



## **Site Audit Report – UWS South Werrington Sub- Precinct**

Prepared for:  
**University of Western Sydney**

Prepared by:  
**ENVIRON Australia Pty Ltd**

Date:  
**March 2009**

Project Number:  
**AS120943**

Audit Number:  
**MGH 53**

5 March 2009

Our Ref: AS120928

University of Western Sydney  
c/o Fitzwalter Group  
Level 1, 41 McLaren Street

North Sydney NSW 2060

Attention: Robert Walsh

Dear Rob

**Re: Site Audit Report - UWS South Werrington Sub-Precinct**

I have pleasure in submitting the Site Audit Report for the subject site. The Site Audit Statement, produced in accordance with the NSW Contaminated Land Management Act 1997 follows this letter. The Audit was commissioned by University of Western Sydney to assess the suitability of the site for the intended range of uses.

Thank you for giving me the opportunity to conduct this Audit. Please call me on 9954 8119 if you have any questions.

Yours faithfully,  
ENVIRON Australia Pty Ltd



Michael Hayter  
EPA Accredited Site Auditor 0001

# NSW Site Auditor Scheme

## SITE AUDIT STATEMENT



**A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.**

**This form was approved under the Contaminated Land Management Act 1997 on 21 February 2005. For more information about completing this form, go to Part IV.**

### PART I: Site audit identification

**Site audit statement no.** MGH 53

This site audit is a ~~statutory audit~~/non-statutory audit\* within the meaning of the *Contaminated Land Management Act 1997*.

**Site auditor details** (as accredited under the *Contaminated Land Management Act 1997*)

Name: Michael Hayter Company: ENVIRON Australia Pty Ltd

Address: Level 3, 100 Pacific Highway (PO Box 560)

North Sydney NSW

Postcode: 2060

Phone: 02 9954 8100

Fax: 02 9954 8150

#### Site details

Address: UWS Werrington North, Great Western Highway, Werrington, NSW

Postcode: 2747

Property description (*attach a list if several properties are included in the site audit*)

Lot 1 DP 791299

Local Government Area: Penrith Council

Area of site (e.g. hectares): 28 ha

Current zoning: Commercial, Residential, Medium Density Residential, Light Industrial, Environmental Conservations, Open Space.

To the best of my knowledge, the site ~~is~~/is not\* the subject of a declaration, order, agreement or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*.

**Declaration/Order/Agreement/Notice\* no(s):** NA

\* *Strike out as appropriate*

**Site audit commissioned by**

Name: Robert Walsh

Company: Fitzwalter Group on Behalf of  
University of Western Sydney

Address: Level 1, 41 McLaren St, North Sydney NSW

Postcode: 2060

Phone: 8925 6760

Fax: 8929 6798

Name and phone number of contact person (if different from above)

NA

**Purpose of site audit**

- ☒ A. To determine land use suitability (*please specify intended use[s]*)

*Residential, commercial, environment protection, open space*

**OR**

☐ ~~B(i) To determine the nature and extent of contamination, and/or~~

☐ ~~B(ii) To determine the appropriateness of an **investigation/remedial  
action/management plan\***, and/or~~

☐ ~~B(iii) To determine if the land can be made suitable for a particular use or uses by  
implementation of a specified remedial action plan/management plan\* (please specify  
intended use[s])~~

.....

**Information sources for site audit**

Consultancy(ies) which conducted the site investigation(s) and/or remediation

- Douglas Partners
- WSP Environmental

Title(s) of report(s) reviewed:

- Report on Land Capability Assessment, South Werrington Sub Precinct, Douglas Partners, July 2007.
- Report on Phase 1 Contamination Assessment, South Werrington Sub Precinct, Douglas Partners, April 2007.
- Preliminary Phase 2 Environmental Assessment, University of Western Sydney, South Werrington Sub Precinct, WSP Environmental, February 2009

Other information reviewed (including previous site audit reports and statements relating to the site)

NA

**\* Strike out as appropriate**

**Site audit report**

Title: Site Audit Report – UWS South Werrington Sub-Precinct

Report no. MGH 53 (Environ Ref: AS120943) Date: March 2009

*\* Strike out as appropriate*

## PART II: Auditor's findings

Please complete either Section A or Section B, **not** both. (*Strike out the irrelevant section.*)

Use Section A where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land use(s).

Use Section B where the audit is to determine the nature and extent of contamination and/or the appropriateness of an investigation or remedial action or management plan and/or whether the site can be made suitable for a specified land use or uses subject to the successful implementation of a remedial action or management plan.

### Section A

☒ **I certify that, in my opinion, the site is **SUITABLE** for the following use(s) (*tick all appropriate uses and strike out those not applicable*):**

- ☐ ~~Residential, including substantial vegetable garden and poultry~~
- ☐ ~~Residential, including substantial vegetable garden, excluding poultry~~
- ☒ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☒ Day care centre, preschool, primary school
- ☒ Residential with minimal opportunity for soil access, including units
- ☒ Secondary school
- ☒ Park, recreational open space, playing field
- ☒ Commercial/industrial
- ☐ ~~Other (*please specify*) .....~~

**subject to compliance with the following environmental management plan**  
(*insert title, date and author of plan*) **in light of contamination remaining on the site:**

.....  
.....  
.....

**OR**

☐ ~~I certify that, in my opinion, the site is **NOT SUITABLE** for any use due to the risk of harm from contamination.~~

### Overall comments

Asbestos cement pipe found near TP04 to be delineated and removed in accordance with best practice.

**Section B**

Purpose of the plan<sup>1</sup> which is the subject of the audit .....

**I certify that, in my opinion:**

- ☐ the nature and extent of the contamination HAS/HAS NOT\* been appropriately determined

**AND/OR**

- ☐ the investigation/remedial action plan/management plan\* IS/IS NOT\* appropriate for the purpose stated above

**AND/OR**

- ☐ the site **CAN BE MADE SUITABLE** for the following uses *(tick all appropriate uses and strike out those not applicable):*

- ☐ Residential, including substantial vegetable garden and poultry
- ☐ Residential, including substantial vegetable garden, excluding poultry
- ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☐ Day care centre, preschool, primary school
- ☐ Residential with minimal opportunity for soil access, including units
- ☐ Secondary school
- ☐ Park, recreational open space, playing field
- ☐ Commercial/industrial
- ☐ Other *(please specify)* .....

**if the site is remediated/managed\* in accordance with the following remedial action plan/management plan\* *(insert title, date and author of plan)***

.....  
 .....  
 .....

**subject to compliance with the following condition(s):**

.....  
 .....  
 .....

<sup>1</sup> For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

**\* Strike out as appropriate**

**Overall comments**

.....

.....

.....

.....

.....

.....

**PART III: Auditor's declaration**

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. 0001).

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997*, and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed .....  ..... Date ..... 5/3/09 .....



## PART IV: Explanatory notes

*To be complete, a site audit statement form must be issued with all four parts.*

### How to complete this form

**Part I** identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

**Part II** contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remedial action or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use(s) of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A or Section B of Part II, **not** both.

In **Section A** the auditor may conclude that the land is *suitable* for a specified use(s) OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further remediation or investigation of the site was needed to render the site fit for the specified use(s). Any **condition** imposed should be limited to implementation of an environmental management plan to help ensure the site remains safe for the specified use(s). The plan should be legally enforceable: for example a requirement of a notice under the *Contaminated Land Management Act 1997* (CLM Act) or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the *Environmental Planning and Assessment Act 1979*.

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

In **Section B** the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or whether land can be made suitable for a particular land use or uses upon implementation of a remedial action or management plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

In **Part III** the auditor certifies his/her standing as an accredited auditor under the CLM Act and makes other relevant declarations.

### Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to:

#### Department of Environment and Conservation (NSW)

Contaminated Sites Section  
PO Box A290, SYDNEY SOUTH NSW 1232  
Fax: (02) 9995 5930

AND

the **local council** for the land which is the subject of the audit.

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## List of Abbreviations

AHD	Australian Height Datum
ALS	Australian Laboratory Services
ASET	Australian Safer Environment and Technology Pty Ltd. (Laboratory)
ANZECC	Australian and New Zealand Environment and Conservation Council
BaP	Benzo(a)pyrene
BGL	below ground level
BTEX	Benzene, Toluene, Ethylbenzene & Xylenes (Monocyclic aromatic Hydrocarbons)
CN	Cyanide (total or free)
CT	Certificate of Title
DP	Deposited Plan
DQO	Data Quality Objectives
EPA	Environment Protection Authority (NSW)
ESA	Environmental Site Assessment report
ha	Hectare
km	Kilometres
LOR	Limit of Reporting
m	Metres
MAH	Monocyclic Aromatic Hydrocarbons
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Fe: Iron, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury, Se: Selenium
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
m BGL	Metres below ground level
µg/L	Micrograms per Litre
NATA	National Association of Testing Authorities
NC	Not Calculated
ND	Not Detected
ng/L	Nanograms per Litre
NEHF	National Environmental Health Forum
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
n	Number of Samples
OCPs	Organochlorine Pesticides
OH&S	Occupational Health & Safety
OPPs	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photoionisation Detector
PQL	Practical Quantitation Limit
pH	a measure of acidity, hydrogen ion activity
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
SILs	Soil Investigation Levels
SVOCs	Semi Volatile Organic Compounds
TPHs	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
VENM	virgin excavated natural material
VOCs	Volatile Organic Compounds
-	On tables is "not calculated", "no criteria" or " not applicable"



# 1 Introduction

A non-statutory site contamination audit has been conducted in relation to the University of Western Sydney's (UWS) South Werrington Sub-Precinct site.

The audit was conducted to provide an independent review of whether the land is suitable for any specified use or range of uses by an EPA Accredited Auditor, i.e. an Audit under Section 47 (1) (b) (iia) of the NSW *Contaminated Land Management Act 1997* (the CLM Act).

The audit was conducted to support redevelopment of the site under several zoning areas including general residential, medium density residential, light industrial environmental conservation and public recreation.

Details of the audit are:

Requested by: Robert Walsh of Fitzwalter Group on behalf of the University of Western Sydney

Request/Commencement Date: 29 September 2008

Auditor: Michael Hayter

Accreditation No.: 0001

The scope of the audit included:

- Review of the following reports:

Report on Land Capability Assessment, South Werrington Sub Precinct, Douglas Partners (Douglas), July 2007.

Report on Phase 1 Contamination Assessment, South Werrington Sub Precinct, Douglas Partners, April 2007.

Preliminary Phase 2 Environmental Assessment, University of Western Sydney, South Werrington Sub Precinct, WSP Environmental (WSP), February 2009

- A site visit was performed by the Auditor on 1 October 2008.
- Discussions were held with WSP who undertook the Phase 2 investigation.

## 2 Site Details

### 2.1 Location

The site locality is shown on Attachment 1, Appendix A.

The site details are as follows:

Street address:	UWS Werrington North, Great Western Highway, Werrington, NSW 2747
Identifier:	Lot 1 DP 791299
Local Government:	Penrith Council
Owner:	University of Western Sydney
Site Area:	28 Ha approx

A survey plan of the site has been provided in Attachment 2, Appendix A.

### 2.2 Zoning

The current zoning of the site is General Residential, Medium Density Residential, Light Industrial, Environmental Conservation and Open space.

### 2.3 Adjacent Uses

The site is located within an area of mixed rural residential, commercial and university campus land uses. Residential properties adjoin the land to the east and north. An adjacent Sydney Water property has been subject to contamination investigations and a Site Audit which identified the presence of 10 former USTs which were removed and remediated. No groundwater contamination was identified. The Site Audit Report determined that the Sydney Water site was suitable for ongoing use as a depot. Other than the Sydney Water depot, the adjacent land uses do not appear to be likely to impact the UWS site.

### 2.4 Site Condition

WSP described the site in 2009 as being predominantly grassed with scattered woodland and currently vacant. WSP noted the presence of a few small structures in the southwest including a shed, toilet and work bench, three empty drums, and presence of manhole covers with associated sewer lines beneath the site. WSP also note the presence of earthen flood control embankments along the east and northeast boundaries of the site. WSP commented that the embankments appeared to be composed of earth material sourced from the site.

The Auditor inspected the site on 1 October 2008. The site appearance was consistent with the consultant's report, with no visible signs of contamination.

## 2.5 Proposed Development

It is understood that the site is to be redeveloped for a mix of low density and medium density residential, commercial, environment protection and open space land uses.

The consultant has assessed the land for the most sensitive land use (residential with gardens and accessible soil). The Auditor has followed the same procedure.



### 3 Site History

Douglas (2007) provided a site history based on site inspection, historical aerial photographs, council and regulatory records searches and Certificates of Title. The review indicated that the site has been used for non specific rural/residential and/or rural/commercial/agricultural purposes since the 1920s. Historic air photographs indicate the presence of an oval track on the western portion of the site that was possibly used for horse racing. There were some indications of historical agricultural or horticultural activities. The regulatory searches did not reveal any notices in relation to contamination.

In the Auditor's opinion, the site history provides a satisfactory general indication of past activities and indicates a low potential for contamination.

## 4 Potential for Contamination

Based on the historical review and site inspections Douglas (2007) identified the following Areas of Environmental Concern (AECs) on the subject site:

- AEC 4 (part of) extending onto the UWS property from adjacent land with evidence of former building footprints and building rubble including fragments of brick, tile and AC sheeting;
- AEC 5 located on the southern boundary of the UWS land and included abandoned waste stockpiles containing metal, timber and AC sheeting;
- AEC 8 consisting of flood control embankments along the east and northeast boundaries of the site.

WSP subsequently inspected the site in 2008 and noted that the boundaries of AEC 4 and AEC 5 did not extend onto the UWS land and no waste material was visible on the site in the areas previously identified by Douglas.

Based on the historical review and site inspections, potential contaminating activities were identified as:

- Agriculture including possible horticulture/market gardening;
- Waste disposal (including potential demolition material) from surrounding land.

The following contaminants of concern (COCs) were identified:

- Soil – heavy metals, petroleum hydrocarbons (TPH/BTEX), PAHs, phenols, pesticides, PCBs and asbestos;
- Groundwater - heavy metals, TPH/BTEX, PAHs, phenols and VCHs.

The Auditor considers that the identified COCs effectively covered the range of possible contamination. The Auditor agrees with the observations of WSP that waste material in previously identified AECs did not extend across the site boundary.

## **5 Stratigraphy and Hydrogeology**

### **5.1 Geology**

Douglas referenced the 1:100,000 scale Penrith Map Series and indicated the bedrock geology of the site consists of Bringelly shale of the Wianamatta Group of Triassic Age. The formation consists of shale, claystone, laminate and minor coal bands which is typically overlain by stiff residual clay soil.

Logs prepared by WSP indicate that the sub-surface profile of the site comprises up to 1m of reworked natural soil, typically dark brown organic silty clay containing some vegetation material and charcoal fragments, overlying orange brown silty clay, grading into weathered shale. Minor superficial (road base) filling was identified at one out of 40 test pit locations.

### **5.2 Hydrogeology**

Douglas described the hydrogeological characteristics of the area as follows:

- The Bringelly Shale has a low permeability resulting in low yields to boreholes;
- The regional groundwater in the Wianamatta Group is typically brackish to saline. The groundwater is generally unsuitable for stock, irrigation and potable use;

Groundwater was sampled by WSP during the investigations performed for this contamination assessment.

## 6 Investigations Performed

WSP developed a Phase 2 sampling and analysis plan and performed the field investigations in December 2008. The investigation programme, agreed in advance with the Auditor, comprised:

- Excavating, logging and sampling 3 test pits in AEC 4, two test pits in AEC 5 and five test pits in AEC 8;
- Excavation, logging and sampling 30 additional test pits to 3m or refusal on a systematic grid across the remainder of the site outside the AECs, on the condition that should any indicators of contamination be encountered, then the requirements for additional investigation would be agreed with the Auditor;
- Drilling, logging and sampling 3 groundwater monitoring wells to 8m or refusal. Two of the wells were located in AEC 4 and AEC 8 to assess groundwater quality in the vicinity of the Sydney Water Depot on the eastern boundary of the site.
- One shallow/surface soil sample from each test pit was analysed for heavy metals, petroleum hydrocarbons (TPH/BTEX), PAHs, phenols, pesticides, PCBs and asbestos. A total of 10 deeper soil samples were also analysed for the same parameters;
- Groundwater samples were analysed for heavy metals, TPH/BTEX, PAHs, phenols and VCHs.

The sampling locations are shown in Attachment 3, Appendix A.

## 7 Evaluation of Quality Assurance and Quality Control

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations.

The Auditor's assessment follows in Tables 7.1 and 7.2.

<b>Table 7.1: QA/QC – Sampling and Analysis Methodology Assessment</b>	
<b>Sampling and Analysis Plan and Sampling Methodology</b>	<b>Auditor Comments</b>
Sampling Pattern and Locations	<p><b>Soil:</b> Ten investigation locations targeted the identified AECs. Thirty additional locations were placed systematically across the remainder of the area outside the AECs on the condition that should any indicators of contamination be encountered, then the requirements for additional investigation would be discussed with the Auditor. In the Auditor's opinion the sampling pattern and locations were appropriate for a preliminary assessment.</p> <p><b>Groundwater</b> Monitoring wells were installed and sampled at 3 locations (AEC4/5, AEC8 adjacent to Sydney Water Depot, and third location in the centre of the site). The Auditor considers that the locations were appropriate to assess groundwater.</p>
Sampling Density	The sampling density of 40 locations over approximately 28 Ha is less than the minimum recommended by EPA (1995) "Sampling Design Guidelines". The Auditor considers that the sample density was adequate for the purposes of a preliminary investigation considering the site conditions and low potential for contamination as assessed from historical review and site inspections.
Sample depths	Soil samples were collected and analysed from the shallow top soil horizon at all of the sampling locations. Additional soil samples were collected from depth at 25% of the sampling locations. In the Auditor's opinion, this sampling strategy was appropriate and adequate to characterise the primary material types present on site.
Monitoring wells	Drilling was performed using solid augers to 8m or refusal in shale. The wells were reported to be equipped with in 50mm diameter screen and casing, gravel packs and seals to appropriate standards. Construction logs were not provided. The wells were developed after drilling and allowed to stand for one week prior to sampling. Procedures were satisfactory.
Sample Collection Method	Soil samples were collected using a backhoe. Collection and handling methods were satisfactory. The monitoring wells were purged and groundwater samples were taken using a peristaltic pump. Measurements of water level, pH, EC and Redox potential were performed in the field. Satisfactory field data sheets were provided.
Decontamination Procedures	Sampling equipment was appropriately decontaminated between sampling locations to prevent cross contamination.

**Table 7.1: QA/QC – Sampling and Analysis Methodology Assessment**

<b>Sampling and Analysis Plan and Sampling Methodology</b>	<b>Auditor Comments</b>
Sample handling and containers	All samples were placed into prepared and preserved sampling bottles provided by the laboratory and chilled during storage and subsequent transport to the labs.
Chain of Custody	Completed chain of custody forms were provided in the report.
Detailed description of field screening protocols	Field screening for volatiles was undertaken using a PID. PID screening procedure was provided in the SAQP. Calibration certificates were not provided. PID readings were all low.
Sampling Logs	Soil logs are provided within the report, indicating sample depth, PID readings and lithology.
Analytical Suite	Samples were correctly analysed for metals, TPH/BTEX, PAHs, PCB, OC pesticides and asbestos as specified in the SAQP.

**Table 7.2: QA/QC – Field and Lab Quality Assurance and Quality Control**

<b>Field and Lab QA/QC</b>	<b>Auditor Comments</b>
Field quality control samples	Field quality control samples comprised two intra-laboratory duplicates and two inter-laboratory triplicate soil samples and one duplicate groundwater sample. No trip spikes were analysed. However, considering field observations and apparent absence of volatile organic contamination this is considered to be acceptable. The total frequency of field duplicates for soil (4 in 53 samples) fell slightly below the guideline of 10% but was nevertheless acceptable in the opinion of the Auditor.
Field quality control results	The RPD results from the field quality control samples were outside the desirable range in some cases. However the level of exceedence was not unduly high considering matrix variability and the low absolute concentrations of the analytes. RPD results for groundwater were satisfactory considering the low absolute concentrations measured.
NATA registered laboratory and NATA endorsed methods	The project laboratory was LabMark Pty Ltd and the secondary laboratory was Envirolab. Both laboratories are NATA accredited for the relevant analyses. All laboratory certificates were NATA stamped.
Analytical methods	In-house analytical methods were included in the laboratory test certificates. While, references to the USEPA methods for extraction and analysis were given, the exact methods used have not been detailed.
Holding times	Review of the COCs and laboratory certificates indicate that the holding times had been met.
Practical Quantitation Limits (PQLs)	PQLs for soil were all less than the threshold criteria for the contaminants of concern. PQLs for groundwater exceeded the

**Table 7.2: QA/QC – Field and Lab Quality Assurance and Quality Control**

Field and Lab QA/QC	Auditor Comments
	threshold criteria for arsenic, chromium and copper. The laboratory indicated that the PQLs were increased due to matrix interference. Considering the results for other parameters and the absence of contamination in soil, these non compliances are not material.
Laboratory quality control samples	Laboratory quality control samples including laboratory duplicates, matrix spikes, matrix spike duplicates, surrogate spikes and laboratory blanks were undertaken by the laboratory at appropriate frequencies.
Laboratory quality control results	The results for the majority of laboratory quality control samples were within appropriate limits.
Data Quality Objectives and Data Evaluation (completeness, comparability, representativeness, precision, accuracy)	Predetermined data quality objectives (DQOs) were set for laboratory analyses including blanks, replicates, duplicates, laboratory control samples, matrix spikes, surrogate spikes and internal standards. These were discussed with regard to the five category areas. There was no discussion regarding actions required if data do not meet the expected objectives.

### Auditor Comments

In considering the field investigation programme and analytical data as a whole, the levels of completeness, comparability, representativeness, precision and accuracy of the data are satisfactory for the purposes of the assessment. The Auditor concludes that despite some minor technical non-compliance with guidelines, the analytical results are acceptable and sufficient to draw valid conclusions, whilst the potential variability in the results would not affect the conclusions of the investigation.

## 8 Environmental Quality Criteria

The Auditor has assessed the soil data provided by WSP by reference to Soil Investigation Levels for Urban Redevelopment Sites in NSW (SIL Column 1 – 'residential with gardens and accessible soil' and Environmental Investigation Levels (EIL Column 5 'provisional phytotoxicity') in DEC *Guidelines for the NSW Site Auditor Scheme* (2006).

EPA (1994) *Guidelines for Assessing Service Station Sites* have also been referred to for assessing TPH and BTEX results. These guidelines relate to sensitive land uses and are therefore appropriate when applied to this site.

The Auditor has considered the need for remediation based on the 'aesthetic' contamination as outlined in the NEPM (1999) Schedule B(1) *Guideline on the Investigation Levels for Soil and Groundwater* that states that 'there are no numeric Aesthetic Guidelines but the fundamental principle is that the soils should not be discoloured, malodorous (including when dug over or wet) nor of abnormal consistency.

There are no national or EPA approved guidelines for asbestos in soil relating to human health. DEC (2006) state that Auditors must exercise their professional judgement when assessing whether a site is suitable for a specific use. The DEC states that the position of the Health Department is that there should be no asbestos in surface soil.

The Auditor has assessed the groundwater data by reference to ANZECC (2000) Guidelines for Fresh and Marine Water Quality for fresh water.

There are no reliable Australian criteria for TPH in groundwater. The current NSW EPA position is that there should be no free phase product in groundwater, and that the aromatic components of dissolved phase TPH in groundwater should be assessed using the ANZECC (200) trigger values where available. The guidelines include criteria from some BTEX compounds and for some polycyclic aromatic hydrocarbons.

Environmental quality criteria are listed in Appendix B.



## 9 Evaluation of Soil Investigation Results

### 9.1 Field Results

The preliminary soil sampling programme comprised 40 test pits indicated in Attachment 3, Appendix A. Logs prepared by WSP indicate that the sub-surface profile of the site comprises up to 1m of (locally) reworked natural soil, typically dark brown organic silty clay containing some vegetation material and charcoal fragments, overlying orange brown silty clay, grading into weathered shale. No groundwater was encountered in the test pits. No staining, malodours, demolition material, AC sheeting fragments or other indicators of contamination were reported on the surface of the site or in the test pits. A section of fibre cement pipe was reported near TP 04.

### 9.2 Analytical Results

Soil samples were analysed for heavy metals, TPH/BTEX, PAHs, phenols, pesticides, PCBs and asbestos. The results are summarised in Table 9.1. Soil sampling locations are shown as Attachment 3, Appendix A.

**Table 9.1: Summary of Analytical Results for Fill Samples**

Analyte	N	Detections	Maximum (mg/kg)	Mean (mg/kg)	n > SIL Column 1 (DEC 2006) or SSG	n > EIL Column 5 (DEC 2006)
Asbestos	53	0	-	-	-	-
Arsenic	53	50	20	7.1	0	0
Total Chromium	53	53	47	21	0	0
Copper	53	53	39	12	0	1
Lead	53	52	41	17	0	2
Nickel	53	53	25	7.3	0	0
Zinc	53	53	82	16	0	5
Mercury (inorganic)	53	6	0.08	0.062	0	0
PCBs	52	0	-	-	0	-
OCP/OPP	52	0	-	-	0	-
TPH (C <sub>6</sub> -C <sub>9</sub> )	52	0	-	-	0	-
TPH (C <sub>10</sub> -C <sub>36</sub> )	52	0	-	-	0	-
BTEX	53	0	-	-	0	-
Total PAHs	52	0	-	-	0	-
Total Phenolics	52	0	-	-	0	-

n number of samples

- No criteria available/used

Key features of the analytical results were as follows:

- Typical background levels of heavy metals were reported in all of the soil samples. Reported concentrations did not exceed the relevant SILs (health risk based investigation levels) or EILs (phytotoxicity based investigation levels) in any samples;
- Petroleum hydrocarbons, BTEX, pesticides, PCBs, PAHs or phenolics were not detected in any soil samples;
- Asbestos was not detected in any soil samples. A sample of fibre cement pipe encountered at TP 04 was confirmed to contain asbestos.

On the basis of the initial field and analytical results which did not identify any evidence of contamination, no further detailed sampling was deemed necessary.

WSP recommended that the section of asbestos cement pipe encountered near TP04 be delineated and removed according to current best practice.

## 10 Evaluation of Groundwater Investigation Results

### 10.1 Field Results

The groundwater sampling programme comprised three monitoring wells located as indicated in Attachment 3, Appendix A. Groundwater was encountered at depths ranging from 3.55 to 4.98m below top of casing. The sampled groundwater was cloudy with no sheen or odour.

### 10.2 Analytical Results

Groundwater samples were analysed for heavy metals, TPH/BTEX, PAHs, phenols, and volatile organic compounds. The results are summarised in Table 9.1. Monitoring well locations are shown as Attachment 3, Appendix A.

<b>Table 10.1: Summary of Analytical Results for Groundwater Samples (ug/L)</b>						
<b>Analyte</b>	<b>PQL</b>	<b>MW1</b>	<b>MW2</b>	<b>MW3</b>	<b>ANZECC 2000 Guidelines</b>	<b>NSW EPA Service Station Guidelines</b>
Arsenic	20	<20	<20	<20	13	-
Chromium	5	<5	<10	<10	1	-
Copper	10	<10	<10	<10	1.4	-
Lead	1	6	1	9	3.4	1-5
Nickel	5	<5	<5	<5	11	-
Zinc	5	33	48	50	8	-
Mercury	0.2	<0.2	<0.2	<0.2	0.6	-
TPH	50-200	nd	nd	nd	-	-
Benzene	1	nd	nd	nd	950	300
Toluene	1	nd	nd	nd	180	300
Ethylbenzene	1	nd	nd	nd	80	140
Xylene	2	nd	nd	nd	-	380
Total PAHs	1-10	nd	nd	nd	-	3
VOCs	1-50	nd	nd	nd	Varies	-

- no criteria available/used

nd not detected

Key features of the analytical results were as follows:

- Typical background levels of heavy metals in the Bringelly Shales were reported in the groundwater samples. Reported concentrations of dissolved lead in one sample and dissolved zinc in all samples exceeded the relevant water quality guidelines;

- Petroleum hydrocarbons, BTEX compounds, PAHs, phenolics and VOCs (including chlorinated compounds) were not detected in any samples.

WSP concluded that the concentrations of heavy metals in the groundwater, in particular zinc, reflected background levels in the Bringelly Shales. Given the absence of contamination in the soil, the Auditor agrees with this conclusion.

## 11 Assessment of Risk

The Auditor's assessment of risk is:

- The chemical quality of the soil meets the human health risk based guidelines and the phytotoxicity based guidelines for the proposed range of land uses and the site is suitable for residential use with gardens and accessible soil in accordance with the Decision Process for Assessing Urban Redevelopment sites in DECC (2006) Guidelines for the NSW site Auditor Scheme;
- There is no indication of groundwater contamination. The potential for off-site migration of contaminants in groundwater, surface water or dust is negligible due to the absence of contamination on the site.

The Auditor agrees that the section of asbestos cement pipe encountered near TP04 should be delineated and removed according to current best practice.

## 12 Conclusions and Recommendations

WSP has concluded that “the site is considered to be suitable for residential use with garden and accessible soil”.

The Auditor considers that the investigations detailed in the referenced reports comply with the relevant EPA technical policy documents with the exception of minor omissions and deviations identified in this audit report.

After inspecting the site and having taken all information and reports into consideration, the Auditor concludes that the site is suitable for the range of intended land uses including residential use with gardens and accessible soil in accordance with the definitions and limitations listed on the Site Audit Statement.

## 13 Other Relevant Information

This Audit was conducted for Fitzwalter Associates on behalf of the University of Western Sydney for the purpose of assessing the suitability of the land for the proposed range of uses, as contemplated in Section 47 of the CLM Act.

This summary report may not be suitable for other uses. WSP Environmental included limitations in their report. The audit must also be subject to those limitations. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which he had some control or is reasonably able to check.

The Auditor has relied on the documents referenced in Section 1 of the Site Audit Report in preparing his opinion. If the Auditor is unable to rely on any of those documents, the conclusions of the audit could change.

It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

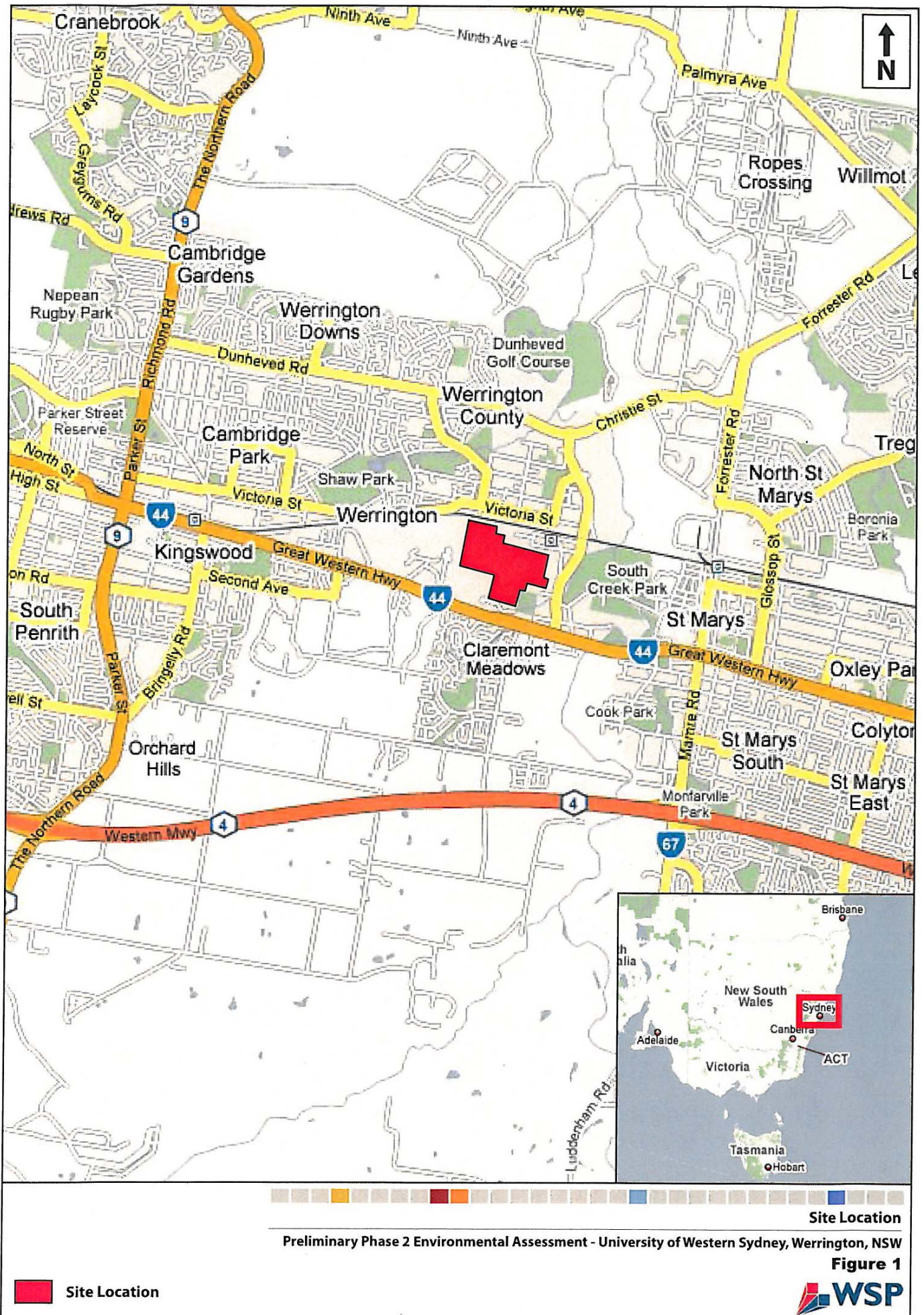
## **Appendix A: Attachments**

**Attachment 1: Site Location**

**Attachment 2: Site Survey Plan**

**Attachment 3: Site Layout and Investigation  
Sample Locations**

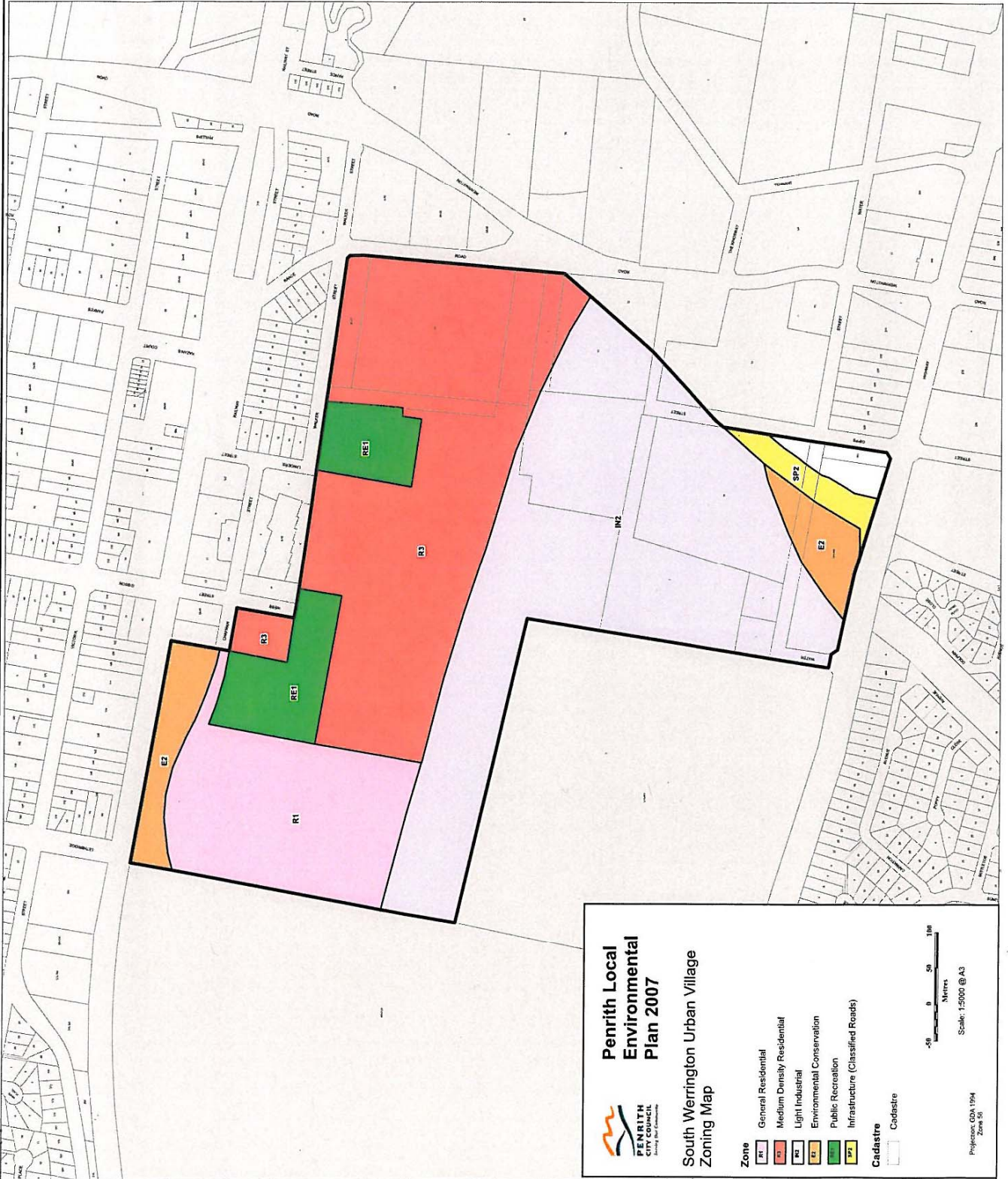




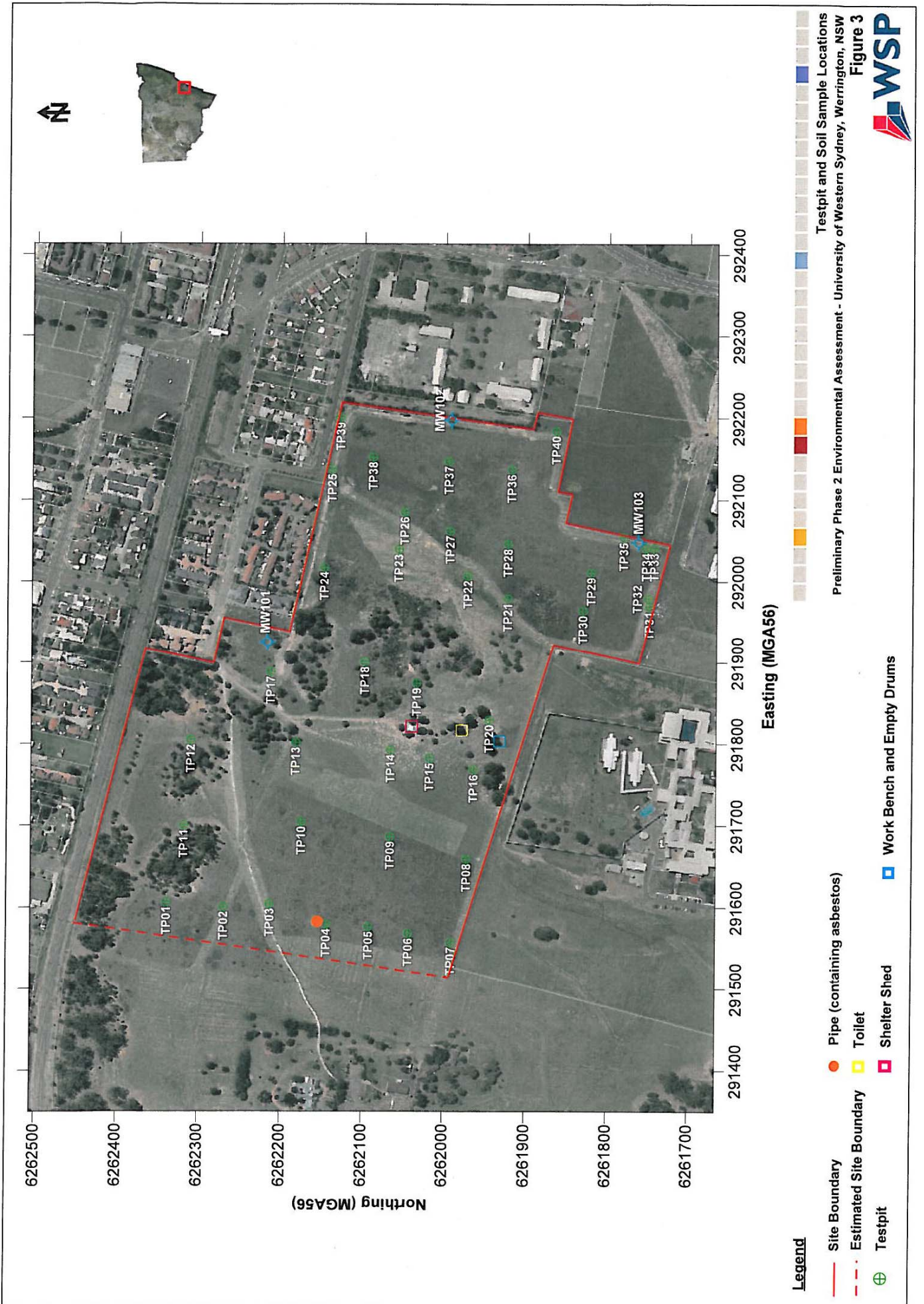




Preliminary Phase 2 Environmental Assessment  
Current Zoning - Blacktown City Council







## **Appendix B: Soil and Groundwater Criteria**



# Soil investigation levels for urban development sites

## Department of Environment and Conservation NSW (April 2006)

Substance	Health-based investigation levels <sup>1</sup> (mg/kg)				Provisional phytotoxicity-based investigation levels <sup>2</sup> (mg/kg)
	Residential with gardens and accessible soil (home-grown produce contributing < 10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools, primary schools, townhouses, villas (NEHF A) <sup>3</sup>	Residential with minimal access to soil including high-rise apartments and flats (NEHF D)	Parks, recreational open space, playing fields including secondary schools (NEHF E)	Commercial or industrial (NEHF F)	
	Column 1	Column 2	Column 3	Column 4	Column 5
<b>Metals and metaloids</b>					
Arsenic (total)	100	400	200	500	20
Beryllium	20	80	40	100	—
Cadmium	20	80	40	100	3
Chromium (III) <sup>4</sup>	12%	48%	24%	60%	400
Chromium (VI)	100	400	200	500	1
Cobalt	100	400	200	500	—
Copper	1,000	4,000	2,000	5,000	100
Lead	300	1,200	600	1,500	600
Manganese	1,500	6,000	3,000	7,500	500
Methyl mercury	10	40	20	50	—
Mercury (inorganic)	15	60	30	75	1 <sup>5</sup>
Nickel	600	2,400	600	3,000	60
Zinc	7,000	28,000	14,000	35,000	200
<b>Organics</b>					
Aldrin + dieldrin	10	40	20	50	—
Chlordane	50	200	100	250	—
DDT + DDD + DDE	200	800	400	1,000	—
Heptachlor	10	40	20	50	—
PAHs (total)	20	80	40	100	—
Benzo(a)pyrene	1	4	2	5	—
Phenol <sup>6</sup>	8,500	34,000	17,000	42,500	—
PCBs (total)	10	40	20	50	—
<b>Petroleum hydrocarbon components<sup>7</sup></b>					
> C16–C35 (aromatics)	90	360	180	450	—
> C16–C35	5,600	22,400	11,200	28,000	—

<b>Soil investigation levels for urban development sites</b> <b>Department of Environment and Conservation NSW (April 2006)</b>					
Substance	Health-based investigation levels <sup>1</sup> (mg/kg)				Provisional phytotoxicity-based investigation levels <sup>2</sup> (mg/kg)
	Residential with gardens and accessible soil (home-grown produce contributing < 10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools, primary schools, townhouses, villas (NEHF A) <sup>3</sup>	Residential with minimal access to soil including high-rise apartments and flats (NEHF D)	Parks, recreational open space, playing fields including secondary schools (NEHF E)	Commercial or industrial (NEHF F)	
	Column 1	Column 2	Column 3	Column 4	Column 5
> C35 (aliphatics)	56,000	224,000	112,000	280,000	—
<b>Other</b>					
Boron	3,000	12,000	6,000	15,000	— <sup>8</sup>
Cyanides (complex)	500	2,000	1,000	2,500	—
Cyanides (free)	250	1,000	500	1,250	—

- 1 The limitations of health-based soil investigation levels are discussed in Schedule B(1) Guidelines on the Investigation Levels for Soil and Groundwater and Schedule B(7a) Guidelines on Health-based Investigation Levels, *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 1999)
- 2 The provisional phytotoxicity-based investigation levels proposed in this document are single number criteria. Their use has significant limitations because phytotoxicity depends on soil and species parameters in ways that are not fully understood. They are intended for use as a screening guide and may be assumed to apply to sandy loam soils or soils of a closely similar texture for pH 6–8.
- 3 National Environmental Health Forum (NEHF) is now known as enHealth.
- 4 Soil discolouration may occur at these concentrations.
- 5 Total mercury
- 6 Odours may occur at these concentrations.
- 7 The carbon number is an 'equivalent carbon number' based on a method that standardises according to boiling point. It is a method used by some analytical laboratories to report carbon numbers for chemicals evaluated on a boiling point GC column.
- 8 Boron is phytotoxic at low concentrations. A provisional phytotoxicity-based investigation level is not yet available.

#### Notes:

This table is adapted from Table 5-A in Schedule B(1): Guidelines on Investigation Levels for Soil and Groundwater to the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 1999).

Soil investigation levels (SILs) may not be appropriate for the protection of ground water and surface water. They also do not apply to land being, or proposed to be, used for agricultural purposes. (Consult NSW Agriculture and NSW Health for the appropriate criteria for agricultural land.)

SILs do not take into account all environmental concerns (for example, the potential effects on wildlife). Where relevant, these would require further consideration.

Impacts of contaminants on building structures should also be considered.

For assessment of hydrocarbon contamination for residential land use, refer to the Guidelines for Assessing Service Station Sites (EPA 1994).



<b>Threshold Concentration for Sensitive Land Use – Soils Guidelines for Assessing Service Station Site (NSW EPA 1994)</b>	
<b>Contaminant</b>	<b>Threshold Concentration (mg/kg)</b>
TPH (C <sub>6</sub> -C <sub>9</sub> )	65
TPH (C <sub>10</sub> -C <sub>36</sub> )	1,000
Benzene	1
Toluene	1.4
Ethylbenzene	3.1
Xylenes (total)	14

## **Appendix C: EPA Approved Guidelines**



# Guidelines made or approved by the EPA under section 105 of the Contaminated Land Management Act 1997

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(as of 28 March 2007)

## Guidelines made by the EPA

- *Contaminated Sites: Guidelines for Assessing Service Station Sites*, December 1994 - servicestnsites.pdf, 1.3Mb
- *Contaminated Sites: Guidelines for the vertical mixing of soil on former broad-acre agricultural land*, January 1995 - [vertmix.pdf](#), 149kb
- *Contaminated Sites: Sampling Design Guidelines*, September 1995
- *Contaminated Sites: Guidelines for Assessing Banana Plantation Sites*, October 1997 - bananaplantsite.pdf, 586 kb
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, November 1997
- *Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report*, April 1999 (revised July 2003) - sroh.pdf, 164kb
- *Contaminated Sites: Guidelines for Assessing Former Orchards and Market Gardens*, June 2005 - orchardgdline05195.pdf, 172 kb
- *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition)*, April 2006 - auditorglines06121.pdf, 510kb
- *Guidelines for the Assessment and Management of Groundwater Contamination*, March 2007 - groundwaterguidelines07144.pdf 604 kb

**Note:** All references in the EPA's contaminated sites guidelines to the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, November 1992) are replaced as of 6 September 2001 by references to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, October 2000), subject to the same terms.

## Guidelines approved by the EPA

### ANZECC publications

- *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*, published by Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC), January 1992
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Paper No 4, October 2000

### **EnHealth publications (formerly National Environmental Health Forum monographs)**

- *Composite Sampling*, by Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, Adelaide
- Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia, June 2002

### **National Environment Protection Council publications**

- National Environment Protection (Assessment of Site Contamination) Measure 1999

The Measure consists of a policy framework for the assessment of site contamination, Schedule A (Recommended General Process for the Assessment of Site Contamination) and Schedule B (Guidelines). Schedule B guidelines include:

- B(1) Guideline on Investigation Levels for Soil and Groundwater
- B(2) Guideline on Data Collection, Sample Design and Reporting
- B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils
- B(4) Guideline on Health Risk Assessment Methodology
- B(5) Guideline on Ecological Risk Assessment
- B(6) Guideline on Risk Based Assessment of Groundwater Contamination
- B(7a) Guideline on Health-Based Investigation Levels
- B(7b) Guideline on Exposure Scenarios and Exposure Settings
- B(8) Guideline on Community Consultation and Risk Communication
- B(9) Guideline on Protection of Health and the Environment During the Assessment of Site Contamination
- B(10) Guideline on Competencies & Acceptance of Environmental Auditors and Related Professionals

### **Other documents**

- Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental, February 1996
- Australian Drinking Water Guidelines, NHMRC & Natural Resource Management Ministerial Council of Australia and New Zealand, 2004

## **Appendix D: Analytical Results**



Table 1: Soil analysis results, 1-08-135, Summary only

	Asbestos	BTEX	Arsenic	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	PAHs (Sum of total)	Phenolics Total	PCBs (Sum of total)	OCP	OPP	TPH C6 - C9 (Sum of total)	TPH C10 - C36 (Sum of total)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			1	1	1		0.05	1	1							
EPA 1994 Service Station						300				20					65	1000
NEPM 1999 EIL			20		100	600	1	60	200							
NEPM 1999 HIL A			100	12000	1000	300	15	600	7000	20	320	10				

Field ID	Sample Date																
ASB-1	15/12/2008	Chrysotile, amosite, crocidolite															
MW101/0.3	21/01/2009	nd	nd	5	19	8	10	nd	2	7	nd	nd	nd	nd	nd	nd	nd
MW102/0.3	21/01/2009	nd	4	<0.1	17	5	10	<0.05	2	5	nd	nd	nd	nd	nd	nd	nd
MW102/3	21/01/2009	nd	1	<0.1	2	4	5	<0.05	2	6							
MW103/0.3	21/01/2009	nd	nd	5	17	12	19	nd	5	11	nd	nd	nd	nd	nd	nd	nd
TP01-1	15/12/2008	nd	nd	5	16	14	16	nd	8	16	nd	nd	nd	nd	nd	nd	nd
TP01-2	15/12/2008	nd	nd	5	11	11	8	nd	2	8	nd	nd	nd	nd	nd	nd	nd
TP02-1	15/12/2008	nd	nd	7	16	14	17	nd	6	21	nd	nd	nd	nd	nd	nd	nd
TP03-1	15/12/2008	nd	nd	8	16	17	12	nd	4	15	nd	nd	nd	nd	nd	nd	nd
TP04-1	15/12/2008	nd	nd	9	11	21	31	nd	25	23	nd	nd	nd	nd	nd	nd	nd
TP05-1	15/12/2008	nd	nd	6	10	19	14	nd	12	22	nd	nd	nd	nd	nd	nd	nd
TP06-1	15/12/2008	nd	nd	12	28	28	30	0.06	21	34	nd	nd	nd	nd	nd	nd	nd
TP06-2	15/12/2008	nd	nd	3	11	13	9	nd	8	13	nd	nd	nd	nd	nd	nd	nd
TP07-1	15/12/2008	nd	nd	6	16	10	12	0.05	8	14	nd	nd	nd	nd	nd	nd	nd
TP08-1	15/12/2008	nd	nd	7	19	7	15	0.05	5	9	nd	nd	nd	nd	nd	nd	nd
TP09-1	15/12/2008	nd	nd	5	13	11	14	nd	10	14	nd	nd	nd	nd	nd	nd	nd
TP10-1	15/12/2008	nd	nd	15	40	10	41	nd	13	15	nd	nd	nd	nd	nd	nd	nd
TP10-2	15/12/2008	nd	nd	7	18	13	11	0.08	4	11	nd	nd	nd	nd	nd	nd	nd
TP11-1	15/12/2008	nd	nd	10	25	10	27	nd	5	16	nd	nd	nd	nd	nd	nd	nd
TP12-1	15/12/2008	nd	nd	9	30	15	33	nd	9	18	nd	nd	nd	nd	nd	nd	nd
TP12-2	15/12/2008	nd	nd	3	10	7	8	nd	1	nd	nd	nd	nd	nd	nd	nd	nd
TP13-1	15/12/2008	nd	nd	2	17	9	8	nd	7	18	nd	nd	nd	nd	nd	nd	nd
TP14-1	15/12/2008	nd	nd	9	28	13	22	nd	9	13	nd	nd	nd	nd	nd	nd	nd
TP15-1	15/12/2008	nd	nd	5	13	10	11	nd	3	7	nd	nd	nd	nd	nd	nd	nd
TP16-1	16/12/2008	nd	nd	8	25	12	20	nd	4	9	nd	nd	nd	nd	nd	nd	nd
TP17-1	16/12/2008	nd	nd	7	19	8	18	nd	3	9	nd	nd	nd	nd	nd	nd	nd
TP18-1	16/12/2008	nd	nd	10	16	9	39	nd	8	14	nd	nd	nd	nd	nd	nd	nd
TP19-1	16/12/2008	nd	nd	8	27	7	10	nd	3	12	nd	nd	nd	nd	nd	nd	nd
TP20-1	16/12/2008	nd	nd	8	28	8	11	nd	3	12	nd	nd	nd	nd	nd	nd	nd
TP20-2	16/12/2008	nd	nd	8	22	10	15	nd	12	10	nd	nd	nd	nd	nd	nd	nd
TP21-1	16/12/2008	nd	nd	5	15	7	9	nd	3	6	nd	nd	nd	nd	nd	nd	nd
TP22-1	16/12/2008	nd	nd	20	24	39	21	nd	20	82	nd	nd	nd	nd	nd	nd	nd
TP22-2	16/12/2008	nd	nd	4	10	15	15	nd	15	20	nd	nd	nd	nd	nd	nd	nd
TP23-1	16/12/2008	nd	nd	10	47	6	25	nd	6	10	nd	nd	nd	nd	nd	nd	nd
TP24-1	16/12/2008	nd	nd	6	18	14	13	nd	8	21	nd	nd	nd	nd	nd	nd	nd
TP25-1	16/12/2008	nd	nd	8	28	7	20	nd	4	11	nd	nd	nd	nd	nd	nd	nd
TP25-2	16/12/2008	nd	nd	4	14	9	9	nd	4	10	nd	nd	nd	nd	nd	nd	nd
TP26-1	16/12/2008	nd	nd	5	17	12	25	nd	5	18	nd	nd	nd	nd	nd	nd	nd
TP27-1	16/12/2008	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
TP28-1	16/12/2008	nd	nd	7	28	12	16	nd	9	16	nd	nd	nd	nd	nd	nd	nd
TP29-1	16/12/2008	nd	nd	7	28	8	17	nd	6	13	nd	nd	nd	nd	nd	nd	nd
TP30-1	16/12/2008	nd	nd	8	29	9	15	nd	6	11	nd	nd	nd	nd	nd	nd	nd
TP31-1	16/12/2008	nd	nd	12	38	13	27	nd	9	26	nd	nd	nd	nd	nd	nd	nd
TP32-1	16/12/2008	nd	nd	8	26	16	15	nd	12	21	nd	nd	nd	nd	nd	nd	nd
TP32-2	16/12/2008	nd	nd	4	13	14	8	nd	5	16	nd	nd	nd	nd	nd	nd	nd
TP33-1	16/12/2008	nd	nd	8	25	16	15	nd	11	21	nd	nd	nd	nd	nd	nd	nd
TP34-1	16/12/2008	nd	nd	14	26	12	36	nd	12	28	nd	nd	nd	nd	nd	nd	nd
TP35-1	16/12/2008	nd	nd	10	26	11	27	nd	12	19	nd	nd	nd	nd	nd	nd	nd
TP36-1	16/12/2008	nd	nd	4	20	8	15	nd	3	5	nd	nd	nd	nd	nd	nd	nd
TP37-1	16/12/2008	nd	nd	5	27	9	11	0.06	4	5	nd	nd	nd	nd	nd	nd	nd
TP38-1	16/12/2008	nd	nd	3	11	6	16	nd	3	8	nd	nd	nd	nd	nd	nd	nd
TP39-1	16/12/2008	nd	nd	5	14	12	11	nd	7	14	nd	nd	nd	nd	nd	nd	nd
TP39-2	16/12/2008	nd	nd	5	13	15	14	nd	7	19	nd	nd	nd	nd	nd	nd	nd
TP40-1	16/12/2008	nd	nd	4	22	3	21	0.07	2	13	nd	nd	nd	nd	nd	nd	nd
TP40-2	16/12/2008	nd	nd	6	12	10	8	nd	4	17	nd	nd	nd	nd	nd	nd	nd

## Statistical Summary

Number of Results	54	53	52	52	52	52	6	52	51	53	53	53	53	53	53	53
Minimum Detect	nd	ND	2	10	3	8	0.05	1	5	ND	ND	ND	ND	ND	ND	ND
Maximum Detect	-	ND	20	47	39	41	0.08	25	82	ND	ND	ND	ND	ND	ND	ND
Average Concentration	-	0	7.1	21	12	17	0.062	7.3	16	0	0	0	0	0	0	0
Standard Deviation	-	0	3.3	8.2	5.8	8.4	0.012	5	11	0	0	0	0	0	0	0
Number of Guideline Exceeded	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Table 2: Groundwater analysis, 1-08-135, UWS Werrington, January 2009

BTX				Chlorinated Hydrocarbons										Halogenated Hydrocarbons										Metals																	
	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total	1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethane	1,2-dichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Carbon tetrachloride	Chlorobenzene	Chloroethane	Chloroform	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Hexachlorobutadiene	TCE	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride	1,2-dibromoethane	Bromodichloromethane	Bromomethane	Chlorodibromomethane	Dibromomethane	Trichlorofluoromethane	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)
EWOL	1	1	1	2	1	350	5	5	5	5	5	5	5	5	5	1	5	50	5	5	5	5	5	5	5	5	5	50	5	5	5	5	50	1	0.1	1	1	1	0.1	1	5
ANZECC 2000 FW 95%	950						6500	180	280	80																								13	0.2	1	1.4	3.4	0.6	1	8
Statistical Summary																																									
Number of Results																																									
Number of Detects																																									
Minimum Detect																																									
Maximum Detect																																									
Average Concentration																																									
Median Concentration																																									
Standard Deviation																																									

PAH/Phenols										TPH			VOC															
	Acenaphthylene	Anthracene	Benz(a)anthracene	Benz(a)pyrene	Benz(b)(k)fluoranthene	Benz(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Phenols Total	Pyrene	TPH C6 - C9 Fraction	TPH C10 - C14 Fraction	TPH C15 - C28 Fraction	TPH C29-C36 Fraction	TPH+C10 - C36 (Sum of total)	1,1-dichloropropene	1,2-dibromo-3-chloropropene	1,3-dichloropropene	2,2-dichloropropene	Bromomethane	Chloromethane	
EWOL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	50	200	50	50	5	5	5	5	5	50	50
ANZECC 2000 FW 95%												16																
Statistical Summary																												
Number of Results																												
Number of Detects																												
Minimum Detect																												
Maximum Detect																												
Average Concentration																												
Median Concentration																												
Standard Deviation																												