

Aileen Hie

From: Todd Hore [thore@jkggroup.net.au]
Sent: Tuesday, 6 July 2010 11:33 AM
To: Aileen Hie
Subject: 42791

EIS

ENVIRONMENTAL INVESTIGATION SERVICES

A division of Jeffery & Kafauskas Pty Ltd
ABN 17 003 550 801

Aileen,

Could you please schedule the following for EIS project E23765KH, St Ives:

- 42791-39 (Dup 4) – arsenic

Please undertake on a 3 day turnaround.

Regards,

For and on behalf of
ENVIRONMENTAL INVESTIGATION SERVICES

Todd Hore
Senior Environmental Engineer

115 Wicks Road, Macquarie Park, NSW, 2113
PO Box 976, North Ryde BC, NSW, 1670
Tel: 02 9888 5000
Fax: 02 9888 5004
email: thore@jkggroup.net.au
Web: www.jkggroup.net.au

*** IMPORTANT ***

This email and any attachments are confidential and may be privileged in which case neither is intended to be waived. If you have received this message in error, please notify us and remove it from your system. It is your responsibility to check any attachments for viruses and defects before opening or sending them on. At the Company's discretion we may send a paper copy for confirmation. In the event of any discrepancy between paper and electronic versions the paper version is to take precedence.

Envirolab Ref: 42791 B
Due: 9/7/10
72hr T/A.

6/07/2010



APPENDIX C

(Site History Documents – Groundwater Bore Records)

E23765KH, St Ives

Map created with NSW Natural Resource Atlas - <http://www.nratlas.nsw.gov.au>

Thursday, July 01, 2010



0 4 Km

Legend

Symbol	Layer	Custodian
●	Groundwater Bores	
▭	Catchment Management Authority boundaries	
~	Major rivers	
▬	Primary/arterial road	
▬	Motorway/freeway	
▬	Railway	
▬	Runway	
~	Contour	
■	Background	
	Topographic base map	

Copyright © 2010 New South Wales Government. Map has been compiled from various sources and may contain errors or omissions. No representation is made as to its accuracy or suitability.

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Thursday, July 1, 2010

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW022928

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW022928
LIC-NUM 10BL016460
AUTHORISED-PURPOSES IRRIGATION
INTENDED-PURPOSES GENERAL USE
WORK-TYPE Bore
WORK-STATUS (Unknown)
CONSTRUCTION-METHOD Cable Tool
OWNER-TYPE Private
COMMENCE-DATE
COMPLETION-DATE 1958-03-01
FINAL-DEPTH (metres) 50.20
DRILLED-DEPTH (metres) 50.30
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY N/A
GWMA 603 - SYDNEY BASIN
GW-ZONE -
STANDING-WATER-LEVEL
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
RIVER-BASIN 213 - SYDNEY COAST - GEORGES RIVER
AREA-DISTRICT
CMA-MAP
GRID-ZONE
SCALE
ELEVATION
ELEVATION-SOURCE (Unknown)
NORTHING 6266156.00
EASTING 329436.00
LATITUDE 33 43' 51"
LONGITUDE 151 9' 32"
GS-MAP 0055A3

AMG-ZONE 56
 COORD-SOURCE GD.,PR. MAP
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH GORDON
 PORTION-LOT-DP 99999

Licensed (top)

COUNTY CUMBERLAND
 PARISH GORDON
 PORTION-LOT-DP N/A

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	Steel	-0.10	5.90	203			(Unknown)

Water Bearing Zones (top)

FROM- DEPTH (metres)	TO- DEPTH (metres)	THICKNESS (metres)	ROCK- CAT-DESC	S- W-L	D- D- L	YIELD	TEST- HOLE- DEPTH (metres)	DURATION	SALINITY
18.20	18.20	0.00	(Unknown)	3.60		0.25			Good

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	3.04	3.04	Loam		
3.04	6.09	3.05	Clay White Red		
6.09	9.14	3.05	Clay White Shaley		
9.14	12.19	3.05	Clay White Red		
12.19	18.28	6.09	Shale Grey Water Supply		
18.28	24.38	6.10	Sandstone Shaley Water Supply		
24.38	27.43	3.05	Shale Grey		
27.43	39.62	12.19	Sandstone Cream Water Supply		
27.43	39.62	12.19	Shale Grey		
39.62	48.76	9.14	Shale Grey Water Supply		
48.76	50.29	1.53	Sandstone White		

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Thursday, July 1, 2010

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW103894

Works Details (top)

GROUNDWATER NUMBER GW103894
 LIC-NUM 10BL159957
 AUTHORISED-PURPOSES MONITORING BORE
 INTENDED-PURPOSES MONITORING BORE
 WORK-TYPE Bore
 WORK-STATUS (Unknown)
 CONSTRUCTION-METHOD
 OWNER-TYPE
 COMMENCE-DATE
 COMPLETION-DATE 2000-10-09
 FINAL-DEPTH (metres) 3.50
 DRILLED-DEPTH (metres) 3.50
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY N/A
 GWMA -
 GW-ZONE -
 STANDING-WATER-LEVEL
 SALINITY
 YIELD

Site Details (top)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE
 NORTHING 6266122.00
 EASTING 329317.00
 LATITUDE 33 43' 52"
 LONGITUDE 151 9' 28"
 GS-MAP

AMG-ZONE 56
 COORD-SOURCE
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH GORDON
 PORTION-LOT-DP 3//12504

Licensed (top)

COUNTY CUMBERLAND
 PARISH GORDON
 PORTION-LOT-DP 3 12504

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	3.50				Auger
1	1	Casing	PVC Class 18	0.00	0.00	50			

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL COMMENT
0.00	0.15	0.15	CONCRETE	
0.15	1.00	0.85	SILTY SAND	
1.00	2.00	1.00	SILTY CLAY	
2.00	3.50	1.50	CLAY,ORANGE AND GREY	

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Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Thursday, July 1, 2010

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A Licensed Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW032711

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW032711
 LIC-NUM 10BL019887
 AUTHORISED-PURPOSES IRRIGATION
 INTENDED-PURPOSES IRRIGATION
 WORK-TYPE (Unknown)
 WORK-STATUS (Unknown)
 CONSTRUCTION-METHOD (Unknown)
 OWNER-TYPE Private
 COMMENCE-DATE
 COMPLETION-DATE 1966-01-01
 FINAL-DEPTH (metres) 42.60
 DRILLED-DEPTH (metres) 42.70
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY N/A
 GWMA 603 - SYDNEY BASIN
 GW-ZONE -
 STANDING-WATER-LEVEL
 SALINITY
 YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN 212 - HAWKESBURY RIVER
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE (Unknown)
 NORTHING 6266621.00
 EASTING 329608.00
 LATITUDE 33 43' 36"
 LONGITUDE 151 9' 39"
 GS-MAP 0055A3

AMG-ZONE 56
 COORD-SOURCE GD.,PR. MAP
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH GORDON
 PORTION-LOT-DP 3 219148

Licensed (top)

COUNTY CUMBERLAND
 PARISH GORDON
 PORTION-LOT-DP N/A

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	Drilled	0.00	0.00	152			(Unknown)

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	42.67	42.67	Clay Nominal		
0.00	42.67	42.67	Sandstone Nominal		
0.00	42.67	42.67	Shale Nominal		

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Thursday, July 1, 2010

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW028301

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW028301
 LIC-NUM 10BL016162
 AUTHORISED-PURPOSES DOMESTIC
 INTENDED-PURPOSES GENERAL USE
 WORK-TYPE Bore open thru rock
 WORK-STATUS (Unknown)
 CONSTRUCTION-METHOD Cable Tool
 OWNER-TYPE Private
 COMMENCE-DATE
 COMPLETION-DATE 1966-03-01
 FINAL-DEPTH (metres) 68.50
 DRILLED-DEPTH (metres) 68.60
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY N/A
 GWMA 603 - SYDNEY BASIN
 GW-ZONE -
 STANDING-WATER-LEVEL
 SALINITY
 YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN 212 - HAWKESBURY RIVER
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE (Unknown)
 NORTHING 6266760.00
 EASTING 330481.00
 LATITUDE 33 43' 32"
 LONGITUDE 151 10' 13"
 GS-MAP 0055A3

AMG-ZONE 56
 COORD-SOURCE GD.,PR. MAP
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH GORDON
 PORTION-LOT-DP 89

Licensed (top)

COUNTY CUMBERLAND
 PARISH GORDON
 PORTION-LOT-DP BL J

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	(Unknown)	-0.30	20.60	152			Suspended in Clamps

Water Bearing Zones (top)

FROM- DEPTH (metres)	TO- DEPTH (metres)	THICKNESS (metres)	ROCK- CAT-DESC	S- W- L	D- D- L	YIELD	TEST- HOLE- DEPTH (metres)	DURATION	SALINITY
51.50	54.20	2.70	(Unknown)			0.38			invalid code

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.91	0.91	Clay		
0.91	6.70	5.79	Clay Light Brown Yellow		
6.70	8.83	2.13	Shale Grey		
6.70	8.83	2.13	Clay Seams		
8.83	18.28	9.45	Shale Dark Brown Sticky		
18.28	25.90	7.62	Sandstone Medium		
25.90	31.39	5.49	Sandstone Grey		
25.90	31.39	5.49	Shale Bands		
31.39	32.91	1.52	Shale Grey		
32.91	38.10	5.19	Sandstone Cream Traces		
32.91	38.10	5.19	Shale		

38.10	39.62	1.52	Sandstone Cream Soft
39.62	44.19	4.57	Sandstone Hard
44.19	50.29	6.10	Sandstone Grey
50.29	50.90	0.61	Sandstone Soft
50.90	51.81	0.91	Sandstone Grey Shale Water Supply
51.81	68.58	16.77	Sandstone Grey Water Supply

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.



(Site History Documents – Historical Land Title Records)

ADVANCE LEGAL SEARCH PTY LIMITED

(ACN 077 067 068)
ABN 49 077 067 068

P.O. Box 149
Yagoona NSW 2199

Telephone: +612 9754 1590
Mobile: 0412 169 809
Facsimile: +612 9754 1364
Email: alsearch@optusnet.com.au

23rd June 2010

ENVIRONMENTAL INVESTIGATION SERVICES

PO Box 976,
NORTH RYDE BC NSW 1670

Attention: Todd Hore

**RE: 132 – 138 Killeaton Street,
St Ives
JOB NO. E23765KH**

Current Search

Folio Identifier 2/748682 (title attached)
DP 748682 (plan attached)
Dated 21st June 2010
Registered Proprietor:
DASMIN PTY LIMITED

Title Tree
Lot 2 DP 748682

Folio Identifier 2/748682

Certificate of Title Volume 14160 Folio 100

Certificate of Title Volume 11807 Folio 5

Certificate of Title Volume 11043 Folio 171

Certificate of Title Volume 107030 Folio 226

Certificate of Title Volume 10394 Folio 70

Certificate of Title Volume 10058 Folio 154

Certificate of Title Volume 330 Folio 167

**Summary of proprietor(s)
Lot 2 DP 748682**

Year	Proprietor
	(Lot 2 DP 748682)
2003 – Todate	Dasmin Pty Limited
1987 – 2003	Trustees of the Passionist Fathers
	(Lot 1 DP 609871 – CTVol 14160 Fol 100)
1980 – 1987	Trustees of the Passionist Fathers
	(Lot 2 DP 551851 – CTVol 11807 Fol 5)
1972 – 1980	Trustees of the Passionist Fathers
	(Lot 1 DP 535149 – CTVol 11043 Fol 171)
1969 – 1972	Trustees of the Passionist Fathers
	(Lot 311 DP 235715 – CTVol 10730 Fol 226)
1968 – 1969	Trustees of the Passionist Fathers
	(Lot 31 DP 230508 – CTVol 10394 Fol 70)
1966 – 1968	Trustees of the Passionist Fathers
	(Lot 4 DP 225410 – CTVol 10058 Fol 154)
1965 – 1966	Trustees of the Passionist Fathers
	(Part Portion 406 Parish Gordon – Area 40 Acres – CTVol 330 Fol 167)
1944 – 1965	Trustees of the Passionist Fathers
1936 – 1944	Raymond Ouvrier Alphonus Foley, clerk in the holy orders Albert Spratt, clerk in the holy orders
1927 – 1936	Perpetual Trustee Company (Limited)
1912 – 1927	Richard Edward Nancarrow, clerk
1902 – 1912	Maria Nancarrow, widow
1878 – 1902	Richard Nancarrow, stonemason

Requested Parcel : Lot 2 DP 748682

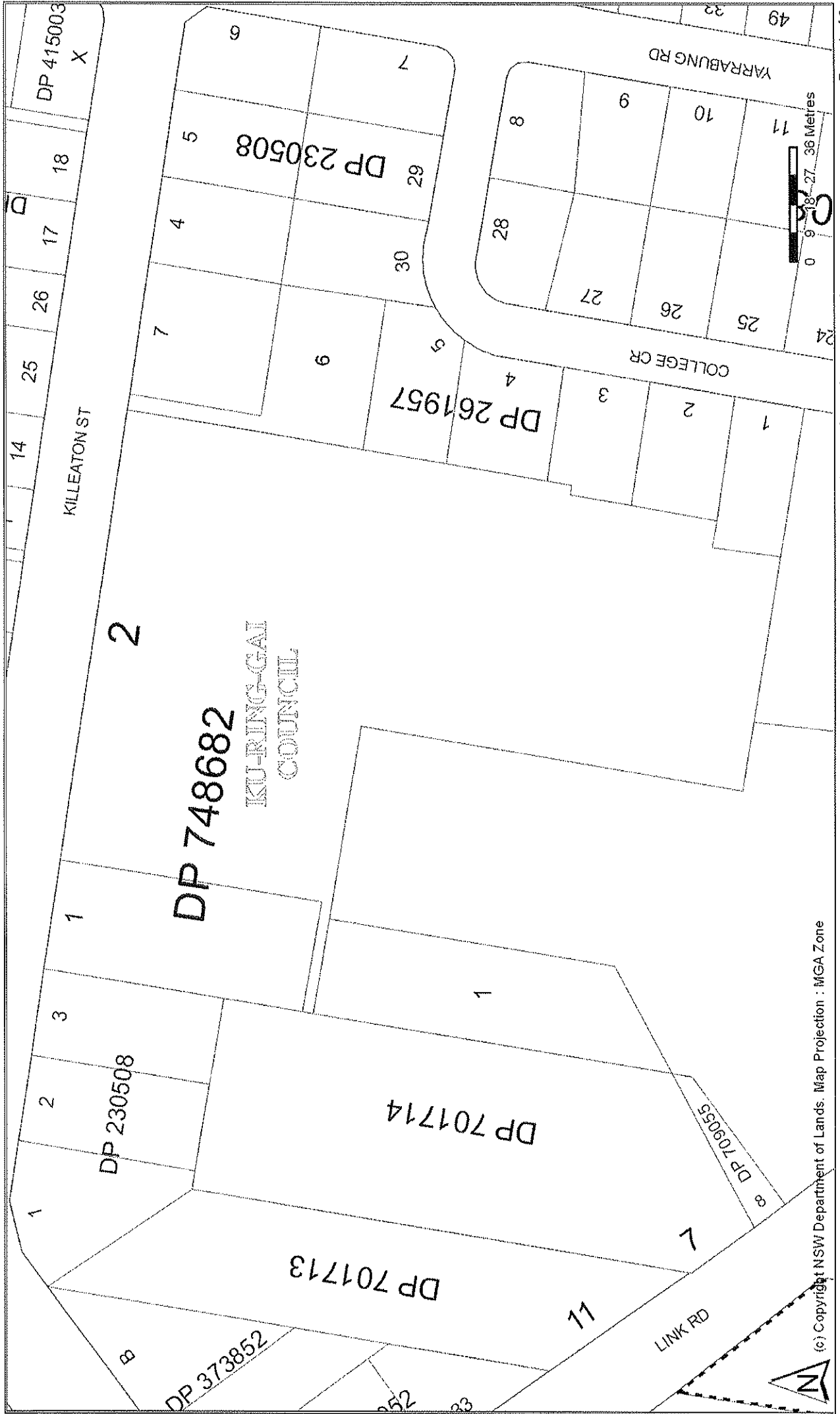
Identified Parcel : Lot 2 DP 748682

LGA : KU-RING-GAI

Parish : GORDON

County : CUMBERLAND

Locality : ST IVES



(c) Copyright NSW Department of Lands. Map Projection : MGA Zone



Advance Legal Search Pty Ltd

Phone: 02 9754 1590



Advanced Legal Search Pty Ltd hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act. Information provided through Tri-Search an approved LPI/NSW Information Broker

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 2/748682

SEARCH DATE	TIME	EDITION NO	DATE
-----	----	-----	----
21/6/2010	8:25 AM	2	16/1/2003

LAND

LOT 2 IN DEPOSITED PLAN 748682
 AT ST IVES
 LOCAL GOVERNMENT AREA KU-RING-GAI
 PARISH OF GORDON COUNTY OF CUMBERLAND
 TITLE DIAGRAM DP748682

FIRST SCHEDULE

DASMIN PTY LIMITED (T 9288999)

SECOND SCHEDULE (5 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
- 2 DP230508 EASEMENT TO DRAIN WATER APPURTENANT TO THE LAND ABOVE DESCRIBED AFFECTING THE LAND SHOWN SO BURDENED IN DP609871. SEE K428424
- 3 DP261957 EASEMENT FOR DRAINAGE 1 WIDE APPURTENANT TO THE LAND WITHIN DESCRIBED AFFECTING THE PART OF LOT 1 IN DP261957 SHOWN SO BURDENED IN DP261957
- 4 DP261957 EASEMENT FOR DRAINAGE 2 WIDE APPURTENANT TO THE LAND WITHIN DESCRIBED AFFECTING THE PART OF LOT 4 IN DP261957 SHOWN SO BURDENED IN DP261957
- * 5 AF440444 CAVEAT BY KARIMBLA PROPERTIES (NO. 4) PTY LTD

NOTATIONS

NOTE: THE CERTIFICATE OF TITLE FOR THIS FOLIO OF THE REGISTER DOES NOT INCLUDE SECURITY FEATURES INCLUDED ON COMPUTERISED CERTIFICATES OF TITLE ISSUED FROM 4TH JANUARY, 2004. IT IS RECOMMENDED THAT STRINGENT PROCESSES ARE ADOPTED IN VERIFYING THE IDENTITY OF THE PERSON(S) CLAIMING A RIGHT TO DEAL WITH THE LAND COMPRISED IN THIS FOLIO.

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***



Advance Legal Search Pty Ltd

Phone: 02 9754 1590

LP On-Line

Advanced Legal Search Pty Ltd hereby certifies that the information contained in this document has been provided electronically by the Registrar General.
Information provided through Tri-Search an approved LPLMSB Information Broker

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

21/6/2010 8:27AM

FOLIO: 2/748682

First Title(s): OLD SYSTEM
Prior Title(s): VOL 14160 FOL 100

Recorded	Number	Type of Instrument	C.T. Issue
4/9/1987	DP748682	DEPOSITED PLAN	FOLIO CREATED EDITION 1
16/1/2003	9288999	TRANSFER	EDITION 2
19/4/2010	AF440444	CAVEAT	


*** END OF SEARCH ***

Signatures and seals only

Peter M. McFadden C.P.
 REGISTRAR

Charles Bondett
 M.C.A.

A. J. [Signature]
 MEMBER



Council Clerk's Certificate

I hereby certify that -

(a) the requirements of the Local Government Act, 1919 (other than the requirements for the registration of plans), and

(b) the requirements of section 34B of the Metropolitan Water, Sewerage and Drainage Act, 1924, as amended, (Hunter District Water, Sewerage, and Drainage Act, 1938, as amended)

have been complied with by the applicant in relation to the proposed SUBDIVISION

(Insert "new road", "subdivision" or "consolidated lot" set out herein)

Subdivision No. 87/23

Date 4th August 1987

(Signature) *[Signature]*
 Council Clerk

*This part of certificate to be deleted where the application is only for a consolidated lot or the opening of a new road or where the land to be subdivided is wholly outside the areas of operations of the Metropolitan Water Sewerage and Drainage Board and the Hunter District Water Board.
 †Delete if inapplicable.

DP 748682

Registered 29-9-1987

C.A. No 87/23 OF 4-8-1987

Title System TORRENS

Purpose SUBDIVISION

of Map KU-RING-GAI SH. 37

of Plan DP 609871 (DP230508)

PLAN OF SUBDIVISION OF LOT 1 IN D.P. 609871

Reduction Ratio: 1000
 Lengths are in metres

Municipality: KU-RING-GAI
 City

Locality: ST IVES

Parish: GORDON

County: CUMBERLAND

This is sheet 1 of this plan in _____ sheets
 (Delete if inapplicable)

PETER STEWART BRAHAM
 of 27 WONGAMA CREEK, BEECHBROOK
 a surveyor registered under the Surveyors Act, 1928, as amended, hereby certifies that the survey represented on this plan ~~is~~ is correct and has been made ⁱⁿ ~~in~~ in accordance with the Survey Practice Regulations, 1977 and was completed on 28th May 1987

(Signature) *[Signature]*
 Surveyor registered under Surveyors Act, 1928, as amended
 Datum time of Assymptote A = B
 *Strike out either (a) or (b) †Insert date of survey

Panel for use only for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements or restrictions as to user

NO. 2111

MPD

SURVEYOR'S REFERENCE 39017



STATE OF NEW SOUTH WALES
REGISTERED
STATE OF TITLE

PROPERTY ACT, 1900



Appln. No. 4373

Prior Title Vol. 11807 Fol. 5

Vol. 14160 Fol. 100
CANCELLED
EDITION ISSUED

23 6 1980



I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

[Signature]

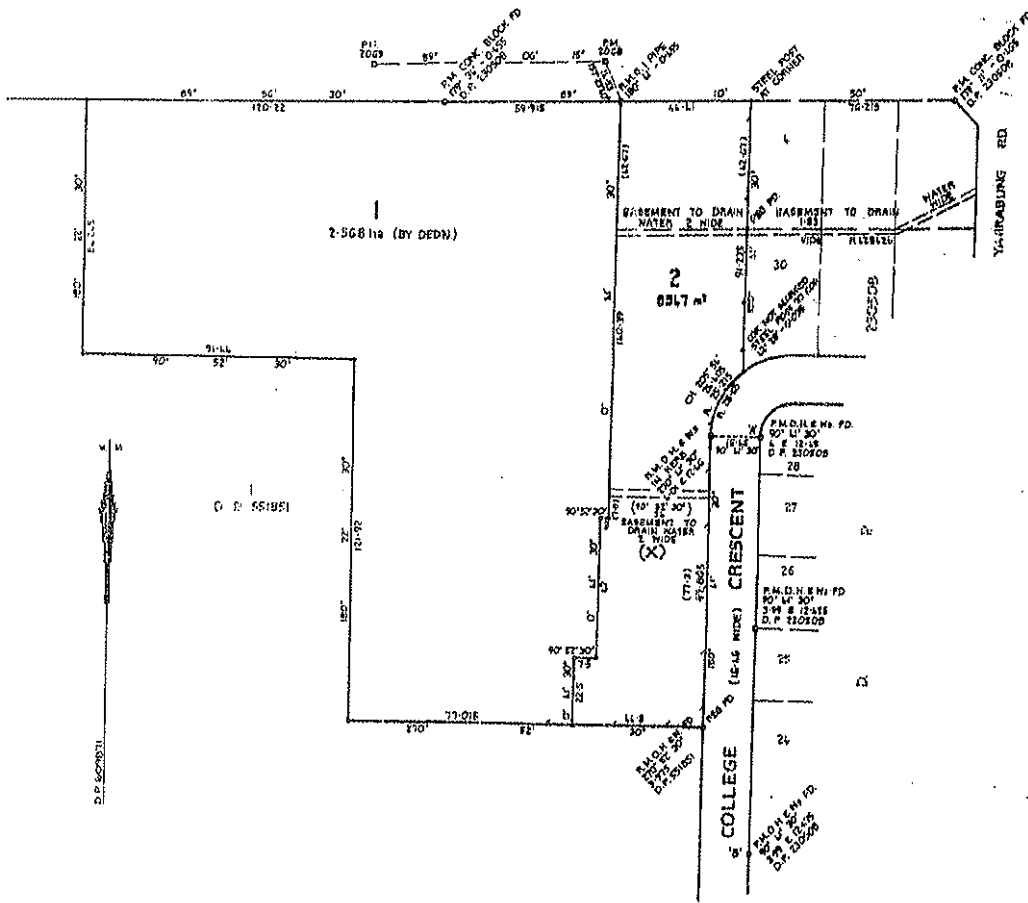
Registrar General.



PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES

KILLEATON STREET EAST



ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 1 in Deposited Plan 609871 at St. Ives in the Municipality of Ku-ring-gai Parish of Gordon and County of Cumberland being part of Portion 406 granted to Michael Ansell on 19-10-1831.

FIRST SCHEDULE

TRUSTEES OF THE PASSIONIST FATHERS.

SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. DP230508 Easement to drain water appurtenant to the land above described affecting the land shown so burdened in Deposited Plan 609871. See K428424.
3. D.P. 609871 EASEMENTS TO DRAIN WATER APPURTENANT TO THE LAND ABOVE DESCRIBED.

1979M7

[Signature]
Reg. Gen.
3.9.1981

B97

/Req: B573231
/Doc: CT 14160-100
/Prt: 21-Jun-2010

PERSONS AT

STATE OF TITLE OR ANY NOTIFICATION HEREON

(Page 1) Vol. 14160 Fol. 100

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE REGISTRAR GENERAL'S OFFICE

NEW SOUTH WALES
C **STATE OF TITLE**
 PROPERTY ACT, 1900



11807

NEW SOUTH WALES

Appln. No. 4373

Vol. **11807** Fol. **5**

Prior Title Vol. 11043 Fol. 171

Edition issued 5-4-1972



11807 Fol. 5

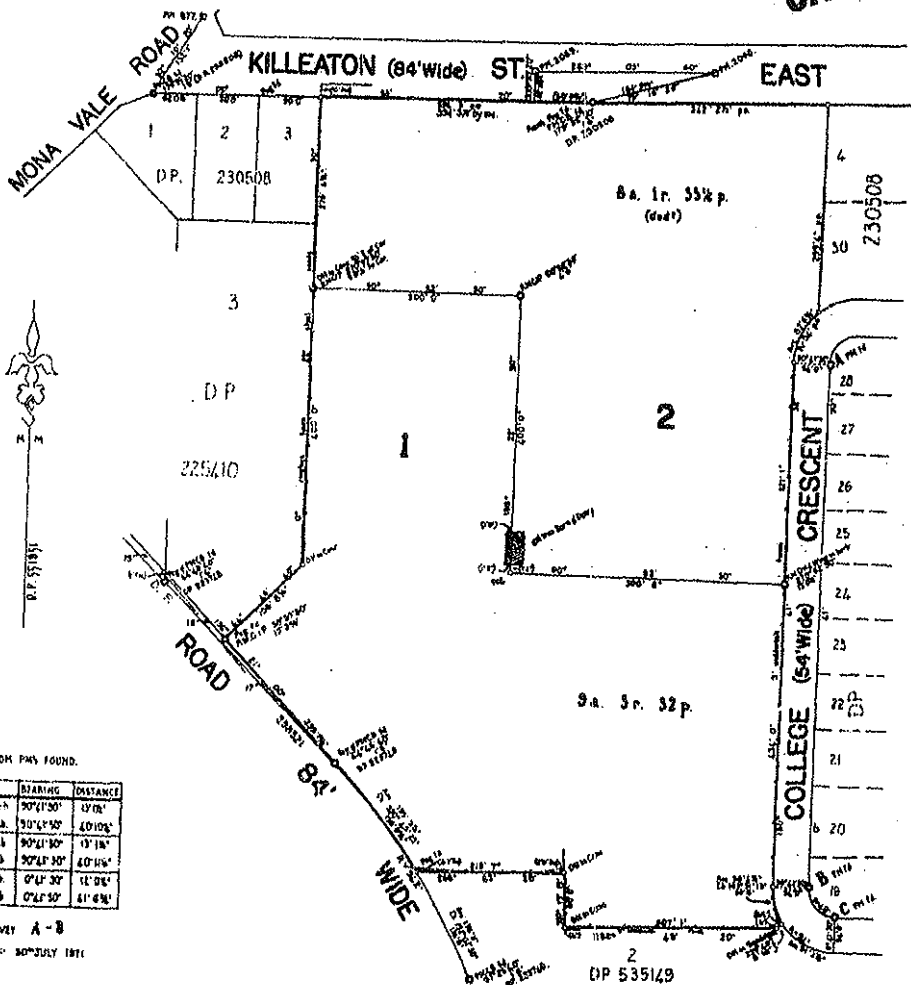
I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Jawatson
 Registrar General.



PLAN SHOWING LOCATION OF LAND

CANCELLED



ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 2 in Deposited Plan 551851 at St. Ives in the Municipality of Ku-ring-gai Parish of Gordon and County of Cumberland being part of Portion 406 granted to Michael Ansell on 19-10-1831.

FIRST SCHEDULE

TRUSTEES OF THE PASSIONIST FATHERS.

SECOND SCHEDULE

- Reservations and conditions, if any, contained in the Crown Grant above referred to.
- Basement to drain water appurtenant to the land above described created by the registration of Deposited Plan 230508. See K428424.

Jawatson
 Registrar General.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

B97 /Req: B573234 /Doc: CT 11807-005 /Prt: 21-Jun-2010

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERT

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR

NATURE

INSTRUMENT NUMBER

DATE

ENTERED

Signature of Registrar General

Title of the instrument *whole*
 23.6.1980
 New Certificate of Title here issued to *as follows*
 for lots in *Deceased* Plan No. *609871*
 Lots *1+2* Vol. *12160* Folios *194* respectively.

REGISTRAR GENERAL



NEW CERTIFICATES OF TITLE ISSUED ON *23.6.1980* NO DEALING TO BE REGISTERED WITHOUT REFERENCE TO SAID DATING MATTERS.

SECOND SCHEDULE (continued)

NATURE

INSTRUMENT NUMBER

DATE

PARTICULARS

ENTERED

Signature of Registrar General

CANCELLATION

D.P. 609871

Interests created pursuant to Section 89B Conveyancing Act 1919, by the registration of Deceased Plan 609871

3.6.1980

[Signature]

NOT RECORDED IN REGISTER AND NOT RECORDED IN REGISTER

CT 21.5.80
21/6/80
23/6/80



STATE OF TITLE
PROPERTY ACT, 1900, as amended.



10730

Application No. 4373
Prior Title Volume 10394 Folio 70

Vol 330-167



CANCELLED
Vol. **10730** Fol. **226**
Edition Issued 8-2-1968
CANCELLED

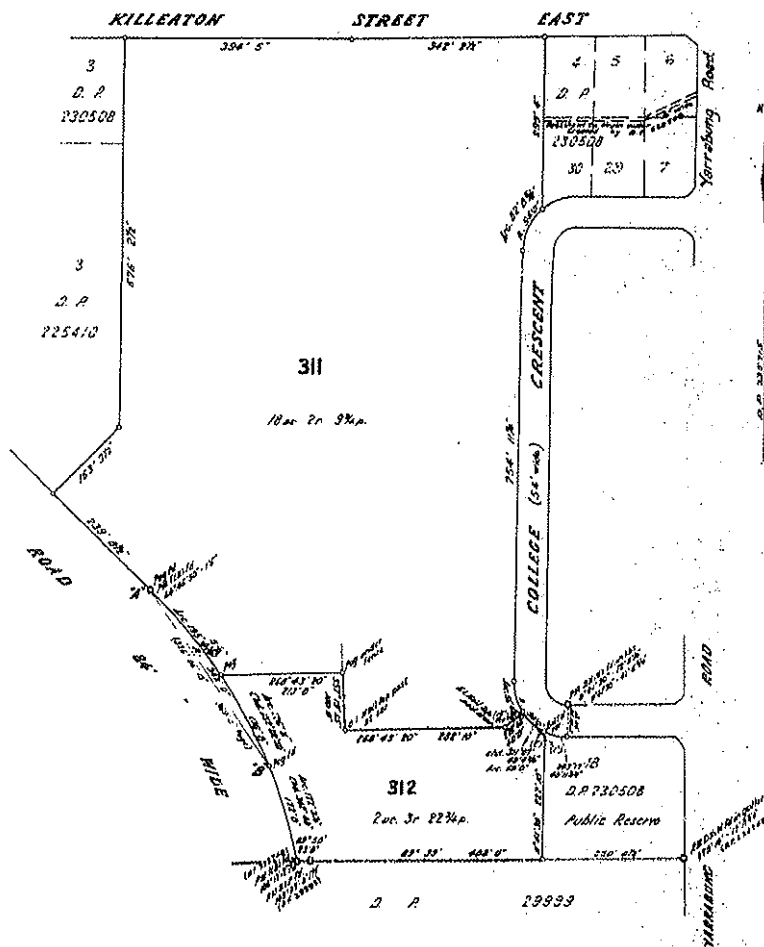
I certify that the person described in the First Schedule is the registered proprietor of the under-mentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Witness *[Signature]*

[Signature]
Registrar General.



PLAN SHOWING LOCATION OF LAND



ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 311 in Deposited Plan 235715 at St. Ives in the Municipality of Ku-ring-gai Parish of Gordon and County of Cumberland being part of Portion 406 granted to Michael Ansell on 19-10-1831.

FIRST SCHEDULE (continued overleaf)

TRUSTEES OF THE PASSIONIST FATHERS.

SECOND SCHEDULE (continued overleaf)

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. Easement to drain water appurtenant to the land above described created by the registration of Deposited Plan 230508 See K428424.

[Signature]
Registrar General.

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE.

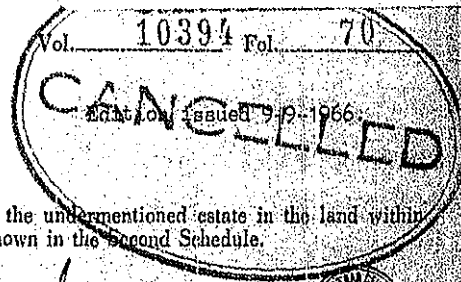
B97
/Req: B573238
/Doc: CT 10730-226
/Prt: 21-Jun-2010

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING

REON

(Page 1) Vol. **10730** Fol. **226**

Appln. No. 4373
Prior Title Vol. 10058 Fol. 154



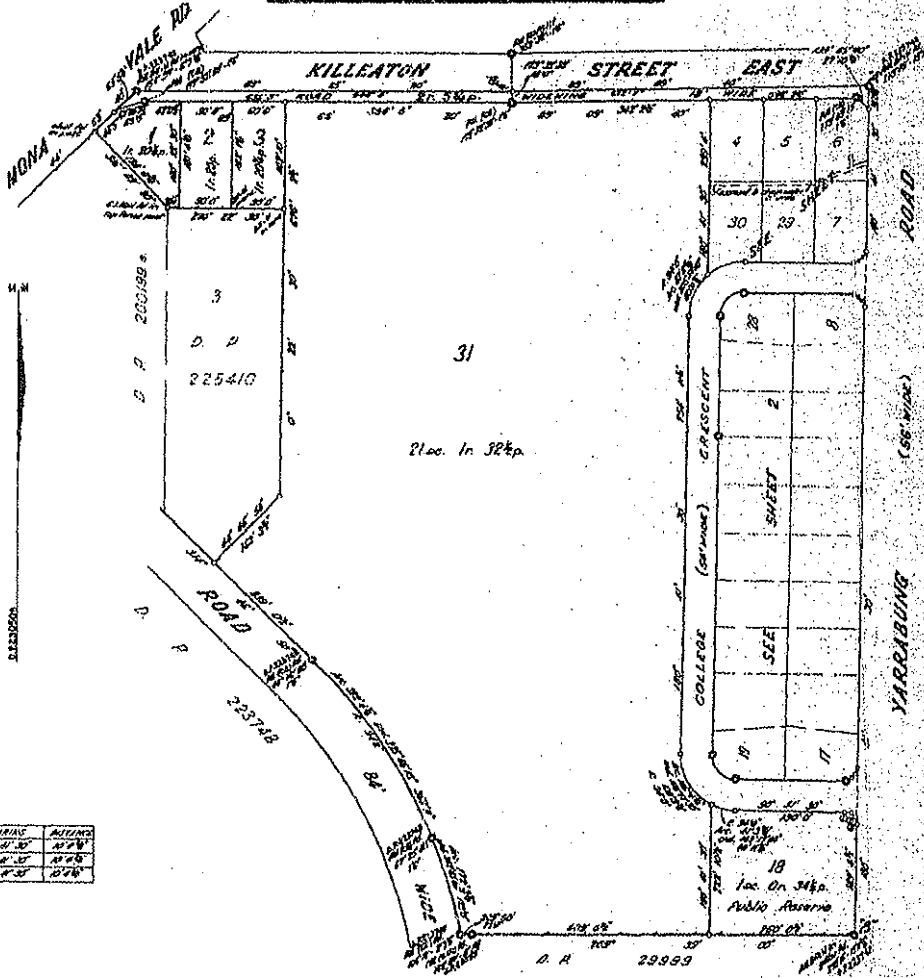
I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Witness *J. O'Sullivan.*

Jarvis
Registrar General.



PLAN SHOWING LOCATION OF LAND



LINE	BEARING	MEASUREMENT
1	N 81° 30'	107.74
2	S 81° 30'	107.74
3	N 81° 30'	107.74
4	S 81° 30'	107.74

ESTATE AND LAND REFERRED TO.

Estate in Fee Simple in Lot 31 in Deposited Plan 230508 at St. Ives in the Municipality of Ku-ring-gai Parish of Gordon and County of Cumberland being part of Portion 406 granted to Michael Ansell on 19-10-1831.

FIRST SCHEDULE (Continued overleaf)

TRUSTEES OF THE PASSIONIST FATHERS.

Jarvis
Registrar General.

SECOND SCHEDULE (Continued overleaf)

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. Easement to drain water appurtenant to the land above described created by the registration of Deposited Plan 230508. See K428424.

Jarvis
Registrar General.

BOX 97
REP: B573240
DOC: CT 10394-070
PRT: 21/06/2010

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TILES OFFICE

(Page 1) Vol. 10394 Fol. 70

NEW SOUTH WALES

CERTIFICATE OF TITLE
PROPERTY ACT, 1900, as amended.



10058

Application No. 4373

Vol. 10058 Fol. 154

Prior Title Vol. 330 Fol. 167

MA 1st Edition issued 16-7-1965



I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

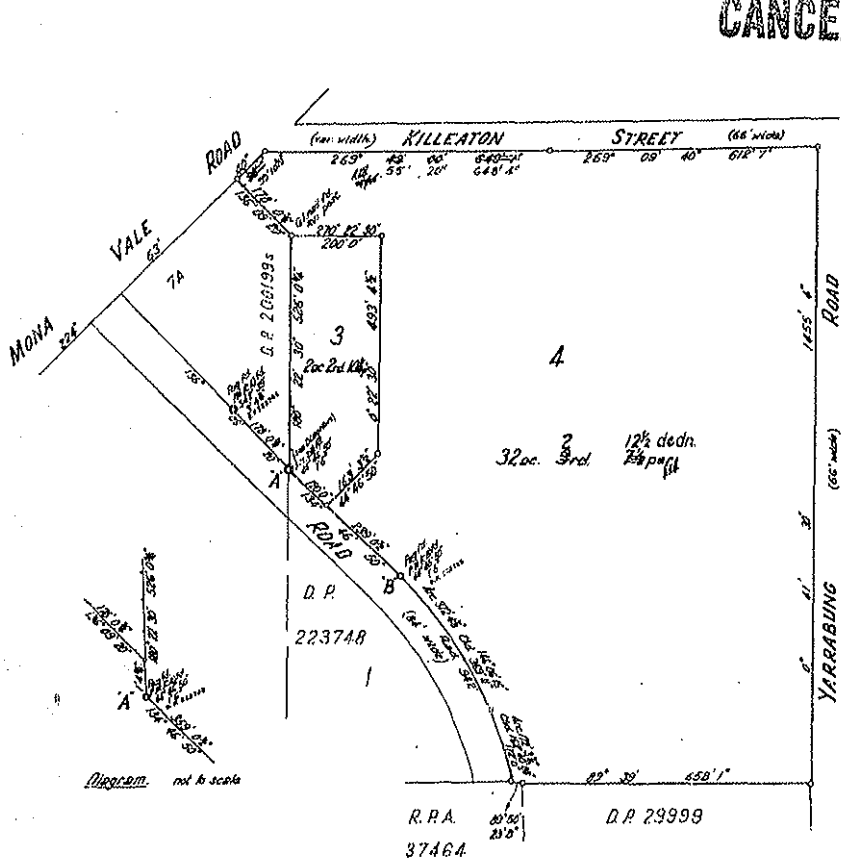
Witness *J. Charles*

Jawataon
Registrar General.



PLAN SHOWING LOCATION OF LAND

CANCELLED



ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 4 in Deposited Plan 225410 at St. Ives in the Municipality of Ku-ring-gai Parish of Gordon and County of Cumberland being part of Portion 406 granted to Michael Ansell on 19-10-1831.

FIRST SCHEDULE (continued overleaf)

TRUSTEES OF THE PASSIONIST FATHERS.

Jawataon
Registrar General.

SECOND SCHEDULE (continued overleaf)

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.

Jawataon
Registrar General.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE

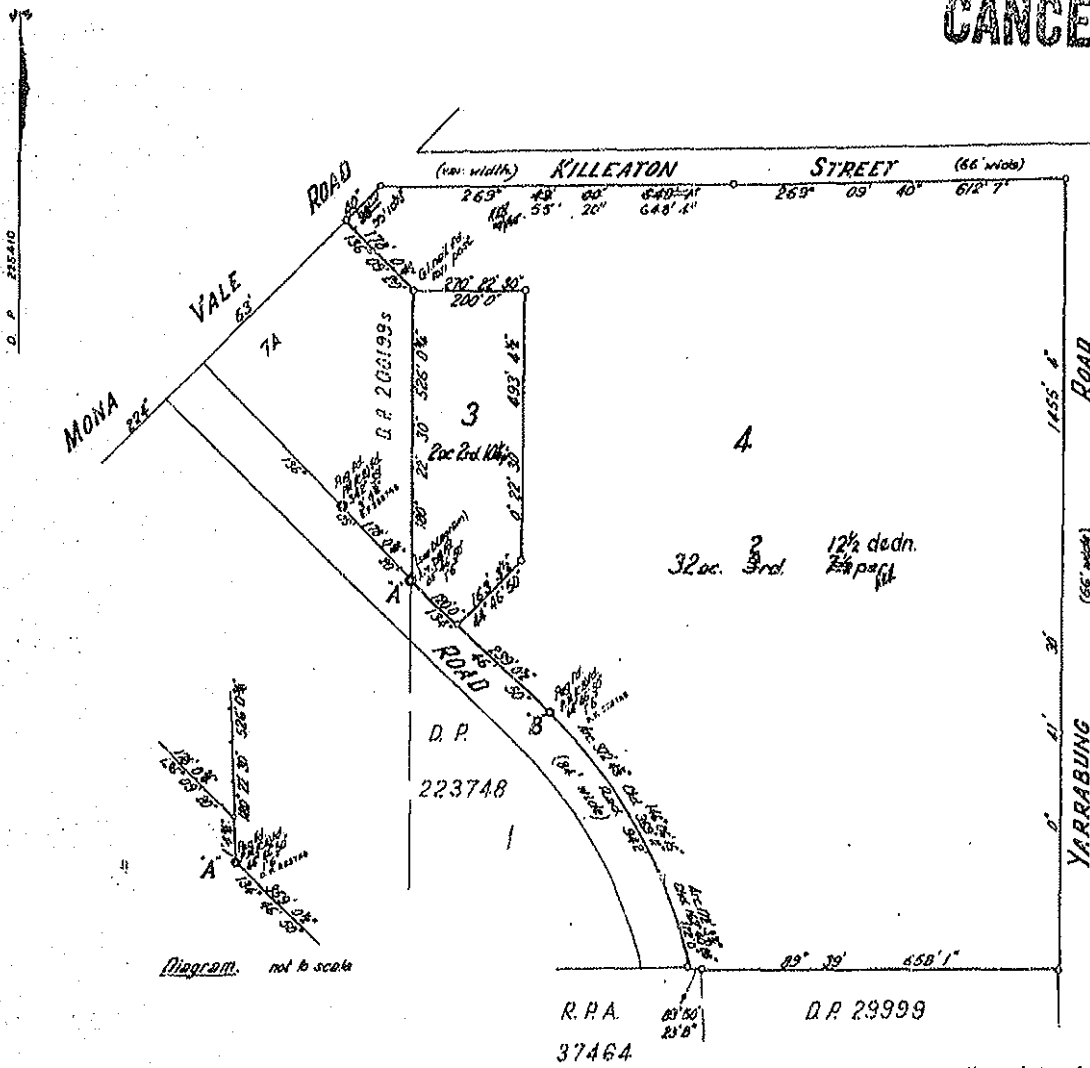
B97
/Req: B573242
/Doc: CT 10058-154
/Pt: 23-Jun-2010

PERSONS ARE CAUTIONED AGAINST DENYING ANY RIGHTS WHICH MAY BE CLAIMED BY THE REGISTERED PROPRIETOR

89001
Fol. 154
Vol. 10058
(Page 1)

PLAN SHOWING LOCATION OF LAND

CANCELLED



Note: Lot 4 has been compiled from information in D.P. 223748



(Site History Documents – Council Records)

Address 132-138 Killeaton Street ST IVES NSW 2075



Property No 135953 Status Current

Applications to List Property

14 Applications Show history

Group	Category	ID	St	Description	Address
ConvDA	DM	1253/06/DM	C	187 APARTMENTS WITH CARPARKING FOR 413	
ConvDA	DS	809/01/DSA	P	AMENDMENT - DEMOLISH THEN BUILD 86 SEPP	
ConvDA	DS	809/01/DS	P	DEMOLITION THEN BUILD 86 SEPP5 DWELLING	
DA	MultiUnit	DA1253/06	C	Adaptive re-use of former monastery building to	
LGA	SECT124	LGA0009/10	P	Section 124	
OHBN	121ZP	OHBN0418/10	P	Certificate under Section 121ZP	
OHBN	735A	OHBN0419/10	P	Certificate under Section 735A	
PlanCert	c14925	PC0790/10	P	Section 149 (2) & (5) Certificate	
RatCert	603Cert	Rat0774/10	P	Certificate under 603 of LG Act (1993)	
Section95a	Extension	EXT0005/09	P	Adaptive re-use of former monastery building to	
Section96	MultiUnit	MOD0361/09	P	Modification of DA1253/03 proposing change to	
Section96	MultiUnit	MOD0136/08	P	Modification of DA1253/06 proposing modificatio	
Section96	MultiUnit	MOD0089/09	P	Modification of DA1253/06 proposing changes to	
Section96	MultiUnit	MOD0076/10	P	Modification of DA1253/06 proposing deletion of	



(Site History Documents – WorkCover Records)



Our Ref: D10/079773
Your Ref: Todd Hore

25 JUN 2010

23 June 2010

Attention: Todd Hore
Environmental Investigation Services
PO Box 976
NORTH RYDE BC NSW 1670

Dear Mr Hore,

RE SITE: 132-138 Killeaton Street St Ives NSW

I refer to your site search request received by WorkCover NSW on 22 June 2010 requesting information on licences to keep dangerous goods for the above site.

A search of the Stored Chemical Information Database (SCID) and the microfiche records held by WorkCover NSW has not located any records pertaining to the above-mentioned premises.

If you have any further queries please contact the Dangerous Goods Licensing Team on (02) 4321 5500.

Yours Sincerely

A handwritten signature in black ink, appearing to be 'Diana Hayes'.

Diana Hayes

Senior Licensing Officer
Dangerous Goods Team

WorkCover. **Watching out for you.**

WorkCover NSW ABN 77 682 742 966 92-100 Donnison Street Gosford NSW 2250 Locked Bag 2906 Lisarow NSW 2252
Telephone 02 4321 5000 Facsimile 02 4325 4145 WorkCover Assistance Service 13 10 50
DX 731 Sydney Website www.workcover.nsw.gov.au



APPENDIX D
(Previous Geotechnical Borehole Logs)



Borehole No.
1 1/2

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V Method: SPIRAL AUGER R.L. Surface: \cong 159.1m
Date: 29-8-02 JK250 Datum: ASSUMED
Logged/Checked by: Y.N./*[Signature]*

Groundwater Record	ES USO DS DS	SAMPLER	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
				0			TOPSOIL/FILL: Silty clay, low plasticity, dark grey mottled yellow brown, with fine gravel.	MC > PL			GRASS COVER
			N = 21 5,9,12	1		CH	SILTY CLAY: high plasticity, mottled light grey, yellow and red brown, with ironstone gravel	MC \cong PL	H	> 600 > 600 > 600	
			N > 20 11,20/ 100mm	2			as above, but with low strength shale bands.			> 600 > 600 > 600	
				2			SHALE: dark grey and brown, with ironstone bands.	DW	L	> 600	LOW TO MODERATE 'TC' BIT RESISTANCE
				3			as above, but dark grey.	DW	M		MODERATE RESISTANCE
				4				DW-SW	M-H		MODERATE TO HIGH RESISTANCE
				5							
				6				SW	H		HIGH RESISTANCE
				6			REFER TO CORED BOREHOLE LOG				
				7							

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Borehole No.
1 2/2

CORED BOREHOLE LOG

Client:		SIMHILT CONSTRUCTIONS PTY LTD							
Project:		PROPOSED RESIDENTIAL DEVELOPMENT							
Location:		138 KILLEATON STREET, ST IVES, NSW							
Job No. 17065V	Core Size: NMLC	R.L. Surface: \cong 159.1m							
Date: 29-8-02	Inclination: VERTICAL	Datum: ASSUMED							
Drill Type: JK250	Bearing: -	Logged/Checked by: Y.N./ <i>Y.N.</i>							
Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS	
								DEFECT SPACING (mm)	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.
							EL VL L H H VH EL	500 300 100 50 30 10	Specific General
		5							
		6		START CORING AT 6.0m SHALE: dark grey bedded grey.	SW	H	X		- J, 90°, IR
		7				M	X		- J, 30°, S, P
80% RETURN		8				H	X		- J, 80°, S, P
		9		END OF BOREHOLE AT 9.0m		M	X		- Cr, 50mm.t - J, 65°, S, P - J, 35°, S, P
		10							- CS, 3mm.t - J, 70°, S, P - Cr, 30mm.t
		11							- J, 60°, S, P - J, 60°, S, P - J, 45°, S, P - J, 50°, S, P



Borehole No.
2 1/2

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V Method: SPIRAL AUGER R.L. Surface: \approx 159.5m
Date: 30-8-02 JK450 Datum: ASSUMED
Logged/Checked by: Y.N./ *[Signature]*

Groundwater Record	ES	U50	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			TOPSOIL/FILL: Silty clay, medium plasticity, dark grey mottled brown and grey.	MC > PL			GRASS COVER
					N = 10 3,4,6	1		CH	SILTY CLAY: high plasticity, light grey mottled yellow.	MC \approx PL	VSt H	500 400 400	
					N = 36 6,15,21	2		CL	as above, but medium plasticity, with low strength shale bands.	MC < PL	H	> 600 550 570	
						3			SHALE: dark grey, bedded grey.	XW	VL		VERY LOW 'TC' BIT RESISTANCE
						4			as above, but dark grey.	XW-DW DW	L M		VERY LOW TO LOW RESISTANCE MODERATE RESISTANCE
						5			as above, but dark grey.				
						6				DW	L-M		LOW RESISTANCE
						7							

▼
AFTER 1 HOUR



Borehole No.

2 2/2

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V **Method:** SPIRAL AUGER JK450 **R.L. Surface:** \cong 159.5m
Date: 30-8-02 **Datum:** ASSUMED

Logged/Checked by: Y.N. / *Y.N.*

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	U50	DB									
								SHALE: dark grey.	DW	M		MODERATE RESISTANCE
					8			END OF BOREHOLE AT 7.5m				
					9							
					10							
					11							
					12							
					13							
					14							



Borehole No.
3 1/1

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V Method: SPIRAL AUGER R.L. Surface: \approx 159.2m
Date: 29-8-02 JK250 Datum: ASSUMED
Logged/Checked by: Y.N./*Y.N.*

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DS									
					0			TOPSOIL/FILL: Silty clay, medium plasticity, yellow brown mottled grey with roots.	MC \approx PL			GRASS COVER
				N = 12 4,6,6	1		CH	SILTY CLAY: high plasticity, mottled light grey, yellow and red brown.	MC \approx PL	H	460 450 450	
				N = 36 10,17,19	2		CL	as above, but medium plasticity, with iron indurated and very low strength shale bands.	MC < PL		480 550 480	
					3			SHALE: dark grey, bedded grey and brown, with ironstone bands.	XW-DW	L		LOW 'TC' BIT RESISTANCE
					4				DW	L-M		LOW TO MODERATE RESISTANCE
					5			as above, but dark grey.		M		MODERATE RESISTANCE
					6			END OF BOREHOLE AT 6.0m				
					7							

▼
AFTER
20 HRS



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Borehole No.
4 1/1

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V Method: SPIRAL AUGER R.L. Surface: \approx 159.2m
Date: 30-8-02 JK450 Datum: ASSUMED
Logged/Checked by: Y.N. *Y.N.*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	ES	USO	DB	DS										
DRY ON COMPLETION						0			TOPSOIL/FILL: Silty clay, low plasticity, dark grey mottled grey.	MC > PL			GRASS COVER	
					N = 11 3,4,7	1		CH	SILTY CLAY: high plasticity, light grey mottled yellow brown.	MC \approx PL	H	550 550 550		
					N > 39 8,16, 23/100mm	2			as above, but with low strength shale bands.	MC < PL		550 450 500		
						2			SHALE: dark grey bedded grey and dark brown.	XW-DW	VL-L			VERY LOW TO LOW 'TC' BIT RESISTANCE
						3			as above, but dark grey.	DW	L			
					4									
					5									
					6									
					7				END OF BOREHOLE AT 7.0m		L-M		LOW TO MODERATE RESISTANCE	

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AFTER 4 HRS



Borehole No.
5 1/2

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD		Project: PROPOSED RESIDENTIAL DEVELOPMENT		Location: 138 KILLEATON STREET, ST IVES, NSW							
Job No. 17065V		Method: SPIRAL AUGER JK250		R.L. Surface: \approx 159.2m							
Date: 29-8-02		Logged/Checked by: Y.N./ <i>YN</i>		Datum: ASSUMED							
Groundwater Record	SAMPLES			Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DS								
				0			TOPSOIL/FILL: Silty clay, low plasticity, dark grey, with roots.	MC \approx PL			GRASS COVER
			N = 12 3,5,7	1		CH	SILTY CLAY: high plasticity, mottled light grey, red brown and yellow.	MC > PL	VSt	400 350 400	
			N = 30 7,10,20	2			as above, but with ironstone and very low strength shale bands.		H	> 600 > 600 > 600	
				3				MC < PL			
				4			SHALE: dark grey with red brown ironstained bands.	DW	L		LOW 'TC' BIT RESISTANCE
				6				DW	L-M		MODERATE 'TC' BIT RESISTANCE WITH LOW RESISTANCE
				7			REFER TO CORED BOREHOLE LOG				



Borehole No.
5 2/2

CORED BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V **Core Size:** NMLC **R.L. Surface:** \cong 159.2m
Date: 29-8-02 **Inclination:** VERTICAL **Datum:** ASSUMED
Drill Type: JK250 **Bearing:** - **Logged/Checked by:** Y.N./*Y.N.*

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION		Weathering	Strength	POINT LOAD STRENGTH INDEX $I_p(50)$	DEFECT DETAILS		
				Rock Type, grain characteristics, colour, structure, minor components.	Strength				DEFECT SPACING (mm)	DESCRIPTION	
										Type, inclination, thickness, planarity, roughness, coating.	Specific
		6									
		7		START CORING AT 7.0m							
70% RETURN		8		SHALE: dark grey bedded grey, highly fractured.	DW	M-H	X			<ul style="list-style-type: none"> J, 60°, IS, S, P J, 45°, IS, S, P Cr, 50mm.t Cr, 80mm.t Cr, 100mm.t Cr, 150mm.t Cr, 120mm.t Cr, 70mm.t 	
				as above, but grey with clay seams.	XW	EL-VL					
					DW	M					
					DW	M					
		9		INTERBEDDED SHALE AND SANDSTONE: fine grained, light grey and grey.			X		<ul style="list-style-type: none"> J, 45°, SP, 2mm.t, CS CS, 10mm.t 		
			SANDSTONE: fine grained, light grey.	DW	M	X					
		10		END OF BOREHOLE AT 10.0m							
		11									
		12									

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Borehole No.

6 1/2

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V Method: SPIRAL AUGER R.L. Surface: \approx 158.7m
Date: 30-8-02 JK450 Datum: ASSUMED
Logged/Checked by: Y.N./

Groundwater Record	ES	US	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
					0			TOPSOIL/FILL: Silty clay, low plasticity, dark brown and grey.	MC < PL			GRASS COVER
				N = 14 4,6,8	1		CL	SILTY CLAY: medium plasticity, mottled red brown, yellow and light grey.	MC < PL	H	550 570 520	
				N = 38 11,14,24	2			as above, but ironstone iron indurated.			> 600 > 600 > 600	
					3			SHALE: grey, with ironstone bands.	XW	L		VERY LOW 'TC' BIT RESISTANCE
					4			SHALE: dark grey, with light grey clay bands.				
					5			as above, but with ironstone bands.	DW	L-M		LOW RESISTANCE
					6							
					7			SANDSTONE: fine grained, light grey.	DW	M		MODERATE RESISTANCE

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▼
AFTER
2 HRS



Borehole No.
6 2/2

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V **Method:** SPIRAL AUGER JK450 **R.L. Surface:** ≈ 158.7m
Date: 30-8-02 **Datum:** ASSUMED
Logged/Checked by: Y.N./ *Y.N.*

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.i)	Remarks
	ES	US	DB									
							SANDSTONE: fine grained, light grey.	DW	M		
					8			END OF BOREHOLE AT 7.5m				
					9							
					10							
					11							
					12							
					13							
					14							

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Borehole No.
7 / 1/1

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V Method: SPIRAL AUGER R.L. Surface: \approx 159.8m
Date: 30-8-02 JK450 Datum: ASSUMED
Logged/Checked by: Y.N./*ly*

Groundwater Record	ES	USO	DB	DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			TOPSOIL/FILL: Silty clay, medium plasticity, grey and dark grey, with roots.	MC > PL			GRASS COVER
					N = 11 3,4,7	1		CH	SILTY CLAY: high plasticity, light grey mottled yellow and brown.	MC > PL	VSt	250 320 300	
					N = 31 7,12,19	2			as above, but with shale bands.	MC < PL	H	> 600 > 600 > 600	
						3			SHALE: dark grey.	XW-DW	VL		VERY LOW 'TC' BIT RESISTANCE
						4							
						5				DW	L-M		LOW RESISTANCE
						6					M		MODERATE RESISTANCE
						6			END OF BOREHOLE AT 6.0m				
						7							

▼
AFTER
3 HRS



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Borehole No.

8 1/1

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V
Date: 30-8-02

Method: SPIRAL AUGER
JK450

R.L. Surface: \approx 158.8m
Datum: ASSUMED

Logged/Checked by: Y.N. / *YN*

Groundwater Record	SAMPLES				Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB	DS								
					0			TOPSOIL/FILL: Silty clay, low plasticity, dark grey mottled brown.	MC > PL			GRASS COVER
				N = 15 4, 6, 9	1		CH	SILTY CLAY: medium plasticity, red brown mottled yellow and light grey, with ironstone gravel.	MC < PL	H	550 550 500	
				N = 31 8, 13, 18	2						> 600 > 600 > 600	
					3			SHALE: grey, with ironstone bands.	XW-DW	VL-L		VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS
					4			SHALE: bedded dark grey, yellow brown and grey, with ironstone bands.	DW	L-M		LOW RESISTANCE
					5					M		MODERATE RESISTANCE
					6			END OF BOREHOLE AT 6.0m				
					7							

▼
AFTER 2 HRS

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Borehole No.
9 1/1

BOREHOLE LOG

Groundwater Record		ES US DS SAMPLER	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
				0			TOPSOIL/FILL: Silty clay, medium plasticity, brown and grey.	MC > PL			GRASS COVER
			N = 21 6,9,12	1		CH	SILTY CLAY: medium to high plasticity, red brown mottled yellow and light grey, with ironstone bands.	MC < PL	H	> 600 > 600 > 600	
			N > 26 15,26/ 150mm	2			as above but with light grey mottled red brown, with shale bands.			> 600 > 600	
				2			SHALE: dark grey bedded brown, with ironstone bands.	DW	L-M		LOW 'TC' BIT RESISTANCE WITH LOW BANDS
				3							
				4			as above, but dark grey.	DW	M		LOW RESISTANCE WITH VERY LOW BANDS
				6					M-H		LOW TO MODERATE RESISTANCE
				6			END OF BOREHOLE AT 6.0m				
				7							

▼ AFTER 1 & 1/4 HRS

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Borehole No.
10 1/1

BOREHOLE LOG

Client: SIMHILT CONSTRUCTIONS PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW

Job No. 17065V Method: SPIRAL AUGER R.L. Surface: \approx 160.4m
Date: 30-8-02 JK450 Datum: ASSUMED
Logged/Checked by: Y.N. / *dy*

Groundwater Record	SAMPLES	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Ref. Density	Hand Penetrometer Readings (kPa.)	Remarks
			0			TOPSOIL/FILL: Silty clay, medium plasticity, brown and grey, with roots.	MC > PL			GRASS COVER
		N = 18 4, 8, 11	1		CH	SILTY CLAY: medium to high plasticity, red brown mottled yellow and light grey, with ironstone gravel.	MC < PL	H	450 500 450	
			2			SHALE: dark grey bedded yellow brown, with ironstone bands.	DW	L-M		LOW 'TC' BIT RESISTANCE WITH VERY LOW BANDS
			3							
			4			as above, but dark grey.				
			5					M		LOW RESISTANCE WITH MODERATE RESISTANCE
			6			END OF BOREHOLE AT 6.0m				
			7							

▼
AFTER 1 HOUR

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Borehole No.
101
1/3

BOREHOLE LOG

Client: DASMIN PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 138 KILLEATON STREET, ST IVES, NSW.

Job No. 20607V **Method:** SPIRAL AUGER JK550 **R.L. Surface:** ≈ 159.70m
Date: 5-10-06 **Datum:** ASSUMED
Logged/Checked by: H.D./

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	U50	DS									
DRY ON COMPLETION OF AUGER -ING ON COMPLETION OF CORING					0			FILL: Sandy clay, medium plasticity, dark brown.	MC > PL			GRASS COVER APPEARS POORLY COMPACTED
				N = 8 2,4,4	1		CH	SILTY CLAY: high plasticity, light grey.	MC > PL	VSt	300 250 250	RESIDUAL
				N > 15 7, 15/ 150mm REFUSAL	2			As above, but with XW shale bands.	MC < PL	H	> 600 > 600	VERY LOW 'TC' BIT RESISTANCE
								SHALE: dark grey.	XW	EL		LOW RESISTANCE
					3			REFER TO CORED BOREHOLE LOG				50mm PVC STANDPIPE INSTALLED TO 11.6, SLOTTED FROM 6.0m, BAILED TO 6.2m DEPTH ON COMPLETION.
					4							
					5							
					6							
					7							



Borehole No.
101
2/3

CORED BOREHOLE LOG

Client:	DASMIN PTY LTD	
Project:	PROPOSED RESIDENTIAL DEVELOPMENT	
Location:	138 KILLEATON STREET, ST IVES, NSW.	
Job No.	20607V	Core Size: NMLC
Date:	5-10-06	Inclination: VERTICAL
Drill Type:	JK550	Bearing: -
		R.L. Surface: ≈ 159.70m
		Datum: ASSUMED
		Logged/Checked by: H.D./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS	
								DEFECT SPACING (mm)	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.
		2		START CORING AT 2.65m CORE LOSS: 0.35m.					
90% RETURN		3		SHALE: dark grey.	XW	EL			
		4			DW	VL	X		CS, 0°, 60mmt. CS, 0°, 40mmt.
19HRS AFTER BAILING CORE WATER		5			XW	EL	X		CS, 5°, 110mmt
		6		CORE LOSS: 0.10m. SHALE: dark grey. CORE LOSS: 0.20m.	DW	VL-L			
		7		SHALE: dark grey with medium strength iron indurated seams.	XW	EL			CS, 0°, 100mmt.
		8		SILTY CLAY: medium to high plasticity, light grey.	RS	H			HP = 460, 490, 540 kPa.
		9		SANDSTONE: fine to medium grained, light grey and dark grey. SANDSTONE: coarse to medium grained, light grey with dark grey laminae, bedded at 5-20°.	DW	VL			XWS, 0°, 100mmt. J, 60°, P. S, RUNS 100mm XWS, 5°, 120mmt J, 50°, P. S, RUNS 110 mm.
					Fr	M-H	X		J, 80-90°, Un, R, RUNS 600mm, PARTLY HEALED.



Borehole No.
102
 1/2

BOREHOLE LOG

Client: DASMIN PTY LTD
 Project: PROPOSED RESIDENTIAL DEVELOPMENT
 Location: 138 KILLEATON STREET, ST IVES, NSW.

Job No. 20607V Method: SPIRAL AUGER R.L. Surface: ≈ 158.50m
 Date: 6-10-06 JK550 Datum: ASSUMED
 Logged/Checked by: H.D./

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	US	DB									
DRY ON COMPLETION OF AUGERING				N = 10 3,4,6	0		CH	TOPSOIL: Sandy clay, medium plasticity, dark brown. SILTY CLAY: high plasticity, yellow brown mottled red brown.	MC < PL MC < PL	H	480 450 510	GRASS COVER RESIDUAL
				N = 30 9,12,18	1		CL	SILTY CLAY: high plasticity, light grey mottled red brown, with fine grained ironstone gravel.			> 600 > 600	
				N = 38 10,15,23	2							
					3							
ON COMPLETION OF CORING					4		XW	SHALE: grey with medium strength iron indurated bands.		EL		VERY LOW 'TC' BIT RESISTANCE
					5			REFER TO CORED BOREHOLE LOG				
					6							
					7							



Borehole No.
102
2/2

CORED BOREHOLE LOG

Client:		DASMIN PTY LTD								
Project:		PROPOSED RESIDENTIAL DEVELOPMENT								
Location:		138 KILLEATON STREET, ST IVES, NSW.								
Job No. 20607V		Core Size: NMLC		R.L. Surface: ≈ 158.50m						
Date: 6-10-06		Inclination: VERTICAL		Datum:						
Drill Type: JK550		Bearing: -		Logged/Checked by: H.D./						
Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS		
								DEFECT SPACING (mm)	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.	
		4		START CORING AT 4.56m						
90% RET-URN		5		CORE LOSS: 0.15m. SHALE: dark grey speckled orange brown.	XW	EL	X		M strength seam, 60mmt	
				CORE LOSS: 0.06m SANDY CLAY: medium plasticity, dark grey.	RS	(H)				HP = 500, 430, 480kPa.
FULL RET-URN		6		SANDSTONE: fine to medium grained, dark grey and light grey.	XW	EL	X			
				SANDSTONE: fine to medium grained, light grey speckled yellow brown.				X		
				CORE LOSS: 0.05m. SANDSTONE: fine to medium grained, brown and red brown, bedded at 5-15°.	DW	M		X		FRACTURED ZONE, 300mmt
		8		SANDSTONE: fine to medium grained, light grey, with brown laminae, bedded at 5°.	SW		X		CS, 10°, 30mmt	
	CORE LOSS: 0.05m SANDSTONE: fine to medium grained, light grey with brown laminae, bedded at 10-20°.			SW	M		X		XWS, 5°, 30mmt	
		9		SANDSTONE: fine to medium grained, light grey with dark grey laminae, bedded at 5-20°.	Fr		X		J, 60°, Ur, R, RUNS 100mmt	
								X		Bc, 10°, P, S, CLAY INFILL.
		10		END OF BOREHOLE AT 10.0m						

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Borehole No.
201
1/3

BOREHOLE LOG

Client: DASMIN PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 132-138 KILLEATON STREET, ST IVES, NSW

Job No. 23765V **Method:** SPIRAL AUGER JK300 **R.L. Surface:** ≈ 159.4m
Date: 17-2-10 **Datum:** AHD
Logged/Checked by: L.Y./

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB	DS									
						0			FILL: Sandy silty clay, low plasticity, dark grey, with a trace of roots.	MC > PL			GRASS COVER APPEARS MODERATELY COMPACTED
				N = 10 3,4,6		1		CH	SILTY CLAY: high plasticity, light grey mottled brown, with a trace of ironstone gravel.	MC > PL	H	500 550 570	RESIDUAL
				N = 34 9,13,21		2						> 600 > 600 > 600	
				N > 13 17,13/ 150mm REFUSAL		3		-	SHALE: grey.	XW-DW	VL	-	VERY LOW TO LOW 'TC' BIT RESISTANCE WITH LOW BANDS
						4							
						5			REFER TO CORED BOREHOLE LOG				
						6							
						7							

▼
AFTER
25 DAYS





Borehole No.
201
2/3

CORED BOREHOLE LOG

Client: DASMIN PTY LTD										
Project: PROPOSED RESIDENTIAL DEVELOPMENT										
Location: 132-138 KILLEATON STREET, ST IVES, NSW										
Job No. 23765V			Core Size: NMLC			R.L. Surface: ≈ 159.4m				
Date: 17-2-10			Inclination: VERTICAL			Datum: AHD				
Drill Type: JK300			Bearing: -			Logged/Checked by: L.Y./ <i>[Signature]</i>				
Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$		DEFECT DETAILS	
							EL	VI	DEFECT SPACING (mm)	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.
		4		START CORING AT 4.29m						
		5		CORE LOSS 0.1m SHALE: dark grey, with iron indurated bands.	DW	L				- Cr, 340mm.t
		6								- Cr, 70mm.t
		7		CORE LOSS 0.09m SHALE: dark grey.	DW	L				- XWS, 40mm.t
		8		SANDSTONE: fine grained, light grey, with occasional bedding at 0-30°.	DW-SW	M-H				- XWS, 60mm.t
		9								- XWS, 50mm.t
		10								- Cr, 90mm.t
										- Cr, 50mm.t
										- Be, 60°, P, R
										- Be, 40°, P, R

FULL
RET
URN



Borehole No.
202
1/2

BOREHOLE LOG

Client: DASMIN PTY LTD
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: 132-138 KILLEATON STREET, ST IVES, NSW

Job No. 23765V **Method:** SPIRAL AUGER JK300 **R.L. Surface:** ≈ 160.3m
Date: 17-2-10 **Datum:** AHD
Logged/Checked by: L.Y./

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB									
					0			FILL: Sandy silty clay, low plasticity, dark grey, with a trace of roots.	MC > PL			APPEARS MODERATELY COMPACTED
				N = 9 3,4,5	1		CH	SILTY CLAY: high plasticity, light grey mottled brown.	MC > PL	VSt -H	330 370 410	RESIDUAL
				N = 28 9,14,14	2			SHALE: grey, with ironstone bands.	XW	EL-VL	> 600 > 600 > 600	VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS
				N > 27 27/150mm REFUSAL	3							
					4							
					5				DW	L-M		LOW RESISTANCE WITH MODERATE BANDS.
					6			REFER TO CORED BOREHOLE LOG				
					7							

▼
AFTER
25 DAYS

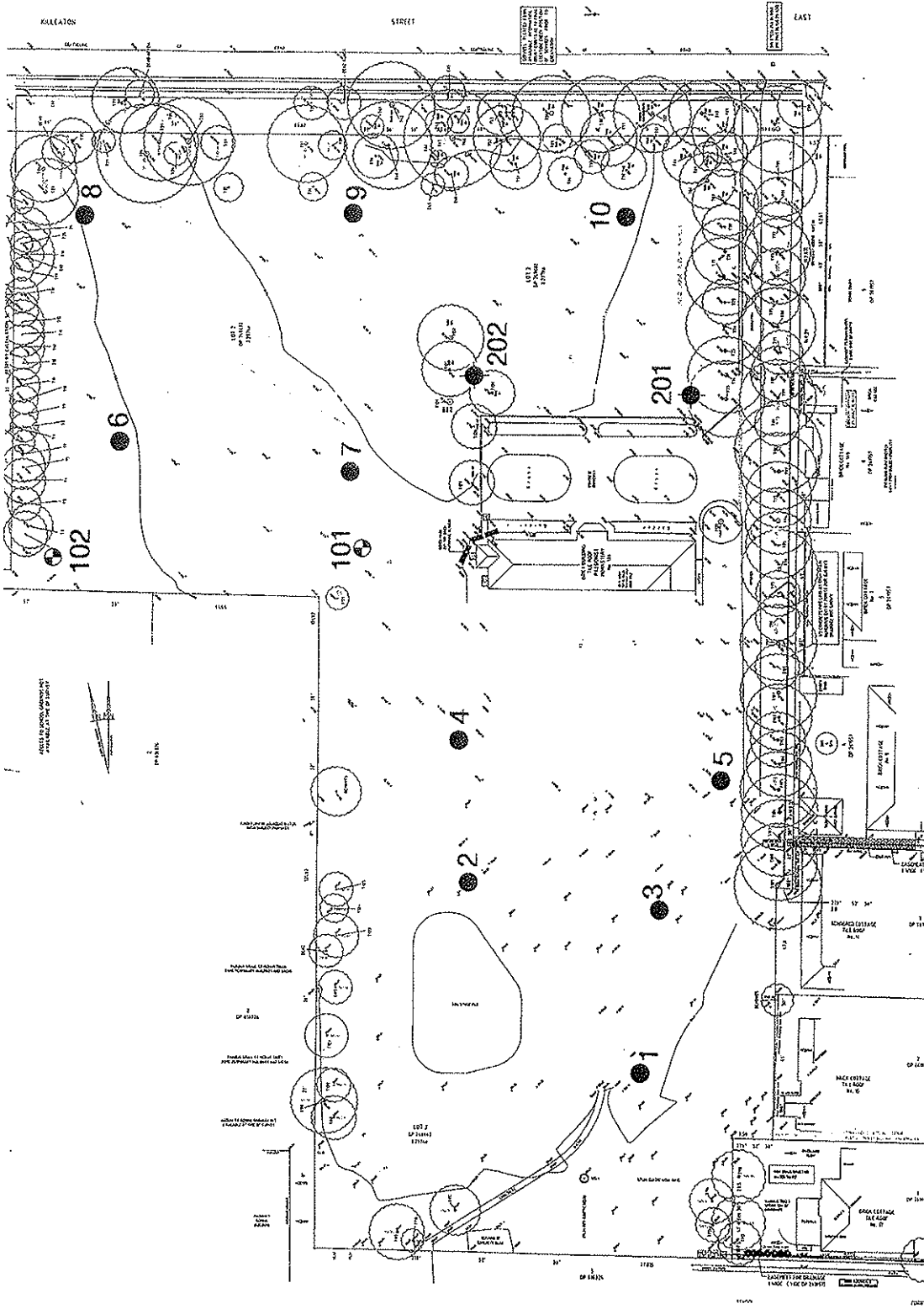
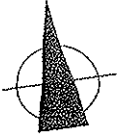


Borehole No.
202
2/2

CORED BOREHOLE LOG

Client: DASMIN PTY LTD		Project: PROPOSED RESIDENTIAL DEVELOPMENT		Location: 132-138 KILLEATON STREET, ST IVES, NSW																		
Job No. 23765V		Core Size: NMLC		R.L. Surface: ≈ 160.3m																		
Date: 17-2-10		Inclination: VERTICAL		Datum: AHD																		
Drill Type: JK300		Bearing: -		Logged/Checked by: L.Y. / 7																		
Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	DEFECT DETAILS															
							POINT LOAD STRENGTH INDEX $I_s(50)$						DEFECT SPACING (mm)						DESCRIPTION Type, inclination, thickness, planarity, roughness, coating.			
							EL	VL	L	M	H	VH	EL	500	1000	1500	2000	2500	3000	Specific	General	
		5		START CORING AT 5.65m																		
		6		SHALE: dark grey.	DW	M			X													
		7							X													
		8		SANDSTONE: fine grained, light grey, with cross bedding at 5-15°.	DW-SW	M-H				X												
FULL RETURN		9								X												
		10				H				X												
		11								X												
				END OF BOREHOLE AT 11.24m						X												
																						50mm DIAMETER PVC STANDPIPE INSTALLED TO 11.24m, SLOTTED BETWEEN 11.24m AND 8.24m

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BOREHOLE LOCATION PLAN

Jeffery and Katuskas Pty Ltd
 CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS
 Report No. 23765V Figure No. 1

- BOREHOLE FEB 2010
- BOREHOLE OCT 2006
- BOREHOLE AUG 2002

LEGEND





APPENDIX E

(Sampling Protocols and QA/QC Definitions)



SOIL AND GROUNDWATER SAMPLING PROTOCOLS

These protocols specify the basic procedures to be used when sampling soils or groundwater for environmental site assessments undertaken by EIS. The purpose of these protocols is to provide standard methods for: sampling, decontamination procedures for sampling equipment, sample preservation, sample storage and sample handling. Deviations from these procedures must be recorded.

Soil Sampling

- a) Prepare a test pit/borehole log.
- b) Layout sampling equipment on clean plastic sheeting to prevent direct contact with ground surface. The work area should be at a distance from the drill/rig excavator such that the drill rig/excavator can operate in a safe manner.
- c) Ensure all sampling equipment has been decontaminated prior to use.
- d) Remove any surface debris from the immediate area of the sampling location.
- e) Collect samples and place in glass jar with a Teflon seal. This should be undertaken as quickly as possible to prevent the loss of volatiles. If possible, fill the glass jars completely.
- f) Collect samples for asbestos analysis and place in a zip-lock plastic bag.
- g) Label the jar and/or bag with the EIS job number, sample location (eg. BH1), sampling depth interval and date. If more than one sample container is used, this should also be indicated (eg. 2 = Sample jar 1 of 2 jars).
- h) Photoionisation detector (PID) screening of volatile organic compounds (VOCs) should be undertaken on samples using the soil sample headspace method. Headspace measurements are taken following equilibration of the headspace gasses in partly filled zip-lock plastic bags. PID headspace data is recorded on the borehole/test pit log and the chain of custody forms.
- i) Record the lithology of the sample and sample depth on the borehole/test pit log in accordance with AS1726-1993²³.
- j) Store the sample in a sample container cooled with ice or chill packs. On completion of the sampling the sample container should be delivered to the lab immediately or stored in the refrigerator prior to delivery to the lab. All samples are preserved in accordance with AS 4482.1:2005, AS 4482.2:1999 and AS/NZS 5667.1:1998.
- k) Check for the presence of groundwater after completion of each borehole using an electronic dip metre or water whistle. Boreholes should be left open until the end of fieldwork. All groundwater levels in the boreholes should be rechecked on the completion of the fieldwork.

²³ *Geotechnical Site Investigations*, Standards Australia 1993 (AS1726-1993)



- l) Backfill the boreholes/test pits with the excavation cuttings or clean sand prior to leaving the site.

Decontamination Procedures for Soil Sampling Equipment

- a) All of the equipment associated with the soil sampling procedure should be decontaminated between every sampling location.
- b) The following equipment and materials are required for the decontamination procedure:
 - Phosphate free detergent (Decon 90)
 - Potable water
 - Stiff brushes
 - Plastic sheets
- c) Ensure the decontamination materials are clean prior to proceeding with the decontamination.
- d) Fill both buckets with clean potable water and add phosphate free detergent to one bucket.
- e) In the bucket containing the detergent scrub the sampling equipment until all the material attached to the equipment has been removed.
- f) Rinse sampling equipment in the bucket containing potable water.
- g) Place cleaned equipment on clean plastic sheets.

If all materials are not removed by this procedure, high-pressure water cleaning is recommended. If any equipment is not completely decontaminated by both these processes that equipment should not be used until it has been thoroughly cleaned.

Groundwater Sampling

Groundwater samples are more sensitive to contamination than soil samples and therefore adherence to this protocol is particularly important to obtain reliable, reproducible results. The recommendations detailed in AS/NZS 5667.1:1998 are considered to form a minimum standard.

The basis of this protocol is to maintain the security of the borehole and obtain accurate and representative groundwater samples. The following procedure should be used for collection of groundwater samples from previously installed groundwater monitoring wells.

- a) After monitoring well installation, at least three bore volumes should be pumped from the monitoring wells (well development) to remove any water introduced during the drilling process and/or the water that is disturbed during installation of the monitoring well. This should be completed prior to purging and sampling.



- b) Groundwater monitoring wells should then be left to recharge for at least three days before purging and sampling. Prior to purging or sampling the condition of each well should be observed and any anomalies recorded on the field data sheets. The following information should be noted: the condition of the well, noting any signs of damage, tampering or complete destruction; the condition and operation of the well lock; the condition of the protective casing and the cement footing (raised or cracked); and, the presence of water between protective casing and well.
- c) Take the groundwater level from the collar of the piezometer/monitoring well using an electronic dip meter. The collar level should be taken (if required) during the site visit using a dumpy level and staff.
- d) Purging and sampling of piezometers/monitoring wells is done on the same site visit when using micro-purge (or low flow) techniques. Layout and organize all equipment associated with groundwater sampling in a location where they will not interfere with the sampling procedure and will not pose a risk of contaminating samples. Equipment generally required includes:
- Micropore filtration system or Stericup single-use filters (for heavy metals samples).
 - Filter paper for Micropore filtration system.
 - Bucket with volume increments.
 - Sample containers: teflon bottles with 1 ml nitric acid, 75mL glass vials with 1 mL hydrochloric acid, 1 L amber glass bottles.
 - Bucket with volume increments.
 - Flow cell.
 - pH/EC/Eh/T meters.
 - Plastic drums used for transportation of purged water.
 - Esky and ice.
 - Nitrile gloves.
 - Distilled water (for cleaning).
 - Electronic dip meter.
 - Micro-purge pump pack and pump head.
 - Air and water tubing for Micro-purge.
 - Groundwater sampling forms.
- e) If single-use stericup filtration is not being used, clean the Micropore filtration system thoroughly with distilled water prior to use and between each sample. Filter paper should be changed between samples. 0.45um filter paper should be placed below the glass fibre filter paper in the filtration system.
- f) Ensure all non-disposable sampling equipment is decontaminated or that new disposable equipment is available prior to any work commencing at a new location. The procedure for decontamination of groundwater equipment is outlined at the end of this section.



- g) Disposable gloves should be used whenever samples are taken to protect the sampler and to assist in avoidance of contamination.
- h) Groundwater samples are obtained from the monitoring wells using low flow/micro-purge sampling equipment to reduce the disturbance of the water column and loss of volatiles.
- i) During pumping to purge the well, the pH, temperature, conductivity, dissolved oxygen, redox potential and groundwater levels are monitored (where possible) using calibrated field instruments to assess the development of steady state conditions. Steady state conditions are generally considered to have been achieved when the difference in the pH measurements was less than 0.2 units and the difference in conductivity was less than 10%.
- j) All measurements are recorded on specific data sheets.
- k) Once steady state conditions are considered to have been achieved, groundwater samples are obtained directly from the pump tubing and placed in appropriate glass bottles, BTEX vials or plastic bottles.
- l) All samples are preserved in accordance with water sampling requirements detailed in the NEPM 1999 and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice in accordance with AS/NZS 5667.1:1998.
- m) Record the sample on the appropriate log in accordance with AS1726:1993. At the end of each water sampling complete a chain of custody form.

Decontamination Procedures for Groundwater Sampling Equipment

- a) All of the equipment associated with the groundwater sampling procedure (other than single-use items) should be decontaminated between every sampling location.
- b) The following equipment and materials are required for the decontamination procedure:
 - Phosphate free detergent.
 - Potable water.
 - Distilled water
 - Plastic Sheets or bulk bags (plastic bags)
- c) Fill one bucket with clean potable water and phosphate free detergent, and one bucket with distilled water.
- d) Flush potable water and detergent through pump head. Wash sampling equipment and pump head using brushes in the bucket containing detergent until all materials attached to the equipment are removed.
- e) Flush pump head with distilled water.
- f) Change water and detergent solution after each sampling location.
- g) Rinse sampling equipment in the bucket containing distilled water.



- h) Place cleaned equipment on clean plastic sheets.
- i) If all materials are not removed by this procedure that equipment should not be used until it has been thoroughly cleaned



QA/QC DEFINITIONS

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994²⁴) methods and those described in *Environmental Sampling and Analysis, A Practical Guide*, (H. Keith 1991²⁵).

Practical Quantitation Limit (PQL), Limit of Reporting (LOR) and Estimated Quantitation Limit (EQL)

These terms all refer to the concentration above which results can be expressed with a minimum 95% confidence level. The laboratory reporting limits are generally set at ten times the standard deviation for the Method Detection limit (MDL) for each specific analyte. For the purposes of this report the LOR, PQL, and EQL are considered to be equivalent.

When assessing laboratory data it should be borne in mind that values at or near the PQL have two important limitations. *"The uncertainty of the measurement value can approach, and even equal, the reported value. Secondly, confirmation of the analytes reported is virtually impossible unless identification uses highly selective methods. These issues diminish when reliably measurable amounts of analytes are present. Accordingly, legal and regulatory actions should be limited to data at or above the reliable detection limit"* Keith 1991.

Precision

The degree to which data generated from repeated measurements differ from one another due to random errors. Precision is measured using the standard deviation or Relative Percent Difference (RPD). Acceptable targets for precision in this report will be less than 50% RPD for concentrations greater than ten times the PQL, less than 75% RPD for concentrations between five and ten times the PQL and less than 100% RPD for concentrations that are less than five times the PQL.

Accuracy

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter being measured. The assessment of accuracy for an analysis can be achieved through the analysis of known reference materials or assessed by the analysis of surrogates, field blanks, trip spikes and matrix spikes.

²⁴ SW-846: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, US EPA, 1994 (US EPA SW-846)

²⁵ *Environmental Sampling and Analysis, A Practical Guide*, Keith, H, 1991 (Keith 1991)



The proximity of an averaged result to the true value, where all random errors have been statistically removed. Accuracy is measured by percent recovery. Acceptable limits for accuracy generally lie between 70% to 130% recoveries. Certain laboratory methods may allow for values that lie outside these limits.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is primarily dependent upon the design and implementation of the sampling program. Representativeness of the data is partially ensured by the avoidance of contamination, adherence to sample handling and analysis protocols and use of proper chain-of-custody and documentation procedures.

Completeness

Completeness is a measure of the number of valid measurements in a data set compared to the total number of measurements made and overall performance against DQIs. The following information is assessed for completeness:

- Chain-of-custody forms;
- Sample receipt form;
- All sample results reported;
- All blank data reported;
- All laboratory duplicate and RPDs calculated;
- All surrogate spike data reported;
- All matrix spike and lab control spike (LCS) data reported and RPDs calculated;
- Spike recovery acceptable limits reported; and
- NATA stamp on reports.

Comparability

Comparability is the evaluation of the similarity of conditions (eg. sample depth, sample homogeneity) under which separate sets of data are produced. Data comparability checks include a bias assessment that may arise from the following sources:

- Collection and analysis of samples by different personnel;
- Use of different techniques;
- Collection and analysis by the same personnel using the same methods but at different times; and
- Spatial and temporal changes (due to environmental dynamics).



Blanks

The purpose of laboratory and field blanks is to check for artifacts and interferences that may arise during sampling and analysis.

Matrix Spikes

Samples are spiked with laboratory grade standards to detect interactive effects between the sample matrix and the analytes being measured. Matrix Spikes are reported as a percent recovery and are prepared for 1 in every 20 samples. Sample batches that contain less than 20 samples may be reported with a Matrix Spike from another batch. The percent recovery is calculated using the formula;

$$\frac{(\text{Spike Sample Result} - \text{Sample Result}) \times 100}{\text{Concentration of Spike Added}}$$

Acceptable recovery limits are 70% to 130%.

Surrogate Spikes

Samples are spiked with a known concentration of compounds that are chemically related to the analyte being investigated but unlikely to be detected in the environment. The purpose of the Surrogate Spikes is to check the accuracy of the analytical technique. Surrogate Spikes are reported as percent recovery.

Duplicates

Laboratory duplicates measure precision, expressed as Relative Percent Difference. Duplicates are prepared from a single field sample and analysed as two separate extraction procedures in the laboratory. The RPD is calculated using the formula where D1 is the sample concentration and D2 is the duplicate sample concentration:

$$\frac{(D1 - D2) \times 100}{\{(D1 + D2)/2\}}$$



APPENDIX F
(Equipment Calibration Certificates)



FIELD CALIBRATION FORM

PID			
Make: MiniRAE	Model: 2000	Unit: 2A	Date of last factory calibration: 2/2/10
Date of calibration: 30/6/10		Name of Calibrator: TH	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: 100 ppm		Error in measured reading: ± 0 ppm	
DISSOLVED OXYGEN			
Make:		Model: Aqua DY	
Date of calibration:		Name of Calibrator:	
Span value: 70% to 130%%			
Measured value:			
pH METER			
Make: Orion		Model: Four star	
Date of calibration:		Name of Calibrator:	
Buffer 1: Theoretical pH = 7.01± 0.01		Expiry date:	Lot No:
Buffer 2: Theoretical pH = 4.01± 0.01		Expiry date:	Lot No:
Measured reading of Buffer 1:			
Measured reading of Buffer 2:			
Slope:			
CONDUCTIVITY METER			
Make: Orion		Model: Four star	
Date:	Name of Calibrator:	Temperature: °C	
Calibration solution:		Expiry date:	Lot No:
Theoretical conductivity at temperature (see solution container):			µS/cm
Measured conductivity:			µS/cm
REDOX METER			
Make: Orion		Model: Four star	
Date of calibration:		Name of Calibrator:	
Calibration solution:		Expiry date:	Lot No:
Theoretical redox value:		240mV	
Measured redox reading:		mV	

RENTALS

Equipment Report - MINIRAE 2000 PID

This PID has been performance checked / calibrated* as follows:

Calibration	Actual Value	Reading	Pass?	
Zero – fresh air	0.0 ppm	0.0 ppm	<input checked="" type="checkbox"/>	
Span – Isobutylene	103 ppm	103 ppm	<input checked="" type="checkbox"/>	
Set Alarm limits to	High	100 ppm	Low	50 ppm
Operations Check				
<input checked="" type="checkbox"/>	Performance Check (pump, lamp, sensor & battery voltage check)			
<input checked="" type="checkbox"/>	Battery Charged	<input checked="" type="checkbox"/>	Filters Check	<input checked="" type="checkbox"/>
			Spare battery Voltage (5.5v minimum)	6 V
<input checked="" type="checkbox"/>	Electrical Safety Tag attached (AS/NZS 3760)		Tag No:	Valid to:
<input checked="" type="checkbox"/>	Bump test 1 Date: 02/02/2010			

* Calibration gas traceability information is available upon request.

Date: 02/02/2010 Checked by: MILENKO

Signed: _____

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum \$20 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
<input checked="" type="checkbox"/>	<input type="checkbox"/>	MiniRae 3000 PID / Operational Check, plus Battery Voltage @ 5.3 V
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lamp Voltage @ 10.6 V Compound Set to: ISOBUTYLENE Cfactor: 1
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Protective yellow rubber boot
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inlet probe (attached to PID)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Spare water trap filter(s) Qty _____
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Charger 240V to 12V 500mA
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Instruction Manual behind foam on the lid of case "
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Quick Guide Sheet behind foam on the lid of case "
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Spare Alkaline Battery Compartment with batteries
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Inline Moisture trap Filter Guide Laminated
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Calibration regulator & tubing (optional)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Carry Case
<input type="checkbox"/>	<input type="checkbox"/>	Check to confirm electrical safety (tag must be valid)

Processors Signature/ Initials MS

EE Quote Reference	18453	Condition on return
Customer Ref		
Equipment ID	PID MINISAI	
Equipment serial no.	110901778	

Phone: (Free Call) 1300 735 295		Environmental Assessment Technologies		Fax: (Free Call) 1800 667 123	
<small>Melbourne Branch 5 Collyer Ave, Sec 2/3/4 Email: RentalsEnviroVIC@thermofisher.com</small>	<small>Sydney Branch Level 1, 4 Tuttyvera Road, North Ryde 2113 Email: RentalsEnviroNSW@thermofisher.com</small>	<small>Adelaide Branch 27 Beulah Road, Norwood, South Australia 5007 Email: RentalsEnviroSA@thermofisher.com</small>	<small>Brisbane Branch Unit 2/6 Ross St Newstead 4006 Email: RentalsEnviroQLD@thermofisher.com</small>	<small>Perth Branch 121 Beringarra Ave Malaga WA 6000 Email: RentalsEnviroWA@thermofisher.com</small>	



APPENDIX G
(ProUCL Calculations)

General Statistics

Data File		Variable:	Arsenic	
Raw Statistics		Normal Distribution Test		
Number of Valid Samples	26	Shapiro-Wilk Test Statistic	0.323112	
Number of Unique Samples	13	Shapiro-Wilk 5% Critical Value	0.92	
Minimum	2	Data not normal at 5% significance level		
Maximum	250	95% UCL (Assuming Normal Distribution)		
Mean	17.57692	Student's-t UCL	33.79068	
Median	5			
Standard Deviation	48.40014	Gamma Distribution Test		
Variance	2342.574	A-D Test Statistic	3.286871	
Coefficient of Variation	2.753619	A-D 5% Critical Value	0.797393	
Skewness	4.790495	K-S Test Statistic	0.306294	
Gamma Statistics		K-S 5% Critical Value	0.179778	
k hat	0.614622	Data do not follow gamma distribution at 5% significance level		
k star (bias corrected)	0.569345	95% UCLs (Assuming Gamma Distribution)		
Theta hat	28.59795	Approximate Gamma UCL	28.62175	
Theta star	30.87219	Adjusted Gamma UCL	29.58456	
nu hat	31.96033			
nu star	29.60593	Lognormal Distribution Test		
Approx. Chi Square Value (.05)	18.18132	Shapiro-Wilk Test Statistic	0.845038	
Adjusted Level of Significance	0.0398	Shapiro-Wilk 5% Critical Value	0.92	
Adjusted Chi Square Value	17.58962	Data not lognormal at 5% significance level		
Log-transformed Statistics		95% UCLs (Assuming Lognormal Distribution)		
Minimum of log data	0.693147	95% H-UCL	21.26121	
Maximum of log data	5.521461	95% Chebyshev (MVUE) UCL	24.06528	
Mean of log data	1.864843	97.5% Chebyshev (MVUE) UCL	29.51413	
Standard Deviation of log data	1.105205	99% Chebyshev (MVUE) UCL	40.21736	
Variance of log data	1.221478	95% Non-parametric UCLs		
		CLT UCL	33.18995	
		Adj-CLT UCL (Adjusted for skewness)	42.71866	
		Mod-t UCL (Adjusted for skewness)	35.27696	
		Jackknife UCL	33.79068	
		Standard Bootstrap UCL	32.61465	
		Bootstrap-t UCL	109.3253	
		Hall's Bootstrap UCL	91.7231	
RECOMMENDATION		Percentile Bootstrap UCL	35.69231	
Data are Non-parametric (0.05)		BCA Bootstrap UCL	47.42308	
Use 99% Chebyshev (Mean, Sd) UCL		95% Chebyshev (Mean, Sd) UCL	58.95181	
		97.5% Chebyshev (Mean, Sd) UCL	76.85475	
		99% Chebyshev (Mean, Sd) UCL	112.0216	