

14 November 2003

Mr. George Rolfe  
Site 3 Development Company Pty Ltd  
Level 37, 2 Chifley Square  
Sydney NSW 2000

**RE: ACID SULFATE SOIL ASSESSMENT, SOPA SITE 3, HOMEBUSH**

## **1 INTRODUCTION**

HLA Envirosiences Pty Limited (HLA) were engaged by Site 3 Development Company Pty Ltd to conduct an assessment for the presence of acid sulfate soils (ASS) at the property defined as Site 3, Australia Avenue, Sydney Olympic Park, Homebush Bay, NSW (the Site). The Site location is depicted on Figure 1.

HLA understands that the Site, currently vacant, will be developed for future Residential Retail land use. The ASS assessment was therefore conducted to evaluate whether subsurface soil conditions would require specific management measures during the development process.

## **2 BACKGROUND INFORMATION**

### **2.1 Acid Sulfate Soils**

Acid sulfate soils are the common name given to sediments and soils containing iron sulfide which, when exposed to oxygen (and water) generate sulfuric acid. Formation conditions require the presence of iron-rich sediments, sulfate (usually from seawater), removal of reaction products such as bicarbonate, the presence of sulfate reducing bacteria and a plentiful supply of organic matter. The relatively specific conditions under which the acid sulfate soils are formed usually limit their occurrence to low lying parts of coastal floodplains, rivers and creek (Stone, Y. et. al, 1998).

### **2.2 Expected Site Geology**

Reference to the *Sydney 1:100 000 Geological Series Sheet 9130* (DMR, 1983) indicates that the Site is expected to be underlain by man made fill overlying Triassic Aged Ashfield Shales of the Wianamatta Group. Ashfield Shales typically comprise black to dark grey shale and laminite.

The *Sydney 1:100 000 Soil Landscape Series Sheet 9130* (Soil Conservation Service NSW) maps the Site as being located on soils of the Blacktown Soil Landscape Group. These soils are associated with the in-situ weathering of shale bedrock and are typified as low permeability clays.

S4013901\_RPT\_14NOV03



The *Prospect/Parramatta River Acid Sulfate Soil Risk Map* (DIPNR, December 1997, Edition 2) maps the Site as being located in an area of disturbed terrain, with unknown occurrence of Acid Sulfate Soils, although soil investigations are required to assess these areas for acid sulfate potential.

## 2.3 Previous Environmental Investigation

HLA completed a Site Contamination Assessment (SCA) of the subject Site in July 2002 (refer HLA 2002). The SCA involved the completion of 23 soil boreholes across the Site (refer Figure 2). With respect to the context of this ASS assessment, pertinent information is summarised below.

Generally the soil strata comprised fill material overlying stiff silty clay grading to weathered shale and shale (bedrock). The fill predominantly comprised reworked clay, sand, silt and gravel. The natural soil profile consisted predominantly stiff red/brown or red/grey, low to medium plasticity clay grading to shale bedrock.

## 3 SCOPE OF WORK

Works completed by HLA were in accordance with our proposal dated 21 October 2003 and ASSMAC 1998 Guidelines and included:

- Completion of 4 hand auger soil borings and logging of encountered soil conditions (refer Figure 2);
- Collection of soil samples from each borehole;
- Submission of soil samples to a National Association of Testing Authorities (NATA) registered laboratory for analysis. Soil samples were tested for:
  - Peroxide Oxidation Combined Acidity & Sulfate (POCAS – ASSMAC Method 21);
  - Total Oxidisable Sulfur (TOS – ASSMAC Method 20); and
  - Soil pH.
- Provision of this report.

## 4 RESULTS OF INVESTIGATION

### 4.1 Soil Conditions

Soil conditions encountered during the completion of the hand augering program consisted of fill material overlying stiff clay. Fill material predominantly comprised reworked clay, silty sand and gravel. The natural soil profile consisted of predominantly stiff red/brown and red/grey/white clays and silty clays (refer borelogs, Attachment A). These conditions are consistent with the results of HLA's previous investigation.

### 4.2 Soil Results

Results of analytical testing (refer Table 1 and Attachment B) indicate that acid sulfate soil conditions were not identified. All significant results were not detected above laboratory practical quantitation limits and are therefore below *NSW Acid Sulfate Soil Management Advisory*



Committee (1998) Guidelines. Soil pH levels were in the normal range and were not significantly lowered by the oxidation process.

## 5 CONCLUSION

Based on the results of the ASS assessment undertaken, HLA concludes that specific ASS management measures would not be required for the proposed redevelopment.

Yours faithfully,

**HLA-Envirosciences Pty Limited**

A handwritten signature in black ink, appearing to read 'Iain Macfarlane'.

**Iain Macfarlane**  
Environmental Scientist

A handwritten signature in black ink, appearing to read 'Alex Latham'.

**Alex Latham**  
Senior Environmental Scientist

Attachments:      Site Location Map  
                         Site Map  
                         Table 1 – Soil Analytical Results (POCAS, pH & TOS)  
                         Borelogs  
                         ALS Laboratory Report

This document was prepared for the sole use of Site 3 Development Company Pty Ltd and the regulatory agencies that are directly involved in this project, the only intended beneficiaries of our work. No other party should rely on the information contained herein without the prior written consent of HLA-Envirosciences Pty Limited and Site 3 Development Company Pty Ltd.



## 6 REFERENCES

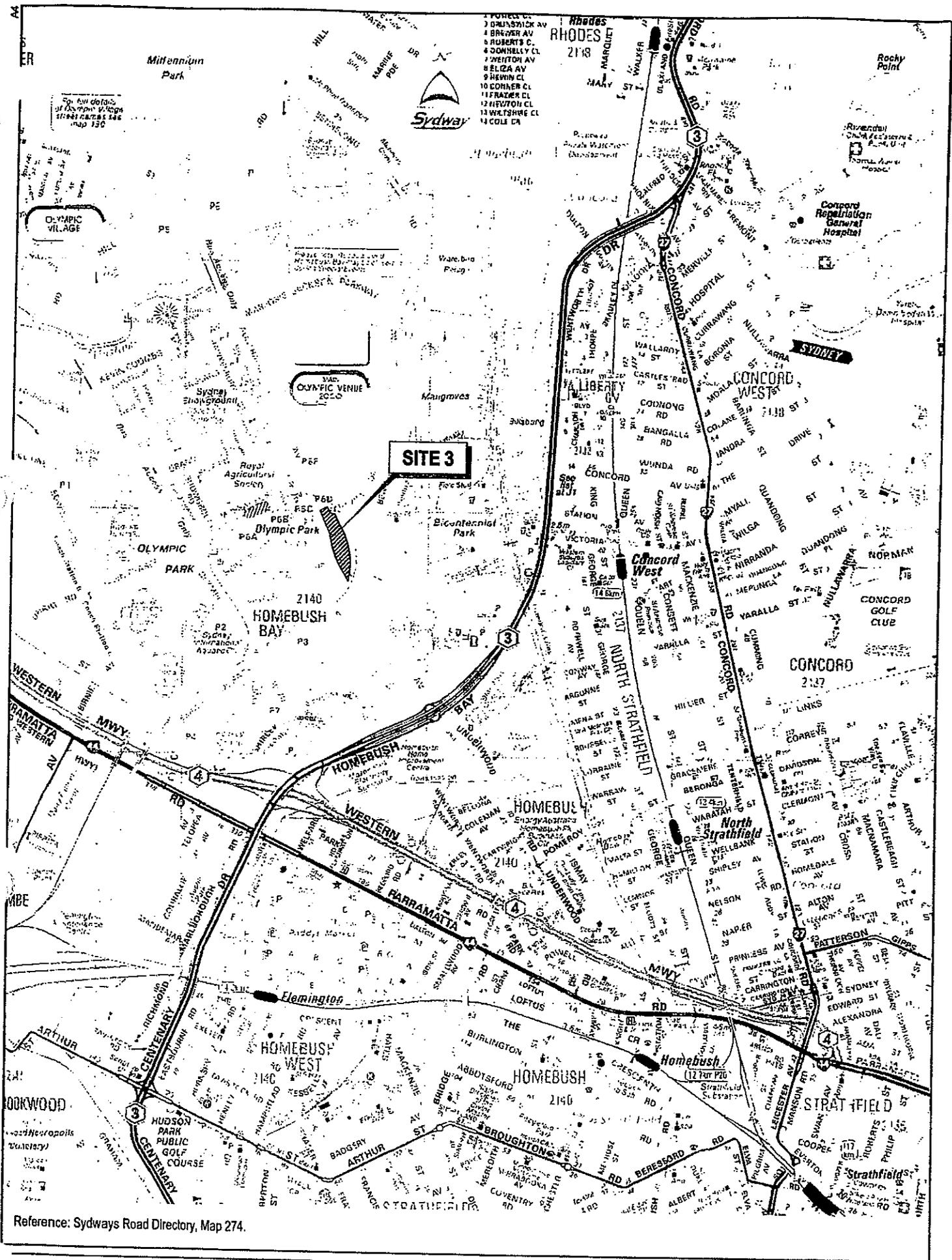
Department of Land and Water Conservation (1997) *Parramatta River Acid Sulfate Soil Risk Map – Edition Two*

HLA Envirosciences Pty Limited (2002). *Site Contamination Investigation, Site 3, Sydney Olympic Park Town Centre, Homebush, NSW*. Report Site 3\J1938.rpt.doc, 9 July 2002.

NSW Department of Mineral resources (1983) *Geological Series Sheet 9130 (Edition 1)*

Soil Conservation Service of NSW (1983) *Soil Landscape Series Sheet 9130*

Stone Y, Ahern C R and Blunden B (1998). *Acid Sulfate Soil Manual*. NSW Acid Sulfate Soil Management Advisory Committee (ASSMAC), Wollongbar, NSW, Australia (1998).



Reference: Sydways Road Directory, Map 274.



**SITE LOCATION MAP**  
 Site 3 Development Company Pty Ltd  
 Acid Sulfate Soil Assessment - SOPA Site 3  
 Homebush Bay, New South Wales

FIGURE

1



PROJECT-FILE NAME

S40139\_002

DATE November 2003

DRAWN LJE

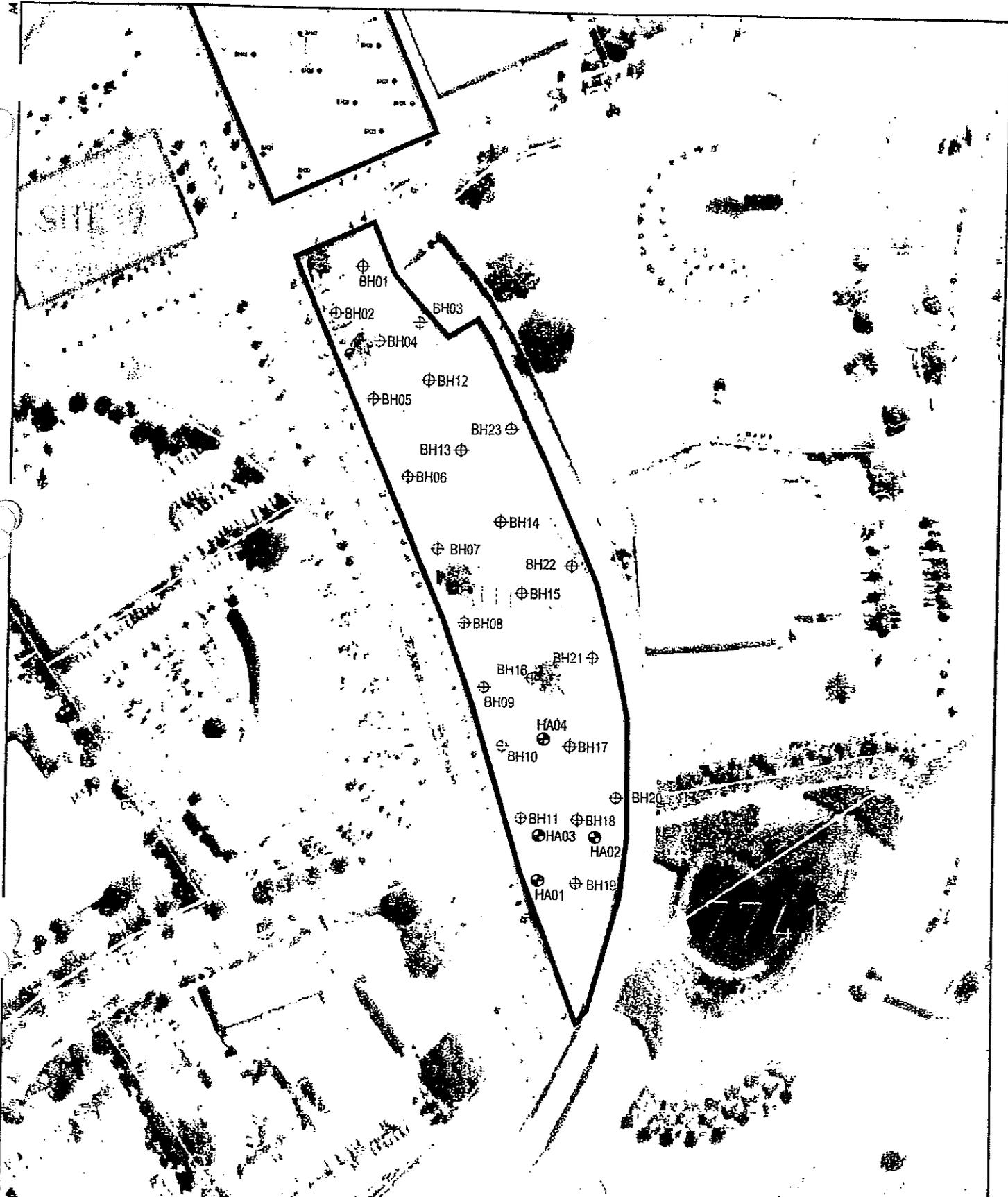
APPROVED *[Signature]*

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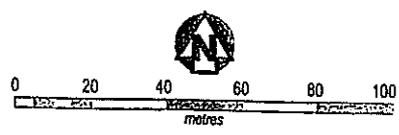
Source: Plan supplied by Sydney Olympic Park Authority.

**LEGEND**

- ⊕ BH01 BOREHOLE SAMPLE LOCATION (HLA 2002)
- ⊕ HA01 HAND AUGER SAMPLE LOCATION (HLA 2003)



**SITE LAYOUT AND SAMPLING LOCATION PLAN**  
 Site 3 Development Company Pty Ltd  
 Acid Sulfate Soil Assessment - SOPA Site 3  
 Homebush Bay, New South Wales



FIGURE

**2**

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○

○

○

Table 1 - Soil Sample Analytical Results (Ass)

Sample ID Depth (mbgs) Material Type Date Sampled	ASSMAC (1998) Guidelines				HA01 1.0-1.1 Clay 24/10/03	HA02 0.4-0.5 Clay 24/10/03	HA03 1.0-1.1 Clay 24/10/03	HA04 1.3-1.4 Clay 24/10/03
	Action Criteria 1-1000 tonnes disturbed		Action Criteria if more than 1000 tonnes disturbed					
	Sulfur Trail % S oxidisable	Acid Trail mol H <sup>+</sup> /tonne	Sulfur Trail % S oxidisable	Acid Trail mol H <sup>+</sup> /tonne				
S (Pos)	0.10	-	0.03	-	<0.02	<0.02	<0.02	<0.02
TPA	-	62	-	18	<2	<2	<2	<2
TSA	-	62	-	18	<2	<2	<2	<2
pH before Oxidation	-	-	-	-	7.2	6.4	6	6.6
pH after Oxidation	-	-	-	-	6.8	6.2	4.5	7.3

Notes:

(mbgs) = metres below ground surface

- = no guideline value

< = not detected above laboratory  
practical quantitation limit (PQL)

Criteria based on Fine Texture, approximate clay content >= 40%, where, % < 0.002mm



HLA - Envirosciences  
 55-65 Grandview Street  
 Pymble, NSW 2073  
 Telephone: 02 9988 4422  
 Fax: 02 9988 4441

# HAND AUGER LOG HA01

PROJECT NUMBER S4013901 DATE 24/10/2003  
 PROJECT NAME Site 3 - Multiplex SURFACE ELEVATION \_\_\_\_\_  
 LOCATION SOPA site 3, Sydney Olympic Park  
 DRILLING METHOD Hand Auger  
 SAMPLING METHOD Grab  
 LOGGED BY J. Macfarlane  
 STABILISED WATER LEVEL \_\_\_\_\_  
 GROUND WATER ELEVATION \_\_\_\_\_  
 COMMENTS Grass/Gravel surface

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
			HA01_0.0-0.1		0.0		Silty SAND, Topsoil (FILL) medium dense to dense, dry, brown, minor organics and gravel	0.05
			HA01_0.4-0.5		0.2		Silty sandy CLAY (FILL), firm to stiff, slightly moist, medium plasticity, brown/grey with some reds and oranges, minor gravel and rubble	
			HA01_1.0-1.1	*	0.4			
					0.6			
					0.8			
					1.0		Sandy CLAY (CLS), firm to stiff, slightly moist, medium plasticity, dark brown/brown, very minor ash	1.00
					1.2		Hand Auger refusal on rock Total Depth: 1.20 m	1.20

GENERAL LOG S4013901.GPJ\_HLA\_SYD.GDT 7/11/03

**HLA**

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# HAND AUGER LOG HA02

PROJECT NUMBER S4013901 DATE 24/10/2003  
 PROJECT NAME Site 3 - Multiplex SURFACE ELEVATION \_\_\_\_\_  
 LOCATION SOPA site 3, Sydney Olympic Park  
 DRILLING METHOD Hand Auger  
 SAMPLING METHOD Grab  
 LOGGED BY I. Macfarlane  
 STABILISED WATER LEVEL \_\_\_\_\_  
 GROUND WATER ELEVATION \_\_\_\_\_  
 COMMENTS Grass/Gravel surface

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
			HA02_0.0-0.1		0.0		Silty sandy CLAY (FILL), firm to very stiff, dry, low plasticity, dark brown/brown, minor gravel, rocks, shale and sandstone	
			HA02_0.4-0.5	*	0.4			
					0.2			
					0.4			
					0.6			
					0.8			
					0.90		Hand Auger refusal on hard clay Total Depth: 0.90 m	0.90

GENERAL LOG S4013901.GPJ HLA\_SYD.GDT 7/1/03

PROJECT NUMBER S4013901 DATE 24/10/2003  
 PROJECT NAME Site 3 - Multiplex SURFACE ELEVATION \_\_\_\_\_  
 LOCATION SOPA site 3, Sydney Olympic Park  
 DRILLING METHOD Hand Auger  
 SAMPLING METHOD Grab  
 LOGGED BY I. Macfarlane  
 STABILISED WATER LEVEL \_\_\_\_\_  
 GROUND WATER ELEVATION \_\_\_\_\_  
 COMMENTS Grass/Gravel surface

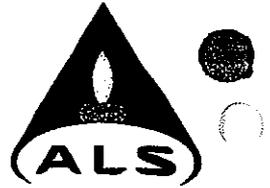
PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
		☞	HA03_0.0-0.1		0.0		Silty sandy CLAY (FILL), dry to slightly moist, low to medium plasticity, brown with some oranges and reds, minor gravel and rocks	
		☞	HA03_0.4-0.5		0.4		Silty CLAY (FILL), firm, slightly moist, medium plasticity, brown/orange/grey/white	0.40
		☞	HA03_1.0-1.1	*	1.0		CLAY (CL), firm, slightly moist, medium plasticity, grey/white with orange and red streaks, very minor shale	0.80
					1.2			
							Total Depth: 1.30 m	1.30

**HAND AUGER LOG HA04**

PROJECT NUMBER S4013901 DATE 24/10/2003  
 PROJECT NAME Site 3 - Multiplex SURFACE ELEVATION \_\_\_\_\_  
 LOCATION SOPA site 3, Sydney Olympic Park  
 DRILLING METHOD Hand Auger  
 SAMPLING METHOD Grab  
 LOGGED BY I. Macfarlane  
 STABILISED WATER LEVEL \_\_\_\_\_  
 GROUND WATER ELEVATION \_\_\_\_\_  
 COMMENTS Grass/Gravel surface

PID (ppm)	BLOW COUNTS	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
		☞	HA04_0.0-0.1		0.0		Silty sandy CLAY (FILL), firm, dry, low plasticity, brown, minor shale, rocks and gravel	
		☞	HA04_0.4-0.5		0.2		Silty sandy CLAY (FILL), firm, slightly moist, low to medium plasticity, light brown/orange/red, minor rocks and shale	0.35
		☞	HA04_1.0-1.1		0.4			
		☞	HA04_1.3-1.4	*	0.6		CLAY (CL) stiff, slightly moist, medium plasticity, white/grey/red/orange	1.00
		☞			0.8		Silty CLAY (CL-ML), firm, slightly moist to moist, low to medium plasticity, dark brown with some light brown streaks	1.20
		☞			1.0		Hand Auger refusal on crumbly clay	1.30
					1.2		Hand Auger refusal on very hard surface Total Depth: 1.50 m	1.50

13 NOV 2003



**CERTIFICATE OF ANALYSIS**

**CONTACT:** MR IAIN MACFARLANE  
**CLIENT:** HLA-ENVIROSCIENCES PTY LTD  
**ADDRESS:**  
P O BOX 726  
PYMBLE NSW 2073  
**ORDER No.:** 126323  
**PROJECT:** S4013901

**BATCH:** ES43079  
**SUB BATCH:** 0  
**LABORATORY:** SYDNEY  
**DATE RECEIVED:** 27/10/2003  
**DATE COMPLETED:** 11/11/2003  
**SAMPLE TYPE:** SOIL  
**No. of SAMPLES:** 4

**COMMENTS**

pH determined and reported on 1:5 soil/water extract. This report  
supersedes any previous preliminary reports of the same batch number.

**NOTES**

This is the Final Report and supersedes any preliminary reports with this batch number.  
All pages of this report have been checked and approved for release.

**ISSUING LABORATORY: SYDNEY**

**Address**  
277-289 Woodpark Road  
SMITHFIELD NSW 2164

**Phone:** 61-2-8784 8555  
**Fax:** 61-2-8784 8500  
**Email:** cindy.suen@alsenviro.com

Signatory

**LABORATORIES**

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Sydney  
Newcastle  
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Singapore  
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Santiago  
Antofagasta  
Lima



NATA Accredited Laboratory Number 825

Site: SYDNEY

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Batch: ES43079  
 Sub Batch: 0  
 Date of Issue: 11/11/2003  
 Client: HLA-ENVIROSCIENCES PTY LTD  
 Client Reference: S4013901



# CERTIFICATE OF ANALYSIS



METHOD		ANALYSIS DESCRIPTION	SAMPLE IDENTIFICATION			
			Laboratory I.D.	1	2	3
EA-002	pH Value		24/10/2003	24/10/2003	24/10/2003	24/10/2003
EA-055	Moisture Content (dried @ 103°C)		HA01_	HA02_	HA03_	HA04_
			1.0-1.1	0.4-0.5	1.0-1.1	1.3-1.4
		UNIT	LOR			
			0.1	6.4	6.0	6.6
		%	0.1	14.8	15.6	12.5



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**CONTACT:** MR IAIN MACFARLANE  
**CLIENT:** HLA-ENVIROSCIENCES PTY LTD  
**ADDRESS:**  
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PYMBLE NSW 2073

**BATCH:** ES43079  
**SUB BATCH:** 1  
**LABORATORY:** SYDNEY  
**DATE RECEIVED:** 27/10/2003  
**DATE COMPLETED:** 11/11/2003  
**SAMPLE TYPE:** SOIL  
**No. of SAMPLES:** 4

**ORDER No.:** 126323  
**PROJECT:** S4013901

**COMMENTS**

Results apply to sample(s) as submitted. POCAS as per method of Ahern et al (1998). Results expressed as mole H+/tonne. TOS as per Ahern et al (1998). Analysis conducted by ALS Brisbane, NATA Site No. 818. This report supersedes any previous preliminary reports of the same batch number.

**NOTES**

This is the Final Report and supersedes any preliminary reports with this batch number. All pages of this report have been checked and approved for release.

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Lima



**NATA Accredited Laboratory Number 825**  
**Site: SYDNEY**

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 Sub Batch: 1  
 Date of Issue: 11/11/2003  
 Client: HLA-ENVIROSCIENCES PTY LTD  
 Client Reference: S4013901



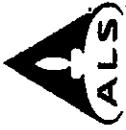
# CERTIFICATE OF ANALYSIS



METHOD	ANALYSIS DESCRIPTION	Laboratory I.D.				SAMPLE IDENTIFICATION				
		Date Sampled	1	2	3	4	24/10/2003	24/10/2003	24/10/2003	24/10/2003
		UNIT	HA01_	HA02_	HA03_	HA04_	HA01_	HA02_	HA03_	HA04_
EA-002	pH after Oxidation	LOR	1.0-1.1	6.2	4.5	7.3				
EA-022	Ca (Acid Reacted)	%	<0.02	<0.02	<0.02	<0.02				
EA-022	Ca (KCl)	%	0.18	0.22	0.06	0.23				
EA-022	Ca (Peroxide)	%	0.12	0.17	0.04	0.13				
EA-022	Mg (Acid Reacted)	%	<0.02	<0.02	<0.02	<0.02				
EA-022	Mg (KCl)	%	0.03	0.04	0.07	0.03				
EA-022	Mg (Peroxide)	%	0.03	0.03	0.05	0.02				
EA-022	Na (Acid Reacted)	%	<0.02	<0.02	<0.02	<0.02				
EA-022	Na (KCl)	%	0.05	0.07	0.11	0.07				
EA-022	Na (Peroxide)	%	0.03	0.04	0.06	0.03				
EA-022	S (KCl)	%	<0.02	0.05	0.03	0.02				
EA-022	S (Peroxide)	%	<0.02	0.04	0.02	<0.02				
EA-022	S (Pos)	%	<0.02	<0.02	<0.02	<0.02				
EA-022	TAA	mole/tonne	<2	<2	<2	<2				
EA-022	TPA	mole/tonne	<2	<2	<2	<2				
EA-022	TSA	mole/tonne	<2	<2	<2	<2				
EA-022	pH (KCl)		7.7	6.8	5.2	7.8				
EA-023	S(HCL Extractable)	%	0.02	0.06	0.04	0.03				
EA-023	S(Total Oxidisable Sulfur)	%	<0.02	<0.02	0.02	0.02				
EA-023	S(Total)	%	0.03	0.07	0.06	0.05				

Batch: ES43079  
 Sub Batch: 1  
 Date of Issue: 11/11/2003  
 Client: HLA-ENVIROSCIENCES PTY LTD  
 Client Reference: S4013901

# QUALITY CONTROL REPORT



METHOD		ANALYSIS DESCRIPTION	UNIT	LOR	SAMPLE IDENTIFICATION															
					Laboratory I.D.	200														
					Date Sampled	27/10/2003														
					METHOD	BLANK														
METHOD		ANALYSIS DESCRIPTION	UNIT	LOR	CHECKS AND SPIKES															
EA-002		pH after Oxidation		0.1		---														
EA-022		Ca (Acid Reacted)	%	0.02		<0.02														
EA-022		Ca (KCl)	%	0.02		<0.02														
EA-022		Ca (Peroxide)	%	0.02		<0.02														
EA-022		Mg (Acid Reacted)	%	0.02		<0.02														
EA-022		Mg (KCl)	%	0.02		<0.02														
EA-022		Mg (Peroxide)	%	0.02		<0.02														
EA-022		Na (Acid Reacted)	%	0.02		<0.02														
EA-022		Na (KCl)	%	0.02		<0.02														
EA-022		Na (Peroxide)	%	0.02		<0.02														
EA-022		S (KCl)	%	0.02		<0.02														
EA-022		S (Peroxide)	%	0.02		<0.02														
EA-022		S (Pos)	%	0.02		<0.02														
EA-022		TAA	mole/tonne	2		<2														
EA-022		TPA	mole/tonne	2		<2														
EA-022		TSA	mole/tonne	2		<2														
EA-022		pH (KCl)		0.1		---														
EA-023		S(HCL Extractable)	%	0.02		<0.02														
EA-023		S(Total Oxidisable Sulfur)	%	0.02		<0.02														
EA-023		S(Total)	%	0.01		<0.01														







