22 July 2011

SITE AUDIT REPORT AND SITE AUDIT STATEMENT

Caddens Release Area C, Kingswood, NSW, 2747

Submitted to:
Mr P Scott
Landcom
Level 2, 330 Church Street
Parramatta NSW 2124

REPORT

Report Number. 097623019_014_R_Rev0

Statement Number: RJP024

Distribution:

1 x hard copy (SAR and SAS) to Landcom
1 x PDF copy (SAR and SAS) to Landcom
1 x Golder file copy (SAR and SAS)
1 x hard copy (SAS) to NSW OEH
1 x hard copy (SAS) to Penrith Council

Golder Associates

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Golder Associates

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 26 March 2009. For more information about completing this form, go to Part IV.

PART I: Site audit identification

Site audit statement no. ...***RJP024***.....

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: *Roger Parker* Company: *Golder Associates Pty Ltd*

Address: 124 Pacific Highway, St Leonards, NSW

c/- PO Box 1302, Crows Nest, NSW Postcode: *1585*

Phone: *(02) 9478 3900* Fax: *(02) 9478 3901*

Site details

Address: *Caddens Release Area, north of Caddens Road, Kingswood, NSW* .

Postcode: *2747*

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

The Site is defined as Area C of the overall Caddens Release Area, in Kingswood, NSW.

The Site is identified and legal description is as follows:

Lot 6 Deposit Plan 567411

Lot 100 Deposit Plan 564332

A plan showing the location of Area C has been presented as Figure 1, attached to this Site Audit Statement.

Local Government Area: *Penrith City Council*

Area of site (e.g. hectares): *10.7 hectares*

Current zoning: *Part Rural 1D under IDO 93*

Strike out as appropriate

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/Agreement/Proposal/Notice* no(s) ……..

Strike out as appropriate

Site audit commissioned by

Name: *Mr Phillip Scott*

Company: *Landcom*

Address: *Level 2, 330 Church Street, Parramatta, NSW* Postcode: *2124*

Phone: *(02) 9841 8600* Fax: *(02) 9841 8666*

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 gardens and accessible soils

OR

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

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

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

~~……..~~

Information sources for site audit

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

Parsons Brinckerhoff Australia Pty Limited and WSP Environmental Pty Ltd

Title(s) of report(s) reviewed ……..

1. *Sampling, Analysis and Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW. Parsons Brinckerhoff. January 2009. Reference 2116943A PR_9331. (PB 2009a).*
2. *Sampling, Analysis and Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW. Parsons Brinckerhoff. January 2009. Reference 2116943A PR_9331_revA. (PB 2009b).*
3. *Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. March 2009. Reference 2116943A PR_9627 (PB 2009c).*
4. *Caddens Release Phase 2 Environmental Site Assessment, Kingswood, NSW – Hydrogeological Assessment. Parsons Brinckerhoff. 08 May 2009. Reference 2116943A MO_0005 (PB 2009e).*

Strike out as appropriate

5. *Caddens Release – SAQP Auditor Comments. Parsons Brinckerhoff. 19 May 2009. Reference 2116943A/LT_0066/KT/fr (PB 2009f).*
6. *Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. June 2009. Reference 2116943A PR_9627 RevA (PB 2009g).*
7. Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. July 2009. Reference 2116943A PR_9627 RevB (PB 2009h).
8. *Geotechnical, Salinity and Environmental Site Assessment, Caddens Release Area, Werrington Enterprise Learning and Living (WELL) Precinct. Parsons Brinckerhoff. 21 April 2006. Reference 2113017A PR_3431 Rev B (PB 2006a).*
9. *Delineation of soil hotspots and remediation works at 'Area C' Caddens Release, Caddens Road, Kingswood, NSW. WSP Environmental. 19 May 2010. Reference 2171 RWP Draft (WSP 2010).*
10. *Soil Validation – Caddens Release Area C, Caddens Road, Kingswood, NSW. WSP Environmental. 3 March 2011. Reference 0002171 Validation Draft (WSP 2011).*

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

1. Hazardous Materials Survey, Caddens Release, Caddens Road, Kingswood, NSW 2747. Parsons Brinckerhoff. March 2009. Reference 2116943A PR_9607 (PB 2009d)

Site audit report

Title: *Site Audit Report, Caddens Release Area C, Kingswood, NSW, 2747.*

Report no: *097623019 007 R Rev0* Date: *22 July 2011*

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:

The approach adopted by PB and WSP was to assess shallow soil contamination across Area C by means of collecting grab samples or samples from a hand auger / hydraulic excavator bucket. In areas of environmental concern identified from previous investigations soil samples were collected and analysed at a density consistent with NSW EPA Sampling

Design Guidelines. In other areas a reduced sampling and analysis density was adopted as agreed with the Auditor.

PB assessed groundwater quality at one monitoring well located in Area C and a further three monitoring wells located in the vicinity of Area C. The monitoring wells were designed to intercept the shallowest groundwater table encountered at that location. The soil investigations identified four contamination 'hotspots'.

WSP undertook subsequent contamination delineation, remediation and validation at the four contamination 'hotspots'. The validation sampling and analysis demonstrated that remediation of the contamination was satisfactory.

The Auditor considers that the scope of the investigation in Area C was adequate to characterise the Site for residential land use, with garden accessible soils.

The Auditor concludes that the land in Area C in its present form is suitable for the proposed residential use.

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/management plan* *(insert title, date and author of plan)*

……

……

subject to compliance with the following condition(s):

……

Overall comments

……

……

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

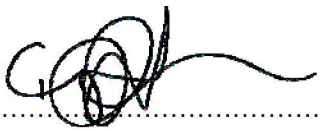
PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. **9825**).

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 …26 July 2011…….

PART IV: Explanatory notes

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

How to complete this form

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

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

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

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

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

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

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

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

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

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

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

Where to send completed forms

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

Department of Environment and Climate Change (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
Fax: (02) 9995 5930

AND

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

22 July 2011

SITE AUDIT REPORT

Caddens Release Area C, Kingswood, NSW, 2747

Submitted to:
Mr P Scott
Landcom
Level 2, 330 Church Street
Parramatta NSW 2124

REPORT

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Golder Associates

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TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 General

This Site Audit Report (SAR) has been prepared by Mr Roger Parker of Golder Associates Pty Ltd (Golder), at the request of Mr Philip Scott of Landcom. Mr Parker is an accredited Site Auditor under the Contaminated Land Management Act (1997) (accreditation no. 9825).

The Caddens Release Area, Kingswood, NSW contains three distinct parcels of land; Areas A to C. SARs and Site Audit Statements (SASs) have previously been prepared for Areas A and B (see Figure 1) by Mr Roger Parker (Golder Document 097623019 007 R Rev0). At the time of preparation of the SAR for Areas A and B, Area C (herein referred to as 'Area C' or 'the Site') was deemed not suitable for the proposed residential and open space use due to the presence of soil contamination hotspots. Subsequently further delineation, remediation and validation work was undertaken to remove the soil contamination hotspots in Area C.

This SAR has been prepared in response to investigations and remedial works conducted on Area C (see Figures 2). The SAR supports the Site Audit Statement (SAS) (Reference, Golder Associates Pty Ltd, 097623019_009_ SAS_Area C_RJP023_Final.doc) issued for the proposed residential and open space use of Area C. This SAR makes reference to guidance documents originally issued by the environmental regulator under the names of NSW Environment Protection Authority (NSW EPA), NSW Department of Environment and Conservation (NSW DEC), NSW Department of Environment and Climate Change (NSW DECC), NSW Department of Environment, Climate Change and Water (DECCW) and the current Office of Environment and Heritage (OEH, part of the Department of Premier and Cabinet). For the purpose of currency, the organisation is referred to as the NSW OEH in this report. OEH guidelines are referenced by the name of the organisation at the time of publication (eg DECCW).

The audit has involved the review of several reports prepared by Parsons Brinckerhoff (PB) and WSP Environmental (WSP), as listed in Table 1 and subsequent information obtained by the Auditor. Auditor review comments and a checklist of compliance with the NSW OEH Guidelines for Consultants Reporting on Contaminated Sites (DECCW 1997) are provided in Appendix A. In response to the Auditor comments, PB provided updated versions of each report until it met with the Auditor's approval. This SAR should be read in conjunction with these reports as prompted.

The Audit has been completed as a statutory Audit under S52 of the Contaminated Land Management Act 1997, and in accordance with the OEH Guidelines for the NSW Site Auditor Scheme (2nd Edition) (DECCW 2006).

1.2 Purpose of Report

The purpose of a Site Audit is to provide an independent review:

- that relates to investigation and/or remediation, carried out in respect of the actual or possible contamination of land; and
- that is conducted for the purpose of assessing 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 the investigation or remediation;
  - iii) whether the land is suitable for any specified use or range of uses;
  - iv) what investigation or remediation remains necessary before land is suitable for any specified use or range of uses; and
  - v) the suitability and appropriateness of a plan of remediation, a long term management plan, a voluntary investigation proposal or remediation proposal.

In the case of this Site, the audit is intended to specifically review the following reports to assess the nature and extent of any contamination of the land and whether the site is or (subject to an appropriate remediation strategy) could be made suitable for residential and recreational open space use:

- Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. July 2009. Reference 2116943A PR_9627 RevB (PB 2009h) (herein referred to as 'PB Phase 2 ESA');
- Delineation of soil hotspots and remediation works at 'Area C' Caddens Release, Caddens Road, Kingswood, NSW. WSP Environmental. 19 May 2010. Reference 2171 RWP Draft (WSP 2010) (herein referred to as 'WSP Delineation'); and
- Soil Validation – Caddens Release Area C, Caddens Road, Kingswood, NSW. WSP Environmental. 3 March 2011. Reference 0002171 Validation Draft (WSP 2011) (herein referred to as 'WSP Validation').

The Phase 2 ESA report addressed Areas A, B and C of the Caddens Release Area. The three areas were subject to review by the Auditor and an SAR for Areas A, B and C and SASs for Areas A and B were issued on 14 September 2009. Due to the presence of contamination hotspots in Area C the Auditor considered that further work was required to be undertaken before an SAS could be issued for Area C. The further work comprised the "Delineation of soil hotspots and remediation works at 'Area C'" and the "Soil Validation – Caddens Release Area C". This SAR references all investigations undertaken within Area C, ie the three reports identified above. For completeness, this SAR repeats much of the information related to Area C that was included in the 2009 SAR.

Information pertaining to the Audit is presented in Table 1.

Table 1: Audit information

Name of Auditor	Mr Roger Parker
Term of appointment	From 26 May 2011
Audit requested by	Philip Scott, Landcom
Date of engagement	23 April 2009
Address of Site	Caddens Release Area, north of Caddens Road, Kingswood, NSW 2747
Title and Zoning information	**Area C:** Lot 6 Deposit Plan 567411 - rural 1D under IDO 93 Lot 100 Deposit Plan 564332 - rural 1D under IDO 93
Local Government Authority	Penrith City Council
Current owners	Landcom
Current occupiers	Vacant
List of documents reviewed	1. Sampling, Analysis and Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW. Parsons Brinckerhoff. 16 January 2009. Reference 2116943A PR_9331. (PB 2009a)
	2. Sampling, Analysis and Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW. Parsons Brinckerhoff. 21 January 2009. Reference 2116943A PR_9331_revA. (PB 2009b)
	3. Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. 6 March 2009. Reference 2116943A PR_9627 (PB 2009c)
	4 Caddens Release Phase 2 Environmental Site Assessment, Kingswood, NSW – Hydrogeological Assessment. Parsons Brinckerhoff. 8 May 2009. Reference 2116943A MO_0005 (PB 2009e).
	5. Caddens Release – SAQP Auditor Comments. Parsons Brinckerhoff. 19 May 2009. Reference 2116943A/LT_0066/KT/fr (PB 2009f).
	6. Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. June 2009. Reference 2116943A PR_9627 RevA (PB 2009g)
	7. Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. July 2009. Reference 2116943A PR_9627 RevB (PB 2009h)

	8.	Geotechnical, Salinity and Environmental Site Assessment, Caddens Release Area, Werrington Enterprise Learning and Living (WELL) Precinct. Parsons Brinckerhoff. 21 April 2006. Reference 2113017A PR_3431 Rev B (PB 2006a)
	9.	Delineation of soil hotspots and remediation works at 'Area C' Caddens Release, Caddens Road, Kingswood, NSW. WSP Environmental. 19 May 2010. Reference 2171 RWP Draft (WSP 2010)
	10.	Soil Validation – Caddens Release Area C, Caddens Road, Kingswood, NSW. WSP Environmental. 3 March 2011. Reference 0002171 Validation Draft (WSP 2011)

Other documents referred to during the preparation of this Site Audit Report were:

- Hazardous Materials Survey, Caddens Release, Caddens Road, Kingswood, NSW 2747. Parsons Brinckerhoff. March 2009. Reference 2116943A PR_9607 (PB 2009d).

1.3 Audit Activities

The Audit activities included:

- Visits by the Auditor and the Auditor's representative to the Site;
- Review the Geotechnical, Salinity and Environmental Site Assessment dated 21 April 2006 (PB 2006a);
- Review and comment on the Sampling, Analysis and Quality Plan (SAQP) dated 16 January 2009 (PB 2009a and subsequent revision dated 21 January 2009 (PB 2009b);
- Review and comment on supplementary hydrogeological assessment dated 8 May 2009 (PB 2009e) and response to Auditor comments regarding the SAQP dated 19 May 2009 (PB 2009f);
- Review and comment on the PB Phase 2 Environmental Site Assessment (ESA), dated 6 March 2009 (PB 2009c) and subsequent revisions dated 2 June 2009 (PB 2009g) and 14 July 2009 (PB 2009h);
- Review and comment on the WSP Delineation, dated 19 May 2010 (WSP 2010) and WSP Validation, dated 3 March 2011 (WSP 2011);
- Preparation of the Site Audit Report and issue Site Audit Statement.

In conducting the review, the Auditor has assessed the information provided by PB and WSP in their reports on the basis of the checklist of information published in the Guidelines for Consultants Reporting on Contaminated Sites (DECCW 1997).

Copies of relevant correspondence between the Auditor, Landcom, PB, and the NSW OEH are presented in Appendix A.

2.0 SITE INFORMATION

The information presented in this section has been obtained from reports by Parsons Brinckerhoff (PB 2009a-h), and the Auditor's general knowledge of the area.

2.1 Site Identification and Location

The Site is located to the north of Caddens Road, Kingswood, NSW 2747 in the local government area of Penrith (refer to Figures 1 and 2).

Area C is a roughly rectangular parcel of land (to the east of Areas A and B) which has an area of approximately 10.7 hectares (Figure 1).

Area C is formally identified as Lot 6 in DP 567411 and Lot 100 in DP 564332.

2.2 Site Description and Setting

. Observations were recorded by PB during previous investigations (PB 2006a). In general Area C comprises predominantly open farm land and market gardens with occasional clusters of trees. Area C is bounded to the south by Caddens Road, to the north partly by open farm land and partly by an archives repository, to the east by residential properties on the western fringe of Claremont Meadows, and to the west by market gardens and open farmland.

2.3 Physical Site Setting

2.3.1 Topography and Drainage

Area C falls relatively gently from approximately 60m AHD in the west to 40m AHD in the east. Drainage is poorly defined with surface run-off likely to be intercepted by field drains where present.

2.3.2 Geology and Soils

Geological Series 1:100,000 Sheet 9030 Penrith maps the underlying bedrock at the Site as middle Triassic Bringelly Shale, part of the Wianamatta Group deposits. The Bringelly Shale deposits comprise shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff.

Soil Landscape Series 1:100,000 Sheet 9030 Penrith maps the soils at the Site as the Luddenham Group. These soils are found on undulating to rolling hills on Wianamatta Group shales. Soils typically comprise dark podzolic soils or massive earthy clays on crests (<100cm), moderately deep (70-150cm) red podzolic soils on upper slopes, moderately deep (<150cm) yellow podzolic soils and prairie soils on lower slopes and drainage lines. Luddenham Group soils can present a high soil erosion hazard, and comprise localised low permeability, highly plastic subsoil.

Subsurface conditions encountered during field investigations and summarised by PB are provided in Table 2 below.

Table 2: General stratigraphic log

Depth (m BGL)	Description
0.0-0.3	TOPSOIL: Sandy clay, low plasticity, red brown with some rootlets
0.1-1.0 (variable up to 11.0 in places)	Sandy CLAY: Low to medium plasticity, red brown with some silt
0.5-3.6	SANDSTONE: Orange / grey, fine grained, iron staining, extremely weathered, extremely low strength

PB noted that the Site was found to be largely natural material or reworked natural material (topsoil).

2.3.3 Hydrogeology

PB state that groundwater within the Bringelly Shale is located within a deep regional confined aquifer. Minor perched groundwater is also present within the weathered shale profile, however these lenses are discontinuous and do not form an aquifer.

PB also state that groundwater movement within the shale is limited to flow along secondary features such as laminations, fractures, joints, between inter-bedded units and faults. Minor groundwater flow may also occur within some of the coarser sedimentary units although PB indicated these not to be laterally extensive thus restricting groundwater movement.

PB has identified, from the NSW Office of Water records, two registered groundwater bores within 1 km radius of the Site. These are located approximately 500 m south and were drilled for domestic stock and irrigation purposes. PB note a lack of water supply bores in the area which indicates the low economic value of groundwater in the area.

2.4 Site History

The PB Phase 2 ESA provides a description of the Site history summarised from previous investigations (PB 2006a) which were based upon aerial photographs. The following summary is based on review of the aerial photographs provided by PB in Appendix J of the Phase 2 ESA.

By 1947 Area C comprised open farmland with dense vegetation at the western end. By 1970 the western end had been cleared of vegetation and cultivated. No other significant changes were evident.

Development comprising dwellings and other buildings to the north and east of Area C had commenced by 1970. Extensions to the archives buildings to the north continued through the 1980s and 1990s until they reached the northern boundary of Area C by 2005.

3.0 SITE ASSESSMENT

PB conducted investigations at the Site in 2006 and 2009, and prepared the following reports:

- Geotechnical, Salinity and Environmental Site Assessment, Caddens Release Area, Werrington Enterprise Learning and Living (WELL) Precinct was prepared by PB in April 2006 (PB 2006a);
- Sampling, Analysis and Quality Plan (SAQP) (PB 2009a and subsequent revision PB 2009b); and
- Phase 2 Environmental Site Assessment (Phase 2 ESA) (PB 2009c and subsequent revisions PB 2009g and PB2009h).

WSP conducted investigations in 2010 and 2011, and prepared the following reports:

- Delineation of soil hotspots and remediation works at 'Area C' Caddens Release, Caddens Road, Kingswood, NSW. WSP Environmental. 19 May 2010. Reference 2171 RWP Draft (WSP 2010)
- Soil Validation – Caddens Release Area C, Caddens Road, Kingswood, NSW. WSP Environmental. 3 March 2011. Reference 0002171 Validation Draft (WSP 2011)

3.1 PB Geotechnical, Salinity and Environmental Site Assessment

This investigation included additional parcels of land adjacent to Areas A, B and C which did not form part of the Phase 2 investigation and were not the subject of this audit.

The scope of work included:

- A review of Site history;
- A site inspection and limited sampling;
- Drilling of eight boreholes, including 2 groundwater monitoring wells;
- Laboratory testing for contamination and salinity; and
- Site assessment based on relevant OEH guidelines.

A total of 8 soil samples were analysed for a combination of heavy metals, total petroleum hydrocarbons (TPH; benzene, toluene, ethyl benzene and xylenes (BTEX); polycyclic aromatic hydrocarbons (PAHs); organochlorine pesticides (OCPs); polychlorinated biphenyls (PCBs); volatile organic compounds (VOCs); and asbestos. No groundwater contamination samples were collected.

In general results indicated potential contaminants below the limit of detection or adopted site assessment criteria except for one sample which recorded a concentration of DDE at 0.5mg/kg (sample location BH4, Area C). Fibrous cement materials (potentially containing asbestos) were identified in two locations.

From the Site history, Site inspection and results of the limited investigation, PB identified a number of potentially contaminated areas. Those which related to Area C included market gardens and small areas of fill / waste materials.

PB concluded that potential contamination is not widespread across the Caddens Release study area.

3.2 PB Sampling, Analysis and Quality Plan (SAQP)

3.2.1 Sampling Rationale

The PB SAQP proposed an investigation which comprised the collection of shallow soil and groundwater samples from across the Site. In summary, the proposed investigation planned included 86 soil sampling locations (C1-C86) and 2 groundwater sampling locations (existing well MW3 and new well MW4).

PB proposed to concentrate soil sampling locations in areas of environmental concern (AECs) which were derived from the potentially contaminated areas identified during previous investigations. In these areas, PB proposed to comply with the minimum sampling density requirements set out in Table 1 of NSW OEH Sampling Design Guidelines (EPA 1995). In other, lower risk areas, PB proposed to conduct sampling at approximately 50% of the minimum frequency recommended in EPA 1995. No groundwater sampling rationale was provided in the SAQP.

Auditor Comment:

The Auditor considers that the proposed soil and groundwater sampling plan was adequate based on the past uses of the Site, results from previous reports and low risk of significant soil and groundwater contamination.

3.2.2 Analytical Suite

The soil analytical programme (including quality assurance / control) proposed by PB for Areas A, B and C is presented in Table 3. PB did not provide details on how the stated number of analyses were to be distributed between Areas A, B and C.

Table 3: Soil analytical programme (Source: PB SAQP, 2009b).

Analytical Suite	No. Primary Samples	Intra-laboratory Duplicates	Inter-laboratory Duplicates	Trip spike	Equipment Rinsate
Heavy Metals	380	38	19		10
OCPs	100	10	5		10
PAHs	100	10	5		10
Asbestos	80	8	4		10
TPH (C_{10}-C_{36})	180	18	9	1	10
TPH (C_6-C_9) and BTEX	35	4	2	1	10
VOCs	20	2	1		10

The groundwater analytical programme (including quality assurance / control) proposed by PB for Areas A, B and C is presented in Table 4.

Table 4: Groundwater analytical programme (Source: PB SAQP, 2009b).

Analytical Suite	No. Primary Samples	Intra-laboratory Duplicates	Trip spike
Heavy Metals	6	1	
OCPs	6	1	
PAHs	6	1	
TPH (C_{10}-C_{36})	6	1	1
TPH (C_6-C_9) and BTEX	6	1	1

Auditor Comment:

The Auditor considers that the analytical suite proposed was appropriate based on the findings of the previous investigations and likely sources of soil and groundwater contamination.

3.2.3 Adopted Site Assessment Criteria

The soil assessment criteria proposed by PB in the SAQP is presented in Table 5. These were derived from the NSW OEH Guidelines for the NSW Site Auditor Scheme (DECCW 2006), and the NSW OEH Guidelines for Assessing Services Station Sites (EPA 1994).

Table 5: Soil investigation levels

Analyte	Residential with gardens and accessible soil (NEHF A), mg/kg	Threshold Concentrations for Sensitive Land Use, mg/kg	Provisional phytotoxicity based investigation levels (mg/kg)	Adopted Investigation Levels
Arsenic	100	-	20	**100**
Cadmium	20	-	3	**20**
Chromium (III)	12%	-	400	**100**[1]
Chromium (VI)	100	-	1	**100**
Copper	1000	-	100	**1000**
Lead	300	-	600	**300**
Mercury	15	-	1	**15**
Nickel	600	-	60	**600**
Zinc	7000	-	200	**7000**
TPH C_6 to C_9	-	65	-	**65**
TPH C_{10} to C_{36}	-	1000	-	**1000**
Benzene	-	1	-	**1**
Toluene	-	1.4	-	**1.4**
Ethyl benzene	-	3.1	-	**3.1**
Total xylenes	-	14	-	**14**
Total PAHs	20	20	-	**20**
Benzo(a)pyrene	1	1	-	**1**
Aldrin + Dieldrin	10	-	-	**10**
Chlordane	50	-	-	**50**
DDT+DDD+DDE	200	-	-	**200**
Total PCBs	10	-	-	**10**
Asbestos	-	-	-	**Non detect**

[1] PB adopted the investigation level for chromium (VI) as a conservative screening value

Auditor comment:

The Auditor notes that the NSW OEH Guidelines for the NSW Site Auditor Scheme (2nd Edition) (DECCW 2006) requires that soils be assessed against both the appropriate health-based investigations levels and provisional phytotoxicity-based investigation levels. The Auditor also notes that PB has not compared the results of the soil investigation with the corresponding phytotoxicity-based investigation levels (discussed further in Section 3.3.2). However, the Auditor notes that PB has considered phytotoxicity in their assessment of soil impacts, and is satisfied that soil contamination poses a low risk to the environment.

The groundwater assessment criteria proposed by PB in the SAQP is presented in Table 6, these were derived from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) based on trigger values for freshwater with 95% protection of species.

Area C is in a region serviced by potable water supply by Sydney Water Corporation. A review of registered groundwater wells indicated the nearest wells (2 wells) were approximately 1 km from Area C and the next nearest wells (3 wells) were approximately 2 km from Area C. A review of records for the nearest well indicated its proposed use was for stock watering and the aquifer was deep (>15 metres) within in slate/shale, aquifer thickness was small and yield was low.

A large proportion of Area C is located within a low-lying swampy area presenting a potential salinity hazard. The NSW EPA's Guidelines for the Assessment and Management of Groundwater Contamination (March 2007) recommends a 'filter' total dissolved solids concentration of 2000 ppm to confidently rule out use of groundwater as a likely drinking water supply. Field sampling by PB indicated groundwater salinity in the four wells installed by PB ranging from 380 mg/L to 865 mg/L.

While the salinity of the groundwater does not preclude its use as a drinking water supply, the absence of existing nearby drinking water extraction and the depth and low yield of the acquifer indicate that the most appropriate beneficial use of the groundwater is environmental uses. Hence the ANZECC 2000 Freshwater -Trigger Value with 95% Protection are considered appropriate groundwater criteria for Area C.

Table 6: Groundwater investigation levels

Analyte	Freshwater Trigger Value with 95% Protection, µg/L	Adopted Trigger Value, µg/L
TPH C_6 to C_9	-	-
TPH C_{10} to C_{36}	-	-
Benzene	950	**950**
Toluene	180	**180**
Ethyl benzene	80	**80**
m & p-xylene	275	**275**
Arsenic (III)	24	**24**
Cadmium	0.2	**0.2**
Chromium (VI)	1.0	**1.0**
Copper	1.4	**1.4**
Lead	3.4	**3.4**
Mercury	0.6	**0.6**

Nickel	11	**11**
Zinc	8.0	**8.0**
Benzo(a)pyrene	0.2	**0.2**
Napthalene	16	**16**
Phenanthrene	2	**2**
Anthracene	0.4	**0.4**
Fluoranthene	1.4	**1.4**
Total Phenols	320	**320**

Auditor comment:

The Auditor notes that PB has not included a trigger value for petroleum hydrocarbons (TPH) as there are none provided by ANZECC 2000. In such circumstances it common practice to use the limit of detection of the laboratory as a conservative screening value. The Auditor notes that concentrations of TPH recorded in groundwater during this investigation were below the limit of detection of the laboratory. The Auditor therefore concludes that no further investigation into concentrations of TPH is necessary

3.3 Phase 2 Environmental Site Assessment

A Phase 2 ESA was conducted by PB in January and February 2009 (PB 2009c, PB 2009g and PB 2009h).

3.3.1 Scope of Work

PB states that the scope of work conducted as part of the Phase 2 ESA included:

- A review and updating (as necessary) of site history which consisted of:
  - A detailed site inspection;
  - A review of anecdotal information provided by Landcom;
  - A database search of Office of Water records; and
  - A review of previous contamination assessment reports.
- A review and updating (as necessary) of physical setting including geological and hydrological information and topography; and
- Soil and groundwater sampling which consisted of:
  - Soil sampling at 15 test pits and 72 surface locations ; and
  - Groundwater sampling from 4 monitoring wells.

The scope of intrusive investigations conducted at Area C is summarised in Table 7 below.

Three groundwater wells were installed during the investigation (MW4 located in Area C, and MW5 and MW6 located in Area B). These and one pre-existing well (MW3 located in Area A) were sampled to assess groundwater contamination. The four groundwater samples were analysed for heavy metals, OCPs, PAHs, TPH and BTEX.

Table 7: Area C – Phase 2 soil investigations

Area / AEC	Study	Contaminants of Concern	No. Sample locations	# Analyses					
				Metals	OCPs	PAHs	TPH / BTEX	Asbestos	VOCs
Whole of Area C	PB	Pesticides	87	85	41	16	32	12	6
Area C (lower risk)	PB	N/A	34	36	8	0	6	0	0
Area C (highlighted yellow)	PB	Various particularly metals, hydrocarbons, asbestos	52	49	33	16	26	12	6
Market gardens	PB	Pesticides	11	11	11	8	11	4	4
Western boundary	PB	Asbestos	4	4	4	4	4	2	2
Mound in SW corner	PB	Various particularly metals, hydrocarbons, asbestos	2	2	2	1	2	0	1
Remediation Area 1	PB	Various	1	1	0	1	0	1	0
Remediation Area 2	PB	Various	1	1	1	1	1	1	0

Auditor Comment:

The Auditor notes that the scope of groundwater investigation did not meet the objectives stated in the SAQP as two of the pre-existing wells (MW1 and MW2) could not be located. PB was requested to provide additional discussion and justification for the reduction in groundwater water monitoring wells (PB 2009e). PB stated that the wells provided targeted areas of environmental concern and were widely distributed to provide adequate coverage across the Site. PB also stated that groundwater quality within the Bringelly Shale is of generally poor quality and the reduced well numbers were unlikely to significantly impact on groundwater characterisation. In addition PB stated that an assessment of the Site history indicates that groundwater contamination due to previous activities is of low risk.

The Auditor is satisfied that given the history of the Site and concentration of contaminants encountered in the soils and groundwater, the reduction in groundwater monitoring locations does not significantly affect the conclusions of the investigation.

3.3.2 Analytical Results for Soils

PB reported that the majority of soil analytical results were recorded below the limit of laboratory detection or the adopted assessment criteria. Two exceptions were noted at sample locations C80 and C82 where analytical results exceeded the adopted assessment criteria for Total PAH and benzo(a)pyrene (BaP); and at sample location C82 where analytical results exceeded the adopted assessment criteria for TPH.

There were no fragments of asbestos-containing materials found in Area C, nor were asbestos fibres detected during laboratory analysis. However, PB noted that a number of fragments of fibrous cement sheeting were observed at the surface of Areas A and B during the Hazardous Materials survey conducted on 22 January 2009 (PB 2009d). Soil samples associated with these fragments detected no asbestos fibres.

Auditor comments:

The Auditor notes that the results for Total PAH and BaP at location C82 are greater than 250% of the adopted investigation levels and therefore can be classified as hotspots. The results from adjacent sample location C80 indicate the presence of hydrocarbon impacted soils extending beyond the immediate locality of sample C82.

The Auditor also notes that a number of soil results from each area exceed the provisional phytotoxicity based investigation levels for copper and zinc. The Auditor notes that PB has attributed these results to naturally occurring minerals in the soil, and state that the past and present use of the Site for agriculture, and no visible signs of plant distress observed during the Site inspection suggest that these concentrations are not adversely impacting flora. These results are discussed further in Section 5.2 below.

The Auditor notes that the sampling frequency achieved conforms to the SAQP, however, with the exception of heavy metals the analysis density typically does not. However, the Auditor notes that with the exception of samples C80 and C82, all other results for soils were recorded below the adopted assessment criteria or limits of laboratory detection. Furthermore, the Auditor notes that current and previous activities at the Site are unlikely to have resulted in significant contamination. The Auditor therefore concludes that the reduction in sampling and analysis frequency do not significantly affect the conclusions of the investigation.

3.3.3 Analytical Results for Groundwater

The groundwater results presented include results from wells across Areas A to C. All results have been included as groundwater is not static and because there are a limited number of wells present across the site.

PB reported that the majority of groundwater analytical results were recorded below the limit of laboratory detection or the adopted assessment criteria. A number of exceptions were noted for heavy metals as summarised in Table 8.

Table 8: Summary of groundwater data

Monitoring Well	Area	µg/L		
		Chromium	Copper	Zinc
MW03	Area A	<1.0	<1.0	24
MW04	Area C	<1.0	4.8	45
MW05	Area B	1.6	6.3	57

MW06	Area B	3.6	7.4	29
Adopted trigger level		**1.0**	**1.4**	**8**

PB states that the concentrations of heavy metals recorded are likely to be a result of normal background concentrations in the area as no significant sources of chromium, copper or zinc contamination were identified during the soil investigations.

Auditor comment:

The Auditor notes no potentially contaminating past or present activity has been identified at the locations where groundwater wells were installed. Furthermore, soil samples collected at various depths during the installation of these wells did not identify significant concentrations of chromium, copper or zinc. The Auditor therefore concludes that the results for heavy metals recorded in the groundwater monitoring wells sampled during this investigation are unlikely to have been derived from Site based contamination.

3.4 WSP Delineation and WSP Validation

The Phase 2 ESA identified soil hotspots in Area C at sample locations C80 and C82. WSP subsequently undertook delineation works of the soil hotspots in Area C in 2010 and validation works in 2011 (WSP 2010 and WSP 2011). The delineation works identified the lateral extent of the soil hotspots identified by PB at sample locations C80 and C82 by sampling 31 locations to a maximum depth of 1.0 m, noted in Table 7.

Four hotspot areas were identified and remediated by excavating the top layer soil to a maximum depth of 0.3 m.

The validation works consisted of soil sampling at 12 locations following the excavation of soil from the hotspot areas, as noted in Table 9.

Table 9: Area C – Phase 2 soil investigations

Area / AEC	Study	Contaminants of Concern	No. Sample locations	# Analyses					
				Metals	OCPs	PAHs	TPH / BTEX	Asbestos	VOCs
Total WSP Delineation	WSP Delineation	PAH, TPH	16	1	0	35	35	0	0
Total WSP Validation	WSP Validation	PAH, TPH	12	0	0	12	6	0	0
	WSP Delineation	PAH, TPH	5	0	0	5	5	0	0
	WSP Validation	PAH, TPH	1	0	0	1	0	0	0
	WSP Delineation	PAH, TPH	7	1	0	9	9	0	0
	WSP Validation	PAH, TPH	1	0	0	1	1	0	0
Remediation Area 3	WSP Delineation	PAH, TPH	1	0	0	2	2	0	0
	WSP Validation	PAH, TPH	5	0	0	5	5	0	0
Remediation Area 4	WSP Delineation	PAH, TPH	1	0	0	2	2	0	0
	WSP Validation	PAH, TPH	5	0	0	5	0	0	0

3.4.1.1 Analytical Results for Soils

The WSP Delineation works identified four out of thirty-five samples which exceeded the adopted criteria for Total PAH, benzo(a)pyrene and TPH (C_{10}-C_{36}). The validation works identified one out of twelve samples that exceeded the adopted criteria for benzo(a)pyrene.

The results are summarised in Table 10 below.

Table 10: Summary of soil analytical results from validation

Sample ID	Study	Analyte Concentration (mg/kg)		
		BaP	Total PAH	TPH (C_{10}-C_{36})
C80	PB	2.7	46.8	-
C82	PB	6.6	102.1	1,070
C82W2 – 0.1 m	WSP Delineation	1.9	26.2	1,075[3]
C82 – 0.1 m	WSP Delineation	2.0	28.2	1,705[3]
A3 – 0.1 m	WSP Delineation	17	258.4	2,775
D3 – 0.1 m	WSP Delineation	3.2	47.7	-

4E	WSP Validation	1.2	-	-
Adopted Investigation Level		**1**[1]	**20**[1]	**1,000**[2]

- Sample did not exceed adopted criteria
[1] NEPM 1999 HIL A
[2] EPA 1994 Service Station Guidelines
[3] Silica Gel Clean-up

4.0 PB PHASE 2 ESA EVALUATION OF QA / QC

An integral part of any investigation, remediation or validation work is implementation of a quality assurance and quality control (QA/QC) program to demonstrate that the environmental data collected is appropriate for the purpose of the work.

Data Quality Objectives (DQO) and Data Quality Indicators (DQI) form the basis of any QA/QC program to assess the completeness, comparability, representativeness, precision, and accuracy of the data. The QA/QC program includes field and laboratory aspects of the work.

In this section the QA/QC results from the following reports will be evaluated: Phase 2 Environmental Site Assessment (PB 2009c, PB 2009g and PB2009h). Section 5 evaluates the QA/QA results from the WSP reports.

4.1 Data Quality Objectives

The data quality objectives (DQOs) for this investigation are presented in Section 2 of Phase 2 with reference to United States Environmental Protection Agency *Guidance for the Data Quality Objectives Process, EPAQA/G4* (2000) and *Data Quality Objectives Process for Hazardous Waste Site Investigations, EPAQA/G4HW* (2000). These are summarised below.

4.1.1 State the Problem

PB defines the problem as follows;

"The purpose of this assessment is to determine whether soil contamination from previous activities on site pose a risk to human health for a standard residential land use with gardens and accessible soil, or the environment."

Auditor comment:

The Auditor notes that for part of Area C the purpose of the assessment is also to determine whether soil contamination from previous activities on site poses a risk to human health for a recreational open space land use. However, the Auditor notes that PB has considered recreational open space land use in their assessment.

4.1.2 Identify the Decisions

PB lists the decisions to be made as:

- Are the surface soils contaminated?
- Is the groundwater contaminated?
- If contamination exists, does this pose an unacceptable risk to potential receptors?
- If contamination exists, is remediation or management required?

4.1.3 Identify Inputs to Decision

In summary, PB identifies the inputs to the decision as being:

- The sampling density and method;
- Analytical results; and
- Appropriate assessment criteria.

4.1.4 Define the Study Boundaries

The study boundaries identified by PB are summarised in Table 1 above.

4.1.5 Develop a Decision Rule

PB applied the following decision rules:

- The analytical data was assessed to check whether individual samples exceeded the adopted assessment criteria;
- The analytical data was assessed to check whether individual samples exceeded 250% of the site assessment criteria; and
- If analytical data exceeded the assessment criteria or 250% of the assessment criteria further assessment or remediation will be required.

4.1.6 Specify Limits on Decision Errors

PB states that data will be *"assessed against various quality attributes such as selectivity, precision, completeness and comparability"*: PB mentions setting limits on the relative percentage difference between primary and QA/QC samples as presented in later sections of the report.

4.1.7 Optimise the Design for Obtaining Data

PB states that the assessment was designed considering the findings of the site inspection, historical site features, previous investigation, NSW sampling design guidelines and accessible areas of the site.

PB also states that as agreed with the Auditor sampling density was decreased to below the minimum recommended by the relevant guidelines in areas of lower concern. This allowed sampling to be focussed in areas of greatest concern.

Auditor comment:

The Auditor concludes that the data quality objectives PB have set for this investigation are appropriate.

4.2 Field Quality Assurance and Quality Control

An evaluation of the field QA/QC program involves an assessment of the sampling team, decontamination procedures, sample collection and COC documentation, sampling splitting techniques, duplicate frequency, field QC sample results, and calibration of field instrumentation.

The field QA/QC procedures adopted by PB during the investigation are discussed in the following sections.

4.2.1 Sampling Team

PB identifies Dave Hogberg and Hadi Khairuddin as those responsible for completing the fieldwork. PB state that both are experienced environmental scientists, no further details are provided.

4.2.2 Sampling Frequency

PB states that the soil sampling frequency in areas of environmental concern (AEC) was in accordance with the NSW OEH *Sampling Design Guidelines* (DECCW 1995). Other areas of lower risk were sampled at a rate of approximately 50% of the guidelines.

PB provides soil sampling and analysis frequencies for each part of the Site in Tables 6-1 and 6-2 of the Phase 2 ESA. These are summarised in Table 11.

Table 11: PB Sampling and analysis frequency

Area of Site	Area (Ha)	# Sampling points	Equivalent frequency (analyses per Ha)	Maximum No. analyses per analyte	Equivalent frequency (analyses per Ha)	Minimum equivalent frequency recommended by DECCW 1995
Area C (lower risk)	6.2	34	5.5	34	5.5	11.0[1]
Area C (AEC)	4.5	52	11.6	49	11.0	11.6

[1] DECCW 1995 does not provide a recommended equivalent minimum density for sites exceeding 5 hectares. The recommended equivalent density for 5 hectares has therefore been used to compare the sampling and analysis densities achieved in area greater than 5 hectares during this investigation.

Auditor comment:

The Auditor notes that in each area of the Site the number of sampling points complies with PB's proposed sampling frequency and DECCW 1995. However, in most cases the maximum number of analyses per analyte in each area of the Site does not comply with PB's proposed sampling frequency or DECCW 1995.

The Auditor is satisfied that despite the departure from the stated objectives the soil investigation is sufficient to adequately characterise the Site given its history and nature of the contamination encountered.

4.2.3 Sampling Methodology

PB states that soil samples were generally collected either by grab sample, directly from an excavator bucket immediately after excavation, or from a hand auger. Soil samples were placed in 250 mL glass jars leaving no headspace and closed using Teflon coated lids. Disposable nitrile gloves were worn by field personnel during sampling and changed between samples to prevent cross contamination.

Duplicate soil samples were collected at each location and screened for volatile organic compounds (VOCs) using a photo-ionisation detector (PID). The PID was calibrated in the field prior to works using a 100ppm isobutylene in air standard. Calibration sheets are provided by PB in Appendix G of the Phase 2 ESA.

Sampling equipment was cleaned with phosphate-free detergent and rinsed with distilled water between sampling locations and at varying depths to prevent cross contamination. Rinsate samples were collected in containers supplied by the laboratory which contained appropriate preservatives. These included a 1L glass bottle for analysis of general organic compounds including petroleum hydrocarbons and polycyclic aromatic hydrocarbons, two 40 mL hydrochloric acid preserved vials for analysis of volatile organic compounds, and a single 125 mL nitric acid preserved plastic bottle for analysis of field filtered heavy metals. Sample containers were filled completely and transported to the laboratory in ice cooled boxes.

PB states that prior to sampling, groundwater wells were gauged using an interface level probe to detect the possible presence of light non-aqueous phase liquids (LNAPLs). Groundwater wells MW3 and MW4 were purged of 2 well volumes prior to sampling. Due to slower recharge rates groundwater wells MW5 and MW6 were not purged prior to sampling. Groundwater field parameters were provided by PB in Appendix G of the Phase 2 ESA.

During purging water quality parameters including pH, electrical conductivity, redox, dissolved oxygen, turbidity and temperature were recorded. With the exception of redox (MW3), water quality parameters measured after the 2 well volumes had been purged were within 10% of the parameters measured after 1 well volume had been purged.

PB states that after purging the wells groundwater samples were collected in glass containers using low flow micro purge techniques. Containers were sealed with Teflon-lined lids and labelled with a water proof pen. Sample containers were then transported to the laboratory in ice cooled boxes.

Auditor Comment:

The Auditor notes that monitoring wells were not purged in accordance with the procedures stated in the SAQP. The Auditor also notes that 2 well volumes are not usually sufficient to adequately assess whether water quality parameters have stabilised during purging. However, the Auditor accepts that groundwater recharge rates within the Bringelly shale are generally slow and groundwater levels do not always recover sufficiently quickly following purging of multiple well volumes to allow a sample to be collected within a reasonable timeframe.

The Auditor notes that significant groundwater contamination was not identified during the investigation which is consistent with the past and present use of the Site and results of the soil sampling. The Auditor therefore concludes that the sampling methodology adopted for this investigation is reasonable.

4.2.4 Borehole Logs and other Field Records

PB provides graphical logs for the groundwater monitoring bores and test pits conducted during this investigation (Appendix B). Logs for the grab samples collected have been omitted from the final version of the Phase 2 ESA (PB 2009h). Although PB does not state which logging method was adopted for this investigation, bore and test pits logs have been prepared in general accordance with the Unified Classification System AS1726 – 1993.

PB also provides copies of field calibration and groundwater field parameter records (Appendix G) prepared during fieldwork.

Auditor Comment:

The Auditor considers the logs and field records for this investigation are acceptable.

4.2.5 Sample and Chain of Custody Documentation

PB provides completed chain of custody sheets and laboratory sample receipts for all samples collected and analysed.

Chain of custody forms generally contain relevant information and have been acknowledged by the laboratories that performed the analysis. The sample preservation and transport to laboratories are considered to be appropriate based on the chain of custody documentation presented.

4.2.6 Field Duplicate Frequency

PB Phase 2 ESA involved analysis of 86 primary samples, and eight duplicate and three triplicate samples. This equates to a frequency of 9.3% for duplicate samples and 3.5% for triplicate samples against a proposed frequency of 10% and 5 % respectively.

Auditor Comment:

The Auditor concludes that the field duplicate frequency achieved is in accordance with AS4482.1-2005 and is suitable for assessing QA/QC for this investigation.

4.2.7 Field Duplicate Field Triplicates, Field Blank, Rinsate Blank and Trip Spike Results

PB present field duplicate results in summary tables contained with Appendix F of the Phase 2 ESA. The variance between sample pairs is expressed in terms of the Relative Percentage Difference (RPD). PB reports the following RPD results which exceeded the stated data quality indicators for this project (30-50% for inorganics and non-volatile organics, and 100% for volatile organics):

- C8_0.0-0.1 and QA06 with 54% for lead and 52% for zinc.

Golder's calculation of the RPD for duplicate pairs found the following exceedances of the data quality indicators:

- C8_0.0-0.1 and QA06 with 38.3% for chromium, 53.8% for lead and 51.9% for zinc;
- C9_0.0-0.1 and QA03 with RPD of 45.55% for lead; and
- C44_0.0-0.1 with RPD of 40.0% for lead.

Golder's calculation of the RPD for triplicate pairs found the following exceedances of the data quality indicators.

- C14_0.0-0.1 and QA02 with RPD of 54.5% for copper;
- C21_0.0-0.1 and QA05 with RPD of 39.3% for copper; and
- C44_0.0-0.1 and QA69 with RPD of 40.0% for lead.

All field blank, rinsate blank and trip spike results were within the corresponding data quality indicators set by PB in the SAQP.

Auditor Comment:

The Auditor notes that PB does not discuss the significance of the RPD results exceeding the stated data quality indicators. However, the Auditor notes that in total 4 out of 50 valid RPD results for heavy metals did not comply with the stated data quality indicators, indicating a completeness of 96%. While there are some exceedances of the data quality indicators, the Auditor is satisfied that overall, the data are adequate and that the results of the investigation can be relied upon.

4.3 Laboratory QA/QC Program

Evaluation of the laboratory QA/QC program involves an assessment of laboratory accreditation, analytical methods, COC documentation, holding time information, and laboratory QC samples. The following sections provide an evaluation of the laboratories QA/QC program.

The laboratory QA/QC programmes performed by the primary and secondary laboratories during the investigation are discussed in the following sections.

4.3.1 Laboratory Accreditation and Analytical Methods

Analyses reported in the Phase 2 ESA were performed by Envirolab Services Pty Ltd (primary laboratory, NATA accreditation number 2901) and ALS Laboratory Group (secondary laboratory, NATA accreditation number 825).

The Auditor considers that the laboratories and analytical methods used in the investigation are appropriate.

4.3.2 COC Documentation and Analysis Holding Time

PB provides chain of custody (CoC) documentation and sample receipt notification in Appendix E of the Phase 2 ESA.

PB notes that with the exception of six QA samples analysed for PAHs and OCPs, appropriate holding times were observed during the investigation. PB states that these six results are not considered significant as both the primary and QA samples were below the limit of detection of the laboratory.

The Auditor concludes that COC and sample receipt documentation are complete, and that with the exception of the six QA samples highlighted by PB, sample holding times observed during this investigation are appropriate. The Auditor also concludes that the results from the six samples

which did not comply with holding time protocol do not adversely affect the overall results of the QA/QC programme.

4.3.3 Laboratory QC Samples

PB states that the majority of matrix spike (88.6%) laboratory control samples (96.2%)and surrogate (93.9%) recoveries completed as part of the primary internal quality control were compliant with the data quality indicators stated in the SAQP (surrogate recovery between 70% and 130%, matrix spike recovery between 70% and 130% for organics and between 80% and 120% for inorganics).

The laboratory certificates show that all method blanks were below the detection limit of the analytical methods.

The laboratory certificates also show that 4 of the laboratory duplicate results recorded RPD values above the data quality indicators stated in the SAQP.

Auditor Comment:

PB does not provide a complete quantitative assessment demonstrating that the primary and secondary laboratories have complied with their data quality indicators for 95% of the results presented. However the Auditor is satisfied that the internal laboratory QC procedures and results demonstrate that the results are reliable and conclusions can be drawn from the data.

4.4 Overall QA/QC Assessment

Auditor Comment:

The Auditor concludes that the overall QA/QC program adopted was generally in accordance with the NEPM (1999) and NSW OEH Guidelines, and demonstrates sufficient confidence in the reliability of the results to draw conclusions from this assessment.

5.0 WSP EVALUATION OF QA / QC

In this section the QA/QC results from the following reports will be evaluated:

- WSP Delineation of Soil Hotspots and Remediation Works Plan (WSP 2010); and
- WSP Soil Validation (WSP 2011).

The WSP reports refer to a small parcel of land along the southern boundary of Area C where PB identified soil hotspots.

5.1 Data Quality Objectives

The data quality objectives (DQOs) for the investigations are presented within the WSP reports.

5.1.1 State the Problem

The WSP delineation report defines the problem as:

"Landcom require an understanding of the extent of the TPH and PAH impacted soil at former PB sample locations C80 and C82."

The WSP validation report defines the problem as:

"Landcom require the removal of the TPH and PAH impacted soils at Areas 1-4 specified in the WSP RWP."

Auditor comment:

The Auditor notes that for part of Area C the purpose of the assessment is also to determine whether soil contamination from previous activities on site pose a risk to human health for a recreational open space land use. However, the Auditor notes that PB has considered recreational open space land use in their assessment.

5.1.2 Identify the Decisions

The WSP Delineation (WSP 2010) identified the decision to be made as:

- "What is the lateral extent of the TPH and PAH hotspots identified at PB sample locations C80 and C82?"

The WSP Validation Works (WSP 2011) decision statement made was:

- Removal of the extent of TPH and PAH hotspots identified at WSP remediation areas 1-4."

5.1.3 Identify Inputs to Decision

In summary, WSP identifies the inputs to the decision as being:

- Historical information (from PB investigations) on TPH and PAH contamination;
- Analytical results of soil samples for TPH, PAH and other selected analytes; and
- Visual observations.

5.1.4 Define the Study Boundaries

The study boundaries identified for the WSP Delineation include the physical site boundary (Property 86 in Lot 6 DP 567411) to a maximum depth of 1 m. The WSP Validation defines the study boundaries as Areas 1-4, which represent the remediation areas, to a maximum depth of 0.3 m.

5.1.5 Develop a Decision Rule

WSP applied the following decision rules:

- The analytical data was assessed to check whether individual samples exceeded the adopted assessment criteria of NEPM (1999) HIL A and NSW EPA (1994) Service Station Guidelines; and
- In accordance with DECC 2006 the analytical data was assessed to check whether individual samples exceeded 250% of the site assessment criteria.

5.1.6 Specify Limits on Decision Errors

WSP (WSP 2010 and WSP 2011) state that "the precision, accuracy, repeatability, completeness and comparability of the data generated" will be assessed. WSP set limits on the relative percentage difference (RPD) between primary and QA/QC samples as presented in later sections of the report.

5.1.7 Optimise the Design for Obtaining Data

WSP state that the purpose of the assessment was to identify a resource-effective data collection design for generating data to meet the project objectives (WSP 2010 and WSP 2011). The project objectives for the WSP Delineation include the creation and implementation of the site-specific SAQP and the Remediation Works Plan. In the case of the WSP Validation the project objectives were to implement the site specific Remediation Works Plan.

Auditor comment:

The Auditor concludes that the data quality objectives WSP has set for this investigation are appropriate.

5.2 Field Quality Assurance and Quality Control

An evaluation of the field QA/QC program involves an assessment of the sampling team, decontamination procedures, sample collection and COC documentation, sampling splitting techniques, duplicate frequency, field QC sample results, and calibration of field instrumentation.

The field QA/QC procedures adopted by WSP during the investigations are discussed in the following sections.

5.2.1 Sampling Team

WSP identifies David Jackson, an environmental scientist and Aaron Young, a project scientist were responsible for completing the fieldwork of the WSP Delineation and WSP Validation works respectively. No further details are provided.

5.2.2 Sampling Frequency

WSP states that a sampling grid as determined in the WSP SAQP (2010) was prepared and that the area between the grid samples surrounding the hotspot locations (C80 and C82) were delineated with additional 2 m and 5 m 'step-out' samples. All samples were analysed for PAHs and TPH C_{10}-C_{36} and one sample (C82) was analysed for heavy metals. Sampling for these analytes was undertaken as PB found exceedances of Benzo(a)pyrene, Total PAHs and TPH C_{10}-C_{36}.

As part of the WSP validation works twelve surface soil samples were taken. WSP provide no reference to appropriate guidelines or provide reasoning to the sample frequency. All surface samples were analysed for PAHs and six samples (samples from Areas 2 and 3) were analysed for TPH C_{10}-C_{36}.

Auditor comment:

The sampling program was undertaken in accordance with that proposed by WSP and review and comments by the Auditor (refer to Auditor Letter, dated 30 June 2010, Review of delineation of soil hotspots and remediation works plan at Area C, Caddens Release, Caddens Road, Kingswood, NSW). The Auditor is satisfied with the sampling frequency.

The Auditor is satisfied that the soil investigation is sufficient to adequately characterise the Site given its history and nature of the contamination encountered.

5.2.3 Sampling Methodology

5.2.3.1 WSP Delineation

WSP states that soil samples were collected during the delineation works using a 'Bobcat" mounted auger directly from the centre of the auger head by hand using disposable nitrile gloves. New nitrile gloves were used for each sampling event and the auger was cleaned with a wire brush and washed using phosphate-free detergent and rinsed with potable water to avoid contamination. A rinsate sample was collected from the auger stem an analysed for TPH, PAH and heavy metals.

Soil samples were subdivided with one part screened with a Flame-Ionisation Detector (FID) and the other in to a laboratory-prepared 250 mL glass jar. The soil samples were preserved in accordance with NEPC (1999) guidelines with samples immediately placed and stored in a chilled esky. The FID was calibrated daily and calibration sheets are attached to the report.

5.2.3.2 WSP Validation

WSP states that soil samples in the remediation areas 1-4 were collected using a hand trowel which was cleaned between each sampling location using Decon 90 followed by a rinse with potable water. Disposable nitrile gloves were worn and changed between samples. The samples were placed into laboratory-prepared 250 mL glass jars and immediately placed into an esky filled with ice for preservation.

Auditor Comment:

The Auditor considers that WSP's soil sampling methods for the investigations were appropriate.

5.2.4 Borehole Logs and other Field Records

The WSP Delineation report provides graphical logs for each of the soil sample locations conducted during this investigation (Attachment B). Although WSP does not state which logging method was adopted for this investigation, bore and test pits logs have been prepared in general accordance with the Unified Soil Classification System and details of any discolouration, staining, odours or other indicators of contamination were noted.

No borehole logs are provided for the WSP Validation works as only surface samples were taken.

Auditor Comment:

The Auditor considers the logs and field records for this investigation are acceptable.

5.2.5 Sample and Chain of Custody Documentation

WSP provides completed chain of custody sheets and laboratory sample receipts for all samples collected and analysed. It should be noted that two of three chain of custody documents for the WSP Delineation works were not signed by the field scientist.

Chain of custody forms generally contain relevant information and have been acknowledged by the laboratories that performed the analysis. The sample preservation and transport to laboratories are considered to be appropriate based on the chain of custody documentation presented.

5.2.6 Field Duplicate Frequency

WSP Delineation involved collection of 31 primary samples and analysis of two duplicate and one triplicate samples. This equates to a frequency of 6.5% for duplicate samples and 3.2% for triplicate samples.

WSP Validation involved collection of 12 primary samples and analysis of one duplicate and one triplicate samples. This equates to a frequency of 8.3% for duplicate samples and triplicate samples.

Auditor Comment:

The Auditor concludes that the field duplicate frequency achieved is generally in accordance with AS4482.1-2005 and is suitable for assessing QA/QC for this investigation.

5.2.7 Field Duplicate, Field Blank, Rinsate Blank and Trip Spike Results

The WSP Delineation and Validation works present field duplicate and triplicate results in summary tables contained with their Attachments. The variance between sample pairs is expressed in terms of the Relative Percentage Difference (RPD). WSP used the following control limits:

- Should not exceed 50% RPD at concentration levels greater than 10 times the limit of reporting (LOR).
- Should not exceed 75% RPD at concentrations between five to ten times the LOR.
- Should not exceed 100% RPD at concentration levels less than two times the LOR.
- The WSP Delineation works reported no RPD results which exceeded the control limits and the rinsate blank results were all below laboratory detection limits.

The WSP Validation works reported the following RPD results which exceeded the control limits:

- 3E and DUP1 with RPDs of 133% for Benzo(a)pyrene, 120% for Chyrsene, 146% for Phenanthrene and 156% for Pyrene.

Auditor Comment:

The Auditor notes exceedances of the RPD criteria for 4 analytes for one duplicate. These are not considered to be significant for the overall data quality. The Auditor therefore concludes that the RPD assessment and other field data quality indicators sufficiently demonstrate that the results of the investigation can be relied upon.

5.3 Laboratory QA/QC Program

Evaluation of the laboratory QA/QC program involves an assessment of laboratory accreditation, analytical methods, COC documentation, holding time information, and laboratory QC samples.

The laboratory QA/QC programmes performed by the primary and secondary laboratories during the investigation are discussed in the following sections.

5.3.1 Laboratory Accreditation and Analytical Methods

Analyses reported in the WSP Delineation and Validation works were performed by Envirolab Services Pty Ltd (primary laboratory, NATA accreditation number 2901) and MGT-LabMark Environmental Laboratories (secondary laboratory, NATA accreditation number 13535).

The Auditor considers that the laboratories and analytical methods used in the investigation are appropriate.

5.3.2 COC Documentation and Analysis Holding Time

WSP provides chain of custody (CoC) documentation and sample receipt notification as attachments to the Delineation and Validation Reports. No holding time exceedances were noted.

The Auditor is satisfied with the compliance with holding time requirements.

5.3.3 Laboratory QC Samples

The laboratory certificates for the WSP Delineation works show that four TPH surrogate recoveries were not possible to report due to the high concentration of analytes in the samples which caused interference. All other surrogate recoveries were within the laboratory data quality indicators. The laboratory control spike and matrix spike results were within the laboratory data quality indicators.

The laboratory certificates of the WSP Validation works show that all laboratory control spike and surrogate recoveries completed as part of the primary and secondary laboratories internal quality control were compliant with the data quality indicators (recovery between 70% and 130% for organics and between 80% and 120% for inorganics).There were no matrix spike recoveries.

The laboratory certificates show that all method blanks were below the detection limit of the analytical methods.

The laboratory certificates also show that all laboratory duplicate results recorded RPD values within the laboratory control limits.

Auditor Comment:

The Auditor is satisfied that the internal laboratory QC procedures and results demonstrate that the results are reliable and conclusions can be drawn from the data.

5.4 Overall QA/QC Assessment

Auditor Comment:

The Auditor concludes that the overall QA/QC program adopted was generally in accordance with the NEPM (1999) and NSW OEH Guidelines, and demonstrates sufficient confidence in the reliability of the results to draw conclusions from this assessment.

6.0 AUDITOR'S ASSESSMENT OF RISK

6.1 Background Factors

In the preparation of this SAR the Auditor is not aware of any background contamination in the vicinity of the Site. The Auditor has compared the results of the investigations performed by PB and WSP directly with the relevant health-based investigation levels and threshold concentrations and has made no allowance for local background factors.

6.2 Assessment of Contamination

Soil

The Auditor has reviewed the soil and groundwater contamination data presented in the Phase 2 investigation conducted by PB and WSP Delineation and Validation Works. The review is based on the investigation / trigger levels developed by PB and WSP, and agreed by the Auditor as shown in Tables 5 and 6.

The soil contamination identified by PB was confined to a small portion of Area C within the vicinity of sample locations C80 and C82. The contamination identified is in the form of benzo(a)pyrene (2.7mg/kg at C80 and 6.6mg/kg at C82), total PAHs (46.8mg/kg at C80 and 102.1mg/kg at C82) and TPH (C_{10}-C_{36}) (1070mg/kg at C82) which exceed the adopted investigation levels for the Site. The part of the Site represented by locations C80 and C82 was subject to subsequent remediation and validation works by WSP.

One soil sample was also found to exceed the provisional phytotoxicity-based investigation levels for copper and zinc. The sample location (C84) was adjacent to the identified areas of environmental concern.

The Auditor notes that all samples which exceeded the provisional phytotoxicity-based investigation levels for copper and zinc are described as naturally occurring topsoil. The Auditor therefore concludes that these concentrations are likely to be a result of natural variation within the shallow soil, potentially concentrated by the action of surface water, and do not pose a significant risk to the environment. The Auditor also notes that relatively high concentrations of zinc and copper are typically present in groundwater within the Bringelly Shale.

The remaining soil results of PB were either below the limit of detection for the analytical method or below the PB's adopted investigation levels for the Site.

There were no fragments of asbestos-containing materials found in Area C, nor were asbestos fibres detected during laboratory analysis.

The soil contamination identified by PB at C80 and C82 was delineated by WSP (2010). The delineation works identified 4 areas contaminated by TPH and PAH. The exceedances identified were in the form of benzo(a)pyrene (1.9 to 17 mg/kg), total PAHs (26.2 to 258.4 mg/kg) and TPH C_{10}-C_{36} (1075 to 2775 mg/kg).The remediation consisted of excavating the areas to a maximum depth of 0.3 m and undertaking validation sampling. The WSP validation sampling returned one exceedance in the form of benzo(a)pyrene (1.2 mg/kg at 4E). The remaining soil results were either below the limit of detection for the analytical method or below the adopted investigation levels for the Site.

Groundwater

Concentrations of chromium (1.6 µg/L in MW05 and 3.6 µg/L in MW06), copper (4.8 µg/L in MW04, 6.3 µg/L in MW05, and 7.4 µg/L in MW06) and zinc (24 µg/L in MW03, 45 µg/L in MW04, 57 µg/L in MW05, and 29 µg/L in MW06) were recorded in groundwater above the ANZECC trigger levels for 95% protection of freshwater species (ANZECC 2000) during the investigation. The remaining groundwater results were either below the limit of detection for the analytical method or below the adopted assessment criteria for the investigation.

The concentrations of chromium, copper and zinc are not coincident with soil contamination at the locations of the groundwater wells. Furthermore, the history of the Site indicates no previous contaminating activity.

The Auditor therefore concludes that the results are unlikely to have been derived from Site-based contamination.

6.3 Potential Receptors

The intended land use will comprise residential properties with accessible soil and recreational open spaces. The portion of Area C in which soil contamination was identified is proposed for recreational open space. The potential future receptors will therefore comprise;

- Residential users of the Site;
- Recreational users of the Site;
- Site maintenance workers; and
- Construction contractors during development

6.4 Potential Exposure Pathways

The PB Phase ESA identified the following contaminants as being potentially present within a small portion of Area C in the vicinity of sample locations C80 and C82:

- Benzo(a)pyrene;
- Total PAHs; and
- TPH (C_{10}-C_{36}).

The principal human health exposure pathway for benzo(a)pyrene, total PAHs and TPH (C_{10}-C_{36}) is via ingestion of soil and soil derived dust, and direct dermal contact (benzo(a)pyrene).

The contaminated portion of Area C was remediated and validated by WSP. All validation sample analyses with the exception of one analysis for benzo(a)pyrene complied with the validation criteria. There was one exceedance, for benzo(a)pyrene for sample location 4E (1.2 mg/kg) which was slightly above the adopted criteria of 1 mg/kg. WSP carried out a UCL calculation on validation samples collected in the remediation area and, noting that the result of the UCL calculation (0.6 mg/kg) was below the adopted criteria, considered that the material was suitable to remain on site.

Auditor Comment:

The Auditor does not consider the use of statistics appropriate under these circumstances. However, the Auditor considers the exceedance to be minor and is satisfied that no significant exposure pathways remain.

6.5 Human Health and Ecological Risk

Since remediation, the Auditor concludes that in Area C there is no current unacceptable risk to human health or ecological systems from contaminated soils or groundwater. The Auditor also concludes that contaminated soil or groundwater will not pose a risk to human health or groundwater following the proposed development of residential properties in Area C.

6.6 Aesthetic Impact

The Auditor concludes that the Site will have no aesthetic impact on the proposed development and surrounding land uses.

6.7 Chemical Mixtures

Based on the results of the sampling and analysis, the Auditor considers that issues related to chemical mixtures in the subsurface have been addressed.

6.8 Migration of Contaminants onto Site

The Auditor concludes that at this time there is no unacceptable risk of contaminants migrating onto Site from neighbouring land.

6.9 Migration of Contaminants from Site

The Auditor concludes that there is no unacceptable risk of contaminants migrating from the Site to neighbouring land.

7.0 CONCLUSIONS

7.1 Adequacy of Site Investigation

The Auditor considers that the scope of works completed during the investigation at the Site was adequate for the purposes of characterising soil and groundwater contamination.

The field and laboratory QA/QC is considered satisfactory and generally complies with the NEPM and NSW OEH-endorsed guidelines. Where exceptions have been noted by the Auditor these are not considered to be significant in the context of the investigation and proposed development.

7.2 Adequacy of the contamination delineation, remediation and validation

The Auditor considers that the scope of works completed during the contamination delineation, remediation and validation was adequate for the purposes of addressing the soil contamination.

The field and laboratory QA/QC is considered satisfactory and generally complies with the NEPM and NSW OEH-endorsed guidelines. Where exceptions have been noted by the Auditor these are not considered to be significant in the context of the investigation and proposed development.

7.3 Compliance with Regulatory Guidelines and Directions

The Auditor is satisfied that all relevant regulatory guidelines and directions have been complied with. Where exceptions have been noted by the Auditor these are not considered to be significant in the context of the investigation and proposed development.

7.4 Final Condition of Site

The Site Audit has been completed to assess the suitability of the Site for a mixture of residential and recreational open space land uses as defined in the Guidelines for the NSW Site Auditor Scheme (DECCW 2006) and in Schedule B(1) Guideline Investigation Levels for Soil and Groundwater (NEPC 1999).

The Auditor has followed the *Guidelines for the NSW Site Auditor Scheme 2nd Edition* (DECCW 2006) and has followed the decision process for assessing urban redevelopment sites as provided in pages 50 and 51 of the guidelines. A copy is provided in Appendix C.

In general, the Auditor considers that:

- The site assessment, and contamination delineation, remediation and validation complies substantially with the Guidelines for Consultants Reporting on Contaminated Sites (EPA 1997);
- Aesthetic issues are not significant in the context of the proposed development;
- Soil and groundwater data has been assessed against relevant investigation and trigger levels for the proposed development;
- The Audit has not relied on any background concentrations to assess site contamination;
- Impacts of chemical mixtures are not significant given the low concentrations of contaminants observed on the Site; and
- There is low risk of contaminants migrating onto or off the Site.

7.5 Suitability of the Site for the Planned Use

The Auditor concludes that the land in Areas C in its present form is suitable for the proposed residential use.

8.0 CLOSURE

This SAR is a discussion of the Auditor's review of available information and forms the basis for the SAS for Area C. The SAS outlines the Auditor's assessment of site suitability and associated conditions for which future development must comply.

A copy of the SAS has been forwarded to the NSW OEH and has been included as an attachment to this report. Any deviations from the SAS must be approved by an appropriately accredited Site Auditor in conjunction with the NSW OEH.

9.0 LIMITATIONS

Your attention is drawn to the document "Limitations", which is included in Appendix C of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

10.0 REFERENCES

PB 2006a — Geotechnical, Salinity and Environmental Site Assessment, Caddens Release Area, Werrington Enterprise Learning and Living (WELL) Precinct. Parsons Brinckerhoff. 21 April 2006. Reference 2113017A PR_3431 Rev B.

PB 2009a — Sampling, Analysis and Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW. Parsons Brinckerhoff. 16 January 2009. Reference 2116943A PR_9331.

PB 2009b — Sampling, Analysis and Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW. Parsons Brinckerhoff. 21 January 2009. Reference 2116943A PR_9331_revA.

PB 2009c — Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. 6 March 2009. Reference 2116943A PR_9627

PB 2009d — Hazardous Materials Survey, Caddens Release, Caddens Road, Kingswood, NSW 2747. Parsons Brinckerhoff. March 2009. Reference 2116943A PR_9607

PB 2009e — Caddens Release Phase 2 Environmental Site Assessment, Kingswood, NSW – Hydrogeological Assessment. Parsons Brinckerhoff. 8 May 2009. Reference 2116943A MO_0005

PB 2009f — Caddens Release – SAQP Auditor Comments. Parsons Brinckerhoff. 19 May 2009. Reference 2116943A/LT_0066/KT/fr

PB 2009g — Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. June 2009. Reference 2116943A PR_9627 RevA

PB 2009h — Phase 2 Environmental Site Assessment (ESA) Caddens Release. Kingswood, NSW, 2747. Parsons Brinckerhoff. July 2009. Reference 2116943A PR_9627 RevB

ANZECC 2000 — *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, 2000.

DECCW 2006 — *Guidelines for the NSW Site Auditor Scheme (2nd edition)*, NSW Department of Environment and Conservation, 2006.

DECCW 2007 — *Guidelines for the Assessment and Management of Groundwater Contamination*, NSW Department of Environment and Conservation. 2007.

DECCW 2008 — *Waste Classification Guidelines, Part 1: Classifying Waste*, NSW Department of Environment and Climate Change, 2008.

DECCW 1994 — *Guidelines for Assessing Service Station Sites*, NSW Environment Protection Authority, 1994.

DECCW 1995 — *Sampling Design Guidelines*, NSW Environment Protection Authority, 1995.

DECCW 1997 — *Guidelines for Consultants Reporting on Contaminated Sites*, NSW Environment Protection Authority, 1997.

NEPC 1999 — *National Environment Protection (Assessment of Site Contamination) Measure*, National Environment Protection Council, 1999.

WSP 2010 — Delineation of soil hotspots and remediation works at 'Area C' Caddens Release, Caddens Road, Kingswood, NSW, WSP Environmental, 2010.

WSP 2011 Soil Validation – Caddens Release Area C, Caddens Road, Kingswood, NSW. WSP Environmental, 2011.

Report Signature Page

GOLDER ASSOCIATES PTY LTD

Roger Parker
NSW Contaminated Site Auditor

TC/RP/tc:rb

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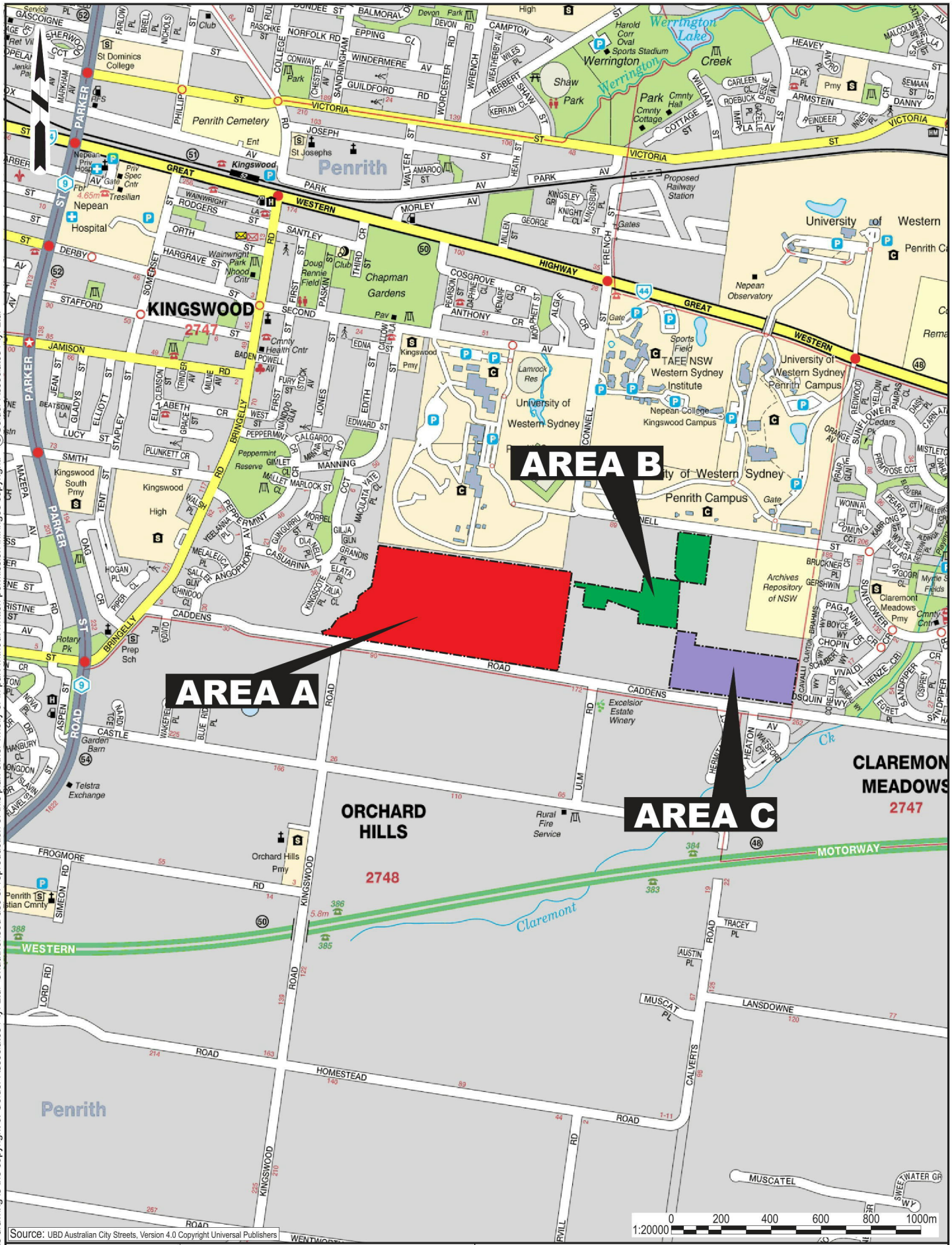

Golder Associates www.golder.com GOLDER ASSOCIATES PTY LTD	CLIENT: LANDCOM		PROJECT: SITE AUDIT REPORT : CADDENS RELEASE AREA, KINGSWOOD, NSW					
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	CHECKED: RB	DATE: 23.05.2011						
	SCALE: 1:20,000	A4	PROJECT No: 097623019	DOC No: 014	DOC TYPE: R	FIGURE No: F0001	REV No: 0	FIGURE 1

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LEGEND

BOUNDARY OF **AREA C**

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CLIENT: LANDCOM				PROJECT: SITE AUDIT REPORT : CADDENS RELEASE AREA, KINGSWOOD, NSW				
DRAWN: HC	DATE: 23.05.2011			TITLE: AREA C				
CHECKED: RB	DATE: 23.05.2011							
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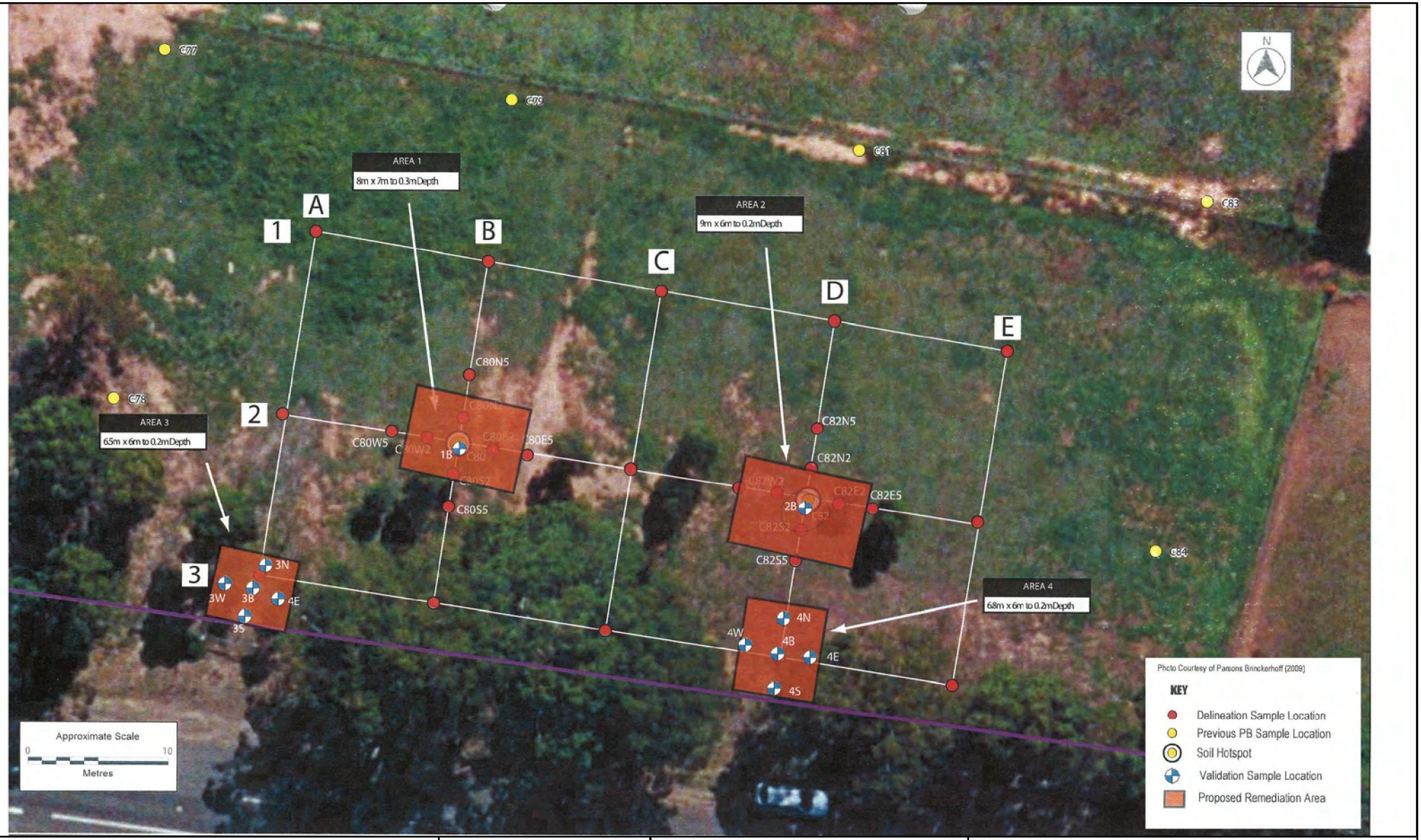

NOTE: Figure sourced from WSP Environment and Energy
Report: Soil Validation - Caddens Release Area C, Caddens Road, Kingswood, NSW
Ref 0002171 Validation Draft
Figure 3 - Remediated Areas and Validation Sample Locations.

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CLIENT	LANDCOM	PROJECT	SITE AUDIT REPORT: CADDENS RELEASE AREA, KINGSWOOD, NSW
DRAWN AJW	DATE 23/05/2011	TITLE	**REMEDIATED AREAS AND VALIDATION SAMPLE LOCATIONS**
CHECKED RB	DATE 23/05/2011		
SCALE		PROJECT No 097623019	FIGURE No 3 / REV No 0 / A4

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APPENDIX A

Relevant Correspondence

25 February 2009 Project No. 097623019 001 L Rev0

Mr P Scott
Landcom
Level 2, 330 Church Street
Parramatta
NSW 2124

REVIEW OF SAMPLING, ANALYSIS & QUALITY PLAN – CONTAMINATION INVESTIGATIONS AT CADDENS RELEASE, KINGSWOOD, NSW

Dear Philip

INTRODUCTION

On behalf of the Landcom, the Auditor has reviewed the Parsons Brinkerhoff (PB) report *Sampling, Analysis & Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW* (Reference 2116943A PR_9331) dated 16 January 2009 (herein referred to as the 'the Report').

Below, comments are provided reflecting the sections as presented in the Report.

COMMENTS

1. Introduction - objectives

1) Reference is made in the first paragraph to Figure 1 – Site Location, however the Auditor notes that the figure presented in Appendix A is labelled Figure 1a. Please amend accordingly.

3.3 Inputs to the Decision

2) The second paragraph refers to "three areas" in which sampling will be completed with consideration to the EPA Sampling Design Guidelines. Reference to the figure on which these areas are presented is incomplete, please amend.

3.4 Study boundary

3) The first paragraph refers to Figure 2-7, however, the Auditor notes that these figures have not been provided in Appendix A. These figures should be provided or reference to them should be removed.

3.5 Site decision rule

4) The first paragraph states that "historical information, site observations, soil analytical data will be used to assess the nature and extent of the contamination at the site (if any)". The Auditor notes that groundwater contamination will be assessed as part of the proposed investigation and should be included in this paragraph.

3.7 Optimising the sampling design for obtaining data

5) The final sentence states that "the sampling design may be subject to change during field works in order to optimise the amount of obtainable data". The Auditor notes that it is the value of obtainable data not necessarily the amount that is important, and assumes that this is the intended meaning of the statement.

5. Areas of Environmental Concerns (AEC) and Contaminants of Concern (CoC)

6) The opening paragraph to this section appears to have a missing component or typographic error at the end. Please amend.

7) Table 5-1 lists "Proposed contamination investigation" for each investigation area in the right hand column. However, the Auditor notes that the number of samples indicated in this column does not correspond to the number of samples to be collected from each area and requests that further clarity is provided.

6.1 Sampling pattern and density

8) Table 6-1 provides the sampling rationale for the soil investigation. However, there is no rationale for the number and location of groundwater monitoring boreholes. Please provide.

   No explanation is given in regards to how the proposed sampling density complies (or otherwise) with the EPA Sampling Design Guidelines (1995) and the residual undetected hot spot sizes. Further explanation should be provided.

6.2.2 Sampling Methodology

9) Table 6-2 states that "test pitting will be undertaken with a backhoe in non-sensitive areas i.e. areas that are not of archaeological significance or ecological value". The Auditor requests that a plan showing the location and extent of these areas is provided.

   Table 6-2 also states that "samples will be collected from the bucket / auger, with the sampling equipment cleaned with suitable phosphate-free detergent and rinsed with distilled water between sampling episodes". The Auditor requests that further explanation is provided with regards to the definition of sampling episodes.

   The Auditor suggests that all monitoring boreholes are sealed at the base with bentonite to prevent possible downward migration of contaminants into underlying aquifers.

   Table 6-2 states "purging will involve the removal of at least five volumes of water, if practicable". The Auditor assumes this should read "five well volumes of water" and asks that the statement be amended accordingly. The Auditor also asks for further clarity of the purging procedure should it not be practicable to remove five well volumes of water, for example if the wells runs dry without field parameters stabilising.

   Table 6-2 states that "except where slow well recovery rates are present, wells will not be sampled until the standing water level has recovered to 70% of its pre-purge level". The Auditor requests further clarity of the sampling procedure in the event that slow well recovery rates are encountered at the site.

6.3.1 Soil

10) The Auditor notes that there are missing words from the first sentence in this section and requests it be amended accordingly.

    Table 6-3 provides details of the proposed analytical programme for the investigation. The Auditor notes that the table does not include groundwater testing and associated QAQC analysis.

    The Auditor requests that further explanation is provided of how samples will be selected or excluded from the analytical programme provided.

    The penultimate paragraph identifies "Enviolab" as the primary laboratory for the analytical programme. The Auditor notes this should read "Envirolab".

7. Site assessment criteria

11) The 2nd paragraph makes reference to "SWC". This reference should be amended accordingly.

    The 5th paragraph discusses the use of 95% Upper Confidence Limits to appropriately validate the site. The Auditor notes that it is good practice to consider zoning the site by historic and proposed use, and spatial distribution patterns exhibited by the data.

7.2.1 Potential beneficial uses

12) The penultimate paragraph states that PB has “selected trigger values for the protection of 95 percent of marine water species for the majority of contaminants”. The Auditor assumes this is intended to be freshwater species as these are given in Table 7-3.

7.2.2 Unlikely uses

13) Table 7-3 lists the adopted groundwater investigation levels for the site. The Auditor notes that with the exception of lead all other metals included in the soil assessment criteria have been omitted. The Auditor requests that PB provide justification of why these metals and other contaminants of concern referred to in preceding sections have been omitted from this list.

9. References

14) The Auditor notes that NSW DECC Waste Classification Guidelines: Part 1: Classifying Waste were published in 2008 not 2009.

15) The Auditor note that there is no reference to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000).

Appendices

16) The third figure provided in Appendix A has no label, please amend.

17) Please provide the following procedure documents as referenced by those provided.

- CLM1.1;
- CLM4.1;
- CLM4.2;
- CLM 4.3; and
- CLM 4.4

General

18) The Auditor notes that no contingency plan has been included with the SAQP to explain how the investigation may be varied and managed if conditions at the site differ from those expected or the required data quality objectives are not achieved. The Auditor requests that this additional information be provided by PB.

CLOSURE

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process. A Site Audit Report and Site Audit Statement will be issued when the Audit process has been completed for the site's development, subject to receipt of appropriate documents.

If you have any further questions please contact the undersigned.

Yours sincerely

GOLDER ASSOCIATES PTY LTD

Kylie Lloyd
NSW DECC Accredited Auditor

MU/KL/mu

CC: Kris Thomas (Parsons Brinckerhoff)
Michael Gray (APP Corporation Pty Ltd)

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27 February 2009 Project No. 097623019 002 L Rev0

Mr P Scott
Landcom
Level 2, 330 Church Street
Parramatta
NSW 2124

REVIEW OF SAMPLING, ANALYSIS & QUALITY PLAN – CONTAMINATION INVESTIGATIONS AT CADDENS RELEASE, KINGSWOOD, NSW

Dear Philip

INTRODUCTION

On behalf of the Landcom, the Auditor has reviewed the Parsons Brinkerhoff (PB) report *Sampling, Analysis & Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW* (Reference 2116943A PR_9331_revA) dated 21 January 2009 (herein referred to as the 'the Report').

The Auditor considers that the SAQP is adequate for the proposed intrusive investigations. However, the Auditor notes the following apparent typographical errors, omissions and inconsistencies.

1. Introduction - objectives

1) Reference is made in the first paragraph to Figure 1 – Site Location, the figure presented in Appendix A is labelled Figure 1a.

3.3 Inputs to the Decision

2) The reference to "figures" made in this paragraph is incomplete.

3.4 Study boundary

3) Reference is made to Figure 8 however no Figure 8 is provided in Appendix A. The Auditor notes that two drawings are labelled Figure 9.

5. Areas of Environmental Concerns (AEC) and Contaminants of Concern (CoC)

4) The number samples listed in the right hand column of Table 5-1 do not correspond to the total number of samples stated for each area. For example the total number of samples listed in the table for Area A (samples A1 – A221) is 211. See item 8) below.

6.1 Sampling pattern and density

5) Sampling locations and density in areas of environmental concern are not highlighted yellow on Figure 1. Areas highlighted yellow on Figures 9 and 9 (as labelled) are noted to be a "Possible contamination source".

6) Table 6-1 provides the sampling rationale for the soil investigation. However, there is no rationale for the number and location of groundwater monitoring boreholes. The Auditor notes the locations of groundwater proposed for this investigation and concludes that they will be sufficient to provide an

indication of regional groundwater quality variation across the site. However, the number and location of groundwater wells should be reviewed and extended if necessary following collection of soil data.

7) With the exception of groundwater monitoring wells on Figure 2, the proposed sampling locations for each site are not shown on Figures 2-7 (as referenced).

8) No explanation is given in regards to how the proposed sampling density complies (or otherwise) with the EPA Sampling Design Guidelines (1995) and the residual undetected hot spot sizes. PB will need to demonstrate how the achieved sampling density complies (or otherwise) with the EPA Sampling Design Guidelines (1995) when the Phase 2 reports are prepared.

6.2.2 Sampling Methodology

9) Table 6-2 states that "test pitting will be undertaken with a backhoe in non-sensitive areas i.e. areas that are not of archaeological significance or ecological value". The Auditor requests that a plan showing the location and extent of these areas and identifying the method of sampling is provided with the Phase 2 reports.

7.2.1 Potential beneficial uses

10) The penultimate paragraph states that PB has "selected trigger values for the protection of 95 percent of marine water species for the majority of contaminants". The Auditor assumes this is intended to be freshwater species as these are given in Table 7-3.

9. References

11) There is no reference to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000).

Appendices

12) There are two drawings labelled Figure 9 in Appendix A.

CLOSURE

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process. A Site Audit Report and Site Audit Statement will be issued when the Audit process has been completed for the site's development, subject to receipt of appropriate documents.

If you have any further questions please contact the undersigned.

Yours sincerely

GOLDER ASSOCIATES PTY LTD

Kylie Lloyd
NSW DECC Accredited Auditor

MU/KL/mu

CC: Kris Thomas (Parsons Brinckerhoff)
Michael Gray (APP Corporation Pty Ltd)

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04 April 2009 Project No. 097623019 003 L Rev0

Mr P Scott
Landcom
Level 2, 330 Church Street
Parramatta
NSW 2124

REVIEW OF PHASE 2 ENVIRONMENTAL SITE ASSESSMENT (ESA), CADDENS RELEASE, KINGSWOOD, NSW, 2747

Dear Philip

Introduction

On behalf of Landcom, the Auditor has reviewed the Parsons Brinkerhoff (PB) draft report *Phase 2 Environmental Site Assessment (ESA), Caddens Release, Kingswood, NSW, 2747* (Reference 2116943A PR_9627) dated 6 March 2009 (herein referred to as the 'the Report').

Below, general comments are provided followed by specific comments reflecting the sections as presented in the reports. Tables follow the text containing the Auditor's checklist and additional comments that require addressing.

General Comments

Comments referring to various sections of each report follow:

Page i

1) There is a typographical error as report has been dated 6 March 2008 and should read 6 March 2009. Please amend.

Executive Summary

2) In addition to the list of potential sources of contamination provided on page viii, a burnt out car and fibrous cement materials (potentially containing asbestos) were identified in the Sampling, Analysis and Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW (the "SAQP", reference 2116943A PR_9331_revA dated 21 January 2009). Please amend.

3) In addition to the list of potential contaminants identified on page ix, polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) were identified in the SAQP. Please amend.

4) Please include within the second dot point on page ix mention of the surface asbestos cement sheeting identified on site.

1.1 Introduction

5) Reference is made in the first paragraph to Figure 1a, however this figure is not included in the report. In addition, Figures 1 to 5 are missing from the report and should be provided.

1.2 Objectives

6) The extent of intrusive works stated in the second paragraphs should read 335 surface soil samples. Please amend.

2.4 Study boundary

7) Table 2-2 identifies the property IDs and corresponding lot / deposited plan numbers for each parcel of land which make up the study boundary. Property ID 96 (lot 11 / DP 719600) is missing from the list. In addition, a small parcel of land at the western end of Area A (lot 2107 / DP 263159) is missing from the list. Please update the table to include all parcels of land within the study boundary.

2.5 Site decision rule

8) The second paragraph states "the assessment of contaminants present was undertaken in accordance with the specified criteria". It is not clear what this statement means, please revise.

2.7 Optimising the sampling design for obtaining data

9) This paragraphs states that the assessment was designed considering (among other things) accessible areas of the site. However, no explanation is offered as to how access constraints were overcome to optimise the sampling design.

3.1 Site identification

10) Reference is made to Figure 1a which has not been included in the report. Please provide.

11) The final sentence states that "the site is identified in Table 3-2". Table 3-2 summarises the characteristics and development limitations for the Luddenham soil landscape unit. Please delete or amend accordingly.

3.2 Site description

12) Property ID 96 and the parcel of land lot 2107 / DP 263159 is missing from Table 3-1. Please include.

13) The burnt out car is noted as being located in the north eastern corner of property ID 98. Table 6-1 of the SAQP notes the location of the burnt out car in the south west corner of property ID 98, whereas targeted sampling (A197 to A221, Figure 9) was conducted in the south east corner.

The Auditor notes that the position of the burnt out car could not be located during the Phase 2 investigation (Table 5-1) and is concerned that this has resulted in targeting sampling being conducted wrong area. Further explanation should be provided.

4.1.1.1 Summary of Site Land Use

14) The Auditor understands that the distillery was not located on the Site. Please confirm.

5. Potential Contamination Issues

15) Table 5-1 describes the total number and type of sample locations for each Area A-C. In addition, the table lists the number of samples and type of investigation method for individual area of environmental concern (AEC). However, it is not clear which sample locations have been selected to target each AECs, as the AECs are not labelled or delineated on Figure 9.

In addition, Table 5-1 does not describe how the analysis programme was selected to target the individual AECs. The Auditor requests that further information is provided in each respect.

5.1 Groundwater rationale

16) Table 5-2 describes the sampling rationale for groundwater at the Site. The table states that groundwater wells MW3 and MW4 were located in a down gradient position and wells MW5 and MW6 were located in an up-gradient position. However, it is not clear how this rationale was derived when the groundwater was inferred to flow towards the creek in the centre of the Site (Section 3.4). Further justification for the selection of these locations should be provided.

17) Four groundwater wells were sampled where the SAQP had stated 6 locations would be sampled during the Phase 2 investigations. No explanation has been provided as to why only 4 wells were

available for sampling and what impact the reduced number of locations has had on the validity of the groundwater assessment and conclusions drawn from it. Further discussion is required.

6.2 Contamination assessment

18) Table 6-1 describes the sampling density that was achieved at the Site. The combined areas for Areas A-C differ from those provided in Table 2-2. For example, the combined area for Area A in Table 6-1 (36.8Ha) is greater than that in Table 2-2 (33.74Ha). Both tables will need to be amended to reflect the accurate area of each Area and sub-Area.

19) The stated diameter of hotspot that can be detected with 95% confidence has been derived in Table 6-1 by converting the achieved sampling density into an equivalent sampling density (points / hectare) and comparing the resultant density with Table A in the NSW EPA Sampling Design Guidelines (1995). The Auditor notes that the equivalent density calculated for the yellow shaded part of Area A and B is incorrect and should read 22.5 and 12.5 respectively.

20) The Auditor also notes that the hotspot diameter calculated does not consider the analysis density for each Area / sub-Area. For example the number of sampling locations stated for the yellow shaded area of Area B is 52 where the number of analyses conducted for polycyclic aromatic hydrocarbons (PAHs) in the same area is 16 which will significantly affect the diameter of hotspot that can be detected with 95% confidence. Further discussion is required (see point 23) below).

6.2.1 Soil Sampling

21) It is the soil analysis regime rather than the sampling regime which is presented in Table 6-2. In addition, column one heading has a typographic error and should read “Analytical Suites”. The table should be amended accordingly.

22) Six rinsate samples and seven field blanks were analysed (Table Q7, Appendix F). Table 6-2 should be amended to reflect the analysis performed. Furthermore, the Auditor notes that sample certificates for equipment rinsate and field blank samples are missing from Appendix E.

23) The Auditor notes that the number of analyses for each suite differs from that proposed in the SAQP as the conditions on Site suggested soil contamination was unlikely. However, no explanation is given as to why certain locations within each Area were analysed for a particular analysis suite where others were not. For example, PAHs were only tested in the south east and south west corners of Area C without any apparent explanation. Further explanation is required to support the selected analysis programme.

24) Paragraph six states that “all sampling locations were measured from fixed points and located on the site plans with GPS. The Auditor notes from Figures 9 and 10 that a number of sampling locations appear to have been situated within surface water features in Area A (e.g. A50-51 and A57-58). The sampling locations should be checked and accurately plotted on Figures 9 and 10.

6.2.2 Groundwater

25) Groundwater wells were developed on 4 February 2009 (Appendix G) and were then sampled on 9 February 2009. However, the SAQP (Table 6-2) states that “after development, no purging or sampling of the monitoring wells will be conducted for a minimum of 7 days to allow the formation to equilibrate”. Further discussion is required as to whether the altered sampling protocol will impact on the validity of the results and conclusions drawn from them.

8.1 Surface / subsurface conditions

26) The Auditor notes that “Sandy CLAY” material was reported to extend to depths up to 11m below ground level (MW5) and depths regularly in excess on 1m below ground level (bgl) at other locations. Please amend Table 8-1 to more accurately reflect the generalised stratigraphic sequence at the Site.

8.3.2 Petroleum hydrocarbons

27) One sample (C80_0.0-0.1) recorded a concentration of total petroleum hydrocarbons (TPH) C10-C36 (1070mg/kg) above the adopted assessment criteria for Area C (1000mg/kg). An attempt to calculate the 95% upper confidence limit (UCL) mean value for TPH C10-C36 has been made however; the

method adopted does not comply with the NSW EPA Sampling Design Guidelines (1995) nor is the data set for this Area appropriate for such a calculation.

The Auditor concludes that this result is anomalous and unlikely to be indicative of a widespread contamination, however further explanation is required regarding the origin of hydrocarbon contamination at this location (see point 28) below).

8.3.3 Polycyclic aromatic hydrocarbons

28) Two samples (C80_0.0-0.1 and C82_0.0-0.1) recorded concentration of Total PAH (46.8mg/kg and 102.2mg/kg respectively) above the selected assessment criteria for Area C (40mg/kg). A 95% UCL of 169mg/kg has been derived for Total PAH. However, this figure is above the adopted assessment criteria not below as stated. Again the method of calculation does not comply with the NSW EPA Sampling Design Guidelines (1995) nor is the data set for this Area appropriate for such a calculation.

In addition, each sample was found to contain a concentration of benzo(a)pyrene (B(a)P) of 2.7mg/kg and 6.6mg/kg respectively which exceeds the adopted assessment criteria of 2mg/kg. No attempt has been made to derive a 95% UCL value for B(a)P. However, it is noted that both Total PAH and B(a)P in sample C82_0.0-0.1 are greater than 250% of the adopted assessment criteria and therefore classify as contamination hotspots.

The Auditor notes that (as with TPH) no attempt has been made to determine the origin of hydrocarbon contamination at these locations, indeed the soil descriptions for each sample (Appendix B) are identical to many of those described across the Site. In conclusion, the Auditor agrees that additional sampling is required to delineate and quantify the area of soil impacted by the hydrocarbon contamination at sample location C82. Furthermore, detailed justification should be provided as to how the analytical density adequately addresses the remaining uncertainty within the data collected from across the Site.

8.3.6 Asbestos

29) The report states that no asbestos fibres were detected in the samples tested but some isolated fibrous cement fragments were observed at the surface during a HAZMAT survey. There is no discussion regarding the origin of the fibrous cement fragments. Also no laboratory analysis was conducted on samples located around the location of the fragments in Area A.

The Auditor is therefore concerned that the sampling and analysis programme does not adequately address the residual risks to future development. Further discussion is required.

Additionally, the Auditor notes that both the executive summary and the conclusions and recommendations sections of the report state that no sub surface fibrous cement sheeting was noted on site but does not mention the identification of surface fibrous cement fragments.

8.4 Groundwater conditions

30) Table 8-4 describes the depth to groundwater in MW5 and MW6 as 11.59m bgl and 8.105m bgl respectively. However, the log for MW5 and MW6 (Appendix B) indicates the boreholes were terminated at a depth of 11m bgl and 8m bgl respectively. This discrepancy should be resolved.

31) Table 8-4 states that groundwater was found to be in the interface between the sandy clay and sandstone. However standing water levels appear to be within the sandstone (MW4), within the sandy clay (MW5) and within shale (MW6). Further discussion is required.

32) Table 8-4 references Figure 12 which presents interpreted groundwater contours which are plotted to flow in southerly direction radiating from well MW5. This interpretation contradicts the direction of flow inferred from published information (Section 3.4), and the direction of flow of the creek that bisects the Site.

The Auditor is concerned that the interpretation of groundwater flow is incorrect and that the location of wells does not allow for the accurate interpretation of hydraulic gradient across the Site. Consequently, there is some doubt whether the assessment of groundwater contamination is adequate to identify contaminants entering or leaving the Site. Further discussion is required.

9.1 Field quality control results

33) The second paragraph states that 1 in 20 primary laboratory samples were to be analysed for quality purposes. However, the SAQP stated 1 in 10 primary laboratory duplicates were to be collected and analysed during the fieldwork. Please amend.

9.3 Internal and external laboratory QA / QC

34) Table 9-1 states that holding times were met for all batches. However, samples scheduled for analysis on 20 February 2009 (email from Mr D Hogberg, Parsons Brinckerhoff to Aileen Hie, Envirolab Services Pty Ltd dated 20 February 2009) exceeded the maximum holding time for PAHs and organochlorine pesticides (OCPs) given in Table 5-A National Environment Protection (Assessment of Site Contamination) Measure 1999 Schedule B(3). The statement should be amended and further discussion provided.

35) Table 9-1 describes the decontamination of field sampling equipment. However, this only includes reference to disposing of old nitrile gloves between sampling rounds. The description should be expanded to included decontamination of hand augers and excavator buckets as proposed in Table 6-2 of the SAQP.

36) Table 9-1 summarises the results of rinsate water analysis. However, no laboratory certificates for rinsate water analysis have been provided in Appendix E. Please provide.

37) Table 9-1 described the use of trip blank samples during fieldwork. However, no laboratory certificates have been provided for this analysis. Please provide.

10.2 Soil Impacts

38) The second paragraph should include volatile organic compounds (VOCs) as these were included in the analysis programme. Please update.

39) The isolated hotspot of PAHs at location C82 should also include B(a)P. Please amend (note this also applies to Section 11.2 bullet 1).

10.3 Groundwater Impacts

40) ANZEEC (2000) should be replaced by ANZECC (2000). Note, this also applies to section 12. References.

11.1 Findings

41) No reference has been made to the fibrous cement sheeting observed in Areas A and B (see point 29) above). Please amend.

Figures

42) Figures 1 to 5 appear to be missing from the report and should be provided.

43) The locations of some samples in Area A have been plotted within surface water features on Figures 9 and 10. These locations should be checked and re-plotted if necessary.

Appendix B – Borehole logs

44) Sample location A213 is shown as a surface sampling location on Figure 9 although a test pit log has been provided. Conversely, location A212 is shown as a test pit on Figure 9 but no test pit log is provided. Please amend accordingly.

45) Test pit logs have been provided for locations A78 and A79. However, there are corresponding summary soil descriptions for each location which differ from the test pit logs provided. Please revise.

Appendix C – Analytical Results Tables

46) There are numerous incorrect values and duplicated entries in the summary tables provided. These should be checked and corrected.

Appendix E – Laboratory analysis reports

47) There are no laboratory sample receipts provided with the reports. Please provide.

48) There are numerous reports missing when compared with the data summarised in Appendix C. Please provide.

CLOSURE

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process. A Site Audit Report and Site Audit Statement will be issued when the Audit process has been completed for the site's development, subject to receipt of appropriate documents.

If you have any further questions please contact the undersigned.

Yours sincerely

GOLDER ASSOCIATES PTY LTD

Kylie Lloyd
NSW DECC Accredited Auditor

MU/KL/mu

Attachments: Auditor's checklist

CC: Kris Thomas (Parsons Brinckerhoff)
Michael Gray (APP Corporation Pty Ltd)

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Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Executive Summary	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Background		✓			
Objectives of the investigation		✓			
Scope of the work		✓			
(Where appropriate) a summary of sampling results in table format containing minimum, arithmetic average and 95% UCL for each analyte		✓			Reference to PAHs and VOCs missing from potential contaminants. No summary of results included however reference is made to whether results exceed the assessment criteria
Summary of conclusions and recommendations.		✓			
SCOPE OF WORK	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
A clear statement of scope of work.		✓			Section 1.3.although scope includes a review of site history and physicl setting which was complete at an earlier stage. Scope has been updated to reflect sampling of 4 groundwater wells not the 6 wells proposed in the SAQP.
SITE IDENTIFICATION	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Street number, street name and suburb		✓			General locality given in Section 1.1.
Lot number and Deposited Plan number		✓			Table 2-2 provides Lot / DP for each property ID, however property ID 96 (lot 11 DP 719600), and Lot / DP 2107 / 263159 (no property ID listed) are missing from table.
Geographic coordinates related to a nearby cadastral corner of a State Survey Control Mark		✖			Large site, coordinates of sampling locations listed in Appendix B Borehole Logs
Locality map		✖			Referred to as Figure 1a (Section 1.1) not provided in figures.
Current site plan with scale bar, showing north, local water drainage and other local environmentally significant features.		✖			No site plan provided, although other plans show the extent of the site, local water drainage, topography, archaeology etc.
SITE HISTORY	✓	✓(s)	✓(s)	✓(s)	**Auditor's comment on inclusion / reference (if applicable)**
Zoning- previous, present and proposed		✓			Section 1.1 - current zoning a mixture of Rural 1(d) and Agricultural Protection 1(a).
Land use- previous present and proposed		✓			Previous (Section 4.) and present (Table 3-1) land uses are provided, however proposed development plans are omitted other than to say the site may be rezoned as residential usage.
Summary of council rezoning, relevant development and building approvals records.		✖			
Chronological list of site uses, indicating information gaps and unoccupied periods		✓			Summary of Phase 1 report (March 2006) provided
Review of aerial photographs		✓			Summary of Phase 1 report (March 2006) provided
Site photographs (with date, location indicated on site maps)		✓			Appendix A, descriptions of each photograph are provided.
Inventory of chemicals and wastes associated with site use and their on-site storage location		✖			Not relevant
Possible contaminant sources and potential off-site effects		✓			Section 5.2 Site conceptual model
Site layout plans showing present and past industrial processes		✖			Not relevant
Sewer and service plans.		✖			Not relevant
Description of manufacturing processes		✖			Not relevant
Details and locations of current and former underground and aboveground storage tanks		✖			None identified
Product spill and loss history		✖			Not relevant
Discharges to land, water and air		✖			Not relevant
Disposal locations		✖			Not relevant
Relevant complaint history		✖			Not relevant
Local site knowledge of residents and staff – both present and former		✖			Not included but not considered necessary
Summary of local literature about the site, including newspaper articles		✖			Not included but not considered necessary
Details of building and related permits, licences, approvals and trade waste agreements		✖			Not included but not considered necessary

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Historical use of adjacent land		✓			Included

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Local usage of ground/surface waters, and locations of bores/pumps		✓			Groundwater bore information presented, no discussion of local surface water usage despite several ponds / dams noted in accompanying figures.
Integrity assessment (assessment of the accuracy of information)		✖			Not included but not considered crucial for this report.
SITE CONDITION AND SURROUNDING ENVIRONMENT	✓	✓(s)	✓(s)	✓(s)	**Auditor's comment on inclusion / reference (if applicable)**
Topography		✓			Generic topography described in Table 3-2, topographic contours shown on Figure 7 - Site Salinity
Conditions at site boundary such as type and condition of fencing, soil stability and erosion		✓			Partially described in Table 3-1
Visible signs of contamination such as discolouration or staining of soil, bare soil patches – both on-site, and off-site adjacent to the boundary		✓			Table 5-1
Visible signs of plant stress		✓			Not included. Comment requested
Presence of drums, wastes and fill materials		✓			Table 5-1
Odours		✓			Not included. Comment requested
Condition of building and roads		✓			Table 5-1
Quality of surface water		✓			Not included. Comment requested
Flood potential		✖			Not considered necessary
Details of any relevant local sensitive environment – e.g. rivers, lakes, creeks, wetlands, local habitat areas, endangered flora and fauna.		✓			Not specifically discussed although partial references included. Given findings, additional comments not required.
GEOLOGY AND HYDROGEOLOGY	✓	✓	✓(s)	✓(s)	**Auditor's comment on inclusion / reference (if applicable)**
Soil stratigraphy using recognised classification methods, e.g. Australian Standard 1726, Unified Soil Classification Table		✓			Table 3-2
Location and extent of imported and locally derived fill		✓			Described in Table 5-1
Site borehole logs or test pit logs showing stratigraphy		✓			Appendix B
Detailed description of the location, design and construction of on site wells		✓			Bore logs and construction details of new monitoring wells provided in Appendix B. Location presented on Figure 9, 10 and 12.
Description and location of springs and wells in the vicinity		✖			Not confirmed either way
Depth to groundwater table		✓			Appendix I
Direction and rate of groundwater flow		✓			Reference to published conductivity (Table 8-4) and inferred groundwater contours (Figure 12) provided.
Direction of surface water run-off		✓			Topography and creek lines shown on accompanying figures
Background water quality		✓			Not included. Comment requested
Preferential water courses		✓			Not included. Comment requested
Summary of local meteorology		✖			Not considered necessary
SAMPLING AND ANALYSIS PLAN AND SAMPLING METHODOLOGY		✓(s)	✓(s)	✓(s)	**Auditor's comment on inclusion / reference (if applicable)**
Sampling, analysis and data quality objectives (DQOs)		✓			
Rationale for the selection of:					
o sampling pattern		✓			Sampling patterns presented on Figure 9, although distribution of analyses not discussed. Possible contamination sources shown on plans a re not labelled, there it is not possible to determine AEC they relate to in Table 5-1.
o sampling density including an estimated size of the residual hot spots that may remain undetected		✓			Presented in Table 6-1 but are not contaminant specific.
o sampling locations including locations shown on a site map		✓			Figures 9 and 10
o sampling depths		✓			Appendix B and C
o samples for analysis and samples not analysed		✓			Appendix B and C
o analytical methods		✓			Not included comment requested
o analytes for samples		✖			Discussed for each area / parcel in Table 5-1, and in overall terms (Tables 6-2 and 6-3) but not for specific samples.

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Detailed description of the sampling methods including:					
o sample containers and type of seal used		✓			
o sampling devices and equipment e.g. auger type		✓			
o equipment decontamination procedures		✓			
o sample handling procedures		✓			
o sample preservation methods and reference to recognised protocols, e.g. APHA or US EPA SW 846		×			Not discussed
Detailed description of field screening protocols		✓			Brief description of screening procedures provided
FIELD QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) **DEC AUDITOR REQUIREMENTS (2006)**	· Auditors **MUST** ensure that the data from the site assessment is reliable and representative of the condition of the site. · The auditor **MUST** check the reliability and fitness for purpose of both field sampling procedures and laboratory program. ***Refer internal checklist for further detail*** *[Resources/Environmental/Contaminated Site Audits/Internal DEC Checklists/2006 Auditor Guidelines QAQC Checklist].*				
FIELD QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)	**✓(N)**	**✓**	**N/A**	**✓**	**Auditor's comment on inclusion / reference (if applicable)**
Detail of sampling team		✓			Names provided but no details of qualifications or experience.
Decontamination procedures carried out between sampling events		✓			
Logs for each sample collected including time, location, initials of sampler, duplicated locations, duplicate type, chemical analyses to be preformed, site observations and weather conditions		✓			Weather conditions not noted
Chain of custody fully identifying for each sample the sampler, nature of the sample, collection date, analyses to be preformed, sample preservation method, departure time from the site and dispatch courier(s)		✓			Sampler not identified on CoC
Sample splitting techniques		×			Not included please include
Statement of duplicate frequency		✓			
Field blank results		×			Laboratory certificates not inlcuded, please include
Background sample results		✓			Inferred as being those in undisturbed areas of the site.
Rinsate sample results		×			Laboratory certificates not inlcuded, please include
Laboratory-prepared trip spike results for volatile analytes		✓			Only one trip spike (groundwater sampling) provided. Please provide results for trip spike which accompanied the soil sampling.
Trip blank results		×			Laboratory certificates not inlcuded, please include
Field instrument calibration (when used).		✓			
LABORATORY QA/QC	**✓(N)**	**✓**	**N/A**	**✓**	
A copy of signed chain-of-custody forms acknowledging receipt date and time, and identity of samples included in shipments		✓			
Record of holding times and a comparison with method specifications		✓			Discussed in Table 9-1 but no comparison with appropriate holding times for particular analytes provided.
Analytical methods used		×			Not included please include
Laboratory accreditation for analytical methods used		×			Not included please include
Laboratory performance in inter-laboratory trials for the analytical methods used, where available		✓			Laboratory internal QA/QC results provided but not summarised or discussed fully within the report text.
Description of surrogates and spikes used		×			Not included please include
Percent recoveries of spikes and surrogates		✓			Included within appendices but not discussed in the report text.
Instrument detection limit		✓			Laboratory PQLs provided in results summary tables (Appendix C)
Method detection limits		✓			
Matrix or practical quantification limits		✓			
Standard solution results		×			Not included please include
Reference sample results		×			Not included please include
Reference check sample results		×			Not included please include
Daily check sample results		×			Not included please include
Laboratory duplicate results		×			Not included please include
Laboratory blank results		×			Not included please include
Laboratory standard charts		×			Not included please include

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
QA/QC DATA EVALUATION	✓(N)	✓	N/A	✓	**Auditor's comment on inclusion / reference (if applicable)**
Evaluation of all QA/QC information listed above against the stated DQOs, including a discussion of: o documentation completeness o data completeness o data comparability (see next point) o data representatives		✖			Discussed in terms of conformance to DQIs set in SAQP but not in terms of overall completeness
precision and accuracy for both sampling and analysis for each analyte in each environmental matrix informing data users of the reliability, unreliability, or qualitative value of the data		✓			General statement re. quality provided in Section 9.6 however this does not consider the impact of not being able to sample two of the proposed groundwater locations.
Data comparability checks, which should include e.g. bias assessment – which may arise from various sources, including: o collection and analysis of samples by different personnel o use of different methodologies o collection and analysis by the same personnel using the same methods but at different times o spatial and temporal changes (because of the environmental dynamics)		✖			Not discussed but not critical
Relative per cent differences for intra- and inter-laboratory duplicates					
BASIS FOR ASSESSMENT CRITERIA **DEC AUDITOR REQUIREMENTS (2006)**	· Decision-making flow chart describes how HILs and PILs **MUST** be applied to different proposed land uses. · Where more than one land use if proposed, the auditors assessment of suitability **MUST** relate to the most sensitive of the proposed land uses. · HILs and PILs are not appropriate criteria for assessing fill material that has · The auditor **MUST** apply, without multiplication, the criteria listed in the Auditors may apply the NEPM for semi-volatile TPH fractions (C16-C35 and >C35) for soil, but Auditor MUST state whether or not the most appropriate groundwater assessment criteria				
BASIS FOR ASSESSMENT CRITERIA	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Table listing all selected assessment criteria and references		✓			Tables 7-1, 7-2 and 7-4
Rationale for and appropriateness of the selection of criteria		✓			
Assumptions and limitations of criteria		✓			
RESULTS	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Summary of previous results, if appropriate					N/A
Summary of all results, in a table that: o shows all essential details such as sample numbers and sampling depth o shows all assessment criteria o highlights all results exceeding the assessment criteria		✓			Tables 8-2 and 8-5
Site plan showing all sample locations, sample identification numbers and sampling depths		✓			Figure 9, sampling depths not shown but can be determined by cross referencing with logs
Site plan showing the extent of soil and groundwater contamination exceeding selected assessment criteria for each sampling depth		✓			Figure 10, showing soil exceedences only

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
SITE CHARACTERISATION **DEC AUDITOR REQUIREMENTS (2006)**	· Auditors **MUST** consider the potential for contamination to migrate from the site which is the subject of the site audit. · The auditor **MUST** discuss in the site audit report evidence for the occurrence of off-site migration of contaminants and give an opinion on the impacts on likely receptors. · If the auditor believes the off-site migration of contamination should be · The auditor **MUST** take all reasonable steps to advise the site owner or occupier · Auditors **MUST** check that the potential for groundwater contamination has been · If groundwater contamination is identified, the auditor **MUST** check that the · Auditors **MUST** ensure that the presence of separate phase contaminants has · Where assessment of sediments has been undertaken, site auditors **MUST** · The auditor **MUST** check that aesthetic issues have been considered in the				
SITE CHARACTERISATION	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Assessment of type of all environmental contamination, particularly soil and groundwater		✓			
Assessment of extent of soil and groundwater contamination, including off-site effects		✓			Locations of samples exceeding assessment criteria have been identified however no discussion of the adequacy of the analysis programme provided.
Assessment of the chemical degradation products					N/A
Assessment of possible exposure routes and exposed populations (humans, ecological)		✓			Only discussed following desk based assessment. Site contamination discussed in terms of soil and groundwater impacts only.
REMEDIAL ACTION PLAN **DEC AUDITOR REQUIREMENTS (2006)**	· Auditor **MUST** be satisfied that any proposed or completed remediation is · Remedial strategies **MUST** have regard to current regulations and DEC guidance. · Contamination at a site **MUST** be remediated to meet the appropriate clean-up · Irrespective of depth, an auditor **MUST NOT** endorse any proposal to leave · The site auditor **MUST** where relevant, demonstrate in their site audit reports · Site auditors **MUST** demonstrate in their site audit reports an awareness of the · Site auditors **MUST** have regard to the provisions of the NSW Gov't frameworks · Auditors **MUST NOT** endorse a mgmt strategy proposed for a site which · Auditors **MUST** check that documentation is produced for the disposal of · Sites with UXO **MUST** only be assessed by someone qualified to manage UXO · Auditors **MUST** check that all primary sources of groundwater contamination, · If a source cannot be removed, the auditor **MUST** clearly state in the site audit · Auditor **MUST** take reasonable steps (clearly and in writing) to advise the · DECs policy is that a natural attenuation proposal **MUST** be accompanied by an · Where MNA is proposed as part of an overall remedial strategy for ongoing				
REMEDIAL ACTION PLAN	**N/A**	**N/A**	✓	✓**(s)**	**Auditor's comment on inclusion / reference (if applicable)**
Remediation goal					Not Applicable
Discussion of the extent of remediation required					Not Applicable
Discussion of possible remedial options and how risk can be reduced					Not Applicable
Rationale for the selection of recommended remedial option					Not Applicable
Proposed testing to validate the site after remediation					Not Applicable
Contingency plan if the selected remedial strategy fails					Not Applicable
Interim site management plan (before remediation), including e.g. fencing, erection of warning signs, stormwater diversion					Not Applicable
Site management plan (operation phase): o site stormwater management plan o soil management plan o noise control plan o dust control plan, including wheel wash (where applicable) o odour control plan o occupational health and safety plan					Not Applicable
Remediation schedule					Not Applicable
Hours of operation					Not Applicable

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Contingency plans to respond to site incidents, to obviate potential effects on surrounding environment and community					Not Applicable
Identification of regulatory compliance requirements such as licences and approvals					Not Applicable
Names and phone numbers of appropriate personnel to contact during remediation					Not Applicable
Community relations plans, where applicable					Not Applicable
Staged progress reporting, where appropriate					Not Applicable
Long-term site management plan					Not Applicable
VALIDATION	**N/A**	**N/A**	**N/A**	✓	**Auditor's comment on inclusion / reference (if applicable)**
Rationale and justification for the validation strategy including: o clean-up criteria and statistically based decision-making methodology o validation sampling and analysis plan					Not Applicable
Details of a statistical analysis of validation results and evaluation against the clean-up criteria					Not Applicable
Verification of compliance with regulatory requirements set by the EPA, WorkCover and local government.					Not Applicable
ONGOING SITE MONITORING	**N/A**	**N/A**	**N/A**	✓	**Auditor's comment on inclusion / reference (if applicable)**
Ongoing site monitoring requirements (if any), including monitoring parameters and frequency					Not Applicable
Results of monitoring analyses including all relevant QA/QC reporting requirements stated above					Not Applicable
Ongoing site/equipment maintenance, e.g. containment cap integrity					Not Applicable
Details of party(ies) responsible for maintenance and monitoring program					Not Applicable
CONCLUSIONS AND RECOMMENDATIONS **DEC AUDITOR REQUIREMENTS (2006)**	· Where groundwater contamination is present, and auditor **MUST** discuss its impact on the suitability of the site for a proposed use in the site audit report. This applies for onsite and offsite contamination sources. · Where groundwater contamination under a site poses an unacceptable risk to users of the site for a proposed use, the auditor **MUST** indicate in the site audit statement that the site is unsuitable for that use				
CONCLUSIONS AND RECOMMENDATIONS	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Brief summary of all findings		✓			
Assumptions used in reaching the conclusions		✓			
Extent of uncertainties in the results		✖			Please include
Where remedial action has been taken, a list summarising the activities and physical changes to the site					N/A
A clear statement that the consultant considers the subject site to be suitable for the proposed use (where applicable)		✓			
A statement detailing all limitations and constraints on the use of the site (where applicable)		✓			
Recommendations for further work, if appropriate.		✓			

√ Include this section
(S) A summary is adequate if detailed information was included in an available referenced previous report.
(N) Include only if there is to be no further site investigation
N/A Not applicable

Caddens Release Project No. 2116943A

0 Client Ref. 0

Auditor comments Date:

Comment	PB response
1	Corrected in next revision
2	Corrected in next revision
3	Corrected in next revision
4	Corrected in next revision
5	Corrected in next revision
6	Corrected in next revision
7	Corrected in next revision
8	Corrected in next revision
9	**Not relevant - unhindered access across the site**
10	Corrected in next revision
11	Corrected in next revision
12	Corrected in next revision
13	**The burnt out car was previously located in the north eastern corner of ID 98 and not the south west. The increased sampling density (A197-A221) was based on the findings of the Phase 1 and not the burnt out car.**
14	**The distillery is located outside the study boundary.** Will be corrected in the next revision.
15	**To be discussed.**
16	**Two of the previous monitoring wells could not be located. To be discussed.**
17	**To be discussed.**
18	Corrected in next revision
19	Corrected in next revision
20	Corrected in next revision
21	Corrected in next revision
22	Corrected in next revision
23	Corrected in next revision
24	Corrected in next revision
25	**5 days is sufficient for the formation to equilibrate.**
26	Corrected in next revision
27	**To be discussed.**
28	**To be discussed.**
29	Corrected in next revision
30	Corrected in next revision
31	Corrected in next revision
32	**To be discussed.**
33	Corrected in next revision
34	Corrected in next revision
35	Corrected in next revision
36	Corrected in next revision
37	Corrected in next revision
38	Corrected in next revision
39	Corrected in next revision
40	Corrected in next revision
41	Corrected in next revision
42	Corrected in next revision
43	Corrected in next revision
44	Corrected in next revision
45	Corrected in next revision
46	Corrected in next revision
47	Corrected in next revision
48	Corrected in next revision

Checklist
Integrity assessment To be discussed.

23 April 2009 Project No. 097623019 004 L Rev0

Mr P Scott
Landcom
Level 2, 330 Church Street
Parramatta
NSW 2124

SITE AUDITOR SERVICES, CADDENS RELEASE AREA, KINGSWOOD, NSW, 2747

Dear Philip

Further to our meeting on 22 April 2009, we write to confirm that Ms Kylie Lloyd is no longer in the employment of Golder Associates Pty Ltd, and therefore cannot continue with the non-statutory contaminated site audit for the Caddens Release area under the terms of our original agreement.

In accordance with your request to maintain continuity with Golder Associates for the audit, we can confirm that Mr Roger Parker (NSW DECC accredited auditor 9825) can continue with the work in accordance with the terms of our original agreement, and can make the necessary arrangements to transfer the audit into his name.

We trust that we have interpreted your requirements correctly and we would be grateful if you could confirm this in writing (by return or email). We look forward to working with you on the remainder of this audit.

Yours sincerely

GOLDER ASSOCIATES PTY LTD

Roger Parker
NSW DECC Accredited Auditor

MU/RP/mu

Attachments:
CC: Michael Gray (APP Corporation Pty Ltd)
Ms Kylie Lloyd

j:\env\2009\097623019_landcom_caddens realease_csa\correspondence out\097623019_004_l_rev0_transfer_to_roger_parker.doc

LANDCOM

23 April 2009

Roger Parker
Golder Associates
PO Box 1032
Crows Nest NSW 1585

Dear Roger,

Site Auditor Services – Caddens Release Area Kingswood

I write in response to your letter instant and our meeting of 22 April 2009 at APP's Office and I note that Kylie Lloyd is no longer employed at Golder Associates. I also note that Golder Associates has offered your services as a NSW DECC accredited auditor to complete the scope of work under the Landcom/Golder Associates Contract (No 848/09) dated 13 January 2009.

Landcom is pleased to confirm that it accepts Golder's offer for your appointment to the position of DECC accredited auditor under the abovementioned contract. Please make the necessary arrangements for the audit to be transferred into your name.

Yours sincerely

Philip Scott
Project Director

Level 2, 330 Church Street
Parramatta NSW 2150
PO Box 237 Parramatta NSW 2124
DX 28448 Parramatta
ABN 79 268 260 688
Telephone 61 2 9841 8600
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Certified Environmental Management

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ABN 80 078 004 798
NCSI Certified Quality System ISO 9001

Our reference: 2116943A/LT_0066/KT/fr
Your reference: 097623019 002 L Rev0

19 May 2009

Michael Gray
Project Director
APP Corporation Pty Ltd
APP House
53 Berry Street
North Sydney NSW 2060

Dear Michael

Caddens Release - SAQP Auditor Comments

Further to a recent meeting with the auditor (Roger Parker, Golder Associates), PB has reviewed the auditor's comment relating to the SAQP in a letter dated 4 April 2009 (Ref 097623019 002 L Rev0), in particular comment 8), regarding the sampling density of the investigation.

As a result of a site meeting with the auditor (Kylie Lloyd, Golder Associates) on 20 January 2009, it was agreed to reduce the sampling density in areas of low risk to 50% of the sampling density stated in the NSW Sampling Design Guidelines. In areas of environmental concern, which are highlighted in yellow in Figure 9, the sampling density is in accordance with the guidelines.

This reduced sampling density in the lower risk areas was designed based on the findings of the Phase 1 assessment, which concluded the likelihood of contamination to be present as low. Therefore, it was assumed that if no elevated concentrations of contaminants were detected on a 50% sampling density then even if the full sampling density was applied the probability of detecting elevated concentrations would be minimal. On this basis the approach was considered to be pragmatic for such a low risk site.

Furthermore, the spatial distribution of the contaminants of concern (pesticides and the importation of fill) given the history of the site, would likely to be widespread, if present at all, and not localised. Therefore, the reduced sampling density is considered satisfactory to characterise the site. In addition, field observations showed that the site was largely natural and the potential for contamination is low.

I trust you find this satisfactory. If you would like more information, please do not hesitate to contact me.

Yours sincerely

K. Thomas.

Kris Thomas

Senior Environmental Scientist
PB Accredited Project Manager
Parsons Brinckerhoff Australia Pty Limited

MEMORANDUM

Date: 8 May 2009

To: Michael Gray

Copy : Roger Parker

From: Graham Hawkes and Angus McFarlane

Job no: 2116943A

Re: Caddens Release Phase 2 Environmental Site Assessment, Kingswood, NSW - Hydrogeological Assessment

Parsons Brinckerhoff Australia Pty Limited
Ernst & Young Centre
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Sydney NSW 2000
GPO Box 5394
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Michael,

A Sampling Analysis & Quantity Plan (PB, 2009a) and ESA (PB, 2009b) for a proposed development site at Caddens Release, Kingswood, western Sydney was reviewed by Kylie Lloyd, a NSW DECC accredited auditor from Golder Associates (Golder, 2009). The review raised a series of questions relating to the assessment. This communication addresses the hydrogeological issues commencing with a more detailed description of the site geology and hydrogeology and also addresses specific comments relating to the investigation. In particular the groundwater related issues addressed in this communication are points 16, 17, 25, 30, 31, 32 outlined in the review (Golder, 2009).

1.0 Site Geology

Reference to the 1:100 000 Geology of the Penrith Sheet 9030 (1991) indicates the site is underlain by Bringelly Shale of mid Triassic age, the uppermost unit of the Wianamatta Group. The Bringelly Shale is composed of interbedded shale, carbonaceous claystone, laminate, fine to medium grained lithic sandstone and some coal and tuff. The site is located geologically towards the central part of the Penrith Basin where the Bringelly Shale is up to 90 metres thick and underlain by the Hawkesbury Sandstone. The Bringelly Shale is underlain by the medium to coarse grained Hawkesbury sandstone. The Bringelly shale is characteristically dark grey and laminated, weathering rapidly at the surface forming moderately to highly reactive residual clay of medium to high plasticity.

A south-west to north-east oriented basalt and dolerite dyke is mapped in the north-western part of the site. The dyke of Jurassic age intrudes the Bringelly Shale. These dykes are common in western Sydney and typically form local high points due to the resistive nature of the intrusive parent rock with in less resistive shale.

Alluvium of Quaternary age typically consisting of sand, silt and clay overlies the Bringelly shale along major creeks in the area including South Creek and in the lower reaches of Werrington Creek. Structurally the site lies between the north-south oriented Narellan Lineament along which south Creek follows and the north-east and south west oriented Kooree Creek Lineament.

2.0 Site Hydrogeology

Groundwater within the Bringelly Shale is located within a deep regional confined aquifer. Minor perched groundwater is also present within the weathered shale profile however these lenses are discontinuous and do not form an aquifer.

Groundwater within the Bringelly Shale is generally of poor quality; specifically salinity and hardness are of concern (Woolley, 1987). The Wianamatta Shales typically have a low permeability and yields from bores typically range between 0.1 and 1 L/s. Salinity is generally high with values from surrounding bores ranging from 3,000 to 50,000 mS/cm. Groundwater movement within the shale is limited to flow along secondary features such as laminations, fractures, joints, between interbedded units and faults. Minor groundwater flow may also occur within some of the coarser sedimentary units such as siltstone; however these units are typically not laterally extensive thus restricting groundwater movement.

The Hawkesbury Sandstone is the main regional aquifer in western Sydney and is often the target for groundwater supply bores in the region yielding high volumes of good quality groundwater.

A review of bores registered with the Department of Water and Energy (DWE) indicates the presence of twenty bores within a 4.5 kilometre radius of the site for which there is limited information. Of the twenty bores ten are shallow monitoring wells at one location, 2km to the west. The closest bores are GW060794 and GW103764 located approximately 500m south of the site and were constructed for domestic and stock and irrigation purposes. GW 060794 is constructed to a depth of 78 m, terminating in fractured shale with a groundwater yield of only 0.02 to 0.06 L/sec. GW103764 was constructed to a depth of 231m and drawing a groundwater yield of up to 0.83 L/sec from the Hawkesbury Sandstone. The next nearest three bores are located approximately 1.2 km to the north of the site and were constructed in1962 for waste disposal purposes. The lack of water supply bores in the area indicates the low economic value of groundwater in the area. A summary of bore details from the DWE database is presented in Table 1.

Table 1 Summary of DWE registered bores

DWE Bore	Standing Water Level (m bgl)	Geology	Total Depth (m)	Date sampled
GW105054	46	0-92 Shale 92-210 Sandstone	210	-
GW020547	9.10	0-1 Top soil 1-9 Alluvium 9-91 Shale	91	01-06-1963
GW020069	9.1	0-9 Clay 9-75 Shale	75	01-06-1962
GW019680	10.9	0-11 Clay 16-53 Shale	53	01-04-1962
GW060794	-	0-6 Clay 6-78 Slate or Shale	75	01-02-1985
GW103764	-	0-6 Topsoil/ clay 6-123 Shale 123-231 Sandstone	231	06-10-1995
GW029710	6.0	0-3 Loam 3-8 Alluvium	8	01-04-1969
GW026231	6.0	0-4 Silt/ Loam 4-8.5 Alluvium	8.5	01-01-1966
GW101178	8.0	0-2 Sandy Clay 2-6 Sand 6-10.5 Alluvium 10.5-11 Shale	11	15-01-1998

3.0 Groundwater Monitoring Bores

Three monitoring wells (MW4, MW5 and MW6) were constructed at the site to assess the groundwater conditions at the site. These monitoring wells were designed to intersect the first

water bearing zone within the Bringelly Shale and range in depth from .6.9m to 11.0 m. The geology encountered on site comprised weathered sandstones and shales, is consistent with lithologies in the Bringelly Shale group. A fourth monitoring well (MW3) was constructed as part of a previous investigation. Details of the four monitoring bores MW3, MW4, MW5 and MW6 are contained in Table 2.

Table 2 Site bores details

Bore	Geology intersected	Screened interval (m bgl)	Standing Water Level (m bgl)	Groundwater Elevation (m AHD)	Date groundwater level was recorded
MW3	Unknown	Unknown	3.36	49.38	09/02/09
MW4	Weathered Sandstone	4.0-6.9	3.62	44.49	09/02/09
MW5	Sandy clay/ weathered sandstone	8.0-11.0	10.50	56.33	09/02/09
MW6	Sandy clay/ weathered sandstone/ shale	5.0-8.0	7.62	53.04	09/02/09

Monitoring wells MW4-MW6 were drilled using solid flight augers and completed with 50 mm diameter screwed PVC casing and a three metre machine slotted 0.4mm aperature screen at the base of the hole. The borehole annulus was infilled with 1 to 2 mm diameter gravel pack to one metre above the screen interval. A 0.5 m bentonite seal was emplaced above the gravel to reduce the likelihood of surface water ingress. The remaining borehole annulus was infilled with grout and the monitoring well was completed with a lockable gattic flush with ground level. Monitoring wells were surveyed relative to m AHD.

4.0 Specific auditor queries

4.1 Query 16 relating to Section 5.1 Groundwater rationale

"Table 5-2 *describes the sampling rationale for groundwater at the Site. The table states that groundwater wells MW3 and MW4 were located in a down gradient position and wells MW5 and MW6 were located in an up-gradient position. However, it is not clear how this rationale was derived when the groundwater was inferred to flow towards the creek in the centre of the Site (Section 3.4). Further justification for the selection of these locations should be provided".*

The rationale for MW3 and MW4 being described as up gradient wells and MW5 and MW6 described as down gradient wells was based on incorrect preliminary assumptions of local the groundwater flow direction being to the south.

Shallow groundwater typically follows the topography and local drainage lines, in this case towards Werrington Creek. Based on this assumption and re-interpretation of the static water level data it is expected that groundwater would flow in a northerly direction. Locally within the catchment groundwater may not flow in the overall northerly direction for a variety of factors including:

- The Site is in an area of indistinct drainage and as such groundwater gradients would be slight;
- Perched groundwater within the clayey soils may not represent a laterally continuous aquifer;
- Unmapped dolerite dykes may locally influence the groundwater flow direction;
- The influence of local topography.

Reference to groundwater studies undertaken at nearby Badgerys Creek within the Bringelly Shale as part of the Second Sydney Airport investigations (PPK, 1999), indicate the groundwater flow is heavily influenced by intrusive dolerite dykes and local drainage patterns.

4.2 Query 17 relating to Section 5.1 Groundwater rationale

"Four groundwater wells were sampled where the SAQP had stated 6 locations would be sampled during the Phase 2 investigations. No explanation has been provided as to why only 4 wells were available for sampling and what impact the deduced number of locations has had on the validity of the groundwater assessment and conclusions drawn from it. Further discussion is required."

When the SAQP (PB, 2009a) was prepared with intention to increase the monitoring well network from the existing three monitoring wells (MW1 to MW3) to six with the inclusion of three additional monitoring wells (MW4 to MW6). However it transpired that monitoring wells MW1 and MW2 were destroyed before the commencement of this investigation. Thus only four monitoring wells were available for groundwater sampling. All four bores were screened in the first water bearing zone of the Bringelly Shale unit.

It is assessed that despite the reduced number of monitoring wells, the distribution of monitoring wells was widespread and provides adequate coverage across the Site. It is further assessed that since the Site in underlain by groundwater of poor quality within the low permeable Bringelly Shale the reduction in bore numbers is unlikely to significantly impact on groundwater characterisation. In addition an assessment of the site history indicates that groundwater contamination due to previous activities is of low risk.

4.3 Query 25 relating to Section 6.6.2 Groundwater

"Groundwater wells were developed on 4 February 2009 (Appendix G) and were then sampled on 9 February 2009. However, the SAQP (Table 6-2) states that "after development, no purging or sampling of the monitoring wells will be conducted for a minimum of 7 days to allow for the formation to equilibrate". Further discussion is required as to whether the altered sampling protocol will impact on the validity of the results and conclusions drawn from them."

The primary aim of the groundwater sampling program was to obtain a representative groundwater from the Bringelly Shale. The decision to reduce the recovery timeframe from seven days to five days was made on the basis that the monitoring wells recovered more quickly than expected indicating that groundwater derived from the Bringelly Shale was entering the monitoring well. It is assessed that the change is sampling protocol has no significant impact on the quality of groundwater results and that the results obtained are representative of the groundwater conditions within the Bringelly Shale.

4.4 Query 30 relating to Section 8.4 Groundwater conditions

"Table 8-4 describes the depth to groundwater in MW5 and MW6 as 11.59 mbgl and 8.105m bgl respectively. However, the log for MW5 and MW6 (Appendix B) indicates the boreholes were terminated as a depth of 11m bgl and 8m bgl respectively. This discrepancy should be resolved."

The standing water levels previously stated in the report were incorrect. Corrected measured groundwater levels and calculated levels relative to m AHD are presented in **Table** above.

4.5 Query 31 relating to Section 8.4 Groundwater conditions

"Table 8-4 states that groundwater was found to be in the interface between the sandy clay and sandstone. However standing water levels appear to be within the sandstone (MW4), within the sandy clay (MW5) and within shale (MW6). Further discussion is required."

The Bringelly Shale is an interbedded formation consisting predominately of shale but is also composed of siltstone, sandstone and some volcanic tuff. Groundwater may occur at the interface between the weathered soil profile and underlying bedrock however in monitoring wells MW4 and MW6 this does not appear to be the case. During the drilling program some moisture may have been intersected within the unsaturated zone however groundwater levels measured within the unconfined aquifer clearly indicate the groundwater is derived from the bedrock. In monitoring wells MW4 and MW5 the groundwater is assessed as being derived from the weathered sandstone. Similarly in MW6 the groundwater is assessed as being derived from the weathered shale. Groundwater levels measured within some or all of the shallow monitoring wells may not represent the regional aquifer but may be poorly connected localised perched groundwater within the weathered bedrock and not representative of the regional water table.

4.5 Query 32 relating to Section 8.4 Groundwater conditions

Table 8-4 references Figure 12 which presents interpreted groundwater contours which are plotted to flow in a southerly direction radiating from well MW5. This interpretation contradicts the direction of flow inferred from published information (Section 3.4), and the direction of flow of the creek that bisects the Site."

"The Auditor is concerned that the interpretation of groundwater flow is incorrect and that the location of the wells does not allow for the accurate interpretation across the Site. Consequently, there is some doubt whether the assessment of groundwater contamination is adequate to identify contaminants entering of leaving the site. Further discussion is required."

The Site is bisected by Werrington Creek that flows to the north. Monitoring wells MW4-MW6 and MW3 are located on the western side eastern side of the creek respectively. The interpretation of groundwater flow on Figure 12 (PB, 2009b) was undertaken incorrectly by contouring the elevation of the watertable and ignoring the influence of the drainage lines. It is assessed there is insufficient data to contour the groundwater elevation to produce a potentiometric head contour map.

Reference to the topographic map indicates the Site is intersected by catchment boundaries to the east and west as shown on Figure 12. The watertable elevation in an unconfined aquifer is typically a subdued reflection of the topographic topographic surface. Groundwater flow is inferred to be perpendicular to the catchment boundary and towards the creek systems. Thus groundwater flow at the eastern part of the Site is radial from MW5 (centred on a local topographic high) and elsewhere generally northward flowing in the direction of Werrington Creek. Analysis of groundwater levels from monitoring wells MW4, MW5 and MW6 confirm local groundwater flow (in the south eastern part of the Site) is in a south-westerly direction towards Werrington Creek.

In analysing the distribution of monitoring wells across the Site three are located in the main central subcatchment part of the Site and MW4 is located in a subcatchment to the east. No bores are located in the subcatchment to the west of the Site. An assessment of the site history indicates it is unlikely that any significant groundwater contamination exists within the site. In the unlikely event that groundwater contamination was present at the Site and given the low permeability and laterally discontinuous nature of the saturated zone within the Bringelly Shale any contamination would be localised.

References:

Golder Associates 2009; Review of Phase 2 Environmental Site assessment (ESA), Caddens Release, Kingswood, NSW, 2747. Correspondence 097623019 003 L Rev0, dated 4 April.

Herbert, C, 1979. The Geology and Resource Potential of the Wianamatta Group. New South Wales Geological Survey-Bulletin 25. 203pp

New South Wales Department of Minerals and Energy (1991); Penrith 1:100 000 Geological Series Sheet 9030, Edition 1.

PB, 2009a; Sampling, Analysis & Quality Plan – Contamination Investigations at Caddens Release, Kingswood, NSW, 2747. Landcom. Report No 2116934a\PR_9331, dated January 2009.

PB, 2009b; Phase 2 Environmental Site Assessment (ESA) Caddens Release, Kingswood, NSW, 2747. Landcom. Report No 2116934a\PR_9627, dated March 2009.

PPK 1999; Environmental Impact Statement, Second Sydney airport Proposal, Department Transport and Regional Services.

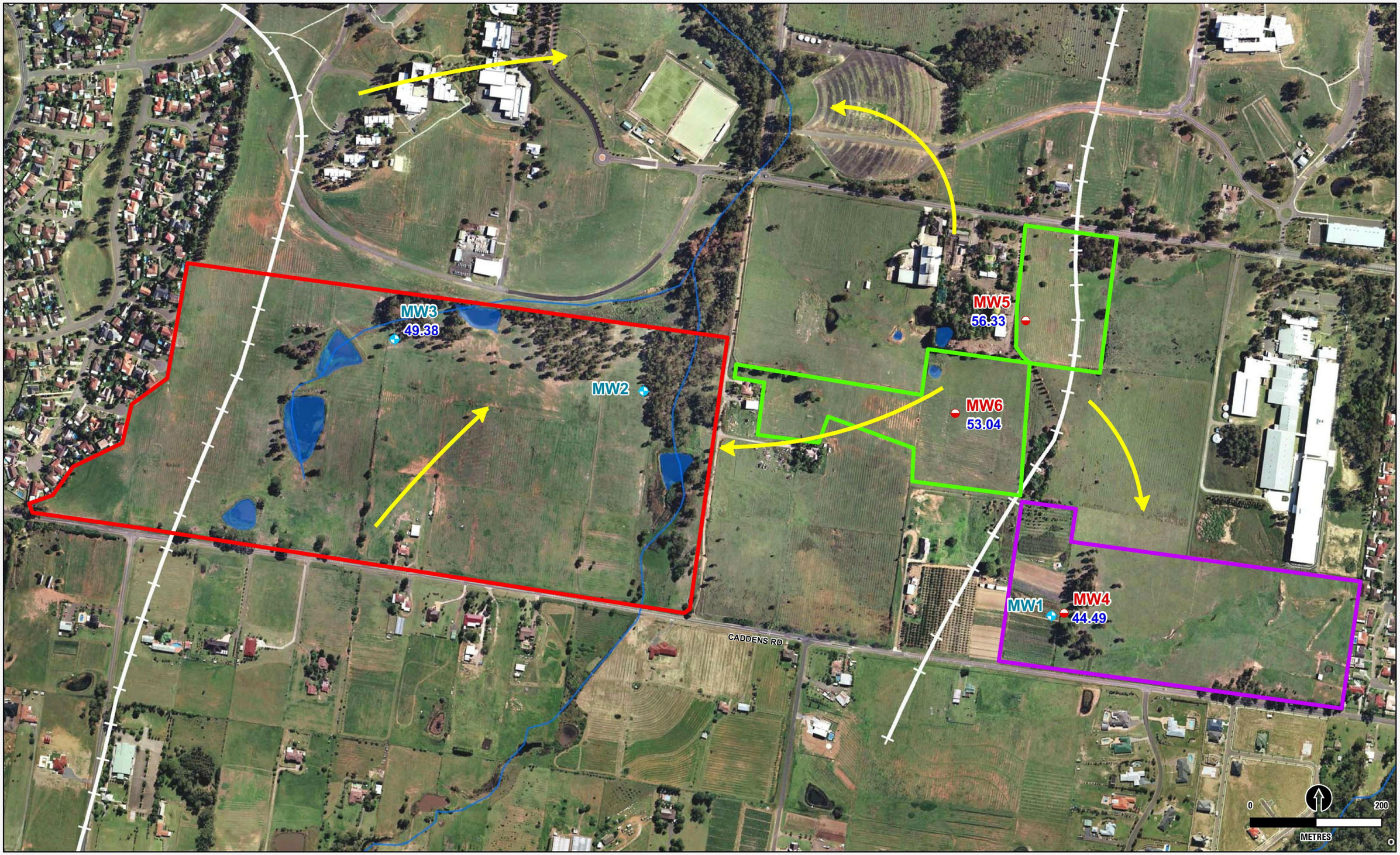
Penrith Geological sheet series 9030-3N

Woolley, 1991; Groundwater in Penrith 1:100 000 Geological sheet. New South Wales Geological Survey, Department of Mineral Resources.

I trust these comments satisfy your present requirements. Should you require further clarification please contact me on 9292 5193 or by email ghawkes@pb.com.au.

Regards
Graham Hawkes
Principal Hydrogeologist.

Attach: Figure 12



Catchment divide

Inferred groundwater flow direction

49.3 Groundwater elevation (mAHD)

Figure 12 Groundwater Flow

29 May 2009 Project No. 097623019 005 L Rev0

Mr P Scott
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NSW 2124

REVIEW OF SUPPLEMENTARY INFORMATION PROVIDED IN SUPPORT OF THE PHASE 2 ENVIRONMENTAL SITE ASSESSMENT (ESA), CADDENS RELEASE, KINGSWOOD, NSW, 2747

Dear Philip

Introduction

On behalf of Landcom, the Auditor has reviewed the following supplementary documents provided by Parsons Brinkerhoff (PB) following the review of the Phase 2 Environmental Site Assessment report dated March 2009 (Reference 2116943A PR_9627):

- A memorandum titled Caddens Release Phase 2 Environmental Site Assessment, Kingswood, NSW – Hydrogeological Assessment (Reference MO_0005) dated 8 May 2009 (herein referred to as 'the Memo'); and
- A letter titled Caddens Release – SAQP Auditor Comments (Reference 2116943A/LT_0066/KT/fr) dated 19 May 2009 (herein referred to as 'the Letter')

Below, comments are provided reflecting the sections as presented in the Memo and the Letter respectively.

The Memo

3.0 Groundwater Monitoring Bores

1) Table 2 provides an updated summary of groundwater bore details and recorded groundwater levels. Note that the "Geology intersected" and the "Screened Interval" for bore MW3 are "clay / shale" and "1.0-4.0m" respectively as provided by the Geotechnical, Salinity and Environmental Site Assessment report prepared by PB in April 2006 (reference 2110317A PR_3431 Rev B).

   Table 2 provides updated results of the groundwater level monitoring apparently conducted on 09 February 2009. However, these results differ from those recorded on the corresponding field sheets provided in Appendix G of the Phase 2 Environmental Site Assessment report.

   The table presents groundwater levels for bores MW3 and MW4 which were collected on 04 February 2009 prior to well development. The levels presented for bores MW5 and MW6 appear to be new as they do not correspond to results recorded on the field sheets on 04 February 2009 or 09 February 2009. No explanation has been offered as to why these levels have been changed from those recorded in the field. Further explanation is required.

2) The final paragraph states that monitoring wells MW4 to MW6 were completed with lockable gattic covers flush with ground level. This contradicts Appendix I which indicates that the wells were

completed with monument covers ranging between 0.6 and 0.8m above ground level. This contradiction should be resolved.

4.1 Query 16 relating to Section 5.1 Groundwater rationale

3) PB acknowledges that the rationale originally provided for the location of groundwater monitoring wells was based on incorrect preliminary assumptions of the local groundwater flow. While PB has provided additional discussion regarding likely groundwater flow conditions at the site, they do not provide a rationale for the locations selected for the monitoring wells. This should be provided.

4.2 Query 17 relating to Section 5.1 Groundwater rationale

4) The third paragraph states that "despite the reduced number of monitoring wells, the distribution of monitoring wells was widespread and provides adequate coverage across the site". However, in the absence of an adequate groundwater sampling rationale this statement cannot be supported.

The third paragraph continues to say that owing to "groundwater of poor quality within the low permeability Bringelly Shale the reduction in bore numbers is unlikely to significantly impact on groundwater characterisation". Again, in the absence of an adequate groundwater sampling rationale this statement cannot be supported.

The Auditor agrees that based on the summary of historical information contained within the Phase 2 Environmental Site Assessment report that there is a low risk of groundwater contamination. However, the Auditor requests that the supporting historical information is provided within the revised Phase 2 report so that this can be checked.

4.4 Query 30 relating to Section 8.4 Groundwater conditions

5) PB has acknowledged that the standing water levels previously stated in the report were incorrect and provide corrected measured groundwater levels in Table 2. However, PB does not provide an explanation as to why the field records for MW5 and MW6 were incorrect whereas the records for MW3 and MW4 were apparently reliable. Furthermore, they do not explain how the measurements have been corrected. Further explanation is required.

4.5 Query 32 relating to Section 8.4 Groundwater conditions

6) PB has acknowledged that the original interpretation of groundwater contours was incorrect and state that there is insufficient data to contour the groundwater elevation to produce a potentiometric head contour map. PB has provided an updated interpretation of groundwater flow based on topography which is reasonable. The groundwater sampling rationale should be should be updated accordingly.

The Letter

7) The discussion regarding reduced sampling density is accepted as the agreed approach for this assessment. However, no comment has been provided regarding analysis density and how this relates to individual areas of environmental concern. Further discussion will be required in this respect.

CLOSURE

PB should revise the Phase 2 Environmental Site Assessment report with due consideration to the comments that have been made in this response letter. Given some of the contradictions in the data, PB may want to consider the need for re-sampling.

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process.

If you have any further questions please contact the undersigned.

Yours sincerely

GOLDER ASSOCIATES PTY LTD

Roger Parker
NSW DECC Accredited Auditor

MU/RP/mu

Attachments:

CC: Kris Thomas (Parsons Brinckerhoff)
Michael Gray (APP Corporation Pty Ltd)

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29 June 2009 Project No. 097623019 006 L Rev0

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REVIEW OF REVISED PHASE 2 ENVIRONMENTAL SITE ASSESSMENT (ESA), CADDENS RELEASE, KINGSWOOD, NSW, 2747

Dear Philip

Introduction

On behalf of Landcom, the Auditor has reviewed the Parsons Brinkerhoff (PB) revised draft report *Phase 2 Environmental Site Assessment (ESA), Caddens Release, Kingswood, NSW, 2747* (Reference 2116943A PR_9627 Rev A) dated 2 June 2009 (herein referred to as the 'the Report').

Comments

Table 1 below provides a summary of the issues raised in our review of the first draft (letter reference 097623019 003 L Rev0 dated 04 April 2009) which have been addressed by PB in the Report.

Further comments have been provided which relate to new information included within the Report and where issues remain outstanding. Many of these issues are minor and relate incomplete amendment of text or tables.

Additional tables containing the Auditor's checklist and additional comments that require addressing are attached.

Table 1: Issues satisfactorily addressed by PB

Report Section	Comment Ref.	Comment
Inside Cover	1	The typographical error has been corrected.
Executive Summary	2-4	Updated to include reference to asbestos in the potential sources of contamination as requested. However, no mention of the burnt out car has been included. The potential contaminants have been updated as requested. Asbestos cement sheeting has been included within the Report findings as requested.
1.1 Introduction	5	Figure 1a has been provided as requested.
1.2 Objectives	6	The number of samples has been corrected as requested.
2.4 Study boundary	7	Additional areas have been included in Table 2-2 as requested.

Report Section	Comment Ref.	Comment
2.5 Site decision rule	8	Section has been updated; see further review comments 3 to 5 below.
2.7 Optimising the sampling design for obtaining data	9	Section has been updated.
3.1 Site identification	10 & 11	Figure 1a has been provided and reference to Table 3-2 removed as requested.
3.2 Site Description	12 & 13	Table 3-1 has been updated to include additional land parcels as requested. The location of the burnt out car is now noted to have been in the south east portion of property ID 98.
4.1.1.1 Summary of site land use	14	Summary of site land use now provided in Section 4.1.2 which has been amended from previous version. See further comment 10 below.
5. Potential contamination issues	15	Areas of environmental concern (AEC) have been identified on Figure 13. Table 6-2 provides additional detail on how the analysis programme was selected to targets individual AECs. See further comments 12 to 15 below.
5.1 Groundwater rationale	16 & 17	Section 5.1 has been updated. See further comments 16 below.
6.2 Contamination assessment	18-20	Table 6-1 has been updated to reflect the individual areas as provided in Table 2-2, and the corrected equivalent sampling density as requested. Hotspot diameter calculations have not been updated although additional detail regarding the number of analyses in each AEC has been provided in Table 6-2. See further comments 17 to 22 below.
6.2.1 Soil sampling	21-24	Table 6-3 (formerly 6-2) has been updated to correct the typographical error. Laboratory certificates for the equipment rinsate and field blank samples have been provided in Appendix E as requested. Table 6-2 provides detail on the number and type of analyses for each AEC. See further comments 23 to 24 below.
6.2.2 Groundwater	25	Further discussion regarding time for groundwater wells to equilibrate has been provided as requested.
8.1 Surface / subsurface conditions	26	Table 8-1 has been updated as requested.
8.3.2 Petroleum hydrocarbons	27	The Section has been updated. See further comments 31 to 34 below.
8.3.3 Polycyclic aromatic hydrocarbons	28	The Section has been updated. See further comments 35 to 36 below.
8.3.6 Asbestos	29	Section 8.3.6 has been updated to include discussion regarding the origin of fibrous cement fragments. The Executive Summary and Conclusions and Recommendations Sections have been amended accordingly.
8.4 Groundwater conditions	30-32	Table 8-4 has been updated as requested.

Report Section	Comment Ref.	Comment
9.1 Field quality control results	33	The second paragraph has been updated as requested.
9.3 Internal and external laboratory QA/QC	34-37	Table 9-1 has been updated Laboratory certificates for the equipment rinsate and field blank samples have been provided in Appendix E as requested. Additional information has been provided in Table 9-2; see further comments 40 to 51 below.
10.2 Soil Impacts	38 & 39	Section 10.2 has been updated as requested.
10.3 Groundwater impacts	40	The typographical error has been corrected.
11.1 Findings	41	Reference has been provided.
Figures	42 & 43	Figures 1a to 5 have been provided as requested. Sample locations depicted on Figures 9 and 10 have been moved to the edge of water features.
Appendix B	44 & 45	Changes have been made to test pit and grab sample logs as requested.
Appendix C	46	There remains a number of incorrect values presented in the summary tables, see further comment 59 below
Appendix E	47 & 48	Sample receipts have been provided, however there are a number of laboratory certificates missing. See further comment 60 below.

Further Comments

The following comments are made in respect of issues that remain outstanding in the Report. Furthermore, typographical errors, omissions and other necessary corrections that should be made in the final version of the Report have been highlighted.

Executive Summary

1) Reference to the burnt out car previously identified in Area A should be included in the potential sources of contamination on page vii.

2. Data quality objectives

2) The Sections described in Table 2-1 should be checked and corrected where appropriate. For example, in Step 2 reference is made to Section 2.2 – Site Description and Site Inspection however, the site description is provided in Section 3.

2.5 Site decision rule

3) Reference to groundwater analytical data should be made in the first paragraph.

4) Reference to statistical assessment should be removed from the third paragraph as this is no longer relevant.

5) The Auditor notes that for this assessment the primary decision rule used to answer the ESA decisions listed in Section 2.2 Decision Identification, was whether the result from individual samples exceeded the adopted site assessment criteria. PB should consider amending Section 2.5 to reflect this.

2.6 Decision error limits

6) Reference to Section 3.5 in the first paragraph should be corrected to read Section 2.5.

7) Reference to Table 6-1 should be corrected to read Table 9-2.

3.5 Groundwater database search

8) The first paragraph makes reference to two groundwater bores 500m to the south of the site, whereas the second paragraph states there is one registered bore is present within 1km of the site. Please correct.

3.6 Groundwater Monitoring Bores

9) Table 3-3 should be amended to show the correct units in column 3.

4.1.2 Summary of site land use

10) Reference should be made to the various buildings that have been demolished on the site between 1970 and 2005 as depicted on the aerial photographs provided in Appendix J.

4.1.3 Summary of surrounding land use

11) Reference to the location of the diesel storage referred to in the Executive Summary and Section 5.2.2 Potential off-site sources should be included.

5. Potential contamination issues

12) The Auditor notes that in Table 5-1 the description of potentially contaminating activity associated with the abandoned car no longer present in Area A has been changed from “burning of chemicals” to “leaks”. Furthermore, the likelihood of contamination has been downgraded from “medium” to “low”. There is no apparent explanation for these changes.

13) Figure 13 has been provided to show the location of each of the AECs listed in Table 5-1. However, the former location of the abandoned car in Area A is not identified on Figure 13. Also, the whole of land parcel 105 (Area B) is shaded yellow although it is not clear why.

    Table 5-1 describes a fill mound in the southern portion of Area C whereas Figure 13 shows “fill material” present (unshaded) at the eastern end of Area C. The southern boundary of Area C is also shaded yellow without a corresponding AEC described in Table 5-1.

    Figure 13 and Table 5-1 should be updated to correctly record the location of all AECs.

14) Table 5-1 describes the investigation method in the fill material in the north west corner of land parcel 102 as 1 test pit and 5 grab samples. However, Figure 13 shows 4 grab samples in this AEC please amend.

15) Table 5-1 describes the investigation method in the market gardens in southern portion of land parcel 87 as 1 test pit and 1 grab sample. However, Figure 13 shows 11 grab samples were collected in this AEC, please amend.

5.1 Groundwater rationale

16) Table 5-2 describes the sampling rationale for the new (MW4-6) and existing (MW3) groundwater wells. These are described as downstream from the AEC in Area A (MW3) and located within an AEC (MW4-6).

    No explanation is offered as to why certain AECs have not been targeted or why wells MW5 and MW6 have been located topographically upslope from their corresponding AEC. However, the Auditor is satisfied that based on the historic use of the site, relatively low permeability of the soils and underlying bedrock, and low concentrations of contaminants within the soils, the site poses a very low risk to ground and surface water receptors.

6.2 Contamination Assessment

17) The diameter of hotspot that can be detected with 95% confidence for each given location in Table 6-1 is incorrect as the sampling density does not equal the analysis density. Furthermore, no discussion regarding the appropriateness of the hotspot diameters calculated has been provided. This column should be removed or further discussion regarding appropriateness provided.

18) Table 6-2 summarises the analysis schedule for each AEC. The Auditor notes that the total number of organochlorine pesticide analyses was 145 (Table 6-3) not 155 as stated.

19) No analysis density or critical size of hotspots have been determined in Table 6-2 to demonstrate compliance with the NSW EPA Sampling Design Guidelines (1995) or Sampling Analysis and Quality Plan, or the appropriateness of the analysis density when compared to the proposed future use of the site. This should be provided.

20) Table 6-2 should be updated to include the analysis schedule for the lower risk parts of Area A to C. For example, asbestos analysis was performed on samples A12-16, A22 and A24-25 without any explanation, although the Auditor notes that these sample locations correlate reasonably well with the former farm buildings referred to in comment 10 above.

21) Specific details regarding the potential contamination sources described under "Rationale" should be provided to support the corresponding analysis schedule.

22) The number of analyses for each Area and AEC in Table 6-2 should be checked against the summary tables in Appendix C and laboratory certificates in Appendix E and corrected where appropriate.

6.2.1 Soil sampling

23) The number of soil analyses for each analytical suite in Table 6-3 should be checked against the summary tables in Appendices C and F, and laboratory certificates in Appendix E and corrected where appropriate.

24) The third paragraph states that a "sample from each sample location was analysed for metals". However, a total of 388 locations were sampled whereas 363 primary samples were analysed. This statement should be amended.

6.2.2 Groundwater

25) The column 1 header in Table 6-4 should be amended to read "Analytical Suite".

6.2.3 Laboratory analysis and quality assurance / quality control (QA / QC)

26) Bullet 4 should be amended to reflect the actual number of field and rinsate blanks used for this assessment.

7. Assessment criteria

27) Reference to Figure 8 in paragraph 5 should be changed to Figure 9 which shows the 3 subdivided areas.

28) Table 7-3 shows the waste classification criteria where leachable concentrations have been determined. The table should be updated to include the correct waste classification criteria (i.e. without TCLP analysis) for this assessment.

8.3 Soil Analytical results

29) Reference to Section 8 in the second paragraph should be changed to Section 7.

30) Please provide the selected assessment criteria for the soil investigation in Table 8-2.

8.3.2 Petroleum hydrocarbons

31) Reference to Appendix E in the first paragraph should be changed to Appendix C.

32) Reference to sample C80 should be changed to C82.

33) Neighbouring samples to sample C82 for which analysis results are available are C81 and C84, please amend.

34) The Auditor notes that no analysis was performed on sample C80. Furthermore, the results obtained from sample C78 recorded concentrations above the detection limits for TPH C_{15}-C_{28} and TPH C_{29}-C_{36}. The Auditor concludes that there is a possibility that the area impacted by petroleum hydrocarbons could extend west of sample C82, this should be considered within the remedial action plan proposed in Sections 11.2 and 11.3.

Polycyclic aromatic hydrocarbons

35) The fifth paragraph states that the "concentration detected is likely to be from a localised diesel spillage / farm machinery", however it does not state which location this is referring to, please amend.

36) The Auditor notes that samples C80 and C82 are adjacent and therefore the elevated concentrations recorded above the assessment criteria may be a result of more widespread contamination in that part of the Site. No analysis was conducted on samples collected to the west of C80 and north east of C82, and samples to the north and east are approximately 25m away from C80 and C82. The remedial action plan proposed in Sections 11.2 and 11.3 should consider the concentrations of benzo(a)pyrene and total PAHs at both locations.

8.3.7 Waste classification

37) The sample exceeding the general solid waste criteria for lead is sample A68 not A86 as shown, please amend.

8.5 Groundwater analytical results

38) Please provide the selected site assessment criteria in Table 8-5.

39) Reference to Appendix C and Appendix E below Table 8-5 should be reversed.

9.1 Field quality control results

40) The second paragraph should be corrected to state that one trip spike and six field blanks were analysed as part of the soil investigation.

41) The Auditor notes that although the frequency of inter- and intra-laboratory duplicates varied for each analytical suite, overall the frequencies provided in Table 6-3 (subject to correction, see comment 23 above) have met the stated objectives.

9.2 Field duplicate results

42) The second paragraph should be amended to be consistent with row 4 of Table 9-2.

9.3 Internal and external laboratory QA/QC

43) Reference to Appendix F in the second paragraph should be corrected to read Appendix E.

44) Further discussion or summary of the internal laboratory QA/QC results should be provided in this section or Table 9-2.

9.4 Summary of field QA / QC results

45) Reference to Table 10-2 above should be amended to read Table 9-2 below.

9.6 QA/QC Summary

46) Row 3 of Table 9-2 states that "samples were split by taking soils directly from the hand auger". It is not clear what is meant by this, further explanation is required.

47) Reference to bacterial contaminates should be removed from row 4 of Table 9-2.

48) Row 4 states that the six QA samples which did not meet the holding time requirements for OCP and PAHs are not deemed significant due to the fact that the results of the primary and duplicate samples were lower than the detection limits / adopted assessment criteria. The Auditor notes that without these QA samples (most of which are not included in the summary tables in Appendix F) the required duplicate frequencies have still been adhered to.

49) Row 7 should be updated to include decontamination procedures for test pit and hand auger locations.

50) Row 8 makes reference to rinsate samples that were not collected during this investigation, please remove. The Auditor notes that all rinsate sample results were below the limits of detection of the analytical method.

51) Row 11 should be updated to include samples B48 and C8 which reported RPD results of 64% (nickel) and 54% (lead) respectively. The summary tables in Appendix F should be checked against the laboratory certificates (Appendix E) and corrected where appropriate.

10.2 Soil impacts

52) In the final paragraph reference should be made to the elevated concentrations of total PAHs and benzo(a)pyrene recorded at sample locations C80 and C82.

11. Conclusions and Recommendations

53) Throughout this section, reference should be made to the elevated concentrations of total PAHs and benzo(a)pyrene recorded at sample location C80 as well as C82. Both concentrations exceed the adopted site assessment criteria for Area C and should therefore be included in the proposed additional delineation and remedial action plan.

Figures

54) Figures 1a to 8 show the incorrect site boundaries, please amend.

55) Figure 10 should be corrected to show sample C82 exceeding the site assessment criteria for TPH, not C80.

56) Figure 13 should be updated to include the former location of the burnt out car in Area A and identify the AEC at the southern boundary of Area C.

Appendix B – Borehole Logs

57) Soil descriptions for test pit logs are duplicated in the summary table at the back of Appendix B. However, the descriptions and depths in the summary logs differ from those in the test pit logs. The duplicated logs should be corrected or removed.

Appendix C – Analytical Results Tables

58) A number of entries exist within the summary tables in Appendix C for which no corresponding laboratory certificate, sample receipt or chain of custody form could be located. Additional duplicated rows have also been included. These have been summarised in Table 2 below. Note this is not an exhaustive list; the data tables should be checked against all laboratory certificates in Appendix E and corrected where appropriate.

Table 2

Table	Area	Analyte (s)	Sample ID	Issue
1	A	Metals	QA12	No Laboratory Certificate / Sample Receipt
1	A	Metals	QA18	No Laboratory Certificate / CoC
1	A	Metals	QA20	No Laboratory Certificate / Sample Receipt
2	A	TPH/BTEX	A221	No Laboratory Certificate / CoC
2	A	TPH/BTEX	QA13	No Laboratory Certificate / CoC
3	A	PAH	QA18	No Laboratory Certificate / CoC
3	A	PAH	QA20	No Laboratory Certificate
4	A	OCPs	QA18	No Laboratory Certificate / CoC
6	A	Asbestos	A14	Duplicated row
1	B	Metals	B32	Repeated row with incorrect values
1	B	Metals	B39	Incorrect values
1	B	Metals	QA31	Incorrect values
4	B	DDE	B07	DDE should be <0.1 (not 0.3)
6	B	Asbestos	B6	Missing from summary table

Table	Area	Analyte (s)	Sample ID	Issue
1	C	Metals	QA02	No Laboratory Certificate / CoC
2	C	Total Xylenes	C8-C86	Should be <3 (not <2)
2	C	C6-C9	C64	No laboratory Certificate / CoC

Appendix E – Laboratory analysis reports

59) All laboratory certificates, chain of custody sheets and sample receipts should be provide (see Table 2).

Appendix F – QA/QC summary tables

60) A number of duplicated entries and entries which are not included within the summary tables in Appendix C have been identified and should be corrected. These include:

- TPH /BTEX - QA43, QA44, QA42, QA56, QA66, QA67, QA06, QA69 and QA71;
- OCPs – QA66, QA67, QA69 and QA06;
- VOCs – QA67 and QA44; and
- Field blank FB-220109

This list is not exhaustive; all duplicate results should be compared to laboratory certificates in Appendix E and summary tables in Appendix C and corrected where appropriate.

61) VOC data tables should be updated to identify whether the sample pairs are duplicates or triplicates.

Appendix J – Historical aerial photographs from previous investigation

62) The site boundary is incorrectly shown on the aerial photographs. The 1978 aerial photograph shows the boundary too far to the east.

Please note that most of these comments relate to minor details that have been missed by PB. The Auditor does not require a further draft providing PB are satisfied that they can resolve these issues in a final version. The Auditor will provide a review of the final report to confirm these changes have been made.

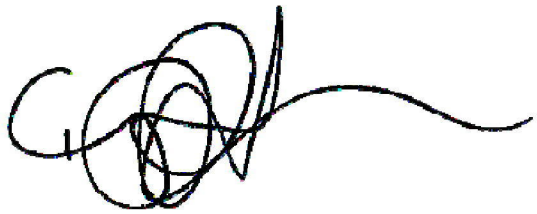
CLOSURE

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process. A Site Audit Report and Site Audit Statement will be issued when the Audit process has been completed for the site's development, subject to receipt of appropriate documents.

If you have any further questions please contact the undersigned.

Yours sincerely

GOLDER ASSOCIATES PTY LTD



Roger Parker
NSW DECC Accredited Auditor

MU/RP/mu

Attachments: Auditor's checklist

CC: Kris Thomas (Parsons Brinckerhoff)
Michael Gray (APP Corporation Pty Ltd)

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Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Executive Summary	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Background		✓			
Objectives of the investigation		✓			
Scope of the work		✓			
(Where appropriate) a summary of sampling results in table format containing minimum, arithmetic average and 95% UCL for each analyte		✓			
Summary of conclusions and recommendations.		✓			
SCOPE OF WORK	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
A clear statement of scope of work.		✓			
SITE IDENTIFICATION	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Street number, street name and suburb		✓			
Lot number and Deposited Plan number		✓			
Geographic coordinates related to a nearby cadastral corner of a State Survey Control Mark		✖			Large site, coordinates of sampling locations listed in Appendix B Borehole Logs
Locality map		✓			
Current site plan with scale bar, showing north, local water drainage and other local environmentally significant features.		✓			No site plan provided, although other plans show the extent of the site, local water drainage, topography, archaeology etc.
SITE HISTORY	✓	✓(s)	✓(s)	✓(s)	**Auditor's comment on inclusion / reference (if applicable)**
Zoning- previous, present and proposed		✓			Section 1.1 - current zoning a mixture of Rural 1(d) and Agricultural Protection 1(a).
Land use- previous present and proposed		✓			Previous (Section 4.) and present (Table 3-1) land uses are provided, however proposed development plans are omitted other than to say the site may be rezoned as residential usage.
Summary of council rezoning, relevant development and building approvals records.		✖			Not applicable
Chronological list of site uses, indicating information gaps and unoccupied periods		✓			Summary of Phase 1 report (March 2006) provided
Review of aerial photographs		✓			Summary of Phase 1 report (March 2006) provided. Additional features such as former
Site photographs (with date, location indicated on site maps)		✓			Appendix A, descriptions of each photograph are provided.
Inventory of chemicals and wastes associated with site use and their on-site storage location		✖			Not relevant
Possible contaminant sources and potential off-site effects		✓			Section 5.2 Site conceptual model
Site layout plans showing present and past industrial processes		✖			Not applicable
Sewer and service plans.		✖			Not applicable
Description of manufacturing processes		✖			Not applicable
Details and locations of current and former underground and aboveground storage tanks		✖			None identified
Product spill and loss history		✖			Not applicable
Discharges to land, water and air		✖			Not applicable
Disposal locations		✖			Not applicable
Relevant complaint history		✖			Not applicable
Local site knowledge of residents and staff – both present and former		✖			Not included but not considered necessary
Summary of local literature about the site, including newspaper articles		✖			Not included but not considered necessary
Details of building and related permits, licences, approvals and trade waste agreements		✖			Not included but not considered necessary
Historical use of adjacent land		✓			Included

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Local usage of ground/surface waters, and locations of bores/pumps		✓			Groundwater bore information presented, no discussion of local surface water usage despite several ponds / dams noted in accompanying figures.
Integrity assessment (assessment of the accuracy of information)		×			Not included but not considered crucial for this report.
SITE CONDITION AND SURROUNDING ENVIRONMENT	✓	✓(s)	✓(s)	✓(s)	**Auditor's comment on inclusion / reference (if applicable)**
Topography		✓			Generic topography described in Table 3-2, topographic contours shown on Figure 7 - Site Salinity
Conditions at site boundary such as type and condition of fencing, soil stability and erosion		✓			Partially described in Table 3-1
Visible signs of contamination such as discolouration or staining of soil, bare soil patches – both on-site, and off-site adjacent to the boundary		✓			Tables 3-1 and 5-1
Visible signs of plant stress		✓			
Presence of drums, wastes and fill materials		✓			Tables 3-1 and 5-1
Odours		✓			No odours noted.
Condition of building and roads		✓			Table 5-1
Quality of surface water		×			No comment provided, please include
Flood potential		×			Not considered necessary
Details of any relevant local sensitive environment – e.g. rivers, lakes, creeks, wetlands, local habitat areas, endangered flora and fauna.		✓			Not specifically discussed although partial references included. Given findings, additional comments not required.
GEOLOGY AND HYDROGEOLOGY	✓	✓	✓(s)	✓(s)	**Auditor's comment on inclusion / reference (if applicable)**
Soil stratigraphy using recognised classification methods, e.g. Australian Standard 1726, Unified Soil Classification Table		✓			Table 3-4
Location and extent of imported and locally derived fill		✓			Tables 3-1 and 5-1
Site borehole logs or test pit logs showing stratigraphy		✓			Appendix B
Detailed description of the location, design and construction of on-site wells		✓			Bore logs and construction details of new monitoring wells provided in Appendix B. Location presented on Figure 9, 10 and 12.
Description and location of springs and wells in the vicinity		×			No comment provided, please include
Depth to groundwater table		✓			Table 8-4 and Appendix I.
Direction and rate of groundwater flow		✓			Reference to published conductivity (Table 8-4) and inferred groundwater flow direction (Figure 12) provided.
Direction of surface water run-off		✓			Topography and creek lines shown on accompanying figures
Background water quality		✓			
Preferential water courses		✓			Not included. Comment requested
Summary of local meteorology		×			Not considered necessary
SAMPLING AND ANALYSIS PLAN AND SAMPLING METHODOLOGY		✓(s)	✓(s)	✓(s)	**Auditor's comment on inclusion / reference (if applicable)**
Sampling, analysis and data quality objectives (DQOs)		✓			
Rationale for the selection of:					
o sampling pattern		✓			Further discussion to be provided see response comments
o sampling density including an estimated size of the residual hot spots that may remain undetected		×			Sampling / analysis density not provided. Estimated size of residual hotspots have been incorrectly calculated based on sample location (not analysis) density.
o sampling locations including locations shown on a site map		✓			Figures 9 and 10
o sampling depths		✓			Appendix B and C
o samples for analysis and samples not analysed		✓			Samples not analysed have not been specifically mentioned but can be derived from results contained in Appendix C
o analytical methods		✓			
o analytes for samples		×			A summary of laboratory analyses for each sample should be provided in the appendices.

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Detailed description of the sampling methods including:					
o sample containers and type of seal used		✓			
o sampling devices and equipment e.g. auger type		✓			
o equipment decontamination procedures		✓			
o sample handling procedures		✓			
o sample preservation methods and reference to recognised protocols, e.g. APHA or US EPA SW 846		×			Discussed for rinsate samples only. Please provide for groundwater samples.
Detailed description of field screening protocols		✓			Brief description of screening procedures provided
FIELD QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)	· Auditors **MUST** ensure that the data from the site assessment is reliable and representative of the condition of the site.				
DEC AUDITOR REQUIREMENTS (2006)	· The auditor **MUST** check the reliability and fitness for purpose of both field sampling procedures and laboratory program. ***Refer internal checklist for further detail*** *[Resources/Environmental/Contaminated Site Audits/Internal DEC Checklists/2006 Auditor Guidelines QAQC Checklist].*				
FIELD QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)	**✓(N)**	**✓**	**N/A**	**✓**	**Auditor's comment on inclusion / reference (if applicable)**
Detail of sampling team		✓			Names provided but no details of qualifications or experience.
Decontamination procedures carried out between sampling events		✓			
Logs for each sample collected including time, location, initials of sampler, duplicated locations, duplicate type, chemical analyses to be preformed, site observations and weather conditions		✓			Weather conditions not noted
Chain of custody fully identifying for each sample the sampler, nature of the sample, collection date, analyses to be preformed, sample preservation method, departure time from the site and dispatch courier(s)		✓			Sampler not identified on CoC
Sample splitting techniques		×			Sample splitting techniques provided but not clear.
Statement of duplicate frequency		✓			
Field blank results		✓			
Background sample results		✓			Inferred as being those in undisturbed areas of the site.
Rinsate sample results		✓			
Laboratory-prepared trip spike results for volatile analytes		✓			
Trip blank results		✓			
Field instrument calibration (when used).		✓			
LABORATORY QA/QC	**✓(N)**	**✓**	**N/A**	**✓**	
A copy of signed chain-of-custody forms acknowledging receipt date and time, and identity of samples included in shipments		✓			
Record of holding times and a comparison with method specifications		✓			Identified in table 9-1 and discussed in Table 9-2.
Analytical methods used		✓			
Laboratory accreditation for analytical methods used		✓			
Laboratory performance in inter-laboratory trials for the analytical methods used, where available		×			Laboratory internal QA/QC results provided but not summarised or discussed fully within the report text.
Description of surrogates and spikes used		×			Not included please include
Percent recoveries of spikes and surrogates		×			Included within appendices but not discussed in the report text.
Instrument detection limit		✓			Laboratory PQLs provided in results summary tables (Appendix C)
Method detection limits		✓			
Matrix or practical quantification limits		✓			
Standard solution results		×			Summary and discussion of internal laboratory internal QA/QC results required in the report.
Reference sample results		×			
Reference check sample results		×			
Daily check sample results		×			
Laboratory duplicate results		×			
Laboratory blank results		×			
Laboratory standard charts		×			

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
QA/QC DATA EVALUATION	**✓(N)**	**✓**	**N/A**	**✓**	**Auditor's comment on inclusion / reference (if applicable)**
Evaluation of all QA/QC information listed above against the stated DQOs, including a discussion of:					
o documentation completeness					Discussed in terms of conformance to DQIs set in SAQP but not quantified in terms of overall completeness
o data completeness					
o data comparability (see next point)		x			
o data representatives					
Precision and accuracy for both sampling and analysis for each analyte in each environmental matrix informing data users of the reliability, unreliability, or qualitative value of the data		✓			General statement re. quality provided in Section 9.7 but not substantiated (see comments above)
Data comparability checks, which should include e.g. bias assessment – which may arise from various sources, including:					
o collection and analysis of samples by different personnel					Not discussed but not critical
o use of different methodologies					
o collection and analysis by the same personnel using the same methods but at different times		x			
o spatial and temporal changes (because of the environmental dynamics)					
Relative per cent differences for intra- and inter-laboratory duplicates		✓			Summarised in Table 9-2 and Appendix F
BASIS FOR ASSESSMENT CRITERIA	· Decision-making flow chart describes how HILs and PILs **MUST** be applied to different proposed land uses.				
DEC AUDITOR REQUIREMENTS (2006)	· Where more than one land use if proposed, the auditors assessment of suitability **MUST** relate to the most sensitive of the proposed land uses.				
	· HILs and PILs are not appropriate criteria for assessing fill material that has				
	· The auditor **MUST** apply, without multiplication, the criteria listed in the				
	Auditors may apply the NEPM for semi-volatile TPH fractions (C16-C35 and >C35) for soil, but				
	Auditor MUST state whether or not the most appropriate groundwater assessment criteria				
BASIS FOR ASSESSMENT CRITERIA	**✓**	**✓**	**✓**	**✓**	**Auditor's comment on inclusion / reference (if applicable)**
Table listing all selected assessment criteria and references		✓			Tables 7-1, 7-2 and 7-4
Rationale for and appropriateness of the selection of criteria		✓			
Assumptions and limitations of criteria		✓			
RESULTS	**✓**	**✓**	**✓**	**✓**	**Auditor's comment on inclusion / reference (if applicable)**
Summary of previous results, if appropriate					Not applicable
Summary of all results, in a table that:					
o shows all essential details such as sample numbers and sampling depth					Tables 8-2 and 8-5, assessment criteria and individual samples exceeding the assessment criteria (Table 8-2) not presented
o shows all assessment criteria		✓			
o highlights all results exceeding the assessment criteria					
Site plan showing all sample locations, sample identification numbers and sampling depths		✓			Figure 9, sampling depths not shown but can be determined by cross referencing with logs
Site plan showing the extent of soil and groundwater contamination exceeding selected assessment criteria for each sampling depth		✓			Figures 10 and 12. Correction to Figure 10 required.

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
SITE CHARACTERISATION	· Auditors **MUST** consider the potential for contamination to migrate from the site which is the subject of the site audit.				
DEC AUDITOR REQUIREMENTS (2006)	· The auditor **MUST** discuss in the site audit report evidence for the occurrence of off-site migration of contaminants and give an opinion on the impacts on likely receptors.				
	· If the auditor believes the off-site migration of contamination should be				
	· The auditor **MUST** take all reasonable steps to advise the site owner or occupier				
	· Auditors **MUST** check that the potential for groundwater contamination has been				
	· If groundwater contamination is identified, the auditor **MUST** check that the				
	· Auditors **MUST** ensure that the presence of separate phase contaminants has				
	· Where assessment of sediments has been undertaken, site auditors **MUST**				
	· The auditor **MUST** check that aesthetic issues have been considered in the				
SITE CHARACTERISATION	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Assessment of type of all environmental contamination, particularly soil and groundwater		✓			
Assessment of extent of soil and groundwater contamination, including off-site effects		✓			Locations of samples exceeding assessment criteria have been identified however no discussion of the adequacy of the analysis programme provided.
Assessment of the chemical degradation products					Not applicable
Assessment of possible exposure routes and exposed populations (humans, ecological)		✓			Only discussed following desk based assessment. Site contamination discussed in terms of soil and groundwater impacts only.
REMEDIAL ACTION PLAN	· Auditor **MUST** be satisfied that any proposed or completed remediation is				
DEC AUDITOR REQUIREMENTS (2006)	· Remedial strategies **MUST** have regard to current regulations and DEC guidance.				
	· Contamination at a site **MUST** be remediated to meet the appropriate clean-up				
	· Irrespective of depth, an auditor **MUST NOT** endorse any proposal to leave				
	· The site auditor **MUST** where relevant, demonstrate in their site audit reports				
	· Site auditors **MUST** demonstrate in their site audit reports an awareness of the				
	· Site auditors **MUST** have regard to the provisions of the NSW Gov't frameworks				
	· Auditors **MUST NOT** endorse a mgmt strategy proposed for a site which				
	· Auditors **MUST** check that documentation is produced for the disposal of				
	· Sites with UXO **MUST** only be assessed by someone qualified to manage UXO				
	· Auditors **MUST** check that all primary sources of groundwater contamination,				
	· If a source cannot be removed, the auditor **MUST** clearly state in the site audit				
	· Auditor **MUST** take reasonable steps (clearly and in writing) to advise the				
	· DECs policy is that a natural attenuation proposal **MUST** be accompanied by an				
	· Where MNA is proposed as part of an overall remedial strategy for ongoing				
REMEDIAL ACTION PLAN	**N/A**	**N/A**	✓	✓**(s)**	**Auditor's comment on inclusion / reference (if applicable)**
Remediation goal		N/A			
Discussion of the extent of remediation required		N/A			
Discussion of possible remedial options and how risk can be reduced		N/A			
Rationale for the selection of recommended remedial option		N/A			
Proposed testing to validate the site after remediation		N/A			
Contingency plan if the selected remedial strategy fails		N/A			
Interim site management plan (before remediation), including e.g. fencing, erection of warning signs, stormwater diversion		N/A			
Site management plan (operation phase):		N/A			
o site stormwater management plan		N/A			
o soil management plan		N/A			
o noise control plan		N/A			
o dust control plan, including wheel wash (where applicable)		N/A			
o odour control plan		N/A			
o occupational health and safety plan		N/A			
Remediation schedule		N/A			
Hours of operation		N/A			

Section	Stage 1	Stage 2	RAP	Val/ Mon	Comments
Contingency plans to respond to site incidents, to obviate potential effects on surrounding environment and community		N/A			
Identification of regulatory compliance requirements such as licences and approvals		N/A			
Names and phone numbers of appropriate personnel to contact during remediation		N/A			
Community relations plans, where applicable		N/A			
Staged progress reporting, where appropriate		N/A			
Long-term site management plan		N/A			
VALIDATION	**N/A**	**N/A**	**N/A**	✓	**Auditor's comment on inclusion / reference (if applicable)**
Rationale and justification for the validation strategy including:		N/A			
o clean-up criteria and statistically based decision-making methodology		N/A			
o validation sampling and analysis plan		N/A			
Details of a statistical analysis of validation results and evaluation against the clean-up criteria		N/A			
Verification of compliance with regulatory requirements set by the EPA, WorkCover and local government.		N/A			
ONGOING SITE MONITORING	**N/A**	**N/A**	**N/A**	✓	**Auditor's comment on inclusion / reference (if applicable)**
Ongoing site monitoring requirements (if any), including monitoring parameters and frequency		N/A			
Results of monitoring analyses including all relevant QA/QC reporting requirements stated above		N/A			
Ongoing site/equipment maintenance, e.g. containment cap integrity		N/A			
Details of party(ies) responsible for maintenance and monitoring program		N/A			
CONCLUSIONS AND RECOMMENDATIONS	· Where groundwater contamination is present, and auditor **MUST** discuss its impact on the suitability of the site for a proposed use in the site audit report. This applies for onsite and offsite contamination sources.				
DEC AUDITOR REQUIREMENTS (2006)	· Where groundwater contamination under a site poses an unacceptable risk to users of the site for a proposed use, the auditor **MUST** indicate in the site audit statement that the site is unsuitable for that use				
CONCLUSIONS AND RECOMMENDATIONS	✓	✓	✓	✓	**Auditor's comment on inclusion / reference (if applicable)**
Brief summary of all findings		✓			
Assumptions used in reaching the conclusions		✓			
Extent of uncertainties in the results		✓			Included in section 11.3
Where remedial action has been taken, a list summarising the activities and physical changes to the site					Not applicable
A clear statement that the consultant considers the subject site to be suitable for the proposed use (where applicable)		✓			
A statement detailing all limitations and constraints on the use of the site (where applicable)		✓			
Recommendations for further work, if appropriate.		✓			

√ Include this section
(S) A summary is adequate if detailed information was included in an available referenced previous report.
(N) Include only if there is to be no further site investigation
N/A Not applicable

30 July 2009 Project No. 097623019

Audit Officer
Department of Consveration and Climate Change
PO Box A290
Sydney South
NSW, 1232

SITE AUDIT NOTIFICATION

In 2009, I (Mr. Roger Parker of Golder Associates) was commissioned by Landcom to complete a non-statutory Site audit of the Caddens Release Area in Kingswood, NSW. The audit had originally been commissioned to Ms. Kylie Lloyd, formerly of Golder Associates. When Ms. Lloyd departed Golder Associates in March 2009, Landcom requested that I complete the site audit. No documentation of statutory notification was identified during the project hand over, and I assumed it was intended to be a non-statutory site audit.

During the process of annual return preparation I have realised that in fact this should be a Statutory Audit. As such, please find attached the Statutory Site Notification (Reference RJP022, 023, 024) for your review and processing.

Please contact the undersigned should you require further clarification.

GOLDER ASSOCIATES PTY LTD

Roger Parker
Accredited Site Auditor

Attachments: SAN RJP022, 023, 024

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NSW Site Auditor Scheme
SITE AUDIT NOTIFICATION

Department of
Environment and Conservation (NSW)

Section 53C of the* Contaminated Land Management Act 1997 *requires auditors to notify the EPA of proposed statutory site audits within seven days of their being commissioned.

Proposed site audit details

Site audit no. RJP022, RJP023, RJP024

This proposed site audit is a **statutory audit/~~non-statutory audit~~*** within the meaning of the *Contaminated Land Management Act 1997 (see s.47(2))*.

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

Name: Roger Parker Company: Golder Associates Pty. Ltd.

Address: 50 Burwood Road, Hawthorn, VIC, Postcode: 3122

c/- PO Box 1302, Crows Nest, NSW, 1585

Phone 02 9475 3900 Fax 02 9478 3901

Site details

Address Caddens Release Area, Kingswood Postcode 2747

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

Rural lands, with open field, vegetated areas, and some residential housing. The Site is bounded to the north by O'Connell Street, and the University of Western Sydney (Penrith Campus), to the east by Archives Repository of NSW, to the south by Caddens Road, and to the west by residential properties. The Site is being audited in three subdivisions (Areas A, B and C), with three Site audit statements being issued.

Local Government Area: Penrith City Council

Area of site (e.g. hectares): 55.63 ha Current zoning: rural

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

Declaration/Order/Agreement/Notice* no(s) ……..……

……

**** Strike out as appropriate***

Site audit commissioned by

Name: Phillip Scott Company: Landcom

Address: Level 2, 330 Church Street, Parramatta, NSW Postcode: 2124

Phone: 9841 8600 Fax: 9841 8666

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

……..

Purpose of proposed site audit

☑ A. To determine land use suitability *(please specify intended use[s], if known)*

…Residential, with gardens and accessible 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])*

……..

Nature of statutory requirement(s) (not applicable for non-statutory audits)

☐ ~~Requirement(s) under the *Contaminated Land Management Act 1997* (e.g. remediation order) *(please specify, including date of issue)*~~

……..

☐ ~~Requirement(s) imposed by an environmental planning instrument *(please specify, including date of issue)*~~

……

☐ ~~Development consent requirement(s) under the Environmental Planning and Assessment Act 1979 (please specify consent authority and date of issue)~~

. ……

☐ ~~Requirement(s) under other legislation *(please specify, including date of issue)*~~

……..

……...

**** Strike out as appropriate***

Overall comments

Scope of this Site Audit is to comply with the requirements of the NSW Department of Environment and Climate Change (DECC) and the Guidelines for the NSW Site Auditor Scheme (2006).

This Audit was originally commenced by Ms. Kylie Lloyd (formerly of Golder Associates Pty Ltd). The client requested that the Audit be completed by Golder Associates (by Mr. Roger Parker), at the time of Kylie's departure. It is noted that when the audit was originated by Ms. Lloyd, statutory notification of this audit cannot be found.

Auditor's declaration

I certify that the information supplied in this form and any attached pages 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 …30 July 2009……

Please send completed forms to:

Department of Environment and Conservation (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
Fax: (02) 9995 5930

3 March 2010 Project No. 097623019-010-L-Rev0

Mr Phillip Scott
Landcom
Level 2, 330 Church Street
Parramatta
NSW 2124

REVIEW OF SAMPLING, ANALYSIS & QUALITY PLAN – DELINEATION OF SOIL HOTSPOTS IN 'AREA C' CADDENS RELEASE, CADDENS ROAD, KINGSWOOD, NSW

Dear Phillip

Introduction

The Auditor has reviewed the WSP Environmental (WSP) report *Sampling, Analysis & Quality Plan – For the Delineation of Soil Hotspots in 'Area C' Caddens Release, Caddens Road, Kingswood, NSW* (Reference 2171 SAQP Draft) dated 04 February 2010 (herein referred to as the 'the Report'). Comments are provided under the WSP SAQP headings.

5 Data Quality Objectives (DQO)

Step 4 – Defining the study Boundaries

1) Reference is made to Figure 4 however; Figure 4 is not provided in Attachment A. The Auditor notes that the proposed sample locations are presented in Figure 3. (Also a reference to Figure 4 under section 6.4 Delineation Works)

6 Sampling, Analysis and Quality Plan

6.4 Delineation Works

2) Following further review of the works undertaken by Parsons Brinckerhoff (PB) in Area C it is considered that the SAQP proposed by WSP will not adequately address the contamination concerns at the site.

3) The locations identified by PB as hotspots are not clearly delineated and it is unclear whether the contamination is isolated to the hotspot areas as identified by PB or indicative of more wide spread contamination across Area C.

4) A limited frequency of TPH and PAH analysis in soil was conducted by PB. Of the 86 soil samples collected within Area C, 16 samples were analysed for PAHs and 32 soil samples were analysed for TPHs. The soil samples analysed for PAHs were limited to the south west and south east corners of Area C.

5) Although the presence of PAHs in the north of Area C is unlikely given the site history, it is the Auditor's opinion that the PB analytical program does not provide a basis for the nomination of hot spots on the site.

6) The Auditor considers that the SAQP to delineate the hotspot locations using step out sampling intervals of 2m, 5m and 10m that extend laterally from sample locations C80 and C82 will not address

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A.B.N. 64 006 107 857

the uncertainty associated with the current site data and will not provide the information required to demonstrate that contamination is not more wide spread across Area C.

7) It is also noted that a procedure to identify (relocate) the precise location of sample locations C80 and C82 is not presented in the SAQP.

CLOSURE

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process. A Site Audit Report and Site Audit Statement will be issued when the Audit process has been completed for the site's development, subject to receipt of appropriate documents.

If you have any further questions please contact the undersigned.

Yours sincerely

GOLDER ASSOCIATES PTY LTD

Roger Parker
NSW DECC Accredited Auditor

CRH/RJP/crh

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1st April 2010 Reference No. 097623019-011-L-Rev0

Mr Philip Scott
Landcom
Level 2, 330 Church Street
Parramatta
NSW 2124

REVIEW OF SAMPLING, ANALYSIS & QUALITY PLAN – DELINEATION OF SOIL HOTSPOTS IN 'AREA C' CADDENS RELEASE, CADDENS ROAD, KINGSWOOD, NSW

Dear Philip

Introduction

The Auditor has reviewed the WSP Environmental (WSP) report *Sampling, Analysis & Quality Plan – For the Delineation of Soil Hotspots in 'Area C' Caddens Release, Caddens Road, Kingswood, NSW* (Reference 2171 SAQP Draft2) dated 26 March 2010 (herein referred to as 'the SAQP').

For ease of reference comments are provided under the WSP SAQP headings.

5 Data Quality Objectives (DQO)

Step 4 – Defining the study Boundaries

1) Reference is made to the spatial boundaries being limited to the date the works are completed. This should read "the temporal boundaries will be limited to the date the works are completed".

6 Sampling, Analysis and Quality Plan

6.3 Preliminary Works

WSP state that they intend to confirm the accurate locating of sample locations C80 and C82 by re-sampling. However, it is not clear how re-sampling will achieve the desired outcome. The Auditor notes that re-sampling in close proximity to sample locations C80 and C82 is unlikely to yield identical results to those reported by PB. While the Auditor agrees that it is sensible to resample locations C80 and C82, the stated purpose of the sampling is unlikely to be achieved.

6.4 Delineation Works

The Auditor notes that this section has been substantially updated from the previous version of the SAQP reviewed on 3rd March 2010. The Auditor has the following comments in relation to the updated Delineation works.

2) WSP do not provide a rationale for the 15m sampling grid proposed. This should be provided.

3) WSP do not state which samples (including location and depth) will be scheduled for analysis, or the basis upon how they will decide which samples will be scheduled for analysis. This should be provided.

4) The Auditor notes that WSP now propose to use a mechanical auger to collect samples rather than the hand auger previously proposed. No justification or assessment of the appropriateness of this

technique is provided by WSP given that sampling from mechanical augers is not good practice. Justification for this sampling method should be provided.

5) WSP state that they will screen the soil samples using a Flame-ionisation detector (FID). However, WSP do not state what they are using the FID to screen for. This should be provided. Also, reference is made to a PID in a later section. WSP should clarify which equipment they intend to use.

CLOSURE

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process. A Site Audit Report and Site Audit Statement will be issued when the Audit process has been completed for the site's development, subject to receipt of appropriate documents.

If you have any further questions please contact the undersigned.

Yours sincerely

GOLDER ASSOCIATES PTY LTD

Roger Parker
NSW DECC Accredited Auditor

MU/RJP/mu

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4th June 2010

Project No. 097623019_012_L_Rev0_Delineation report review letter

Mr P Scott
Landcom
Level 2, 330 Church Street
Parramatta
NSW 2124

REVIEW OF DELINEATION OF SOIL HOTSPOTS AND REMEDIATION WORKS PLAN AT AREA C CADDENS RELEASE, CADDENS ROAD, KINGSWOOD, NSW

Dear Philip

Introduction

On behalf of Landcom, the Auditor has reviewed the WSP draft letter *Delineation of Soil Hotspots and Remediation Works Plan at 'Area C' Caddens Release, Caddens Road, Kingswood, NSW* (reference 2171 RWP Draft) dated 19 May 2010 (herein referred to as the 'the Report').

The Auditor has some concerns regarding the results and conclusions of the delineation sampling (discussed below). Consequently the Auditor has provided this letter as interim advice before proceeding with the review of WSP's Remediation Works Plan, and draft Remedial Action Plan prepared by Parsons Brinckerhoff (reference 2116943A PR_0430, dated 15 September 2009 – a copy of which we received on 4 June 2010).

For ease of reference, comments have been made under the WSP Report headings.

Comments

6.2 Analytical Results and Discussion

1) WSP obtained two total petroleum hydrocarbon (TPH) results (samples C82 @ 0.1m, and C82W2 @ 0.1m) that exceeded the concentration of total recoverable hydrocarbon (TRH) for the same sample following silica gel clean-up. These results are counterintuitive to the process of silica gel clean-up which is intended to remove biogenic hydrocarbons from the TRH result (i.e. the concentration should go down not up).

   The Auditor notes that WSP instructed the primary laboratory to run the silica gel clean-up procedure and TPH analysis on a new extract taken from the primary sample, rather than the original extract from which the TRH concentration was obtained. WSP should have analysed the new extract for TRH prior to silica gel clean-up to provide a result against which the TPH concentration could be compared to give an indication of the proportion of biogenic and petrogenic hydrocarbons in the soil sample.

2) WSP speculate that the TPH concentrations in samples C82 @ 0.1m and C82W2 @ 0.1m are likely to "come from a petroleum based source". However, for samples where the TPH concentration was lower than the TRH concentration (primary samples A3 @ 0.1m, and D3 @ 0.1m), WSP conclude that the TPH and polycyclic aromatic hydrocarbons (PAH) are not from petroleum sources, rather they are likely to be from the frequent charcoal inclusions observed within the soil.

The Auditor notes that this conclusion is based on the observation that the silica gel clean-up procedure appeared to remove a large proportion of biogenic hydrocarbons from the sample, however as discussed above may not have been the case as the silica gel clean-up procedure was applied to a new extract from the primary sample, not the original extract.

3) WSP conclude that the PAH concentrations in samples A3 @ 0.1m and D3 @ 0.1m can be attributed to charcoal observed within the soil matrix. However, WSP do not propose remediation of the soil at location D3 despite concentrations of benzo(a)pyrene and total PAH being notably higher than for samples C82 @ 0.1m and C82W2 @ 0.1m. It is not clear why WSP have proposed remediation of location A3 but not D3. Furthermore WSP have not provided evidence which adequately identifies the source of PAH in the soil or that conclusively links PAH to TPH or TRH concentrations.

In response to comments 1) to 3) above the Auditor requests that WSP provide further justification for the analytical approach adopted for this investigation (with particular reference to the use of silica gel clean-up which wasn't included in the SAQP review by the Auditor) and the conclusions that have been made from the results.

6.3 Waste Classification

4) WSP classify in-situ soils for disposal as General Solid Waste (Non-putrescible) based on the *General Approval of the Immobilisation of Contaminants in Waste* (approval number 1999/05) which applies to ash-contaminated natural excavated materials.

However, WSP conclude that samples C82 @ 0.1m and C82W2 @ 0.1m include petroleum derived hydrocarbons. Therefore these samples should not be classified using the *General Approval of the Immobilisation of Contaminants in Waste* (approval number 1999/05). Once WSP have responded to comments 1) to 3) above they should re-classify the soils appropriately.

7 Data Quality Assessment

5) The Auditor notes that WSP have provided very limited information with regards to the data quality assessment. In particular WSP provide no assessment of data quality indicators (DQIs) for the investigation. WSP should provide an assessment of DQIs and other quality control / assurance data (including laboratory QA/QC) in accordance with the NSW DEC Contaminated Sites *Guidelines for the NSW Site Auditor Scheme* (2nd Edition), Appendix V.

8 Delineation Conclusions

6) It is unclear why WSP have not performed delineation sampling at locations A3 and D3. Rather, they have estimated the area of potentially contaminated soils at location A3 only. When addressing the Auditor's concerns above, WSP should provide further justification for this decision.

CLOSURE

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process. A Site Audit Report and Site Audit Statement will be issued when the Audit process has been completed for the site's development, subject to receipt of appropriate documents.

If you have any further questions please contact the undersigned.

Yours sincerely

GOLDER ASSOCIATES PTY LTD

Roger Parker
NSW DECC Accredited Auditor

MU/RP/mu

CC: David Jackson (WSP Environmental)
Michael Gray (APP Corporation Pty Ltd)

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30th June 2010 Reference No. 097623019_013_L_Rev0

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NSW 2124

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Dear Philip

Introduction

On behalf of Landcom, the Auditor has reviewed the WSP draft letter *Delineation of Soil Hotspots and Remediation Works Plan at 'Area C' Caddens Release, Caddens Road, Kingswood, NSW* (reference 2171 RWP Draft) dated 19 May 2010 (herein referred to as the 'the Report') and subsequent letter *Response to Interim Audit Advice of Delineation of Soil Hotspots at Area C, Caddens Road, Kingswood, NSW* (reference 2171.IAR01) dated 10 June 2010 (herein referred to as the 'the Letter').

The Auditor still has some concerns regarding the results and conclusions of the delineation sampling (discussed below). However, to expedite matters the Auditor has assumed that these will be addressed by WSP and incorporated into an updated version of Section 9 Remediation Works Plan. The Auditor has proceeded with the review of Section 9 Remediation Works Plan on this basis.

For ease of reference, comments have been made under the separate WSP Letter and Report headings.

Comments - Letter

6.2 Analytical Results and Discussion

1) The Auditor does not follow the arguments put forward by WSP for the exclusion of the shallow soil contamination (BaP and total PAH) identified at location D3 from the proposed remediation works based upon the evidence provided by WSP.

   Location D3 should be included in the proposed remediation works (discussed below). If not, then the Auditor will need to assess the residual risks resulting from the contamination and an appropriate land use will be noted in the Site Audit Report and Site Audit Statement for Area C.

6.3 Waste Classification

2) The Auditor notes WSP's clarification of the classification of waste based upon General Approval of the Immobilisation of Contaminants on Waste (approval number 1999/05). The Auditor advises that Landcom / WSP should satisfy themselves that approval 1999/05 applies in this case before disposing of soils as general solid waste (non-putrescible).

7 Data Quality Assessment

3) The Auditor notes reference to Attachment D of the Report and has the following comments to make with respect to the Data Quality Assessment.

4) One (1) inter-laboratory (triplicate) sample was analysed as part of the investigation not two (2) as stated in Section F.2.6 in Attachment D. Please amend.

5) The frequency of inter-laboratory triplicate samples did not comply with the SAQP. Please comment.

6) Section F.3.7 and Section F.4 of Attachment D refer to some of the reported QA/QC data not meeting the criteria set by the primary and secondary laboratories. WSP does not identify these results or provide discussion as to their significance. Please provide.

8 Delineation Conclusions

7) The Auditor does not accept WSP's comments regarding location D3. The Auditor does however accept that validation sampling should adequately delineate the contamination at location A3, subject to the comments made below. This approach should also be applied to the remediation of location D3.

Comments – Report

9 Remediation Works Plan

8) The Auditor makes the general comment that this section of the Report should be updated to include location D3. The Auditor also notes that it is appropriate to apply the same remedial approach to location D3 as for A3.

9.4.2 Area 2 Validation Sampling Plan

9) The Auditor is not clear as to why excavation of soil in Area 2 does not extend to sample location C82W5. Sample C82W5 should act as the validation sample at the western limit of this excavation. Figure 5 in Attachment A should be updated accordingly.

9.4.3 Area 3 Validation Sampling Plan

10) The Auditor notes that WSP did not delineate the extent of contamination at location A3 during the delineation of hotspots. However, WSP proposes to collect samples from the base of excavation only. This will not validate the side of the excavation. The validation sampling plan should be updated accordingly (note this will also apply to location D3).

9.4.4 Failed Validation Sampling Contingency Plan

11) WSP describes how excavations will be deepened to 0.3m if validation samples from the base of the excavation are found to fail the site validation criteria. WSP do not explain how excavations will progress if the subsequent validation samples also fail the criteria. Also, WSP do not explain how excavations will be widened if validation sampling from the walls (see comment 10) above) fail the site validation criteria. The validation sampling plan should be amended accordingly.

9.5 Site Management Issues

WSP refers to *Section 10 Site management issues* of the draft *Remedial Action Plan* prepared by Parsons Brinckerhoff (PB) (reference 2116943A PR_0430 dated September 2009) provided as Attachment G. The Auditor notes that a Site Management Plan (SMP) including an Occupational Health and Safety Plan and Environmental Management Plan will be provided by the appointed contractor and environmental consultant for the remediation work. The Auditor will review these plans when they are available.

CLOSURE

The Auditor is satisfied that providing WSP include the additional items discussed above, the remediation work can proceed without a further review of the remediation works plan. A final copy of the plan will be required for the Auditor's records.

Please note that this letter has been provided as interim advice, and in keeping with NSW DECC's guidance you are advised that this letter does not constitute a Site Audit Report or Site Audit Statement and does not pre-empt the conclusion that may be made at the end of the audit process. A Site Audit Report and Site Audit Statement will be issued when the Audit process has been completed for the site's development, subject to receipt of appropriate documents.

If you have any further questions please contact the undersigned.

Yours sincerely

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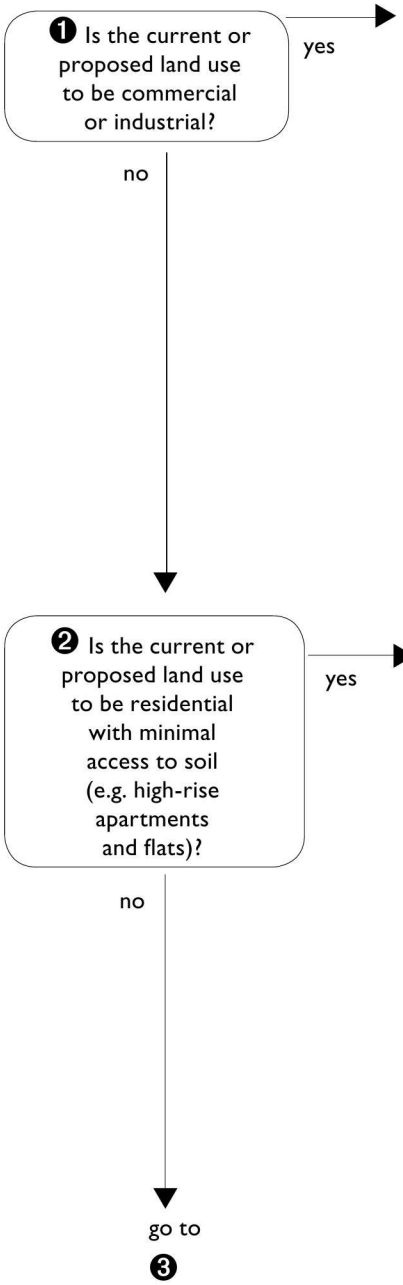
APPENDIX B

DECC Assessment Flowchart

APPENDIX I: Decision-making process for assessing urban redevelopment sites

Note: Where SILs are not available, or assessment against them is inconclusive for the site, and either an abridged or detailed human health site-specific risk assessment has been undertaken, check that all the requirements of the checklist in Appendix VII are satisfied.



Commercial or industrial

A. Check that:
- all site assessment, remediation and validation reports follow the 1997 EPA publication *Guidelines for Consultants Reporting on Contaminated Sites*
- any contaminant odours emanating from site soils have been adequately addressed
- soils have been assessed against health-based investigation levels (see column 4 in Appendix II)
- any issues relating to local area background soil concentrations that exceed appropriate site soil criteria have been adequately addressed in the site assessment report(s)
- the human health impacts of chemical mixtures have been assessed
- the site management strategy is appropriate
- any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed and reported to the site owner or occupier.

B. Prepare a site audit report and site audit statement.

Residential with minimal access to soil, e.g. high-rise apartments and flats

A. Check that:
- all site assessment, remediation and validation reports follow the 1997 EPA publication *Guidelines for Consultants Reporting on Contaminated Sites*
- aesthetic issues have been addressed
- soils to be retained on-site underneath buildings or slabs have been assessed against health-based investigation levels (see column 2 in Appendix II)
- soils to be retained on-site **not** underneath buildings or slabs have been assessed against the lower of the health-based investigation levels and provisional phytotoxicity-based investigation levels (see columns 2 and 5 in Appendix II)
- any issues relating to local area background soil concentrations that exceed appropriate site soil criteria have been adequately addressed in the site assessment report(s)
- all impacts of chemical mixtures have been assessed
- the site management strategy is appropriate
- any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed and reported to the site owner or occupier.

B. Prepare a site audit report and site audit statement.

❸ Is the current or proposed land use to be residential with gardens and accessible soil (home produce contributing less than 10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools or primary schools, or town houses or villas; OR parks, recreational open space or playing fields, including secondary schools?

yes →

Residential with gardens and accessible soil (home produce contributing less than 10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools or primary schools, or town houses or villas, OR
Parks, recreational open space or playing fields, including secondary schools?

A. Check that:
- all site assessment, remediation and validation reports follow the 1997 EPA publication *Guidelines for Consultants Reporting on Contaminated Sites*
- aesthetic issues have been addressed
- soils have been assessed against the lower of the appropriate health-based investigation levels and provisional phytotoxicity-based investigation levels (see columns 1, 3 and 5 in Appendix II)
- any issues relating to local area background soil concentrations that exceed appropriate site soil criteria have been adequately addressed in the site assessment report(s)
- all impacts of chemical mixtures have been assessed
- the site management strategy is appropriate
- any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed and reported to the site owner or occupier.

B. Prepare a site audit report and site audit statement.

no ↓

❹ The current or proposed land use is residential with substantial vegetable garden and/or poultry, OR a more sensitive land use. →

Residential with substantial vegetable garden and/or poultry, OR a more sensitive land use.

A. Check that:
- all site assessment, remediation and validation reports follow the 1997 EPA publication *Guidelines for Consultants Reporting on Contaminated Sites*
- aesthetic issues have been addressed
- the consultant has undertaken a detailed site-specific human health risk assessment that satisfies all the requirements of the checklist in Appendix VII, and includes a scientifically justified analysis of food-chain exposures
- the site has been assessed against the provisional phytotoxicity-based investigation levels (see column 5 in Appendix II)
- any issues relating to local area background soil concentrations that exceed the site soil criteria have been adequately addressed in the site assessment report(s)
- all impacts of chemical mixtures have been assessed
- the site management strategy is appropriate
- any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed and reported to the site owner or occupier.

B. Prepare a site audit report and site audit statement.

APPENDIX C

Limitations

LIMITATIONS

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