ENVIRON

Site Audit Report

Honeysuckle Development
South Park

for

Honeysuckle Development Corporation

May 2005

Ref: 31-0069G
Audit GN 77

ENVIRON

27 May 2005 Ref. 31-0069G

Honeysuckle Development Corporation
Level 2
251 Wharf Road
Newcastle, NSW 2300

Attention: Jacob Whiting

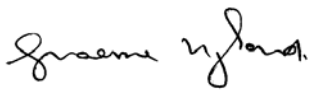
Dear Jacob,

Site Audit Report
Honeysuckle Development, South Park

I have pleasure in submitting the Site Audit Report for the subject site, South Park. Honeysuckle Development Corporation commissioned the Audit to assess the suitability of the site for the intended land use. The Site Audit Statement produced in accordance with the Contaminated Land Management Act follows this letter. The Audit is not currently required for statutory purposes.

Thank you for giving me the opportunity to conduct this Audit. Please call me on (02) 9954 8100 if you have any questions.

Yours faithfully,
ENVIRON Australia Pty Ltd



Graeme Nyland
EPA Accredited Site Auditor 9808

NSW Site Auditor Scheme
SITE AUDIT STATEMENT

Department of Environment and Conservation (NSW)

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

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

PART I: Site audit identification

Site audit statement no. GN77

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:	Graeme Nyland	Company:	Environ Australia Pty Ltd
Address:	Level 5, 60 Miller St (PO Box 560)		
	North Sydney NSW	Postcode:	2060
Phone:	02 9954 8100	Fax:	02 9954 8150

Site details

Address: Honeysuckle Drive, Newcastle, NSW (known as South Park)

Postcode: 2300

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

- Part Lot 1111 DP 1027135 (Attachment A)

Local Government Area: Newcastle City Council

Area of site (e.g. hectares): 0.8946 Current zoning: 3 (c) City Centre

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): N/A

**** Strike out as appropriate***

Site audit commissioned by

Name: Peter Bowles

Company: Honeysuckle Development Corporation

Address: Suite 2, 265 Wharf Road, Newcastle Postcode: 2300

Phone: 02 4927 3813 Fax: 02 4929 1927

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

- Jacob Whiting, Phone 02 4927 3816

Purpose of site audit

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

- High density residential land uses, details not determined.

~~**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

- *PPK Environment and Infrastructure Pty Ltd (PPK)*
- *Parsons Brinckerhoff (PB) formerly PPK. :*
- *Robert Carr & Associates Pty Ltd (RCA).*

Title(s) of report(s) reviewed:

- Draft Sampling and Analysis Plan Honeysuckle Development', January 2002 by PPK Environment and Infrastructure Pty Ltd (PPK).
- 'Sampling and Analysis Plan Honeysuckle Development', March 2002, by PPK.
- 'Draft Environmental Site Assessment, South Park, (Part Lot 1111 DP 1027135) Honeysuckle, NSW, June 2002, by PPK.
- 'Draft Quality Assurance and Quality Control Report, Environmental Site Assessment, Honeysuckle, NSW', October 2002, by Parsons Brinckerhoff (PB) formerly PPK.

**** Strike out as appropriate***

- ‘Environmental Site Assessment, South Park, (Part Lot 1111 DP 1027135) Honeysuckle, NSW, November 2002, by PB.
- ‘Quality Assurance and Quality Control Report, Environmental Site Assessment, Honeysuckle, NSW’, February 2003, by PB.
- ‘Contaminant Delineation and Remedial Action Plan. South Park, Newcastle, Honeysuckle Development Corporation’ 15 September 2003 by Robert Carr & Associates Pty Ltd (RCA).
- ‘Contaminant Delineation and Remedial Action Plan. South Park, Newcastle, Honeysuckle Development Corporation’ Draft May 2004 by RCA.
- ‘Contaminant Delineation and Remedial Action Plan. South Park, Newcastle, Honeysuckle Development Corporation’ August 2004 by RCA.
- ‘Site Remediation and Validation Report. South Park, Honeysuckle’. Draft April 2005 by RCA.
- ‘Site Remediation and Validation Report. South Park, Honeysuckle’. Final May 2005 by RCA.

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

N/A

Site audit report

Title: Site Audit Report – Honeysuckle Development South Park.

Report no. GN 77 Date: May 2005

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

- It is recommended that groundwater should not be used on-site unless it is demonstrated to be suitable for site specific uses.
- The phytotoxicity of the various metals within the soils should be assessed and the appropriate landscaping undertaken, if the fill materials are to be used for landscaping at the site.

~~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):

  ……..

  ……..

  ……..

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

**** Strike out as appropriate***

~~Overall comments~~

……..

……..

……..

……..

……..

……..

PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. 9808).

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 ……ORIGINAL SIGNED BY G.NYLAND…… Date …….27 MAY 2005…….

PART IV: Explanatory notes

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

How to complete this form

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

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

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

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

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

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

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

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

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

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

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

Where to send completed forms

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

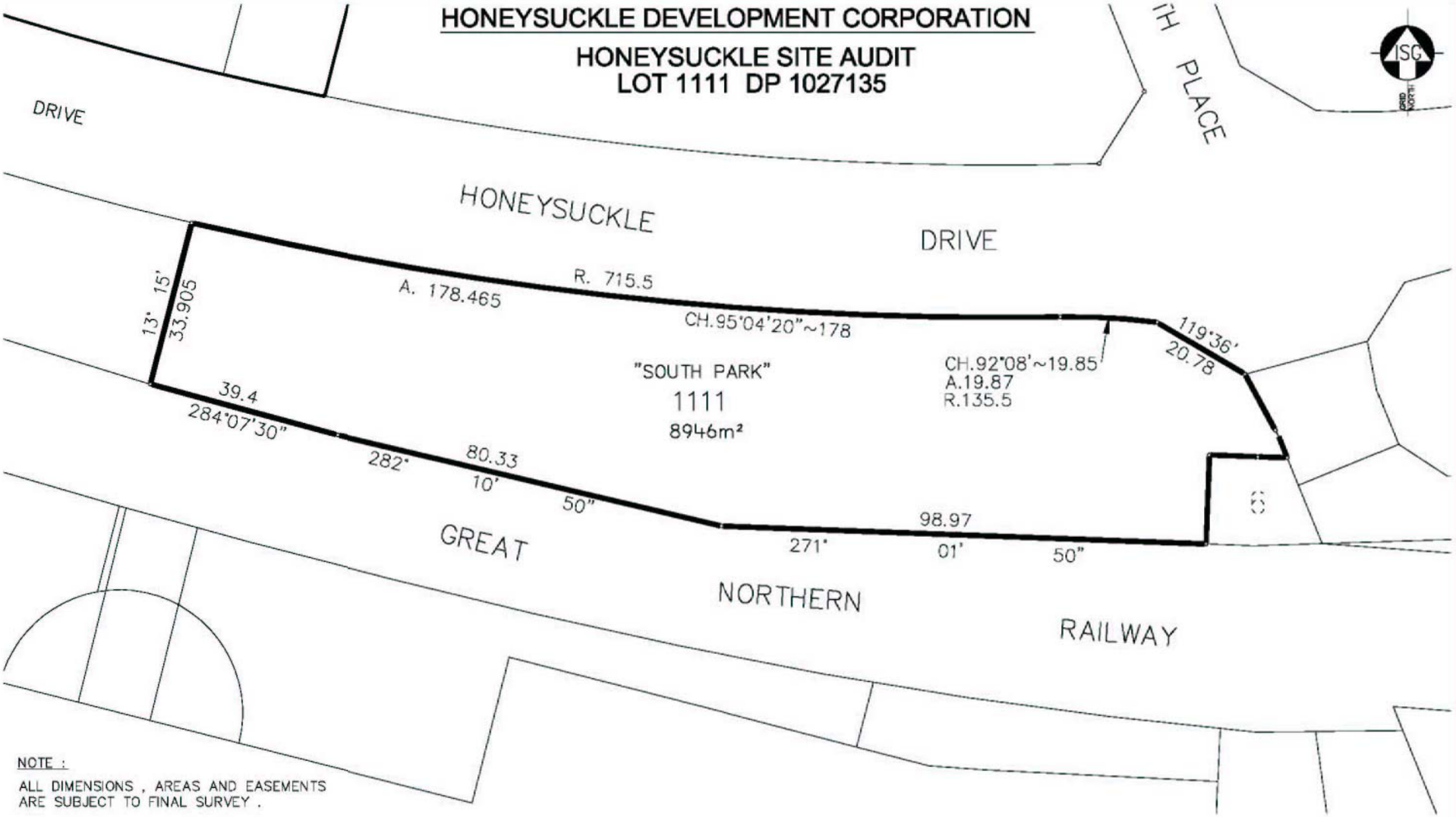
Department of Environment and Conservation (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
Fax: (02) 9995 5930

AND

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

HONEYSUCKLE DEVELOPMENT CORPORATION

HONEYSUCKLE SITE AUDIT
LOT 1111 DP 1027135



NOTE :

ALL DIMENSIONS , AREAS AND EASEMENTS ARE SUBJECT TO FINAL SURVEY .

HARPER SOMERS O'SULLIVAN
SURVEY, ECOLOGY, PLANNING, DEVELOPMENT
241 DENISON STREET , BROADMEADOW
NEWCASTLE , NSW , 2292. DX 7949 NEWCASTLE
PHONE (02) 4961 6500
FAX (02) 4961 6794 E-mail: survey@hso.com.au

Surveyed by	
Designed by	
Drawn by	M.JOHNSTON
Checked by	
Date	

Title: HONEYSUCKLE SITE AUDIT PLAN LOT 1111 DP 1027135

Client: HONEYSUCKLE DEVELOPMENT CORPORATION

Scale: 1 :750

Autocad ref: H:/16819_SITE AUDIT_ MARCH 2003.dwg

Date: 11TH NOVEMBER 2003

REFERENCE No. : 16819

ATTACHMENT 1 – Survey Plan

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

AHD	Australian Height Datum
ALS	Australian Laboratory Services
Amdel	Amdel Laboratories
ANZECC	Australian and New Zealand Environment and Conservation Council
ASET	Australian Safer Environment & Technology Pty Ltd
AST	Above ground Storage Tank
BaP	Benzo(a)pyrene
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethylbenzene & Xylenes (Monoaromatic Hydrocarbons)
CN	Cyanide (total or free)
DP	Deposited Plan
DLWC	Department of Land & Water Conservation
EPA	Environment Protection Authority (NSW)
ESA	Environmental Site Assessment
ha	Hectare
HDA	Honeysuckle Development Area
HDC	Honeysuckle Development Corporation
LOR	Limit of Reporting
MIBC	Mono Isobutyl Carbinol
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Fe: Iron, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury, Sn: Tin
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
µg/L	Micrograms per Litre
NATA	National Association of Testing Authorities
NC	Not Calculated
ND	Not Detected
ng/L	Nanograms per Litre
NEHF	National Environmental Health Forum
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
n	Number of Samples
OCPs	Organochlorine Pesticides
OH&S	Occupational Health & Safety
OPPs	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photoionisation Detector
PQL	Practical Quantitation Limit
pH	a measure of acidity, hydrogen ion activity
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan
RPD	Relative Percent Difference
SAS	Site Audit Statement
SAR	Site Audit Report
SVOCs	Semi Volatile Organic Compounds
SWL	Standing Water Level
TOM	Total Organic Matter
TPHs	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
-	On tables is "not calculated", "no criteria" or " not applicable"

1 INTRODUCTION

A site contamination audit has been conducted relating to South Park within the Honeysuckle Development Area (HDA), Newcastle. The audit was conducted to provide an independent review of the suitability of the site for its intended use by an EPA Accredited Auditor i.e. an Audit under Section 47 (1) (b) (iia)of the NSW *Contaminated Land Management Act* 1997 (the CLM Act).

The HDA is located adjacent to Newcastle Harbour and consists of reclaimed land that was previously used for rail and port related activities. The Honeysuckle Development Corporation is coordinating the redevelopment of a number of other properties within the HDA. Separate Site Audit Reports and Site Audit Statements have been or will be prepared for these sites by each appointed Auditor.

Requested by:	Peter Bowles on behalf of Honeysuckle Development Corporation**.**
Request/Commencement Date:	8 February 2002
Auditor:	Graeme Nyland
Accreditation No.:	9808

The audit included:

- A review of the following reports:
  - 'Draft Sampling and Analysis Plan Honeysuckle Development', January 2002 by PPK Environment and Infrastructure Pty Ltd (PPK).
  - 'Sampling and Analysis Plan Honeysuckle Development', March 2002, by PPK.
  - 'Draft Environmental Site Assessment, South Park, (Part Lot 1111 DP 1027135) Honeysuckle, NSW, June 2002, by PPK.
  - 'Draft Quality Assurance and Quality Control Report, Environmental Site Assessment, Honeysuckle, NSW', October 2002, by Parsons Brinckerhoff (PB) formerly PPK.
  - 'Environmental Site Assessment, South Park, (Part Lot 1111 DP 1027135) Honeysuckle, NSW, November 2002, by PB.
  - 'Quality Assurance and Quality Control Report, Environmental Site Assessment, Honeysuckle, NSW', February 2003, by PB.
  - 'Contaminant Delineation and Remedial Action Plan. South Park, Newcastle, Honeysuckle Development Corporation' 15 September 2003 by Robert Carr & Associates Pty Ltd (RCA).
  - 'Contaminant Delineation and Remedial Action Plan. South Park, Newcastle, Honeysuckle Development Corporation' Draft May 2004 by RCA.
  - 'Contaminant Delineation and Remedial Action Plan. South Park, Newcastle, Honeysuckle Development Corporation' August 2004 by RCA.
  - 'Site Remediation and Validation Report. South Park, Honeysuckle'. Draft

April 2005 by RCA.

- 'Site Remediation and Validation Report. South Park, Honeysuckle'. Final May 2005 by RCA.

- Site visits on 19 February 2002 and 6 April 2005.

The Sampling and Analysis Plan (PPK March 2002) was prepared for 12 sites within the HDA. It included a review of previous reports and aerial photographs. Site plans relevant to each site were also included. The Quality Assurance and Quality Control Report was prepared for 12 sites within the HDA. It included the data quality objectives and the field and laboratory QA/QC results.

The Environmental Site Assessment Report prepared by PB included soil and groundwater sampling for South Park. Groundwater results for the remaining HDA were also tabulated in the report. Only a limited number of samples collected were submitted for analysis. This report concluded that remediation of particular borehole points would be required due to exceedences of the criteria for PAHs, lead, asbestos and coal tar.

The Delineation and Remedial Action Plans prepared by RCA included soil investigations that targeted the previous PB soil sampling locations and included additional groundwater wells. These initially only provided a brief outline of proposed further investigations to define the extent of remediation and then provided more detailed information regarding the remedial action to be taken in the northern section of the site.

The Site Remediation and Validation Report discussed the excavation work undertaken in the north of the site to target fill impacted by tar. Soil validation results collected as base, wall and as test pits were provided.

2 SITE DETAILS

2.1 Location

The HDA is located adjacent to Newcastle Harbour in Newcastle. This entire development area consists of seven 'precincts' most of which have either been sold or developed. Current investigations being undertaken for the Honeysuckle Development Corporation extend from 'Fig Tree Park' to 'Lee Wharf A Curtilage' and cover only two of the seven 'precincts', which, for the purposes of this audit, will be referred to as the HDA.

Located within the HDA is South Park. A site plan of the HDA, indicating the location of South Park is shown as Attachment 1, Appendix A. A survey plan of the South Park site is shown as Attachment 2, Appendix A.

Further site details include:

Street address:	Honeysuckle Drive, Newcastle, NSW (known as South Park)
Identifier:	Part Lot 1111 DP 1027135
Local Government:	Newcastle City Council
Owner:	Honeysuckle Development Corporation
Site Area:	8946 m^2

2.2 Zoning

According to the Newcastle Draft Local Environmental Plan (LEP) the site is zoned as 3 (c) City Centre.

2.3 Adjacent Uses

South Park is located within HDA, which, at the time of the initial inspection remained predominantly undeveloped i.e., vacant land. The HDA overall is located within a predominantly commercial area with some residential land uses.

The boundaries of South Park include:

- Honeysuckle Drive to the north beyond which is a vacant site (Park Residential);
- Floodway to the west beyond which is a vacant site (Lee 4 South);
- Railway land located to the south; and
- Worth Place, which is a bitumen road, and vacant undeveloped land to the east.

2.4 Proposed Development

The site is to be developed for high density residential land uses. No other information was provided.

The proposed development is considered by RCA to fall within a 'residential with minimal access to soil' exposure scenario.

2.5 Site Condition

At the time of the initial inspection the majority of the HDA remained undeveloped.

South Park extends approximately 225 m along the railway easement and 45 m north-south. Materials have been stockpiled at the site and form a grassed mound across the entire South Park site.

At the time of the site visit in April 2005 a small square section adjacent to Honeysuckle Drive had been excavated to approximately 1m. A small stockpile (50 m^3) was noted within a fenced section, leased to Buildev, which is used for the temporary storage of construction materials and site sheds. RCA indicate that this material has been removed from site to Lot 1112 also within the HDA. The remainder of the site remained grassed.

Surface water is likely to flow into a stormwater system that discharges into Newcastle Harbour, the nearest surface water receptor.

3 STRATIGRAPHY AND HYDROGEOLOGY

3.1 Stratigraphy

The majority of land within the HDA has been reclaimed from Newcastle Harbour and Cottage Creek using fill materials. The depth of these materials varies across the HDA, increasing towards the harbour. Previous and current investigations indicate that the fill materials used across the HDA contain substances that are associated with the following:

- past rail activities i.e. railway sleepers, rail spikes
- energy production i.e. coal ash, chitter, coal tar and slag
- construction activities i.e. pipes, wood, building rubble.

While the entire site is grassed, including the 2 m high stockpiled mound, materials such as bricks and rubble were noted within the surface soils. Depth of filling increases towards the south of the South Park Site.

The stratigraphy at South Park as outlined by RCA (November 2003) is summarised in Table 3.1.

Table 3.1 – Generalised Site Stratigraphy

Approximate Depth (m)	Description
0 – 3.0	Fill: Gravels within a sandy and silty matrix. Dark brown to black in colour. Slag gravels, cobbles, and steel fragments. Coal fines and coal tar were encountered over the north of the Site. Depth decreases to approximately 1.5 m towards the northern boundary.
3.0 – depth	Natural : Brown, medium to coarse grained sands. Or Natural: Light grey fine to medium grained sands

Bedrock was not encountered during the investigation at a maximum depth of 5 m.

3.2 Hydrogeology

Groundwater across the HDA is relatively shallow and given its close proximity to Newcastle Harbour, is tidally influenced. Wells installed adjacent to the harbour reported salinity similar to that expected of seawater. Overall flow direction is towards Newcastle Harbour.

Groundwater was encountered in the monitoring wells approximately 3 m below ground level (BGL) within the alluvial sands. Groundwater was encountered at the upper limit of the natural material.

The groundwater levels at South Park are consistent with the levels encountered across the Honeysuckle Development Area.

Nine registered wells for domestic, recreational and industrial use are located within a 1 km radius of the HDA. The depth to water ranged from 4.9 to 10.1 m BGL.

4 SITE HISTORY

The majority of land within the HDA was reclaimed from Newcastle Harbour and the mouth of Cottage Creek sometime between 1896 and 1944. The HDA has previously been used by various government authorities for rail and port related activities. The site history for South Park has been summarised as follows:

- the site was occupied by railway infrastructure and associated workshops from the mid 1950's until mid 1990's.

It is the Auditor's opinion that the site history gives only an indication of the potentially contaminating activities that occurred at South Park. This knowledge has been further enhanced by the high density of sampling, analyses and remediation works undertaken.

5 CONTAMINANTS OF CONCERN

Following a review of the site history and previous investigations undertaken adjacent to the site, the Auditor identified the key contamination sources and activities. These have been tabulated below. These are similar to those identified by the Consultant.

Table 5.1 – Contaminants of Concern

Activity	Contaminants of Concern
Filling	Unknown, could include petroleum hydrocarbons, PAHs, heavy metals (especially Cu, Pb, Zn).
Wharf and storage facility – unknown activities eg spills, pesticide spraying	Could include petroleum hydrocarbons, PAHs and heavy metals

In addition to those contaminants of concern outlined in Table 6.1, PB (2002) identified:

- OCPs, OPPs and PCBs as contaminants of concern for the fill materials which were reflected in the analytical suite by PB and the delineation investigation conducted by RCA.

Asbestos was not identified as a contaminant of concern for fill materials, however samples were submitted for analysis.

In the Auditor's opinion the contaminants of concern listed above are adequately reflected in the analytical suite used by the Consultants, PB and RCA. The individual substances included in each analytical suite are listed in Appendix D.

6 EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

The Auditor has assessed the overall quality of the sampling and analysis program outlined in the reports prepared by PB and RCA in reference to EPA (1997) *Guidelines for Consultants Reporting on Contaminated Sites*. The comments below relate to groundwater and soil investigation works and soil validation results.

The Auditor's assessment follows in Tables 6.1 and 6.2.

Table 6.1 – QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Comments
Representative Sampling: Sampling Pattern, Density and Depth	**Groundwater**: Two wells initially installed by PB were sampled once by PB. Two additional wells were installed by RCA. Over time, a total of four wells have been sampled at South Park with an additional 27 wells, comprising a groundwater well network, located across the Honeysuckle Development Area. The Auditor considers this to be an adequate density. **Soil Investigation**: An approximate grid pattern. The sampling density of 20 locations over 8946m^2 meets the minimum requirement recommended by EPA (1995) "Sampling Design Guidelines". This density provides a 95% confidence of detecting a residual hot spot of approximately 25 m diameter. Additional samples and remediation works were targeted to an area of suspected tar. RCA undertook sampling of fill material in the same locations previously targeted by PB, as fill from only a limited number of test pits had been submitted for analysis. **Soil Validation**: Validation sampling was undertaken from the base of the excavation at a spacing of approximately 5 to 8 m. Given that the fill removal was controlled using visual means this density is considered appropriate. Validation of the final excavation consisted of test pits excavated at the edge and visual indications during the works. Wall validation samples were collected at between 0.5 and 1.7 m depth.

Sampling and Analysis Plan and Sampling Methodology	Comments
Sample Collection	**Soil Investigation:** RCA collected samples by hand with disposable gloves from the test pit excavation. PB Excavations were completed with either a backhoe or a hollow stem auger. Samples were collected with either an SPT or directly from the test pit except for surface samples from boreholes which were collected from the base of the auger. **Soil Validation**: Collected by hand with disposable gloves from the open excavation. **Groundwater:** New disposable bailers were used by PB for each well across the Honeysuckle Development Area. RCA used disposable bailers.
Well Construction	**PB:** Wells are screened over the standing water level and constructed of 50 mm tubing to 5 m with a 3 m screen. **RCA:** Wells are screened over the standing water level, over fill and sand materials to depths of approximately 5.5 m with a 3 m screen.
Detailed description of sampling methods	All samples were placed into sampling bottles provided by the laboratory and chilled during transport to the labs. Samples to be analysed for heavy metals were field filtered by RCA. PB and PPK do not indicate whether samples were field filtered prior to metals analysis. The metals concentrations reported may therefore be over- or under-estimated depending on the groundwater pH.
Chain of custody	Chain of Custody for all samples were provided for all of the samples submitted for laboratory analysis.
Detailed description of field screening protocols	**Soil Investigation:** PB: Field screening of the test pits was undertaken and results were reported within the test pit logs. The highest PID concentration was 41 ppm within fill above the water table. This sample was not submitted for TPH analysis (although it was for PAH analysis). A high value of 37 ppm was reported for fill containing a rail sleeper. This sample was submitted for TPH, BTEX and PAH analysis. Calibration field day sheets were provided. RCA: No field screening was undertaken. **Soil Validation**: Visual observations were used to screen the excavations as the difference between fill and natural was said to be visually obvious. **Groundwater** parameters were measured during

Sampling and Analysis Plan and Sampling Methodology	Comments
	development and purging of the wells by PB and RCA.
Decontamination Procedures	**Soil Investigation:** All sampling equipment including trowels, augers and split spoon samplers were decontaminated between sampling locations. **Soil Validation**: Disposable gloves were used. **Groundwater:** New disposable bailers were used for each well by PPK and RCA.
Sampling Logs (indicating sample depth)	**Soil Investigation RCA**: Logs were provided that indicate sample top depth and stratigraphy. **PB**: The borehole and test pit logs are generally lacking in detail, particularly in relation to sample depths and identified materials. The laboratory noted that some of the samples submitted for asbestos analysis contained fragments of plaster and debris. The borehole logs did not provide any indication of these materials. This reduces the general confidence in the asbestos test results. **Soil Validation**: A sample register was provided which included depth, fate and sample description.

Table 6.2 – QA/QC – Laboratory and Field QA/QC Assessment

Lab and Field QA/QC	Comments
Practical Quantitation Limits (PQLs).	Not all PQLs for the groundwater assessment were sufficiently low, with some PAHs exceeding the PQLs. This has been considered by the Auditor in the results. All PQLs for soil results were met.
Field Quality Control Samples	**Soil Investigation: RCA:** Four inter-laboratory and three intra-laboratory duplicate samples at a frequency of 12% were submitted for analysis. One rinsate blank, two field blanks, one soil trip spike and one water trip spike were submitted for analysis. **Soil Validation**: One blind soil duplicate pairs and three inter-laboratory duplicates were submitted for analysis. Three trip blank samples. **PB**: Groundwater field quality control samples were

Lab and Field QA/QC	Comments
	undertaken by PB for the whole of the HDA.
Field QA/QC undertaken	The results from most quality control samples were within appropriate limits. The exceptions included the following. **RCA:** Inter-laboratory duplicate pair exceeded the RPD of 30% for Fluoranthene (73%) and Pyrene (63%). The check laboratory reported the higher concentrations for these particular contaminants. **PB**: Trip blanks for the HDA reported copper (2 µg/L), zinc (7 µg/L) and mercury (2 µg/L) marginally above PQLs. Given the low levels detected these are unlikely to affect the results and the conclusions of the audit. Intra-laboratory Duplicates: TPH and OCPs were less than PQLs and RPDs for the remaining analytes were generally < 30%. However, a number of metals and individual PAHs had RPDs > 50% (4 metals samples and 1 PAH sample (Fluoranthene and Pyrene)). The concentrations of metals, B(a)P and total PAHs were well below criteria. The RPDs for inter-laboratory duplicates for PAHs were less than 30% where concentrations were > 10x PQLs. One metal sample reported RPDs >30% for lead, manganese and copper.
Data Quality Objectives (DQOs)	**PB**: Predetermined data quality objectives (DQOs) were set and discussed in relation to the results. **Soil Investigation and Validation (RCA)**: DQOs were set for laboratory analyses. These were discussed with regard to the five category areas for the investigation works that concluded the QA/QC documented for the soil samples was of 'sufficient quality'. The validation QA/QC dialogue indicated that the results are 'accurate and reliable'.
NATA registered laboratory and NATA endorsed methods	Laboratories used included: Labmark, Amdel, ALS, ASET (Asbestos PB) and HLA (RCA Asbestos). All laboratory certificates were NATA stamped. The Amdel (check laboratory) method for benzo(a)pyrene in water was not NATA Accredited.
Analytical methods and holding times	In-house analytical methods were included in the laboratory test certificates. RCA provided method details and the relevant USEPA or APHA method codes. Review of the COCs and laboratory certificates indicate that the holding times had been met. This was confirmed by RCA.

Lab and Field QA/QC	Comments
Laboratory QA/QC undertaken	Method blanks, laboratory duplicates, surrogates, laboratory control samples and matrix spikes and matrix spike duplicates were undertaken at appropriate frequencies.
Laboratory QA/QC evaluation	The results from most laboratory quality control samples were within appropriate limits. **PB**: RPD for laboratory duplicate pair for fluroanthene and pyrene marginally exceeded the RPD of 30%. **RCA Investigation**: A number of ALS spike recoveries for pyrene (minimum of 50%), TPH C15-C28 (min 62%), TPH C29-C36 (min 56%), 4-chloro-3-methylphenol (58%) and pentachlorophenol (40%) were less than the desired recovery range. These were all within the same report number which included the soil investigation results. Elevated concentrations of PAHs and TPH C10-C36 were detected by RCA. The inter-laboratory duplicate for pyrene was reported at a higher concentration than for the primary sample with the RPDs for pyrene at 63%. RPDs for C10-C36 were low. The Auditor notes that the spike recoveries were low and that PAH/TPH may be under reported. This has been considered in the review of the results. The only other PAH with a matrix spike was acenaphthene which reported spike results within the appropriate control limits. All other spike recoveries were between the control limits of 70 and 130%. Positive results were obtained in three of the method blanks with TPH C6-C9 and TPH C15-C28 detected above the PQLs. The Auditor considers that the results do not affect the conclusions. Surrogate recoveries were slightly below the limits which RCA considered to be minor discrepancies and not of concern. **Soil Validation**: Benzo(a)pyrene spike recovery results were not available due to significant background concentrations.

In considering the data as a whole, the Auditor concludes that the data is likely to be reliable and useable for the purpose of this audit.

7 ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed the soil data provided by RCA in reference to Soil Investigation Levels for Urban Redevelopment Sites in NSW (SIL Column 4 – 'commercial/industrial' in EPA (1998) *Guidelines for the NSW Site Auditor Scheme*.

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

The Auditor has assessed the groundwater data in reference to ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* for marine waters. Trigger values (TVs) provided are concentrations that, if exceeded, indicate a potential environmental problem and "trigger" further investigation.

There are no EPA-endorsed guidelines for asbestos in soil. The EPA states that the position of the Health Department is that there should be no asbestos in surface soil.

The current criteria for individual substances are reproduced in Appendix B.

Low reliability ANZECC (2000) trigger values have been used where they exist for the individual PAHs (Appendix B). However, a trigger level for total PAHs within groundwater is not provided within the ANZECC (2000) guidelines. As such, the threshold level of 3µg/L from the NSW EPA (1994) Service Station Guidelines has been adopted.

8 EVALUATION OF SOIL ANALYTICAL RESULTS

Soil samples collected prior to any remedial or validation work were tested for a variety of contaminants including PAHs, TPH, BTEX, OCPs, asbestos and heavy metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg). The analytical suite included the most likely contaminants of concern. Overall results for the fill sampled by PB and RCA have been summarised below in Table 8.1. It should be noted that up to three samples were collected in some locations from the same layer of fill material.

The results do not include those obtained from a small tar impacted section on the northern boundary with particularly elevated concentrations of benzo(a)pyrene, total PAHs and TPH C10-C36. Coal tar and coal fines had previously been noted by PB and the material was targeted for remediation works as detailed in Section 10. Soil sampling locations are shown as Appendix A, Attachment 3.

Table 8.1 - Evaluation of Soil Analytical Results – Summary Table (mg/kg).

Analyte	n	Detections	Maximum	n > SIL Column 2 *(EPA 1998)*	*n* > SIL Column 5 *(EPA 1998)*	*n* >EPA *(1994)*
PAHs (total)	52	47	121	**2**	N/A	N/A
Benzo(a)pyrene	52	43	8.5	**4**	N/A	N/A
Benzene	37	1	0.4	N/A	N/A	0
Toluene	37	2	1.5	N/A	N/A	**1**
Ethylbenzene	37	1	0.3	N/A	N/A	0
Xylene	37	2	4	N/A	N/A	0
TPH (c6-c9)	37	4	24	N/A	N/A	0
TPH (c10-c36)	37	2	1031	N/A	N/A	**1**
Asbestos	10	**1**	N/A	N/A	N/A	N/A
Arsenic	27	27	143	0	**4**	N/A
Cadmium	27	7	3	0	0	N/A
Total Chromium	27	26	553	0	0	N/A
Total Cobalt	17	15	8	N/A	N/A	N/A
Copper	27	15	2310	0	**12**	N/A
Lead	27	27	2880	**1**	**2**	N/A
Nickel	27	26	24	0	0	N/A
Zinc	27	27	909	0	**17**	N/A
Manganese	17	17	362	0	N/A	N/A

Mercury (inorganic)	35	17	10	0	**1**	N/A
Total OPPs	2	0	-	0	N/A	N/A
Total OCPs	7	0	-	0	N/A	N/A
PCB	7	0	-	0	N/A	N/A

Note: N/A is not applicable

The most elevated concentrations of metals were detected in the fill material with the exception of manganese where the maximum concentration of 993 mg/kg was detected in the underlying natural alluvial sands.

Elevated concentrations of PAHs and benzo(a)pyrene were detected randomly over the site with two samples exceeding the SILs for PAHs and four for benzo(a)pyrene which is a maximum of 8% of samples. The most elevated concentration of total PAHs was reported during the RCA investigation at 120 mg/kg within a layer of fill that contained a rail sleeper. The 95% UCL for PAHs is 28 mg/kg and for benzo(a)pyrene 2.2 mg/kg, both of which are well below the SILs.

TPH C_{10}-C_{36} was reported at 1031 mg/kg marginally above the criteria of 1000 mg/kg. There was no indication of BTEX, TPH C_6-C_9, OCP or PCB contamination.

One of three samples submitted for asbestos identification reported the presence of asbestos fibres. Chrysotile asbestos was detected by ASET within one sample submitted by PB for analysis which was noted to contain fragments of plaster by the laboratory. The logs did not report any plaster. Asbestos was not detected in any of the other 6 samples submitted by RCA to HLA Envirosciences Pty Ltd Newcastle for analysis or the two samples submitted by PB to ASET. Neither RCA nor PB recorded the presence of visible asbestos in any sample. The Auditor considers that adequate investigations have been undertaken.

The sample that reported the presence of asbestos also reported slightly more elevated concentrations of copper, lead and mercury that detected in other samples at the site.

Lead was reported at 2880 mg/kg above the SIL of 1200 mg/kg within this one sample. Metals were detected at slightly elevated levels across South Park with copper, lead, zinc and mercury detected marginally above the provisional phytotoxicity criteria.

In the Auditor's opinion, the soil analytical results are consistent across the site and the fill material has been adequately characterised. The Auditor is satisfied that no further investigations are needed and that the site criteria for residential with minimal access to soil has been achieved for fill material not associated with the tar material to be targeted for further remediation as detailed in Section 10.

9 EVALUATION OF GROUNDWATER ANALYTICAL RESULTS

Fill materials across the HDA are characterised by elevated concentrations of PAHs and TPHs. Fill over some areas of the HDA have also been impacted by elevated concentrations of metals. Considering the distribution of these impacted materials across the HDA and the arbitrary boundaries between land parcels, groundwater at the HDA has been considered as one data set.

Groundwater samples collected from over the HDA were tested for a variety of contaminants including PAHs, TPH, BTEX, OCPs and heavy metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg). Twenty-one of the wells were sampled and analysed in April 2002. Six further wells installed and sampled between January 2003 and April 2004 have been included in the summary for the HDA.

PB installed and sampled two wells at the site in April 2002. RCA installed two groundwater wells on the down gradient section of South Park, one of which was within the remedial area, prior to remediation works. The wells were sampled in April 2004. All four samples were submitted for TPH, BTEX, PAHs and metals.

Overall results for the HDA and local groundwater results for South Park have been summarised in Table 9.1. These results do not include as detections those where the PQL was greater than the trigger value.

Table 9.1 - Evaluation of Groundwater Analytical Results – Summary Table (µg/L).

Analyte	Honeysuckle Development Area			South Park		
	Detections *n* = 27	Maximum	n > trigger values	Detections *n* = 4	Maximum	n > trigger values
Arsenic	24	130	**18**	4	23	**1**
Cadmium	4	0.4	0	0	-	0
Total Chromium	10	7	0	4	-	0
Copper	24	59	**23**	4	3	**3**
Lead	13	86	**9**	1	5	**1**
Manganese	22 (n=24)	1240	**15**	2 (n =2)	93	0
Nickel	21	8	**2**	3	3	0
Zinc	27	300	**15**	4	93	**2**
Mercury (inorganic)	0 (n = 24)	-	0	0 (n = 2)	-	0
TPH (c6-c9) (µg/L)	2 (n=23)	420	N/A	0	-	NA
TPH (c10-c36) (µg/L)	5 (n=24)	5010	N/A	2	70	NA
Benzene	1 (n=24)	61	0	0	-	NA
Toluene	1	26	0	0	-	NA

Analyte	Honeysuckle Development Area			South Park		
	Detections *n* = 27	Maximum	n > trigger values	Detections *n* = 4	Maximum	n > trigger values
	(n=24)					
Ethylbenzene	1 (n=24)	180	**1**	0	-	NA
Meta- & para- Xylene	1 (n=24)	15	0	0	-	NA
Ortho - Xylene	1 (n=24)	3	0	0	-	NA
Benzo(a)pyrene	5	2	**4**	3 (1 PQL > TV)	2	**3**
Naphthalene	4	92	0	0	-	0
Phenanthrene	5	10	**2**	1	0.3	0
Anthracene	3	1.7	**2**	1 (2 PQL > TV)	0.2	**1**
Fluroanthene	11	4	**6**	3 (1 PQL > TV)	4	**1**
PAHs – total*	10	118	**8**	3 (1 PQL > TV)	36	**3**

Notes: NA – not analysed *assessed NSW EPA (1994)

9.1 Metals

Across the HDA copper and zinc were found at elevated concentrations in some fill materials, with manganese almost inherent at elevated levels within the fill materials. Heavy metals are found at concentrations above trigger values in many wells over the HDA. Manganese was also detected within groundwater across the HDA. These minor impacts to groundwater are likely to have occurred from the local migration of metals from impacted soils. It is the Auditor's opinion that metals within the groundwater across the HDA have generally been adequately characterised.

At South Park, arsenic and zinc were detected in the groundwater at elevated concentrations although less than those generally detected at the HDA.

9.2 PAHs

PAHs are the most common contaminants found in the fill materials over the HDA with the greatest concentrations detected in association with coal tar.

The PQLs for benzo(a)pyrene, anthracene and fluoranthene were above the trigger levels. Benzo(a)pyrene, anthracene, fluoranthene and total PAHs were reported marginally above the adopted criteria. These results are mostly consistent with those reported for the HDA and following the removal of fill from the site, are unlikely to change.

Benzo(a)pyrene was detected in three wells at South Park with the PQL for the remaining well above the trigger value. Given the widespread detections at the site

and given that the down-gradient detection in groundwater in the tar fill was no greater than those on the up-gradient side, the source is not considered to be on-site.

9.3 Petroleum Hydrocarbons

Only localised elevated concentrations of petroleum hydrocarbons have been reported for the HDA. Petroleum impacted groundwater was previously encountered approximately 50 m south of the site. The associated impacted materials have been removed from that site however potentially impacted groundwater at Lee Wharf A was not targeted for remediation.

TPH C_{29}-C_{36} was detected at the up-gradient well at South Park at a low concentration of 70µg/L. This concentration is similar to those previously detected at the HDA.

9.4 Conclusion

RCA conclude that 'remediation of groundwater at the site is not considered a requirement, as contaminants identified are only marginally greater than the guidelines and are limited in extent'.

The Auditor notes that groundwater results are consistent with those over the HDA and the types of fill material encountered at the site. The results indicate that there is some minor impact from PAHs and TPH C_{29}-C_{36} which is most likely sourced from off-site. Any other potential sources in the fill that may have contributed to the overall concentrations have been addressed by the remedial works outlined in Section 10. The Auditor is satisfied that no further investigations are needed.

10 EVALUATION OF REMEDIATION

10.1 Remediation Required

The RAP indicated that the extent of remediation required was limited to an area where elevated concentrations of PAHs and TPH had been detected in association with coal tar.

The remediation goal was to 'render the soil and groundwater at the site suitable for the proposed residential development'.

10.2 Remediation Works

Based on the investigations completed RCA determined that impacted soil targeted for removal could be sent as asphalt waste to landfill and that the proposed option of excavation and disposal would 'enable the site to be cleared of contamination and remove the requirements for long term management plans'.

The remedial works involved the excavation of material consisting of black coal tar (Appendix A, Attachment 4) in January 2005. The tar was located under the fill material previously characterised by RCA and PB. Due to the sloping nature of the site, the excavation varied in depth from 0.5 m at the northern edge to 1.2 m along the southern edge over an area of 24 m^2. The excavation was extended until all visible tar was removed and a visually clean sand base was encountered. The Auditor considers this approach to be appropriate as the material was reportedly visually distinguishable from the fill material and the underlying sands.

A 'dark contaminated layer' comprising gravel, coal washery reject and some ash approximately 0.3 m thick was visible in walls of the excavation in all directions. Coal tar was not apparently observed in this layer. Sampling indicated that the layer was 'contaminated' and further excavations in February 2005 involved removal and stockpiling of the overlying fill material and excavation of the contaminated layer until sands were encountered at depth. The dark layer was found to continue to within 0.5 m to 1 m of the final western and southern walls and to the eastern wall where the dark layer was still encountered.

The walls of the excavation consisted of ballast sized gravel and coal washery reject. Sampling indicated that 'contamination' remained in the walls.

Two test pits to the west, two to the south and seven to the east of the February 2005 excavation were excavated in April 2005 as the final validation samples. Samples were collected from the layer encountered directly above the sand base.

The fill layer extended beyond the northern boundary however, excavations did not continue due to the presence of Telstra optic fibre corridor. The excavation was infilled with the excavated fill material and other fill material that covers the South Park site.

The tar layer was 'easily visually identifiable and was separated from the overlying fill through visual assessment'. The overlying fill was stockpiled and visually validated.

10.3 Validation Activities

Four original wall validation samples were collected in January 2005 from the excavation walls. These apparently targeted the dark layer with TPH C_{10}-C_{36} reported above the criteria of 1000 mg/kg with a maximum of 2720 mg/kg. PAHs were detected in all wall validation samples with the maximum reported to the south of 95 mg/kg and benzo(a)pyrene at 6 mg/kg, both marginally above the criteria.

Following further excavations to the west, south and east, four validation samples were collected in February 2005 from the slag and coal washery reject material. These results reported greater concentrations of PAHs than the original validation samples with total PAHs ranging between 128 mg/kg to 707 mg/kg and benzo(a)pyrene between 2.4 mg/kg and 60 mg/kg. The concentrations of TPH were lower with a maximum of 1165 mg/kg reported.

The excavation was extended only in parts towards the north due to the presence of the fibre optic cable and one validation sample was collected to represent the soils retained. The sample collected in February 2005 reported low concentrations of PAHs at a maximum of 36 mg/kg below the criteria and TPH C_{10}-C_{36} at 1990 mg/kg, marginally above the criteria.

Further excavations were undertaken to the west and south and results from two test pits collected in March 2005 on the west wall and three on the south. These results generally reported only low concentrations of TPH at 305 mg/kg and PAHs mostly less than 15 mg/kg. A slightly elevated concentration of benzo(a)pyrene at 4.2 mg/kg was reported marginally above the criteria of 4 mg/kg in one of the boreholes to the south. The borehole logs indicate that the coal washery reject layer was removed to the west and south of the original excavation.

The test pits excavated to the east of the excavation in March 2005 reported elevated concentrations (results not provided) and excavations continued a further 15 metres to the east. The test pits (March 2005) and wall validation samples (April 2005) located at the extent of the excavation reported TPH C_{10}-C_{36} between 240 mg/kg and 2100 mg/kg and only low concentrations of PAHs with a maximum of 38 mg/kg. These were collected from a black sand layer containing coal washery reject with ash that continues to the east with a thickness of 0.1 m.

Base validation samples were collected from the 'underlying dredged sand' across the excavation at depths varying between 0.5 and 1.8 m depth increasing due to the sloped nature of the site. The results are shown in Table 10.1. One base sample reported total PAHs at 101 mg/kg and benzo(a)pyrene at 8 mg/kg above the criteria of 80 mg/kg and 4mg/kg. One other sample reported benzo(a)pyrene at 4.3 mg/kg. RCA indicate that the sand has been 'locally affected by the overlying coal tar'. Both samples were collected in the area of the former coal tar area. All other samples reported PAHs and benzo(a)pyrene at concentrations below the criteria.

Table 10.1– Evaluation of Validation Analytical Results – Summary Table (mg/kg).

Analyte	n	Detections	Maximum	n > SIL Column 4 (EPA 1998)	NSW EPA (1994)
TPH (C_{10}-C_{36})	11	1	350	NA	0
Total PAHs	11	7	101	**1**	NA
Benzo(a)pyrene	11	7	8	**1**	NA

While some residual contamination was encountered in the base sands from the previously overlying coal tar material, the Auditor considers these to be minor. The test pit logs and validation sampling results indicate that the black layer consisting of coal washery reject and gravels has been removed from the site to the west and south and has been shown to only contain minor TPH impact at the eastern and northern boundaries.

In the Auditor's opinion the excavations have been adequately validated. The Auditor is satisfied that no further investigations are needed and that the site criteria for residential land uses with minimal access to soil have been met.

11 CONTAMINATION MIGRATION POTENTIAL

Given that the most impacted layer has now been removed, residual amounts at the northern and eastern boundaries at 1.4 m reported only low concentrations of contaminants and as groundwater is located at approximately 3 m, the risk of future migration of contaminants to groundwater is considered to be low.

12 ASSESSMENT OF RISK

Given that the remedial excavations were adequately validated and that overall impact is below the human health based threshold concentrations, it is considered that the site would present a low risk to human health if the site were developed for residential land uses with minimal access to soil.

Concentrations of copper, lead, zinc and mercury exceeded the provisional phytotoxic guidelines set by the NSW EPA (1998). There is a risk to plant health from metal phytotoxicity if the fill material is to be located outside the building or slabs of the proposed development. The details of the proposed development were not provided.

13 COMPLIANCE WITH REGULATORY GUIDELINES AND DIRECTIONS

Guidelines currently approved by the EPA under section 105 of the NSW *Contaminated Land Management Act 1997* are listed in Appendix C. The Auditor has used these guidelines.

The RCA investigation and validation works were generally reported in accordance with the EPA (1997) *Guidelines for Consultants Reporting on Contaminated Sites*. The checklist included in that document has been completed and is kept on file. The EPA's *Checklist for Site Auditors using the EPA Guidelines for the NSW Site Auditor Scheme 1998* (December 1999) has also been completed and is kept on file.

No regulatory approvals and licences are known to be required for works at the site.

Approvals from the landfills licensed by the EPA to accept the wastes as classified. RCA indicate that all wastes were classified and disposed of in accordance with the EPA (1999) *Assessment, Classification and Management of Liquid and Non-Liquid Wastes*. Waste was tracked from site to the landfill. RCA indicate that laboratory analysis of the coal tar material was undertaken during previous works, including the analysis of asphaltenes. Given that RCA deemed that the layer related to road construction and the positive results, the waste was classified as inert waste.

14 CONCLUSIONS AND RECOMMENDATIONS

The Consultant, RCA, considers 'that the site is now considered suitable for the proposed high density residential site use'.

Based on the information presented in the Consultant's reports and observations made on site and following *EPA (1998) Decision Process for Assessing Urban Redevelopment Sites*, the Auditor concludes that the site is suitable for the purposes of 'residential with minimal access to soil'.

It is recommended that groundwater should not be used on-site unless it is demonstrated to be suitable for site specific uses.

The phytotoxicity of the various metals within the soils should be assessed and the appropriate landscaping undertaken, if the fill materials are to be used for landscaping at the site.

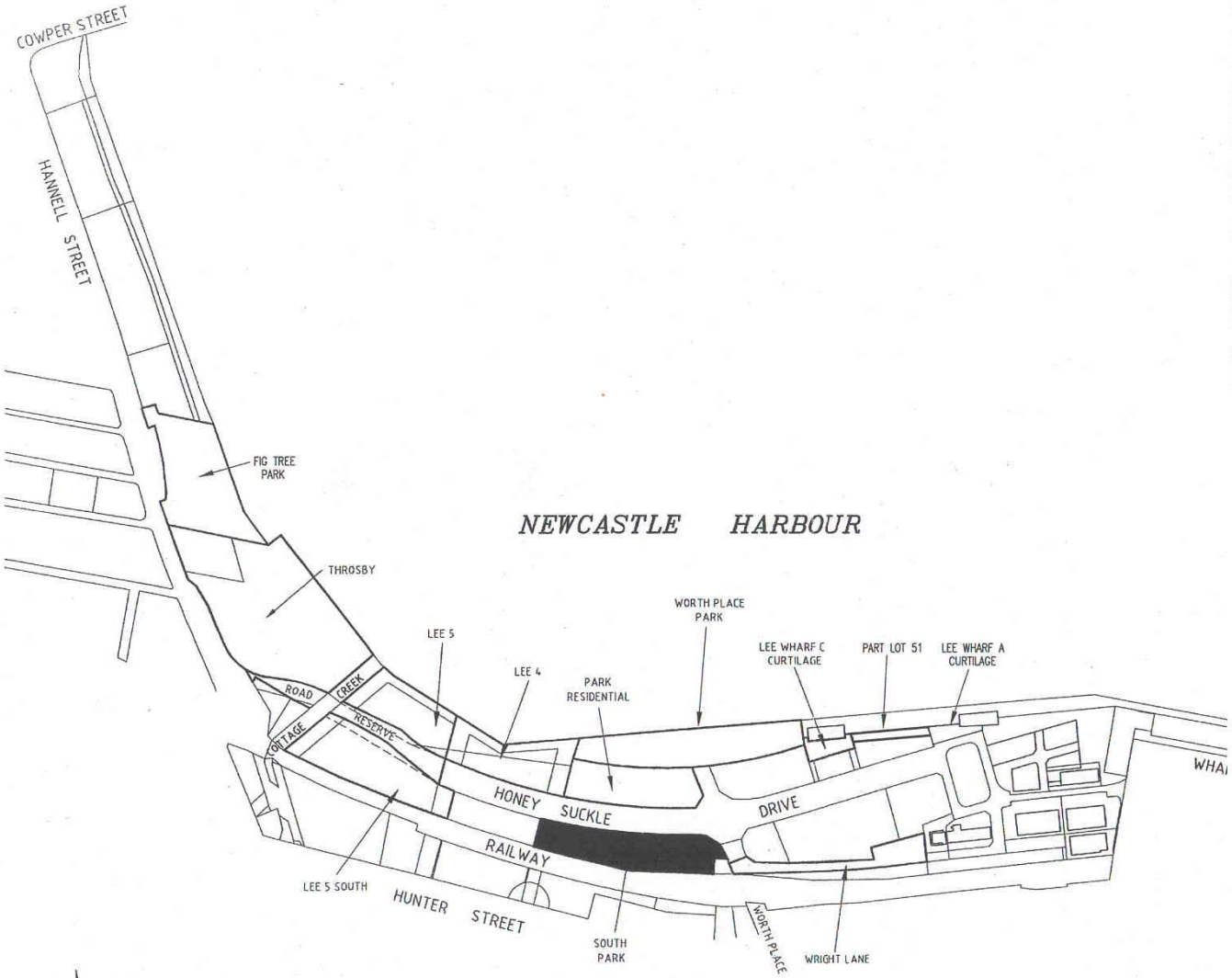
15 OTHER RELEVANT INFORMATION

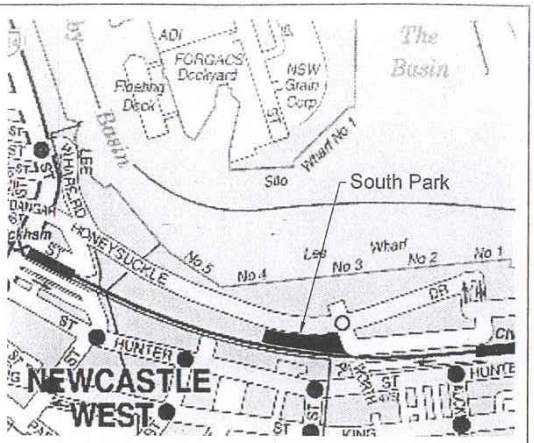
This Audit was conducted for Honeysuckle Development Corporation to provide an independent review of the suitability of the site for its intended use. The audit falls within the definition of an audit under Section 47(1)(b)(iia) of the *NSW Contaminated Land Management Act 1997*, No. 140. This audit report may not be suitable for other uses. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which he had some control or is reasonably able to check.

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

APPENDIX A

ATTACHMENT 1	Honeysuckle Development Area
ATTACHMENT 2	Survey Plan
ATTACHMENT 3	Site Plan and Investigation Locations
ATTACHMENT 4	Excavation Extent and Validation Locations





Locality Plan

ATTACHMENT 1 – Honeysuckle Development Area

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

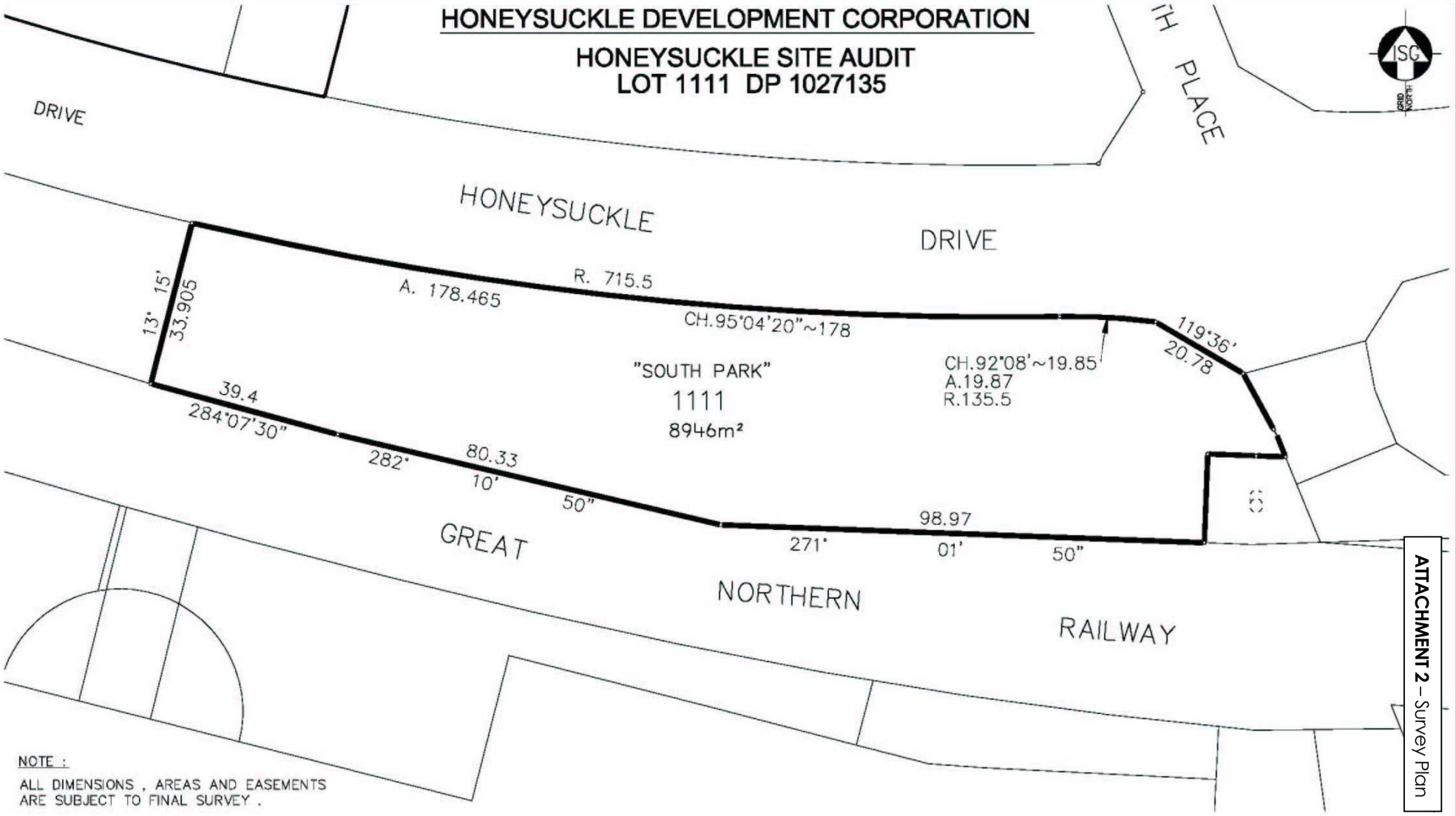
SITE LOCATION PLAN
CONTAMINANT REMOVAL AND VALIDATION
SOUTH PARK, HONEYSUCKLE

CLIENT	Honeysuckle Development Corporation			PROJECT No	3656a
DRAWN BY	SJA	SCALE	As Shown	DRAWING No	1 REV 0
APPROVED BY	SJK	DATE	20/5/05	OFFICE	NEWCASTLE

CDT-DWG-A3V-001/1

HONEYSUCKLE DEVELOPMENT CORPORATION

HONEYSUCKLE SITE AUDIT
LOT 1111 DP 1027135



NOTE :

ALL DIMENSIONS , AREAS AND EASEMENTS ARE SUBJECT TO FINAL SURVEY .

ATTACHMENT 2 – Survey Plan

HARPER SOMERS O'SULLIVAN
SURVEY, ECOLOGY, PLANNING, DEVELOPMENT
241 DENISON STREET , BROADMEADOW
NEWCASTLE , NSW , 2292. DX 7949 NEWCASTLE
PHONE (02) 4961 6500
FAX (02) 4961 6794 E-mail: survey@hso.com.au

Surveyed by	Date
Designed by	
Drawn by M.JOHNSTON	
Checked by	

Title
HONEYSUCKLE SITE AUDIT PLAN
LOT 1111 DP 1027135

Client
HONEYSUCKLE DEVELOPMENT CORPORATION

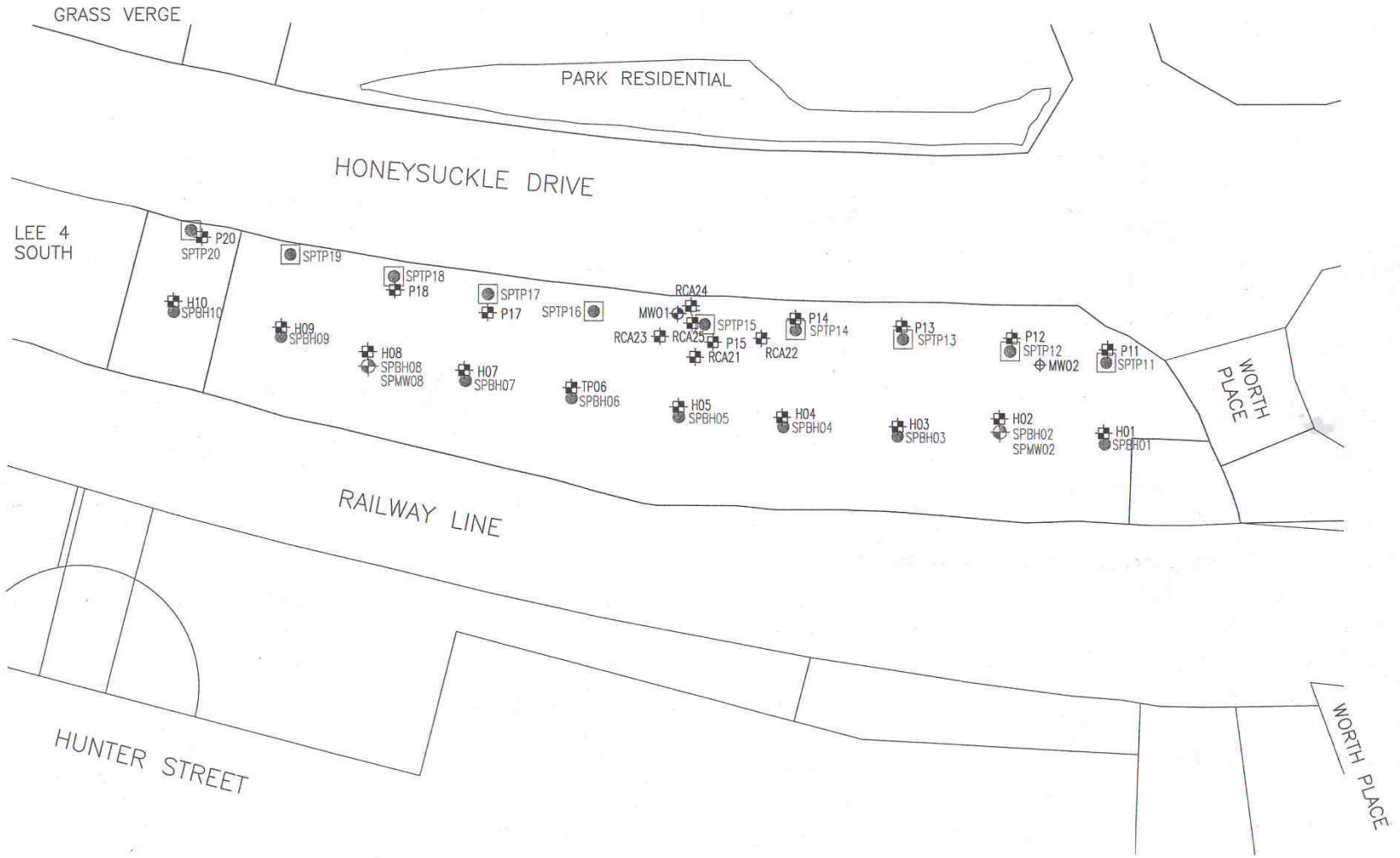
Scale:
1 :750

Autocad ref:
H://16819_SITE AUDIT_ MARCH 2003.dwg

Date
11TH NOVEMBER 2003

HSO
HARPER SOMERS O'SULLIVAN
REFERENCE No. : 16819

ATTACHMENT 3 – Site Plan and Investigation Locations



LEGEND

- Groundwater monitoring well location (PB 2002)
- Bore hole sampling point (PB, 2002)
- Test pit sampling point (PB, 2002)
- Approximate test pit location (RCA, 2004)
- Approximate groundwater monitoring well location (RCA, 2004)

NOTE: Drawing adapted from drawing supplied by Honeysuckle Development Corporation drawn by Parsons Brinkerhoff, Title: Site Layout and Soil Sampling Locations– South Park. Figure 2

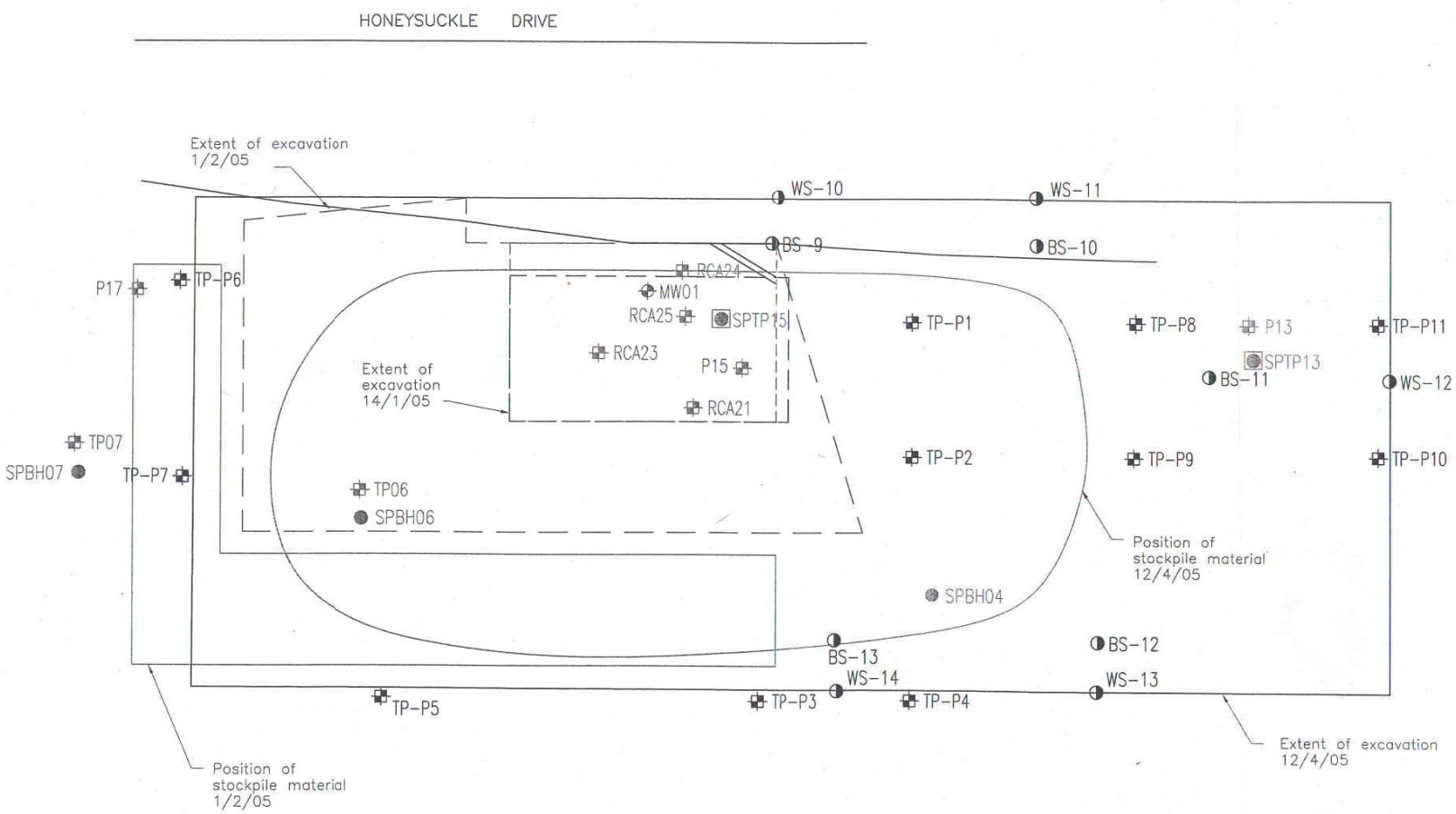
RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

SAMPLE LOCATION PLAN
CONTAMINANT DELINEATION AND
REMEDIAL ACTION PLAN
SOUTH PARK, HONEYSUCKLE

CLIENT	Honeysuckle Development Corporation			PROJECT No	3656
DRAWN BY	SJA	SCALE	1 : 1000	DRAWING No 3	REV 0
APPROVED BY	SA	DATE	17/8/04	OFFICE	NEWCASTLE

CDT-DWG-A3H-001/1

ATTACHMENT 4 – Excavation Extent and Validation Locations



LEGEND

- Validation sample location
- Bore hole sampling point (PB, 2002)
- Test pit sampling point (PB, 2002)
- Approximate test pit location (RCA, 2004)
- Approximate groundwater monitoring well location (RCA, 2004)
- Approximate test pit location

0 1 2 3 4 5
metres

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

SAMPLE LOCATION PLAN 12/4/05
CONTAMINANT REMOVAL AND VALIDATION
SOUTH PARK, HONEYSUCKLE

CLIENT	Honeysuckle Development Corporation			PROJECT No	3656a
DRAWN BY	CW	SCALE	As Shown	DRAWING No	5 REV 0
APPROVED BY	SJA	DATE	30/5/05	OFFICE	NEWCASTLE

CDT-DWG-A3H-001/1

APPENDIX B
SOIL AND GROUNDWATER CRITERIA

Soil Investigation Levels for Urban Redevelopment Sites in NSW (EPA 1998)

Health-based investigation levels[1] (mg/kg)					
Substance	Residential with gardens and accessible soil (home-grown produce contributing less than 10% fruit and vegetable intake; no poultry), including children's day-care centres, preschools and primary schools, or town houses or villas (NEHF A)	Residential with minimal access to soil including high-rise apartments and flats (NEHF D)	Parks, recreational open space, playing fields including secondary schools (NEHF E)	Commercial or industrial (NEHF F)	Provisional phytotoxicity-based investigation levels[4] for sandy loams pH 6-8 (mg/kg)
	Column 1	**Column 2**	**Column 3**	**Column 4**	**Column 5**
Aldrin + Dieldrin	10	40	20	50	-
Arsenic (total)	100	400	200	500	20
Benzo(a)pyrene	1	4	2	5	-
Beryllium	20	80	40	100	-
Cadmium	20	80	40	100	3
Chlordane	50	200	100	250	-
Chromium (III) [2]	12%	48%	24%	60%	400
Chromium (VI)	100	400	200	500	1
Copper	1000	4000	2000	5000	100
Cyanides (complex)	500	2000	1000	2500	-
DDT	200	800	400	1000	-
Heptachlor	10	40	20	50	-
Lead	300	1200	600	1500	600
Manganese	1500	6000	3000	7500	-
Methyl mercury	10	40	20	50	-
Mercury (inorganic)	15	60	30	75	1 [5]
Nickel	600	2400	600	3000	60
PAHs (total)	20	80	40	100	-
PCBs (total)	10	40	20	50	-
Phenol [3]	8500	34000	17000	42500	70
Zinc	7000	28000	14000	35000	200

1 The limitations of health-based soil investigation levels are discussed in the National Environmental Health Forum's *Health-based Soil Investigations Levels,* National Environmental Health Forum (NEHF) Monographs, Soil Science No.1 (Imray & Langley, 1996).

2 Soil discolouration may occur at these concentrations.

3 Odours may occur at these concentrations.

4 the provisional phototoxicity-based investigation levels proposed in this document are single number criteria. Their use has significant limitations because phototoxicity depends on soil and species parameters in ways that are not fully understood. They are intended for use as a screening guide and may be assumed to apply to sandy loam soils, or soils of a closely similar texture, for pH 6-8.

5 Total mercury.

Threshold Concentration for Sensitive Land Use – Soils
Guidelines for Assessing Service Station Site (NSW EPA 1994)

Contaminant	**Threshold Concentration (mg/kg)**
TPH (C_6-C_9)	65
TPH (C_{10}-C_{36})	1,000
Benzene	1
Toluene	1.4
Ethylbenzene	3.1
Xylenes (total)	14

Trigger Values (TV) for Screening Marine Water Quality Data (µg/L) for Slightly to Moderately Disturbed Ecosystems (ANZECC 2000)

Contaminant	Threshold Concentration (µg/L))	Guideline Source
Metals and Metalloids		
Arsenic – As (III/V)	2.3/4.5	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Cadmium – Cd	0.7	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Nickel – Ni	7	
Mercury – Hg	0.1	
Manganese	80	Low reliability trigger values (derived from the mollusc figure) from Volume 2 of ANZECC (2000)
Chromium – Cr (III/VI)	27.4/4.4	ANZECC (2000) 95% protection levels.
Copper – Cu	1.3	
Cobalt	1	
Lead – Pb	4.4	
Zinc – Zn	15	
Aromatic Hydrocarbons		
Benzene	500	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Toluene	180	
Ethylbenzene	5	
o-xylene	350	
m-xylene	75	
p-xylene	200	
Polycyclic Aromatic Hydrocarbons		
Naphthalene	50	ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Anthracene	0.01	Low reliability trigger values from Volume 2 of ANZECC (2000) ANZECC (2000) 99% protection level due to potential for bio-accumulation or acute toxicity to particular species.
Phenanthrene	0.6	
Fluroanthene	1	
Benzo (a) pyrene	0.1	
Chlorinated Alkanes		
Tetrachloroethene - PCE	70	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
1,1,2 Trichlorothene- TCE	330	
1,1,2 Trichlorothene- 1,1,2-TCE	330	
Vinyl chloride (chloroethene)	100	
1,1,1 Trichloroethane – 1,1,1-TCA (111-TCE)	270	
1,1 Dichloroethene	700	
1,1 Dichloroethane	250	
1,2 Dichloroethane	1900	
1,1,2 - Trichloroethane	1900	Moderate reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)
Chloroform	370	Low reliability trigger values (95% level of protection) from Volume 2 of ANZECC (2000)

Trigger Values (TV) for Screening Marine Water Quality Data (µg/L) for Slightly to Moderately Disturbed Ecosystems (ANZECC 2000)

Non-Metallic Inorganics		
Ammonia Total – NH_3 (at pH of 8)	910	ANZECC (2000) 95% protection levels.
Cyanide (Free or unionised HCN)	4	

While the low reliability figures should not be used as default guidelines they will be useful for indicating the quality of groundwater migrating off-site.

APPENDIX C
EPA APPROVED GUIDELINES

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

(*as of 17 March 2004*)

Guidelines made by the EPA

- *Contaminated Sites: Guidelines for Assessing Service Station Sites*, December 1994
- *Contaminated Sites: Guidelines for the vertical mixing of soil on former broad-acre agricultural land*, January 1995.
- *Contaminated Sites: Sampling Design Guidelines*, September 1995
- *Contaminated Sites: Guidelines for Assessing Banana Plantation Sites*, October 1997
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, November 1997
- *Contaminated Sites: Guidelines for the NSW site auditor scheme,* June 1998
- *Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report*, April 1999.

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

Guidelines approved by the EPA

ANZECC publications

- *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites,* published by Australian and New Zealand Environment and Conservation Council (ANZECC) and the National Health and Medical Research Council (NHMRC), January 1992
- *Australian Water Quality Guidelines for Fresh and Marine Waters,* Australian and New Zealand Environment and Conservation Council (ANZECC), November 1992, which are only approved for the purposes of contaminated site assessment, investigation, remediation and site auditing under the Contaminated Land Management Act (or other relevant legislation) commenced before September 2001
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Paper No 4, October 2000

EnHealth publications (formerly National Environmental Health Forum monographs)

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

National Environment Protection Council publications

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

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

B(1) *Guideline on Investigation Levels for Soil and Groundwater*

B(2) *Guideline on Data Collection, Sample Design and Reporting*

B(3) *Guideline on Laboratory Analysis of Potentially Contaminated Soils*

B(4) *Guideline on Health Risk Assessment Methodology*

B(5) *Guideline on Ecological Risk Assessment*

B(6) *Guideline on Risk Based Assessment of Groundwater Contamination*

B(7a) *Guideline on Health-Based Investigation Levels*

B(7b) *Guideline on Exposure Scenarios and Exposure Settings*

B(8) *Guideline on Community Consultation and Risk Communication*

B(9) *Guideline on Protection of Health and the Environment During the Assessment of Site Contamination*

B(10) *Guideline on Competencies & Acceptance of Environmental Auditors and Related Professionals*

Other documents

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

APPENDIX D
ANALYTICAL LISTS AND METHODS

LABMARK ANALYTICAL LIST AND METHODS

TARGET COMPOUNDS	LABMARK METHOD ID	METHODOLOGY SUMMARY
POLYAROMATIC HYDROCARBONS		
Naphthalene	E007.1 , E007.2, E007.3	E007.1: (Water) Triple extraction with DCM. Analysis by GC/MS.
Acenaphthylene		
Acenaphthene		
Fluorene		
Phenanthrene		E007.2: (Soil) 8-10g soil extracted with 20mL DCM/acetone (8:2), Analysis by GC/MS.
Anthracene		
Fluoranthene		
Pyrene		
Benz(a)anthracene		
Chrysene		
Benzo(b)&(k)fluoranthene		E007.3: (Water) Triple extraction with DCM followed by concentrations step. Analysis by GC/MS.
Benzo(a)pyrene		
Indeno(1.2.3-c,d)pyrene		
Dibenz(a,h)anthracene		
Benzo(g,h,i)perylene		
TOTAL PETROLEUM HYDROCARBONS		
C6-C9 Fraction	E003.2 E003.1	E003.2 Soil - 8-10g soil extracted with 20mL methanol. Analysis by P&T/GC/FID. E003.1 Water – direct analysis. Purge and Trap/GC/FID. USEPA 8020
C10-C14 Fraction	E006.2	E006.2 Soil - 8-10g soil extracted with 20mL DCM/Acetone (8:2). Analysis by GC/FID.
C15-C28 Fraction		
C29-C36 Fraction	E004.1	E004.1 Water – DCM extraction. GC/FID.

AMDEL ANALYTICAL METHODS

TARGET COMPOUNDS	AMDEL METHOD ID	METHODOLOGY SUMMARY
HEAVY METALS		
Arsenic	E-5910	E-5910 Soil – HNO_3, HCL & H_2O_2 digestion USEPA 200.2 (modification). ICP-AES
Cadmium		
Chromium		
Copper		
Nickel	E-4870	E-4870 Water – dissolved metals
Lead		
Zinc		
Mercury	E5950	Soil – Kmn04 digestion USEPA 3051. CV-AAS.
	E4850	Water – dissolved mercury in waters
POLYAROMATIC HYDROCARBONS		
Naphthalene	E11101	E11101 Soil – Acetone/Dichloromethane Sonication USEPA 3550B. GC/MS
Acenaphthylene		
Acenaphthene		
Fluorene	E01101	E01101 Water – Dichloromethane extraction. 8270C. GC/MS
Phenanthrene		
Anthracene		
Fluoranthene	E01102	B(a)P not NATA accredited
Pyrene		
Benz(a)anthracene		
Chrysene		
Benzo(b)&(k)fluoranthene		
Benzo(a)pyrene		
Indeno(1.2.3-c,d)pyrene		
Dibenz(a,h)anthracene		
Benzo(g,h,i)perylene		
BTEX COMPOUNDS		
Benzene	E1010	Soil – Methanol Extraction USEPA 5035. GC/MS Purge & Trap
Toluene		
Ethylbenzene		
meta- & para-Xylene	E0010	BTEX – purge & trap
ortho-Xylene		
TOTAL PETROLEUM HYDROCARBONS		
C6-C9 Fraction	E1230	E1230 Soil – Methanol extraction USEPA 5035. Purge and trap GC/MS or GS/FID.
	E0230	E0230 Water – Neat or diluted. Purge and Trap GC/MS. USEPA8260B
C10-C14 Fraction	E1221	E1221 Soil – Acetone/dicholoromethane Sonication USEPA 3550B. GC/FID
C15-C28 Fraction		
C29-C36 Fraction	E0221	E0221 Water – dichloromethane extraction. GC/FID. USEPA8260B
PCBs		
PCB	E1081	E1081 Soil: Acetone/dichloromethane Analysed by GC/ECD detectors
	E00801/E0080	E00801/E0080 Water – Dichloromethane 3 times. Analysed by GC/ECD detectors

ALS ANALYTICAL LISTS AND METHODS

TARGET COMPOUNDS	ALS METHOD ID	METHOD
HEAVY METALS		
Arsenic	EG-0057	
Cadmium		
Chromium		Soil: USEPA 200.2 (mod)
Copper		digest HCL/JN03/H202
Nickel		(ICP/AES)
Lead		
Zinc		
Mercury	EG-0057	Soil: USEPA 200.2 (mod) digest HCL/JN03/H202 (FIM-MS)
Hexavalent Chromium	EG-005T	Water: 1:5 extraction UV-VIS
POLYNUCLEAR AROMATICS		
Naphthalene	EP-0758-SA	EP-0758-SA Soil: Dichloromethane/
Fluorene		Acetone extraction. GC/MS detection
Phenanthrene		
Anthracene		
2-Methylnaphthalene		
Benzo(e)pyrene		
Acenaphthylene		
Acenaphthene		
Fluoranthene		
Pyrene		
N-2-Fluorenylacetamide		
Benz(a)anthracene		
Chrysene		
Benzo(b) & (k)fluoranthene		
7.12-Dimethylbenz(a)anthracene		
Benzo(a)pyrene		
2-Methylcholanthrene		
Indeno(1.2.4-cd)pyrene		
Dibenz0(a.h)anthracene		
Benzo(g.h.I)perylene		
Perylene		
BTEX COMPOUNDS		
Benzene	EP-080-SS	EP-080-SS Soil: Methanolic extraction P&T
Toluene		Followed by GC/MS
Chlorobenzene		
Ethylbenzene	EP-080-WS	EP-080-WS Water: extraction by GC/MS
Meta- & para-Xylene		
Ortho-Xylene		
TOTAL PETROLEUM HYDROCARBONS		
C6-C9 Fraction	EP071-SS	Soil: methanol extraction P&T followed by GC/MS
	EP071-WS	Water: methanol extraction P&T followed by GC/MS
C10-C14 Fraction	EP071-SS	Soil: Dichloromethane/acetone
C15-C28 Fraction		Extraction. GC/FID detection
C29-C36 Fraction		Water: GC/MS
POLYCHLORINATED BIPHENYLS		
Total Polychlorinated biphenyls	EP-0758-SA	EP-0758-SA Soil: Dichloromethane/ Acetone extraction. GC/MS detection
SEMIVOLATILE ORGANIC COMPOUNDS		
Phenols		
Phenol		GCMS

TARGET COMPOUNDS	ALS METHOD ID	METHOD
2-Chlorophenol		
2-Methylphenol		
4-Methylphenol		
2-Nitrophenol		
2.4-Dimethylphenol		
2.4-Dichlorophenol		
2.6-Dichlorophenol		
4-Chloro-3-methylphenol		
2.4.6-Trichlorophenol		
2.4.5-Trichlorophenol		
Pentachlorophenol		
Organochlorine Pesticides		
alpha-BHC	EP-0758-SA	EP-0758-SA Soil: Dichloromethane/ Acetone extraction. GC/MS detection
beta-BHC & gamma-BHC		
delta-BHC		
Heptachlor		
Aldrin		
Heptachlor epoxide		
Endosulfan 1		
Hexachlorobenzene (HCB)		
Trans-Chlordane		
Cis-Chlordane		
Endrin-aldehyde		
Endrine Ketone		
methoxychlor		
4.4'-DDE		
Dieldrin		
Endrin		
Endosulfan 11		
4.4'-DDD		
Endosulfan sulfate		
4.4'-DDT		

AUSTRALIAN SAFER ENVIRONMENT AND TECHNOLOGY PTY LTD (ASET) METHODS

TARGET COMPOUNDS	METHOD
Asbestos	Samples were examined under a Stereo Microscope and selected fibres were analysed by Polarized Light Microscopy inconjunction with Dispersion Staining method **(Safer Environment Method 1)**.

HLA

13 April 2004

Ms Susan Adams
RCA Australia
92 Hill Street
Carrington NSW 2294

RE: ASBESTOS IDENTIFICATION RESULTS

Dear Ms Adams,

This report presents the findings in respect of seven soil samples received by HLA-Envirosciences Newcastle for asbestos identification analysis on 7 April 2004.

1.0 Introduction: Seven soil samples were received by us for asbestos identification analysis.

2.0 Procedures: The samples were examined under a stereo microscope and selected fibres were examined using Polarised Light Microscopy in conjunction with Dispersion Staining Methods (HLA-Envirosciences Method 6).

3.0 Results:

Sample N2055601/5603/1 - H03 - a
Approx Dimensions: 3.5 cm x 3.5 cm x 4.0 cm
The sample consisted of mixture of sandy soil, stones and plant matter.
No Asbestos Detected

Sample N2055601/5603/2 - H05 - a
Approx Dimensions: 3.5 cm x 3.5 cm x 3.0 cm
The sample consisted of mixture of sandy soil, stones and plant matter.
No Asbestos Detected

Sample N2055601/5603/3 - H06 - a
Approx Dimensions: 3.5 cm x 3.5 cm x 4.0 cm
The sample consisted of mixture of sandy soil and stones.
No Asbestos Detected

Sample N2055601/5603/4 - H07 - a
Approx Dimensions: 3.5 cm x 3.5 cm x 4.25 cm
The sample consisted of mixture of sandy soil, stones and plant matter.
No Asbestos Detected

HLA-Envirosciences Pty Limited ABN 34 060 204 702
18 Warabrook Boulevarde, Warabrook NSW 2304 / PO Box 73 HRMC NSW 2310 Tel +61 2 4968 0044 Fax +61 2 4968 0005
Email mail@hla-enviro.com.au
sustainable solutions for environmental, OHS and natural resource management

Sample N2055601/5603/5 - P13 - a
Approx Dimensions: 3.5 cm x 3.5 cm x 5.0 cm
The sample consisted of mixture of sandy soil, stones, plant matter and fragments of chalky plaster.
No Asbestos Detected

Sample N2055601/5603/6 - P14 - a
Approx Dimensions: 3.5 cm x 3.5 cm x 4.0 cm
The sample consisted of mixture of sandy soil, stones, plant matter and fragments of chalky plaster.
No Asbestos Detected

Sample N2055601/5603/7 - P18 - a
Approx Dimensions: 3.5 cm x 3.5 cm x 4.0 cm
The sample consisted of mixture of sandy soil, stones and fragments of chalky plaster.
No Asbestos Detected

HLA-ENVIROSCIENCES PTY LIMITED

Reported by,

Chameen Battegoda
Approved Analyst

Upul Mahen De Silva . BSc. MSc. Grad Dip (Occ Hyg)
Occupational Hygienist / Approved Signatory.

NATA Accredited Laboratory Number: 14399

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