clay and ash. Clay is mod plasticity, red/grey. Ash is fine, grey and powdery mixed up with 10mm size fragments of coal. Gravel is rail ballast.			
					0.70	<b>Pit terminated at 0.7m at refusal on brick walls.</b>	@0.6m several (5) fragments of fibre cement sheeting potentially containing asbestos observed in pit. Fragments from 20-70mm across. Found loosley distributed in coke / coal backfill material.		
1							Sample ASB1 collected for asbestos analysis.		1
2							Duplicate DUP2 also collected.		2
3									3

Method

B = Backhoe

E = Excavator

Sample Type GS

GS = Grab Sample

S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level

PID = Photionisation Detector



# SOIL TEST PIT LOG

**TEST PIT No.: TP8**

Page: 1 of 1

CLIENT: Rail Corporation NSW

JOB No.: 21/14037

COMMENCED: 17 August 2005

PROJECT: Macdonaldtown Triangle Delineation Sampling

COMPLETED: 17 August 2005

LOCATION: Burren Street, Erskinville, NSW

LOGGED BY: A. Barwick

CONTRACTOR: Bill Paul Excavations

EQUIPMENT: Backhoe

CHECKED BY: L. Clements


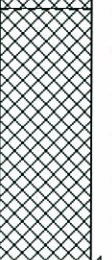
VERTICAL DATUM: AHD - RL20.16

HORIZONTAL DATUM: MGA

TOTAL DEPTH (m): 1.0

X-COORDINATE: 332309.33

Y-COORDINATE: 6247753.58

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0						Ground Surface			0
	B	GS	TP8/0.1-0.3	3.1	0.00	<b>FILL</b> Sandy gravel. Sand is medium grained, brown to black. Gravel comprise rail ballast up to 150mm. Grass and rootlets at surface.			
	B	GS	TP8/0.4-0.6; DUP3	68.7	0.40	<b>FILL</b> Ash and sandy gravel. Ash is mainly black with small (2-10mm) fragments of coal mixed in. No definitive horizons observed. Base of layer not found.	Copper cables and pipes at 0.4m  Thick layer of black ash and coal located between walls - used as backfill between and parallel to the walls.		
1					1.00	Pit terminated at 1.0m at refusal on brick walls.			1
2									2
3									3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

TEST PIT No.: TP9

Page: 1 of 1

CLIENT: Rail Corporation NSW	JOB No.: 21/14037	COMMENCED: 17 August 2005
PROJECT: Macdonaldtown Triangle Delineation Sampling		COMPLETED: 17 August 2005
LOCATION: Burren Street, Erskinville, NSW		LOGGED BY: A. Barwick
CONTRACTOR: Bill Paul Excavations	EQUIPMENT: Backhoe	CHECKED BY: L. Clements
VERTICAL DATUM: AHD - RL20.15	HORIZONTAL DATUM: MGA	TOTAL DEPTH (m): 2.0
X-COORDINATE: 332298.76	Y-COORDINATE: 6247757.00	

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0					0.00	Ground Surface			0
	B	GS	TP9/0.1-0.3	2.6		<b>FILL</b> Sandy gravel. Sand is medium grained, brown to black. Gravel comprises rail ballast up to 150mm. Some concrete in fill.		[Cross-hatched pattern]	
					0.60	<b>FILL</b> Clay. Mod plasticity. firm. Orange. .		[Cross-hatched pattern]	
	B	GS	TP9/0.7-0.9	4.0				[Cross-hatched pattern]	
					1.00	<b>CONCRETE</b> Concrete slab 100mm thick.		[Dotted pattern]	
					1.10	<b>FILL</b> Clay. Mod plasticity. soft, Brown.		[Cross-hatched pattern]	
	B	GS	TP9/1.6-1.8	30.9				[Cross-hatched pattern]	
2					2.00	Pit terminated at 2.0m at designated depth.		[Cross-hatched pattern]	2
3									3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

TEST PIT No.: TP10

Page: 1 of 1

CLIENT: Rail Corporation NSW

JOB No.: 21/14037

COMMENCED: 17 August 2005

PROJECT: Macdonaldtown Triangle Delineation Sampling

COMPLETED: 17 August 2005

LOCATION: Burren Street, Erskinville, NSW

LOGGED BY: A. Barwick

CONTRACTOR: Bill Paul Excavations

EQUIPMENT: Backhoe

CHECKED BY: L. Clements

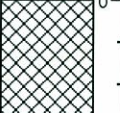


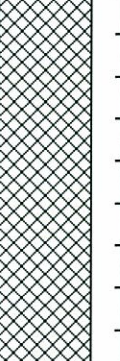
VERTICAL DATUM: AHD - RL20.14

HORIZONTAL DATUM: MGA

TOTAL DEPTH (m): 2.0

X-COORDINATE: 332300.08

Y-COORDINATE: 6247752.78

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0						Ground Surface			0
	B	GS	TP10/0.1-0.3	3.1	0.00	<b>FILL</b> Sandy gravel. Sand is medium grained, brown to black. Gravel comprises rail ballast up to 150mm. Some concrete in fill.			
	B	GS	TP10/0.7-0.9	4.4	0.60	<b>FILL</b> Clay. Mod plasticity. firm. Orange.			
1					1.00	<b>CONCRETE</b> Concrete slab 100mm thick.			1
	B	GS	TP10/1.6-1.8	36.7	1.10	<b>FILL</b> Clay. Mod plasticity. soft, Brown.			
2					2.00	Pit terminated at 2.0m at designated depth.			2
3									3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



# SOIL TEST PIT LOG

TEST PIT No.: TP11

Page: 1 of 1

CLIENT: Rail Corporation NSW

JOB No.: 21/14037

COMMENCED: 17 August 2005

PROJECT: Macdonaldtown Triangle Delineation Sampling

COMPLETED: 17 August 2005

LOCATION: Burren Street, Erskinvill, NSW

LOGGED BY: A. Barwick

CONTRACTOR: Bill Paul Excavations

EQUIPMENT: Backhoe

CHECKED BY: L. Clements

VERTICAL DATUM: AHD - RL20.21

HORIZONTAL DATUM: MGA

TOTAL DEPTH (m): 1.0

X-COORDINATE: 332315.60

Y-COORDINATE: 6247753.46

Depth (m)	Method	Sample Type	Sample Number	PID	Depth/Elevation (m)	DESCRIPTION USCS Soil Group Symbol, colour, soil types, particle characteristics or plasticity, colour, secondary and minor components, moisture content, consistency, structure, geological origin.	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Graphic Log	Depth (m)
0					0.00	Ground Surface			0
	B	GS	TP11/0.1-0.3	2.7	0.00	<b>FILL</b> Sandy gravel. Sand is medium grained, brown to black. Gravel comprise rail ballast up to 150mm.	Large amount of construction rubble - concrete, steel, plastics, hessian bags, coke, coal and ash all found as backfill between and around brick walls.		
	B	GS	TP11/0.5-0.6	10.7	0.50	<b>FILL</b> Ash and sandy gravel. Black. Ash, coke, and coal mixed in with sand.			1
					1.00	Pit terminated at 1.0m on concrete slab.			3

Method  
B = Backhoe  
E = Excavator

Sample Type GS  
GS = Grab Sample  
S = Sample collected by scraping jar along side of test pit

SWL = Standing Water Level  
PID = Photionisation Detector



Appendix B  
Calibration Certificates

# ENVIROEQUIP RENTALS

*Your Friend in the Field*



## EQUIPMENT CERTIFICATION REPORT

RAE SYSTEMS MINIRAE 2000 PID

This PID has been performance checked / calibrated as follows:

- |                                     |                                |   |
|-------------------------------------|--------------------------------|---|
| <input checked="" type="checkbox"/> | Calibrate 0.0 ppm              | Reading <u>0.0</u> ppm                                |
| <input checked="" type="checkbox"/> | Calibrate 93.4 ppm Isobutylene | Reading <u>94.5</u> ppm                               |
| <input checked="" type="checkbox"/> | Charged                        | <input checked="" type="checkbox"/> Lamp Check 10.6eV |
| <input checked="" type="checkbox"/> | Filter Check                   |   |

Date:

12/8/5

Checked by:

[Signature]

Signature:

[Signature]

Please check that the following items are received and all items are returned. Please clean equipment before returning. A \$20 service/repair charge applies to any unclean or damaged items.

<u>Sent</u>	<u>Received</u>	<u>Returned</u>	<u>Description</u>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MiniRae 2000 PID
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Protective Yellow Rubber Boot
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Inlet Probe (Attached to PID).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Charger 240 V to 12V, 500mA
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adapter for Charger
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Instruction Manual
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Quick Reference Guide
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Water Trap Filter
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Carry case
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Spare Water Trap Filter
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Alkaline Battery Adapter
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regulator and Tubing (Optional)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

QUOTE NO.: \_\_\_\_\_

ID: PIDMINSY

SERIAL NO: 110-00 \_\_\_\_\_

ENVIROEQUIP Rentals & Sales Pty Ltd  
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Chatswood NSW 2067

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## Appendix C

# Laboratory Reports and Chain of Custody Documentation



## Envirolab Services Pty Ltd

ABN 37 112 535 645

54 Frenchs Rd Willoughby NSW 2068

ph 02 9958 5801 fax 02 9958 5803

email: tnotaras@envirolabservices.com.au

### CERTIFICATE OF ANALYSIS

**Client:**

**GHD**

57 Herbert St

Artarmon

NSW 2064

**Attention:** Andrew Barwick

**Sample log in details:**

Envirolab Reference:	05/1926
Your Reference:	2114037, MacDonalddtown
No. of samples:	39 Soils, 2 Waters
Date samples received:	18/08/05
Date completed instructions received:	18/08/05

**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 are reported on a dry weight basis for soils and on an as received basis for other matrices.

*TPH in soil: # Percent recovery not available due to significant background levels of analyte in the sample.*

*This report differs from the one issued on 25/8/05 for BTEX for samples Tripsike and Tripblank - these were incorrectly labelled.*

**Report Details:**

Date results requested by: 25/08/05

Date of Preliminary Report: 23/08/05

Date of Final Report: 12/09/05

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This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Tests not covered by NATA are denoted with \*.

INS: Insufficient sample for this test

NT: Not tested

NR: Not requested

PQL: Practical Quantitation level

<: Less than

>: Greater than

LCS: Laboratory Control Sample

Tania Notaras  
Manager



ACCREDITED FOR  
**TECHNICAL  
COMPETENCE**

This report supersedes the previous with the same Reference no.

vTPH & BTEX in Soil	UNITS	05/1926-1	05/1926-2	05/1926-5	05/1926-6	05/1926-7
Our Reference:	-----	TP1	TP1	TP2	TP2	TP2
Your Reference	-----	TP1	TP1	TP2	TP2	TP2
Depth	-----	0.1-0.3	0.5-0.6	0.0-0.2	0.4-0.5	0.8-1.0
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	19/8/05	19/8/05	19/8/05	19/8/05	19/8/05
Date analysed	--	22/8/05	22/8/05	22/8/05	22/8/05	22/8/05
vTPH C <sub>6</sub> - C <sub>9</sub>	mg/kg	<25	<25	[NA]	[NA]	[NA]
Benzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
m + p-Xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate chlorobenzene-d5	%	75	84	74	87	67

vTPH & BTEX in Soil	UNITS	05/1926-10	05/1926-11	05/1926-12	05/1926-13	05/1926-14
Our Reference:	-----	TP3	TP3	TP3	TP4	TP4
Your Reference	-----	TP3	TP3	TP3	TP4	TP4
Depth	-----	0.2-0.3	0.4-0.6	0.8-0.9	0.1-0.2	0.3-0.4
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	19/8/05	19/8/05	19/8/05	19/8/05	19/8/05
Date analysed	--	22/8/05	22/8/05	22/8/05	22/8/05	22/8/05
vTPH C <sub>6</sub> - C <sub>9</sub>	mg/kg	150	<25	[NA]	[NA]	<25
Benzene	mg/kg	3.2	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	10	1.6	<1.0	<1.0	2.4
Ethylbenzene	mg/kg	2.8	<1.0	<1.0	<1.0	1.3
m + p-Xylene	mg/kg	150	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	29	<1.0	<1.0	<1.0	1.0
Surrogate chlorobenzene-d5	%	74	67	79	83	88

vTPH & BTEX in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- -----	05/1926-17 TP4 - Pipe - 17/08/05 Soil	05/1926-19 TP5 0.4-0.5 17/08/05 Soil	05/1926-22 TP6 0.7-0.8 17/08/05 Soil	05/1926-23 TP6 1.3-1.5 17/08/05 Soil	05/1926-24 TP7 0.1-0.2 17/08/05 Soil
Date extracted	--	19/8/05	19/8/05	19/8/05	19/8/05	19/8/05
Date analysed	--	22/8/05	22/8/05	22/8/05	22/8/05	22/8/05
Benzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	<1.0	1.4	<1.0	<1.0	<1.0
Ethylbenzene	mg/kg	<1.0	1.0	<1.0	<1.0	<1.0
m + p-Xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate chlorobenzene-d5	%	86	88	84	88	80

vTPH & BTEX in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- -----	05/1926-25 TP7 0.4-0.6 17/08/05 Soil	05/1926-28 TP8 0.4-0.6 17/08/05 Soil	05/1926-30 TP9 0.7-0.9 17/08/05 Soil	05/1926-32 TP10 0.1-0.3 17/08/05 Soil	05/1926-34 TP10 1.6-1.8 17/08/05 Soil
Date extracted	--	19/8/05	19/8/05	19/8/05	19/8/05	19/8/05
Date analysed	--	22/8/05	22/8/05	22/8/05	22/8/05	22/8/05
Benzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
m + p-Xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate chlorobenzene-d5	%	81	84	79	83	80

vTPH & BTEX in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- -----	05/1926-36 TP11 0.5-0.6 17/08/05 Soil	05/1926-37 DUP 1 - 17/08/05 Soil	05/1926-38 DUP 2 - 17/08/05 Soil	05/1926-39 DUP 3 - 17/08/05 Soil
Date extracted	--	19/8/05	19/8/05	19/8/05	19/8/05
Date analysed	--	22/8/05	22/8/05	22/8/05	22/8/05
vTPH C6 - C9	mg/kg	[NA]	<25	[NA]	[NA]
Benzene	mg/kg	<1.0	<1.0	<1.0	<1.0
Toluene	mg/kg	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0
m + p-Xylene	mg/kg	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0
Surrogate chlorobenzene-d5	%	86	82	80	75

sTPH in Soil (C10-C36)		05/1926-1	05/1926-2	05/1926-10	05/1926-11	05/1926-37
Our Reference:	UNITS	TP1	TP1	TP3	TP3	DUP 1
Your Reference	-----					
Depth	-----	0.1-0.3	0.5-0.6	0.2-0.3	0.4-0.6	-
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	19/08/2005	19/08/2005	19/08/2005	19/08/2005	19/08/2005
Date analysed	--	20/08/2005	20/08/2005	20/08/2005	20/08/2005	20/08/2005
TPH C10 - C14	mg/kg	190	<50	130	<50	210
TPH C15 - C28	mg/kg	6,200	<100	760	<100	12,000
TPH C29 - C36	mg/kg	3,000	<100	210	<100	6,300
Surrogate	%	#	106	#	104	#

PAHs in Soil		05/1926-1	05/1926-2	05/1926-10	05/1926-11	05/1926-37
Our Reference:	UNITS	TP1	TP1	TP3	TP3	DUP 1
Your Reference	-----					
Depth	-----	0.1-0.3	0.5-0.6	0.2-0.3	0.4-0.6	-
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	--	19/08/2005	19/08/2005	19/08/2005	19/08/2005	19/08/2005
Date analysed	--	20/08/0085	20/08/0085	20/08/0085	20/08/0085	20/08/0085
Naphthalene	mg/kg	16	0.30	2.0	0.20	17
Acenaphthylene	mg/kg	29	0.20	<0.10	0.20	44
Acenaphthene	mg/kg	2.3	<0.10	<0.10	<0.10	2.9
Fluorene	mg/kg	12	<0.10	<0.10	<0.10	17
Phenanthrene	mg/kg	150	1.4	1.2	0.30	280
Anthracene	mg/kg	24	0.40	0.20	<0.10	45
Fluoranthene	mg/kg	140	2.2	1.2	0.40	300
Pyrene	mg/kg	160	3.3	1.9	0.60	340
Benzo(a)anthracene	mg/kg	80	1.5	1.5	0.30	190
Chrysene	mg/kg	77	1.5	1.5	0.30	180
Benzo(b,k)fluoranthene	mg/kg	97	1.9	2.0	0.70	230
Benzo(a)pyrene	mg/kg	67	1.3	1.4	0.40	170
Indeno(1,2,3-c,d)pyrene	mg/kg	20	0.70	0.60	0.40	27
Dibenzo(a,h)anthracene	mg/kg	5.8	0.20	0.20	<0.10	3.2
Benzo(g,h,i)perylene	mg/kg	18	0.70	0.60	0.50	21
Surrogate p-Terphenyl	%	116	115	104	114	102

Acid Extractable metals in soil		05/1926-1	05/1926-2	05/1926-10	05/1926-11	05/1926-37
Our Reference:	UNITS	TP1	TP1	TP3	TP3	DUP 1
Your Reference	-----					
Depth	-----	0.1-0.3	0.5-0.6	0.2-0.3	0.4-0.6	-
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Arsenic	mg/kg	9.0	9.0	<4.0	<4.0	20
Cadmium	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	mg/kg	5.3	5.3	1.6	6.2	7.5
Copper	mg/kg	130	81	62	43	160
Lead	mg/kg	230	100	66	120	260
Mercury	mg/kg	0.17	<0.10	<0.10	<0.10	0.19
Nickel	mg/kg	18	16	15	22	16
Zinc	mg/kg	170	350	120	410	270

Moisture						
Our Reference:	UNITS	05/1926-1	05/1926-2	05/1926-5	05/1926-6	05/1926-7
Your Reference	-----	TP1	TP1	TP2	TP2	TP2
Depth	-----	0.1-0.3	0.5-0.6	0.0-0.2	0.4-0.5	0.8-1.0
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Moisture	%	13	5.5	12	8.0	13

Moisture						
Our Reference:	UNITS	05/1926-10	05/1926-11	05/1926-13	05/1926-14	05/1926-17
Your Reference	-----	TP3	TP3	TP4	TP4	TP4 - Pipe
Depth	-----	0.2-0.3	0.4-0.6	0.1-0.2	0.3-0.4	-
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Moisture	%	19	18	4.0	10	38

Moisture						
Our Reference:	UNITS	05/1926-19	05/1926-22	05/1926-23	05/1926-24	05/1926-25
Your Reference	-----	TP5	TP6	TP6	TP7	TP7
Depth	-----	0.4-0.5	0.7-0.8	1.3-1.5	0.1-0.2	0.4-0.6
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Moisture	%	12	10	23	9.3	8.7

Moisture						
Our Reference:	UNITS	05/1926-28	05/1926-30	05/1926-32	05/1926-34	05/1926-36
Your Reference	-----	TP8	TP9	TP10	TP10	TP11
Depth	-----	0.4-0.6	0.7-0.9	0.1-0.3	1.6-1.8	0.5-0.6
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil	Soil
Moisture	%	16	24	7.6	27	11

Moisture				
Our Reference:	UNITS	05/1926-37	05/1926-38	05/1926-39
Your Reference	-----	DUP 1	DUP 2	DUP 3
Depth	-----	-	-	-
Date Sampled		17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil
Moisture	%	8.5	8.0	14

Asbestos Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ----- -----	05/1926-25 TP7 0.4-0.6 17/08/05 Soil	05/1926-26 TP7 Asb-1 - 17/08/05 Soil
Sample Description		20g sand & rocks	50x50x5m m fibre cement sheet
Asbestos ID in materials		[NA]	Chrysotile asbestos detected
Asbestos ID in soil		No asbestos detected	[NA]

vTPH & BTEX in Water	UNITS	05/1926-40	05/1926-41
Our Reference:	-----	Tripspike	Tripblank
Your Reference	-----	-	-
Depth			
Date Sampled		17/08/05	17/08/05
Type of sample		Water	Water
Date extracted	--	24/08/2005	24/08/2005
Date analysed	--	24/08/2005	24/08/2005
Benzene	µg/L	90%	<1.0
Toluene	µg/L	81%	<1.0
Ethylbenzene	µg/L	87%	<1.0
m+p-xylene	µg/L	81%	<2.0
o-xylene	µg/L	83%	<1.0
Surrogate chlorobenzene-d5	%	118	103

Method ID	Methodology Summary
GC.16	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.
GC.14	Soil samples extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
GC.3	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
GC.12	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Metals.20	Determination of various metals by ICP-AES.
Metals.21	Determination of Mercury by Cold Vapour AAS.
LAB.8	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.
ASB.1	Qualitative identification of asbestos type fibres in bulk using Polarised Light Microscopy and Dispersion Staining Techniques. Accreditation does not cover the identification of Synthetic Mineral Fibre.
GC.13	Water samples are analysed directly by purge and trap GC-MS.

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
vTPH & BTEX in Soil						Base + Duplicate + %RPD		
vTPH C6 - C9	mg/kg	25	GC.16	<25	05/1926-1 1	<25    <25	05/1926-1 2	107%
Benzene	mg/kg	1	GC.14	<1.0	05/1926-1 1	<1.0    <1.0	05/1926-1 2	101%
Toluene	mg/kg	1	GC.14	<1.0	05/1926-1 1	1.6    1.6    RPD: 0	05/1926-1 2	124%
Ethylbenzene	mg/kg	1	GC.14	<1.0	05/1926-1 1	<1.0    <1.0	05/1926-1 2	96%
m + p-Xylene	mg/kg	2	GC.14	<2.0	05/1926-1 1	<2.0    <2.0	05/1926-1 2	110%
o-Xylene	mg/kg	1	GC.14	<1.0	05/1926-1 1	<1.0    <1.0	05/1926-1 2	104%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
sTPH in Soil (C10-C36)						Base + Duplicate + %RPD		
TPH C10 - C14	mg/kg	50	GC.3	<50	[NT]	[NT]	Control	64%
TPH C15 - C28	mg/kg	100	GC.3	<100	[NT]	[NT]	Control	62%
TPH C29 - C36	mg/kg	100	GC.3	<100	[NT]	[NT]	Control	66%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
PAHs in Soil						Base + Duplicate + %RPD		
Naphthalene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	126%
Acenaphthylene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	[NT]
Acenaphthene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	[NT]
Fluorene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	127%
Phenanthrene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	128%
Anthracene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	[NT]
Fluoranthene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	128%
Pyrene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	133%
Benzo(a)anthracene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	[NT]
Chrysene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	127%
Benzo(b,k)fluoranthene	mg/kg	0.2	GC.12	<0.20	[NT]	[NT]	Control	[NT]
Benzo(a)pyrene	mg/kg	0.05	GC.12	<0.050	[NT]	[NT]	Control	130%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	GC.12	<0.10	[NT]	[NT]	Control	[NT]

Client Reference: 2114037, MacDonaldtown

Envirolab Reference: 05/1926

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery
Acid Extractable metals in soil								
Arsenic	mg/kg	4	Metals.20	<4.0	[NT]	[NT]	Control	99%
Cadmium	mg/kg	1	Metals.20	<1.0	[NT]	[NT]	Control	96%
Chromium	mg/kg	1	Metals.20	<1.0	[NT]	[NT]	Control	100%
Copper	mg/kg	1	Metals.20	<1.0	[NT]	[NT]	Control	101%
Lead	mg/kg	1	Metals.20	<1.0	[NT]	[NT]	Control	98%
Mercury	mg/kg	0.1	Metals.21	<0.10	[NT]	[NT]	Control	95%
Nickel	mg/kg	1	Metals.20	<1.0	[NT]	[NT]	Control	101%
Zinc	mg/kg	1	Metals.20	<1.0	[NT]	[NT]	Control	100%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery
vTPH & BTEX in Water								
Benzene	µg/L	1	GC.13	<1.0	[NT]	[NT]	Water	118%
Toluene	µg/L	1	GC.13	<1.0	[NT]	[NT]	Water	110%
Ethylbenzene	µg/L	1	GC.13	<1.0	[NT]	[NT]	Water	112%
m+p-xylene	µg/L	2	GC.13	<2.0	[NT]	[NT]	Water	107%
o-xylene	µg/L	1	GC.13	<1.0	[NT]	[NT]	Water	110%
QUALITY CONTROL	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery			
vTPH & BTEX in Soil								
vTPH C6 - C5	mg/kg	[NT]	[NT]	Control	78%			
Benzene	mg/kg	05/1926-28	<1.0    <1.0	Control	89%			
Toluene	mg/kg	05/1926-28	<1.0    <1.0	Control	103%			
Ethylbenzene	mg/kg	05/1926-28	<1.0    <1.0	Control	83%			
m + p-Xylene	mg/kg	05/1926-28	<2.0    <2.0	Control	97%			
o-Xylene	mg/kg	05/1926-28	<1.0    <1.0	Control	93%			

This report supersedes the previous with the same Reference no.



## **Envirolab Services Pty Ltd**

ABN 37 112 535 645

54 Frenchs Rd Willoughby NSW 2068

ph 02 9958 5801 fax 02 9958 5803

email: tnotaras@envirolabservices.com.au

### **SAMPLE RECEIPT ADVICE**

**Client:**

GHD  
57 Herbert St  
Artarmon NSW 2727

ph: 9462 4700  
Fax: 9462 4710

Attention: Andrew Barwick

**Sample log in details:**

Your reference:	2114037, MacDonalddtown
Envirolab Reference:	05/1926
Date received:	18/08/05
Date results expected to be reported:	25/08/05

Samples received in appropriate condition for analysis:	YES
Turnaround time requested:	Standard
Temperature on receipt:	Cool
Cooling Method:	Ice
Completed documentation received:	YES

**Comments:**

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

**Contact details:**

Please direct any queries to Tania Notaras  
ph: 02 9958 5801 fax: 02 9958 5803  
email: tnotaras@envirolabservices.com.au



# CHAIN OF CUSTODY AND ANALYSIS REQUEST FORM

GHD Pty Ltd 57 Herbert Street, Alexandria NSW 2127 Australia, Locked Bag 2727 St Leonards NSW 1580 Telephone: (02) 9462 4700 Fax: (02) 9462 4710 ABN 39 006 486 373

Project No. 2114037 Phone No. 02 9462 4012  
 Project Name No. 6 Donoldtown Fax No. 02 9462 4710  
 Project Manager Andrew Barwick

Sent to Lab: EnviroLab Date Required: 25-8-05  
 Address: [Redacted] Date Submitted: 18-8-05  
 Attention: David Spryngel Page 1 of 4

SAMPLE No.	Date Sampled	No. of Containers	Container Type/Size	MATRIX			PRESERVATION			ANALYSIS REQUIRED	TCLP	COMMENTS
				Water	Soil	Other	Cool	Acid	Other			
1	17/8/05	1	250ml jar									
2	0.5-0.6											
3	0.8-0.9											
4	1.6-1.8											
5	TP2 0.0-0.2											
6	0.4-0.5											
7	0.8-1.0											
8	1.3-1.5											
9	TP3 0.0-0.1											
10	0.2-0.3											
11	0.4-0.6											
12	0.8-0.9											

EnviroLab Services

Date Received: 18/8  
 Received By: [Signature]  
 Job No. 1920

RELINQUISHED BY			RECEIVED BY		
Name	Organisation	Date	Name	Organisation	Date
<u>A. Barwick</u>	<u>GHD</u>	<u>18/8/05</u>	<u>[Signature]</u>	<u>ELS</u>	<u>18/8/05</u>

It is the responsibility of the receiver to verify that the number of samples and their identifying samples numbers correspond to those listed on this form

PLEASE FAXED COMPLETED FORM TO GHD PROJECT MANAGER ON RECEIPT (02) 9462 4710

FILE REF.: C:\Documents and Settings\GHD Admin\Templates\Chain of Custody.xls Page 1

All TCLP on hold until solid results released



**CHAIN OF CUSTODY AND ANALYSIS REQUEST FORM**

GHD Pty Ltd 57 Herbert Street Artarmon NSW 2727 Australia, Locked Bag 2727 St Leonards NSW 1590 Telephone: (02) 9462 4700 Fax: (02) 9462 4710 ABN 98 008 495 375

Project No. 2114037 Phone No. 02 9462 4812  
 Project Name Macedonaldhwa Fax No. 02 9462 4710  
 Project Manager Andrew Barwick

Sent to Lab: ENVIRO Lab Date Required: 25-8-05  
 Address: [Redacted] Date Submitted: 18-8-05  
 Attention: David Spryger Page 2 of 4

SAMPLE NO.	Date Sampled	No. of Containers	Container Type/Size	MATRIX			PRESERVATION			ANALYSIS REQUIRED	COMMENTS
				Water	Soil	Agit	Chill	Agit	Other		
TP4 0.1-0.2	17/8/05	1	250ml JAR							TEL →	
" 0.3-0.4									✓		
" 1.0-1.2									✓		
" 1.5-1.7									✓		
TP4 - PIPE									✓		
TP5 0.0-0.1									✓		
" 0.4-0.5									✓		
" 1.3-1.5									✓		
TP6 0.1-0.3									✓		
0.7-0.8									✓		
1.3-1.5									✓		

**RELINQUISHED BY**  
 Andrew Barwick (Signature) Organisation: GHD Date: 18/8/05 Time: 9:00  
 David Spryger (Signature) Organisation: GCS Date: 18/8/05 Time: 12:00

**RECEIVED BY**  
 Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Signed: \_\_\_\_\_  
 Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Signed: \_\_\_\_\_

It is the responsibility of the receiver to verify that the number of samples and their identifying samples numbers correspond to those listed on this form  
 PLEASE FAXED COMPLETED FORM TO GHD PROJECT MANAGER ON RECEIPT (02) 9462 4710  
 FILE REF: C:\Documents and Settings\GHD\My Documents\GHD Artarmon Templates\GHD Chain of Custody.xls Page 1



# CHAIN OF CUSTODY AND ANALYSIS REQUEST FORM

AGN 39 008 488 372

Telephone: (02) 9462 4700

Phone No. 02 9402 4612

Fax No. 02 9462 4710

Project No. 2114037

Fax: (02) 9462 4710

Sent to Lab: ANU

Address: ANU

Phone: ANU

Fax: ANU

Project Name: Macedonold town

Project Manager: Andrew Barwick

Phone No. 02 9402 4612

Fax No. 02 9462 4710

Project No. 2114037

Date Required: 25-8-05  
Date Submitted: 18-8-05  
Page 3 of 4

Attention: David Spryges

Phone: ANU

Fax: ANU

Project Name: Macedonold town

Project Manager: Andrew Barwick

Phone No. 02 9402 4612

Fax No. 02 9462 4710

Project No. 2114037

SAMPLE No.	Date Sampled	No. of Containers	Container Type (Size)	MATRIX			PRESERVATION			ANALYSIS REQUIRED	COMMENTS
				Water	Soil	Chill	Acid	Other			
24 TP7 0.1-0.2	17/8 05 TP	2	200 ml JAR						✓		
25 " 0.4-0.6			BA						✓		
26 " ASB-1			AS						✓		
27 TP8 0.1-0.3			TP						✓		
28 " 0.4-0.6			BA						✓		
29 TP9 0.1-0.3			TP						✓		
30 " 0.7-0.9			CL						✓		
31 " 1.6-1.8			CL						✓		
32 TP10 0.1-0.3			TP						✓		
33 " 0.7-0.9			CL						✓		
34 " 1.6-1.8			CL						✓		

RELINQUISHED BY				RECEIVED BY			
Name	Organisation	Date	Time	Name	Organisation	Date	Time
A Barwick	GHD	18/8	9.00	David Spryges	ANU	18/8	05.00
RELINQUISHED BY				RECEIVED BY			
Name	Organisation	Date	Time	Name	Organisation	Date	Time

It is the responsibility of the receiver to verify that the number of samples and their identifying samples numbers correspond to those listed on this form

PLEASE FAXED COMPLETED FORM TO GHD PROJECT MANAGER ON RECEIPT (02) 9462 4710

FILE REF: C:\Documents and Settings\GHDMy Documents\GHD Arlton\Templates\GHD Chain of Custody.xls Page 1



**CHAIN OF CUSTODY AND ANALYSIS REQUEST FORM**

GHD Pty Ltd, 57 Herbert Street, Artarmon, NSW 2777 Australia, Locked Bag 7727 St Leonards NSW 1580  
 Telephone: (02) 9462 4700 Fax: (02) 9462 4710  
 Sent to Lab: EAU/NO Lab Date Required: 25-8-05  
 Address: [Redacted] Date Submitted: 18-8-05  
 Attention: David Spry Page 4 of 4  
 Phone: TEL: [Redacted] ANALYSIS REQUIRED: GM PAH Benzene COMMENTS: Hold  
 Fax: [Redacted]

Project No. 2114037 Phone No. 02 9462 4812  
 Project Name Macdonaldtown Fax No. 02 9462 4710  
 Project Manager Andrew Barwick

SAMPLE No.	Date Sampled	No. of Containers	Container Type / Size	MATRIX			PRESERVATION			ANALYSIS REQUIRED	COMMENTS
				Water	Soil	Other	Chill	Acid	Other		
35 TP11 0.1-0.3	17/8/05	1	250ml JAR								
36 11 0.5-0.6			BA								
37 DUP1 1.0.1											
38 DUP2 1.0.4											
39 DUP3 1.0.4											
40 Trip Spike		2	40ml vial								
41 Trip Blank		2	" "								

RELINQUISHED BY				RECEIVED BY			
Name	Organisation	Date	Time	Name	Organisation	Date	Time
<u>A Barwick</u>	<u>GHD</u>	<u>18/8</u>	<u>9.00</u>	<u>[Signature]</u>	<u>ECS</u>	<u>18/8</u>	<u>12.00</u>
RELINQUISHED BY				RECEIVED BY			
Name	Organisation	Date	Time	Name	Organisation	Date	Time

It is the responsibility of the receiver to verify that the number of samples and their identifying samples numbers correspond to those listed on this form  
 PLEASE FAXED COMPLETED FORM TO GHD PROJECT MANAGER ON RECEIPT (02) 9462 4710  
 FILE REF: C:\Documents and Settings\GHD\My Documents\GHD A\Artemon\Templates\GHD Chain of Custody.xls Page 1



## Envirolab Services Pty Ltd

ABN 37 112 535 645

54 Frenchs Rd Willoughby NSW 2068

ph 02 9958 5801 fax 02 9958 5803

email: tnotaras@envirolabservices.com.au

### CERTIFICATE OF ANALYSIS    05/1926A

**Client:**

**GHD**

57 Herbert St

Artarmon

NSW 2064

**Attention:** Andrew Barwick

**Sample log in details:**

Envirolab Reference:	05/1926A
Your Reference:	2114037, MacDonalddtown
No. of samples:	5 Additional Samples
Date samples received:	18/08/05
Date completed instructions received:	24/08/05

**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 are reported on a dry weight basis for soils and on an as received basis for other matrices.

*Zero headspace extraction and BTEX TCLP analysed by SGS Matraville report number 39615.*

**Report Details:**

Date results requested by: 29/08/05

Date of Preliminary Report: Not Issued

Date of Final Report: 30/08/05

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INS: Insufficient sample for this test

NT: Not tested

NR: Not requested

PQL: Practical Quantitation limit

<: Less than

>: Greater than

LCS: Laboratory Control Sample

Tania Notaras

Manager



ACCREDITED FOR  
**TECHNICAL  
COMPETENCE**

Metals in TCLP extract		05/1926A-1	05/1926A-2	05/1926A-10	05/1926A-11
Our Reference:	UNITS	05/1926A-1	05/1926A-2	05/1926A-10	05/1926A-11
Your Reference	-----	TP1	TP1	TP3	TP3
Depth	-----	0.1-0.3	0.5-0.6	0.2-0.3	0.4-0.6
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil
pH of soil for fluid# determ.	pH units	9.01	8.38	8.70	6.60
pH of soil for fluid # determ. (acid)	pH units	1.93	2.01	1.93	1.97
Extraction fluid used		1	1	1	1
pH of final Leachate	pH units	5.05	5.08	5.06	5.02
Arsenic	mg/L	<0.15	<0.15	<0.15	<0.15
Cadmium	mg/L	<0.020	<0.020	<0.020	<0.020
Chromium	mg/L	<0.020	<0.020	<0.020	<0.020
Copper	mg/L	0.080	<0.030	<0.030	<0.030
Lead	mg/L	0.20	0.050	<0.030	0.070
Mercury	mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Nickel	mg/L	<0.030	0.030	<0.030	0.070
Zinc	mg/L	0.67	3.9	0.80	3.1

PAHs in TCLP (USEPA 1311)		05/1926A-1	05/1926A-2	05/1926A-10	05/1926A-11
Our Reference:	UNITS	TP1	TP1	TP3	TP3
Your Reference	-----				
Depth	-----	0.1-0.3	0.5-0.6	0.2-0.3	0.4-0.6
Date Sampled		17/08/05	17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil	Soil
Date extracted	--	29/08/2005	29/08/2005	29/08/2005	29/08/2005
Date analysed	--	29/08/2005	29/08/2005	29/08/2005	29/08/2005
Naphthalene	µg/L	1.6	<1.0	<1.0	<1.0
Acenaphthylene	µg/L	1.9	<1.0	<1.0	<1.0
Acenaphthene	µg/L	<1.0	<1.0	<1.0	<1.0
Fluorene	µg/L	1.2	<1.0	<1.0	<1.0
Phenanthrene	µg/L	3.6	<1.0	<1.0	<1.0
Anthracene	µg/L	<1.0	<1.0	<1.0	<1.0
Fluoranthene	µg/L	1.5	<1.0	<1.0	<1.0
Pyrene	µg/L	1.5	<1.0	<1.0	<1.0
Benzo(a)anthracene	µg/L	<1.0	<1.0	<1.0	<1.0
Chrysene	µg/L	<1.0	<1.0	<1.0	<1.0
Benzo(b,k)fluoranthene	µg/L	<2.0	<2.0	<2.0	<2.0
Benzo(a)pyrene	µg/L	<1.0	<1.0	<1.0	<1.0
Indeno(1,2,3-c,d)pyrene	µg/L	<1.0	<1.0	<1.0	<1.0
Dibenzo(a,h)anthracene	µg/L	<1.0	<1.0	<1.0	<1.0
Benzo(g,h,i)perylene	µg/L	<1.0	<1.0	<1.0	<1.0
Surrogate p-Terphenyl	%	75	70	70	72

Client Reference: 2114037, MacDonaldtown

Envirolab Reference: 05/1926A

BTEX in Zero Headspace				
Our Reference:	UNITS	05/1926A-10	05/1926A-11	05/1926A-14
Your Reference	-----	TP3	TP3	TP4
Depth	-----	0.2-0.3	0.4-0.6	0.3-0.4
Date Sampled		17/08/05	17/08/05	17/08/05
Type of sample		Soil	Soil	Soil
Benzene	µg/L	15	<1.0	8.0
Toluene	µg/L	13	<1.0	5.0
Ethylbenzene	µg/L	<1.0	<1.0	<1.0
Total Xylenes	µg/L	5.0	<3.0	<3.0

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Metals.20	Determination of various metals by ICP-AES.
Metals.21	Determination of Mercury by Cold Vapour AAS.
GC.12	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
SEO-018	Analysis carried out by SGS Matraville - Determination of BTEX by purge and trap/ Gas Chromatography with MS Detection.

Client Reference: 2114037, MacDonalddtown

Enviroiab Reference: 05/1926A

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
Metals in TCLP extract						Base + Duplicate + %RPD		
Arsenic	mg/L	0.15	Metals.20	<0.15	05/1926A-1	<0.15    <0.15	05/1926A-1	104%
Cadmium	mg/L	0.02	Metals.20	<0.020	05/1926A-1	<0.020    <0.020	05/1926A-1	104%
Chromium	mg/L	0.02	Metals.20	<0.020	05/1926A-1	<0.020    <0.020	05/1926A-1	98%
Copper	mg/L	0.03	Metals.20	<0.030	05/1926A-1	0.080    0.080    RPD: 0	05/1926A-1	101%
Lead	mg/L	0.03	Metals.20	<0.030	05/1926A-1	0.20    0.20    RPD: 0	05/1926A-1	96%
Mercury	mg/L	0.0005	Metals.21	<0.0005	05/1926A-1	<0.0005    <0.0005	05/1926A-1	99%
Nickel	mg/L	0.03	Metals.20	<0.030	05/1926A-1	<0.030    <0.030	05/1926A-1	99%
Zinc	mg/L	0.02	Metals.20	<0.020	05/1926A-1	0.67    0.66    RPD: 2	05/1926A-1	102%
QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
PAHs in TCLP (USEPA 1311)						Base + Duplicate + %RPD		
Naphthalene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	65%
Acenaphthylene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	[NT]
Acenaphthene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	[NT]
Fluorene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	76%
Phenanthrene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	77%
Anthracene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	[NT]
Fluoranthene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	75%
Pyrene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	78%
Benzo(a)anthracene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	[NT]
Chrysene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	74%
Benzo(b,k)fluoranthene	µg/L	2	GC.12	<2.0	[NT]	[NT]	Water	[NT]
Benzo(a)pyrene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	86%
Indeno(1,2,3-c,d)pyrene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	[NT]
Dibenzo(a,h)anthracene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	[NT]
Benzo(g,h,i)perylene	µg/L	1	GC.12	<1.0	[NT]	[NT]	Water	[NT]

Client Reference: 2114037, MacDonalddtown

Envirolab Reference: 05/1926A

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate	Spike Sm#	Matrix Spike % Recovery
BTEX In Zero Headspace						Base + Duplicate + %RPD		
Benzene	µg/L	1	SEO-018	<1.0	[NT]	[NT]	Batch	77%
Toluene	µg/L	1	SEO-018	<1.0	[NT]	[NT]	Batch	87%
Ethylbenzene	µg/L	1	SEO-018	<1.0	[NT]	[NT]	Batch	92%
Total Xylenes	µg/L	3	SEO-018	<3.0	[NT]	[NT]	Batch	94%

