Site Audit Report

UTS Blackfriars Campus
4-12 Buckland Street
Chippendale, NSW

Prepared for

University of Technology Sydney

James Davis
NSW EPA Accredited Contaminated Land Site Auditor
Accreditation Number: 0301

Final Report

January 2015 **Report Reference: 600050_0301-1415**

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 31st October 2012. For more information about completing this form, go to Part IV.

PART I: Site audit identification

Site audit statement no. 0301-1415

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 James Davis Company Enviroview Pty Ltd

Address PO Box 327

GLADESVILLE NSW Postcode 1675

Phone 0467 375 481 Fax 02 9817 7004

Site details

Address 4-12 Buckland Street

CHIPPENDALE NSW Postcode 2008

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

Part Lot 1 DP 724081, Lot 1 DP 832799, Lots 10-16 Sec 3 DP 466, Lots 18-20 Sec 3 DP 466, Lots 1-9 Sec 4 DP 466 (see attached plan)

Local Government Area City of Sydney Council

Area of site (e.g. hectares) 2,914m^2 Current zoning 10 Mixed Uses

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

Declaration/Order/Proposal/Agreement/Notice* no(s)

……..

Strike out as appropriate

Site audit commissioned by

Name Angela Clements Company Facilities Management
University of Technology, Sydney

Address Level 19, 15 Broadway, (PO Box 123)

ULTIMO NSW Postcode 2007

Phone 02 9514 9220 Fax N/A

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

……

Purpose of site audit

☐ ~~A. To determine land use suitability (please specify intended use[s])~~
~~Residential with access to soil~~

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])**
Proposed Child Care Facility.

Information sources for site audit

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

Coffey Partners International, Douglas Partners.

Title(s) of report(s) reviewed

Coffey Partners International (September 1993) UTS Blackfriars Site Geotechnical Investigation. Document Reference: S9979/1-AB, 2nd September, 1993 (Coffey Partners International, September 1993);

Coffey Partners International (September 1994) Environmental Site Assessment UTS Blackfriars Development Chippendale. Document Reference: S9979/3-AB, 26th September 1994 (Coffey Partners International, September 1994);

Coffey Partners International (August 1998) Draft Health and Safety Plan, Environmental Management Plan, Site Management Plan Incomplete document Dated August 1998 (Coffey Partners International, August 1998);

Douglas Partners (March 2009) Phase 2 Contamination Assessment, UTS Blackfriars Campus, Chippendale. Document Reference: 45996.01 Dated March 2009 (Douglas Partners, March 2009);

Douglas Partners (January 2015) Remediation Action Plan UTS Blackfriars Campus, Chippendale. Document Reference: 45996.04 Rev 2, Dated January 2015 (Douglas Partners, January 2015);

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

……....

Site audit report

Title: Site Audit Report UTS Blackfriars Campus 4-12 Buckland Street Chippendale, NSW

Report No: 600050_0301-1415 Date: 30th January 2015

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

……

……

……

……

……

……

Section B

Purpose of the plan[1] 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** ~~and management plan~~*** *(insert title, date and author of plan)***

  Douglas Partners (January 2015) Remediation Action Plan UTS Blackfriars Campus, Chippendale. Document Reference: 45996.04 Rev 2, Dated January 2015.

  subject to compliance with the following condition(s):

  1. A long-term site management plan must be prepared at the conclusion of the remediation as required by the Remediation Action Plan and must be implemented.
  2. The remediation works, validation reporting and long-term site management plan must be reviewed by a NSW EPA Accredited Site Auditor with consideration as to whether the site is suitable for the proposed land use, subject to the compliance with the long-term site management plan.

[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

**** Strike out as appropriate***

Overall comments

It is recommended that another Site Audit should be conducted following remediation with the purpose of reviewing the remedial works and to certify that the site is suitable for the proposed residential landuse on completion. The requirement for the Site Audit would ideally form a condition of consent of a Development Application relating to the proposed redevelopment of the site, with regard to SEPP 55, so that it is conducted as a Statutory Site Audit as defined by the *Contaminated Land Management Act 1997.*

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. 0301)**.

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 30th January 2015

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.

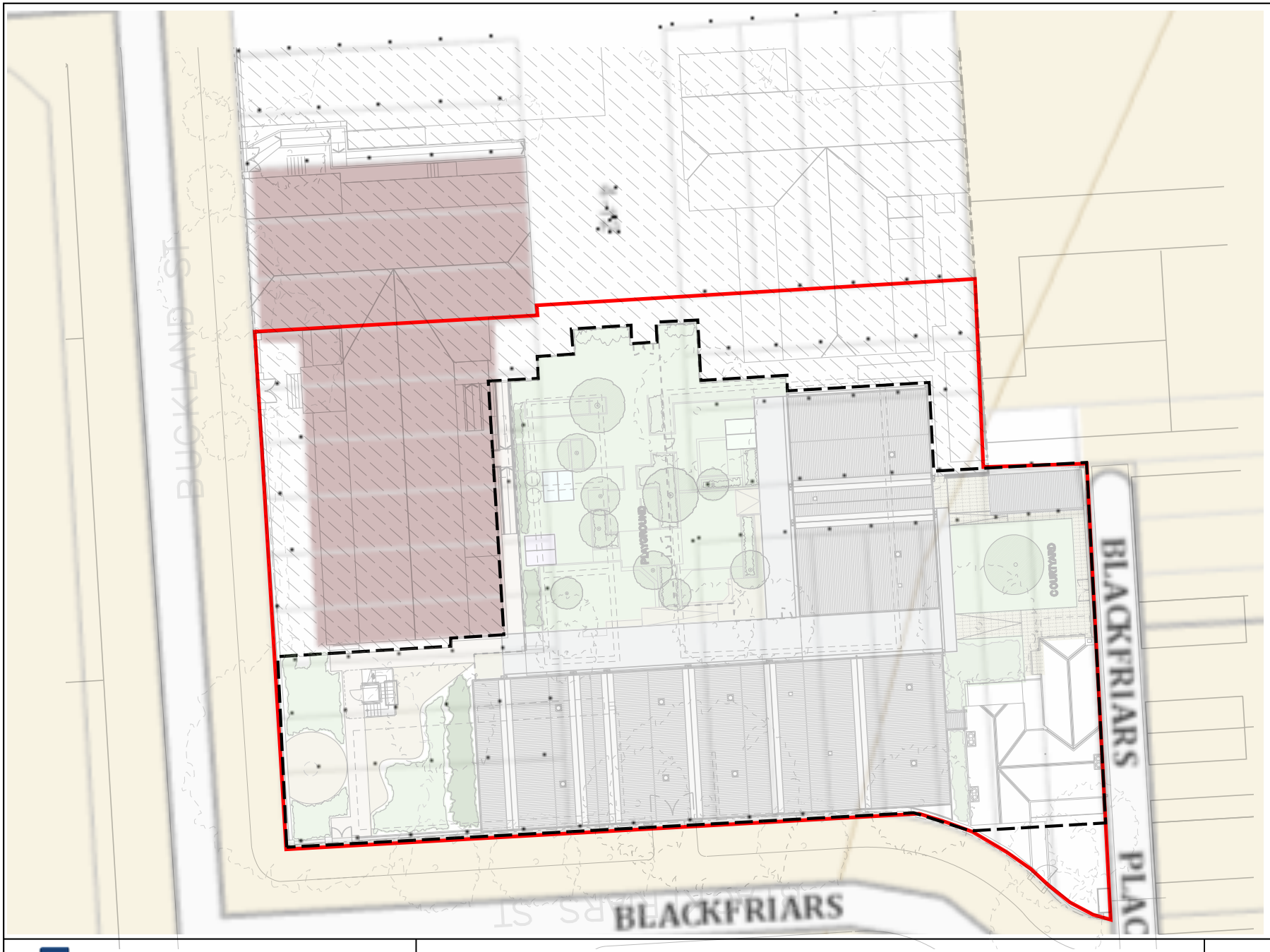
Where to send completed forms

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:

EPA (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
nswauditors@epa.nsw.gov.au

AND

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



ENVIROVIEW

Figure 1. Site Audit Site - Proposed child care centre, 4-12 Buckland Street, Chippendale NSW

Date: 29 January 2015
Drawn By: JRAD
Checked: JRAD
ENVIROVIEW PTY LTD

Report Title

Site Audit Report
UTS Blackfriars Campus
4-12 Buckland Street
Chippendale, NSW

Report Reference: Ref: 600050_0301-1415

Site Audit Details:

Enviroview Project Reference: 600050
Site Auditor: James Davis
Site Auditor Accreditation Number: 0301
Date Audit Commenced: 10 September 2014

List of Site Audit Statements that this report relates to:

0301-1415

Client Details:

Site Audit Commissioned By: University of Technology, Sydney
Client Contact: Angela Clements, Facilities Management Operations

Document Control:

Revision Status	Date	Approved For Issue	Distribution		
			Client	Council	NSW EPA
Final	30/01/2015		*SAR(e)*	*SAS(e)*	*SAS(e)*

Notes: SAS – Site Audit Statement only; SAR – Site Audit Report (and Site Audit Statement)
(e) – electronic copy; (h) – hard copy and number of copies;

Enviroview Pty Ltd
PO Box 327
Gladesville NSW 1675

Executive Summary

This Site Audit Report (SAR) and subsequent Site Audit Statement (SAS) have been produced to document the findings of a Site Audit, conducted by James Davis of Enviroview Pty Ltd, a New South Wales Environmental Protection Authority (NSW EPA) Contaminated Land Accredited Site Auditor on the subject Site located on the UTS Blackfriars Campus, 4-12 Buckland Street, Chippendale, NSW.

The Site Audit has been conducted following a request from the University of Technology, Sydney to undertake a Site Audit on the site and to determine in the Site Auditor's opinion whether the site can be made suitable for the proposed land use. The proposed land use is for a child care facility based on that described in a deferred commencement Development Application determined by the City of Sydney Council. That description is for the removal of an existing temporary university building and for the construction of a new one storey child care centre, the creation of a new open quadrangle play area with new landscaping works to the north of the new building (centre of the site) and the use of an existing building as ancillary office space for the child care centre.

The Site Audit is required as a condition of the deferred commencement Development Application for the proposed development. The condition requires that a Remedial Action Plan (RAP) that was prepared by Douglas Partners is to be peer reviewed by a NSW EPA accredited Site Auditor and for a statement certifying that the RAP is practical and the site will be suitable after remediation for the proposed use to be provided or that a letter of Interim Advice from an accredited NSW EPA Site Auditor advising the site is suitable for the proposed use or capable of being made suitable for the proposed use following remediation. As all Site Audits must conclude with a Site Audit Statement and Site Audit Report and the consent did not include a condition for a Site Audit at the conclusion of the remediation works, it was agreed that a Site Audit Statement was required to meet both the deferred commencement condition and the obligations of the Site Auditor Scheme.

As the Site Audit is being conducted to meet a condition of the Development Application consent, the Site Audit has been conducted as a Statutory Site Audit as defined by section 47(c) of the *Contaminated Land Management Act 1997*.

The material outcome of the Site Audit is this SAR and the subsequent SAS, (SAS number 0301-1415) a copy of which will be attached to the front of this report on completion.

The Site Auditor has inspected the site and has undertaken an independent review of the relevant reports prepared by the contaminated land consultants relating to the site.

The Site Auditor has considered the following matters in relation to those reports:

- The provisions of the *Contaminated Land Management Act 1997* and the *Contaminated Land Management Act (1997) Regulations* and subsequent amendments;
- The provisions of any environmental planning instruments applying to the site; and
- The guidelines made or approved by the NSW DEC under s.105 of the *Contaminated Land Management Act 1997*.

The reports relating to the assessment of the site have been reviewed in relation to the objectives of the Site Audit. The Site Auditor has also visited the site in order to be familiar with the site features and the context of the reports reviewed.

The documents provided by the consultant generally (albeit with some limitations) meet the requirements of the Site Audit in relation to the guidelines for consultants reporting on contaminated sites (NSW OEH, 2011) and other relevant guidelines that apply in relation to methods of data collection, quality and interpretation of the data produced.

With regard to the assessment works conducted the consultants have concluded that fill present on the site is impacted with PAHs and metals, primarily lead. An RAP has been prepared that proposes to remediate the site using a strategy to contain impacted fill below a physical barrier. On the basis of the work undertaken, as described in the reports reviewed, the Site Auditor is satisfied that it provides sufficient detail for the proposed remediation works that is implemented the site can be made suitable for the proposed land use as a child care facility.

The NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition)* prescribe that during an assessment of the suitability of a site for an existing or proposed land use in an urban context, Site Auditors must follow the decision process and checklist for assessing urban redevelopment sites prescribed in the Guidelines. This checklist has been utilised by the Site Auditor in forming the opinion of whether the site can be made suitable for the proposed use.

In conclusion, a Site Audit Statement will be issued certifying that, in the opinion of the Site Auditor that the site can be made suitable for day care, preschool, primary school if the site is remediated in accordance with the RAP that has been reviewed.

The Site Audit Statement will be subject to the condition that a long-term site management plan must be prepared at the conclusion of the remediation and implemented and that the remediation works, validation reporting and long-term management plan is reviewed by a NSW EPA Accredited Site Auditor with consideration as to whether the site is suitable for the proposed land use, subject to the compliance with the long-term site management plan.

Acronyms and Abbreviations

ACM	Asbestos Containing Material
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ASTs	Above ground storage tanks
BTEX	benzene, toluene, ethylbenzene, and xylenes
bgl	Below Ground Level
COC	Chain of custody (can also be contaminants of concern)
CSM	Conceptual Site Model
DA	Development Application
DEC	Department of Environment and Conservation (NSW)
DECC	Department of Environment and Climate Change (NSW)
DECCW	Department of Environment, Climate Change and Water (NSW)
DP	Deposited Plan
HILs	health-based investigation levels
IA	interim advice
LOR	Limit of Reporting
m	Meter
MW	monitoring well
NEHF	National Environmental Health Forum
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
NSW	New South Wales
OCPs	Organochlorine pesticides
OEH	The NSW Office of Environment and Heritage
OPPs	Organophosphorus pesticides
PAH	polycyclic aromatic hydrocarbons
PCoC	Potential contaminants of concern
PID	Photoionisation Detector
PQL	Practical Quantification Limit
RAP	Remedial Action Plan
RPD	Relative Percent Difference
SAQP	Sampling Analysis and Quality Plan
SAR	Site Audit Report
SAS	Site Audit Statement
SEPP 55	State Environmental Planning Policy No. 55 – Remediation of Land
SMP	Site Management Plan
TPH	Total Petroleum Hydrocarbons
USTs	Underground storage tanks
VOCs	Volatile organic compounds
WHS	Work Health Safety

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1 Introduction

1.1 Overview

This Site Audit Report (SAR) and subsequent Site Audit Statement (SAS) have been produced to document the findings of a Site Audit, conducted by James Davis of Enviroview Pty Ltd, a New South Wales Environment Protection Authority[1] (NSW EPA) Contaminated Land Accredited Site Auditor accredited under Part 4 of the *Contaminated Land Management Act 1997* as a Site Auditor.

The Site Audit has been conducted in accordance with the requirements of the *Contaminated Land Management Act 1997* (the 'Act'). The Act defines the Site Audit as follows:

> "Site Audit" means a review:
>
> (a) that relates to management (whether under this Act or otherwise) of the actual or possible contamination of land, and
>
> (b) that is conducted for the purpose of determining any one or more of the following matters:
>
> (i) the nature and extent of any contamination of the land,
>
> (ii) the nature and extent of any management of actual or possible contamination of the land,
>
> (iii) whether the land is suitable for any specified use or range of uses,
>
> (iv) what management remains necessary before the land is suitable for any specified use or range of uses,
>
> (v) the suitability and appropriateness of a plan of management, long-term management plan or a voluntary management proposal.

Furthermore the Act provides the following definitions:

> "Site Audit Report" means a site audit report prepared by a site auditor in accordance with Part 4 [of the Act].
>
> "site audit statement" means a site audit statement prepared by a site auditor in accordance with Part 4 [of the Act].

The *Contaminated Sites: Guidelines for the NSW Auditor Scheme (2nd edition)*, (NSW DEC, 2006) describes the site assessment and Site Audit process where the contaminated land

[1] *The NSW EPA has undergone a number of name changes in the recent past; however certain statutory functions and powers have always and continue to be exercised in the name of the Environmental Protection Authority (NSW EPA). From September 2003 the NSW EPA became part of the NSW Department of Environment and Conservation (NSW DEC), then on 27 April 2007, the NSW DEC became the NSW Department of Environment and Climate Change (NSW DECC), and in August 2009, the NSW DECC became the NSW Department of Environment, Climate Change and Water (NSW DECCW) and then on 4 April 2011, the NSW DECCW became the NSW Office of Environment and Heritage (NSW OEH) within the NSW Department of Premier and Cabinet. Most recently, on 29 February 2012, the NSW EPA became a separate statutory authority. The NSW EPA is responsible for environmental regulation and associated activities throughout NSW including those activities regulated under the Contaminated Land Management Act 1997. The use of the names OEH, DECCW, DECC, DEC and NSW EPA in this report are used with regard to the name relevant at the time and context of the reference, but are considered generally interchangeable and can be interpreted as one and the same.*

consultant is commissioned to design and conduct site assessments and if necessary the remediation and validation, and documents this process and the Site Auditor independently reviews the consultant's assessment, remediation and validation plans or reports and prepares the material outcome of the Site Audit - the Site Audit Report and Site Audit Statement.

The Site Audit must consider the following matters in relation to the works implemented and reported:

- The provisions of the Act and the *Contaminated Land Management Act (1997) Regulations* and subsequent amendments;
- The provisions of any environmental planning instruments applying to the Site; and
- The guidelines made or approved by the NSW EPA under s.105 of the Act.

1.2 Guideline Documents

Guidelines made or approved by the NSW EPA under s.105 of the Act at the time of the Site Audit include:

- Contaminated Sites: Guidelines for the vertical mixing of soil on former broad-acre agricultural land, NSW EPA, 1995 (NSW EPA, 1995)
- Contaminated Sites: Sampling Design Guidelines, NSW EPA, 1995 (NSW EPA, 1995)
- Contaminated Sites: Guidelines for Assessing Banana Plantation Sites, NSW EPA, 1997 (NSW EPA, 1997a)
- Environmental Guidelines: Use and Disposal of Biosolids Products, NSW EPA, 1997 (NSW EPA, 1997b)
- Contaminated Sites: Guidelines for Assessing Former Orchards and Market Gardens, NSW DEC 2005 (NSW DEC, 2005)
- Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition), NSW DEC, 2006 (NSW DEC, 2006)
- Contaminated Sites: Guidelines for the Assessment and Management of Contaminated Groundwater, NSW DEC, 2007 (NSW DEC, 2007)
- Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997, NSW DECC, 2009 (NSW DECC, 2009)
- Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, NSW OEH, 2011 (NSW OEH, 2011)
- National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, 1999 (Amended May 2013) (NEPC, 1999, Amended 2013)
- 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, 2000 (ANZECC/ARMCANZ, 2000)

- Australian Drinking Water Guidelines. National Health and Medical Research Council and Natural Resource Management Ministerial Council, 2004 (NHRMC/NRMMC, 2004)
- Composite Sampling. by Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, Adelaide (NEHF, 1996)
- Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards. Department of Health and Ageing and EnHealth Council, Commonwealth of Australia, 2012 (EnHealth, 2012a)
- Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental, February 1996 (NSW Agr., 1996)

From time to time the NSW EPA may amend the guidelines made or approved under s.105 of the Act. For instance the Contaminated Sites: *Guidelines for Assessing Service Station Sites, NSW EPA, 1994* (NSW EPA, 1994), have recently been rescinded and replaced with the Technical Note: Investigation of Service Station Sites (NSW EPA, 2014). The Technical Note is not made or approved under the Act.

Also of relevance is that on 11th April 2013, the Standing Council on Environment and Water agreed to amend the National Environment Protection (Assessment of Site Contamination) Measure (NEPM). The NSW EPA approved the 2013 amendment to the NEPM on 11 June 2013, with the amendment having affect on 16 May 2013. In NSW, the amended NEPM and its supporting schedules apply to works completed after 15 May 2013.

1.3 Requirement for the Site Audit

The Site Audit is required as a condition of a deferred commencement Development Application (D/2012/1398) for the proposed development of the site as a child care facility. The condition requires that a Remedial Action Plan that was prepared by Douglas Partners dated March 2008 is to be peer reviewed by a NSW EPA accredited Site Auditor and to provide a statement certifying that the RAP is practical and the site will be suitable after remediation for the proposed use or that a letter of Interim Advice from an accredited NSW EPA Site Auditor advising the site is suitable for the proposed use or capable of being made suitable for the proposed use following remediation. As all Site Audits must conclude with a Site Audit Statement and Site Audit Report and the consent did not include a condition for a Site Audit at the conclusion of the remediation works, it was agreed that a Site Audit Statement was required to meet the deferred commencement condition and the obligations of the Site Auditor Scheme.

As the Site Audit is being conducted to meet a condition of the Development Application consent, the Site Audit has been conducted as a Statutory Site Audit as defined by section 47(c) of the *Contaminated Land Management Act 1997*.

1.4 Site Auditor

James Davis of Enviroview Pty Ltd, is a NSW EPA Contaminated Land Accredited Site Auditor accredited as a Site Auditor under Part 4 of the *Contaminated Land Management Act 1997* (NSW EPA Accreditation Number 0301).

The Site Audit has been conducted following a request from Angela Clements on behalf of the University of Technology, Sydney in September 2014.

1.5 Objective and Scope of the Site Audit

The objective of the Site Audit was to independently review the Remediation Action Plan prepared by Douglas Partners and to determine in the Site Auditor's opinion whether the Site can be made suitable for the proposed landuse. The proposed land use is for a child care facility based on the approved development description of a deferred commencement Development Application determined by the City of Sydney Council. That description is for the removal of an existing temporary university building to construct a new one storey child care centre, the creation of a new open quadrangle play area with new landscaping works to the north of the new building the use of an existing building in the south-eastern corner of the site as ancillary office space for the child care centre.

In order to achieve this aim, the Site Auditor inspected the site and has undertaken an independent review of relevant assessment reports relating to the site that have been prepared by contaminated land consultants as well as the Remediation Action Plan and assessed whether the consultant's work followed the relevant guidelines and provides a robust basis for the decisions or actions relating to the site. The review of the various reports has resulted in the Remediation Action Plan being revised in order for the objective the Site Audit to be met.

The material outcome of the Site Audit is this SAR and subsequent SAS, (SAS number 0301-1415) a copy of which will be attached to the front of this report on its completion.

1.6 Documents Reviewed

The following documents were reviewed as part of this Site Audit:

Coffey Partners International (September 1993) *UTS Blackfriars Site Geotechnical Investigation*. Document Reference: S9979/1-AB, 2nd September, 1993 (Coffey Partners International, September 1993);

Coffey Partners International (September 1994) *Environmental Site Assessment UTS Blackfriars Development Chippendale*. Document Reference: S9979/3-AB, 26th September 1994 (Coffey Partners International, September 1994);

Coffey Partners International (August 1998) *Draft Health and Safety Plan, Environmental Management Plan*, *Site Management Plan* Incomplete document Dated August 1998 (Coffey Partners International, August 1998);

Douglas Partners (March 2009) *Phase 2 Contamination Assessment, UTS Blackfriars Campus, Chippendale.* Document Reference: 45996.01 Dated March 2009 (Douglas Partners, March 2009);

Douglas Partners (January 2015) *Remediation Action Plan UTS Blackfriars Campus, Chippendale*. Document Reference: 45996.04 Rev 2, Dated January 2015 (Douglas Partners, January 2015);

1.7 Site Audit Inspections

Whilst undertaking the Site Audit an inspection of the Site was conducted. The following table lists the details of the inspection of the Site conducted by the Auditor.

Table 1-1 Site Inspections

Date	Attendance	Purpose
2nd October 2014	James Davis – Enviroview, Site Auditor Angela Clements – UTS Facilities Management Operations	Site inspection – Site familiarisation of proposed child care facility and site features

1.8 Audit Correspondence

Correspondence in the form of Site Audit interim advice was issued in regard to the Site Audit to clarify and request additional information and to provide guidance on the Site Audit requirements. Site Audit interim advice is provided in **Appendix A**.

1.9 Chronology of Site Assessment and Audit Works

The chronology of events of site assessment, auditor review and preparation of final audit statement and report undertaken at the site has been summarised in the following table.

Table 1-2 Summary of Assessment and Site Audit Works

Date	Action
August 1993	Coffey Partners International conducts an Environmental Site Assessment of the northern portion of the Blackfriars Precinct in preparation of the construction of a child care centre.
April 1994	Planning consent approved for the child care centre from City of Sydney Council.
July 1994	Coffey Partners International a second Environmental Site Assessment across the whole of the Blackfriars Precinct in preparation of the construction of the child care centre located in the northern portion of the site.
August 2008	Coffey Partners International prepares draft Heath, Safety and Environmental Site Management Plans in relation to the capping of the site with a physical barrier system.
February 2009	Douglas Partners conduct a Phase 2 Environmental Site Assessment of the site with regard to the redevelopment of the Blackfriars Precinct including relocation of the child care centre into the heritage residential building to the south of the site and construction of the number of multistorey buildings for student accommodation.
April 2009	Application for planning consent for major alterations to the site including the construction two terrace buildings and a 4-storey student accommodation building alterations to the residence building and relocation of the child care centre and demolition of the building. Application withdrawn July 2009.
March 2009	Douglas Partners prepare a Remediation Action Plan for the remediation of the site for student accommodation and child care centre.
April 2013	Deferred Commencement DA approved for the Removal of an existing temporary university building to construct a new one-storey child care centre. Works include the creation of a new open quadrangle play area with new landscaping works to the north of the new building (centre of the site) and will use the existing building in the south-eastern corner of the site as ancillary office space for the child care centre. Deferred commencement DA has conditions relating to the remediation of the site as per the 2009 Douglas Partner RAP and for the Site Audit in relation to whether the site

Date	Action
	can be made suitable.
10 September 2014	James Davis of Enviroview Pty Ltd is engaged to conduct a site audit for the property. Commencement of Statutory Site Audit 0301-1415.
29 September 2014	Douglas Partners issue Revision 01 of the RAP.
2 October 2014	Site inspection by James Davis of Enviroview Pty Ltd.
3 November 2014	Preparation of Interim Audit Advice 01 on the RAP for the site by the Site Auditor - James Davis.
6 January 2015	Douglas Partners issue Draft (track changes) Revision 02 of the RAP.
30 January 2015	Douglas Partners issue Final Revision 02 of the RAP.
30 January 2015	Preparation of a Site Audit Statement and Site Audit Report for Audit 0301-1415 conducted by James Davis of Enviroview Pty Ltd with regard to whether the site can be made suitable for the proposed land use subject to the implementation of the RAP. Recommendation as a general comment on the Site Audit Statement that a Site Auditor is engaged to conduct a site audit with regard to whether the site is suitable for the proposed land use following remedial works and prior to child care centre occupation.

2 Site Description

2.1 Site Identification

A summary of the Site identification details is provided in the following table.

Table 2-1 Summary Site Details

Street Address:	4-12 Buckland Street, Chippendale, NSW 2008
Property Description:	Part Lot 1 DP 724081 Lot 1 DP 832799 Lots 10-16 Sec 3 DP 466 Lots 18-20 Sec 3 DP 466 Lots 1-9 Sec 4 DP 466
Zoning:	10 Mixed Uses
Local Government Area:	City of Sydney Council
Property Size:	Approximately 2,914m^2

Located within **Appendix B** are plans that depict the site, **Figure 1** identifies the site location of the site and **Figure 2** identifies the Site Audit Site.

The site is located within the central Sydney suburb Chippendale about 1.4 kms south east of the Sydney Town Hall.

2.2 Site Condition and Surrounding Environment

The site is an irregular, almost rectangular-shaped generally flat land parcel located at the northeastern corner of Blackfriars and Buckland Streets, Chippendale. The site is part of the Blackfriars Campus of the UTS and includes and number of existing buildings and features including:

- A two storey heritage listed building (Building B2), located on the western boundary;
- A timber clad demountable building (Building B1) located in the south-western corner of the site;
- A two storey brick residence, labelled as “The Residence”, located in the south-eastern corner;
- Open, bitumen covered car parking facilities and landscaping (paved areas, lawns and gardens) between the buildings;
- Numerous small to large canopy trees are present within the site, particularly in the western and southern site boundaries.

A high brick wall is located (in some locations forming the wall of adjoining buildings including a two storey brick building) on the eastern boundary of the site and Blackfriars Place. The northern boundary of the site subject to the Site Audit is the northern extent of the proposed development, beyond this is the current child care centre comprising of a single storey structure and associated play areas. The fencing along the southern and eastern boundaries comprises steel encased in sandstone columns and footings.

The surrounding land uses were noted at the time of the Douglas Partners (Douglas Partners, March 2009) investigation of the overall Blackfriars precinct and for the site audit site by observations from the site inspection by the Site Auditor:

- To the north: Blackfriars Broadway Inn (a 3 storey building), a carwash and University of Notre Dame (Sydney Campus) buildings fronting Broadway and a child care facility;
- To the east: The University of Notre Dame (including a number of 3 to 4 storey buildings positioned apparently on the site boundary), Blackfriars Place and a 4 storey residential (possibly student accommodation) building;
- To the south: Blackfriars Street, commercial and residential properties beyond (typically 3 storeys in height);
- To the west: Large multistorey brick and sandstone heritage building and Buckland Street and residential properties beyond (typically 3 storeys in height; probable student accommodation).

2.3 Topography and Hydrology

The consultant (Douglas Partners, January 2015) reported the general topography of the site and environs to slope gently downwards to the north, towards Sydney Harbour (Blackwattle Bay). Based on the local topography, the stormwater flow would also be towards Sydney Harbour (north). The site is understood to be located on the southern extent of what was originally Blackwattle swamp.

2.4 Geology and Hydrogeology

The Soil Landscape Map of Sydney (Soil Landscape Series Sheet 9130, Scale 1:100,000, 2002), prepared by the Soil Conservation Service of NSW was referenced and found to indicate that the site is located within a Disturbed Terrain; land that may be extensively disturbed by human activity including complete disturbance, removal or burial of soil, or landfill including soil, rock, building, and waste materials. The investigations by Coffey (Coffey Partners International, September 1994) and Douglas Partners (Douglas Partners, March 2009) indicated fill depths of between 1.6 m and 4.1 m below ground level at the site.

Reference to the Sydney 1:100 000 Geological Series Sheet indicates that the site is underlain by stream alluvium and estuarine deposits (silty to peaty quartz sand, silt and clay) as well as man-made filling. The natural deposits are considered to be mainly alluvium beneath the site. Sandstone bedrock was encountered during the Coffey and Douglas Partners investigations at depths ranging from 3.8 m and 8.3 m below ground level.

A NSW DWE groundwater bore search was conducted on the 10 February 2009. Seven bores were found within a 1 km radius of the site. All the bores were for monitoring purposes. The water bearing zones for two of the bores (109649 and 109648) were indicated as 3.2 - 6.2 m and 5.2 - 6.2 m respectively. Driller logs were also available for Bores 109649 and 109648. Filling was encountered at depths between the surface and 4.8 m, silty sand between 4.8 m

and 5.9 m, silty clay between 2.9 m and 4.9 m, silty sand between 4.9 m and 5.8 m and sandstone between 5.8 m and 7.20 m.

Groundwater was not encountered during drilling for the Douglas Partners (Douglas Partners, March 2009) investigation, however groundwater was observed following installation in the four wells at the site at depths of between 2.08 m and 3.0 m below ground level. These findings confirmed the findings of groundwater by Coffey (Coffey Partners International, September 1993) at about 3.0 m below ground level, reported in 1993. The results show little or no changes in groundwater levels beneath the site over a period of 15 years.

Based on the measured groundwater levels and regional topography, the inferred direction of groundwater flow is towards the north. The groundwater is likely to feed into Blackwattle Bay, which is located approximately 1.3 km north of the subject site.

2.5 Audit Discussion of Site Description

The information provided by the consultants in regards to the site condition and surrounding environment has been checked against, and meets the requirements of NSW EPA Guidelines (NSW OEH, 2011). The information provided is also consistent with the observations made by the Site Auditor during the site inspection conducted on 2nd October 2014.

The consultant has provided the information required in regard to topography and hydrology, geology and hydrogeology.

The consultant included the list of site identification including a list of Lot and Deposited Plan (DP) details. A review of the deposited plans confirms that the site plan and site location provided by the consultant are consistent with the deposited plans for the site. It is noted however the all the previous reports for the site are for the wider Blackfriars precinct, where this Site Audit only relates to the southern part of the Precinct. Unfortunately this portion of the site does not follow lot boundaries as the development utilises what area is available and as the ownership of the site is under a single owner the development is not constrained by the Lot boundaries with the overall Blackfriars Precinct. Hence, the requirements of the site audit in relation to site identification have been met.

Overall, the information provided by the consultant in relation to site condition and the surrounding environment is considered adequate for the purposes of assessing the site for the intended purposes. As such, in the Site Auditor's opinion the information provided meets the requirements of the Site Audit.

3 Site History

The consultant's (Douglas Partners, March 2009), (Douglas Partners, January 2015) presented a limited review of available historical data. The history of the site presented was obtained almost exclusively from an archaeological assessment conducted by Casey and Lowe Associates (Heritage Consultants) in August 1993. An assessment of the reports (not sighted by the Site Auditor) revealed the following:

- Blackfriars School was established on the site in 1883;
- Prior to the school, the site was occupied by an industrial estate which was the largest in nineteenth century Sydney;
- In 1825, the Brisbane distillery was built over a large area, including the site. A brewery was added to the site later;
- Blackwattle creek, which drained to the nearby Blackwattle swamp, was dammed to create a reservoir beside the distillery. The path of Blackwattle creek is now occupied by a sewer line;
- In 1852, the distillery was taken over by Colonial Sugar Refining Company (formerly Australasian Sugar Company). During the refinery's occupation, complaints were made about the pollution of the dam and Blackwattle swamp creek. The waste was later diverted into the Abercrombie Street sewer;
- In 1878, the refinery was moved, the buildings were removed and the land was later subdivided;
- The Department of Education bought the site and school buildings were completed in 1884;
- The original swamp creek survived into the 1890s;
- The playground was first tarred in 1886 - 1887.

The following description of the historical site activities during the industrial use of the site included in the Coffey's report (Coffey Partners International, September 1994) included the following:

> *"In 1825 the Brisbane Distillery was erected over an area which encompassed the Blackfriars estate. The Distillery, described as a series of "gigantic buildings" comprised a distillery, malting-stores, a pair of 40 horsepower steam engines, flour mills and ovens etc. Later a brewery was added. Blackwattle Creek which drained the nearby Black Wattle Swamp area was dammed to create a large reservoir beside the Distillery. A smaller pond is also depicted in the historical maps to the east of the reservoir. The path of Blackwattle Creek is now occupied by a sewer line."*

A review of the historical maps from 1854 (Woolcott & Clarke's Map of Sydney) indicates that the reservoir discussed is in the vicinity of the Site. A plan provided in a 1994 report by Coffey (Coffey Partners International, September 1994) showed outlines of the sugar refinery buildings located on the site and outlines of the reservoir discussed. The plan is provided in **Appendix C**.

The only additional search related to the was a search for dangerous goods licences registered with NSW WorkCover conducted by Douglas Partners in 2009 (Douglas Partners, March 2009) which did not find any records of dangerous goods licences pertaining to the site.

Further review of historical records (http://dictionaryofsydney.org/entry/chippendale) by the Site Auditor found that the University of Technology, Sydney purchased Blackfriars Public School in 1996 for the current uses. However it would appear that the University had an interest in the site in prior to 1994 when it directly engaged consultants to undertake geotechnical and environmental investigations.

3.1 Audit Discussion of Site History

The information required by NSW EPA guidelines (NSW OEH, 2011), in regard to the documentation of the Site history was limited. The consultant's various reports did not include the usual search of relevant records available, such as council records, title information and review of aerial photographs. It would appear that this is due to the relatively rich early history of the site associated with the historic suburb of Chippendale, and the connections with the early industrial development of Sydney, with the relatively long association of the site as an educational precinct as Blackfriars Primary School that opened in 1883 and operated through to the late 1980s.

Records relating to specific industrial history at the site prior to 1883 would have been difficult for the consultant to find with the site, prior to the failed residential subdivision in 1879, part of the much larger Colonial Sugar Refinery and former Brisbane Distillery, which dated back to 1825, predating meaningful records from a contaminated land perspective.

4 Potential Contaminants of Concern

Douglas Partners (Douglas Partners, March 2009) concluded that given the available information, it was considered that the potential sources of contamination included:

- placement of imported filling to form and/ or level the site; and
- historical commercial / industrial site uses.

It was considered by the consultant that the potential contaminants on the subject site may include: (Douglas Partners, March 2009)

- Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn);
- BTEX (Benzene, Toluene, Ethylbenzene and Xylene);
- VOCs (Volatile Organic Compounds);
- TPH (Total Petroleum Hydrocarbons),
- PAH (Poly Aromatic Hydrocarbons);
- OCP (Organochlorine Pesticides);
- PCB (Polychlorinated Biphenyls);
- Cyanide;
- Total Phenolics; and
- Asbestos.

4.1 Audit Discussion of Potential Contaminants of Concern

The consultant has identified a broad range of potential contaminants of concern related to the site history and activities identified on the site.

The consultant did not discuss the rationale for the selection of contaminants of concern that are broad and in a number of instances were not compounds developed at the time of the key industrial use of the site or even the importation of fill onto the site which it is assumed occurred prior to the construction of the school and associated paved areas, and local roads, thought to have occurred in the late 1880's at the latest. It can only be concluded that the consult was not being particularity specific in listing the potential contaminants of concern.

It is the Site Auditors opinion that given the history of the site and surrounding industrial uses at the time that imported fill could have been applied to the site that the key potential for contamination would be from ash and ash/slag materials related to the operation of the distillery and sugar refinery (burning of materials to generate charcoal for filters and to heat boilers), and possible imported gas works waste.

5 Data Quality Objectives

The Data Quality Objectives (DQO) process is used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a Site. It provides a systematic approach for defining the criteria that a data collection design should satisfy. The USEPA developed the DQO process as a seven step iterative planning approach, to be undertaken prior to investigative work.

NSW DEC (2006) states that Site Auditors must check that the consultant has properly addressed and adopted DQOs for the investigation or validation programme and that the consultant's report includes the following:

- A statement of predetermined DQOs for the field and laboratory procedures, including quantitative DQOs (in this instance these DQO are related to the implementation of adequate field and laboratory QA/QC and are referred to as Data Quality Indicators for the quantitative assessment of data quality);
- A plan to achieve pre-determined DQOs; and,
- Procedures to be undertaken if the data does not meet the expected DQOs.

5.1 Audit Discussion on Data Quality Objectives

Data Quality Objectives are a planning tool that is an independent process from the Quality Assurance/Quality Control processes that are standard in both investigation and validation reports. The DQOs are specific to each investigation and should be completed prior to any field work to assist in development of an optimal sampling analytical and quality plan in order to most effectively reach the projects objectives.

Douglas Partners (Douglas Partners, March 2009) and (Douglas Partners, January 2015) developed DQOs in relation to the investigation undertaken for that Site Assessment and proposed remediation validation. The full seven steps were documented, and were consistent with the stated objectives of the assessment and provided detail on the management of data collection and use. The details of the DQOs for the investigation and risk assessment works conducted are deemed sufficient and meet the objectives of this Site Audit. Previous investigations did not include the DQO process, and predated the requirement for the process and all but the earliest publications on DQO by the US EPA.

6 Environmental Site Assessments – Coffey Partners

Coffey Partners International (Coffey) completed two Environmental Site Assessments in 1993 and 1994. The first of the assessments (Coffey Partners International, September 1993) was commissioned by Taylor Thomson and Whitting (Consulting Engineers) in August 1993 in relation to the construction of a child care centre proposed for the northwest portion of the Blackfriars precinct site (approximately where the current child care centre is located to the north of the Site Audit site). The assessments undertaken were to assess the subsurface conditions so that foundation options for the building could be recommended and to assess the likelihood of the presence of any chemical contamination relating to the fill material of unknown origin, believed to have been disposed of on the site.

This first of the assessments involved the drilling of four exploratory boreholes to bedrock, including the coring of 3m of the bedrock material, the collection of environmental soil samples, and the collection of geotechnical soil samples. The report provided to the Site Auditor was not complete and did not contain a plan of the site with sample locations, however the description of the fieldwork conducted indicates that the sampling program was confined to the area of the current child care centre, which is outside the Site Audit site. The results do however provide some information of the characteristics of the fill present across the Blackfriars precinct.

Two soil samples were reported to have been collected from each of the four boreholes for the environmental assessment and submitted for analysis of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), and a suite of heavy metals. The heavy metal suite consisted of arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), lead (Pb), selenium (Se), and zinc (Zn). The TPH and PAH samples were sent to Australian Government Analytical Laboratories (AGAL) and the heavy metal samples were sent to Sydney Analytical Laboratories (SAL).

The laboratory results indicated concentrations of Cu, Zn and Hg in excess of the NSW EPA criteria available at the time - based on ANZECC (ANZECC, 1992) guidelines for standard residential land use. The heavy metals contamination appeared to be restricted to fill material that was reported to be generally 2.5m to 3.9m in thickness. It was noted that the elevated concentrations did not greatly exceed the relevant criteria, however no statistical interpretations was provided. The laboratory results also indicated that concentrations of PAH in excess of the NSW EPA criteria were also present within the soils at Blackfriars site 'significantly' in excess of the criteria. No detections of TPH were recorded. The elevated concentrations appeared to be restricted to the top 1.5m of fill material on the site; in particular observations of coal waste were made in two of the borehole locations. Further, the concentrations of benzo(a)pyrene in fill samples from three locations were in excess of the ANZECC (ANZECC, 1992) health based investigation level.

The investigation found that fill material covers the site generally to a depth of 2.5m to 3.9m below ground level. During the drilling investigation, material comprised of coal waste and cinders was observed at two locations. No olfactory evidence of hydrocarbons or solvents was observed during the drilling in either fill or natural soils.

The alluvium directly underlying the fill was not submitted for laboratory analysis. However, the general impermeable nature and high affinity for absorption of chemical species by

these materials suggests that migration of the detected contaminants through this material is unlikely. However, if further investigations are conducted, it was recommended that materials directly beneath the fill or just at or below the water table be collected and submitted for laboratory analysis.

The consultant commented that that the contamination appeared to be restricted to the fill materials. As such remedial options that could be considered were on-site containment, in-situ remediation or off-site disposal. The consultant stated that discussions with the NSW EPA indicated that extensive clean up of the contaminated material may not be required provided that:

- there is an adequate seal covering any contaminated material which will prevent infiltration of surface water and any airborne disturbance, and
- there is no connection between the material and groundwater, thus restricting off site migration of any dissolved contamination.
- The presence of a bitumen pavement over much of the site and the location of the material well above the water table appears to satisfy these conditions. However, any grassed or unsealed areas may not satisfy these requirements. We therefore recommend that the top 1m of any such "exposed" areas be assessed for potential contamination. Should any contamination be reported, it is recommended that in order to minimise potential exposure, a cover of 300mm to 500mm of clean fill be placed on these areas, followed by seeding and landscaping.

Following discussion between the consultant and UTS, Coffey Partners International Pty Ltd were engaged by UTS to conduct the second assessment at what was described as the 'Blackfriars Development'. The investigations were undertaken in July 1994 and coincided with UTS gaining planning consent site's redevelopment for University buildings, a university residence and a child care centre. The objectives of the assessment were to:

i.) investigate and assess contamination on site;
ii.) compare contaminant concentrations to NSW EPA contaminant guidelines;
iii.) qualitatively assess the implications of contamination in regards to:

- children playing on site;
- contaminants leaching into groundwater;
- health and safety of workers on site; and
- longer term management of site contamination.

It is noted that the proposed child care centre was located where the current child care centre is located outside the current Site Audit site boundary. The University residence is the heritage building located in the southeastern corner of the Site Audit Site.

The report identified from the site history and previous investigations the following areas of environmental concern to exist on the site:

- previous locations of Cooper's Reservoir and pond where the Refinery's effluent was apparently discharged.
- fill over the site generally which was found at three locations to contain elevated concentrations of heavy metals and PAH's and may contain waste from the Distillery/Refinery processes.
- groundwater on the site, which may be contaminated due to previous site, uses and which exists at shallow depths at least in the northern half of the site.

Pits of about 2m by 1m were dug to various depths over the site. A Plan showing the locations of the test pits presented by the consultant is provided in **Appendix D**. Locations TP6, TP8 TP9, TP10 and TP11 are located within the Site Audit Site. Soil was sampled from the surface 0.2m, from distinct fill layers and from below the fill. The soil was placed in 250 ml glass jars, which were placed in ice filled 'eskies' for dispatch to Australian Government Analytical Laboratories (AGAL).

On the basis of the site's background the following suite of analytes was chosen for soil analysis;

- Heavy Metals: As, Cd, Cr, Cu, Hg, Pb, Se, Zn
- Organics: Polycyclic aromatic hydrocarbons (PAH's), Total Petroleum Hydrocarbons (TPH) and Phenols.

The consultant presented a table of field observations that is provided in **Appendix E**.

The consultant reported that fill was encountered over the entire site. In the northern section of the site (outside of the Site Audit site), where the former reservoir and Blackwattle Creek was previously located, the deepest fill present was observed at 3.9m. In the southern half of the site (within the Site Audit Site), fill is shallower from 0.4m to 1.2m depths. The nature of the fill varied over the site. Generally in the southern section, fill consisting of clay and sand with seams of coal, brick and bottle fragments was found.

The consultant concluded that the fill on the site was a result of the infilling of Cooper's reservoir. Other fill on site may be characteristic of the general area that, the soil series map shows to be extensively filled.

Groundwater was encountered at depths of between 1.3m and 3m below the ground surface. The groundwater occurred below the fill layer.

The consultant presented a table of the laboratory results for soil, which is provided in **Appendix F**. Of the samples collected within the Site Audit site detections of TPH were found at TP11. Phenols were not detected in any of the samples. With the exception of TP9, heavy metals exceeded the ANZECC (ANZECC, 1992) guidelines at the surface and at depth for all other samples. Of greatest significance were the elevated mercury and lead levels with concentrations associated with fill. PAHs in excess of the ANZECC guidelines were found at locations TP11. Benzo(a)pyrene also exceeded the ANZECC guidelines at this location.

The consultant summarised the findings with the following points:

- Fill exists over the whole site and appears to range in depth from about 1m to 3.9m;
- The fill appears to have been placed many decades ago on this site and in surrounding, low lying areas of Chippendale and it sources are largely unknown;
- Some of the fill is contaminated at various depths with no clear spatial pattern to the contamination;
- Contaminated portions of the fill contain mercury, lead, zinc, copper and PAHs above the guidelines applied at the time.

The consultant concluded that as the concentrations of contaminants in some of the fill exceed the guidelines applied (ANZECC, 1992), that there was a need to undertake further investigations and/or manage the soil contamination.

A management option was recommended based on the stage of the development, and the location of historic buildings and underground services and with consideration that the contaminated fill was likely present beneath the existing historic buildings on the site and probably wide spread in the general area.

On this basis is was considered 'clearly impractical' to remediate all of the contaminated soil on the site and there would be little beneficial effect in remediating 'blocks' of onsite contaminated soils.

The consultant then recommended a strategy of leaving the contaminated soil in place and covering the soil in such a way that the risk of exposure to site users was to be substantially reduced. Further discussion was provided justifying that the approach would reduce the risk of exposure to workers and users of the site and details of the required cover, including permanent paving, buildings, 150mm of top soil and marker layers in landscaped areas, restriction of access to crawl space under buildings and construction of barriers around larger trees. The following specific recommendations were made:

- Operations and maintenance manual contain warnings of underlying contaminated soils;
- Warning layer in turfed and garden beds; Trap doors and other entrances into building under spaces should be locked and clearly signposted;
- Where garden beds may be disturbed in the future, fences should be constructed to prevent access by site users;
- In the area of the childcare centre, a cover comprising 150 mm turfed topsoil overlying 150 mm compacted road base overlying a plastic warning layer and the 20 mm bitumen already covering the site. It was also recommended an additional plastic warning layer be placed between the topsoil and the child care centre building footprint;
- Soils beneath the university residence should be treated in the same way as the childcare centre, or by applying a sand or concrete or brick paving;
- Soil imported to the site should be assessed for contamination prior to placement; and

- Long-term maintenance plan should be implemented to maintain the barrier system.

Potential groundwater contamination was not considered to be significant as it was unlikely that groundwater was affected by the site contamination, there would be limited or no use of groundwater down gradient and general contamination of groundwater from the area was likely.

6.1 Audit Evaluation of Coffey Site Assessments

The Environmental Site Assessments reported by Coffey (Coffey Partners International, September 1993), (Coffey Partners International, September 1994) has provided a relatively comprehensive study of the site at the time the investigations were conducted with a relatively good description of site conditions, geology and hydrogeology and history.

It is acknowledged that the assessment was conducted over twenty years ago, and a number of key guidelines for site assessments have been developed since that time which the report does not make reference to.

The report findings can only be considered indicative of the site conditions, however the findings are consistent with the documented history of the site. The site has been a School from the late 1800's to recent times, and it would appear that prior to development of the school that the site was filled with uncontrolled fill, containing ash, clinker, coke and coal materials. This has resulted in the fill, which extends in most locations to at least 1.4 mbgl being contaminated with heavy metals and PAHs.

7 Draft Management Plans

In August 1998 Coffey Partners International prepared draft management plans related to the management of the site with regard to Heath and Safety and Environmental Management. These plans, developed in 1998 were presented to the Site Auditor in the document titled “University Of Technology, Sydney Blackfriars Campus Site Management Plan” but will be referred to as the Coffey Site Management Plans (Coffey Partners International, August 1998). It is inferred that the site management plans were developed following the implementation of the recommendations of the Coffey Partners site assessment during the development of the site and the construction of the current child care centre to the north of the Site Audit site. It is noted that the plans are draft and required additional site-specific information to be provided.

The following section provide a brief outline of the plan contents and further discussion is provided on the contents of the management plans in later sections of this report.

7.1 Health and Safety Management Plan

This document provided a general framework for protection of workers against the soil contamination. It outlined the responsibilities of the on-site workers, the controls (work and decontamination zones), the site hazards to be aware of, the safe work practices and the reporting of any breaches of the plan.

7.2 Environmental Management Plan (draft), August 1998

The purpose of this plan was to ensure that al soil material left on site is cover and that any soil material to be disposed off-site is carried out appropriately. It outlined specific requirements in relation to the management of contaminated soil on site.

This Plan was produced to manage the soil contamination through the implementation of the following requirements:

- Placement of protective barriers;
- Maintenance of protective barriers;
- Application of controls on site excavation works; and
- Application of controls on works underneath buildings where there are no soil covers.

It was noted in the subsequent assessment of the site and during the review of the draft Plans by Douglas Partners in 2009 that a number of the requirements of the plan had not been implemented.

8 Phase 2 Environmental Site Assessment

The contaminated land consultant Douglas Partners was engaged by Hutchinson Builders retained in February 2009 to undertake the Phase 2 Environmental Site Assessment with regard to the development of the property including the relocation and demolition of a child care centre, refurbishment of the several buildings and construction of other buildings for student accommodation.

The stated aims of the assessment (Douglas Partners, March 2009) was to:

- Provide an assessment of the general potential for contamination of the site resulting from past and present site uses, subject to site constraints;
- Provide a Preliminary in situ Waste Classification;
- Provide a Preliminary ASS assessment;
- Based on the investigation results, comment on the likely suitability of the site for the proposed redevelopment and identify development constraints associated with site contamination issues;
- Assess the potential for off-site migration of contamination (through groundwater); and
- Enable development of a Remedial Action Plan (RAP), if required.

The assessment included a site history review, drilling of sixteen test bores in the accessible areas of the subject site and installation of four groundwater wells. Soil and groundwater samples were collected and analysed for a range of organic and inorganic contaminants.

8.1 Review of Previous Works

The consultant, Douglas Partners provided a review of the previous works undertaken by Coffey Partners in 1992 and 1993. In addition to those works Douglas Partners also reviewed the Site Management Plans also prepared by Coffey Partners in 1998. It is inferred from the review of these reports that the existing child care centre to the north of the Site Audit site had been constructed. In relation to the works reported and the Site Management Plans

At the time this report was prepared, it was stated that a protective barrier had been placed over the site except areas covered by buildings or pavement. It was noted that in the area of the childcare centre, the cover should have comprised 150 mm turf topsoil overlying 50 mm concrete overlying an orange plastic warning layer. In other unpaved areas, the cover should have comprised 150 mm topsoil overlying an orange plastic warning layer and timber barriers should have been placed around the large trees. However a comment by the consultant (Douglas Partners, March 2009) indicated that at the time of their investigations the plastic warning layer and timber barriers were not evident. It also appeared that other requirements such as trapdoors and other entrances being locked and signposted had also not been completed. On this basis it would appear that although construction works had been completed for the child care centre and a protective barrier had been installed, not all the recommendations of the Coffey Partners assessment had been implemented not all the requirements of the draft management plans had been maintained.

8.2 Environmental Site Assessment Sampling Program

Douglas Partners carried out a soil and groundwater investigation that took place during the period 4th – 11th February 2009 across the Blackfriars precinct including the northern area not included in the Site Audit site.

A total of sixteen test bores used for the assessment with thirteen of the bores drilled using a truck-mounted drill rig with solid flight auger attachment and three bores were hand augured due to lack of drilling rig access. Of the sampling locations in this assessment eight were located within the Site Audit site. Groundwater was not observed during auger drilling, however, groundwater was observed in the installed groundwater wells at least four days after drilling.

The adopted sampling density met the requirements presented in the NSW EPA Guidelines (NSW EPA, 1995), for systematic sampling, on the basis that for a site of 0.66 hectares, a minimum of sixteen sampling points be required to characterise the site. The consultant reported that the borehole locations were selected to provide general site coverage and based on the site access restrictions. The consultant's plan showing borehole locations is provided in **Appendix G**.

8.2.1 Soil Sampling Methodology

It was stated that soil samples were collected at broadly regular intervals or upon signs of contamination. The samples considered most likely to be contaminated from each bore were selected for analysis. The potential for contamination, with regard to each sample, was assessed based on the sample position within the profile, the type of materials involved (filling/ natural) and whether signs of environmental concern were noted (e.g. odours, staining). Note that, upon receipt of the initial test results, a further 24 fill samples were selected for PAH analysis, in order to assess more confidently the spread of PAH contamination across the site.

The general soil sampling procedure was outlines as follows:

- transfer of samples into laboratory-prepared glass jars, and capping immediately with teflon lined lids;
- collection of 10% duplicate samples for QA/QC purposes;
- labelling of sample containers with individual and unique identification, including project number, sample location and sample depth;
- placement of the sample jars and replicate sample bags into a cooled, insulated and sealed container for transport to the laboratory; and
- One trip spike and one trip blank were subjected to the same treatment as the samples.

Envirolab Services Pty Ltd (ELS) and LabMark, both laboratories accredited by the National Association of Testing Authorities (NATA), were employed to conduct the soil sample analysis. Both laboratories are required to carry out routine in-house QC procedures.

8.2.2 Groundwater Well Installation, Development, Sampling

Wells were installed in Test Bores 1, 4, 7 and 8 to a maximum depth of 5.8 m bgl, following completion of drilling, 50 mm diameter, acid washed, class 18, PVC casing and machine slotted, well screen was installed into the test bores. The wells were completed with a gravel pack and a bentonite plug of at least 0.5 m thickness. The wells were finished with a gatic cover flush with the ground surface. The consultant provided groundwater monitoring well construction details.

Following installation, the wells were left to stabilize and then developed between four and six days after installation, using a typhoon pump or hand bailer to remove approximately three well-volumes or until dry to ensure an effective hydraulic connection between the well and the formation. Note: the depths to groundwater table were measured prior to development. Wells 7 and 8 were then sampled immediately after, as they recovered soon after development, whereas Wells 1 and 4 were left for 2 days before sampling as they recovered slowly.

The collection of groundwater samples was carried out using a geopump or hand bailer, in reportedly in accordance with standard field procedures. The samples appeared slightly turbid and were subject to filtration through a 0.45µm filter prior to heavy metal analysis.

Sample handling and transport procedures were conducted as set out below:

- sample containers were labelled with individual and unique identification, including project number and sample number;
- collecting 10% replicate samples for QA/QC purposes;
- samples were placed in insulated coolers and maintained at a temperature of approximately 4°C until transported to the analytical laboratory, and
- Chain–of-Custody documentation was maintained at all times and countersigned by the receiving laboratory on transfer of samples.
- All groundwater samples were dispatched to ELS for analysis.

8.3 Environmental Site Assessment Criteria

The following assessment criteria were adopted for the Douglas Partners assessment.

8.3.1 Soil Assessment Criteria

On the basis that the assessment was for the redevelopment of the site as a combination of child care, student accommodation and educational uses the consultant (Douglas Partners, March 2009) nominated that the relevant assessment criteria, taken from the NSW DEC Contaminated Sites: Guidelines for the NSW Site Auditor Scheme 2nd edition (NSW DEC, 2006), would be the Health-Based Investigation Levels for residential with gardens and accessible soil (HIL Column 1), applicable in the area of the proposed childcare centre, and Health-Based Investigation Levels for residential with minimal access to soils (HIL Column 2), applicable to the remainder of the site. In additional, provisional phytotoxicity-based investigation levels for sandy loams (PPIL Column 5) would be applicable to landscaped

areas. The consultant's figure of the site showing the proposed development in 2009 is provided in **Appendix H**. It is noted that the criteria applied in this manner is not relevant to the current prosed development configuration.

With respect to the petroleum hydrocarbons, (TPH and BTEX), NSW EPA publication Contaminated Sites Guidelines for Assessing Service Station Sites (NSW EPA, 1994) Threshold Concentrations for Sensitive Land use were adopted.

In cases where Australian criteria are not available at the time, internationally recognized site assessment criteria such as Dutch Intervention Values and USEPA Regional IX PRG levels were are adopted as screening reference.

The consultant explained the comparison process in that if a contaminant concentration detected above the threshold concentration in soil/ filling material it would be considered to be significant if:

i.) The concentration of the contaminant is more than 2.5 times the SAC. Any location more than 2.5 times the SAC may be classified as a 'hotspot', requiring further assessment/ management.
ii.) The calculated 95% Upper Confidence Limit average (excluding any 'hotspot' concentrations) of the data set for the contaminant exceeds the health-based SAC [Note that statistical analysis does not apply to the assessment of PPILs];
iii.) The standard deviation of the results is greater than 50% of the SAC. Providing that the 95% UCL average is within the SAC, and no concentrations of the contaminants are at hotspot level, minor exceedences of the SAC may be considered to pose insignificant human health risk under the proposed land-use.

8.3.2 Groundwater Assessment Criteria

Sydney Harbour is considered to be the likely ultimate receiving body for groundwater sourced from the site, whereas the groundwater in the immediate environ may be classified as a "fresh water" ecosystem. On this basis, the groundwater investigation levels (GILs) were selected for the protection of 95% of species for a freshwater ecosystem (a more conservative approach than marine based criteria) in line with DECC guidance.

The guidelines selected as reference for groundwater in this assessment were:

- Guidelines for Fresh and Marine Water Quality' (2000) Australia and New Zealand Environment and Conservation Council (ANZECC). The trigger values for the protection of 95% species for a fresh water ecosystem were used where available. In the absence of the 95% level of protection trigger values the moderate and low reliability trigger values and/or other recognized standing screening criteria were also referenced.
- In cases where Australian criteria are not available, then internationally recognized site assessment criteria such as Dutch Intervention Values and USEPA Regional IX PRG levels are adopted as screening reference. It is noted that these international standards are not endorsed by DECC, but are considered relevant as useful assessment screening values.

8.4 Environmental Site Assessment Results

The following sections summarise the findings and results.

8.4.1 Field Observations

Sixteen bores were drilled to a maximum depth of 6.0 m on 4th, 5th, 6th and 11th February 2009 in the accessible areas of the site. Soil samples were collected from all bores at broadly regular intervals, at changes in the strata or upon signs of contamination. The consultant described the bore lithology in the following table.

Table 8-1 Bore Lithology

Sampling Location	Asphalt	Filling	Clay	Sandy Clay	Sandstone	Completion Depth
1	0-0.04	0.04-2.2	2.2-3.9	-	3.9-5.9	5.9
2	0-0.04	0.04-3.2	3.2-3.5	-	-	3.5
3	0-0.04	0.04-3.6	3.6-4.5	-	-	4.5
4	0-0.03	0.03-4.1	4.1-6.0	-	-	6.0
5	0-0.01	0.01-1.6	1.6-3.5	-	-	3.5
6	-	0-3.6	3.6-4.5	-	-	4.5
7	-	0-1.2	-	-	-	1.2 (r)
7A	-	0-2.2	2.2-4.9	-	4.9-5.6	5.6
8	-	0-3.2	3.2-5.8	-	-	5.8
9	-	0-0.6	-	-	-	0.6 (r)
10	-	0-0.1	-	-	-	0.1(r)
11	0-0.02	0.02-0.35	-	-	-	0.35 (r)
12	-	0-2.2	2.2-5.0	-	-	5.0
13	-	0-3.5	3.5-4.0	-	-	4.0
14	-	0-3.0	3.0-3.8	3.8-4.5	-	4.5
15	0-0.04	0.04-3.2	3.2-4.5	-	-	4.5
16	-	0-3.2	3.2-5.0	-	-	5.0

Note: (r) - auger refusal

Asphalt was encountered in Bores 1-5, 11 & 15 at depths between the surface and 0.04 mbgl. Fill generally comprising clayey sand/sand/clay/silty sand/sandy clay material with various inclusions (viz. gravel, brick, concrete, plastic and sandstone fragments) was encountered in all test bores. Ash and slag inclusions were observed in the filling of Bores 3, 6, 10 and 11. Railway ballast was encountered in the filling of Bore 8. The depth of filling ranged between 1.6 m and 4.1 m bgl.

Natural material comprising clay, sandy clay and sandstone was encountered in all test bores apart from test bores 7 and 9 -11 (which were discontinued at shallow depths due to auger refusal). The depth of the clay material ranged between 1.6 m and 6.0 m bgl. Sandy clay material was encountered only in Bore 14 at a depth of 3.8 m. Sandstone was encountered in Bores 1 and 7A, at a depth of 3.9 m and 4.9 m, respectively.

Test bores 7 and 9 -11 were discontinued at 1.2 m, 0.6 m, 0.1 m and 0.35 m bgl, respectively, due to auger refusal on sandstone boulder filling and concrete and due to possible underground services. [Note: Bore 7 was replaced by Bore 7A]

Free groundwater was not observed while auguring, with the exception of Bore 5 at a depth of 3.2 m.

Selected soil samples were screened for the presence of Total Photo-Ionisable Compounds using a calibrated Photo-Ionisation Detector (PID). The PID levels were provided by the consultant and were typically below 5 ppm, indicating no signs of notable organic compounds.

8.4.2 Site Hydrogeology

Groundwater levels were recorded prior to well development and purging/sampling. The water was noted to be slightly turbid. A summary of measured groundwater levels is provided in the following consultant's table.

Table 8-2 Groundater Levels

Well	Installation Date	Groundwater Levels Recorded (prior to well development)		Groundwater Levels Recorded (prior to purging and sampling)	
		Date of well Development	Water Level (m bgl)	Date of purging and sampling	Water Level (m bgl)
1	6/2/09	10/2/09	2.08	12/2/09	2.03
4	4/2/09	10/2/09	2.93	12/2/09	3.10
7	5/2/09	10/2/09	2.26	10/2/09	3.00
8	5/2/09	10/2/09	3.00	10/2/09	3.00

Note: bgl below ground level

8.4.3 Soil Analytical Results

The following sections provide the key points of the soil sample analytical results.

Soil samples were assessed for the identified potential contaminants of concern, namely: heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn), BTEX, TPH, VOCs, PAH, OCP, OPP, PCB, cyanide and phenols. Asbestos was also analysed in fill soils.

The consultant discussed the results with regard to the relevant site assessment criteria (based on the development configuration at the time). Tables of the assessment results are presented in **Appendix I**.

The laboratory results indicate that contaminant concentrations in the soil samples analysed were within the nominated site assessment criteria with the exceptions for metals, TPH and PAHs:

- Sample 1/0.0-0.5: B(a)P [21 mg/kg], Total PAH [238.5 mg/kg] and TPH (C10-C36) [1360 mg/kg];
- Sample 1/0.7-1.0: B(a)P [7.8 mg/kg];

- Sample 3/0.3-0.5: B(a)P [2.2 mg/kg]; and Total PAH [30.9 mg/kg];
- Sample 6/0.3-0.5: B(a)P [36 mg/kg];
- Sample 7/0.3-0.5: B(a)P [30 mg/kg]; and Total PAH [430.5 mg/kg];
- Sample 8/0.3-0.5: B(a)P [14 mg/kg]; and Total PAH [123.2 mg/kg];
- Sample 9/0.2-0.5: Lead [1500 mg/kg]; and B(a)P [7.2 mg/kg];
- Sample 11/0.2-0.5: B(a)P [15 mg/kg]; Total PAH [128.3 mg/kg]; and TPH (C10-C36) [2120 mg/kg].
- Sample 12/0.3-0.5: B(a)P [13 mg/kg]; and Total PAH [164.7 mg/kg].
- Sample 16/0.2-0.5: B(a)P [16 mg/kg]; and Total PAH [165.7 mg/kg].
- Sample 16/1.7-2.0: B(a)P [6 mg/kg].

The elevated levels of TPH (C10-C36) noted in the two near surface samples from Bores 1 and 11 were further assessed using a 95% upper confidence limit (UCL) calculated using PRO UCL Version 4 (downloaded from the US EPA website). The 95% UCL for TPH (C10-C36) was reported to be less than the site assessment criteria and the TPH (C10-C36) exceedences were not considered significant.

Sample 9/0.2-0.5 collected from the surficial filling had elevated lead concentrations of 1,500 mg/kg and based on the assessment criteria for residential with minimum access to soil the recorded exceedences were also noted to be statistically insignificant as the calculated 95% UCL of 397.2 mg/kg for the average contaminant concentration was within adopted site assessment criteria.

It was noted that the elevated concentrations of total PAH and/or benzo(a)pyrene, detected in eleven samples collected from the surficial filling (between 0.2 - 2.0 m) of Bores 1, 3, 6, 7, 8, 9, 11, 12, and Bore 16 that seven of the eleven samples were at 'hotspot' concentrations, i.e. the detected PAH level was more than 250% of the site acceptance criteria. This was noted to be consistent with the previous investigations undertaken by Coffey Partners (Coffey Partners International, September 1993) and (Coffey Partners International, September 1994).

The consultant reported that exceeded of the Provisional Phytotoxicity Investigation Levels for copper, lead, mercury, nickel and zinc were detected in several samples collected from the surficial filling. The consultant noted that the detected levels were not uncommon in urbanised areas, and the detected heavy metal levels were within the typical background ranges of these metals (Douglas Partners, March 2009).

BTEX, volatile TPH (C6-C9), OCP/OPP, PCB, VOCs, Cyanide and Phenols were not detected in all fill samples analysed. Asbestos was not detected in any of the samples analysed.

8.4.4 Groundwater Analytical Data

The following sections provide the key points of the groundwater sample analytical results. Groundwater sample laboratory results are presented in **xx**.

The groundwater samples were assessed for the identified potential contaminants of concern, namely: heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn), BTEX, TPH, VOCs, PAH, OCP, OPP, PCB, cyanide and phenols.

The laboratory results indicated that contaminant concentrations in all the groundwater samples were within the adopted groundwater investigation levels.

8.5 Consultant's Discussion of Results

A summary of the consultant's discussion of results is provided in the following sections.

8.5.1 Soil

The fieldwork for the assessment revealed the presence of fill materials to depths ranging from about 2.0 m in the western portion to about 4.8 m in the eastern portion, overlying soft to firm clay (alluvium) then sandstone bedrock. The bedrock was encountered at depths ranging from 3.8 m to 5.2 m depth.

Given the proposed land uses (ie. student accommodation, childcare, and student facilities) the laboratory test results were assessed against the health based criteria for residential development with accessible soils (childcare centre), and the health based criteria for residential development with minimal soil access (remainder of site). In additional, provisional phytotoxicity-based investigation levels for sandy loams were applicable in the area of the proposed landscape. With regard to petroleum hydrocarbons, the NSW EPA Contaminated Sites: Guidelines for Assessing Service Station Sites (1994) threshold concentrations for sensitive land were adopted as the site assessment criteria.

The results of the soil analysis indicate that the majority of organic and inorganic contaminant concentrations in all sampled soils were within the adopted site assessment criteria. The exceptions were as follows:

- Concentrations of benzo(a)pyrene (ranging from 2.2 mg/kg to 36 mg/kg), exceeding the SAC, were detected in 13 out of 48 soil samples analysed;
- Concentrations of Total PAH (ranging from 31 mg/kg to 430 mg/kg), exceeding the SAC, were detected in 10 of the 48 soil samples analysed;
- Concentrations of TPH (C10-C36) of 1,360 mg/kg and 2,120 mg/kg, exceeding the SAC of 1,000 mg/kg, at Bore 1 and Bore 11;
- Sample 9/0.2-0.5 collected from the surficial filling had lead concentrations of 1,500 mg/kg, which exceeded the SAC (1,200 mg/kg); and
- Exceedences of PPILs for copper, lead, mercury, nickel and zinc were detected in several samples collected from the surficial filling.

8.5.2 Groundwater

Groundwater was encountered in bores ranging in depths between 2.3 m and 3.8 m below existing ground level.

No groundwater contamination issues were identified. In this light, no unacceptable signs of contamination migration were noted and the potential for environmental impacts due to the contamination of soil appears to be low.

8.6 Environmental Site Assessment Conclusions

Based on the results of this assessment, the consultant considered that the site could be rendered suitable for the proposed redevelopment, subject to the preparation and implementation of a remedial action plan (RAP). The consultant explained that the objective of the RAP would be to remove and/or manage potential exposure routes to the underlying contaminated fill materials. It was noted that given the sporadic distribution of the primary contaminants, PAHs and metals, and the inherent difficulties in excavating deep fill (with heritage buildings on the site), and noting the absence of groundwater impacts that remediation through a "cap and contain" method was considered the most appropriate method for the site. The consultant also explained that an Environmental Management Plan (EMP) would also be required for the long-term management of the capping system, ensuring it's long-term integrity and safety for any persons potentially exposed to the capped materials.

8.7 Audit Evaluation of Environmental Assessment Report

The following sections provide discussion of the Site Audit findings of the Environmental Site Assessment undertaken and reported by the consultant (Douglas Partners, March 2009). The information relating to the site description, condition, surrounding environment and site history has been reviewed and included where relevant in earlier sections of this report.

8.7.1 Assessment Work Program

The assessment works program was found to have a number of limitations with regard to the requirements of the Site Audit. The sample distribution was stated as meeting NSW EPA guidelines, however the design was not strictly systematic as required for the approach taken, sample locations were biased to accessible areas, and not grid based. However as distribution of contamination in fill is not expected to follow a specific distribution pattern of hotspots, which the systematic design is used to locate with a level of probability, it is not considered significant. It would have been preferable that the consultant had justified the number of location selected on a more appropriate basis. With consideration to the consistent results between this more recent investigation and those conducted in 1993 and 1994 the number of sample locations is not critical. This is further accepted with regard to the objectives of the Site Audit as the character of the contamination rather than the distribution is the key concern in relation to the remediation approach being adopted.

QA/QC assessment and interpretation was found to be inadequate. Despite QA/QC samples being collected, the results and interpretation of these and the laboratory QA/QC was not discussed. As such the Site Auditor was not able to review whether QA/QC procedures had been adequate or signified any specific issues in relation the data quality. As for earlier issues, the consistency of the results to the previous site assessments was a consideration in relation to whether the character of the contamination and the appropriateness of the remediation being proposed was appropriate.

8.7.2 Environmental Site Assessment Criteria and Results

The site assessment criteria has been derived from sources made or approved by the NSW EPA under s.105 of the *Contaminated Land Management Act 1997*, at the time the assessment was conducted and are considered appropriate for the protection of human health and the environment at the site with consideration to the proposed land use. The application of the different criteria based upon the proposed development was not well defined and without specific boundaries being applied it was not appropriate to apply different criteria to samples collected from different locations based on the planned development. The limited application of the phytotoxicity based investigations levels are also noted. However considering the conclusions made by the consultant with regard to the management of the site the application of the particular site assessment criteria was inconsequential.

The decision process for assessing urban redevelopment sites requires that the soils be assessed against the appropriate heath-based investigation levels. The consultant did utilise appropriate criteria available at the time. It is noted that the criteria to be applied if the assessment was conducted today would be slightly different in that it would utilise that published in the amended NEPM (NEPC, 1999, Amended 2013). However with regard to the proposed landuse it is noted that investigation levels for PAHs and metals have not changed significantly, although direct comparison for PAHs is not possible. The introduction of Ecological Investigation Levels in the amended NEPM may result in more complete assessment with regard to the metals results.

The consultant discussed the results of the assessment and provided tables that adequately presented the analytical data from the laboratory reports. The reported concentrations of contaminants by the consultant were reviewed and found to be consistent with those reported by the laboratory. The laboratory procedures were appropriate for the identified contaminants of concern and the adopted assessment criteria against which the results were compared.

The conclusions reached by the consultant are considered appropriate, that the site could be made suitable for the proposed landuse with the preparation of an RAP. The proposed remediation strategy pre-empts a thorough analysis of the remediation options, however it is noted that the remediation strategy recommended is consistent with that recommended in the earlier assessments undertaken in 1994 (Coffey Partners International, September 1994), for the proposed development that included the child care centre present on the site.

9 Remedial Action Plan

The planned remediation works are presented in a Remedial Action Plan (RAP) prepared by the environmental consultant, Douglas Partner (Douglas Partners, January 2015). The RAP was initially presented to the Site Auditor as a revision prepared in March 2009 (incorrectly dated March 2008 on the front cover) which was referenced in the Deferred Commencement Development Application that initiated the requirement for this Site Audit. Following review of the RAP by the Site Auditor the RAP was finalised with a revision date January 2015. This section summarises and discusses the RAP and as presented by the consultant. Figures depicting the details of the proposed remediation area and specification are included in **Appendix J**.

9.1 Remediation Objectives

The consultant (Douglas Partners, January 2015) identified the remediation objective of site remediation works were to ensure that the remediated site is rendered suitable for the proposed child care centre, student accommodation and educational facilities development, and that the works will pose no unacceptable risk to human health or to the environment. The reference to the student accommodation is not applicable to the current proposed development.

9.2 Remediation Options and Proposed Approach

In accordance with the Site Auditor Guidelines (NSW DEC, 2006), soil remediation and management is implemented in the following preferred order:

1. on site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. off site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
3. removal of contaminated soil to an appropriate site or facility, followed where necessary by replacement with clean fill;
4. consolidation and isolation of the soil on-site by containment within a properly designed barrier.

The consultant provided discussion with regard to the treatment options with reference to the ANZECC (ANZECC, 1992) guidelines on remediation, which provide a similar hierarchy. Each of the options of treatment, off-site disposal, use of institutional controls and use of a physical barrier system were discussed.

All of the broad options with the exception of the physical barrier system were not considered feasible. It is the Site Auditors opinion that only excavation and offsite disposal or the use of the physical barrier system should have been considered. With regards to the excavation and off-site disposal option the consultant argued that it was not preferable as it could cause potential impacts on the heritage buildings, trees, boundary structures, local community (from waste transport), as well as imposing an unnecessary burden on the capacity of the receiving landfill. The consultant rationalised that essentially this option would only be suitable under circumstances where there is an elevated potential for

unacceptable offsite impacts, such that source removal is critical, or where construction of basements was proposed and which would in any case require to remove the waste soils as part of the construction process.

As such the remediation of the site by the 'isolation of the soil by covering with a properly designed barrier' due to the immobile nature and widespread extent of the contamination, whilst noting the absence of groundwater impacts was considered. The isolation or capping of the soil contamination to create a physical barrier system was considered to be the preferred remedial strategy for the site. Under the proposed development scenario this remedial strategy was considered to pose a lesser environmental risk than other remedial options.

Douglas Partners (Douglas Partners, January 2015) noted that the longer term management would rely on the barrier being permanently maintained and by resurfacing where necessary, or being interrupted/removed only during short term events such as the installation of additional services i.e. during the main redevelopment, including the related remedial works, or during future maintenance. Major disruptions to the barrier are anticipated to fall into the category of developments requiring consent.

The Remediation Action Plan details barrier system designs developed for the following areas:

- Heritage buildings;
- New building slabs;
- Paved areas (including service trenches);
- Landscaped areas (including service trenches);
- Trees to be retained; and
- New trees and shrubs.

9.3 Design and Construction of the Physical Barrier

The designs of the physical barrier system was detailed in the RAP for the various components of surface cover proposed in the development with consideration of the following factors:

- Final design ground levels required by Council, which are understood to be similar to those existing;
- Ease of construction;
- Ease of management;
- Likelihood of future penetration of the barrier system and the straightforward nature of the repair of the barrier system;
- The retention of heritage structures;
- The presence of significant boundary walls being retained;

- The retention of a number of large trees, and their primary root zones; and
- Aesthetic considerations.

The consultant (Douglas Partners, January 2015) had determined that as the physical barrier was to be designed primarily as a separation between humans and the contaminated soils there was no requirement for the barrier to be impermeable, however grading of the physical barrier, and the provision of adequate surface water drainage will minimise the infiltration of surface water. In addition there would be no specific requirements with regard to leachate collection or management of soil vapour or landfill gas due to the nature of the contaminants identified.

The following subsections outline the specific design details for the physical barrier in each of the development areas.

The plan provided in **Appendix J** provides the specification for the barrier design provided in the RAP for each of the features.

It was noted that as a general guide, a batter slope of between 30^{o} and 45^{o} would be retained for any excavation adjacent to existing heritage buildings or boundary structures. This includes existing footpaths, stairs, verandahs etc. that will be retained as part of the heritage listing.

The comment was made in the RAP that in general it was considered that suitable clays compacted to 95% of their standard compaction in 250 mm layers to the required thickness would act as a practical barrier. Should the barrier be required to support structural loadings, consideration should be given to increasing this compaction and the potential for shrink / swell to occur. In this regard guidance of a suitably qualified geotechnical engineer would be required. It has been inferred by the drawing detail provided that this in relation ‘validated clay; and does not preclude the other aspects of the barrier such as permanent paving and the marker layer.

9.3.1 Heritage Buildings

The existing heritage listed buildings shown on the Ground Floor Site Plan provided in the RAP (as edited by DP to show building numbers) presented in the **Appendix J**, will be permanently retained (and refurbished) as part of the redevelopment and therefore a purpose built physical barrier system between the building ground floor and the underlying soils is not feasible, nor deemed necessary (as the soil beneath the building will be effectively covered by the building structure and hence not routinely accessible, and access to the subfloor area will be restricted). No sampling has been carried out within these building footprints, however, it is anticipated that the nature of filling beneath these buildings is similar to that encountered over the remainder of the site.

The management of exposure to the soils beneath the heritage buildings will comprise the following:

- Preparation of an Environmental Management Plan (EMP);
- Nomination of a person/authority responsible to ensure the implementation of the EMP;

- Upgrading (if required) and maintaining adequate roof and surface water drainage and collection measures (ie. preventing ponding of water around the building peripherals and preventing direction of water beneath the building).

9.3.2 Building Slabs

The proposed development includes the construction of a new child care centre. The new buildings will be slab on ground construction, with pier supports.

The RAP requires that all surplus materials excavated during the pier boring, footing construction, building platform levelling and service trench excavation will be stockpiled and classified for off-site disposal, in accordance with the NSW DECCW Waste Classification Guidelines, 2009. An assessment for acid sulphate potential will also be undertaken on the excavated materials, as recommended in the DP Phase 2 Contamination Assessment report (Douglas Partners, March 2009).

The handling of soils during the pier boring, excavation and levelling works will be undertaken in accordance with the management of contaminated soil included in the RAP and discussed later. Adequate personal protective equipment (PPE), as stipulated in the RAP is to be worn at all times during contaminated soil excavation.

Upon installation of the piers and services, excavation of the footings, and preparation of the ground surface (which is likely to include a degree of compaction), a marker layer (geogrid, geotextile or similar) is required to be will be laid. Given the anticipated low leachability of the contaminants, the marker layer does not need to be impermeable. The slab binding layer (typically comprising sand or a sub-base mix) will be laid directly on the marker layer. The building slab will then be formed directly on the blinding layer.

In summary, the physical barrier at the locations of proposed new buildings (or extensions) will comprise the marker layer, overlain by the blinding layer (building design thickness) and the ground floor slab (building design thickness). The physical barrier thickness design is considered adequate as no future penetration of the concrete slab is anticipated unless the buildings are to be demolished. Under that circumstance the marker layer (together with the EMP) will provide a warning as to the presence of contaminated soils beneath. The schematic of the building slab physical barrier is shown on the plan provided in **Appendix J** (detail titled - 'Building Slab'). The laying of underground services beneath the building slabs will be carried out in accordance with the schematic.

The RAP recommended that as all service lines were likely to be installed at depths of less than 0.5 m, it might be more practical (where a significant number of services are proposed) to construct a 0.5 m layer of clean soil beneath the underside of the building slab. The details were presented in the RAP but were described as follows:

- Excavation of the existing fill to a nominal depth of 500 mm below the design underside of the slab (a lesser depth, to the maximum proposed service invert depth, would be acceptable);
- The excavated materials will be stockpiled and assessed for waste classification and acid sulphate soil potential. The classified soils will be disposed off site at a landfill facility licensed to accept the waste under the classification determined;
- The exposed fill materials will be compacted as required;

- The marker layer will be placed over the entire area(s) proposed for the building slab;
- Imported VENM or validated ENM materials will be placed and compacted to an appropriate specification, to the underside of the building slab;
- Underground service trenches will be excavated and service lines laid within the VENM or ENM materials; and
- The building blinding layer and slab will then be formed.

9.3.3 Paved Areas

The proposed development includes a variety of paved configurations, as shown on the Landscape Plan provided in the RAP and presented in **Appendix J**. Some of the paved areas will be utilised by both vehicles and pedestrians, some by pedestrians alone, and some will be constructed solely for the child care centre.

Despite the variation in pavement types and uses a generic physical barrier system has been designed to enable ease of construction and to also marry with the physical barrier system designed for the general landscaped areas. In designing the physical barrier system, consideration has been given to the potential for laying and/or servicing underground utilities in the future, and the likely repair/upgrade of the paving layer itself.

In general, the physical barrier system in areas of proposed paving would comprise the marker layer (as previously discussed), a layer of imported validated materials, the paving sub-base/base-course layer, and then the pavers at the surface. The total construction thickness will be at least 500 mm.

The imported validated materials must comprise either Virgin Excavated Natural Materials (VENM) or Excavated Natural Materials (ENM), as defined in the RAP.

Construction of the barrier system under pavements will comprise the following stages:

- Removal and disposal of existing surface layers (bitumen, grass, concrete);
- Excavation of the existing fill to a depth of at least 500 mm below the design final ground level;
- Excavation of service trenches (where required) to the design invert levels;
- The excavated materials will be stockpiled and assessed for waste classification and acid sulphate soil potential. The classified soils will be disposed off site at a landfill facility licensed to accept the waste under the classification determined;
- The exposed fill materials will be compacted as required;
- The marker layer will be placed over the entire area(s) proposed for paving, including the side walls and base of any service trenches;
- Utilities lines will be placed as required in the lined service trenches;
- Imported VENM or validated ENM materials will be placed and compacted to an appropriate specification, at a thickness equivalent to 500 mm less the paver and

sub-base / base-course thickness. A specific grading may be required for backfilling in service trenches. Typically a sand or gravel backfill materials is placed around utilities lines. This form of backfill is considered appropriate in the service trenches;

- The sub-base / base-course will be laid and compacted;
- The pavers will be laid as per design. The final paver surface will be designed with a minimum 2% grade towards purpose built sub-surface drainage systems. Note that it is important to accurately locate the final positions and alignments of the service trenches, such that minimal disturbance will arise through future maintenance or repair works.

The handling of soils during the removal of the contaminated fill will be undertaken in accordance with the management of contaminated soil included in the RAP and discussed later. Adequate personal protective equipment (PPE), as stipulated in the RAP is to be worn at all times during contaminated soil excavation. The schematic of the paving physical barrier, including service trenches, was provided in the RAP and presented in the Plan presented in **Appendix J** (detail titled - 'Paving').

9.3.4 General Landscaping

The proposed development includes landscaped areas that marry into proposed paved areas, as shown on the Landscape Plan in **Appendix J**. For the purpose of this report, landscaping refers to proposed lawns, gardens and shrub planting. The planting of trees is discussed further in a separate section.

A generic physical barrier system in the RAP has again been designed to enable ease of construction and to also marry with the physical barrier system designed for the paved areas. In designing the physical barrier system, consideration has been given to the potential for laying and/or servicing underground utilities in the future, and the likely repair/upgrade of lawns, gardens and shrub plantings.

In general, the physical barrier system in areas of proposed landscaping will comprise the marker layer (as previously discussed); a layer of imported validated materials, a topsoil layer and turf. There may be minor variations in the thickness or type of topsoil and/or the use of other suitable planting materials. The total construction thickness will be at least 500mm.

The imported validated materials must comprise either VENM or ENM, as defined in the RAP, and may be selected or enhanced to provide adequate nutrient levels and/or drainage characteristics for improved plant growth.

Construction of the physical barrier system for general landscaping will comprise the following stages:

- Removal and disposal of existing surface layers (bitumen, grass, concrete);
- Excavation of the existing fill to a depth of at least 500 mm below the design final ground level;
- Excavation of service trenches (where required) to the design invert levels;

- The excavated materials will be stockpiled and assessed for waste classification and acid sulphate soil potential. The classified soils will be disposed off site at a landfill facility licensed to accept the waste under the classification determined;
- The exposed fill materials will be compacted as required;
- The marker layer will be placed over the entire area(s) proposed for paving, including the side walls and base of any service trenches;
- Utilities lines will be placed as required in the lined service trenches;
- Appropriate planting will be carried out on the finished surfaces once complete.

Note that it is important to accurately locate the final positions and alignments of the service trenches, such that minimal disturbance will arise through future maintenance or repair works. These positions will be included in the EMP.

The handling of soils during the removal of the contaminated fill will be undertaken in accordance with the management of contaminated soil included in the RAP and discussed later. Adequate personal protective equipment (PPE), as stipulated in the RAP is to be worn at all times during contaminated soil excavation.

The schematic of the general landscaping physical barrier, including service trenches, was provided in the RAP and presented in the Plan presented in **Appendix J** (detail titled - 'General Landscaping').

9.3.5 Trees to be Retained

A number of large existing trees will be retained as part of the proposed development. In all, four trees within the property boundaries were identified in the RAP to be retained.

Excavation of soils around the root zones of significant trees always presents a challenge, as the loss of soils (even if temporary) may have a long-term impact on the viability on the future of the tree. In order to minimise the potential impact on the survival of each of the retained trees, whilst also abiding by the objective of the remedial works (ie. appropriately remediated to a condition which would prevent unacceptable risks to human health and/or the environment; and ensure the suitability of the site for it's intended land use) the following procedures were outlined in the RAP to be implemented:

- An arborist will identify the primary root zones (PRZ) of each of the trees to be retained. This will become the zone within which bulk fill excavation will not be permitted. Temporary fencing will be erected around each PRZ during site works;
- Additional soil samples will be recovered by hand within the PRZ (sample numbers to be determined based on the identified PRZ area, but minimum of 4 per tree location). The bores will continue to a maximum depth of 0.5m below existing ground level. Recovered samples (2 from each bore) will be analysed for the identified contaminants of concern, viz. PAH, TPH and Heavy Metals;
- Based on the test results, the following remedial strategies will be implemented within the PRZ:

- If low to moderate contaminant concentrations are detected (i.e. exceeding the EIL/ESL, but below HIL/HSL), a permeable surface cover (necessary to permit continued water infiltration around the tree roots), such as timber decking, will be erected at or above existing ground level. The decking will be designed to prevent direct human contact with the soils beneath.
- If high contaminant concentrations (exceeding HIL/HSL) are detected, some hand excavation of detected "hot spots" or surface soils will take place, under the direction of the arborist. A marker layer and clean soil (probably topsoil) replacement may be required. Once these works are complete to the satisfaction of the Environmental Consultant, the decking construction as detailed above will be undertaken.

- The EMP will detail management requirements, including the maintenance of the decking materials, in the primary root zones. Any imported validated materials used for soil replacement will comprise either VENM or ENM, as defined in the RAP, and may be selected or enhanced to provide adequate nutrient levels and/or drainage characteristics for improved plant growth.

The handling of soils during the removal of the contaminated fill will be undertaken in accordance with the management of contaminated soil included in the RAP and discussed later, and instructions issued by the arborist. Adequate personal protective equipment (PPE), as stipulated in the RAP is to be worn at all times during contaminated soil excavation.

9.3.6 New Tree and Shrub Planting

A number of new trees/shrubs will be planted as part of the proposed redevelopment. A generic physical barrier system has again been designed to enable ease of the planting works and to also marry with the physical barrier system designed for the paved and landscaped areas. In designing the physical barrier system, consideration has been given to the exposure of the new plantings to the contaminated soils, and the potential for maintenance and/or replacement of the plantings in the future.

In general, the physical barrier system in areas of proposed tree and shrub planting will comprise the marker layer (as previously discussed), a layer of imported validated materials, a topsoil layer and turf, or paving layer. There may be minor variations in the thickness or type of topsoil and/or the use of other suitable planting materials. The total construction thickness will be at least 500 mm, with a minimum distance between the contaminated material and tree root bulb of 200 mm.

The imported validated materials will comprise either VENM or ENM, as defined the RAP, and may be selected or enhanced to provide adequate nutrient levels and/or drainage characteristics for improved plant growth.

Construction of the physical barrier system at proposed tree or shrub planting sites will comprise the following stages:

- Removal and disposal of existing surface layers (bitumen, grass, concrete);

- Excavation of the existing fill to the required depth of at least 500 mm below the design final ground level, or to a depth of 200 mm below the proposed base planting level, whichever is greater. The excavation width will be the width of the plant root bulb plus a minimum 200 mm all around;
- The excavated materials will be stockpiled and assessed for waste classification and acid sulphate soil potential. The classified soils will be disposed off site at a landfill facility licensed to accept the waste under the classification determined;
- The marker layer will be placed over the entire excavation surface, including side walls;
- Imported VENM or ENM materials will be placed in the base of the excavation (minimum 200 mm thickness);
- The plant will be positioned in the centre of the excavation, and then the imported VENM or ENM will be placed and compacted around the annulus, as required;
- Topsoil and/or paving materials will be placed at the surface as required.

Note that the minimum thickness of the physical barrier system adjacent to and beyond the tree or shrub planting excavation will be 500 mm.

The handling of soils during the removal of the contaminated fill will be undertaken in accordance with the management of contaminated soil included in the RAP and discussed later. Adequate personal protective equipment (PPE), as stipulated in the RAP is to be worn at all times during contaminated soil excavation.

The schematic of the tree and shrub planting physical barrier, was provided in the RAP and presented in the Plan presented in **Appendix J** (detail titled - 'New Tree Planting').

9.4 Waste Classification and Contaminated Soil Management

The RAP made reference to a preliminary waste classification undertaken as part of the Phase 2 Contamination Assessment (Douglas Partners, March 2009). In summary, in-situ samples were selected for analysis of potential contaminants and TCLP testing. Based on the overall results, the fill was assigned a preliminary classification of General Solid Waste (non-putrescible) as defined under the DECCW Waste Classification Guidelines, 2009, provided that the material is not cross-contaminated with other material. However, as recommended in the RAP and further ex situ waste classification of the filling was recommended upon excavation and stockpiling. It was also noted that building rubble was encountered in the test bores, thus, there was considered to be a potential for asbestos to be present in the filling materials. Whilst it is the opinion of the Site Auditor that this is unlikely on the basis of the age of fill at the site (predating the widespread use of asbestos in building materials), the recommendation is always supported.

A 'spoil contingencies plan' for materials that failed to meet the NSW EPA disposal criteria (ie. general or restricted solid waste), following waste testing was provided for in the RAP. The contingency plan was to manage the storage, treatment and disposal of excavated spoil.

The RAP also provided requirements for the excavated contaminated material to be stockpiled in an appropriate manner, at a suitably segregated location away from the main construction area.

It was noted that transporting of contaminated material from the site shall be via a clearly delineated haul route and this route shall be used exclusively for entry and egress of vehicles used to transport contaminated materials within and away from the site.

Removal of waste materials from the site would be carried out by a licensed contractor holding appropriate license, consent or approvals to dispose the waste materials and recording for waste tracking purposes according to the classification outlined in the NSW EPA Waste Classification Guidelines, and with the appropriate approvals obtained from the NSW EPA, if required.

9.5 Site Validation Plan

Validation requirements for the physical barriers including pavements and capping soils include:

- Surveyed site levels following excavation (prior to construction of the physical barrier system);
- Surveyed site levels upon completion of physical barrier system construction; as-built engineering plans indicating the details of any new barrier system for each type (ie. building slab, paving, service lines, general landscaping, retained trees, and new tree plantings);
- Photographic record of the excavations, construction and completion of each physical barrier type;
- Validation reports confirming the VENM or ENM classification of imported materials;
- Inspection records for the works, prepared by a suitably qualified Environmental Consultant;
- Compaction certification (where required, such as pavement areas) stormwater control plans and details and evidence relating to the installation of the stormwater controls (i.e. surface drainage); and
- Information from the above would be compiled in a suitable format and presented in the validation report to be prepared by an Environmental Consultant.

Any additional sampling, including that of root zones would be included in the validation report.

9.5.1 Imported Materials

Any imported materials proposed for use as filling within the site must be appropriately validated prior to being used within the site. Only the following materials will be permitted for use within the site (upon meeting appropriate checking and validation, see below):

- Virgin Excavated Natural Materials (VENM) as defined under the Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008;
- Excavated Natural Material (ENM) as defined under the Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A – The excavated natural material exemption 2008;

- Quarried natural aggregates / gravels such as blue metal;
- Recycled aggregates meeting the criteria outlined in the Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A – The recovered aggregate exemption 2008.

All materials used as filling, including topsoil and pavement base-course, must be certified within one of the abovementioned categories. The Environmental Consultant for the UTS Blackfriars site must review and be satisfied with the certification provided prior to allowing the materials to be imported to the site.

Additional confirmatory sampling and testing of the materials may be required by the Environmental Consultant prior to allowing the materials to be imported to the site.

9.5.2 Validation Sample Collection and Analysis

It is proposed that any validation, waste classification or additional site characterisation samples be collected and analysed at the following frequency:

- STOCKPILED MATERIAL - 1 sample per 100 m^3 will be taken (or minimum of 3 samples per stockpile) for waste classification. Sample materials to be logged and described in each case. Recovered samples will be analysed for Heavy Metals, PAH, asbestos and TCLP (if required).
- SAMPLES FROM EXCAVATIONS (IF REQUIRED) – 1 sample per 25 m^2 on the excavation base and 1 sample per 15 liner metres along the excavation side walls. Sample depths and materials to be logged in each case. Samples to be analysed for Heavy Metals, PAH, TPH, BTEX and asbestos. Note that, in general, validation sampling of excavations is not required. May be required in circumstances where the physical barrier system cannot be constructed to specification.
- IMPORTED VENM or ENM (IF REQUIRED) – 1 sample per 100 - 250 m^3 of imported fill plus certification that the material comprises VENM or ENM including details of the source site. Samples to be analysed for Heavy Metals, PAH, TPH, BTEX, OCP, PCB, Phenols and asbestos.
- TREES TO BE RETAINED – Minimum of 4 samples in the primary root zone, maximum depth 500 mm. Sample depths and materials to be logged in each case. Samples to be analysed for Heavy Metals, PAH, TPH, BTEX and asbestos.
- Asbestos sampling will be conducted in accordance with the NEPM (2013) guidelines. Laboratory analysis of soil will be reported as % weight for weight for fines, and visually for bonded asbestos.

9.5.3 Sample Collection and Handling

Sampling data shall be recorded to comply with routine Chain of Custody requirements. The general sampling, handling, transport and tracking procedures comprises:

- the use of stainless steel sampling equipment;

- washing of all sampling equipment, including drills or excavator parts in contact with the sample, in a 3% solution of phosphate free detergent (Decon 90) then rinsing with distilled water prior to each sample being collected; transfer of the sample into new glass jars, sealed with a teflon lined lid to eliminate cross contamination during transportation to the laboratory;
- labelling of the sample containers with individual and unique identification including placement of the containers into a chilled, enclosed and secure container for transport to the laboratory; and
- use of chain of custody documentation to ensure that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

9.5.4 Quality Assurance Plan

The consultant outlined in the RAP the required QA/QC procedures to be implemented during any validation sampling to be undertaken, these are summarised in the following sections.

Field QA

Quality assurance (QA) and quality control (QC) procedures will be adopted throughout the field-sampling programme to ensure sampling precision and accuracy and prevent cross contamination.

The consultant will ensure sampling accuracy and precision through the analysis of 10% field duplicate/replicate samples (with 5% inter-laboratory duplicate/replicate and 5% intra-laboratory duplicate/replicates) as well as the collection of field rinsate samples of sampling equipment at a rate of one per 20 samples, or one per day of sampling operations.

Appropriate sampling procedures will be undertaken to ensure that cross contamination does not occur and will follow a Standard Operating Procedure which would specify that:

- Standard operating procedures are followed;
- Site safety plans are developed prior to commencement of works;
- Duplicate or replicate field samples are collected and analysed;
- Equipment rinsate samples are analysed as part of the QA/QC programme;
- Samples are stored under secure, temperature controlled conditions;
- Chain of custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory; and that
- Proper disposal of contaminated soil, fill or groundwater originating from the site area is completed.

Laboratory Quality Assurance and Quality Control

The project laboratory will undertake in-house QA/QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks; and
- Statistical analysis of QC data including control standards and recovery plots.

9.5.5 Validation Reporting

The RAP required that a validation assessment report will be prepared by a qualified environmental consultant in accordance with NSW EPA *Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites* (NSW OEH, 2011) and other appropriate guidance documentation. The report will be submitted to the appropriate certifying authority at the completion of the remediation works program.

The validation report will confirm that the site has been remediated to a suitable standard for the proposed land-use and that no related adverse human health and environmental effects have occurred as a result of the temporary works. The validation report will also include a summary of the information from previous investigations, particularly the materials that remain on-site.

The validation report will record the nature of the physical barrier system at all locations on the site with suitable supporting documentation being provided in regard to barrier thickness, integrity, capping materials, and other treatments applied.

The validation report will include details of the total volume of contaminated materials removed from site, present detailed analytical results where applicable, confirm that placed fill is clean and indicate the final disposal destination of the materials removed from site.

The final validation report will also include, or accompanied by an Environmental Management Plan (EMP) which will include details on the management procedures to be adopted in ensuring the integrity of the physical barrier system, and health and safety precautions to be implemented when accessing (or potentially accessing) the capped contaminated materials.

9.6 Environmental Site Management

The consultant included site management provisions to reduce the impact of the remediation works on the remediation workforce and surrounding environment (including neighbouring properties). An Environmental Management Plan (EMP) that primarily addresses water, air quality, noise, traffic, stockpile, and waste management was presented in the RAP.

The EMP was based on the remediation and construction works being carried out in the following general sequence:

- Demolition and removal of existing buildings (non heritage listed) in the southern portion of the site. (The existing site access driveway will be retained for access to the northern portion of the site);
- Construction of new child care centre in the southern portion of the site;
- Excavation of fill materials and construction of physical barrier system in the southern portion of the site, around the newly constructed buildings. Areas provided with the physical barrier system will be fenced off from the remainder of the site to prevent cross contamination during further stages.

This generic EMP applies to each of the abovementioned works phases, and should be followed in conjunction with any other environmental management protocols stipulated in relevant WorkCover NSW, Australian Standard, and/or Council requirements.

The RAP requires that a site specific Construction Environmental Management Plan (CEMP) shall be provided by the remediation and construction contractor(s). The site specific CEMP shall be reviewed by the environmental consultant. As a minimum, the site specific CEMP shall detail the following:

- Works sequence and timeline;
- Health and Safety Protocols;
- Dust minimisation measures;
- Noise minimisation measures;
- Environment protection measures;
- Equipment to be used;
- Stockpiling locations, including nominated areas for materials not meeting landfill disposal requirements / classifications;
- Nominated landfill(s);
- Truck movements / site access / site egress;
- Proposed source(s) of materials for import, and methods of certification;
- Method(s) for surveying before and after physical barrier construction;
- Measures to prevent cross contamination between areas being remediated (capped) and those already capped;
- Method(s) for inspecting and certifying construction of the physical barrier systems, including any hold points (may be organised and commissioned by the Principal).

The remediation and construction works shall be undertaken with all due regard to the minimisation of environmental effects and to meet all statutory requirements. The successful contractor shall have in place the site specific CEMP such that work on the site complies with the requirements as laid down in relevant legislation, guidelines and codes.

The contractor shall also be responsible to ensure that the site works comply with the following conditions:

- fugitive dust leaving the confines of the site is minimised;
- no water containing any suspended matter or contaminants leaves the site in a manner which could pollute the environment;
- vehicles shall be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas; and
- noise and vibration levels at the site boundaries comply with the legislative requirements.

The appointed remediation and construction contractors will be provided with a copy of the RAP so that they are aware of the contamination status of the soils and the remediation methodology to be adopted. The environmental consultant will also review the CEMP and conduct an induction to ensure adequate understanding of the RAP.

9.7 Occupational Health & Safety

The RAP required that a site specific Occupational Health & Safety (OHS) Plan be prepared and submitted for approval by the appointed remediation and construction contractor(s). The RAP included a comprehensive set of requirements to be addressed.

9.8 Unexpected Asbestos Finds Protocol

Whilst investigations to date have not determined the presence of asbestos in the fill / soils, it is possible (due to the presence of building rubble in the fill) that asbestos-based materials may be uncovered during the remediation and/or construction works. This is likely to be in the form of asbestos-cement sheet fragments (fibro) and is only likely to occur. The physical barrier system proposed for the site is also considered suitable for soils containing asbestos. As such, the remediation approach will not change upon the identification of asbestos in the soil. The only changes will be in the execution of the works (i.e. worker and public protection, monitoring, and licensing) and the classification of any soils requiring off-site disposal.

In the event that asbestos-containing material is encountered, the following 'Asbestos Finds Protocol' has been established:

1. Upon discovery of suspected asbestos containing material, the site foreman is to be notified and the affected area closed off by the use of barrier tape and warning signs. Warning signs shall be specific to Asbestos Hazards and shall comply with the Australian Standard 1319-1994 – Safety Signs for the Occupational Environment.
2. The Environmental Consultant or an Occupational Hygienist is to be notified to inspect the area and confirm the presence of asbestos and determine extent of remediation works and confirm the protocols to be adopted. A report detailing this information will be compiled and provided to the construction manager.
3. The impacted soil (where it forms part of the required construction or remediation excavation process) will be stockpiled for waste classification purposes (including sampling and chemical analysis) and will be disposed of, as a minimum, as asbestos contaminated waste at an appropriately licensed solid waste landfill site. The

stockpile will be lightly wetted and covered with a plastic sheet whilst awaiting disposal.

4. All work associated with asbestos in soil will be undertaken by a contractor holding a class AS1 Licence. The AS1 licensed contractor will liaise with WorkCover as required and obtain all necessary permits to undertake the work. Works will be carried out in accordance with the Code of Practice for the Safe Removal of Asbestos, 2nd Edition, 2005.
5. Monitoring for airborne asbestos fibres is to be carried out during the soil excavation.
6. Documentary evidence (weighbridge dockets) of correct disposal is to be provided to the construction manager.
7. At the completion of the excavation, a clearance inspection is to be carried out and written certification is to be provided by an Occupational Hygienist that the area is safe to be accessed and worked.
8. The area may be reopened for further general excavation or construction work.

Although the presence of fibro in soil is potentially classifiable as friable asbestos by WorkCover (the actual classification status is to be verified by the occupational hygienist), the removal and disposal of soil containing fibro will not include a formal, wet decontamination procedure, encapsulation of the affected area or the use of negative air unit. The licensed contactor must establish, however, a separate area where employees can safely and securely leave clothing and change into disposable suits as necessary.

9.9 Long Term Site Management

Based on the proposed remediation methodology, long-term site management provisions were nominated by the consultant.

The overall remediation strategy relies to a large extent to the ongoing maintenance and monitoring of the physical barrier and in the instances of the retained buildings the requirements under the management plan will be required to ensure access to soils is not permitted.

It is a requirement of the RAP for the management plan to be prepared at the conclusion of the remediation works.

9.10 Audit Discussion of the Remedial Action Plan

Based on the information contained in the consultant's Remedial Action Plan (RAP) (Douglas Partners, January 2015), the Site Auditor finds that the proposed remediation:

- is technically feasible;
- is environmentally justifiable given the proposed development activities; and
- the proposed validation and contingency plans are suitably comprehensive to ensure contamination is managed and will not present an unacceptable risk to users of the site.

The consultant's RAP is based on a containment strategy, tailored for the different features of the site proposed in the development of the site as a child care centre. The containment strategy is for the isolation of the contaminants of concern (PAHs and Metals) in fill

extending from the current surface to depths exceeding 1.4m below a physical barrier, prohibiting users of the site direct contact, being the predominant exposure pathway.

The RAP specifically details the construction specifications for the physical barrier for new construction of building, paths and landscaped areas (including new plantings and existing trees) and provides requirements for existing buildings to be retained as well as the requirements for the long-term management and maintenance of the physical barrier.

Whilst a draft management plan was reviewed for this site audit, it does not specifically address the requirements of the RAP. It is required that following remediation works that a long-term management plan is prepared, detailing the requirements to monitor and maintain the physical barrier system.

A validation programme based on demonstrating the correct construction of the barrier is outlined and includes requirements for additional validation sampling of site soils around mature trees and for the validation of imported materials. The RAP requires that a validation report detailing the implementation of the RAP is prepared and submitted to council. It is recommended a NSW EPA Accredited Site Auditor independently reviews the construction works and validation report and that a Site Audit Statement is prepared certifying that the site is suitable for the proposed landuse as a child care facility prior to occupation of the child care centre.

It is the Site Auditor's opinion that the proposed remediation works as detailed in the RAP are appropriate and that the site can be made suitable for the proposed use of the site as a child care facility following the implementation of the remediation and validation works as detailed in the RAP and subject to the implementation of an appropriate long-term site management plan.

10 Consideration of Regulatory Requirements

The remediation and validation works proposed will be undertaken a remediation ancillary to development and it is understood that these works are included in the Development Approval for the redevelopment of the site. This is fortunate, as the consultant has not provided advice on whether the remediation would be undertaken as 'Category 1' (requiring consent) or as 'Category 2' remediation (not requiring consent) under State Environmental Planning Policy 55 (SEPP 55).

As the Site Audit is a specific requirement of a development consent or approval given under the *Environmental Planning and Assessment Act 1997* it has been conducted as a Statutory Site Audit as defined by section 47(c) of the *Contaminated Land Management Act 1997*.

11 Evaluation of Site Land Use Suitability

The NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition)* prescribe that during an assessment of the suitability of a site for an existing or proposed land use in an urban context, Site Auditors must follow the decision process and checklist for assessing urban redevelopment sites (page 50-51) of the Site Audit Guidelines (NSW DEC, 2006).

For the purposes of this Site Audit the objective is to determine whether the Site can be made suitable as a child care facility. In this instance the decision making process has been applied to assess whether that objective can be met.

The findings of the Site Audit are presented for each requirement of the decision process as follows:

All site assessment, remediation and validation reports follow NSW EPA (1997) Contaminated sites: Guidelines for consultants reporting on contaminated sites.

The documents provided by the consultant meet the requirements of the Site Audit in relation to the Guidelines for consultants reporting on contaminated sites (NSW OEH, 2011).

Aesthetic issues have been addressed.

No specific aesthetic issues were identified and are not expected to be a concern during the remediation and future use of the site as a child care facility.

Soils have been assessed against health-based investigation levels (see columns 1, 3 and 5 in Appendix II)[2]

Soils were assessed against the appropriate and equivalent health-based investigation levels during assessment works and levels detected above the assessment criteria have been the subject of the Remediation Action Plan requiring the construction of a physical barrier and long-term management plan to prohibit direct contact and/or ingestion and or inhalation of contaminated soil.

[2] *Column 1 in Appendix II refers to the Health based soil investigation levels for urban development sites in NSW – 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, town houses and villas presented in the Guidelines for the NSW Site Auditor Scheme (2nd edition) (NSW DEC, 2006)*

Column 3 in Appendix II refers to the Health based soil investigation levels for urban development sites in NSW – parks, recreational openspace, playing fields including secondary schools presented in the Guidelines for the NSW Site Auditor Scheme (2nd edition) (NSW DEC, 2006)

Column 5 in Appendix II refers to the Provisional Phytotoxicity-based investigation levels presented in the Guidelines for the NSW Site Auditor Scheme (2nd edition) (NSW DEC, 2006)

Any issues relating to local area background soil concentrations that exceed appropriate site soil criteria have been adequately addressed in the site assessments report(s).

No local background soil concentrations above the appropriate criteria were identified as an issue.

All impacts of chemical mixtures have been assessed.

No issues relating to chemical mixtures in relation to the identified contaminants of concern are expected.

The site management strategy is appropriate.

The remediation to be undertaken requires that a long-term management plan is implemented following construction of the physical barrier to ensure that it is appropriately monitored and maintained. A comment will be placed on the Site Audit Statement with regard to the requirement for a long-term site management plan to be prepared and the review of remediation works and the management plan by a NSW EPA Accredited Site Auditor with regard to the suitability of the site for the proposed land use, subject to the compliance with the management plan.

Any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed and reported to the site owner or occupier.

The potential for impacted groundwater to migrate from the site is not likely.

On the basis of the decision process followed and information reviewed during the Site Audit the Site Auditor is satisfied that the site can be made suitable for the proposed land use as a child care centre if it is remediated in accordance with the RAP.

12 Conclusions

The reports relating to the assessment of the site have been reviewed in relation to the objectives of the Site Audit. The Site Auditor has also visited the site in order to be familiar with the site features and the context of the reports reviewed.

The documents provided by the consultant generally (albeit with some limitations) meet the requirements of the Site Audit in relation to the guidelines for consultants reporting on contaminated sites (NSW OEH, 2011) and other relevant guidelines that apply in relation to methods of data collection, quality and interpretation of the data produced.

With regard to the assessment works conducted the consultants have concluded that fill present on the site is impacted with PAHs and metals, primarily lead. An RAP has been prepared that proposes to remediate the site using a strategy to contain impacted fill below a physical barrier. On the basis of the work undertaken, as described in the reports reviewed, the Site Auditor is satisfied that it provides sufficient detail for the proposed remediation works that is implemented the site can be made suitable for the proposed land use as a child care facility.

The NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd edition)* prescribe that during an assessment of the suitability of a site for an existing or proposed land use in an urban context, Site Auditors must follow the decision process and checklist for assessing urban redevelopment sites prescribed in the Guidelines. This checklist has been utilised by the Site Auditor in forming the opinion of whether the site can be made suitable for the proposed use.

In conclusion, a Site Audit Statement will be issued certifying that, in the opinion of the Site Auditor that the site can be made suitable for day care, preschool, primary school if the site is remediated in accordance with the RAP that has been reviewed.

The Site Audit Statement will be subject to the condition that a long-term site management plan must be prepared at the conclusion of the remediation and implemented and that the remediation works, validation reporting and long-term management plan is reviewed by a NSW EPA Accredited Site Auditor with consideration as to whether the site is suitable for the proposed land use, subject to the compliance with the long-term site management plan.

13 Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties. Enviroview Pty Ltd or the Site Auditor 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 without prior approval by the client, or amended in any way without prior approval by the Site Auditor, and should not be relied upon by other parties, who should make their own enquires, other than regulatory and planning authorities as required under the *Contaminated Land Management Act 1997* and *State Environmental Planning Policy 55*.

The data used to support the conclusions reached in this report have been obtained by other consultants and have been reviewed with a reasonable level of scrutiny, care and diligence. Every reasonable effort has been made to identify and obtain all relevant data, reports and other information that provide evidence about the condition of the site, and those that were held by the client and the client's consultants, or that were readily available. No liability can be accepted for unreported omissions, alterations or errors in the data collected and presented by other consultants. Accordingly, the data and information presented by others are taken and interpreted in good faith.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations reviewed, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analyses selected are based on the information detailed in the Site history. Further chemicals or categories of chemicals may exist at the Site that was not identified in the Site history and which may not be expected at the Site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

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, Enviroview Pty Ltd and the Site Auditor reserves the right to review the report in the context of the additional information.

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Appendix A:
Audit Interim Advice

3rd November 2014

Ref: 0301-1415 IA 01

Angie Clements
University of Technology Sydney
PO Box 123
ULTIMO NSW 2007

Via email: Angie.Clements@uts.edu.au

Dear Angela

RE: Interim Site Audit Advice 01 – Review of the assessment reports and Revised Remediation Action Plan dated September 2014 prepared by Douglas Partners.

James Davis of Enviroview Pty Ltd has been engaged to provide the services of a NSW EPA Contaminated Land Accredited Site Auditor, to conduct a Site Audit in relation to the site identified as 4-12 Buckland Street, Chippendale NSW. The site is to be redeveloped as a Child Care Centre, which will require the removal of an existing temporary building and construction of a new one storey child care centre, an open quadrangle play area with new landscaping and the reuse of an existing building as office space for the child care centre.

The purpose of this interim advice is to provide comments by the auditor with regard to the site audit objectives and the review of the *Report on Remedial Action Plan UTS Blackfriars Campus Chippendale.* Prepared by Douglas Partner dated September 2014 with the Document reference 45996.04 Rev 1.

This interim advice does not constitute a Site Audit Statement or a Site Audit Report, but is provided to assist with regard to the requirements of the site audit at this interim stage of the Audit. The information provided herein should not be considered pre-emptive of the final audit conclusions. A Site Audit Report and Site Audit Statement will be prepared at the conclusion of the site audit.

Review Comments

1. Section 1.1. This section has the note that it is a planning document and 'does not form a detailed specification for the proposed remediation'. The detailed specification for the barrier strategy specifications are required to be able to conclude that the site can be made suitable with the implementation of the built system. Whilst the RAP is relatively comprehensive the site audit will require, more detail in relation to the barrier system. The RAP is not far from providing this if it can relate the details of the barrier system provided on Appendix A to each of the proposed built features this would enable review to include the adequacy in this regard. It is noted that in most instances additional information on the final levels and the depth of the installed barrier system components will be required.

2. Section 2. Minimising impacts to the environment during remediation is listed twice; the concern here is the remedial plan appears to place protection of the environment during the works with greater emphasis than rendering the site suitable for its long term proposed use.
3. Section 8.5. Please define specifically the 'low to moderate' and 'high' contaminant concentrations discussed in the third bullet point on the results of samples collected from the PRZ, and the associated management requirements.
4. Section 8.6. The landscape concept plan referred to does not reflect the proposed development. Please provide the up-to-date plans for this reference.
5. Section 10. Please ensure that any additional sampling of root zones etc. is provided in the validation report.
6. Section 10.2. Please provide details or reference to the sampling methods for the quantitate assessment of asbestos.
7. Figures. As mentioned earlier it is noted that drawings provided in Appendix B - Proposed Development Drawings do not relate to the current proposed childcare centre. Please review and remove the unnecessary and out-of-date plans and provide correct plans, further in relation to the detail specifications required it is expected that additional drawing will be required.
8. In addition to the first comment earlier on the requirement for details specifications, the Site Audit also needs to consider the long term EMP that is to be implemented in conjunction with the RAP. The overall strategy and concluding site suitability relies on both the implementation of the RAP and the Long Term EMP and the site audit statement needs to make reference to both of the documents in considering whether the site can be made suitable for the proposed landuse. Further, the City of Sydney Council DCP on Contaminated Land requires the placement of a covenant on the title for the land. The covenant must advise of any maintenance works required to be carried out, and that if maintenance is to be carried out, the owner or person proposing to carry out the maintenance, should contact an Environmental Health Officer from Council and that records of any maintenance undertaken on the site should be kept for future reference. This requirement will need to be included in the RAP and Long Term EMP. An acknowledgement from UTS that it is aware of its obligations under the DCP is also required.

Thank you for your time in regard to this matter. If you require additional information or clarification, please do not hesitate to contact me.

Yours sincerely

James Davis
NSW EPA Contaminated Land Site Auditor
Enviroview Pty Ltd

Appendix B:
Site Plans

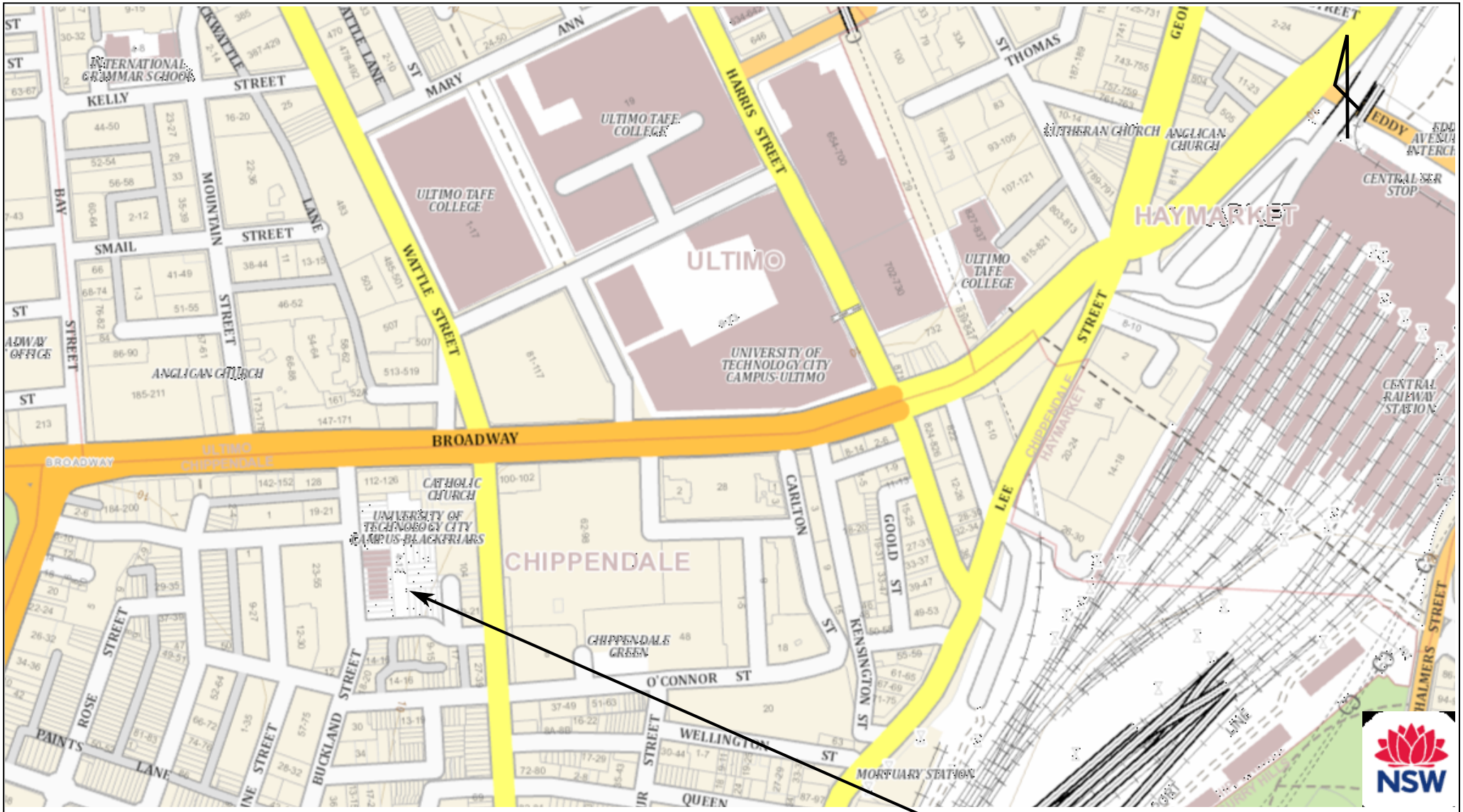
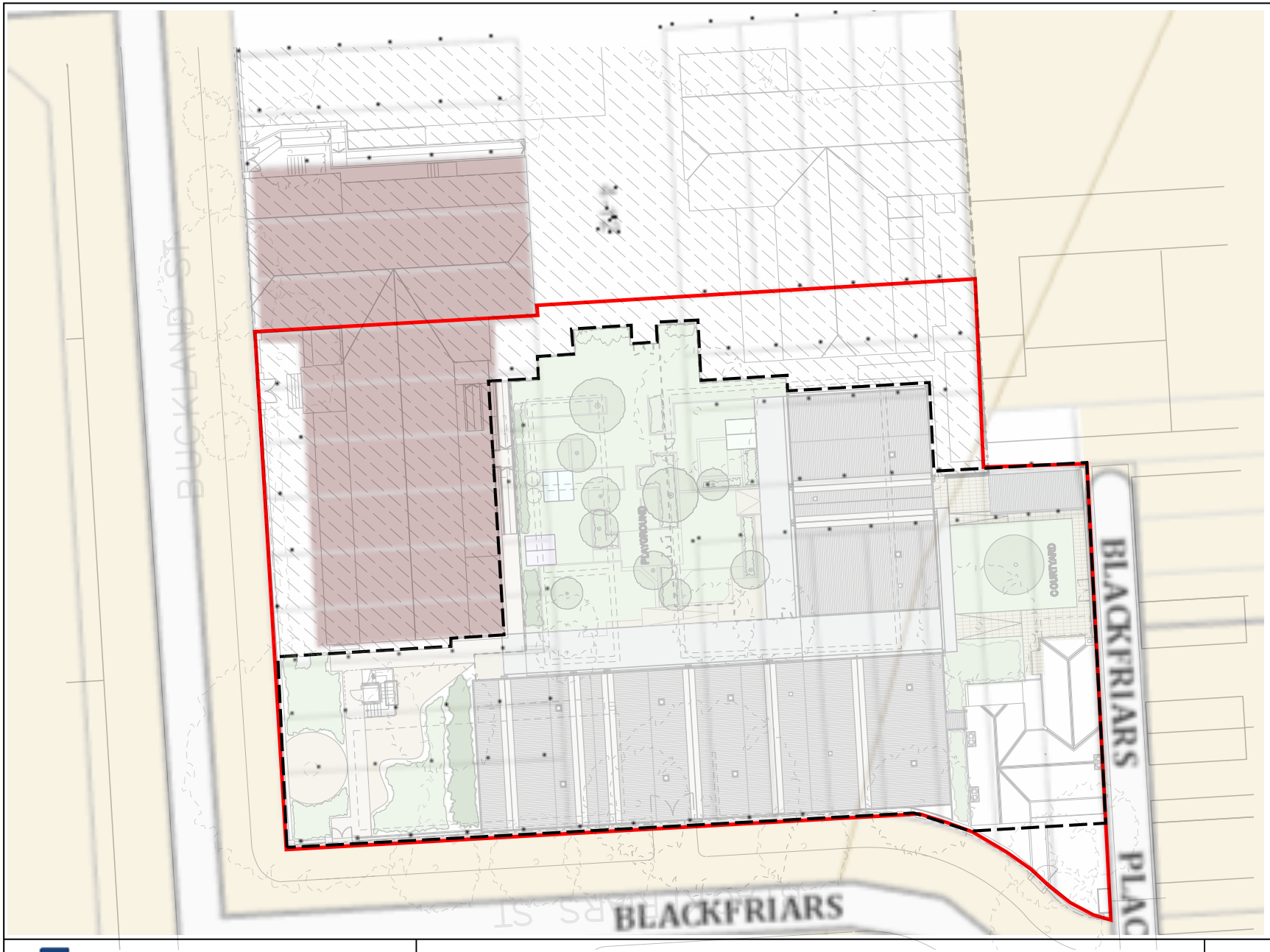


Figure 1. Site Audit Site Location - UTS Blackfriars Campus, 4-12 Buckland Street, Chippendale NSW

Date: 29 January 2015
Drawn By: JRAD
Checked: JRAD
ENVIROVIEW PTY LTD

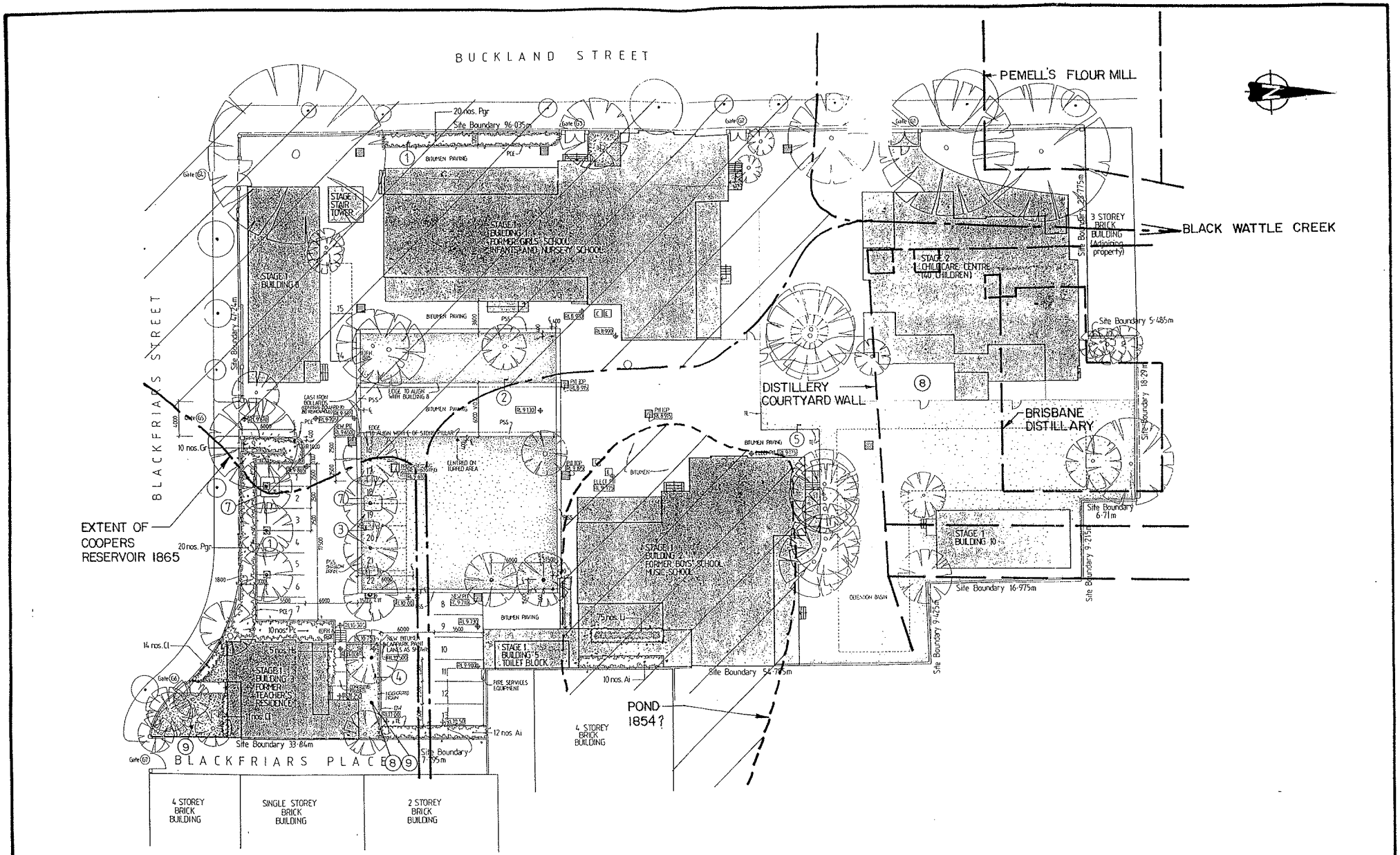


ENVIROVIEW

Figure 2. Site Audit Site - Proposed child care centre, 4-12 Buckland Street, Chippendale NSW

Date: 29 January 2015
Drawn By: JRAD
Checked: JRAD
ENVIROVIEW PTY LTD

Appendix C:
Plan Showing Historic Features



Coffey Partners International Pty Ltd Consulting Engineers in the geotechnical sciences
A.C.N. 003 892 019

revision	description	drawn	approved	date

drawn	AW/MOD
checked	
date	

HOWARD TANNER & ASSOC. PTY. LTD.
PROPOSED CHILD CARE CENTRE
BLACKFRIARS STREET, CHIPPENDALE
SITE HISTORY MAP

COFFEY

drawing no. FIGURE 3

job no. S9979/3

4 0 4 8 12 16 20
scale (metres)

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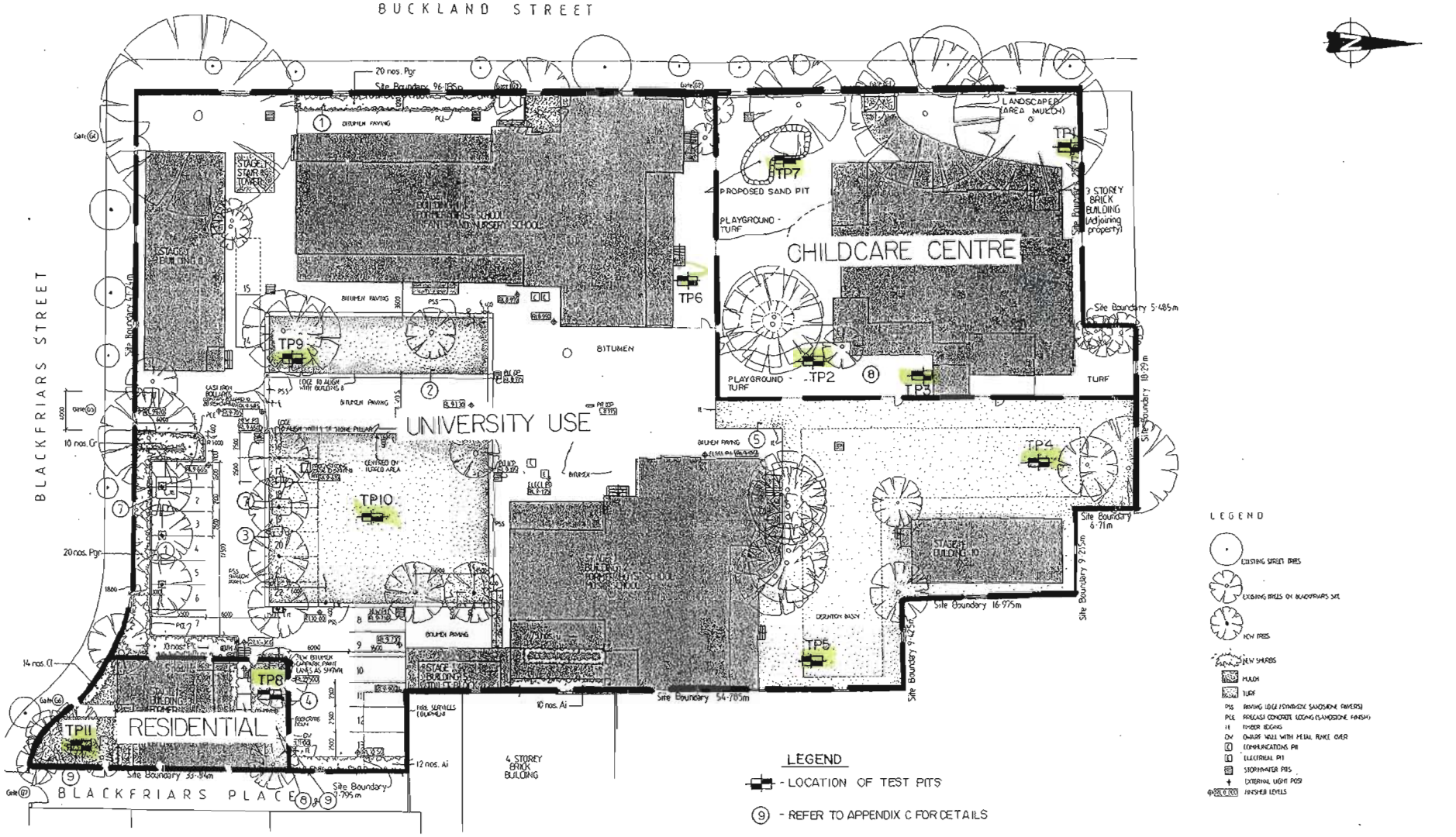
Appendix D:
Environmental Site Assessment Test Pit Locations



Coffey Partners International Pty Ltd Consulting Engineers in the geotechnical sciences
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revision	description	drawn	approved	date

drawn	AW / MOD
checked	
date	

HOWARD TANNER & ASSOC. PTY. LTD.
PROPOSED CHILD CARE CENTRE
BLACKFRIARS STREET, CHIPPENDALE
TEST PIT LOCATIONS AND LANDUSE

FIGURE 2

job no. S9979/3

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Appendix E:
Environmental Site Assessment Field Observations

TABLE 1 SOIL PROFILE SUMMARY AND FIELD OBSERVATIONS AND PID READINGS
JOB NO: S9979/3

Test Pit Depth (m)	Soil Type	Soil Moisture	Soil Unit	PID Readings		Groundwater
				Depth(m)	PID (ppm)	
TP1						
0--0.15	F. Bitumen surface – gravel coal waste	dry	1	0.15	0.4	--
0.15--0.6	F. Black silty sand with hard black gravel fragments (coal/slag fragments)	dry	2.1	0.6	1	--
0.6–2	F. grey sand, clay with brick mortar.	moist	5			--
TP2						
0–0.1	F. Bitumen gravel/coal waste	dry	1			--
0.1--0.2	F. sandy red clay -- with gravel	dry	3			--
0.2–0.55	F. Dark brown sand	dry	4			--
0.5–1.75	F. Brown sand with SS blocks, coal bits and clay seams	moist	5			--
1.75--2.6	N. moist clay with gravel sand seams	moist	6	2	1	--
2.6	N. Grey sand	wet	7	2.6	1.8	groundwater at 2.6m
TP3						
0–0.1	F. Dark brown/silty sand	dry	2.0			--
0.1–0.15	F. White clay	dry	2.2	0.1	0.9	--
0.15–1.0	F. Sand with white gravel and brick fragments	dry	4			--
1–1.5	F. Red clay with gravel	dry	3			--
1.5–1.7	F. White clay	moist	2.2	1.5	1.02	--
1.7–1.8	F. Black silty sand	moist	2.1	1.7	0.4	--
1.8–2.0	N. Grey sand	moist				--
TP4						
0–0.1	F. Coal waste/bitumen	dry	1			--
0.1--0.15	F. Red and yellow clay	dry	3	0.15	1.1	--
0.15–1.5	F. Brown sand, clay with burnt roots	dry	4			--
1.5–3	F. Brown sands with bottle and brick fragments	dry	4.1			--
3–3.1	F. Yellow sand--highly weathered sandstone	moist	8	2.5	2.5	--
3.1	N. Yellow/white sandstone	moist	9			--

TABLE 1 SOIL PROFILE SUMMARY AND FIELD OBSERVATIONS AND PID READINGS
JOB NO: S9979/3

Test Pit Depth (m)	Soil Type	Soil Moisture	Soil Unit	PID Readings		Groundwater
				Depth(m)	PID (ppm)	
TP5						
0–0.1	F. Brown silty sand	dry	4			–
0.1–0.15	F. Black silty sand with gravel and ash (coal waste)	dry	2	0.15	0.8	–
0.15–0.2	F. Red clay	dry	3			–
0.2–0.25	F. White clay/gravelly	moist	2.2			–
0.25–2.5	F. Grey sand clay seams	moist	5			–
2.6–3	N. Grey sand	wet	7		1.7	presume watertable close
TP6						
0–0.5	F. Grey gravelly sand with bottle pieces, & ss fragments	moist	0.401	0.1	2.8	–
0.5–1.1	F. Light brown sandy clay	moist	5			–
1.1–1.2	Grey sand with yellow gravel (sandstone)	wet	6			–
1.2–1.75	F. Grey sand	wet	7	1.75	1.6	presumed watertable at 2m
TP7						
0–0.2	F. Dark grey and red silty sand	moist	2.0			–
0.2–0.4	F. Yellow sand	moist	2.3			–
0.4–0.5	F. Rd clay with gravel	moist	3			–
0.5–1.5	F. Grey sand with dark grey sand seams	moist				–
1.5–2	F. Red gravelly clay	moist	3	2	11.6	–
TP8						
0–0.1	F. Brown/grey silty sand	dry	2			–
0.1–0.25	F. Brown clay with gravel	dry	2.4			–
0.25–0.32	F. Black sand with white fragments of coal and ash	dry	2.5	0.25	80	–
0.32–0.5	F. Dark brown silty clay	dry	3.1			–
0.5–1.2	F. White sand	moist	6.1	1.1	2	–
TP9						
0–0.1	Gravel/bitumen	dry	1.1			–
0.1–0.3	F. Gravelly clay	dry	2.4	0.15	0.8	–
0.3–1.2	F. White/cream sand	moist	6.1			–
1.2–1.4	N. Sandy loam (silty sand) – old topsoil and roots	wet	7.2	1.3	0.6	groundwater table hit at 1.3m

TABLE 1 SOIL PROFILE SUMMARY AND FIELD OBSERVATIONS AND PID READINGS
JOB NO: S9979/3

Test Pit Depth (m)	Soil Type	Soil Moisture	Soil Unit	PID Readings		Groundwater
				Depth(m)	PID (ppm)	
TP10						
0–0.5	F. Grey silty sand	dry	2			–
0.05–0.1	F. Bitument/black gravel	dry	1			–
0.1–0.15	F. Red and white clay	dry	3	0.15	0.4	–
0.15–0.4	F. Grey sand	dry	5			–
TP11 Background and on front yard						
0.05–0.1	F. Topsoil fill – Brown silty sand (loamy sand)	2	6.2		1.2	–
LEGEND						
F = Fill N = Natural M= Moist W= wet ss= sandstone @= at + = and						

Appendix F:
Environmental Site Assessment Soil Results

Table 2. Total concentrations of various analytes in soil samples (All units in mg/kg on a dry weight basis) unless otherwise indicated.

Samples (sample locations)	TP11	TP7	TP3	TP9	TP5	TP1	TP8	TP4	Guidelines: ANZECC 1992	ANZECC 1992	Dutch 1994	Canadian 1991
Depth (m)	0.1	2	1.7	0.15	0.1–0.15	0.6	0.3	2.5	environmenta	health	intervention	
pH	6.4	7.6	7.7	7.8	7.1	8.7	7.6	8.2				6–8
EC(uS/cm)	52	46	2200	75	120	130	270	220				2
HEAVY METALS												
Arsenic	6.7	1.2	4.5	3.5	4.5	5.2	6.9	4.9	200	100	55	
Cadmium	2.1	<1	<1	<1	<1	<1	1.6	<1	3	20	12	
Chromium	25	12	8.6	12	6.4	13	23	12	50		380	
Copper	130	5.5	58	4.9	350	49	92	320	60		190	
Mercury	3.0	<0.2	5.5	<0.2	0.2	1.9	47	4.9	1		10	
Lead	820	24	290	38	140	380	3900	760	300	300	530	
Selenium	<1	<1	<1	<1	<1	<1	<1	<1				
Zinc	360	20	370	12	76	180	800	260	200		720	
ORGANIC CHEMICALS												
Phenols												
Cresols	<1	<1	<1	<1	<1	<1	<1	<1			5	1
Pentachlorophenol	<2	<2	<2	<2	<2	<2	<2	<2			5	0.5
Phenol	<1	<1	<1	<1	<1	<1	<1	<1			40	1
2,3,4,6–Tetrachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1				0.5
2,4,5–Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1				0.5
2,4,6–Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1				0.5
Total phenols	<5	<5	<5	<5	<5	<5	<5	<5		5		
Total cholorophenols	<10	<10	<10	<10	<10	<10	<10	<10			10	
Total Petroleum Hydrocarbons (TPH)												
C6 – C9	<10	<10	<10	<10	<10	<10	<10	<10				
C10 – C14	<10	<10	<10	<10	<10	<10	<10	<10				
C15 – C28	210	<30	<30	<30	<30	<30	<30	<40	40			
C29 – C36	280	<30	<30	<30	<30	<30	<30	<30				
Total C10–C28	490	<100	<100	<100	<100	<100	<100	<100			5000	
Polyaromatic hydrocarbons (PAH's)												
Naphthalene	<1	<1	<1	<1	<1	<1	<1	<1			~10	5
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1	<1				
Acenaphthene	<1	<1	<1	<1	<1	<1	<1	<1				
Fluorene	<1	<1	<1	<1	<1	<1	<1	<1				
Phenanthrene	3	<1	<1	<1	<1	<1	<1	<1				5
Anthracene	1	<1	<1	<1	<1	<1	<1	<1				
Fluoranthene	9.5	<1	<1	<1	<1	<1	<1	2				
Pyrene	9	<1	<1	<1	<1	<1	<1	2.5				10
Benz[a]anthracene	5.5	<1	<1	<1	<1	<1	<1	1.5				1
Chrysene	5	<1	<1	<1	<1	<1	<1	1.5				
Benzo[b]fluoranthene }	11	<1	<1	<1	<1	<1	<1	4				1
Benzo[k]fluoranthene }	comb.	comb.	comb.	comb.	comb.	comb.	comb.	comb.				1
Benzo[a]pyrene	6.5	<1	<1	<1	<1	<1	<1	2		1		1
Indeno[1,2,3–cd]pyrene	5	<1	<1	<1	<1	<1	<1	1.5				1
Dibenz[ah]anthracene	1.5	<1	<1	<1	<1	<1	<1	<1				1
Benzo[ghi]perylene	6.5	<1	<1	<1	<1	<1	<1	2				
Total PAH	65	<10	<10	<10	<10	<10	<10	17		20	40	

GUIDELINES:

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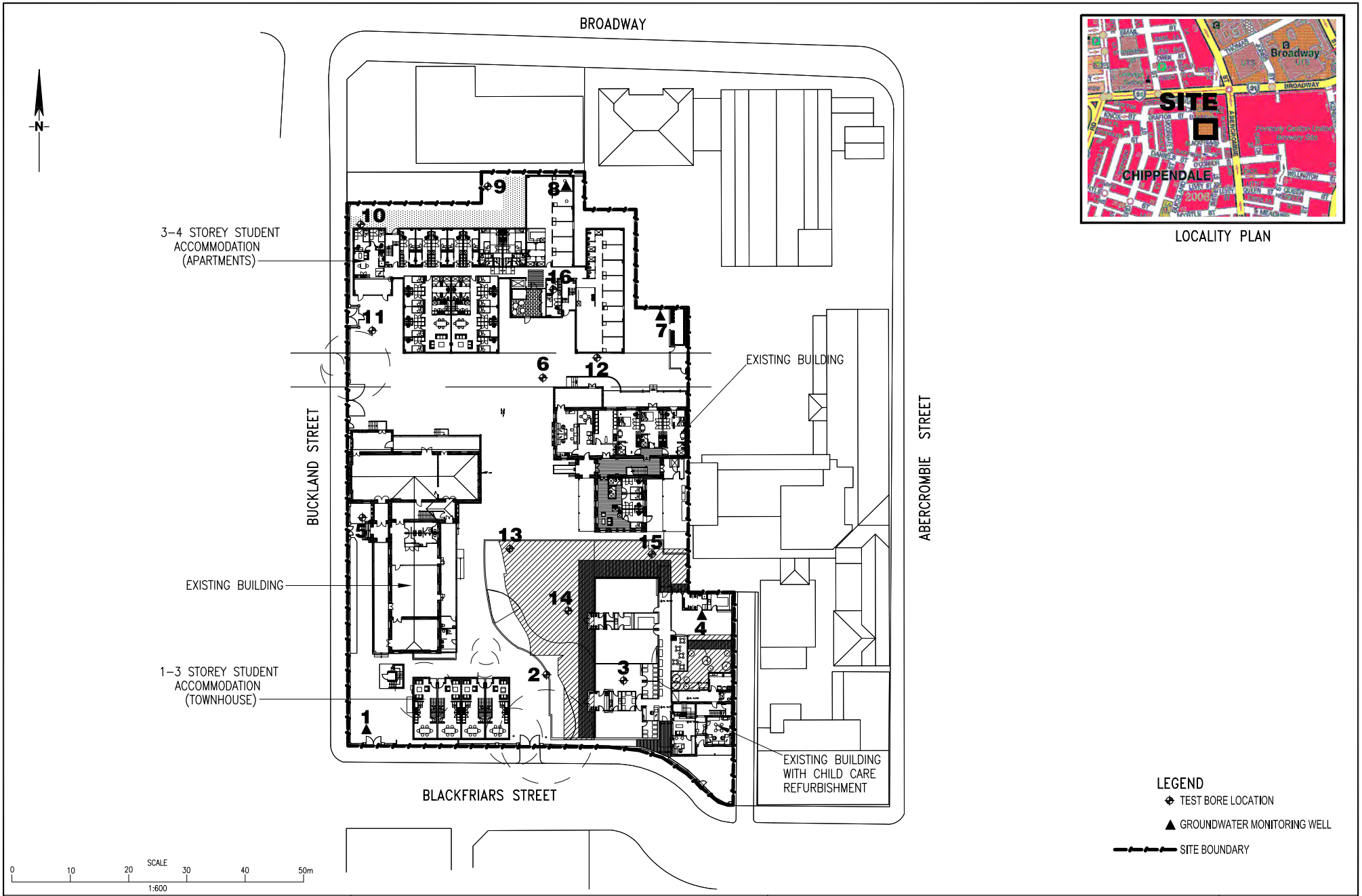
Appendix G:
Phase 2 Assessment Borehole Locations



LOCALITY PLAN

LEGEND

- TEST BORE LOCATION
- GROUNDWATER MONITORING WELL
- SITE BOUNDARY

Douglas Partners
Geotechnics • Environment • Groundwater

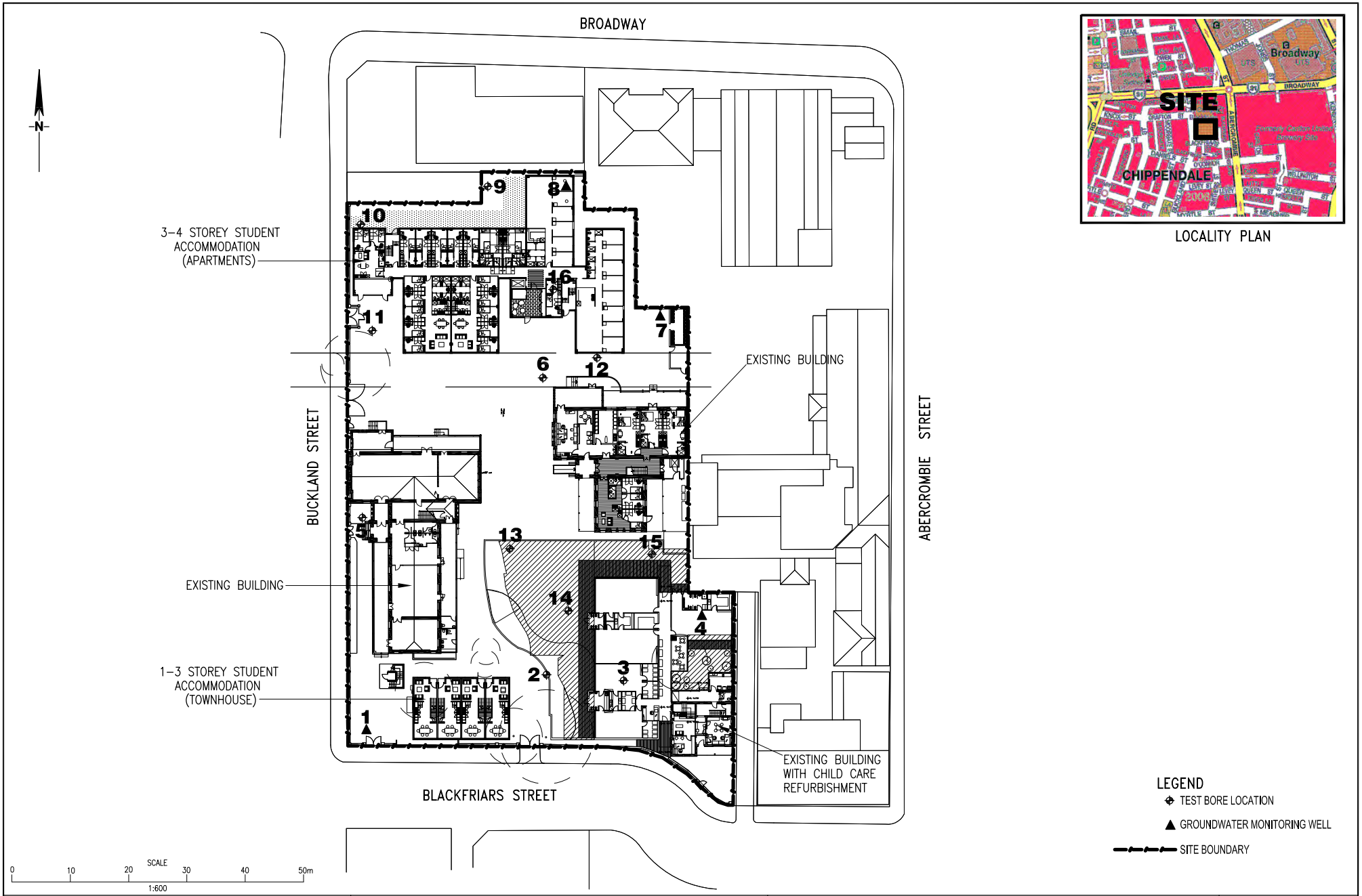
CLIENT: Hutchinson Builders		
DRAWN BY: PSCH	SCALE: As shown	OFFICE: Sydney
APPROVED BY:		DATE: 3.3.2009

TITLE: **Location of Test Bores and Monitoring Wells**
Proposed Student Accomodation and Childcare Centre
Buckland Street, CHIPPENDALE

PROJECT No:	45996.01
DRAWING No:	1
REVISION:	A

P:\45996.01 CHIPPENDALE, UTS - Blackfriars & Buckland Sts - Environmental PG\Drawings\45996.01-1.dwg, 3/4/2009 7:53:06 AM

Appendix H:
2009 Proposed Development



LOCALITY PLAN

LEGEND

- TEST BORE LOCATION
- GROUNDWATER MONITORING WELL
- SITE BOUNDARY

Douglas Partners
Geotechnics • Environment • Groundwater

CLIENT: Hutchinson Builders		
DRAWN BY: PSCH	SCALE: As shown	OFFICE: Sydney
APPROVED BY:		DATE: 3.3.2009

TITLE: **Location of Test Bores and Monitoring Wells**
Proposed Student Accomodation and Childcare Centre
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PROJECT No:	45996.01
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P:\45996.01 CHIPPENDALE, UTS - Blackfriars & Buckland Sts - Environmental PG\Drawings\45996.01-1.dwg, 3/4/2009 7:53:06 AM

Appendix I:
Phase 2 Site Assessment Soil and Groundwater Results

Table 10 - Results of Soil Analysis

(All results in mg/kg unless otherwise stated)

Sample ID	Natural / Filling	Heavy Metals									PAH				TPH		Benzene	Toluene	Ethylbenzene	Total Xylene	VOCs	PCB	OCP[6]	OPP	Total Phenols	Cyanide	Asbestos
		As	Cd	Cr[1]	Cu	Total Pb	TCLP Pb[7]	Hg	Ni	Zn	Total B(a)P[4]	TCLP B(a)P[4 7]	Total +ve PAH	TCLP +ve PAH[7]	C6-C9	C10-C36											
Area of the Proposed Childcare Centre																											
3/0.3-0.5	F	9	<0.5	11	60	290	0.09	2.6	11	84	2.2	<0.001	30.9	<0.002	<25	130	<0.5	<0.5	<1	<3	-	-	-	-	-	-	NAD
3/0.7-1.0	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
3/1.2-1.5	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
3/1.7-2.0	F	<4	<0.5	15	3	19		<0.1	3	2	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
4/0.3-0.5	F	<4	<0.5	7	32	100	0.08	0.8	5	89	0.7	<0.001	7.7	<0.002	<25	<100	<0.5	<0.5	<1	<3	-	-	-	-	-	-	NAD
4/1.2-1.5	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
4/1.7-2.0	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
14/0.3-0.5	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
14/1.2-1.5	F	-	-	-	-			-	-	-	0.07		0.27		-	-	-	-	-	-	-	-	-	-	-	-	-
14/2.2-2.5	F	<4	<0.5	5	3	14		<0.1	<1	15	0.05		0.75		<25	<100	<0.5	<0.5	<1	<3	<2.0	-	-	-	-	-	NAD
15/0.3-0.5	F	<4	<0.5	8	6	29		0.1	2.0	11	<0.05		<0.2		<25	<100	<0.5	<0.5	<1	<3	-	-	-	-	-	-	NAD
15/0.7-1.0	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
15/2.2-2.5	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
Remaining Site Area																											
1/0-0.5	F	<4	<0.5	14	26	88		<0.1	8	100	21	<0.001	238.5	0.001	<25	1360	<0.5	<0.5	<1	<3	-	<1	<0.1	<0.1	<5	<0.5	NAD
1/0.7-1.0	F	-	-	-	-			-	-	-	7.8		74.3		-	-	-	-	-	-	-	-	-	-	-	-	-
2/0.3-0.5	F	-	-	-	-			-	-	-	2.9		30.1		-	-	-	-	-	-	-	-	-	-	-	-	-
2/0.7-1.0	F	<4	<0.5	3	5	25		<0.1	2	5	0.2		1.8		-	-	-	-	-	-	<2.0	<0.1	<0.1	<0.1	<5	<0.5	NAD
2/1.7-2.0	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
2/3.2-3.5	N	<4	<0.5	19	2	10		<0.1	1	22	<0.05		<0.2		<25	<100	<0.5	<0.5	<1	<3	-	-	-	-	-	-	-
5/0.3-0.5	F	<4	<0.5	7	18	50		<0.1	4	44	0.8		8.3		<25	<100	<0.5	<0.5	<1	<3	-	<0.1	<0.1	<0.1	<5	<0.5	NAD
5/1.2-1.5	F	-	-	-	-			-	-	-	0.06		0.26		-	-	-	-	-	-	-	-	-	-	-	-	-
6/0.0-0.1	F	<4	<0.5	10	16	49		<0.1	6	53	0.7		6.5		-	-	-	-	-	-	-	-	-	-	-	-	NAD
6/0.3-0.5	F	-	-	-	-			-	-	-	36	<0.001	50.77	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-
6/0.7-1.0	F	-	-	-	-			-	-	-	0.7		8.2		-	-	-	-	-	-	-	-	-	-	-	-	-
6/1.2-1.5	F	7	<0.5	14	45	77		0.3	13	230	1		13.3		<25	<100	<0.5	<0.5	<1	<3	-	-	-	-	-	-	-
BD1/040209[5]	F	7	<0.5	13	18	52		0.2	11	22	0.7		9.3		-	-	-	-	-	-	-	-	-	-	-	-	-
7/0.3-0.5	F	-	-	-	-			-	-	-	30		430.5		-	-	-	-	-	-	-	-	-	-	-	-	-
7/0.7-1.0	F	<4	<0.5	18	12	300	1.1	1.6	2	32	0.3		3.5		<25	<100	<0.5	<0.5	<1	<3	<2.0	<0.1	<0.1	<0.1	<5	<0.5	NAD
7A/1.7-2.0	F	-	-	-	-			-	-	-	<0.05		<0.2		-	-	-	-	-	-	-	-	-	-	-	-	-
8/0.3-0.5	F	-	-	-	-			-	-	-	14		123.2		-	-	-	-	-	-	-	-	-	-	-	-	-
8/0.7-1.0	F	-	-	-	-			-	-	-	1.1		9		-	-	-	-	-	-	-	-	-	-	-	-	-
8/1.2-1.5	F	5	<0.5	13	210	95		0.7	9	180	0.5		4.5		-	-	-	-	-	-	-	-	-	-	-	-	NAD
8/2.7-3.0	F	5	<0.5	18	28	240	0.89	0.7	11	87	0.4		4.5		<25	<100	<0.5	<0.5	<1	<3	-	<0.1	<0.1	<0.1	<5	<0.5	-
9/0.2-0.5	F	4	0.6	11	75	1500	1.70	0.3	9	500	7.2	<0.001	67.4	<0.002	<25	640	<0.5	<0.5	<1	<3	-	<0.1	0.4	0.8	<5	-	NAD
BDA/110209[5]	F	4	0.6	12	77	720		0.4	8	460	10		116.8		-	-	-	-	-	-	-	-	-	-	-	-	-
10/0.0-0.1	F	<4	<0.5	9	38	140		0.2	5	140	2.2		25.5		<25	350	<0.5	<0.5	<1	<3	-	<0.1	<0.1	<0.1	<5	<0.5	NAD
11/0.2-0.5	F	<4	<0.5	15	65	150	0.15	0.4	15	140	15	<0.001	128.3	<0.002	<25	2120	<0.5	<0.5	<1	<3	-	<1	<0.1	<0.1	<5	-	NAD
BDB/110209[5]	F	<4	<0.5	13	68	160		0.5	16	140	16		139.4		-	-	-	-	-	-	-	-	-	-	-	-	-
BDB1/110209[5]	F	3	0.1	11	58	11	-	-	137	143	0.5		149.3		-	-	-	-	-	-	-	-	-	-	-	-	-
12/0.0-0.1	F	<4	<0.5	5	10	18		<0.1	4	39	0.1		1.2		<25	<100	<0.5	<0.5	<1	<3	-	<0.1	<0.1	<0.1	<5	<0.5	NAD
12/0.3-0.5	F	-	-	-	-			-	-	-	13		164.7		-	-	-	-	-	-	-	-	-	-	-	-	-
12/1.2-1.5	F	-	-	-	-			-	-	-	0.9		10.4		-	-	-	-	-	-	-	-	-	-	-	-	-
13/0.3-0.5	F	-	-	-	-			-	-	-	2.7		36.5		-	-	-	-	-	-	-	-	-	-	-	-	-
13/1.2-1.5	F	-	-	-	-			-	-	-	0.4		3.7		-	-	-	-	-	-	-	-	-	-	-	-	-
13/3.7-4.0	N	<4	<0.5	32	4	16		<0.1	2	2	<0.05		<0.2		<25	<100	<0.5	<0.5	<1	<3	-	-	-	-	-	-	NAD
16/0.2-0.5	F	<4	<0.5	11	47	150	0.1	1.1	8	150	16	<0.001	165.7	0.002	<25	920	<0.5	<0.5	<1	<3	-	<1	<0.1	<0.1	<5	<0.5	NAD
16/0.7-1.0	F	-	-	-	-			-	-	-	1.1		10.1		-	-	-	-	-	-	-	-	-	-	-	-	-
16/1.7-2.0	F	-	-	-	-			-	-	-	6		55.8		-	-	-	-	-	-	-	-	-	-	-	-	-
Trip Blank	-	-	-	-	-	-		-	-	-	-		-		-	-	<0.5	<0.5	<1	<3	-	-	-	-	-	-	-
Trip Spike[8]	-	-	-	-	-	-		-	-	-	-		-		-	-	103	110	104	107/106	-	-	-	-	-	-	-
95% UCL		-	-	-		397.2	-				-	-	-	-	-	836.9	3.0	-	-	-	-	-	-		-		-
Site Assessment Criteria																											
SAC: Residential with gardens and accessible soil (HIL - Column 1)	**Applicable to Area of Proposed Childcare Centre**	**100**	**20**	**100**	**1000**	**300**	**N/A**	**15**	**600**	**7000**	**1**	**N/A**	**20**	**N/A**	**65**	**1000**	**1**	**1.4**	**3.1**	**14**	**Refer to Table 3**	**10**	**10/50/200/10**	**N/A**	**8500**	**500**	**No Asbestos on ground surface[9]**
SAC: Residential with minimal access to soil (HIL - Column 2)	**Applicable to Remaining Site Area**	**400**	**80**	**48000**	**4000**	**1200**	**N/A**	**60**	**2400**	**28000**	**4**	**N/A**	**80**	**N/A**								**40**	**40/200/800/40**	**N/A**	**34000**	**2000**	

SAC: Provisional phytotoxicity-based investigation levels for sandy loams (HIL - Column 5)	Applicable to Proposed Landscape Area	20	3	400	100	600	N/A	1	60	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Waste Classification Threshold Criteria (without TCLP) [2]																												
General Solid Waste (CT1)		100	20	100	N/A	100	N/A	4	40	N/A	N/A	N/A	0.8	N/A	N/A	N/A	10	288	600	1000	N/A	N/A	N/A	4	N/A	320	N/A
Restricted Solid Waste (CT2)		400	80	400	N/A	400	N/A	16	160	N/A	N/A	N/A	3.2	N/A	N/A	N/A	40	1152	2400	4000	N/A	N/A	N/A	15	N/A	1280	N/A
Waste Classification Threshold Criteria (with TCLP) [2]																												
General Solid Waste (CT1)		500	100	1900	N/A	1500	5	50	1050	N/A	10	0.04	200	N/A	650	10000	18	518	1080	1800	N/A	<50	<50	7.5	N/A	16	N/A
Restricted Solid Waste (CT2)		2000	400	7600	N/A	6000	20	200	4200	N/A	23	0.16	800	N/A	2600	40000	72	2073	4320	7200	N/A	<50	<50	30	N/A	64	N/A
VENM																												
Background ranges																												
NEPC		1-50	1	5-1000	2-100	2-100	N/A	0.03	5-500	10-300	-	N/A	-	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Health-based (HIL) and provisional phytotoxicity-based (PPIL) investigation levels																												
HIL		100	20	12000	1000	300	N/A	15	600	7000	20	N/A	1	N/A	65 [3]	1000 [3]	1 [3]	1.4 [3]	3.1 [3]	14 [3]	-	-	-	-	-	-	-	-
PPIL		20	3	400	100	600	N/A	1	60	200	-	N/A	-	N/A	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

1	All Chromium are assumed to exist in the stable Cr(III) oxidation state, as Cr(VI) will be too reactive and unstable in normal environmental conditions
2	NSW DECC *Waste Classification Guidelines* (Table 2) [April 2008]
3	NSW EPA Contaminated Sites *Guidelines for Assessing Service Station Sites* (1994) threshold concentrations for sensitive land use-soils
4	benzo(a)pyrene
5	field replicate sample of sample listed directly above
6	In the order Aldrin + dieldrin, Chlordane, DDT +DDD + DDE, Heptachlor
7	TCLP in mg/L
8	Reported as % Recovery
9	No asbestos present on the ground surface (Correspondence from NSW EPA Director of Contaminated Sites to Accredited Site Auditors)
NEPC	NEPC (1999). National Environmental Protection (Assessment of Site Contamination) Measure *Schedule B(1) Guidelines on the Investigation Levels for Soil and Groundwater, Background Ranges*
HIL/PPIL	NSW EPA Contaminated Sites *Guidelines for the NSW Site Auditor Scheme* (2nd Edition) (2006) Soil Investigation Levels for Urban Redevelopment Sites in NSW Heath-based investigation levels for residential with gardens (HIL Column 1) and Provisional Phytotoxicity Based Investigation Levels (PPIL)
NAD	No asbestos detected at reporting limit of 0.1g/kg
Bold	exceeds criteria
Bold	Denotes hotspot (exceeds 2.5 times SAC)
N/A	Not applicable
-	not analysed

Table 11 - Results of Groundwater Analysis
(All results in µg/L unless otherwise stated)

Sample ID	Heavy Metals (Filtered)								PAH[2]		TPH		Benzene	Toluene	Ethylbenzene	Total Xylene	VOCs	OCP/OPP	PCB	Total Phenols	Hardness (mg$CaCO_3$/L)
	As	Cd	Cr[1]	Cu	Pb	Hg	Ni	Zn	B(a) P	Total +ve PAH	C6-C9	C10-C36									
GW1/120209	<1	<0.1	<1	2.4	<1	<0.5	11.0	18	<1	<2	<10	200	<1.0	<1.0	<1.0	<2.0	<10	<0.2	<2	<0.05	130
GW4/120209	2.1	<0.1	<1	<1	<1	<0.5	<1	15	<1	<2	<10	163	<1.0	<1.0	<1.0	<2.0	<10	<0.2	<2	<0.05	120
GW7/100209	<1	<0.1	<1	<1	<1	<0.5	1.6	13	<1	<2	<10	<100	<1.0	<1.0	<1.0	<2.0	<10	<0.2	<2	<0.05	110
GW8/100209	<1	0.2	<1	<1	<1	<0.5	1	21	<1	<2	<10	<100	<1.0	<1.0	<1.0	<2.0	<10	<0.2	<2	<0.05	430
BD1/100209[3]	<1	<0.1	<1	<1	<1	<0.5	1	11	<1	<2	<10	<100	<1.0	<1.0	<1.0	<2.0	<10	<0.2	<2	<0.05	430
GIL for GW1, 4 and 7 / 100209 (moderate to hard hardness)	13	0.54	2.5	3.5	13.6	0.6	27.5	20	0.2	16/2.0	150	600	950	300	140	350	Refer to Table 5	0.08/0.01/0.2/0.02/0.09[5]	0.6/0.030[6]	320	ND
GIL for GW8/100209 (extreme hardness)		2.0	8.4	12.6	90.8		99	72													

Notes:

1	All Chromium are assumed to exist in the stable Cr(III) oxidation state, as Cr(VI) is too reactive and unstable under the normal environment
2	where results less than practical quantitative limit (PQL), quoted as less than PQL for most individual compounds
3	field replicate sample of sample listed directly above
4	refer to Tables 4 and 5 for GIL rationale and source
5	In the order Chlordane, DDT, Endosulfan, Endrin, Heptachlor
6	In the order Aroclor 1242, Aroclor 1254
-	not analysed/ not applicable
ND	not defined
BOLD	Exceeds GIL

Appendix J:
Remediation Action Plan Schematics

MATERIALS KEY

WP	WET POUR RUBBER
D	DECK - HARDWOOD TIMBER
SP	SAND PIT
AT	ARTIFICIAL TURF
M	PLAY MULCH
MP	MULCHED PLANTING BED
IC	INSITU CONCRETE, EXPOSED AGG FINISH
BE	BRICK EDGE
SB	TIMBER STORAGE BOX
	750mm HIGH INTERNAL FENCE
	1.5m HIGH BOUNDARY FENCE

PLANTING SCHEDULE

	LATIN/COMMON NAME	MATURE HT	SIZE	SPACING	QTY
	Trees				
BC	Backhousia citriodora - Lemon Myrtle	6-7m	100L	-	3
BM	Bambusa multiplex - Stripestem Fernleaf	3-4m	35L	-	5
CR	Citrus reticulata 'Emperor' - Emperor Mandarin	5m	25L	-	2
FR	Fraxinus ang. 'Raywood' - Claret Ash	10m	400L	-	1
LI	Lagerstroemia ind. x. L.Fauriei 'Biloxi' - Crepe Myrtle	6-7m	75L	-	3
TS	Triadica sebifera - Chinese Tallow Wood	7m	100L	-	1
UP	Ulmus parvifolia - Chinese Elm	8-9m	100L	-	1
	Shrubs, Grasses and Groundcover				
C	Coleonema p. 'Compactum' - Dwarf Diosma	1m	200	700	28
d	Dianella tas. 'Wyeena' TAS 300 PBR - Wyenna	800mm	150L	500	23
DB	Dietes bicolour - Fortnight Lily	1m	200	700	23
L	Liriope muscari 'Evergreen Giant' - Liriope	600mm	200	500	55
	Ophiopogon japonicus - Mondo Grass	300mm	150	300	75
P	Pennisetum adv. 'Rubrum' - Purple Fountain Grass	1.2m	200	700	22
s	Scaevola aem. 'Purple Fanfair' - Scaevola	300mm	150	500	24
W	Westringia f. 'Jervis Gem' - Dwarf Westringia	1m	200	700	16

*All plants specified are water wise, drought tolerant and low maintenance
All planting beds will be mulched to help retain soil moisture

Rev.	Description	Approved Date
1	Preliminary DA Review	120828
2	for DA Submission	120904

Consultant

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East Sydney NSW
Australia 2011

Project Name
BLACKFRIARS CHILDCARE

FMU Project Number
02447-N-12

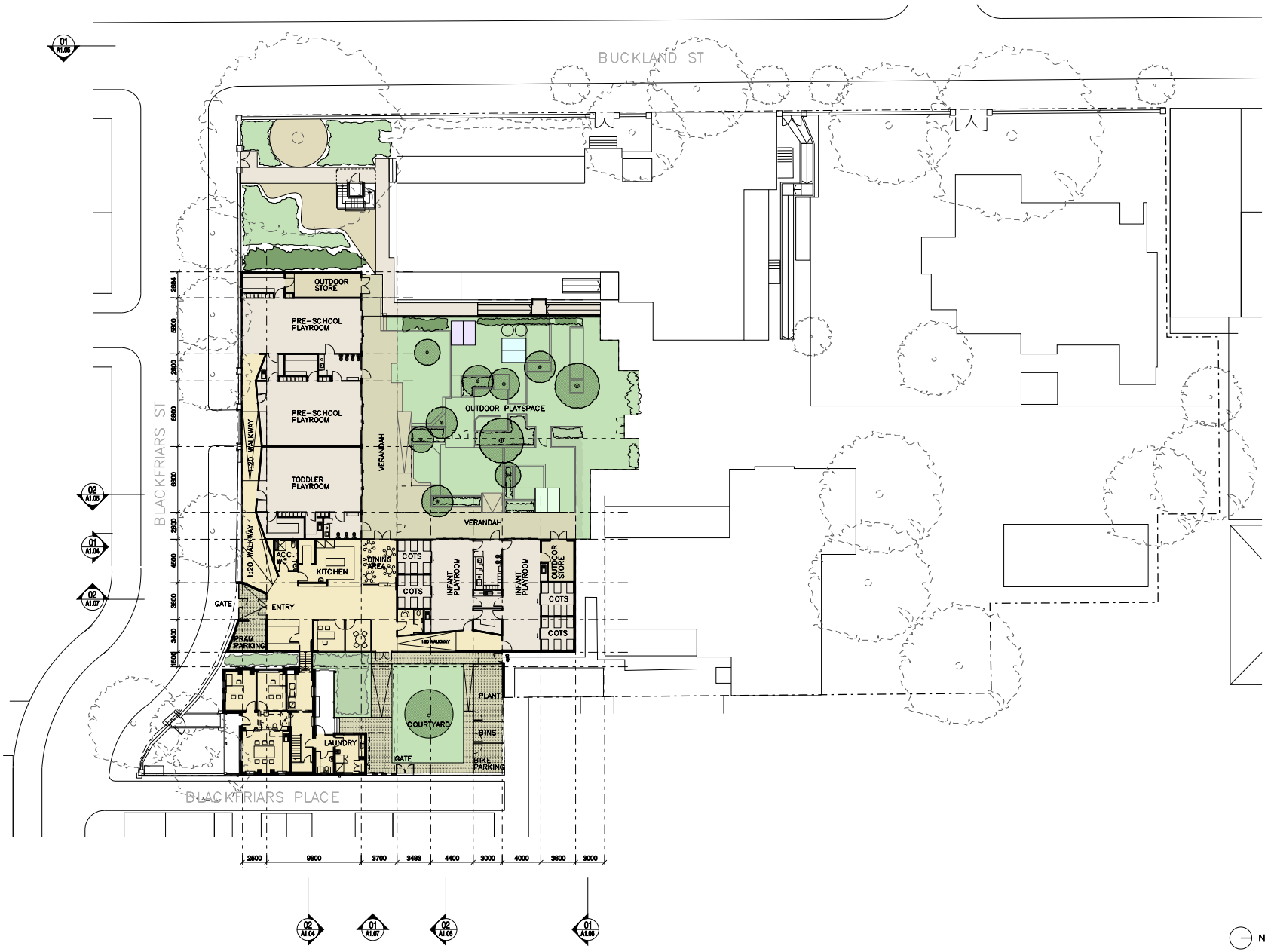
University of Technology, Sydney
FACILITIES MANAGEMENT UNIT
Tower, Building 1, Level 19, 15 Broadway
Broadway NSW 2007
Ph: 9514-2830 Fax: 9514-4690

Drawing Title
LANDSCAPE PLAN

Drawn By	Checked	Approved By	Date App.
KP/RM	RM	RM	120904

Drawing Scale	Drawing Status	
1:100	DA	

UTS Drg File Name	UTS Drg File No	Rev No
CC01GDLP	28663	02



Rev.	Description	Approved Date
P1	Preliminary Issue	22.08.12
P2	Review Issue	03.09.12
01	DA Issue	06.09.12
02	Final DA Issue	22.03.13

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Project Name
UTS
BLACKFRIARS CHILDRENS CENTRE

University of Technology, Sydney
FACILITIES MANAGEMENT UNIT
Tower, Building 1, Level 19, 15 Broadway
Broadway NSW 2007
Ph: 9514-2830 Fax: 9514-4690

Consultant Drawing Title
GROUND FLOOR PLAN

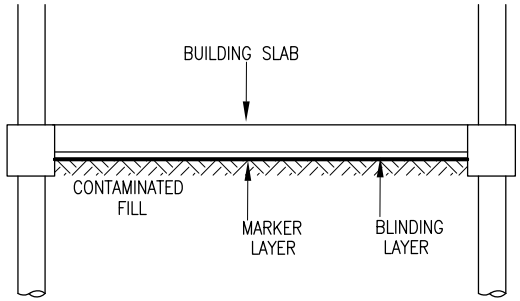
Consultant Drawing No
A1.02

FMU Project Number
02447-N-12

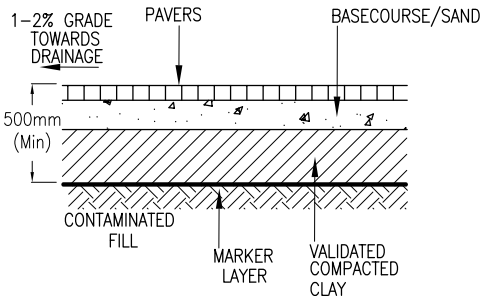
Drawn By	Checked	Approved By	Date App.
TD	GH	GH	22.03.13

Drawing Scale	Drawing Status	
1:200	DA ISSUE	A1

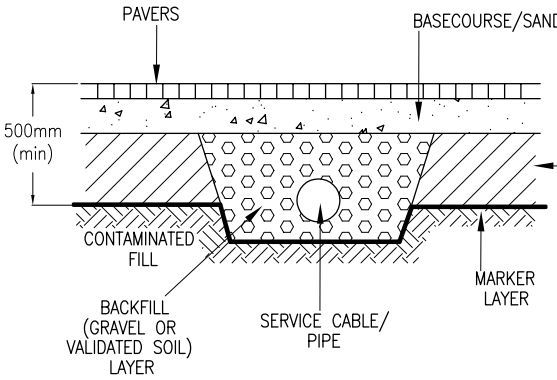
UTS Drg File Name	UTS Drg File No	Rev No
CC01GDAP	28652	02



BUILDING SLAB

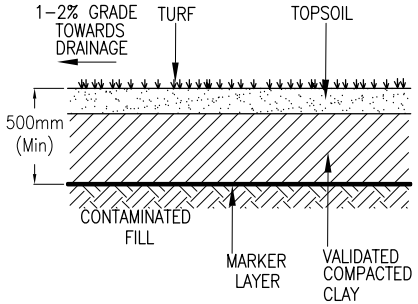


PAVING

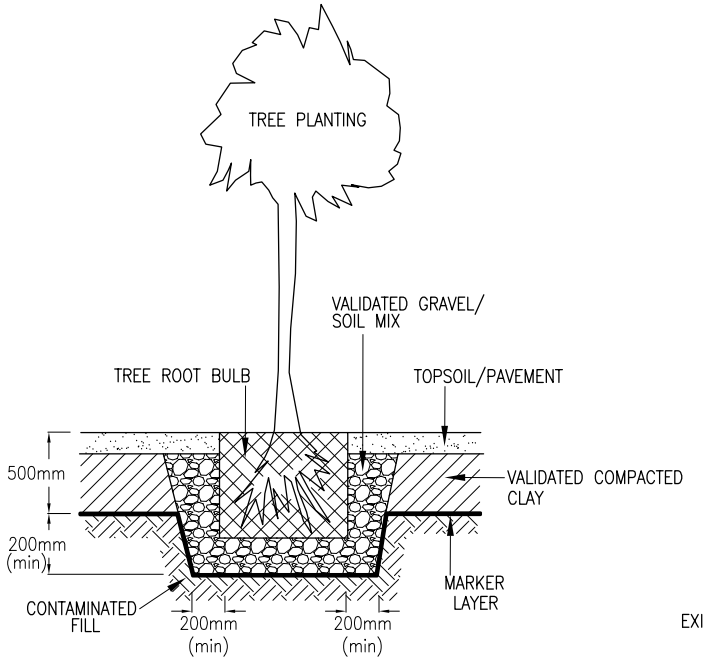


NOTE: Pavement option shown. Building slab or topsoil option may also exist.

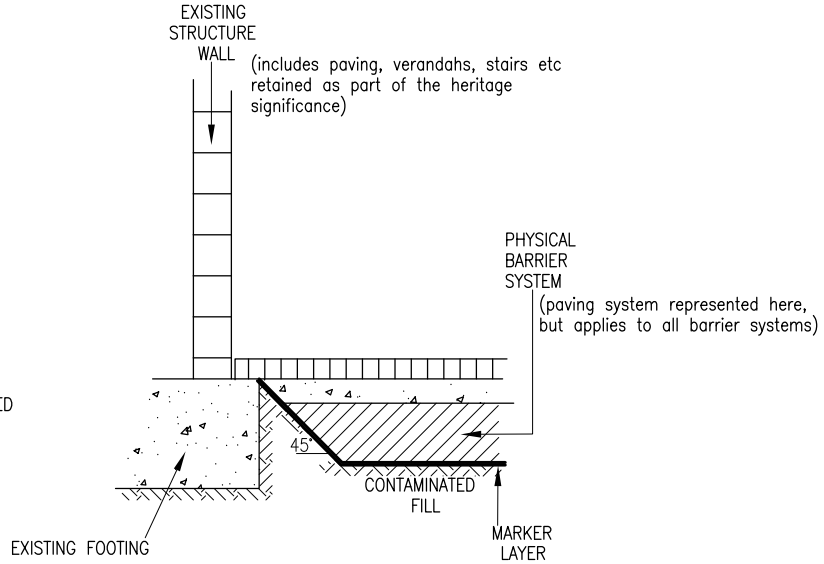
SERVICE LINE



GENERAL LANDSCAPING



NEW TREE PLANTING
(Refer to Context plans for more detail)



EXCAVATIONS ADJACENT TO EXISTING STRUCTURES

Douglas Partners Geotechnics • Environment • Groundwater	CLIENT: Hutchinson Builders		TITLE: **Barrier System Details** **UTS Blackfriars Campus** **CHIPPENDALE**	PROJECT No: 45996.02
	DRAWN BY: PSCH	SCALE: N.T.S. OFFICE: Sydney		DRAWING No: 2
	APPROVED BY:	DATE: 6.3.2009		REVISION: A