Appendix D

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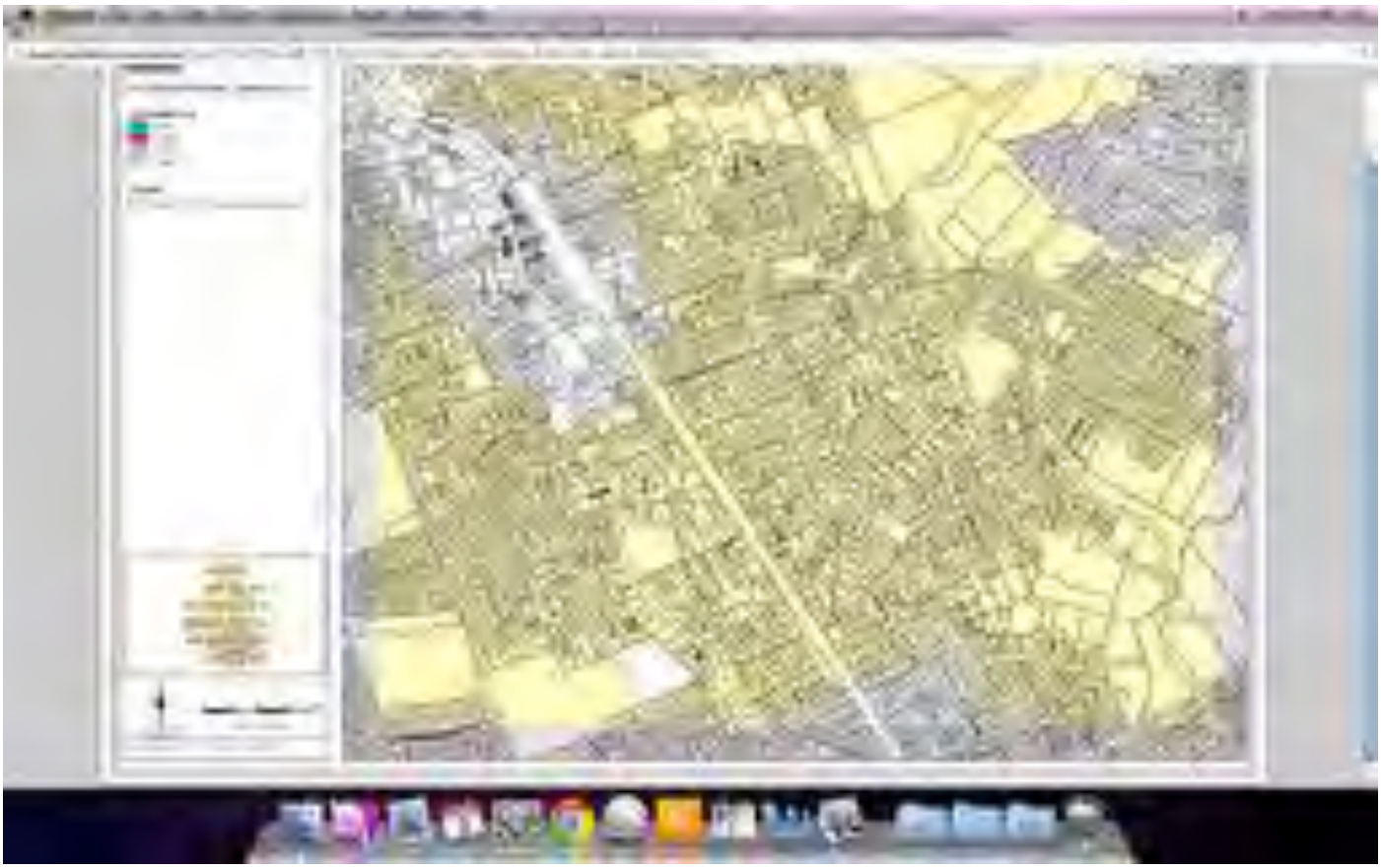
F 1300 64 46 89 W sesl.com.au Pennant Hills NSW 1715 Thornleigh NSW 2120



NSW Office of Water
Work Summary

GW023498

Licence: 10BL017420 **Licence Status:** CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): GENERAL USE

Work Type: Spear
Work Status:
Construct.Method: Pre-drilled
Owner Type: Private

Commenced Date: **Final Depth:** 8.20 m
Completion Date: 01/01/1966 **Drilled Depth:** 8.20 m

Contractor Name:
Driller:
Assistant Driller:

Property: N/A **Standing Water Level (m):**
GWMA: 603 - SYDNEY BASIN **Salinity Description:** Good
GW Zone: - **Yield (L/s):**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.046	99999
Licensed:	CUMBERLAND	ST GEORGE	Whole Lot //

Region: 10 - Sydney South Coast **CMA Map:** 9130-3N
River Basin: 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6261762.0 **Latitude:** 33°46'14.3"S
Elevation Source: (Unknown) **Easting:** 330132.0 **Longitude:** 151°09'56.2"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** GD.,PR. MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Corrugated Galvanised Iron	0.00	7.60	31			Driven into Hole
1	1	Opening	Perforations,Screen - Gauze/Mesh	7.60	8.20	31		1	Mechanically Slotted, A: 15.87mm
1	1	Opening	Perforations,Screen - Gauze/Mesh	7.60	8.20	31		2	Copper Alloy, A: 0.17mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
7.00	7.00	0.00	Unconsolidated	6.80		0.35			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.70	6.70	Sand White	Sand	
6.70	8.22	1.52	Sand White Fossils:shell Fragments Water Supply	Sand	

Remarks

07/08/1974: SITED 118 GENERAL HOLMES DV.2216

***** End of GW023498 *****

NSW Office of Water
Work Summary

GW104127

Licence: 10BL160151 **Licence Status:** CANCELLED

Authorised Purpose(s): RECREATION (GROUNDWATER)
Intended Purpose(s): RECREATION (GROUNDWATER)

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type:

Commenced Date:
Completion Date: 18/07/2001
Final Depth: 180.00 m
Drilled Depth: 180.00 m

Contractor Name: JH ISELT PTY LTD
Driller: Paul John Iselt
Assistant Driller:

Property: N/A
GWMA: -
GW Zone: -
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.021	LT 1 DP 233290
Licensed:	CUMBERLAND	GORDON	Whole Lot 1//233290

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6261243.0
Easting: 328752.0
Latitude: 33°46'30.4"S
Longitude: 151°09'02.2"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	6.00	210			Down Hole Hammer
1		Hole	Hole	6.00	180.00	150			Down Hole Hammer
1	1	Casing	Pvc Class 9	-0.20	6.00	160			Seated on Bottom

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
132.20	132.80	0.60	Unknown	55.00	156.00	0.25	156.00	01:00:00	
171.40	172.00	0.60	Unknown	55.00	180.00	0.50	180.00	02:00:00	

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.40	0.40	TOPSOIL	Topsoil	
0.40	4.90	4.50	CLAY BROWN	Clay	
4.90	6.10	1.20	SANDSTONE YELLOW	Sandstone	
6.10	132.20	126.10	SANDSTONE GREY	Sandstone	
132.20	132.80	0.60	SANDSTONE GREY W.B.	Sandstone	
132.80	171.40	38.60	SANDSTONE GREY	Sandstone	
171.40	172.00	0.60	SANDSTONE GREY W.B.	Sandstone	
172.00	180.00	8.00	SANDSTONE GREY	Sandstone	

Remarks

***** End of GW104127 *****

NSW Office of Water
Work Summary

GW104668

Licence: 10BL160260 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status: Supply Obtained
Construct.Method:
Owner Type: Private

Commenced Date: **Final Depth:** 16.20 m
Completion Date: 16/02/2001 **Drilled Depth:** 16.20 m

Contractor Name:
Driller:
Assistant Driller:

Property: CHARBEN HAULAGE PTY LTD PACIFIC HIGHWAY KILLARA **Standing Water Level:**
GWMA: - **Salinity:**
GW Zone: - **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.021	LT1 DP1017481
Licensed:	CUMBERLAND	GORDON	Whole Lot 1//1017481

Region: 10 - Sydney South Coast **CMA Map:** 9130-3N
River Basin: 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6262579.0 **Latitude:** 33°45'47.3"S
Elevation Source: (Unknown) **Easting:** 329158.0 **Longitude:** 151°09'18.9"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	16.20	100			Unknown

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From	To	Thickness	Drillers Description	Geological Material	Comments

(m)	(m)	(m)			
0.00	1.00	1.00	FILL, SILTY CLAY/BROWN	Fill	
1.00	3.70	2.70	FILL,SILTY CLAY RED-BROWN	Fill	
3.70	5.70	2.00	FILL,SILTY CLAY RED-BROWN/IRONS.GRAV	Fill	
5.70	11.00	5.30	SHALEY CLAY/IRONSTONE/GRAVELS	Clay	
11.00	16.20	5.20	SHALE GREY WITH SILTY CLAY	Shale	

Remarks

***** End of GW104668 *****

NSW Office of Water
Work Summary

GW104669

Licence: 10BL160260 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status: Supply Obtained
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 16/02/2001
Final Depth: 7.00 m
Drilled Depth: 7.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: CHARBEN HAULAGE PTY LTD PACIFIC HIGHWAY KILLARA
GWMA: -
GW Zone: -
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.021	LTR3144N.SHP=067 DP6
Licensed:	CUMBERLAND	GORDON	Whole Lot 1//1017481

Region: 10 - Sydney South Coast
River Basin: 213 - SYDNEY COAST - GEORGES RIVER
Area/District:
CMA Map: 9130-3N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6262560.0
Easting: 329120.0
Latitude: 33°45'47.8"S
Longitude: 151°09'17.4"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	7.00	100			Unknown

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.50	1.50	FILL, SILTY CLAY	Fill	
1.50	7.00	5.50	SILTY CLAY, ORANGE BROWN	Invalid Code	

Remarks

***** End of GW104669 *****

NSW Office of Water
Work Summary

GW104670

Licence: 10BL160260 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method:
Owner Type:

Commenced Date: **Final Depth:** 8.50 m
Completion Date: 16/02/2001 **Drilled Depth:** 8.50 m

Contractor Name:
Driller:
Assistant Driller:

Property: CHARBEN HAULAGE PTY LTD PACIFIC HIGHWAY KILLARA **Standing Water Level:**
GWMA: - **Salinity:**
GW Zone: - **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.021	LTR3144N.SHP=067 DP6
Licensed:	CUMBERLAND	GORDON	Whole Lot 1//1017481

Region: 10 - Sydney South Coast **CMA Map:** 9130-3N
River Basin: 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6262580.0 **Latitude:** 33°45'47.2"S
Elevation Source: (Unknown) **Easting:** 329113.0 **Longitude:** 151°09'17.1"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	8.50	100			Unknown

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	BITUMEN,FILL,SILTY CLAY	Albite	
0.50	4.00	3.50	SILTY CLAY/ORANGE BROWN	Invalid Code	
4.00	8.50	4.50	SILTY CLAY,HIGH PLASTICITY,GREY	Invalid Code	

Remarks

***** End of GW104670 *****

NSW Office of Water
Work Summary

GW106029

Licence: 10BL162952 **Licence Status:** CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status: Supply Obtained
Construct.Method: Down Hole Hammer
Owner Type: Private

Commenced Date:
Completion Date: 11/05/2004
Final Depth: 180.00 m
Drilled Depth: 180.00 m

Contractor Name: INTERTEC DRILLING SERVICES
Driller: Damian Paranihi
Assistant Driller:

Property: PETRE 17 SPRINGDALE RD KILLARA 2071
GWMA: -
GW Zone: -
Standing Water Level: 63.000
Salinity:
Yield: 0.900

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.21	A//343026
Licensed:	CUMBERLAND	GORDON	Whole Lot A//343026

Region: 10 - Sydney South Coast
River Basin: 213 - SYDNEY COAST - GEORGES RIVER
Area/District:
CMA Map: 9130-3N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6262365.0
Easting: 330296.0
Latitude: 33°45'54.8"S
Longitude: 151°10'02.9"E

GS Map: -
MGA Zone: 0
Coordinate Source: GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	5.60	205			Down Hole Hammer
1		Hole	Hole	5.60	120.00	164			Down Hole Hammer
1		Hole	Hole	120.00	180.00	164			Down Hole Hammer
1		Annulus	Concrete	0.00	5.60	205	164		
1	1	Casing	Pvc Class 9	-0.40	77.60	140			Suspended in Clamps, Screwed and Glued
1	1	Casing	Steel	-0.40	5.60	168	158		Seated on Bottom, Suspended in Clamps
1	1	Opening	Slots - Diagonal	12.00	15.00	140		1	Sawn, PVC Class 9, SL: 0.1mm, A: 4.00mm
1	1	Opening	Slots - Diagonal	54.00	57.00	140		1	Sawn, PVC Class 9, SL: 0.1mm, A: 4.00mm

1	1	Opening	Slots - Diagonal	66.00	72.00	140		1	Sawn, PVC Class 9, SL: 0.1mm, A: 4.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
12.00	14.00	2.00	Unknown			0.15			1210.00
54.00	70.00	16.00	Unknown			0.20		00:50:00	1050.00
108.00	110.50	2.50	Unknown			0.15		00:25:00	1140.00
160.00	175.00	15.00	Unknown	63.00		0.40		00:50:00	1190.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.50	1.50	topsoil	Topsoil	
1.50	9.00	7.50	shale	Shale	
9.00	54.00	45.00	sandstone, grey	Sandstone	
54.00	56.10	2.10	sandstone, grey	Sandstone	
56.10	69.50	13.40	sandstone, grey & siltstone	Sandstone	
69.50	70.00	0.50	sandstone, grey with 0.1	Sandstone	
70.00	86.50	16.50	siltstone	Siltstone	
86.50	86.90	0.40	sandstone, grey light grey	Sandstone	
86.90	104.40	17.50	sandstone, light grey	Sandstone	
104.40	124.00	19.60	sandstone, grey dark grey	Sandstone	
124.00	151.50	27.50	sandstone, light grey	Sandstone	
151.50	158.00	6.50	sandstone, light grey - grey	Sandstone	
158.00	175.50	17.50	sandstone, light grey & quartz	Sandstone	
175.50	180.00	4.50	sandstone grey	Sandstone	

Remarks

25/11/2009: updated from original form A

***** End of GW106029 *****


EPA

SESL AUSTRALIA
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Appendix E

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ACT
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Canberra
ACT 2601

VIC
Level 1
88 Mt Alexander Rd
Flemington
VIC 3031

QLD
Level 10
15 Green Square Cl
Fortitude Valley
QLD 4006

BOREHOLE LEGEND

ODOUR DESCRIPTION

Key	Odour description	Contaminant indicated
N	Nil	Not detected
C	Characteristic sharp, pungent	Ammonia
P	Petroleum products	Petrol, diesel, oil
Co	Compost	Decayed organic matter
P	Putrefied	Putrescible waste
R	Rotten egg smell (sulfurous)	Anaerobic or acid sulfate soil
A	Acidic	Respective mineral or organic acid
Ca	Caustic	Caustic material
S	Septic	Decaying organic matter
Sw	Sweet, solvent type	Ketones
Ar	Aromatic	Benzene

AS 4482.1 - 1997

ODOUR STRENGTH

Key	Strength	Description
N	Nil	Nothing detected at or around source
W	Weak	Just detectible at source; location difficult to determine
D	Distinct	Detectable immediately adjacent to source; bearable at source
S	Strong	Detectable 20m from source; bearable at source
VS	Very strong	Detectable >20m from source; pungent at source

AS 4482.1 - 1997

COLOUR KEY

G	Grey
D	Dark
Bl	Black
B	Brown
P	Pink
O	Orange
R	Red
L	Light
Y	Yellow
W	White

MOISTURE CONTENT

VD	Very Dry
D	Dry
MM	Medium Moist
M	Moist
VM	Very Moist
W	Wet

LITHOLOGY

Ba	Basaltic
Qz	Quartz
An	Anthropic
Ss	Sandstone

GRAPHIC LOG

	A horizon
	Interface layer
	B horizon
	Fill

BOREHOLE LOG

Location	BH1	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile				Mottle		Field Texture		Coarse Fragments			Unfilled soil classification	Hydrology		Odour		Field Monitoring PID (ppm)
				Fill	Natural horizons	Colour(s)	Field pH	Abundance	Colour(s)	Fine grain	Coarse grain	Abundance	Size	Lithology		Moisture content %	Interface drainage	Type	Strength	
	Bitumen	<0.1		X														N		
	Pale Brown Medium Clay with Gravel	0.2		X		PB				X								N		
		0.3		X						X										
		0.4		X						X										
		0.5		X						X										
		0.6		X						X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
	Pale Brown, Sticky Light Medium Clay with Shale	1.1		X		PB				X								N		
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
		1.6		X						X										
		1.7		X						X										
		1.8		X						X										
	Dark Brown Clay with Gravel and Tree Root	1.9		X		DB				X								N		
		2		X						X										
		2.1		X						X										
		2.2		X						X										
	Brown Light Medium Clay	2.3		X		B				X								N		
		2.4		X						X										
		2.5		X						X										
		2.6		X						X										
		2.7		X						X										
		2.8		X						X										
		2.9		X						X										
		3		X						X										
		3.1		X						X										
		3.2		X						X										
		3.3		X						X										
		3.4		X						X										
		3.5		X						X										
	Light Brown Light Medium Sandy Clay with Sandstone Inclusions	3.6		X		LB				X	X							N		
		3.7		X						X	X									
		3.8		X						X	X									
		3.9		X						X	X									
		4		X						X	X									
		4.1		X						X	X									
		4.2		X						X	X									
		4.3		X						X	X									
		4.4		X						X	X									
		4.5		X						X	X									

BOREHOLE LOG

Dark Brown Light Medium Clay with Sand	4.6		X		DB				X	X							N		
	4.7		X						X	X									
	4.8		X						X	X									
	4.9		X						X	X									
	5		X						X	X									
	5.1		X						X	X									
	5.2		X						X	X									
	5.3		X						X	X									
	5.4		X						X	X									
	5.5		X						X	X									
Dark Brown Light Medium Clay with Gravel (damp)	5.6		X		DB				X								N		
	5.7		X						X										
	5.8		X						X										
	5.9		X						X										
	6		X						X										
	6.1		X						X										
	6.2		X						X										
	6.3		X						X										
	6.4		X						X										
	6.5		X						X										
	6.6		X						X										
	6.7		X						X										
	6.8		X						X										
	6.9		X						X										
	7		X						X										
	7.1		X						X										
	7.2		X						X										
	7.3		X						X										
	7.4		X						X										
	7.5		X						X										
	7.6		X						X										
	7.7		X						X										
Reddish Brown Medium Clay with Shale	7.8			X	RB				X								N		
	7.9			X					X										
	8			X					X										
	8.1			X					X										
	8.2			X					X										
	8.3			X					X										
	8.4			X					X										
	8.5			X					X										
	8.6			X					X										
	8.7			X					X										
	8.8			X					X										
	8.9			X					X										
	9			X					X										
Limit of Assessment	9.1																		

BOREHOLE LOG

Location	BH2	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Bitumen	<0.1		X														N		
	Grey Silty Clay with Orange Mottling	0.2		X		G			O	X								N		
		0.3		X						X										
		0.4		X						X										
		0.5		X						X										
		0.6		X						X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
	Dark Grey Shale with Lenses of Light Medium Clay	1.6		X		DG				X								N		
		1.7		X						X										
		1.8		X						X										
		1.9		X						X										
		2		X						X										
		2.1		X						X										
		2.2		X						X										
		2.3		X						X										
		2.4		X						X										
		2.5		X						X										
		2.6		X						X										
		2.7		X						X										
		2.8		X						X										
		2.9		X						X										
		3		X						X										
		3.1		X						X										
		3.2		X						X										
		3.3		X						X										
		3.4		X						X										
		3.5		X						X										
		3.6		X						X										
		3.7		X						X										
	Grey Silty Clay with Shale and Increased Soil Moisture	3.8			X	G				X								N		
		3.9			X					X										
		4			X					X										
	Dark Brown Light Clay with Iron Stone Peds	4.1			X	DB				X								N		
		4.2			X					X										
		4.3			X					X										
		4.4			X					X										
		4.5			X					X										

BOREHOLE LOG

	4.6			x				x												
	4.7			x				x												
	4.8			x				x												
	4.9			x				x												
	5			x				x												
Limit of Assessment	5.1																			
	5.2																			
	5.3																			
	5.4																			
	5.5																			
	5.6																			
	5.7																			
	5.8																			
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BOREHOLE LOG

Location	BH3	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

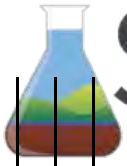
Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Bitumen	<0.1		X														N		
	Brown Light Loamy Clay	0.2		X		B				X								N		
		0.3		X						X										
	Grey Brown Medium Silty Clay Increasingly Red with Depth	0.4		X		GB				X								N		
		0.5		X						X										
		0.6		X						X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
	Dark Grey Shale with Clay Lenses at Depth	1.6		X		DG				X								N		
		1.7		X						X										
		1.8		X						X										
		1.9		X						X										
		2		X						X										
		2.1		X						X										
		2.2		X						X										
		2.3		X						X										
		2.4		X						X										
		2.5		X						X										
		2.6		X						X										
		2.7		X						X										
		2.8		X						X										
		2.9		X						X										
		3		X						X										
		3.1		X						X										
		3.2		X						X										
		3.3		X						X										
		3.4		X						X										
		3.5		X						X										
	Grey Shale and Silty Clay	3.6			X	G				X								N		
		3.7			X					X										
		3.8			X					X										
		3.9			X					X										
		4			X					X										
	Limit of Assessment	4.1																		
		4.2																		
		4.3																		
		4.4																		
		4.5																		

BOREHOLE LOG

Location	BH4	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Bitumen	<0.1		X														N		
	Road Base	0.2		X		G					X							N		
		0.3		X							X									
		0.4		X							X									
		0.5		X							X									
		0.6		X							X									
		0.7		X							X									
	Grey/Orange mixed Sandy Clay Fill	0.8		X		GO				X								N		
	Moving to Shale with Depth	0.9		X		G				X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
		1.6		X						X										
		1.7		X						X										
		1.8		X						X										
		1.9		X						X										
		2		X						X										
		2.1		X						X										
		2.2		X						X										
		2.3		X						X										
		2.4		X						X										
		2.5		X						X										
		2.6		X						X										
		2.7		X						X										
		2.8		X						X										
		2.9		X						X										
		3		X						X										
		3.1		X						X										
		3.2		X						X										
		3.3		X						X										
		3.4		X						X										
		3.5		X						X										
		3.6		X						X										
		3.7		X						X										
		3.8		X						X										
		3.9		X						X										
		4			X					X										
		4.1			X					X										
		4.2			X					X										
		4.3			X					X										
		4.4			X					X										
		4.5			X					X										

BOREHOLE LOG



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Environment & Soil Sciences

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	4.7			X				X										
	4.8			X				X										
	4.9			X				X										
	5			X				X										
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	5.2			X				X										
	5.3			X				X										
	5.4			X				X										
	5.5			X				X										
	5.6			X				X										
	5.7			X				X										
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	6			X				X										
Limit of Assessment	6.1																	
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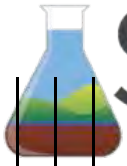
BOREHOLE LOG

Location	BH5	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Bitumen	<0.1		X														N		
	Road Base	0.2		X		G					X							N		
		0.3		X							X									
	Brown/Grey Medium Clay with Gravel and Shale with Depth	0.4		X		BG				X								N		
		0.5		X						X										
		0.6		X						X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
		1.6		X						X										
		1.7		X						X										
		1.8		X						X										
		1.9		X						X										
		2		X						X										
		2.1		X						X										
		2.2		X						X										
		2.3		X						X										
		2.4		X						X										
		2.5		X						X										
		2.6		X						X										
		2.7		X						X										
		2.8		X						X										
	Pale Brown Light Medium Clay with Shale	2.9			X	PB				X								N		
		3			X					X										
		3.1			X					X										
		3.2			X					X										
		3.3			X					X										
		3.4			X					X										
		3.5			X					X										
		3.6			X					X										
		3.7			X					X										
		3.8			X					X										
		3.9			X					X										
		4			X					X										
		4.1			X					X										
		4.2			X					X										
		4.3			X					X										
		4.4			X					X										
		4.5			X					X										

BOREHOLE LOG



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	4.6			X				X										
	4.7			X				X										
	4.8			X				X										
	4.9			X				X										
	5			X				X										
	5.1			X				X										
	5.2			X				X										
	5.3			X				X										
	5.4			X				X										
	5.5			X				X										
	5.6			X				X										
	5.7			X				X										
	5.8			X				X										
	5.9			X				X										
	6			X				X										
Limit of Assessment	6.1																	
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	6.7																	
	6.8																	
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BOREHOLE LOG

Location	BH6	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth	7.8m		AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Bitumen	<0.1		X														N		
	Dark Brown Medium Clay with Gravel and Roadbase	0.2		X		DB				X	X							N		
		0.3		X						X	X									
		0.4		X						X	X									
		0.5		X						X	X									
		0.6		X						X	X									
		0.7		X						X	X									
	Light Brown Medium Clay	0.8		X		B				X								N		
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
	Pale Brown Silty Shale	1.3			X	PB				X								N		
		1.4			X					X										
		1.5			X					X										
		1.6			X					X										
		1.7			X					X										
		1.8			X					X										
		1.9			X					X										
		2			X					X										
		2.1			X					X										
		2.2			X					X										
		2.3			X					X										
		2.4			X					X										
		2.5			X					X										
		2.6			X					X										
		2.7			X					X										
		2.8			X					X										
		2.9			X					X										
		3			X					X										
		3.1			X					X										
		3.2			X					X										
		3.3			X					X										
		3.4			X					X										
		3.5			X					X										
		3.6			X					X										
		3.7			X					X										
		3.8			X					X										
		3.9			X					X										
		4			X					X										
		4.1			X					X										
		4.2			X					X										
		4.3			X					X										
		4.4			X					X										
		4.5			X					X										

BOREHOLE LOG

	4.6			X				X											
	4.7			X				X											
	4.8			X				X											
	4.9			X				X											
	5			X				X											
	5.1			X				X											
	5.2			X				X											
	5.3			X				X											
	5.4			X				X											
	5.5			X				X											
	5.6			X				X											
	5.7			X				X											
	5.8			X				X											
	5.9			X				X											
	6			X				X											
	6.1			X				X											
	6.2			X				X											
	6.3			X				X											
	6.4			X				X											
	6.5			X				X											
	6.6			X				X											
	6.7			X				X											
	6.8			X				X											
	6.9			X				X											
	7			X				X											
	7.1			X				X											
	7.2			X				X											
	7.3			X				X											
	7.4			X				X											
	7.5			X				X											
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	7.8			X				X											
	7.9			X				X											
	8			X				X											
	8.1			X				X											
	8.2			X				X											
	8.3			X				X											
	8.4			X				X											
	8.5			X				X											
	8.6			X				X											
	8.7			X				X											
	8.8			X				X											
	8.9			X				X											
	9			X				X											
Limit of Assessment	9.1																		

BOREHOLE LOG

Location	BH7	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile				Mottle		Field Texture		Coarse Fragments			Unfilled soil classification	Hydrology		Odour		Field Monitoring PID (ppm)
				Fill	Natural horizons	Colour(s)	Field pH	Abundance	Colour(s)	Fine grain	Coarse grain	Abundance	Size	Lithology		Moisture content %	Interface drainage	Type	Strength	
	Bitumen	<0.1		X														N		
	Concrete Slab	0.2		X														N		
	Red and Grey Light Sandy Clay	0.3		X		R				X								N		
		0.4		X		G				X										
		0.5		X						X										
		0.6		X						X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
	Pale Grey Silty Shale	1.3			X	P				X								N		
		1.4			X					X										
		1.5			X					X										
		1.6			X					X										
		1.7			X					X										
		1.8			X					X										
		1.9			X					X										
		2			X					X										
		2.1			X					X										
		2.2			X					X										
		2.3			X					X										
		2.4			X					X										
		2.5			X					X										
		2.6			X					X										
		2.7			X					X										
		2.8			X					X										
		2.9			X					X										
		3			X					X										
	Limit of Assessment	3.1																		
		3.2																		
		3.3																		
		3.4																		
		3.5																		
		3.6																		
		3.7																		
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		3.9																		
		4																		
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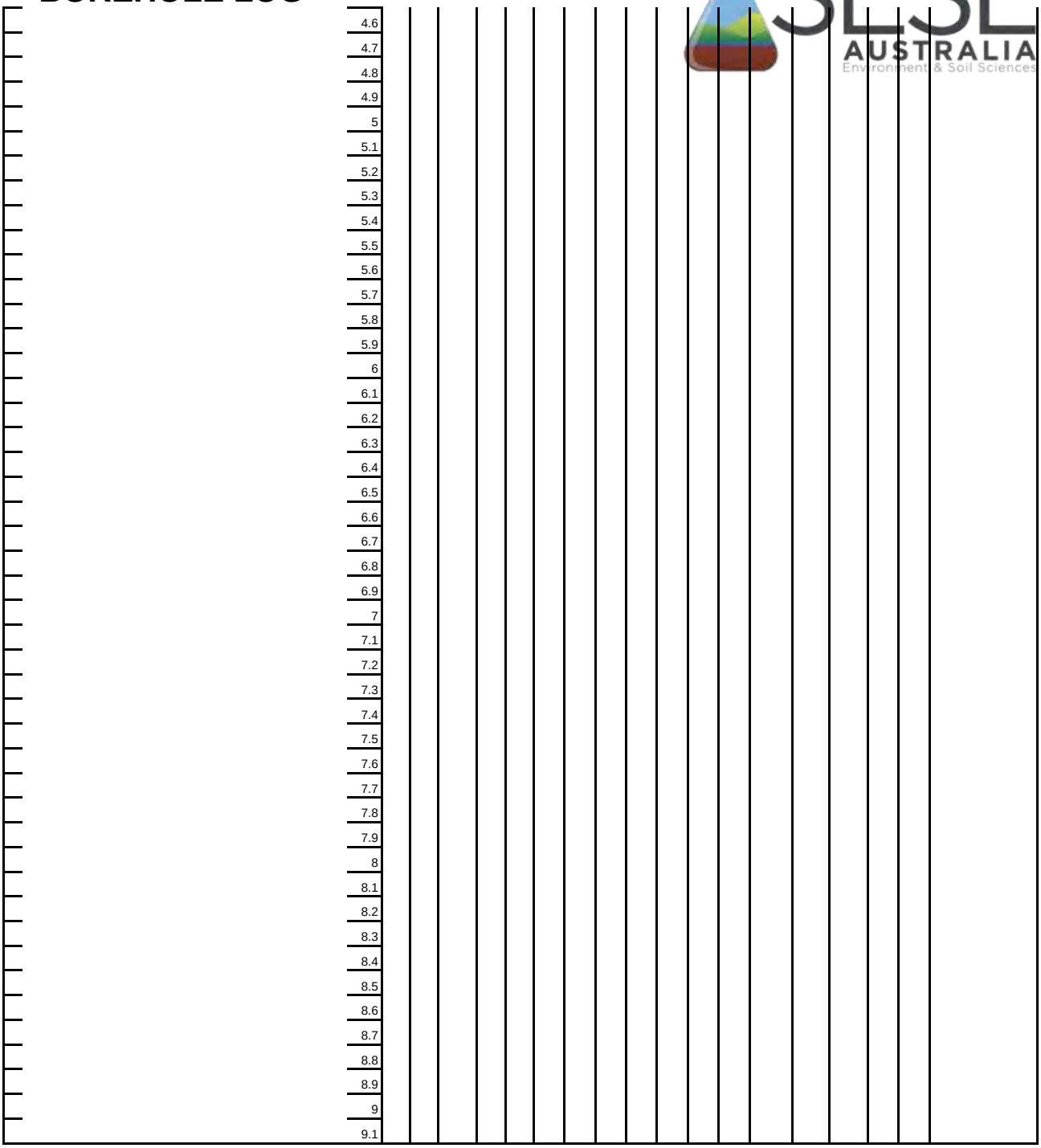
BOREHOLE LOG



BOREHOLE LOG

Location	BH8	Job No.	Client	The Killara Golf Club	Logged by
Drill Type / Method	Drill Rig	Date			AJ
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Bitumen	<0.1																N		
	Brown Mixed Medium Clay with Sandstone Inclusions (0.5)	0.2		X		B				X								N		
		0.3		X						X										
		0.4		X						X										
		0.5		X						X										
		0.6		X						X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
		1.6		X						X										
		1.7		X						X										
		1.8		X						X										
	Red and Grey Sandy Clay	1.9		X		R				X								N		
		2		X		G				X										
		2.1		X						X										
	Dark Brown Medium Clay	2.2		X		DB				X								N		
		2.3		X						X										
		2.4		X						X										
		2.5		X						X										
		2.6		X						X										
		2.7		X						X										
		2.8		X						X										
	Light Brown Medium Clay	2.9		X		LB				X								N		
		3		X						X										
		3.1		X						X										
		3.2		X						X										
		3.3		X						X										
		3.4		X						X										
		3.5		X						X										
	Light Grey/Brown Light Medium Sandy Clay	3.6		X		LG				X								N		
		3.7		X		B				X										
		3.8		X						X										
		3.9		X						X										
		4		X						X										
		4.1		X						X										
		4.2		X						X										
		4.3		X						X										
		4.4		X						X										

BOREHOLE LOG

	4.5		X						X										
	4.6		X						X										
Pale Brown Silty Shale	4.7			X	PB				X								N		
	4.8			X					X										
	4.9			X					X										
	5			X					X										
Limit of Assessment	5.1																		
	5.2																		
	5.3																		
	5.4																		
	5.5																		
	5.6																		
	5.7																		
	5.8																		
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	6																		
	6.1																		
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	9																		
	9.1																		

BOREHOLE LOG

Location	BH9	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile				Mottle		Field Texture		Coarse Fragments			Unfilled soil classification	Hydrology		Odour		Field Monitoring PID (ppm)
				Fill	Natural horizons	Colour(s)	Field pH	Abundance	Colour(s)	Fine grain	Coarse grain	Abundance	Size	Lithology		Moisture content %	Interface drainage	Type	Strength	
	Bitumen	<0.1		X														N		
	Light Brown Sandy Light Clay	0.2		X		LB				X								N		
		0.3		X						X										
		0.4		X						X										
		0.5		X						X										
	Light Brown Medium Sandy Clay with Grey and Orange Mottle	0.6		X		LB			G	X								N		
		0.7		X					O	X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
		1.6		X						X										
	Light Brown Silty Shale	1.7			X	LB				X								N		
		1.8			X					X										
		1.9			X					X										
		2			X					X										
		2.1			X					X										
		2.2			X					X										
		2.3			X					X										
		2.4			X					X										
		2.5			X					X										
		2.6			X					X										
		2.7			X					X										
		2.8			X					X										
		2.9			X					X										
		3			X					X										
		3.1			X					X										
	Light Brown Light Silty Clay	3.2			X	LB				X								N		
		3.3			X					X										
		3.4			X					X										
		3.5			X					X										
		3.6			X					X										
		3.7			X					X										
		3.8			X					X										
		3.9			X					X										
		4			X					X										
	Light Brown Silty Shale	4.1			X	LB				X								N		
		4.2			X					X										
		4.3			X					X										
		4.4			X					X										
		4.5			X					X										

BOREHOLE LOG

	4.6			X				X											
	4.7			X				X											
	4.8			X				X											
	4.9			X				X											
	5			X				X											
Limit of Assessment	5.1																		
	5.2																		
	5.3																		
	5.4																		
	5.5																		
	5.6																		
	5.7																		
	5.8																		
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	9.1																		

BOREHOLE LOG

Location	BH10	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Bitumen	<0.1		X														N		
	Red and Grey Medium Clay	0.2		X		R				X								N		
		0.3		X		G				X										
		0.4		X						X										
		0.5		X						X										
	Grey and Red Light Silty Clay Less Red with Depth	0.6		X		G				X								N		
		0.7		X		R				X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
	Mixture of Dark Brown and Light Brown Medium Clay Fill Darker with Depth	1.6		X		DB				X								N		
		1.7		X		B				X										
		1.8		X						X										
		1.9		X						X										
		2		X						X										
		2.1		X						X										
	Red/Brown Medium Clay	2.2		X		RB				X								N		
		2.3		X						X										
		2.4		X						X										
		2.5		X						X										
		2.6		X						X										
		2.7		X						X										
		2.8		X						X										
		2.9		X						X										
		3		X						X										
		3.1		X						X										
		3.2		X						X										
		3.3		X						X										
		3.4		X						X										
		3.5		X						X										
		3.6		X						X										
		3.7		X						X										
	Pale Grey Silty Shale	3.8			X	PG				X								N		
		3.9			X					X										
		4			X					X										
		4.1			X					X										
		4.2			X					X										
		4.3			X					X										
		4.4			X					X										
		4.5			X					X										

BOREHOLE LOG

	4.6			x				x												
	4.7			x				x												
	4.8			x				x												
	4.9			x				x												
	5			x				x												
Limit of Assessment	5.1																			
	5.2																			
	5.3																			
	5.4																			
	5.5																			
	5.6																			
	5.7																			
	5.8																			
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	8.6																			
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	8.8																			
	8.9																			
	9																			
	9.1																			

BOREHOLE LOG

Location	BH11	Job No.	Client: The Killara Golf Club
Drill Type / Method	Drill Rig	Date	
Slope Position		Slope %	Project
Groundwater depth			AHD (m)

Land Surface Observation / Surface Hydrology

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength
	Bitumen	<0.1		X														N	
	Grey Silty Clay with Gravel	0.2		X		G				X	X							N	
		0.3		X						X	X								
		0.4		X						X	X								
		0.5		X						X	X								
	Brown and Light Brown Medium Clay	0.6		X		B				X								N	
		0.7		X		LB				X									
		0.8		X						X									
		0.9		X						X									
		1		X						X									
		1.1		X						X									
		1.2		X						X									
	Pale Grey Shale with Yellow and Grey Clay Inclusions	1.3		X		PG				X								N	
		1.4		X		Y				X									
		1.5		X		G				X									
		1.6		X						X									
		1.7		X						X									
		1.8		X						X									
		1.9		X						X									
		2		X						X									
		2.1		X						X									
	Light Brown Silty Shale	2.2			X	LB				X								N	
		2.3			X					X									
		2.4			X					X									
		2.5			X					X									
		2.6			X					X									
		2.7			X					X									
		2.8			X					X									
		2.9			X					X									
		3			X					X									
		3.1			X					X									
		3.2			X					X									
		3.3			X					X									
		3.4			X					X									
		3.5			X					X									
		3.6			X					X									
		3.7			X					X									
		3.8			X					X									
		3.9			X					X									
		4			X					X									
	Limit of Assessment	4.1																	
		4.2																	
		4.3																	
		4.4																	
		4.5																	

BOREHOLE LOG

Location	BH12	Job No.	Client: The Killara Golf Club
Drill Type / Method	Drill Rig	Date	
Slope Position		Slope %	Project
Groundwater depth	7.9		AHD (m)

Land Surface Observation / Surface Hydrology

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength
	Brown Loamy clay Moving to Light Clay with Depth	<0.1		X		B				X								N	
		0.2		X						X									
		0.3		X						X									
		0.4		X						X									
		0.5		X						X									
		0.6		X						X									
		0.7		X						X									
		0.8		X						X									
	Brown and Grey Silty Medium Clay	0.9		X		B				X								N	
		1		X		G				X									
		1.1		X						X									
		1.2		X						X									
	Pale Grey Silty Shale	1.3			X	PG				X								N	
		1.4			X					X									
		1.5			X					X									
		1.6			X					X									
		1.7			X					X									
		1.8			X					X									
		1.9			X					X									
		2			X					X									
		2.1			X					X									
		2.2			X					X									
		2.3			X					X									
		2.4			X					X									
		2.5			X					X									
		2.6			X					X									
		2.7			X					X									
		2.8			X					X									
		2.9			X					X									
		3			X					X									
		3.1			X					X									
		3.2			X					X									
		3.3			X					X									
		3.4			X					X									
		3.5			X					X									
		3.6			X					X									
		3.7			X					X									
		3.8			X					X									
		3.9			X					X									
		4			X					X									
		4.1			X					X									
		4.2			X					X									
		4.3			X					X									
		4.4			X					X									
		4.5			X					X									

BOREHOLE LOG

	4.6			X					X										
	4.7			X					X										
	4.8			X					X										
	4.9			X					X										
	5			X					X										
	5.1			X					X										
	5.2			X					X										
	5.3			X					X										
	5.4			X					X										
	5.5			X					X										
	5.6			X					X										
	5.7			X					X										
	5.8			X					X										
	5.9			X					X										
	6			X					X										
	6.1			X					X										
	6.2			X					X										
	6.3			X					X										
	6.4			X					X										
	6.5			X					X										
	6.6			X					X										
	6.7			X					X										
	6.8			X					X										
	6.9			X					X										
	7			X					X										
	7.1			X					X										
	7.2			X					X										
	7.3			X					X										
	7.4			X					X										
	7.5			X					X										
	7.6			X					X										
	7.7			X					X										
	7.8			X					X										
	7.9			X					X										
	8			X					X										
Limit of Assessment	8.1																		
	8.2																		
	8.3																		
	8.4																		
	8.5																		
	8.6																		
	8.7																		
	8.8																		
	8.9																		
	9																		
	9.1																		

BOREHOLE LOG

Location	BH13	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth	4.5		AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Bitumen	<0.1		X														N		
	Brown and Grey Medium Clay	0.2		X		B				X								N		
		0.3		X		G				X										
		0.4		X						X										
		0.5		X						X										
	Brown Light Sandy Clay with Gravel	0.6		X		B				X	X							N		
		0.7		X						X	X									
		0.8		X						X	X									
		0.9		X						X	X									
		1		X						X	X									
		1.1		X						X	X									
		1.2		X						X	X									
	Dark Brown Light Sandy Clay with Lots of Sand	1.3		X		DB				X	X							N		
		1.4		X						X	X									
		1.5		X						X	X									
	Light Brown/Red and Grey Medium Clay	1.6		X		LB				X								N		
		1.7		X		R				X										
		1.8		X		G				X										
		1.9		X						X										
		2		X						X										
		2.1		X						X										
	Light Brown, Dark Grey and Brown Light Silty Clay with Gravel	2.2		X		LB				X	X							N		
		2.3		X		DG				X	X									
		2.4		X		B				X	X									
		2.5		X						X	X									
		2.6		X						X	X									
		2.7		X						X	X									
		2.8		X						X	X									
		2.9		X						X	X									
		3		X						X	X									
		3.1		X						X	X									
	Light Brown and Grey Silty Shale	3.2			X	LB				X								N		
		3.3			X	G				X										
		3.4			X					X										
		3.5			X					X										
		3.6			X					X										
		3.7			X					X										
		3.8			X					X										
		3.9			X					X										
		4			X					X										
		4.1			X					X										
		4.2			X					X										
		4.3			X					X										
		4.4			X					X										
		4.5			X					X										

BOREHOLE LOG

	4.6			x					x															
	4.7			x					x															
	4.8			x					x															
	4.9			x					x															
	5			x					x															
Limit of Assessment	5.1																							
	5.2																							
	5.3																							
	5.4																							
	5.5																							
	5.6																							
	5.7																							
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	9.1																							

BOREHOLE LOG

Location	BH14	Job No.		Client	The Killara Golf Club	Logged by	AJ
Drill Type / Method	Drill Rig	Date					
Slope Position		Slope %		Project			
Groundwater depth				AHD (m)			
Land Surface Observation / Surface Hydrology							

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile				Mottle		Field Texture		Coarse Fragments			Unfilled soil classification	Hydrology		Odour		Field Monitoring PID (ppm)
				Fill	Natural horizons	Colour(s)	Field pH	Abundance	Colour(s)	Fine grain	Coarse grain	Abundance	Size	Lithology		Moisture content %	Interface drainage	Type	Strength	
	Brown Sandy Loam Topsoil	<0.1		X		B				X								N		
		0.2		X						X										
		0.3		X						X										
		0.4		X						X										
		0.5		X						X										
		0.6		X						X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
	Grey, Damp Light Medium Clay with Gravel	1		X		G				X	X							N		
		1.1		X						X	X									
		1.2		X						X	X									
		1.3		X						X	X									
		1.4		X						X	X									
		1.5		X						X	X									
	Gradual Change - Grey, Brown and Red Wet Medium Clay Heavier with Depth	1.6		X		G				X								N		
		1.7		X		B				X										
		1.8		X		R				X										
		1.9		X						X										
		2		X						X										
		2.1		X						X										
		2.2		X						X										
	Grey and Red Medium Clay with Gravel	2.3		X		G				X	X							N		
		2.4		X		R				X	X									
		2.5		X						X	X									
		2.6		X						X	X									
		2.7		X						X	X									
		2.8		X						X	X									
		2.9		X						X	X									
		3		X						X	X									
		3.1		X						X	X									
		3.2		X						X	X									
	Mixed Light and medium Clays with Gravel	3.3		X		B				X	X							N		
		3.4		X						X	X									
		3.5		X						X	X									
		3.6		X						X	X									
		3.7		X						X	X									
		3.8		X						X	X									
		3.9		X						X	X									
		4		X						X	X									
		4.1		X						X	X									
		4.2		X						X	X									
	Light Brown and Grey Silty Shale	4.3			X	LB				X								N		
		4.4			X	G				X										
		4.5			X					X										

BOREHOLE LOG

	4.6		X					X												
	4.7		X					X												
	4.8		X					X												
	4.9		X					X												
	5		X					X												
Limit of Assessment	5.1																			
	5.2																			
	5.3																			
	5.4																			
	5.5																			
	5.6																			
	5.7																			
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BOREHOLE LOG

Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry and Agronomy

Location	BH15	Job No.	Client	The Killara Golf Club	Logged by AJ
Drill Type / Method	Drill Rig	Date			
Slope Position		Slope %	Project		
Groundwater depth			AHD (m)		
Land Surface Observation / Surface Hydrology					

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile: Fill	Soil Profile: Natural horizons	Soil Profile: Colour(s)	Soil Profile: Field pH	Mottle: Abundance	Mottle: Colour(s)	Field Texture: Fine grain	Field Texture: Coarse grain	Coarse Fragments: Abundance	Coarse Fragments: Size	Coarse Fragments: Lithology	Unfilled soil classification	Hydrology: Moisture content %	Hydrology: Interface drainage	Odour: Type	Odour: Strength	Field Monitoring PID (ppm)
	Dark Brown Medium Clay	<0.1		X		DB				X	X							N		
	Red and Grey Medium Clay with Gravel	0.2		X		R				X	X									
		0.3		X		G				X	X									
		0.4		X						X	X									
	Red and Grey Light Medium Clay (Lighter in Colour and Drier than above)	0.5		X		R				X								N		
		0.6		X		G				X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
		1.2		X						X										
		1.3		X						X										
		1.4		X						X										
		1.5		X						X										
		1.6		X						X										
		1.7		X						X										
	Pale Brown/Grey Light Silty Clay	1.8		X		PB				X								N		
		1.9		X		G				X										
		2		X						X										
		2.1		X						X										
		2.2		X						X										
	Red/Brown Medium Clay	2.3		X		RB				X								N		
		2.4		X						X										
		2.5		X						X										
		2.6		X						X										
		2.7		X						X										
		2.8		X						X										
	Red Medium Clay	2.9		X		R				X								N		
		3		X						X										
		3.1		X						X										
		3.2		X						X										
		3.3		X						X										
		3.4		X						X										
		3.5		X						X										
	Brown Light Silty Clay	3.6		X		B				X								N		
		3.7		X						X										
		3.8		X						X										
		3.9		X						X										
		4		X						X										
		4.1		X						X										
		4.2		X						X										
		4.3		X						X										
		4.4		X						X										
		4.5		X						X										

BOREHOLE LOG

Sydney Environmental and Soil Laboratory

Specialists in Soil Chemistry and Agronomy

	4.6		X						X										
	4.7		X						X										
	4.8		X						X										
	4.9		X						X										
Brown/Grey Silty Shale	5			x	B				X								N		
	5.1			x	G				X										
	5.2			x					X										
	5.3			x					X										
	5.4			x					X										
	5.5			x					X										
	5.6			x					X										
	5.7			x					X										
	5.8			x					X										
	5.9			x					X										
	6			x					X										
Limit of Assessment	6.1																		
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BOREHOLE LOG

Sydney Environmental and Soil Laboratory
Specialists in Soil Chemistry and Agronomy

Location BH16	Job No.	Client The Killara Golf Club		Logged by AJ
Drill Type / Method Drill Rig	Date			
Slope Position	Slope %	Project		
Groundwater depth		AHD (m)		
Land Surface Observation / Surface Hydrology				

Sample intervals	Stratigraphic Description	Depth (m)	Graphic log	Soil Profile				Mottle		Field Texture		Coarse Fragments			Unfilled soil classification	Hydrology		Odour		Field Monitoring PID (ppm)
				Fill	Natural horizons	Colour(s)	Field pH	Abundance	Colour(s)	Fine grain	Coarse grain	Abundance	Size	Lithology		Moisture content %	Interface drainage	Type	Strength	
	Dark Brown Sandy Loam Topsoil	<0.1		X		DB				X										
		0.2		X						X										
		0.3		X						X										
	Dark Brown Medium Clay with Red and Grey - Red and Grey Become Dominate with Depth	0.4		X		DB				X										
		0.5		X		R				X										
		0.6		X		G				X										
		0.7		X						X										
		0.8		X						X										
		0.9		X						X										
		1		X						X										
		1.1		X						X										
	Red and Grey Light Crumbly Clay with Gravel	1.2		X		R				X	X									
		1.3		X		G				X	X									
		1.4		X						X	X									
		1.5		X						X	X									
		1.6		X						X	X									
		1.7		X						X	X									
		1.8		X						X	X									
		1.9		X						X	X									
		2		X						X	X									
		2.1		X						X	X									
		2.2		X						X	X									
		2.3		X						X	X									
		2.4		X						X	X									
		2.5		X						X	X									
		2.6		X						X	X									
		2.7		X						X	X									
		2.8		X						X	X									
		2.9		X						X	X									
		3		X						X	X									
		3.1		X						X	X									
		3.2		X						X	X									
		3.3		X						X	X									
		3.4		X						X	X									
		3.5		X						X	X									
		3.6		X						X	X									
		3.7		X						X	X									
		3.8		X						X	X									
		3.9		X						X	X									
		4		X						X	X									
		4.1		X						X	X									
		4.2		X						X	X									
		4.3		X						X	X									
		4.4		X						X	X									
		4.5		X						X	X									

BOREHOLE LOG

Sydney
Environmental and Soil
Laboratory
Specialists in Soil Chemistry and Agronomy

	4.6		X						X	X									
	4.7		X						X	X									
	4.8		X						X	X									
	4.9		X						X	X									
	5		X						X	X									
	5.1		X						X	X									
	5.2		X						X	X									
	5.3		X						X	X									
	5.4		X						X	X									
	5.5		X						X	X									
Dark Brown Medium Heavy Clay	5.6			X	DB				X										
	5.7			X					X										
	5.8			X					X										
	5.9			X					X										
	6			X					X										
	6.1			X					X										
	6.2			X					X										
	6.3			X					X										
	6.4			X					X										
	6.5			X					X										
Red Heavy Clay	6.6			X	R				X										
	6.7			X					X										
	6.8			X					X										
	6.9			X					X										
	7			X					X										
	7.1			X					X										
	7.2			X					X										
	7.3			X					X										
	7.4			X					X										
	7.5			X					X										
Limit of Assessment	7.6																		
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	9																		
	9.1																		

SESL AUSTRALIA
Environment & Soil Sciences

Appendix F

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POST
PO Box 357
Pennant Hills
NSW 1715

LAB
16 Chilvers Rd
Thornleigh
NSW 2120

ACT
Level 5
7 London Cct
Canberra
ACT 2601

VIC
Level 1
88 Mt Alexander Rd
Flemington
VIC 3031

QLD
Level 10
15 Green Square Cl
Fortitude Valley
QLD 4006

Table 1A(3) Soil HSLs for vapour intrusion (mg/kg)

	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				
CHEMICAL	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4m**	**4 m+**	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**	**Soil saturation concentration (Csat)**
SAND													
Toluene	160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL	560
Ethylbenzene	55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	64
Xylenes	40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL	300
Naphthalene	3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	9
Benzene	0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3	360
F1[9]	45	70	110	200	NL	NL	NL	NL	260	370	630	NL	950
F2[10]	110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL	560
SILT													
Toluene	390	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	640
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	69
Xylenes	95	210	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	330

	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				
Naphthalene	4	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	10
Benzene	0.6	0.7	1	2	NL	NL	NL	NL	4	4	6	10	440
F1[9]	40	65	100	190	NL	NL	NL	NL	250	360	590	NL	910
F2[10]	230	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	570
CLAY													
Toluene	480	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	630
Ethylbenzene	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	68
Xylenes	110	310	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	330
Naphthalene	5	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	10
Benzene	0.7	1	2	3	NL	NL	NL	NL	4	6	9	20	430
F1[9]	50	90	150	290	NL	NL	NL	NL	310	480	NL	NL	850
F2[10]	280	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	560

Notes:

(1) Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used,

(2) The key limitations of the HSLs should be referred to prior to application and are presented in Friebel and Nadebaum (2011b and 2011d).

(3) Detailed assumptions in the derivation of the HSLs and information on how to apply the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).

(4) Soil HSLs for vapour inhalation incorporate an adjustment factor of 10 applied to the vapour phase partitioning to reflect the differences observed between theoretical estimates of soil vapour partitioning and field measurements. Refer Friebel & Nadebaum (2011a) for further information.

(5) The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as ‘not limiting’ or ‘NL’.

(6) The HSLs for TPH C_6-C_{10} in sandy soil are based on a finite source that depletes in less than seven years, and therefore consideration has been given to use of sub-chronic toxicity values. The >C_8-C_{10} aliphatic toxicity has been adjusted to represent sub-chronic exposure, resulting in higher HSLs than if based on chronic toxicity. For further information refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).

(7) The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

(8) For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

(9) To obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction.

(10) To obtain F2 subtract naphthalene from the >C_{10}-C_{16} fraction.

Table 1B(5) Generic EILs for aged As, fresh DDT and fresh naphthalene in soils irrespective of their physicochemical properties

	Ecological Investigation Levels (mg total contaminant/kg)		
CHEMICAL	**Areas of ecological significance**	**Urban residential and public open space[1]**	**Commercial and industrial**
Arsenic[2]	40	100	160
DDT[3]	3	180	640
Naphthalene[3]	10	170	370

Notes:

1. Urban residential/public open space is broadly equivalent to the HIL-A, HIL-B and HIL-C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.
2. Aged values are applicable to arsenic contamination present in soil for at least two years. For fresh contamination refer to Schedule B5c.
3. Insufficient data was available to calculate aged values for DDT and naphthalene, consequently the values for fresh contamination should be used.
4. Insufficient data was available to calculate ACLs for As, DDT and naphthalene. The EIL should be taken directly from Table 1B(5).

Table 1B(6) ESLs for TPH fractions F1 – F4, BTEX and benzo(a)pyrene in soil

CHEMICAL	Soil texture	ESLs (mg/kg dry soil)		
		Areas of ecological significance	Urban residential and public open space	Commercial and industrial
F1 C_6-C_{10}	*Coarse/ Fine*	125*	180*	215*
F2 >C_{10}-C_{16}		25*	120*	170*
F3 >C_{16}-C_{34}	*Coarse*	-	300	1700
	Fine	-	1300	2500
F4 >C_{34}-C_{40}	*Coarse*	-	2800	3300
	Fine	-	5600	6600
Benzene	*Coarse*	10	50	75
	Fine	10	65	95
Toluene	*Coarse*	10	85	135
	Fine	65	105	135
Ethylbenzene	*Coarse*	1.5	70	165
	Fine	40	125	185
Xylenes	*Coarse*	10	105	180
	Fine	1.6	45	95
Benzo(a)pyrene	*Coarse*	0.7	0.7	0.7
	Fine	0.7	0.7	0.7

Notes:

(1) ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.

(2) '-' indicates that insufficient data was available to derive a value.

(3) To obtain F1, subtract the sum of BTEX concentrations from C_6-C_{10} fraction and subtract naphthalene from >C_{10}-C_{16} to obtain F2.

SESL AUSTRALIA
Environment & Soil Sciences

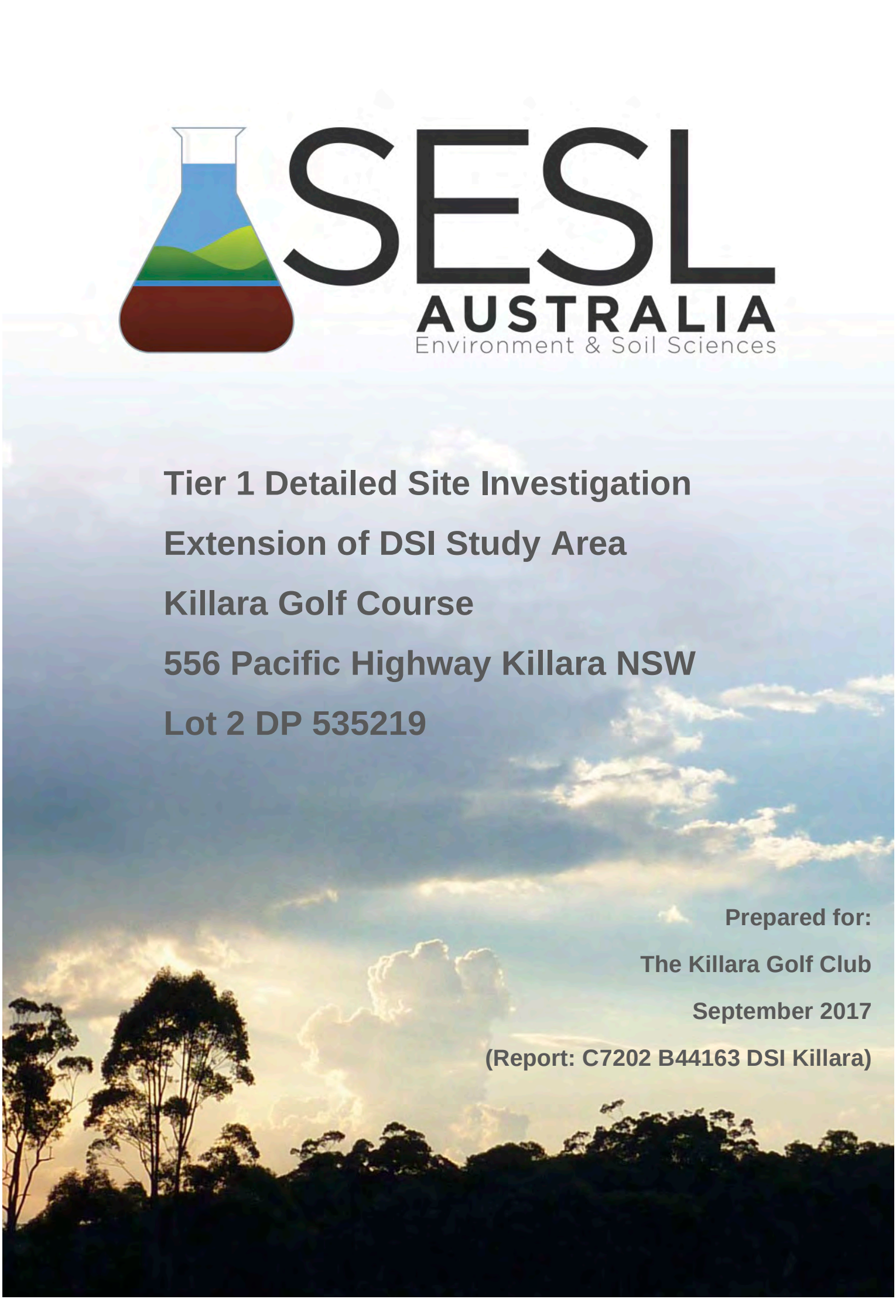
Tier 1 Detailed Site Investigation

Extension of DSI Study Area

Killara Golf Course

556 Pacific Highway Killara NSW

Lot 2 DP 535219



Prepared for:

The Killara Golf Club

September 2017

(Report: C7202 B44163 DSI Killara)

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2.0	22/09/2017	Ryan Jacka	Update document title as per clients request	The Killara Golf Club	22/09/2017	

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Client:	The Killara Golf Club
Document Title:	Detailed Site Investigation – Extension of DSI study area
Document Version:	FINAL 1.0
Reference Number:	C0598 Q7202 B44163

Executive Summary

SESL Australia (SESL) was engaged by Killara Golf Club (the client) to conduct a Tier 1 Detailed Site Investigation (DSI) on part of the property located at 556 Pacific Highway, Killara NSW 2071 (the site). The site is identified as Lot 2 in Deposited Plan (DP) 535219. SESL understands that the clients' intention is to rezone the site for residential development. This report will be used as supporting documentation for the rezoning of the property. This additional DSI was required following council comments to 'Ensure the SESL study investigates the entire Deferred Area 15 site.

This investigation is an extension of the DSI previously prepared by SESL in 2016 (C0598 Q5224 B38160 DSI Killara FB), which investigated the northern portion of the site. Additional investigative works were conducted by SESL Environmental Scientist Andrew Jacovides on 11/07/2017.

The objective of this DSI was to:

- *Provide additional information relating to the proposed R4 zoned area in the north west of the site;*
- *Produce a Tier 1 Detailed Site Investigation (DSI) in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), NEPC 2013, Canberra;*
- *Identify issues of ongoing pollution and non-compliance, as compared to current regulatory criteria;*
- *Identify the likelihood and/or extent of contamination occurring from past or present practices on the site; and*
- *Recommend any further management strategies including additional investigations or remedial action if required.*

The scope of work for this DSI was as follows:

- *Review of the previous environmental investigation reports for the site developed for the site by SESL;*
- *Inspect of the site and immediate surrounds to identify site characteristics that may be suggestive of land contamination;*
- *Conduct a detailed site walkover/inspection by SESL's qualified environmental scientist;*
- *Develop of a Conceptual Site Model (CSM) to identify data gaps that require additional environmental information;*
- *Conduct soil sampling and analysis;*
- *Prepare this DSI report in accordance with NSW EPA guidelines for contaminated lands assessment; and*
- *Propose additional assessments or suitable remedial and validation strategies for the site, if required.*

Two (2) Detailed Site Investigations (DSIs) have been undertaken at SESL, required to investigate the contamination status of the site in regard to the proposed re-zoning and residential landuse. The site works for the initial DSI were undertaken by SESL environmental scientists in February and March 2016. These works were limited to investigating the areas of observed filling below the carpark and clubhouse in the north eastern area of the site.

The additional DSI (detailed in this report) were conducted following comments from Ku-Ring-Gai Council requesting that the 'study investigates the entire Deferred Area 15 site'. The works for the additional DSI were conducted by SESL environmental scientists in July 2017. These works were limited to assessing the area of the proposed re-zoning that were not investigated as part of the initial DSI. This included the observed fill soils in northern area of the site encompassed by the bowling greens and tennis courts.

Soil sampling procedures were devised to addressed variations in fill material within the investigation area. Sampling was undertaken on a judgmental basis based on topography and observed fill, and included near surface and subsurface sampling till natural materials were encountered. A total of twenty-four (24) sampling locations were investigated across both DSIs, with fourteen (14) locations assessed during the initial DIS, and a further ten (10) samples assessed during the additional DSI.

Groundwater well installation and sampling was undertaken as part of the initial DSI. These wells were installed judgmentally to characterise groundwater across the site and observe any influence from potential upstream contaminant sources.

Elevations above the adopted threshold (HIL - Residential A) were observed at a two (2) locations of the site (during the initial DSI) indicating a potential hotspot.

Based on the findings of these site investigations, SESL concludes that some minor soil contamination exists (two borehole locations) within fill materials present at the site. These materials were investigated during the initial DSI, conducted by SESL in February and March, 2016. The fill materials assessed as part of the additional DSI were found to be free from elevated contaminants of concern.

Prior to development for residential purposes being undertaken, a remedial action plan must be developed for the minor hotspot in the south eastern corner of the visitor's carpark, including appropriate validation processes to ensure that at completion of the remediation program that the site is suitable for rezoning. It is possible this remediation can be conducted during future development of the rezoned area, and SESL do not consider it necessary to have remediation completed prior to rezoning.

SESL AUSTRALIA

Andrew Jacovides

Environmental Scientist

Ryan Jacka

Senior Environmental Scientist

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ABBREVIATIONS

AC	Asbestos Cement
AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AMG	Australian Map Grid
APHA	American Public Health Association
ASC	Assessment of Site Contamination
ASS	Acid Sulfate Soils
ASTM	ASTM International (previously American Society for Testing and Materials)
BaP	Benzo(a)pyrene
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
CEC	Cation Exchange Capacity
CLM	Contaminated Land Management Act
COC	Chain of Custody
CPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
CRC CARE	Cooperative Research Centre for Contamination Assessment and Remediation or the Environment
CSM	Conceptual Site Model
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Environment, Climate Change and Water NSW
DLWC	Department of Land and Water Conservation
DNAPL	Dense Non-Aqueous Phase Liquids
DP	Deposited Plan
DQO	Data Quality Objectives
DQI	Data Quality Indicator
DSI	Detailed Site Investigation
EILs	Ecological Investigation Levels.
EPA	NSW Environmental Protection Authority
ESLs	Ecological Screening Levels
GILs	Groundwater Investigation Levels
GW	Ground Water
GME	Groundwater Monitoring Event
HILs	Health Investigation Levels
HSLs	Health Screening Levels
IBC	Intermediate Bulk Container
LEL	Lower Explosive Limit
LEP	Local Environment Plan
LGA	Local Government Area
LCS	Laboratory Control Samples
LOR	Limit of Reporting
LNAPL	Light Non-Aqueous Phase Liquids
mAHD	Metres Australian Height Datum (above mean sea level)
MAHs	Monocyclic Aromatic Hydrocarbons
MEK	Methyl Ethyl Ketone
mbgs	Metres Below Ground Surface
mbtoc	Metres Below Top of Well Casing
MNA	Monitored Natural Attenuation
NA	Natural Attenuation
NAPL	Non-Aqueous Phase Liquid
NATA	The National Association of Testing Authorities
NEE	North east east
NEHF	National Environment and Health Forum
	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health Medical Research Council
NTU	National Turbidity Unit
OCP	Organochlorine Pesticides
OEH	Office of Environment and Heritage NSW
OPP	Organophosphate Pesticides
ORP	Oxidation Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCOC	Potential Contaminants of Concern

PID	Photo Ionisation Detector
PPM	Parts Per Million
PSI	Preliminary Site Investigation
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
RAC	Remediation Acceptance Criteria
RAP	Remedial Action Plan
RPD	Relative Percent Difference
RSL	Regional Screening Levels
SAC	Soil Assessment Criteria
SAQP	Sample Analysis and Quality Plan
SESL	SESL Australia Pty Limited
Smear Zone	Soil impacted with residual groundwater contaminants during rise and fall of groundwater levels
SMP	Site Management Plan
SVOC	Semi-Volatile Organic Compounds
SVR	Site Validation Report
SVW	Soil Vapour Well
SWL	Standing Water Level
TDS	Total Dissolved Solids
TEQ	Toxic Equivalence Quotient
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbon
UCL	Upper Confidence Limit
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Authority
UST	Underground Storage tank
UTM	Universal Transverse Mercator
VMW	Vapour Monitoring Wells
VOC	Volatile Organic Compounds
VRP	Voluntary Remediation Proposal

1 INTRODUCTION

1.1 BACKGROUND

SESL Australia (SESL) was engaged by Killara Golf Club (the client) to conduct a Tier 1 Detailed Site Investigation (DSI) on part of the property located at 556 Pacific Highway, Killara NSW 2071 (the site). The site is identified as Lot 2 in Deposited Plan (DP) 535219. SESL understands that the clients' intention is to rezone the site for residential development. This report will be used as supporting documentation for the rezoning of the property. This additional DSI was required following council comments to 'Ensure the SESL study investigates the entire Deferred Area 15 site.

This investigation is an extension of the DSI previously prepared by SESL in 2016 (C0598 Q5224 B38160 DSI Killara FB), which investigated the northern portion of the site. Additional investigative works were conducted by SESL Environmental Scientist Andrew Jacovides on 11/07/2017.

1.2 OBJECTIVE

The objective of this DSI was to:

- Provide additional information relating to the proposed R4 zoned area in the north west of the site;
- Produce a Tier 1 Detailed Site Investigation (DSI) in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), NEPC 2013, Canberra*;
- Identify issues of ongoing pollution and non-compliance, as compared to current regulatory criteria;
- Identify the likelihood and/or extent of contamination occurring from past or present practices on the site; and
- Recommend any further management strategies including additional investigations or remedial action if required.

1.3 REGULATORY GUIDELINES

The investigation and preparation of this report was undertaken with reference to (but not limited to) the following regulatory guidance documents and standards:

- ANZECC and ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (October 2000);
- ASTM (2000). Standard Practice D2488 90 Description and Identification of Soils (Visual-Manual Procedure). American Society for Testing and Materials;
- CRC CARE (2011). Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater;

- CRC CARE (2013) Petroleum hydrocarbon vapour intrusion assessment: Australian guidance, CRC CARE Technical Report no. 23, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia;
- EnHealth (2012) Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia (2012);
- National Environmental Protection Council (NEPC) (2013). National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended April 2013);
- NHMRC & NRMMC (2011). Australian Drinking Water Guidelines (ADWG) - National Health and Medical Research Council & Natural Resource Management Ministerial Council;
- NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme (2nd Ed.) (2006);
- NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination (March 2007);
- NSW DECCW (2010) Vapour Intrusion: Technical Practice Note, September 2010;
- NSW Department of Urban Affairs and Planning (1998) Managing Land Contamination: Planning Guidelines: SEPP 55 Remediation of Land, August (1998);
- NSW EPA (1995). Sampling Design Guidelines (1995);
- NSW EPA (1996). Protection of the Environment Operations (Waste) Regulation (1996);
- NSW EPA (2014). Technical Note: Investigation of Service Station Sites, NSW EPA, April (2014);
- NSW EPA (2014). Waste Classification Guidelines (November 2014);
- NSW EPA (2015). Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (July 2015);
- NSW OEH (2011). Guidelines for Consultants Reporting on Contaminated Sites (2011). NSW Office of Environment and Heritage;
- Standards Australia (1993) AS1726-1993. Geotechnical Site investigations Australian Standard;
- Standards Australia (2005). Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds AS4482.1 (2005) and Part 2: Volatile substances, AS4482.2 (2005);
- USEPA (2000). Guidance for the Data Quality Objectives Process, EPAC QA/G-4 DEC/600/r-96/055, United States Environmental Protection Agency Office of Environmental Information, Washington DC; and
- Western Australia Department of Health (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

1.4 SCOPE OF WORK

The scope of work for this DSI was as follows:

- Review of the previous environmental investigation reports for the site developed for the site by SESL;
- Inspect of the site and immediate surrounds to identify site characteristics that may be suggestive of land contamination;
- Conduct a detailed site walkover/inspection by SESL's qualified environmental scientist;
- Develop of a Conceptual Site Model (CSM) to identify data gaps that require additional environmental information;
- Conduct soil sampling and analysis;
- Prepare this DSI report in accordance with NSW EPA guidelines for contaminated lands assessment; and
- Propose additional assessments or suitable remedial and validation strategies for the site, if required.

1.5 PERSONNEL

The site works were undertaken 11th July 2017 by SESL Environmental Scientists.

Table 1 – Project Personnel

Personnel	Position	Project Task
Ryan Jacka B Env Sc, M Env Sc, MEIANZ, SSA, CEnvP	Senior Environmental Scientist	- Conduct site observation - Report Review and Authorisation
Andrew Jacovides B Nat Sc Env Mgt	Environmental Scientist	- Conduct site observation & soil sampling - Report Preparation

2 SITE DESCRIPTION

2.1 SITE LOCATION AND OWNERSHIP

Access to the site is currently via a driveway northbound on Pacific Highway, Killara. The total site area is approximately 40,700m^2. The area of investigation is approximately 12,000 m^2. The site is legally defined as Lot 2 in DP 535219 and is currently owned by Killara Golf Club Limited.

2.2 SITE IDENTIFICATION

The following details describe the portion of land investigated during this DSI:

Table 2 – Site Identification

Site Owner	Killara Golf Club Limited
Site Address	556 Pacific Highway, Killara NSW 2071
Lot and DP Number	Lot 2 DP 535219
Local Government Area	Ku-ring-gai Council
Current Zoning	Deferred Area 15 (KLEP 2015)
Distance from Sydney CBD	Approximately 15km north of the CBD
Geographical Coordinates	33°46'12.89"S 151°09'29.46"E
Investigation Area	Approximately 12 000m^2 (Figure 2)
Site Elevation	Approximately 110m AHD
Locality Map	Figure 1
Site Layout	Figure 2

2.3 SURROUNDING LAND USE

The site itself is zoned Residential 2(b) (KPSO) and as Deferred Area 15 (KLEP 2015) within the Ku-ring-gai Council local government area. The site is surrounded by RE2 Private Recreational (the remaining section of the golf course) to the west of the site. East of the site is R4 High Density Residential and both north and south of the site are R2 Low Density Residential. Gordon Golf Club is located to the north west of the site. Ravenswood School for Girls is north of the club. Regimental Park and Killara Train station are east of the site. A service station and a shopping strip are located immediately east of the site.

2.4 SITE LAYOUT AND INFRASTRUCTURE

The site layout can be viewed in Figure 2. The area highlighted in yellow is the area investigated in this DSI. The site is predominately a section of the golf course with two tennis courts and two bowling greens in the northern portion of the site. The clubhouse and carpark are at the eastern end of the site and are included in the investigation area. A small clubhouse and sheds are located adjacent the bowling green.

The site is connected to local electricity, mains water, stormwater drainage and sewer system.

2.5 PHYSICAL SITE CHARACTERISTICS

Topography and Drainage

The site topography was observed to be sloping in a south westerly direction. The elevation across the investigation area is approximately 110 meters (m) Australian Height Datum (AHD) but ranges from 98 metres on the golf course to 119m in the carpark. Stormwater is presumed to flow south westerly over the course and into a pond on site. Onsite water is expected to be channelled through contours to on site capture where possible.

Geology

The *Soil Landscapes of the Sydney 1:100,000 Sheet* (Chapman et al. 1989) indicates the site to be within the Glenorie soil landscape group, with friable dark brown loam topsoils overlying hard setting brown clay loam subsoil and whole coloured, reddish brown strongly pedal clay at depth. Undulating to rolling low hills on Wianamatta Group shales. Most typically extensively cleared tall open-forest (wet sclerophyll forest).

Based on the topography of the site, it is expected that significant filling has occurred to obtain current levels. Natural soils, fitting the above description were present beneath fill materials.

Hydrogeology

A groundwater bore search was undertaken using the groundwater database under Office of Water, Department of Primary Industries (www.allwaterdata.water.nsw.gov.au). Six (6) groundwater bores are located within a 1km radius of the site (see Appendix B).

A domestically used bore hole (GW023498) was located approximately 200m east of the site. Three (3) boreholes (GW104668, GW104669 and GW104670) were approximately 800m north of the site. One borehole (GW106029) was located approximately 1km to the east of the site.

SESL was advised that a groundwater well is positioned in the western corner of the visitors carpark. This well was observed during the site inspection. It is noted that this well was constructed to monitor groundwater contamination from the upslope mechanics workshop.

Surface Water

One surface water body was observed at the time of the site assessment. A pond is located on the golf course approximately 400m to the west of the site. Links creek is located approximately 600m west of the site.

Acid Sulfate Soil

A search was undertaken through the Ku-ring-gai Council's record under the Ku-ring-gai Local Environmental Plan 2015 to determine the acid sulfate soil risk on site. The Acid Sulfate Soils Map identified there was no risk of Acid Sulfate Soils on the site. Based on the elevation and geological land unit of the area, it is not expected that acid sulfate soils are present.

Proximity to Local Sensitive Environments

The nearest sensitive environment is Lane Cove National Park, which is located approximately 2km west of the site. No other sensitive cultural or other environmental receptors are identified in close proximity to the site.

Soil and Groundwater Contamination

As part of the development assessment process, SESL was engaged by the client to undertake a Tier 1 Preliminary Site Investigation for the site. The findings of that investigation indicated the need for a Tier 1 Detailed Site investigation (See SESL report: C0598.Q4957.B36607 TKGC PSI FA). Soil and groundwater are potentially contaminated due to historical site uses and migration of contaminated groundwater from adjacent sites. SESL is not aware of any previous environmental investigations relating to this site.

2.6 SITE HISTORY

A review of the site history was undertaken to assess the historical use of the site, and in particular to identify activities with potential to contaminate soil, groundwater and surface water at the site. The historical review included:

- Current and historical certificates of title;
- Current and historical aerial photographs;
- Council planning documentation; and
- The NSW EPA Contaminated Lands database.

2.7 HISTORICAL TITLE SEARCH

The current and historical Certificates of Title was obtained from the Department of Lands and reviewed to assess the history of ownership and therefore possible landuse of the site.

The site is currently described as Lot 2 DP 535219. The registered owner of the site is listed as Killara Golf Club Limited. The history of ownership based on the Certificates of Titles is summarised in Table 3 and copies of the titles are provided in Appendix A.

Table 3 – Summary of Owners for Lot 2 DP 535219

Duration	Owner(s)	Suspected Land use Activities
Circa 1926 – 10.11.1980	Lindfield Golf and Recreational Club Pty. Limited	Golf club and recreational facilities
10.11.1980 – Present	Killara Golf Club Limited.	Golf club and recreational facilities

2.8 HISTORICAL AERIAL PHOTOGRAPHS

Aerial photographs from 1930, 1970, 1982, 1951, 1961, 1994 and 2004 were obtained from Land and Property Information Division for review to assess the history of the development of the site, copies of the aerial photographs can be in Appendix A.

1930 The site appears to already be being used as a golf course with minimal vegetation and covered surface. Houses along Pacific highway exist and there are some areas of disturbed land behind these. Surrounding land uses include residential, cleared land and dense vegetation. Regimental Park to the north of the site has been cleared.

1951 The site now has a clubhouse and car park established with one bowling green constructed. It appears the ground has been raised where the bowling green has been constructed. More houses appear on the southern boundary of the golf course. Vegetation on site is slightly denser. Residential dwelling density has increased surrounding the site. Regimental Park to the north of the site appears to have grass coverage.

1961 The land in the northeastern corner of the site has been developed with a small number of residential properties. What appears to be a second bowling green, at a lower elevation to the previous is being constructed. The golf course grounds and the surrounding seem relatively unchanged.

1970 Vegetation on site has reduced in density. Residential properties north of the site have increased in density. The second bowling green appears completed. Cars now appear in the carpark indicated the site is operational. The golf course has increased surface indentations such as sandpits. A small pond appears in the western corner of the course. The surrounding area seems relatively unchanged.

1982 Vegetation on site has increased. Two tennis courts have been constructed below one of the bowling greens and appears to be on raised ground. The pond on the golf course seems to have increased in size. A small structure appears opposite the pond on raised group. The residential houses that boarder the east of the site on Pacific Highway have been redeveloped and now include three high density dwellings. Vegetation in the surround area appears to have slightly decreased.

1994 The pond in the western corner appears to have increased in size. The small structure opposite appears to have more land cleared surround it and possible paving. The site and surrounds appear relatively unchanged from the 1982 aerial photograph.

2004 A path/road has been made across the site from the clubhouse carpark to the small structure and paved area opposite the pond. A carpark or cart parking area has been established below the small structure. The site and surrounding area remain relatively unchanged from the 1994 photograph.

2.9 Site Zoning and Council Records

Ku-ring-gai Local Environmental Plan 2015 is the principle-planning instrument regulating landuse and development in the area. Ku-ring-gai Planning Scheme Ordinance (KPSO) and the Draft Ku-ring-gai Local Environment Plan 2013 are other planning instruments to be considered as they list the site as Residential 2(b) and RE2 Private Recreation respectively. The site is currently zoned Deferred Area 15 due to the proposed zoning changes.

The Section 149 (2) & (5) planning certificate for the property was obtained from Ku-ring-gai Council and a copy is provided in Appendix A. The following information has been noted following a review of the certificate:

- The site does not include or comprise critical habitat;
- The site is not identified as a conservation area;
- The site is identified as containing an item of environmental heritage significance under the Ku-ring-gai Planning Scheme Ordinance and is listed as a Draft Heritage Item under Draft Ku-ring-gai Local Environment Plan 2013;
- The site is not affected by the operation of Section 38 or 39 of the *Coastal Protection Act 1979*;
- The site is not subject to mine subsidence under section 15 of the *Mine Subsidence Compensation Act 1961*;
- The site is not identified as bushfire prone land under the *Environmental Planning and Assessment Act 1979*. Ku-ring-gai Development Control Plan No.38- Residential Design Manual restrict the development of this site due to bushfire risk;
- The site is effected by Ku-ring-gai Development Control Plan No.47 - Water Management due to flood related controls on development;

- The site is not identified as biodiversity certified under part 7A of the *Threatened Species Conservation Act 1995*;
- This site is not affected by a Biobanking Agreement under part 7A of the *Threatened Species Conservation Act 1995;*
- This site may contain threatened species, populations and ecological communities listed under the *Threatened Species Conservation Act 1995* and or the *Environment Protection Biodiversity Conservation Act 1999* (Commonwealth);
- This site may contain one or more of the following endangered or critically endangered ecological communities as described in the final determination of the scientific committee to list the ecological communities under Part 3 of Schedule 1 or Part 2 of Schedule 1A of the *Threatened Species Conservation Act 1995*:
    - Blue Gum High Forest;
    - Duffys Forest Ecological Community in the Sydney Basin Bioregion;
    - Sydney Turpentine Ironbark Forest; and
    - Coastal Upland Swamp.
- The site is not affected by a Property Vegetation Plan under the *Native Vegetation Act 2003*;
- This site is not affected by an order under the *Tree (dispute Between Neighbours) Act 2006*; and
- This site is affected by a Tree Preservation Order pertaining to trees greater than 5m height or canopy spread exceeding 4m. Council consent will be required to ring bark, cut down, lop, prune, remove, injure or willfully destruct trees subject to this order.

The Section 149 Certificate identified the following matters prescribed by Section 59 (2) of the *Contaminated Land Management Act 1997* and noted that the site:

- Is **not** identified as significantly contaminated land within the meaning of the Act;
- Is **not** subject to a management order within the meaning of the Act;
- Is **not** the subject of an approved voluntary management order within the meaning of the Act;
- Is **not** subject to an ongoing maintenance order within the meaning of the Act;
- Is **not** the subject of a site audit statement within the meaning of the Act; and
- Is **not** expected to be contaminated by Ku-ring-gai Council. However, council advises that prior to urban settlement, large areas of Ku-ring-gai were used for agricultural and horticultural activities. These activities may cause contamination and any concerns should be investigated.

2.10 EPA Contaminated Sites Database

A search of the NSW Environmental Protection Authority (EPA) contaminated land public record was performed to assess if the site or surrounding sites have been declared as contaminated sites. It should be noted that this

database is not a comprehensive list of all contaminated land in NSW, this record only lists sites regulated under Part 3 of the *Contaminated Land Management Act 1997.*

A search undertaken on the 27/10/2015 for the Ku-ring-gai Council LGA, returned 24 notices relating to 5 sites listed under the *Contaminated Land Management Act 1997* within the suburb of Killara (see Appendix B). A summary of information related to this site is shown in Table 4.

Table 4 – Summary of EPA Contaminated Lands notices issued to the suburb of Killara

Site and Address	Issued Date	Description	Distance from site
BP Australia, 478 Pacific Highway, Killara	22.10.2014 22.10.2014	1) Voluntary Management Proposal EPA approved the voluntary investigation proposal by BP Australia PTY LTD. The site is the location of a service station. The soil and/or groundwater at the site is contaminated with petroleum hydrocarbons and BTEX. 2) Declaration of Significantly Contaminated Land The service station site is significantly contaminated with petroleum hydrocarbon contaminated groundwater migrating offsite and a risk of human exposure to contaminated vapours via soil disturbance.	350m south of the site.
Caltex Service Station, 684-696 Pacific Highway, Killara	28.03.2003 27.11.2002 Repealed 1.2.2010	1) Voluntary Remediation Proposal EPA approved the voluntary remediation proposal by Charben Haulage PTY LTD to remediate the soil and groundwater at the former Caltex Service Station. The contaminants on site are identified as petroleum hydrocarbons and BTEX and are migrating offsite in groundwater. The site is significantly contaminated. 2) Declaration of investigation area EPA defined an investigation area for significantly contaminated land as a result of a former service station (692B-694 Pacific Highway) which operated for 40 years. Contaminants identified to have migrated off site in soil and groundwater are petroleum hydrocarbons and BTEX. It has know to have impacted four (4) sites and part of the Pacific Highway adjacent to the site. The EPA repealed the investigation in 2010 following the conclusion of management options, declaring these sites were no longer significantly contaminated.	800 - 850m north of the site.

	5.3.2003 Repealed 1.2.2010	3) Investigation Order EPA ordered Caltex Petroleum PTY LTD, as the person principally responsible for the contamination to investigate, audit and implement plans to manage contamination issues at the former service station site and the four (4) sites and roadway impacted by contaminants. The EPA repealed the investigation in 2010 following the conclusion of management options, declaring these sites were no longer significantly contaminated.	
	15.12.2004	4) End of Declaration Notice The site was suspected to be impacted by petroleum hydrocarbons and BTEX from the nearby former Caltex service station. Investigations into soil and groundwater revealed the site was not significantly contaminated. No further investigations were to apply to this site.	
	15.12.2004	5) Declaration of Remediation Area EPA revised the investigation area to exclude the non-contaminated 684-684A Pacific Highway, Killara site. It confirms that high concentrations of contaminants (petroleum hydrocarbons and BTEX) are present in a groundwater plume beneath the sites and is moving down gradient. It has the potential to cause harm to the environment including down gradient of groundwater flow.	
	12.4.2005 Amended 1.2.2010	6) Variation on Declaration of Remediation Area EPA revised the investigation area to include the Pacific Highway easement adjacent to 690, 692, 692B, 694 and 696 Pacific Highway, Killara. In 2010 the variation was amended to only include 692B and 694 Pacific Highway, Killara following investigations that concluded the other sites were not significantly contaminated.	
	4.8.2006	7) Remediation Order for Additional Areas EPA issued a remediation order to Caltex Petroleum PTY LTD which required them to conduct short term remediation, a method to delineate the extent of the groundwater plume, consult with the community and have reports audited.	
	24.5.2007	8) Remediation Order for Additional Areas EPA issued a further remediation order to Caltex Petroleum PTY LTD	
	27.11.2007	9) Variation of Remediation Order EPA added 690,692 and 696 Pacific Highway, Killara to the sites to be remediated. It was also made a requirement that site auditors audit the site	

	1.2.2010	and produce a report determining if the sites being assessed are suitable for specified land uses. 9) Repeal of Order EPA declared all investigated sites to have the contamination issue managed and were considered no longer significantly contaminated. This repealed/amended all previous notices.	
	28.5.2003	10) Site Audit Statement One NSW accredited site auditor provided a site audit statement confirming the site details and confirmed the audit was being carried out to confirm the NSW EPA requirement stated in the remediation order issues to Caltex Petroleum PTY LTD.	
	13.1.2007	11) Site Audit Statement Two Accredited site auditor advised the EPA that the remediation plan carried out by Caltex Petroleum PTY LTD was appropriate for this site.	
	8.8.2008	12) Site Audit Statement Three Accredited site auditor advised the EPA that these sites were suitable for residential development with minimal opportunity for soil access including units.	

2.11 DANGEROUS GOODS LICENSE SEARCH

A search of the Stored Chemical Information Database and microfiche records held by WorkCover NSW did not locate any records pertaining to the site (See Appendix A).

The results of the search indicate that no chemicals are reported as being stored at the Site.

2.12 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

SESL conducted a Tier 1 Preliminary Site Investigation as part of the Development Assessment requirement for the site to be rezoned, (See SESL report: C0598.Q4957.B36607 TKGC PSI FA). The findings of the report are summarised in Sec 2.5.7. Following the completion of the PSI, a DSI was prepared for a section of the site (northern section) by SESL in 2016 (C0598 Q5224 B38160 DSI Killara FB).

SESL was not aware of any other environmental investigations previously conduced for the site. The existence of a groundwater monitoring well in the east of the upper carpark suggests an investigation into the contamination status of the adjacent service station. No records were available for the findings of this investigation.

2.13 Current Landuse and Associated Practices

The site has a number of recreational activities performed, including golf, lawn bowls and tennis. Associated infrastructure such as carpark and the clubhouses also see general passive use. Key site activities of the current landuse and practices, including previous practices that may contribute to contamination being present include the establishment and maintenance of high performance sports turf of the golf course and bowling greens, and the importation of fill to contour and create level benches for the bowling and tennis areas.

The use of pesticides and herbicides in these areas historically presents a risk for contamination being present. Modern practices use less persistent products, however the residual impacts of previous practices may still present a risk to the proposed development.

2.14 Integrity Assessment

The integrity of information provided in this DSI was considered reliable. The DSI followed appropriate methods of investigation with the desktop survey being consistent with field observation and anecdotal evidence presented. Details regarding the site history and present status of the site have been largely obtained from official records sourced from Ku-Ring-Gai Council, NSW EPA, NSW Land and Property Information Department and Workcover NSW. These documents are considered accurate and credible. All information provided, as part of this report was believed to be true, accurate and representative of the past and present status of the site at the time of this investigation.

3 SITE RECONNAISSANCE

Site walkover and intrusive soil sampling was conducted by a SESL environmental scientist on 11th July, 2017 for the purpose of this DSI. Site works for the initial DSI were undertaken by SESL scientists on 23rd, 24th 25th February, and 17th March 2016.

3.1 STORMWATER

Based on the site topography, stormwater is unlikely to flow onto the site from surrounding land due to existing stormwater infrastructure. No significant issues were identified with respect to stormwater management on this property.

3.2 CHEMICAL STORAGE

Chemical storage for golf course use is in the maintenance sheds on the west of the golf course. No chemical stores were observed during the site inspection. Some records of historical chemical use exist in site diaries; however, no persistent pollutants were recorded. It is expected that persistent pollutants such as pesticides, would have been used historically due to the prevalence of use in recreational sports turf industries.

3.3 HAZARDOUS BUILDING MATERIALS

Potential asbestos-containing fragments are expected in the older buildings of the site. No asbestos was observed during the assessment. Asbestos-containing materials are commonly found in external structures such as walls and eaves, and internal wet areas such as bathrooms and kitchens. Asbestos was also commonly used for pipe lagging and insulation and also fire doors. The age of the structures also presents a risk for the presence of potential lead paint.

No PCB containing capacitors or SMF materials were identified at the time of the site assessment.

3.4 CUT AND FILL

Significant filling was observed within the investigation area throughout the site assessment. The bowling greens and tennis courts were observed to elevated above the adjacent course, indicating filling. Boreholing confirmed the presence of fill of varying depths, to a maximum depth of 3 m.

The initial site works conducted for the initial DIS confirmed the presence of fill in the northern car park area of the site. Fill was observed to vary between 1.2 m and 7.7 m below the surface.

3.5 WASTE MANAGEMENT

The site is currently used for recreational purposes. Waste is expected to be generated through typical maintenance of the course and grounds, predominantly greenwaste. The clubhouse generates food and general waste through catering activities. No issues relating to waste management were observed.

3.6 AREAS OF ENVIRONMENTAL CONCERN

A number of Areas of Environmental Concern (AEC) are associated with the former uses of the site. These include the use of the site for as general agricultural land, the presence of fill materials at the site, and the presences of degrading residential dwellings and sheds. These AEC and the Contaminants of Potential Concern associated with them are outlined in the table below.

Table 5 – Areas of Environmental Concern

Area of Environmental Concern	Contaminants of Potential Concern
AEC1: Potential for on-site migration of contamination from adjacent service station.	• Heavy metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Mn) • PAHS, TPHs, BTEXN • VOCs
AEC 2: Potential cut and fill activity during pre-development stage and to level former structure on site, particularly carparks.	• Organochlorine Pesticides (OCP) • Organophosphate Pesticides (OPP) • Heavy metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Mn) • PAHS, TPHs, BTEXN • Asbestos • VOCs • PCBs

4 RELEVANT GUIDELINES FOR CONTAMINATION ASSESSMENT AND MANAGEMENT

4.1 RELEVANT GUIDELINES

Assessment criteria will be based on guidelines made or approved by the NSW EPA under Section 105 of the *Contaminated Land Management Act 1997*. These include EPA's Contaminated Sites series of guidelines, and fundamental guideline documents such as the Australian and New Zealand Guidelines for the *Assessment and Management of Contaminated Sites* (ANZECC/NHMRC 1992) and *National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013*), NEPC 2013, Canberra (NEPM).

The ASC NEPM 2013 incorporates a recommended general process for the assessment of site contamination and a set of 9 specific guidelines. The process and guidelines are closely based on previous documentation widely used for assessing site contamination (such as ANZECC/NHRMC 1992 and the various National Environmental Health Forum monographs and proceedings). Assessment criteria have been drawn from other guidelines and information sources, if not available in the above guidelines.

4.2 PROPOSED DEVELOPMENT

SESL believes the investigation area is to be rezoned for residential development. This report is to be used as part of the development process.

4.3 NATIONAL ENVIRONMENTAL PROTECTION MEASURE (CONTAMINATED SITES) 1999

National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), NEPC 2013, Canberra (ASC NEPM 2013) provides a national framework for conducting assessments of contaminated sites in Australia.

The purpose of the (ASC NEPM 2013) is to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community which includes regulators, site assessors, environmental auditors, landowners, developers and industry.

The ASC NEPM 2013 addresses assessment of contamination, and does not provide specific guidance on prevention of site contamination. The desired environmental outcome for the ASC NEPM 2013 is to provide adequate protection of human health and the environment, where site contamination has occurred, through the development of an efficient and effective national approach to the assessment of site contamination.

Schedule A in the ASC NEPM 2013 outlines the general process for assessment of site contamination, with reference to Schedules B (1) to B (9) for guidance on each step of the process.

In broad terms, the assessment process as provided in Schedule A can be described as:

Tier 1 PSI — Preliminary investigation, laboratory analysis and interpretation, and assessment of results with reference to investigations levels;

Tier 1 DSI — Where required, detailed investigation, laboratory analysis and interpretation is completed, and the need for risk assessment to derive response levels and/or the need for remediation is evaluated; and

Tier 2 or 3 — Site-specific risk assessment to confirm/define appropriate health and ecological investigation levels.

Overarching guidance is provided on community consultation and risk communication, protection of health and safety during assessment of site contamination, and expected competencies of environmental auditors and related professionals.

ASC NEPM 2013 provides a framework for the use of investigation and screening levels for the protection of human health, ecosystems, groundwater resources and aesthetics. Investigations levels and screening levels are applicable to the Tier 1 site assessment. The adopted investigation and screening levels for this assessment is as follow:

i) Health Investigation Levels (HILs);
ii) Health Screening Levels (HSLs);
iii) Ecological Investigation Levels (EILs); and
iv) Ecological Screening Levels (ESLs).

Health Investigation Levels

HILs are scientifically based, generic assessment criteria designed to be used in the Tier 1 assessment for assessing human health risk via all relevant pathways of exposure. HILs are designed to be intentionally conservative and based on a reasonable worst-case scenario for the following generic land use settings:

A — Residential with garden/accessible soil (home grown produce contributing less than 10% of vegetable and fruit intake; no poultry) this category includes children's day-care centres, preschools and primary schools.

B — Residential with minimal opportunities for soil access, including dwellings with fully and permanently paved yard space such as high-rise apartments and flats.

C Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves), which should be subject to a site-specific assessment where appropriate.

D Commercial/industrial includes shops and offices as well as factories and industrial sites.

The site is currently used as a golf club. Due to the proposed rezoning of this section of the property to medium density residential, with the possibility for soil access, high human exposure to the site needs to be accounted for. Therefore, the Health Investigation Levels selected for the site is **HIL – Residential A.**

ASC NEPM 2013 Schedule B7 defined the HILs as the concentration of a contaminant above, which further appropriate investigation and evaluation will be required. It is also stated “levels in excess of the HILs do not imply unacceptability or that a significant health risk is likely to be present”.

The ASC NEPM 2013 Schedule B7 states at the very least, the maximum and the 95% UCL of the arithmetic mean contaminant as well as localised elevated values must be compared to the HILs. Two additional (secondary) criteria should also be met, namely that the standard deviation of the results must be <50% of the relevant investigation level and that no single value exceeds 250% of the relevant investigation level.

ASC NEPM 2013 also states that the HILs are not intended to be used as clean-up levels for contaminated sites. The requirement of clean-up should be based on site-specific assessment and risk management options.

The adopted HIL is shown in Table 6.

Table 6 – Health Investigation Levels for Soil Contaminants

Chemical	Health-based investigation levels (mg/kg)			
	Residential[4] A	Residential[1] B	Recreational[1] C	Commercial/ Industrial[1] D
Metals and Inorganics				
Arsenic[2]	***100***	500	300	3,000
Beryllium	***60***	90	90	500
Boron	***4,500***	40,000	20,000	300,000
Cadmium	***20***	150	90	900
Chromium (VI)	***100***	500	300	3,600
Cobalt	***100***	600	300	4,000
Copper	***6,000***	30,000	17,000	240,000
Lead[3]	***300***	1,200	600	1,500
Manganese	***3,00***	14,000	19,000	60,000
Mercury (Inorganic) [5]	***40***	120	80	730
Methyl Mercury[4]	***10***	30	13	180
Nickel	***400***	1,200	1,200	6,000
Selenium	***200***	1,400	700	10,000
Zinc	***7,400***	60,000	30,000	400,000
Cyanide	***250***	300	240	1,500
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as BaP TEQ)[6]	***3***	4	3	40
Total PAHs[7]	***300***	400	300	4000
Phenols				
Phenol	***3,000***	45,000	40,000	240,000
Pentachlorophenol	***100***	130	120	660
Cresols	***400***	4,700	4,000	25,000
Organochlorine Pesticides				
DDT+DDE+DDD	***240***	600	400	3,600
Aldrin and Dieldrin	***6***	10	10	45
Chlordane	***50***	90	70	530
Endosulfan	***270***	400	340	2,000
Endrin	***10***	20	20	100
Heptachlor	***6***	10	10	50
HCB	***10***	15	10	80

Methoxychlor	***300***	500	400	2,500
Mirex	***10***	20	20	100
Toxaphene	***20***	30	30	160
Herbicides				
2,4,5-T	***600***	900	800	5,000
2,4-D	***900***	1,600	1,300	9,000
MCPA	***600***	900	800	5,000
MCPB	***600***	900	800	5,000
Mecoprop	***600***	900	800	5,000
Picloram	***4,500***	6,600	5,700	35,000
Other Pesticides				
Atrazine	***320***	470	400	2,500
Chlorpyrifos	***160***	340	250	2,000
Bifenthrin	***600***	840	730	4,500
Other Organics				
PCBs[8]	***1***	1	1	7
PBDE Flame Retardants (Br1-Br9)	***1***	2	2	10

Notes: This table is adapted from Table 2 in Schedule B7: Derivation of Health-Based Investigation Levels, *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013* (NEPC 2013).

HIL A: Residential with garden/accessible soil (home-grown produce <10% fruit and vegetable intake (no poultry)), also includes childcare centres, preschools and primary schools.

HIL B: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

1 HIL C: Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include areas of undeveloped open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate.

HIL D: Commercial/industrial includes premises such as shops, offices, factories and industrial sites.

2 Arsenic: HIL for arsenic assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate

3 Lead: HIL for lead is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HILD D) where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate

4 Methyl mercury: Assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition, the reliability and quality of sampling/analysis should be considered.

5 Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present.

6 Carcinogenic PAHs: HIL for carcinogenic PAHs is based on the 8 carcinogenic PAHs and their respective TEFs (potency relative to BaP) adopted by CCME 2008. The BaP TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its BaP TEF, given below, and summing these products.

PAH Species	TEF	PAH Species	TEF
Benzo(a)anthracene	0.1	Benzo(g,h,i)perylene	0.01
Benzo(a)pyrene	1	Chrysene	0.01
Benzo(b+j)fluoranthene	0.1	Dibenzo(a,h)anthracene	1
Benzo(k)fluoranthene	0.1	Indeno(1,2,3-c,d)pyrene	0.1

Where the BaP occurs in bitumen fragments it is relatively immobile and does not represent a significant health risk.

7 Total PAHs: HIL for total PAH is based on the sum of the 16 PAHs most commonly reported for contaminated sites (WHO 1998). The application of the total PAH HIL should consider the presence of carcinogenic PAHs and naphthalene (the most volatile PAH). Carcinogenic PAHs reported in the total PAHs should meet the BaP TEQ HIL. Naphthalene reported in the total PAHs should meet the relevant HSL.

8 PCBs: HIL for PCBs relates to non-dioxin-like PCBs only. Where a PCB source is known, or suspected, to be present at a site a site-specific assessment of exposure to all PCBs (including dioxin-like PCBs) should be undertaken.

Health Screening Levels (HSLs)

4.3.1.1 Petroleum Hydrocarbon Compounds

ASC NEPM 2013 adopts the Health Screening Levels for various petroleum hydrocarbon compounds developed by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE). Friebel and Nadebaum 2011 provide the methodology for assessing human health risk via the inhalation and direct contact pathways of selected petroleum compounds and fractions.

The HSLs apply to the same landuse scenarios with additional consideration of soil texture and depth to determine the appropriate soil, groundwater and soil vapour criteria.

The ASC NEPM 2013 provides HSL fractions and corresponding equivalent carbon range for petroleum hydrocarbon compounds (see Table 7). HSLs are given only for F1, F2 and BTEX as the heavier petroleum compounds of F3 and F4 are non-volatile and do not pose a concern for vapour intrusion. However exposure can be via direct contact pathways (dermal contact, incidental oral ingestion and dust in halation). Friebel and Nadebaum 2011 provides the HSLs for direct contact, however for most site assessments, these levels are unlikely to trigger further investigation or site management as the values are substantially higher than most soil screening levels.

Table 7 – HSL Fractions and Corresponding Equivalent Carbon Range

Fraction Number	Equivalent Carbon Number Range
F1	$C_6 – C_{10}$
F2	$>C_{10} – C_{16}$
F3	$>C_{16} – C_{34}$
F4	$>C_{34} – C_{40}$

As aforementioned, HSLs for soil, groundwater and soil vapour haven been developed based on soil texture. The HSLs assume a uniform soil profile and the highest proportion of the soil texture from the soil profile should be used selecting the appropriate HSLs. For Tier 1 soil assessment, the HSL classifications of sand, silt and clay may be broadly applied to soil texture classification in Table A1 of Australian Standard 1726 as follow:

i) Coarse grained soil: >50% of particles (by weight) <63mm and >0.075mm
- Sand: >50% of particles (by weight) <2.36mm; or
- Gravel: >50% of particles (by weight) >2.36mm.

ii) Fine-grained soil: >50% of particles (by weight) <0.075mm
- Silts and clays (liquid limit >50%);
- Silts and clays (liquid limit <50%); or
- Highly organic soils.

4.3.1.2 Asbestos

ASC NEPM 2013 adopted the HSLs from the Western Australia Department of Health (WA DoH) *Guidelines of Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia 2009.* The HSLs are based on scenario-specific likely exposure levels, that include bonded and friable asbestos levels (see Table 8).

Asbestos only poses human health risk when asbestos fibres are made airborne and inhaled. Bonded asbestos is not readily made airborne except through substantial physical damage. ASC NEPM 2013 states “the assessment and management of asbestos contamination should take into account the condition of the asbestos materials and the potential for damage and resulting release of asbestos fibres”.

The HSLs are to be used for Tier 1 assessment, in the event of an exceedance that triggers the need for a Tier 2 site-specific assessment. Site-specific assessments of asbestos contaminated sites should be designed to

describe the nature and quantity of asbestos present in the soil that can sufficiently develop a risk management plan for the current and proposed landuse of the site.

Table 8 – Health Screening Levels for Asbestos Contamination in Soil

	Health Screening Level (w/w)			
Form of asbestos	**Residential A[1]**	Residential B[2]	Recreational C[3]	Commercial/ Industrial D[4]
Bonded ACM	**0.01%**	0.04%	0.02%	0.05%
Fibrous Asbestos (FA) and Asbestos Fines (AF) [5] (Friable Asbestos)	**0.001%**			
All forms of asbestos	**No visible asbestos for surface soil**			

Note: This table is adapted from Table 7 in Schedule B1: Health Screening Levels of Asbestos Contamination in Soil, *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013* (NEPC 2013).

1 Residential A with garden/accessible soil also includes childcare centres, preschools and primary schools.

2 Residential B with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

3 Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.

4 Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.

5 The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres.

Ecological Investigation Levels (EILs)

Ecological Investigation Levels (EILs) have been developed for assessing risk to terrestrial ecosystem for common contaminants in soil. The EILs are derived for specified levels of species protection depending on land use and are principally applied to the top 2m of the soil.

Table 9 – EILs Landuse Criteria and Protection Levels

Land Use	Levels of Protection
Areas of ecological significance	99%
Urban residential areas and public open space (HIL A, B and C)	80%
Commercial and industrial	60%

Schedule B5 of ASC NEPM 2013 provides the EILs for Arsenic, Copper, Trivalent Chromium, DDT, Naphthalene, Nickel, Lead and Zinc. The methodology to derive the EILs considers the physicochemical properties of soil and contaminants and the capacity of the local ecosystem to accommodate increases in contaminant levels above ambient background.

EILs are obtained by summing added ambient background concentration (ABC) and contaminant limit (ACL). ABC is the soil concentration in a specified locality that is the total of naturally occurring background level and the contaminant levels that have been introduced by general anthropogenic sources. ACL is the added concentration above the ACB of a contaminant which require further investigation on the impact on ecological values.

The derivation of EILs takes into consideration the ageing of contamination (>2 years) and soil properties as the toxicity of soil contaminants will reduce over time. Values for ACL based on pH, CEC and exposure scenario are provided for Lead, Zinc, Copper, Nickel and Trivalent Chromium. This method of deriving EILs only applies to metals and metalloids, with the exception of Arsenic. Generic EILs for Arsenic, DDT and Naphthalene are shown in Analytical Table 1.

Methodology for Tier 2 site-specific assessments to determine site-specific EILs is provided in Schedule B5(b).

Ecological Screening Levels (ESLs)

Ecological Screening Levels (ESLs) haven been developed for selected petroleum hydrocarbon compounds to assess risk to terrestrial ecosystem. The ESLs adopts the same four fractions from the HSLs (see Table 7), however the soil texture standards are only divided into two: coarse or fine.

ESLs were adopted based on a review of Canadian guidance, a risk based TPH standards for human health and ecological aspects for various land uses in the *Canada-wide standard for petroleum hydrocarbons in soil* (CCME 2008).

In summary, the Investigation and Screening Levels adopted for this assessment is as follow:

- NEPC 2013, ASC NEPM 2013 Schedule B7, Table 1(A)1 – Health Investigation Levels for Soil Contaminants, Exposure Setting **Residential A**;
- NEPC 2013, ASC NEPM 2013 Schedule B7, Table 7 – Health Screening Levels for Asbestos Contamination in Soil, Exposure Setting **Residential A;**
- NEPC 2013, ASC NEPM 2013 Schedule B7, Table 1(A)3 – Soil Health Screening Levels for Vapour Intrusion;
- NEPC 2013, ASC NEPM 2013 Schedule B5b & B5c, Ecological Investigations Levels
- NEPC 2013, ASC NEPM 2013 Schedule B7, Table 1(B)5 – Generic EILS for Aged As, Fresh DDT and Fresh Naphthalene in Soils; and
- NEPC 2013, ASC NEPM 2013 Schedule B7, Table 1(B)6 – ESLs for TPH Fractions F1-F4, NTEX and Benzo(a)pyrene in Soil.

4.4 AUSTRALIAN AND NEW ZEALAND GUIDELINES FOR THE ASSESSMENT AND MANAGEMENT OF CONTAMINATED SITES (ANZECC/NHMRC, 1992)

The *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (ANZECC/NHMRC, 1992) provide a risk management approach consistent with the attainment of environmental outcomes described in the ASC NEPM 2013.

Contamination of land is defined as the presence in, on or under the land of a substance at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment[1].

The objectives of contaminated site remediation (ANZECC/NHMRC, 1992) are:

1. To render a site acceptable and safe for the long term continuation of its existing/proposed use;
2. To minimise environmental and health risks both on and off site to acceptable levels; and
3. To maximise to the extent practicable, the potential future uses of the site.

The ANZECC/NHRMC 1992 Guidelines provides two basic approaches in dealing with contaminated sites.

[1] Contaminated Land Management Act (CLM Act) 1997

i) A strict adherence to a set of preferred soil criteria used to define a condition of contamination and to serve as the standard which sites must meet in order to be considered to have been decontaminated; or

ii) A more flexible use of pre-determined soil criteria use chiefly to provide guidance as to whether a detailed investigation is required, confirm no further action is needed or provide guidance for clean-up in appropriate circumstances. This approach relies on careful consideration of site-specific data to derive acceptable criteria, which will ensure that public health, local amenity and soil, air water and quality are protected.

The ANZECC/NHRMC 1992 Guidelines concluded that the most appropriate approach for Australia is to adopt the combination of both approaches that incorporates, at a national level a general set of management principles and soil quality guidelines which guide site assessment and may guide site clean-up action, eliminating where appropriate, the need to develop costly site specify criteria. This approach also recognises that every site is different and that in many cases site specific acceptable criteria and clean-up technologies will need to be developed which reflect local conditions.

4.5 THE MANAGING LAND CONTAMINATION: PLANNING GUIDELINES – REMEDIATION OF LAND, NSW EPA 1997 (SEPP55 GUIDELINES)

The Managing Land Contamination: Planning Guidelines – Remediation of Land, NSW EPA 1997 (SEPP55 Guidelines) establishes the best practice for managing land contamination through the planning and development control process. The planning and development control process as provided for in the *Environmental Planning and Assessment Act 1979* plays an important role in the management of land contamination. The integration of land contamination management into the planning and development control process will:

- Ensure that changes of land use will not increase the risk to health or the environment;
- Avoid inappropriate restrictions on land use; and
- Provide information to support decision-making and to inform the community.

The SEPP55 Guidelines include:

a) Information to assist in the investigation of contamination possibilities;
b) A decision making process that responds to the information obtained from an investigation;
c) Information on how planning and development control can cover the issues of contamination and remediation;
d) A suggested policy approach for planning authorities;

e) Discussion of information management systems and notification and notation schemes, including the use of Section 149 planning certificates notations; and
f) Approaches to prevent contamination and reduce the environmental impact from remediation activities.

SEPP 55 Guidelines provides consistent statewide planning and development controls for the remediation of contaminated land and ensures the following:

- Landuse changes do not occur until planning authorities consider whether the land is contaminated and whether it needs to be remediated to make it suitable for the proposed use;
- Remediation of contaminated land is permissible throughout the State;
- Remediation requires consent only where it has the potential for significant environmental impacts or does not comply with a council's policy for contaminated land;
- Most remediation proposal which require consent are advertised for public comment;
- All remediation is carried out in accordance with appropriate standards and guidelines;
- Applications for remediation are not refused without substantial justification; and
- Councils are notified at commencement and completion of remediation.

4.6 RELEVANT LEGISLATION

NSW has a comprehensive suite of guidelines relating to assessment and management of contamination, administered under the *Contaminated Land Management Act (CLM Act) 1997* and the *Environmental Planning and Assessment Act 1997*. These include the following:

- Contaminated Sites: Guidelines for Assessing Service Station Sites, NSW EPA, 1994;
- Contaminated Sites: Sampling Design Guidelines, NSW EPA, 1995;
- Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land, NSW EPA 1998;
- Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, NSW OEH, 2011;
- Contaminated Sites: Guidelines for the NSW Site Auditor Scheme, NSW DEC, April 2006;
- Waste Classification Guidelines Part 1: Classifying Waste, NSW EPA 2014.

Guidelines approved under the CLM Act also include ADWG (2011) *Australian Drinking Water Guidelines,* ANZECC/ARMCANZ (2000) *Water Quality Guidelines* and GMRRW (2008) *Guidelines for Managing Risk in Recreational Waters.*

SESL's policy of meeting the spirit and intent of State Legislation where possible, consideration will be given in the first instance to NSW legislation and guidelines, where these do not conflict with Commonwealth legislative

requirements. State legislation and guidelines are directly relevant to any offsite components of the proposed remediation.

5 SOIL SAMPLING, ANALYSIS PLAN AND SAMPLING METHODOLOGY

5.1 SAMPLING TEAM

The details and duties (see Table 10) of the soil sampling team, over the three days were as follows:

a) Sample collector:
- Soil sample collection according to sampling regime.
- Described soil horizon features.
- Responsible for decontamination between sampling.

b) Sample logger:
- Identified testing location and depth of profiles.
- Labeled sample containers.
- Recorded field conditions current at sampling into the sample log.
- Recorded soil profile information.
- Nominated field duplicates at the nominated ratio.
- Recorded analytes to be tested for each sample.
-

The details and duties (see Table 10) of the water sampling team, on 17th March 2016 were as follows:

c) Sample collector:
- Water sample collection using a Micropurge;
- Measured Standing Water Level; and
- Collected Sample in appropriate containers.

d) Sample logger:
- Identified groundwater well locations;
- Labeled sample containers;
- Recorded field conditions current at sampling into the sample log;
- Recorded instrument readings.
- Recorded analytes to be tested for each sample.

Table 10 – Soil Sampling Team Personnel

Personnel	Position	Qualifications	Project Task
Andrew Jacovides	Environmental Scientist	Bachelor of Natural Science (Environmental Management) Workcover Construction Work in NSW (White Card) Senior First Aid Certificate Manual Handling Training Waste Classification and Reform Training	Conduct site visual assessment Identify sampling location Conduct soil sampling

5.2 SAMPLING REGIME – SOIL

The fieldwork for the assessment was devised to address the issues identified as potential for contamination as set out in Sections 3. The sampling objective was to gather information with regard to the type, location, level and extent of potential contamination due to the historical landuses and historical filling at the site. This process provided sufficient supporting data (according the DQO's) to allow recommendations to be made on whether the possible site contamination is compliant with the proposed landuse and the environmental concerns.

5.3 SAMPLE COLLECTION – SOIL

The selection of the sampling locations was formed based on a judgmental sampling pattern. Sampling locations were based on areas where fill was observed. For this DSI sampling event (11/07/2017) a total of ten (10) sampling locations were investigated across the site, with forty-two (42) samples collected for the purpose of laboratory analysis. All samples were analysed for a contamination screening suite (heavy metals, TRH, OCP, PCB, PAH, BTEX & asbestos). Samples were collected directly from push tube liners and placed directly into laboratory supplies 20 mL glass jars. The samples were then placed into a chilled container and transported to a NATA accredited laboratory for the purpose of analysis, under Chain of Custody (CoC) procedures. Four (4) Quality Assurance/Quality Control (QAQC) samples were collected throughout this investigation. The summary of sampling location selection is show in Table 12.

Table 11 – Soil Sampling Location Selection

Sampling Location	Date	Maximum Depth	Justification
BH1	11/07/2017	2200	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH2	11/07/2017	1000	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH3	11/07/2017	700	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH4	11/07/2017	3000	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH5	11/07/2017	2200	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH6	11/07/2017	1200	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH7	11/07/2017	900	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH8	11/07/2017	1200	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH9	11/07/2017	600	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs
BH10	11/07/2017	1500	Within the area of identified filling. Analyse soils for pesticides, heavy metals, PCBs, TRH, BTEXN, PAHs, OCPs and OPPs

5.4 Composite Sample Procedure

No composite samples were taken during this assessment.

5.5 Decontamination Procedure

The sampling and decontamination procedures adopted during the fieldwork for this assessment included hand tools decontaminated prior to use and in between samples to prevent cross contamination. Disposable gloves were used for the collection of soil samples directly from the push tube casings.

6 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was developed based on the information obtained during the investigation process to allow assessment of potential sources of impact, chemicals of concern, transport mechanism and receptors.

6.1 SOURCES OF IMPACT

In summary, the sources of impact (areas of environmental concern – AEC) identified in the assessment area include:

- AEC 1: Uncontrolled fill from unknown origin used to level the raise and level the site; and
- AEC 2: Potential historical pesticide and herbicide use at the site.

6.2 CONTAMINANTS OF CONCERN

Based on the potential sources and the findings of the current investigation, the contaminants of concerns include the following:

- Heavy Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg)
- Polycyclic Aromatic Hydrocarbon (Carcinogenic and Total);
- Total Recoverable hydrocarbons (TRH);
- BTEX (Benzene, Toluene, Ethylbenzene, Xylene);
- Organochlorine Pesticides (OCP); and
- Organophosphorus Pesticides (OPP).

6.3 FATE AND TRANSPORT

Transport Medium and Control

The anticipated primary transport media for the migration of contaminants of concern are:

- Migration of contaminated material through erosion and dust during construction works:
  - Any identified contaminated soil materials can be managed during remediation process prior to or during future construction.
- Surface runoff to stormwater drainage system:
  - All stormwater on site can be managed during future development, under the guidance of a site construction management plan.

Potential Migration Pathways

There are a number of mechanisms by which identified receptors may come into contact with contaminated sources, including the following:

- Incidental dermal contact or ingestion of impacted soils;
- Generation of impacted dusts, aerosols or sediments from impacted soils;
- Inadvertent use of contaminated groundwater; and
- Surface runoff and stormwater drainage system.

6.4 POTENTIAL SURROUNDING RECEPTORS

The potential human receptors are as follow:

- Construction workers during construction being exposed to contaminated soils;
- Community members living within vicinity of the site;
- Visitors to the site; and
- Future occupants of the developed site.

7 QUALITY ASSURANCE & QUALITY CONTROL PLAN

7.1 DATA QUALITY OBJECTIVES

The purpose of establishing data quality objectives (DQOs) is to ensure the field investigations and analyses are undertaken in a way that enables the collection and reporting of reliable data on which to base the site validation. The DQOs and the procedures designed to achieve these objectives are listed below.

Table 12 – Data Quality Objectives

Process	Response
Step 1. Define the problem	Contamination status of the site is unknown, and is required to determine the suitability of the site for the proposed change of landuse and subdivision
Step 2. Identify the goal of the study.	The objective of sampling was to determine if contamination exists, and if present determine the extent of the contamination and assess the suitability of the site for the intended subdivision
Step 3. Identify information inputs	Data inputs for the project: Findings from desktop review. Results of soil analysis to be gained by the assessment process. Visual inspection to determine the depth of fill material.
Step 4. Define the boundaries of the Study	The area of the investigation is the portion of the lot proposed for rezoning (see Figure 2). The vertical boundary of the assessment is the maximum depth of the boreholes The sample medium comprises of soil within each of the boreholes.
Step 5. Develop the analytical approach	A review of the previous site usage and site history review to identify the main contaminants of potential concern (see Section 2). Concentrations of potential contaminants will be compared to criteria set in Section 4.3 to assess the potential impact to soil and to assess the waste disposal requirements.
Step 6. Specify performance or acceptance criteria.	The guidelines, as listed in Section 4, to assess the contamination status of the soils within the area of investigation. That being Residential A – with garden/accessible soil (home grown produce contributing less than 10% of vegetable and fruit intake; no poultry) this category includes children's day-care centres, preschools and primary schools
Step 7. Develop the Plan for obtaining data	Samples will be collected as per Section 5. A qualified environmental consultant undertook sampling with the rationale behind the selection of sample locations is provided in Table 12 and Table 13. Quality Assurance (QA) procedures was used as described in Section **Error! Reference source not found.** and Quality Control (QC) samples collected to allow evaluation of DQI.

7.2 DATA QUALITY INDICATORS AND DATA EVALUATION

SESL has selected the following Data Quality Indicators (DQIs) to ensure that the data obtained from the assessment is of sufficient quality to be used to draw reliable and representative conclusions in an assessment of the environmental conditions of the investigation area.

Documentation and Data Completeness

The completeness of data is defined as the percentage of analytical results that are considered valid. Valid chemical data values that have been identified as acceptable or acceptable as qualified during the data validation process. The completeness is a comparison of the total number of samples accepted against the total number of samples, calculated as a percentage. The project goal for completeness is greater than 90%. QA/QC for completeness includes the following:

- All critical locations sampled;
- All required samples collected (i.e. surface and in depth samples);
- Sampling team are well informed, qualified and experienced;
- Correct and complete documentation;
- Appropriate analysis methods and PQLs;
- Compliance of sample holding times; and
- All data entries in the database are correct, properly entered, checked and that any typographical errors in the database are corrected and the data re-entered properly.

Data Comparability

Comparability expresses the confidence that the data may be considered to be equivalent for each sampling and analytical event and deemed suitable for comparison. In order to assess comparability, field procedures, laboratory sample preparation procedures, analytical procedures and reporting units must be known and similar to establish protocols (Standard Operating Procedures). Qualitatively, data subject to strict QA/QC procedures will be deemed more reliable, therefore more comparable, than other data.

Data Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of parameter variations at sample points or environmental conditions and obtaining suitable samples from these sites.

Sample selection and analysis will be conducted in order to meet the specific objectives of the particular phase of work. Analysis for the contaminants of concern will be selectively conducted based on the identified contaminants of concern, and the field observations.

Precision and Accuracy for Sampling and Analysis

Precision and accuracy for sampling and analysis expresses the quantitative measure of the variability and closeness of the data. This DQI is crucial to provide information to data users of the reliability, unreliability or qualitative value of the data representing each analyte in each environmental matrix. QA/QC includes:

- Correct and appropriate Standard Operating Procedures applied and complied with;
- Assessment of RPDs are satisfactory; and
- Independent review of QA/QC data satisfactory.

7.3 FIELD AND LABORATORY QUALITY ASSURANCE PROGRAM

Quality Assurance (QA) and Quality Control (QC) practices were applied to all stages of data gathering and subsequent sample handling procedures. These are designed to provide control over both field and laboratory operations. Additionally, the analytical laboratories will complete their own internal QA procedures during the analysis of samples. Details of the QA/QC program are described below.

Quality Assurance

All fieldwork followed the SESL procedure to ensure that all environmental samples were collected by a set of uniform and systematic methods as required by the QA system.

The SESL field procedure describe the following:

- Decontamination procedures;
- Sample identification procedures;
- Information requirements for soil bore logs;
- Chain of custody information requirements;
- Sample duplicate frequency; and
- Field calibration requirements (if necessary).

Quality Control Results

The results of the field and laboratory quality control samples were assessed to determine:

- The quality of the data generated;
- whether the data meets the objectives of the study; and
- whether data is acceptable for the intended use.

Field QC

Four (4) field duplicate samples were collected during the sampling works conducted at the site. These duplicates were soil samples, and were labelled QAQC1-4, with no reference to its corresponding sample marked on the sampling containers.

Laboratory Quality Control

The following data quality indicators will be used for the investigation:

- All samples were analysed by NATA accredited methods in accordance with ANZECC (1996) and NEPC (1999) guidelines;
- Maximum acceptable sample holding times was 30 days;
- Samples were appropriately handled;
- Laboratory method blank analyses were required to be below the limits of reporting PQL;
- All compound concentrations were (if required) spiked at similar concentration to sample results;
- All PQLs must be less than the assessment criteria;
- The relative percent difference of duplicates was determined and compared to the following criteria for acceptability. The acceptance criteria are:
    i. Less than 30% for field duplicates. Where concentrations were less than 5 times the LOR, RPDs were not calculated;
    ii. Less than 30% for inter laboratory duplicates;
    iii. No limit for laboratory duplicates where the detection is less than 10 times the PQL; and
    iv. Less than 50% for laboratory duplicates where the detection is between 10 and 20 times the PQL.
    v. Less than 20% for laboratory duplicates where the detection limit is greater than 20 times the PQL.
- RPDs for control spike duplicates to be compared to an acceptable limit of 25%;
- RPDs for Matrix Spike Duplicates to be compared to an acceptable limit of 25%; and
- Percent recoveries of control spikes and matrix spikes to be compared to an acceptable range of 70-130%. In addition, percent recoveries of surrogates were also compared to the USEPA surrogate recovery limits.

All laboratory analysis was conducted at NATA accredited laboratory under chain of custody procedures. Analysis was conducted through ALS Environmental Division Newcastle located in Mayfield West, NSW (NATA #825).

Spike recovery analysis was conducted for each group of contaminants to determine the suitability and accuracy of the results obtained.

Laboratory Blanks

Laboratory or control blanks consist of reagents specific to each individual method and are prepared and analysed by laboratories in the same manner as regular samples. The preparation and analysis of laboratory blanks enable the measurement of contamination within the laboratory.

Ideally, no contamination should be present in blanks. However, in the event that contamination is detected, the following actions are taken:

- The organic test results are not to be corrected by subtracting any blank value;
- If any analyte is found in blank but not a sample, no action is taken;
- No absolute results are reported unless the analyte concentration within a sample exceeds 10 times the amount in any blank for common contaminates, or five times the amount for any other analyte; and

Professional judgment is used where little or not contamination is present in the associated blanks, but contamination is suspected in actual samples.

Laboratory Duplicates

Laboratory duplicate samples are prepared in the laboratory by splitting a field sample and analysing it as two independent samples. The analysis of laboratory duplicate samples provides an indication of analytical precision and may be influenced by sample heterogeneity. The laboratory duplicate RPDs are used to assess the laboratory precision.

7.4 QAQC Results

QAQC procedures conducted as part of the PSI included standard laboratory procedures.

Field Duplicate Samples

Field duplicate samples (blind field replicate samples submitted to the laboratory to provide a check of the precision (repeatability) of laboratory analysis) were submitted to the laboratory for analysis.

Data for primary and duplicate samples was collated and reported as a RPD of the concentration of both samples. See Analytical Table 2 for RPD results.

The results of field duplicate samples and performance against DQIs is outlined in Table 13.

Table 13 – Summary of Soil Vapour RPDs

Summary of Vapour Quality Sample Results			
Total RPDs	336	actual	
Total RPD > 30%	4	1.19%	min. target
Total RPD <= 30%	332	98.81%	=>95%
Total Primary	42	actual	min. target
Total Field Duplicates	4	9.5%	5.0%

7.5 LABORATORY QAQC

Laboratory QA/QC for soil vapour analysis comprised chain-of-custody documentation, sample integrity and holding times, sample temperatures on receipt, use of acceptable NATA-registered laboratory methods and laboratory QA/QC results.

ALS has provided a QA/QC report of laboratory control samples performance, and other quality performance records provided with laboratory certificates in Appendix D.

Table 14 – Laboratory QAQC Performance

Lab	Report #	Quality Control Samples	Holding Times	Frequency of Quality Control Samples	Comments
ALS	EN1717363 & 1717267	No outliers.	No outliers.	No outliers.	The performance of laboratory QAQC samples is considered acceptable.

7.6 STATEMENT ON DATA QUALITY

Overall, the data quality objectives were met during the investigation, as demonstrated throughout the report. Documentation was maintained and complete, sufficient data was collected to characterise the site in accordance with statutory requirements, the data have been shown to be of sufficient quality to provide confidence that the data is representative of site conditions, and precision and accuracy has been demonstrated in the field and laboratory QA/QC programs. No field blanks or spikes were collected during the investigation. A review of results, and the semi to non-volatile nature of the primary contaminants of concern resulted in this not being considered a concern with the reliability of data.

The overall data quality performance against DQOs indicates the analytical data is considered to be representative of site conditions at the time the investigation, and suitable to enable valid assessment of the site.

7.7 REPORTING

On completion of this investigation, the SESL Environmental Scientists have prepared this report summarising the works performed and assessed the results and findings in order to demonstrate compliance with the objectives of the DSI.

Based on the identified contaminants of concern and field observations and screening, soil samples were submitted for analysis.

Error! Reference source not found. provides a summary of the sampling regime for the DSI.

Table 15 – Summary of Sample Analysis

Sample Type and Analysis	Number of Samples	Number of Duplicate Samples
Heavy metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg)	42	4
Polycyclic Aromatic Hydrocarbons (PAH)	42	4
Benzene, Toluene, Ethylbenzene & Xylene (BTEX)	42	4
Total Recoverable Hydrocarbons (TPH)	42	4
Organochlorine Pesticides (OCP)	42	4
Organophosphorus Pesticides (OPP)	42	4
Polychlorinated Biphenyls (PCB)	42	4

8 SUMMARY OF RESULTS

8.1 SITE STRATIGRAPHIC CONDITIONS

The site is a golf course with associated infrastructure, including a club house, carparks, tennis courts and bowling greens. This DSI was limited to investigating the northern area encompassed by bowling greens and tennis courts.

Field observations made throughout the investigation process identified the presence of deep filling of variable depth across the investigation area site. Fill material was encountered at all sampling locations to a maximum depth of 3.0m. Beneath fill, natural light brown silty shale was observed. No investigations were conducted beyond the depth of natural materials.

8.2 SOIL ANALYTICAL RESULTS SUMMARY

A total of forty-two (42) samples were collected and analysed as part of this Detailed Site Investigation. All samples were analysed for contaminants of potential concern (CoPC) outlined in Section 6 of this report.

The laboratory analysis of soil samples collected as part of this investigation indicated that contaminants of concern were were below adopted Health Investigation Levels Residential A (HIL-A) and Health Screening Levels A (HSL-A). Therefore, the site area investigated as part of this investigation is considered suitable for the proposed re-zoning and residential landuse.

A summary of results compared to the assessment criteria can be seen in Analytical Table 1, accompanied by complete NATA laboratory certificates, chain of custody (CoC) documentation and sample receipt advice (Appendix D).

8.3 QA/QC RESULTS

Quality assurance / quality control (QA/QC) procedures conducted within this DSI included standard laboratory QA/QC procedures (see Section 7: Quality Assurance & Quality Control Plan). All laboratory replicate samples were found to be within acceptable levels.

One field QAQC sample was taken for every ten (10) samples collected. In total, 4 soil duplicate samples were collected during the DSI. The results of the QA/QC samples found that most analytes were within the acceptable Relative Percent Difference (RPD) range of 30%. 98.81% of RPD comparisons were within the acceptable range, meeting the minimum target of 95%. For RPD comparisons that were outside the acceptable range (>30%), all analyte concentrations were observed to be below the adopted thresholds, indicating that there is very low risk of consequential error. As the samples consist of heterogeneous fill material, variation is expected even within a single sample. Due to the low results and sample heterogeneity, no ongoing issue related to QAQC has been identified.

Based on the QA/QC results, the data is considered suitable for use in assessing the site. Results of QA/QC analysis can be seen in the NATA test certificates in Analytical Table 2.

8.4 CALCULATION OF 95% UPPER CONFIDENCE LIMIT (UCL)

The 95% UCL demonstrates with 95% confidence that the average contaminant concentration of the soil represented by the data set is at or below the concentration stated.

EPA recommends a minimum of ten samples for 95% UCL calculation. For large soil volumes (i.e. >2,500m^3) the minimum sampling rate should not be less than 1 sample per 250m^3.

In accordance with Procedure D of the *NSW EPA Sampling Design Guidelines (1995)* each domain or stockpile should be categorized separately. Non-detect samples need to be included in calculations of 95% UCL. Non-detect values are substituted with a value of half of the detection limit of the laboratory apparatus.

The 95% UCL can be calculated using the following formula:

$$\text{UCL average} = X + t_{\alpha,\, n-1}\,(s/\sqrt{n})$$

Where:

UCL	upper confidence limit of the arithmetic average concentration of the sampling are at the 1-α confidence level
X	arithmetic average of all samples
$t_{\alpha,\, n-1}$	A test statistic (student's t at an α level of significance and n-1 degrees of freedom)
s	standard deviation of the sample measurements
n	number of sample measurements
α	the probability that the 'true' average concentration of the sampling area might exceed the UCL average determined by the above equation

UCL calculations were not undertaken as part of this DSI, as all analytes were below the adopted thresholds within all samples, indicating that there is no risk of average contamination concentrations exceeding the adopted thresholds.

9 CONCLUSION

9.1 SITE CHARACTERISATION

The subject site is the Killara Golf Club located at 556 Pacific Highway, Killara 2071 and is defined as Lot 2 DP 535219. The investigation area for this DSI is approximately 12,000 m^2. The site currently operates as a golf club with other recreational activities including tennis courts and bowling greens. The site has been historically cut and filled to varying depths across the site, predominately beneath the carparks, bowling greens and tennis courts.

Based on the site history review and the review of aerial photographs, it appears that the Site has historically been used as a golf course and has been filled to achieve the current landscape. This fill is of unknown origin. Onsite activities involved in course maintenance include pesticide and herbicide use. A service station adjacent to the site has historically had groundwater contamination issues. The investigation area has been limited to the area to be rezoned for residential.

Two (2) Detailed Site Investigations (DSIs) have been undertaken at SESL, required to investigate the contamination status of the site in regard to the proposed re-zoning and residential landuse. The site works for the initial DSI were undertaken by SESL environmental scientists in February and March 2016. These works were limited to investigating the areas of observed filling below the carpark and clubhouse in the north eastern area of the site.

The additional DSI (detailed in this report) were conducted following comments from Ku-Ring-Gai Council requesting that the 'study investigates the entire Deferred Area 15 site'. The works for the additional DSI were conducted by SESL environmental scientists in July 2017. These works were limited to assessing the area of the proposed re-zoning that were not investigated as part of the initial DSI. This included the observed fill soils in northern area of the site encompassed by the bowling greens and tennis courts.

Soil sampling procedures were devised to addressed variations in fill material within the investigation area. Sampling was undertaken on a judgmental basis based on topography and observed fill, and included near surface and subsurface sampling till natural materials were encountered. A total of twenty-four (24) sampling locations were investigated across both DSIs, with fourteen (14) locations assessed during the initial DIS, and a further ten (10) samples assessed during the additional DSI.

Groundwater well installation and sampling was undertaken as part of the initial DSI. These wells were installed judgmentally to characterise groundwater across the site and observe any influence from potential upstream contaminant sources.

Elevations above the adopted threshold (HIL - Residential A) were observed at a two (2) locations of the site (during the initial DSI) indicating a potential hotspot.

9.2 SUMMARY

The objective of the DSI reports was to determine the presence and/or extent of potential soil and groundwater contamination prior to the rezoning of the property located at 556 Pacific Highway, Killara NSW. SESL environmental scientists undertook the site works and soil sampling in February and March, 2016 (initial DSI) and July 2017 (additional DSI).

A total of twenty-four (24) boreholes were judgementally sampled across the site, over the two investigation carried out by SESL. Soil samples were collected throughout the soil profiles, with samples taken at varying intervals till natural materials were encountered. The laboratory results were compared against the Health Investigation Levels (HIL-A) and Health Screening Levels (HSL-A) for all samples collected as part of the site investigations.

Initial DSI

Carcinogenic PAH's were found to be elevated above the adopted threshold at (2) locations. Asbestos was identified at one location on site (BH 1), with fibre concentrations below the threshold value (HSL-A). A number of soil samples beneath the carpark had elevated concentrations of Polycyclic Aromatic Hydrocarbons, but were below the threshold value (HIL-A). One groundwater well had elevated Total Recoverable Hydrocarbon concentrations (MW2), but was below the threshold value, while another bore had elevated volatile concentrations (MW1).

The results of the soil sampling undertaken at the Site indicated that some contaminants of concern were found to exceed the adopted HIL A – Residential threshold. SESL believes that, based on laboratory analysis and site observations, the fill in the region of BH 1 and BH 16 may be an isolated area of contamination. Additionally, elevated PAH concentrations were identified 0.5m below the surface across all carpark locations. Following UCL calculations, is has been determined that the soils do not exceed the adopted threshold (HIL-A), and therefore no action is required.

TRH concentrations in the MW2 (located in the visitor's carpark) were observed to be elevated based on laboratory analysis. SESL suspects that this is a results of offsite groundwater contamination associated with the upstream maintenance workshop. Additionally, elevated PID readings were observed in the well headspace within MW1 (located in the maintenance carpark). Subsequent analytical results confirmed contaminants of concern concentrations within groundwater were within the adopted threshold. SESL suspects that elevated vapour moisture may be the cause of the elevated PID readings observed on site.

Additional DSI

The laboratory analysis of soil samples collected as part of this investigation indicated that contaminants of concern were were below adopted Health Investigation Levels Residential A (HIL-A) and Health Screening

Levels A (HSL-A). No additional hotspots of contamination were observed in the laboratory results for this investigation.

Conclusion

Based on the findings of these site investigations, SESL concludes that some minor soil contamination exists (two borehole locations) within fill materials present at the site. These materials were investigated during the initial DSI, conducted by SESL in February and March, 2016. The fill materials assessed as part of the additional DSI were found to be free from elevated contaminants of concern.

Prior to development for residential purposes being undertaken, a remedial action plan must be developed for the minor hotspot in the south eastern corner of the visitor's carpark, including appropriate validation processes to ensure that at completion of the remediation program that the site is suitable for rezoning. It is possible this remediation can be conducted during future development of the rezoned area, and SESL do not consider it necessary to have remediation completed prior to rezoning.

10 LIMITATIONS

This report only covers the site conditions at the time of inspection (11 July 2017). Should there be any variation in the site conditions beyond this date, such as imported fill, chemical spillage, illegal dumping, further assessment will be required.

This report is for the use of the Client and any relevant authorities that rely on the information for development applications and approval processes. Any reliance on this report by third parties shall be at such parties' sole risk. This report shall only be presented in full and may not be used to support any other objective other than those set out in the report.

SESL's assessment is necessarily based on the result of limited site investigations and upon the restricted program of visual assessment of the surface and consultation of available records. Neither SESL, nor any other reputable consultant, can provide unqualified warranties nor does SESL assume any liabilities for site conditions not observed, or accessible during the time of investigations.

No site investigations can be thorough enough to provide absolute confirmation of the presence or absence of substances, which may be considered contaminating, hazardous or polluting. Similarly, the level of testing undertaken cannot be considered to unequivocally characterise the degree or extent of contamination on site. In addition, regulatory or guideline criteria for the evaluation of environmental soil and groundwater quality are frequently being reviewed and concentrations of contaminants which are considered acceptable at present may in the future be considered to exceed acceptance criteria. Similar conditions may prevail in regard to site remediation standards as different regulatory mechanisms are developed and implemented.

11 REFERENCES

ANZECC (1996) *Guidelines for the Laboratory Analysis of Contaminated Soils* – Australian and New Zealand Environment and Conservation Council

Australian Standard AS1726:1994 *Geotechnical Site Investigations*

Australian Standards AS4482.1:2005 *Guide to the Sampling and Investigation of Potentially Contaminated Soil (Part 1 & 2)* enHealth 2012, Australian exposure factor guidance. Environmental Health Subcommittee (enHealth) of the Australian Health Protection Principal Committee, Canberra, Australia.

Hazelton, P.A, Bannerman, S. M. and Tille, P. J. (1989), *Soil Series Sheet 9030 – Penrith.* Soil Conservation Service of NSW, Sydney

National Environmental Protection (Assessment of Site Contamination) Measures, NEPC 1999;

National Environmental Protection (Assessment of Site Contamination) Amendment Measures, NEPC 2013;

NSW DEC (2006) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme

NSW EPA (2014) Technical Note: Investigation for Service Station Sites

NSW EPA (2014) Waste Classification Guidelines Part 1: Classifying Waste

NSW EPA (1994) *Guidelines for Assessing Service Station Sites*

NSW EPA (1995) *Contaminated Sites: Sampling Design Guidelines*

NSW EPA (1999) *Contaminated Sites: Guidelines of Significant Risk of Harm from Contaminated Land and the Duty to Report*

Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014;

NSW OEH (2011) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites

Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014;

Soil Series No. 1, 2nd Edition, 1998 and 3rd Edition, (1999) Health-Based Soil Investigation Levels, National Environmental Health Forum monographs

WA DoH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009)

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Figure 1

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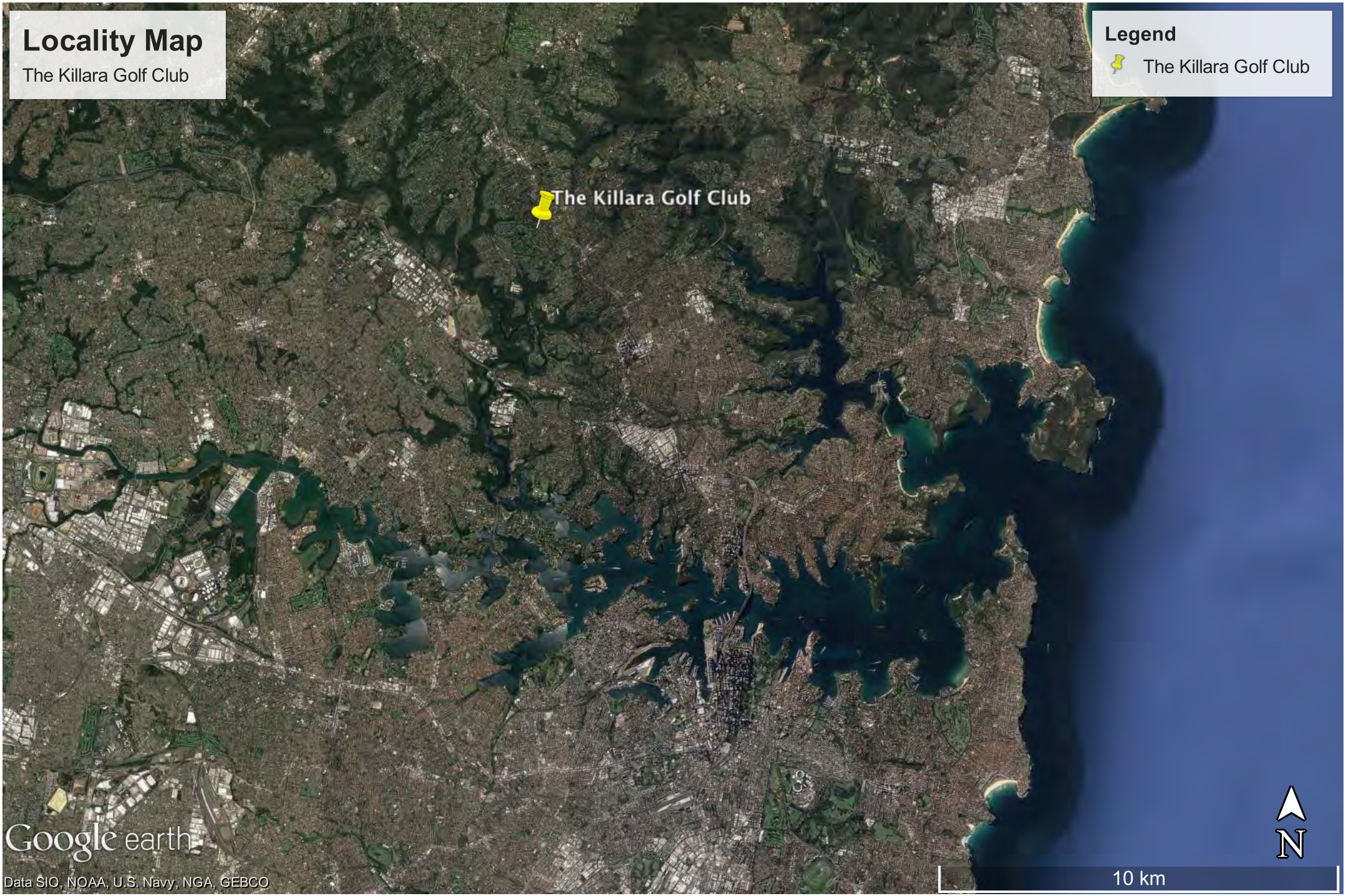
Locality Map
The Killara Golf Club
Legend
The Killara Golf Club
The Killara Golf Club
Google earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
N
10 km

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Figure 2

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Title: Sampling Location Map
Location: The Killara Golf Club
Project: Killara Golf Club DSI
Date: 11/07/2017

Legend
Borehole Locations

Note: Approximate locations only

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Analytical Table 1

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Table A1 Soil Analytical Results Summary

		NA	BTEX							Halogenated Benzenes	Lead	Metals					
		Moisture Content	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	Hexachlorobenzene	Lead	Arsenic	Cadmium	Chromium (III+VI)	Chromium VI	Copper	Mercury
		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		1	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	2	5	0.1
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Clay																	
0-1m			0.7	480				110									
1-2m			1					310									
2-4m			2														
>4m			3														
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space												100					
NEPM 2013 Table 1A(1) HILs Res A Soil										10	300	100	20		500	6,000	40
Field ID	**Date**																
BH Surface	**11/07/2017**	11.0	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	37	<5	<1	8	<8	15	<0.1
BH1 500	**11/07/2017**	17.0	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	29	30	<1	24	<24	19	0.6
BH1 1200	**11/07/2017**	10.4	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	18	8	<1	10	<10	28	<0.1
BH1 2000	**11/07/2017**	16.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	26	10	<1	12	<12	25	<0.1
BH1 2200	**11/07/2017**	19.0	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	19	6	<1	11	<11	12	<0.1
BH2 Suface	**11/07/2017**	8.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	<5	<5	<1	5	<5	<5	2.1
BH2 300	**11/07/2017**	8.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	<5	<5	<1	<2	<2	<5	<0.1
BH2 500	**11/07/2017**	9.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	10	8	<1	7	<7	26	0.3
BH2 700	**11/07/2017**	5.1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	17	10	<1	9	<9	48	0.1
BH2 1000	**11/07/2017**	17.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	20	12	<1	13	<13	34	<0.1
BH3 Surface	**11/07/2017**	14.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	<5	<5	<1	7	<7	6	0.5
BH3 300	**11/07/2017**	7.0	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	<5	<5	<1	<2	<2	<5	<0.1
BH3 600	**11/07/2017**	18.0	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	44	6	<1	7	<7	35	<0.1
BH3 700	**11/07/2017**	18.8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	11	<5	<1	7	<7	7	<0.1
BH4 Surface	**11/07/2017**	7.3	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	6	7	<1	8	<8	<5	2.9
BH4 1000	**11/07/2017**	12.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	20	9	<1	9	<9	30	<0.1
BH4 2000	**11/07/2017**	20.0	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	17	7	<1	12	<12	22	<0.1
BH4 2300	**11/07/2017**	21.8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	121	6	<1	10	<10	12	<0.1
BH4 3000	**11/07/2017**	23.3	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	22	10	<1	20	<20	17	<0.1
BH5 Surface	**11/07/2017**	10.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	6	<5	<1	4	<4	<5	<0.1
BH5 400	**11/07/2017**	15.3	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	20	9	<1	8	<8	11	0.2
BH5 1000	**11/07/2017**	11.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	17	8	<1	9	<9	40	<0.1
BH5 1600	**11/07/2017**	22.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	21	14	<1	9	<9	30	<0.1
BH5 2200	**11/07/2017**	20.7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	18	7	<1	16	<16	15	<0.1
BH6 Surface	**11/07/2017**	7.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	<5	<5	<1	2	<2	<5	<0.1
BH6 500	**11/07/2017**	22.3	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	28	<5	<1	16	<16	<5	<0.1
BH6 1000	**11/07/2017**	16.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	14	12	<1	7	<7	24	<0.1
BH6 1200	**11/07/2017**	22.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	18	6	<1	19	<19	6	<0.1
BH7 Surface	**11/07/2017**	32.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	79	18	<1	16	<16	16	2.8
BH7 500	**11/07/2017**	19.8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	32	10	<1	25	<25	10	<0.1
BH7 900	**11/07/2017**	21.4	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	15	6	<1	17	<17	6	<0.1
BH8 Surface	**11/07/2017**	12.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	21	<5	<1	8	<8	8	<0.1
BH8 500	**11/07/2017**	14.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	24	18	<1	15	<15	6	0.2
BH8 1000	**11/07/2017**	15.9	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	44	13	<1	28	<28	12	<0.1
BH8 1200	**11/07/2017**	23.8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	25	11	<1	22	<22	10	<0.1
BH9 Surface	**11/07/2017**	13.8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	36	10	<1	19	<19	18	0.3
BH9 400	**11/07/2017**	17.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	29	8	<1	28	<28	8	0.1
BH9 600	**11/07/2017**	11.6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	38	8	<1	21	<21	24	<0.1
BH10 Surface	**11/07/2017**	20.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	48	28	<1	22	<22	13	1.0
BH10 500	**11/07/2017**	21.1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	50	11	<1	19	<19	12	0.3
BH10 1000	**11/07/2017**	21.7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	27	14	<1	19	<19	8	0.1
BH10 1500	**11/07/2017**	23.4	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	23	11	<1	26	<126	10	<0.1

Table A1 Soil Analytical Results Summary

		Metals		Organochlorine Pesticides															
		Nickel	Zinc	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Clay																		
0-1m																		
1-2m																		
2-4m																		
>4m																		
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space														180				
NEPM 2013 Table 1A(1) HILs Res A Soil		400	7,400				6		50						240		270	
Field ID	**Date**																	
BH Surface	**11/07/2017**	6	77	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH1 500	**11/07/2017**	18	43	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH1 1200	**11/07/2017**	6	30	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH1 2000	**11/07/2017**	2	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH1 2200	**11/07/2017**	4	24	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH2 Suface	**11/07/2017**	<2	10	<0.05	<0.05	<0.05	0.08	<0.05	0.15	0.07	0.08	<0.05	<0.05	<0.2	<0.05	0.08	<0.05	<0.05
BH2 300	**11/07/2017**	<2	13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH2 500	**11/07/2017**	7	43	<0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	0.08	<0.05	<0.05
BH2 700	**11/07/2017**	12	66	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH2 1000	**11/07/2017**	6	48	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH3 Surface	**11/07/2017**	3	23	<0.05	<0.05	<0.05	0.07	<0.05	0.13	0.06	0.07	<0.05	<0.05	<0.2	<0.05	0.07	<0.05	<0.05
BH3 300	**11/07/2017**	<2	5	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	0.07	<0.05	<0.05
BH3 600	**11/07/2017**	3	20	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH3 700	**11/07/2017**	10	54	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH4 Surface	**11/07/2017**	2	16	<0.05	<0.05	<0.05	0.22	<0.05	0.84	0.39	0.45	<0.05	<0.05	<0.2	<0.05	0.22	<0.05	<0.05
BH4 1000	**11/07/2017**	6	43	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH4 2000	**11/07/2017**	3	16	<0.05	<0.05	<0.05	0.10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	0.10	<0.05	<0.05
BH4 2300	**11/07/2017**	5	24	<0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	0.08	<0.05	<0.05
BH4 3000	**11/07/2017**	4	13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH5 Surface	**11/07/2017**	<2	13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH5 400	**11/07/2017**	3	34	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH5 1000	**11/07/2017**	13	95	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH5 1600	**11/07/2017**	<2	16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH5 2200	**11/07/2017**	5	14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH6 Surface	**11/07/2017**	<2	<5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH6 500	**11/07/2017**	<2	7	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH6 1000	**11/07/2017**	<2	<5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH6 1200	**11/07/2017**	3	6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH7 Surface	**11/07/2017**	5	90	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH7 500	**11/07/2017**	4	38	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH7 900	**11/07/2017**	4	<5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH8 Surface	**11/07/2017**	2	60	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH8 500	**11/07/2017**	2	22	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH8 1000	**11/07/2017**	9	24	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH8 1200	**11/07/2017**	4	9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH9 Surface	**11/07/2017**	4	35	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH9 400	**11/07/2017**	5	29	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH9 600	**11/07/2017**	2	30	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH10 Surface	**11/07/2017**	9	69	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH10 500	**11/07/2017**	4	38	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH10 1000	**11/07/2017**	7	17	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05
BH10 1500	**11/07/2017**	10	16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05

Table A1 Soil Analytical Results Summary

		Organochlorine Pesticides									Organophosphorous Pesticides							
		Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon	Dichlorvos
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Clay																		
0-1m																		
1-2m																		
2-4m																		
>4m																		
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space																		
NEPM 2013 Table 1A(1) HILs Res A Soil				10				6		300					160			
Field ID	**Date**																	
BH Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH1 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH1 1200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH1 2000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH1 2200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH2 Suface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH2 300	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH2 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH2 700	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH2 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH3 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH3 300	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH3 600	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH3 700	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH4 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH4 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH4 2000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH4 2300	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH4 3000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH5 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH5 400	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH5 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH5 1600	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH5 2200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH6 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH6 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH6 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH6 1200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH7 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH7 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH7 900	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH8 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH8 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH8 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH8 1200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH9 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH9 400	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH9 600	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH10 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH10 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH10 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH10 1500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Table A1 Soil Analytical Results Summary

		Organophosphorous Pesticides							PAH									
		Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Clay																		
0-1m																		
1-2m																		
2-4m																		
>4m																		
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space																		
NEPM 2013 Table 1A(1) HILs Res A Soil																		
Field ID	**Date**																	
BH Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH1 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH1 1200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH1 2000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH1 2200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH2 Suface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH2 300	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH2 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH2 700	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH2 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH3 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH3 300	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH3 600	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH3 700	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH4 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH4 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH4 2000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH4 2300	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH4 3000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH5 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH5 400	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH5 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH5 1600	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH5 2200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH6 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH6 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH6 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH6 1200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH7 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH7 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH7 900	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH8 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH8 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH8 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH8 1200	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH9 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH9 400	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH9 600	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH10 Surface	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH10 500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH10 1000	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH10 1500	**11/07/2017**	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table A1 Soil Analytical Results Summary

		PAH							Pesticides				Polychlorinated Biphenyls	TPH				
		Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Vic EPA List)	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl	PCBs (Sum of total)	C6-C9	C10-C14	C15-C28	C29-C36	C6-C10
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Clay																		
0-1m					5													
1-2m																		
2-4m																		
>4m																		
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space					170													
NEPM 2013 Table 1A(1) HILs Res A Soil								300					1					
Field ID	**Date**																	
BH Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH1 500	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH1 1200	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH1 2000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH1 2200	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH2 Suface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH2 300	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH2 500	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH2 700	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH2 1000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH3 Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH3 300	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH3 600	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH3 700	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH4 Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH4 1000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH4 2000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH4 2300	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH4 3000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH5 Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH5 400	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH5 1000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH5 1600	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH5 2200	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH6 Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH6 500	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH6 1000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH6 1200	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH7 Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH7 500	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH7 900	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH8 Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH8 500	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH8 1000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH8 1200	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH9 Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH9 400	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH9 600	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH10 Surface	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH10 500	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH10 1000	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10
BH10 1500	**11/07/2017**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10

Table A1 Soil Analytical Results Summary

		TPH						
		C10-C16	C16-C34	+C10-C36 (Sum of total)	C10-C40 (Sum of total)	C34-C40	F1 minus BTEX	F2 minus Naphthalene
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		50	100	50	50	100	10	50
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Clay								
0-1m							50	280
1-2m							90	
2-4m							150	
>4m							290	
NEPM 2013 Table 1B(5) Generic EIL - Urban Res & Public Open Space								
NEPM 2013 Table 1A(1) HILs Res A Soil								
Field ID	**Date**							
BH Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH1 500	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH1 1200	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH1 2000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH1 2200	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH2 Suface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH2 300	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH2 500	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH2 700	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH2 1000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH3 Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH3 300	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH3 600	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH3 700	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH4 Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH4 1000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH4 2000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH4 2300	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH4 3000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH5 Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH5 400	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH5 1000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH5 1600	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH5 2200	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH6 Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH6 500	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH6 1000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH6 1200	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH7 Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH7 500	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH7 900	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH8 Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH8 500	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH8 1000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH8 1200	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH9 Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH9 400	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH9 600	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH10 Surface	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH10 500	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH10 1000	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50
BH10 1500	**11/07/2017**	<50	<100	<50	<50	<100	<10	<50

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Analytical Table 2

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Table A2 QAQA

					BTEX							Halogenated Benzenes	Lead	Metals							Organochlorine Pesticides						
					Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	Hexachlorobenzene	Lead	Arsenic	Cadmium	Chromium (III+VI)	Copper	Mercury	Nickel	Zinc	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	chlordane	Chlordane (cis)
Lab Report Number	Lab Name	Field ID	Matrix	Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L													
				LOR ALS	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
				LOR ALS	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ES1711924	ALS	BH2 Surface	Soil	11/07/2017	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	<5	<5	<1	5	<5	2.1	<2	10	<0.05	<0.05	<0.05	0.08	<0.05	0.15	0.07
ES1711924	ALS	QAQC1	Soil	11/07/2017	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	6	<5	<1	6	<5	1.7	2	11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*1.2*	*0.5*	*0.5*	*3*	*0.5*	*21*	*1*	*2.2*	*0.5*	*0.5*	*0.5*	*1.6*	*0.5*	*3*	*1.4*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**<5xLOR**	**0.00%**	**0.00%**	**<5xLOR**	**0.00%**	**21.05%**	**<5xLOR**	**<5xLOR**	**0.00%**	**0.00%**	**0.00%**	**<5xLOR**	**0.00%**	**<5xLOR**	**<5xLOR**

					BTEX							Halogenated Benzenes	Lead	Metals							Organochlorine Pesticides						
					Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	Hexachlorobenzene	Lead	Arsenic	Cadmium	Chromium (III+VI)	Copper	Mercury	Nickel	Zinc	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	chlordane	Chlordane (cis)
Lab Report Number	Lab Name	Field ID	Matrix	Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L													
				LOR ALS	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
				LOR ALS	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ES1711924	ALS	BH5 Surface	Soil	11/07/2017	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	6	<5	<1	4	<5	<0.1	<2	13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ES1711924	ALS	QAQC2	Soil	11/07/2017	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	<5	<5	<1	4	<5	0.3	<2	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*1.2*	*0.5*	*0.5*	*2*	*0.5*	*3*	*0.5*	*2.6*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**<5xLOR**	**0.00%**	**0.00%**	**<5xLOR**	**0.00%**	**<5xLOR**	**0.00%**	**<5xLOR**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

					BTEX							Halogenated Benzenes	Lead	Metals							Organochlorine Pesticides						
					Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	Hexachlorobenzene	Lead	Arsenic	Cadmium	Chromium (III+VI)	Copper	Mercury	Nickel	Zinc	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	chlordane	Chlordane (cis)
Lab Report Number	Lab Name	Field ID	Matrix	Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L													
				LOR ALS	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
				LOR ALS	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ES1711924	ALS	BH7 Surface	Soil	11/07/2017	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	79	18	<1	16	16	2.8	5	90	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ES1711924	ALS	QAQC3	Soil	11/07/2017	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	105	21	<1	20	24	2.5	6	125	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*21*	*4.2*	*0.5*	*10*	*4.8*	*28*	*3*	*25*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**28.26%**	**<5xLOR**	**0.00%**	**22.22%**	**<5xLOR**	**11.32%**	**<5xLOR**	**32.56%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

					BTEX							Halogenated Benzenes	Lead	Metals							Organochlorine Pesticides						
					Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	Hexachlorobenzene	Lead	Arsenic	Cadmium	Chromium (III+VI)	Copper	Mercury	Nickel	Zinc	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	chlordane	Chlordane (cis)
Lab Report Number	Lab Name	Field ID	Matrix	Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L													
				LOR ALS	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
				LOR ALS	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.05	5	5	1	2	5	0.1	2	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ES1711924	ALS	BH9 Surface	Soil	11/07/2017	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	36	10	<1	19	18	0.3	4	35	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ES1711924	ALS	QAQC4	Soil	11/07/2017	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.05	20	<5	<1	9	10	<0.1	4	97	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*7.2*	*2*	*0.5*	*9.5*	*3.6*	*3*	*2*	*19.4*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**57.14%**	**<5xLOR**	**0.00%**	**71.43%**	**<5xLOR**	**<5xLOR**	**<5xLOR**	**93.94%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Notes:

Where values are less than LOR, 50% of LOR is used for the RPD calculation.
Red shading indicates RPD >30% (where the minimum value is > 5 X the maximum laboratory LOR), or blank sample detected concentrations.
LOR = laboratory limit of reporting.

SUMMARY

Total RPD Comparisons				
Total RPD Comparisons	336			
Total RPD > 30%	4	**min. target**		**Achieved Quality Targets?**
% RPD <= 30%	98.81%	=>95%		**Y**
Total Soil Primary	42			
Total Groundwater Primary	0			
Total Primary	**42**	**min. target**	**actual**	
Total Blind Replicates	4	5.0%	9.5%	**Y**
Total Replicates	4	10.0%	9.5%	**N**

Table A2 QAQA

					Organochlorine Pesticides																Organophosphorous Pesticides						
					Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon
Lab Report Number	**Lab Name**	**Field ID**	**Matrix**	**Date**																								
				LOR ALS	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05
				LOR ALS	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ES1711924	ALS	BH2 Surfrace	Soil	11/07/2017	0.08	<0.05	<0.05	<0.2	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ES1711924	ALS	QAQC1	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
				Largest concentration multiplier of minimum LOR	*1.6*	*0.5*	*0.5*	*0.5*	*0.5*	*1.6*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**<5xLOR**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**<5xLOR**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

					Organochlorine Pesticides																Organophosphorous Pesticides						
					Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon
Lab Report Number	**Lab Name**	**Field ID**	**Matrix**	**Date**																								
				LOR ALS	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05
				LOR ALS	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ES1711924	ALS	BH5 Surface	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ES1711924	ALS	QAQC2	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

					Organochlorine Pesticides																Organophosphorous Pesticides						
					Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon
Lab Report Number	**Lab Name**	**Field ID**	**Matrix**	**Date**																								
				LOR ALS	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05
				LOR ALS	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ES1711924	ALS	BH7 Surface	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ES1711924	ALS	QAQC3	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

					Organochlorine Pesticides																Organophosphorous Pesticides						
					Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon
Lab Report Number	**Lab Name**	**Field ID**	**Matrix**	**Date**																								
				LOR ALS	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05
				LOR ALS	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ES1711924	ALS	BH9 Surface	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ES1711924	ALS	QAQC4	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Notes:

Where values are less than LOR, 50% of LOR is used for the RPD calculati
Red shading indicates RPD >30% (where the minimum value is > 5 X the r
LOR = laboratory limit of reporting.

SUMMARY

Total RPD Comparisons			
Total RPD Comparisons	336		
Total RPD > 30%	4	**min. target**	
% RPD <= 30%	98.81%	=>95%	
Total Soil Primary	42		
Total Groundwater Primary	0		
Total Primary	**42**	**min. target**	**actual**
Total Blind Replicates	4	5.0%	9.5%
Total Replicates	4	10.0%	9.5%

Table A2 QAQA

					Organophosphorous Pesticides								PAH															
					Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Acenaphthene	Acenaphthylene	Anthracene	Benz[a]anthracene	Benzo[a] pyrene	Benzo[b+j]fluoranthene	Benzo[g,h,i]perylene	Benzo[k]fluoranthene	Chrysene	Dibenz[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-c,d]pyrene	Naphthalene	Phenanthrene	Pyrene
Lab Report Number	**Lab Name**	**Field ID**	**Matrix**	**Date**																								
				LOR ALS	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
				LOR ALS	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ES1711924	ALS	BH2 Surfrace	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
ES1711924	ALS	QAQC1	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

					Organophosphorous Pesticides								PAH																	
					Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Acenaphthene	Acenaphthylene	Anthracene	Benz[a]anthracene	Benzo[a] pyrene	Benzo[b+j]fluoranthene	Benzo[g,h,i]perylene	Benzo[k]fluoranthene	Chrysene	Dibenz[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-c,d]pyrene	Naphthalene	Phenanthrene	Pyrene
Lab Report Number	**Lab Name**	**Field ID**	**Matrix**	**Date**																								
				LOR ALS	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
				LOR ALS	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ES1711924	ALS	BH5 Surface	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
ES1711924	ALS	QAQC2	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

					Organophosphorous Pesticides								PAH																	
					Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Acenaphthene	Acenaphthylene	Anthracene	Benz[a]anthracene	Benzo[a] pyrene	Benzo[b+j]fluoranthene	Benzo[g,h,i]perylene	Benzo[k]fluoranthene	Chrysene	Dibenz[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-c,d]pyrene	Naphthalene	Phenanthrene	Pyrene
Lab Report Number	**Lab Name**	**Field ID**	**Matrix**	**Date**																								
				LOR ALS	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
				LOR ALS	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ES1711924	ALS	BH7 Surface	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
ES1711924	ALS	QAQC3	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

					Organophosphorous Pesticides								PAH																	
					Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Acenaphthene	Acenaphthylene	Anthracene	Benz[a]anthracene	Benzo[a] pyrene	Benzo[b+j]fluoranthene	Benzo[g,h,i]perylene	Benzo[k]fluoranthene	Chrysene	Dibenz[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-c,d]pyrene	Naphthalene	Phenanthrene	Pyrene
Lab Report Number	**Lab Name**	**Field ID**	**Matrix**	**Date**																								
				LOR ALS	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
				LOR ALS	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ES1711924	ALS	BH9 Surface	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
ES1711924	ALS	QAQC4	Soil	11/07/2017	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
				Largest concentration multiplier of minimum LOR	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
RPD					**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Notes:

Where values are less than LOR, 50% of LOR is used for the RPD calculati
Red shading indicates RPD >30% (where the minimum value is > 5 X the r
LOR = laboratory limit of reporting.

SUMMARY

Total RPD Comparisons			
Total RPD Comparisons	336		
Total RPD > 30%	4	**min. target**	
% RPD <= 30%	98.81%	=>95%	
Total Soil Primary	42		
Total Groundwater Primary	0		
Total Primary	**42**	**min. target**	**actual**
Total Blind Replicates	4	5.0%	9.5%
Total Replicates	4	10.0%	9.5%

Table A2 QAQA

					PAH	Pesticides				Polychlorinated Biphenyls	TPH											
					PAHs (Vic EPA List)	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl	PCBs (Sum of total)	C6-C9	C10-C14	C15-C28	C29-C36	C6-C10	C10-C16	C16-C34	+C10-C36 (Sum of total)	C10-C40 (Sum of total)	C34-C40	F1 minus BTEX	F2 minus Naphthalene
Lab Report Number	Lab Name	Field ID	Matrix	Date																		
				LOR ALS	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10	50	100	50	50	100	10	50
				LOR ALS	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10	50	100	50	50	100	10	50
ES1711924	ALS	BH2 Surface	Soil	11/07/2017	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10	<50	<100	<50	<50	<100	<10	<50
ES1711924	ALS	QAQC1	Soil	11/07/2017	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10	<50	<100	<50	<50	<100	<10	<50
				Largest concentration multiplier of minimum LOR	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
RPD					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

					PAH	Pesticides				Polychlorinated Biphenyls	TPH											
					PAHs (Vic EPA List)	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl	PCBs (Sum of total)	C6-C9	C10-C14	C15-C28	C29-C36	C6-C10	C10-C16	C16-C34	+C10-C36 (Sum of total)	C10-C40 (Sum of total)	C34-C40	F1 minus BTEX	F2 minus Naphthalene
Lab Report Number	Lab Name	Field ID	Matrix	Date																		
				LOR ALS	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10	50	100	50	50	100	10	50
				LOR ALS	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10	50	100	50	50	100	10	50
ES1711924	ALS	BH5 Surface	Soil	11/07/2017	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10	<50	<100	<50	<50	<100	<10	<50
ES1711924	ALS	QAQC2	Soil	11/07/2017	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10	<50	<100	<50	<50	<100	<10	<50
				Largest concentration multiplier of minimum LOR	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
RPD					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

					PAH	Pesticides				Polychlorinated Biphenyls	TPH											
					PAHs (Vic EPA List)	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl	PCBs (Sum of total)	C6-C9	C10-C14	C15-C28	C29-C36	C6-C10	C10-C16	C16-C34	+C10-C36 (Sum of total)	C10-C40 (Sum of total)	C34-C40	F1 minus BTEX	F2 minus Naphthalene
Lab Report Number	Lab Name	Field ID	Matrix	Date																		
				LOR ALS	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10	50	100	50	50	100	10	50
				LOR ALS	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10	50	100	50	50	100	10	50
ES1711924	ALS	BH7 Surface	Soil	11/07/2017	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10	<50	<100	<50	<50	<100	<10	<50
ES1711924	ALS	QAQC3	Soil	11/07/2017	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10	<50	<100	<50	<50	<100	<10	<50
				Largest concentration multiplier of minimum LOR	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
RPD					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

					PAH	Pesticides				Polychlorinated Biphenyls	TPH											
					PAHs (Vic EPA List)	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl	PCBs (Sum of total)	C6-C9	C10-C14	C15-C28	C29-C36	C6-C10	C10-C16	C16-C34	+C10-C36 (Sum of total)	C10-C40 (Sum of total)	C34-C40	F1 minus BTEX	F2 minus Naphthalene
Lab Report Number	Lab Name	Field ID	Matrix	Date																		
				LOR ALS	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10	50	100	50	50	100	10	50
				LOR ALS	0.5	0.05	0.05	0.2	0.05	0.1	10	50	100	100	10	50	100	50	50	100	10	50
ES1711924	ALS	BH9 Surface	Soil	11/07/2017	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10	<50	<100	<50	<50	<100	<10	<50
ES1711924	ALS	QAQC4	Soil	11/07/2017	<0.5	<0.05	<0.05	<0.2	<0.05	<0.1	<10	<50	<100	<100	<10	<50	<100	<50	<50	<100	<10	<50
				Largest concentration multiplier of minimum LOR	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
RPD					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Notes:

Where values are less than LOR, 50% of LOR is used for the RPD calculati
Red shading indicates RPD >30% (where the minimum value is > 5 X the r
LOR = laboratory limit of reporting.

SUMMARY

Total RPD Comparisons			
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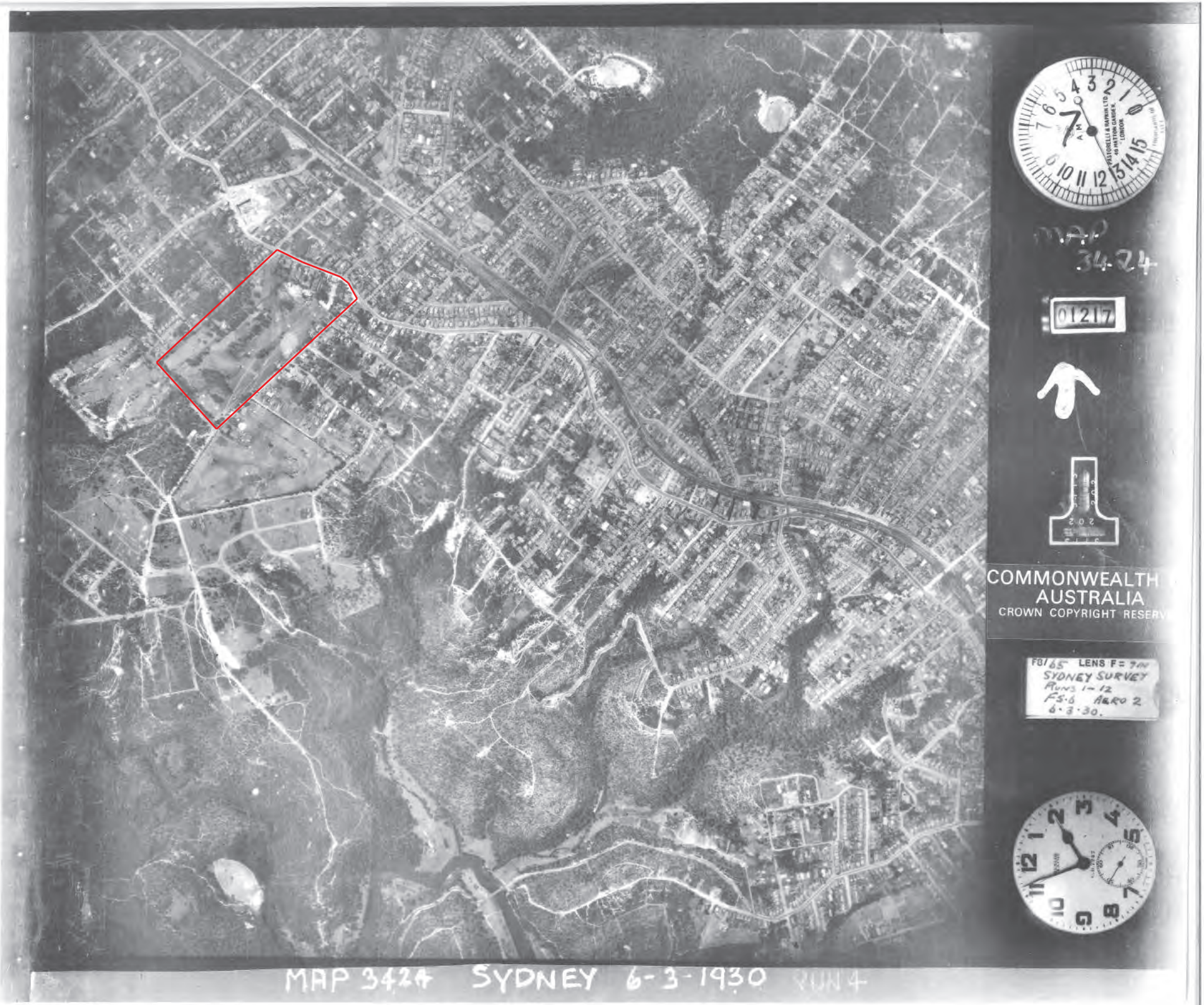
Total Primary	**42**	**min. target**	**actual**
Total Blind Replicates	4	5.0%	9.5%
Total Replicates	4	10.0%	9.5%

SESL AUSTRALIA
Environment & Soil Sciences

Appendix A

ABN 70 106 810 708
T 1300 30 40 80
F 1300 64 46 89
E info@sesl.com.au
W sesl.com.au

POST PO Box 357, Pennant Hills NSW 1715
LAB 16 Chilvers Rd, Thornleigh NSW 2120
ACT Level 5 Tower A, 7 London Cct, Canberra ACT 2601
VIC Level 1, 21 Shields St, Flemington VIC 3031
QLD Level 10, 15 Green Square Cl, Fortitude Valley QLD 4006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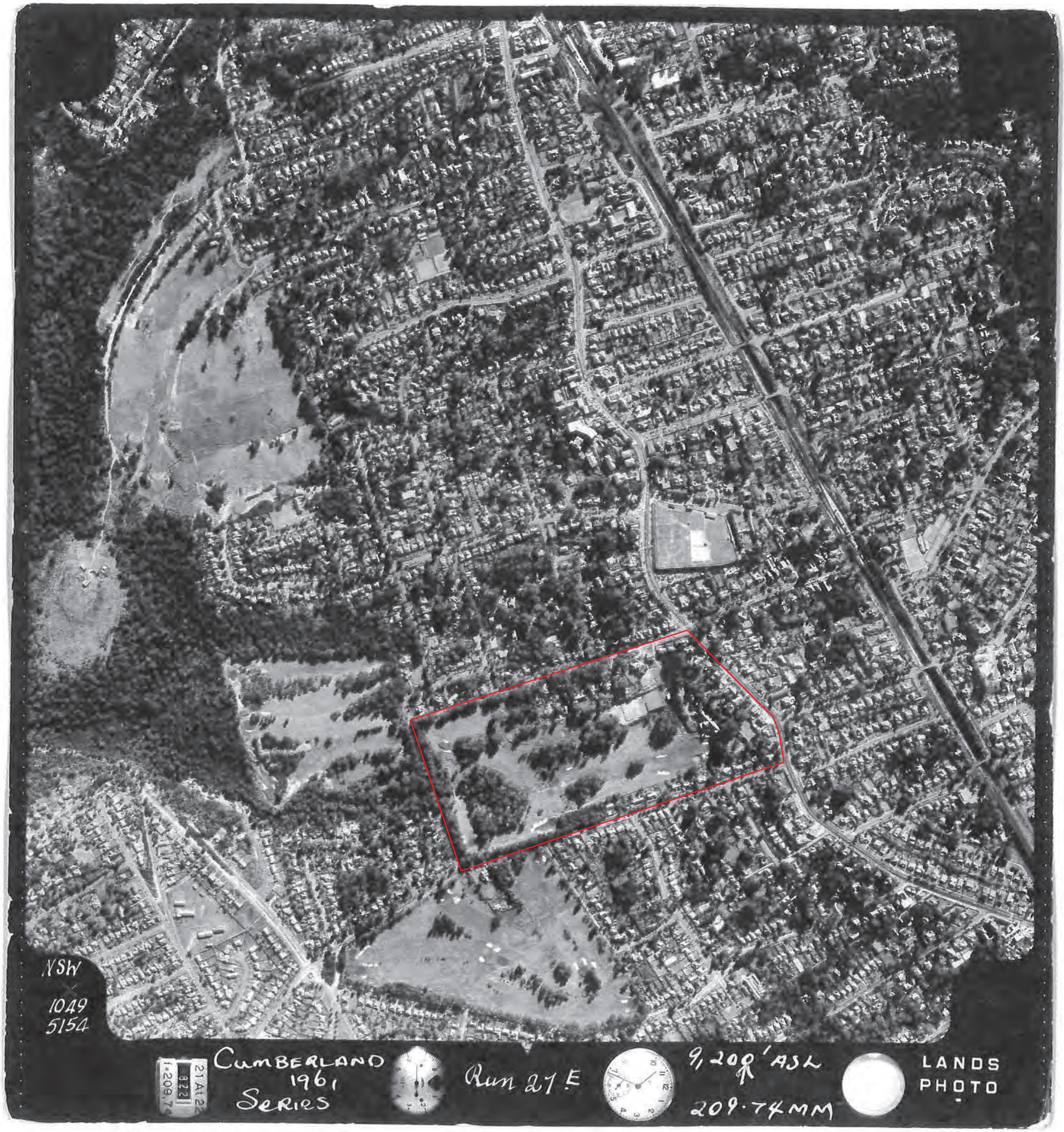
COMMONWEALTH
AUSTRALIA
CROWN COPYRIGHT RESERV
F81/65 LENS F= 7in
SYDNEY SURVEY
RUNS 1-12
FS·6 AERO 2
6·3·30.
MAP 3424 SYDNEY 6-3-1930 RUN 4


472-94
1951
SYDNEY (Co.CUMBERLAND) RUN 7 ↓ MAY 51 12"12200
LANDSPHOTO


NSW
1049
5154
CUMBERLAND
1961
SERIES
Run 27 E
9,200' ASL
209·7KMM
LANDS
PHOTO


N.S.W.
1911
5146
CUMBERLAND
1970 SERIES
NSW 1911
RUN 13
7·7·70
7.500A·S·L
152.37M·M
CROWN
COPY N S W
LAND PHOTO
LOG E
1ST COPY

NSW
3242
135

SYDNEY 1982
1:16 000 COLOUR
(MISC. 1474) NSW 3242

RUN 18
10.8.82

2560m ASL
151.45mm

IST COPY

1994

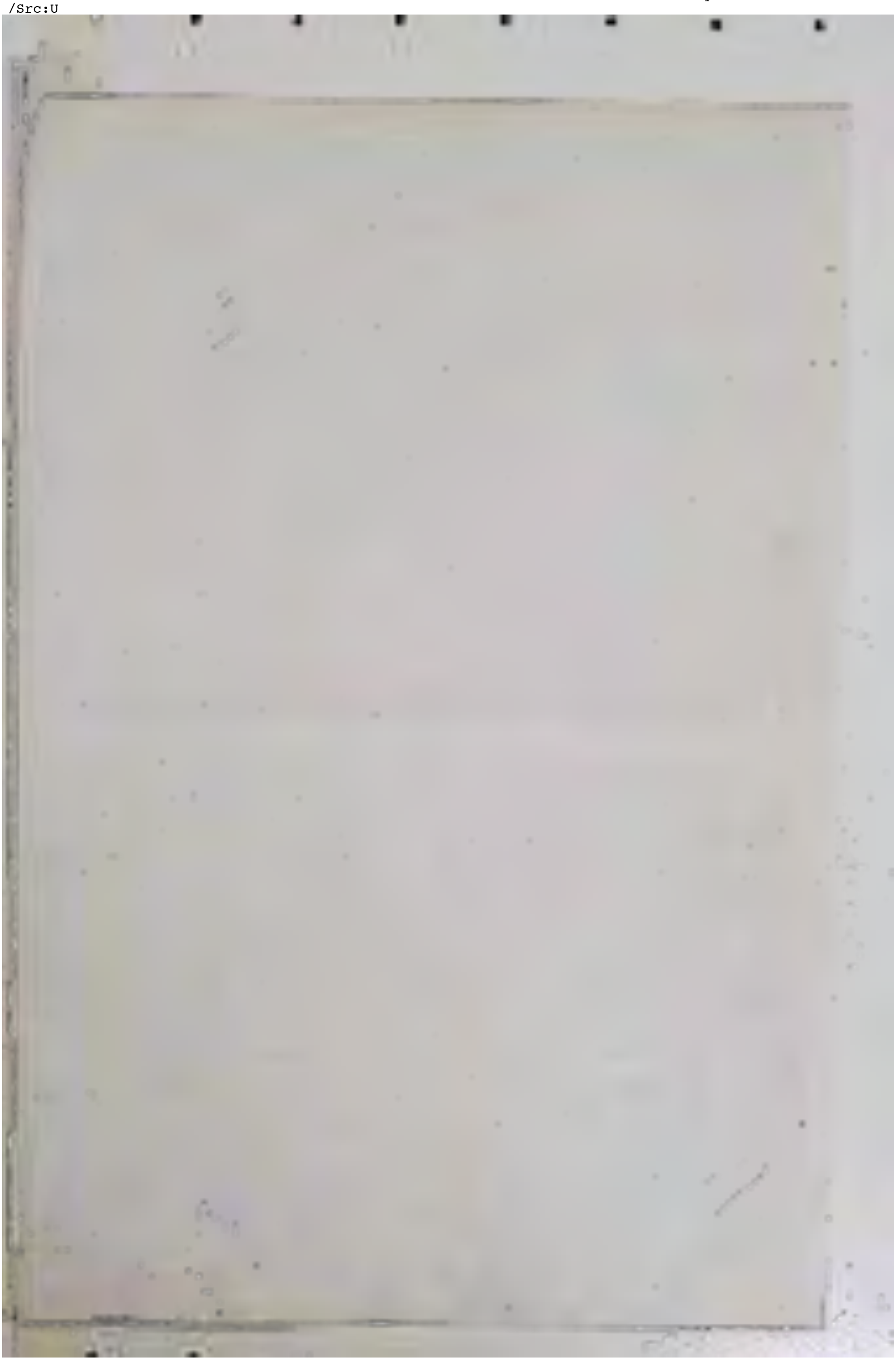
2004

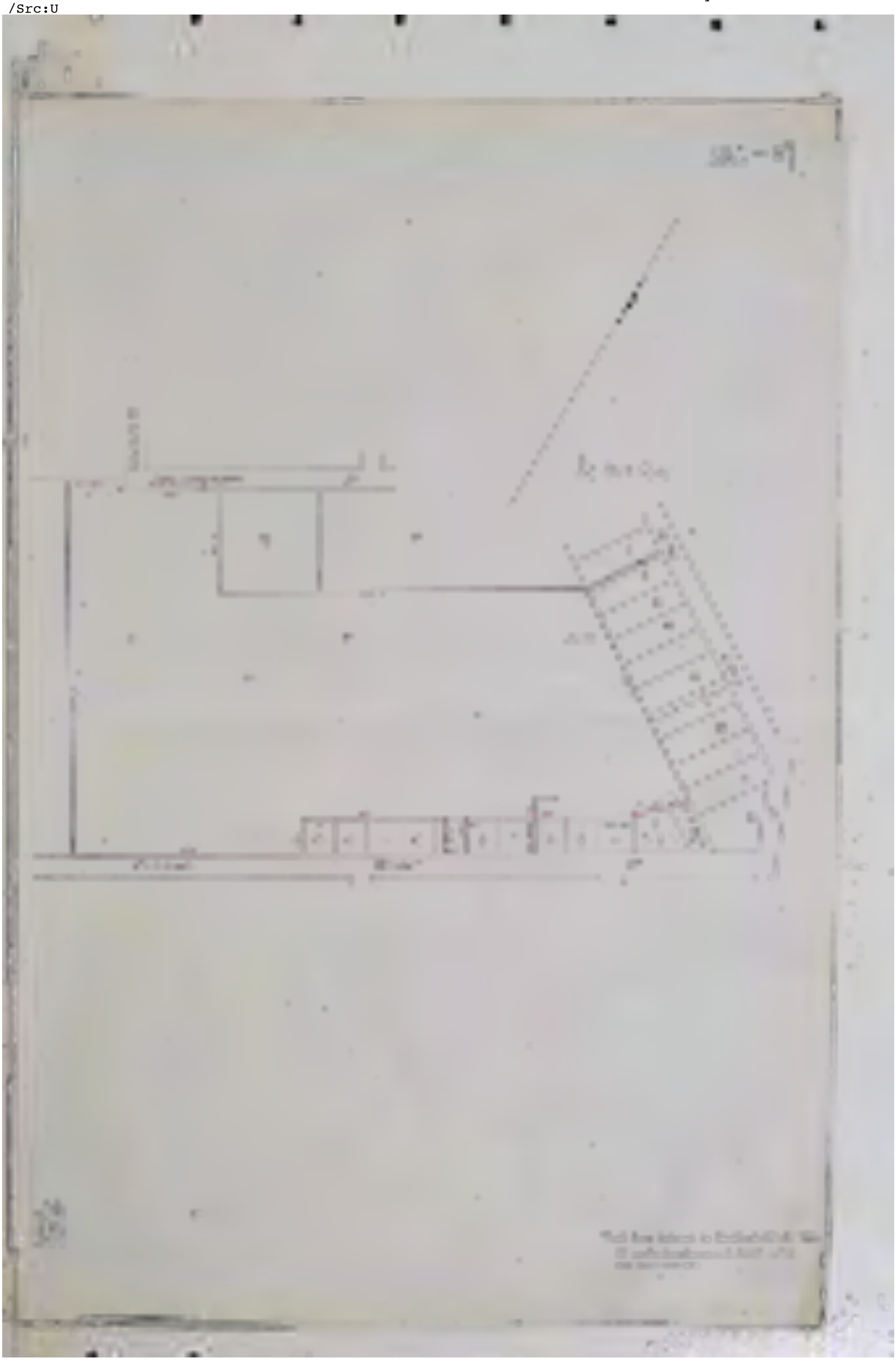
SEARCH REPORT

SUBJECT LAND:	"GOLF CLUB KILLARA" 556 PACIFIC HWY, KILLARA 2071 Lot 2 in Deposited Plan 535219
TITLES:	Volume 3863 Folio 119 Volume 10669 Folio 149 Volume 11070 Folio 109 Folio 2/535219
OWNERSHIP:	
from Circa 1926 to 10.11.1980	Lindfield Golf and Recreation Club Pty Limited (Formally The Killara Golf Club Limited and Killara Golf Club Pty Limited)
from 10.11.1980 to Date	The Killara Golf Club Limited

15th October 2015

SAI GLOBAL PROPERTY





[redacted]

[illegible]

[illegible]

[illegible]

[illegible]


CANCELLED

CANCELLED

Order number: 32082725
Your Reference: 32082469
09/10/2015

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE
9/10/2015 8:51AM

FOLIO: 2/535219

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 11070 FOL 109

Recorded	Number	Type of Instrument	C.T. Issue
28/3/1988		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
26/8/1988		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
3/8/1993		AMENDMENT: LOCAL GOVT AREA	
13/8/1993		AMENDMENT: LOCAL GOVT AREA	
13/5/2011	AG231607	RESTRICTION ON USE OF LAND BY/VESTED IN PRESCRIBED AUTHORITY	
13/5/2011	AG231608	POSITIVE COVENANT	EDITION 1
12/3/2015	AJ122666	REQUEST	

*** END OF SEARCH ***

PRINTED ON 9/10/2015

PLANNING CERTIFICATE

UNDER SECTION 149 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

818 Pacific Highway, Gordon NSW 2072
Locked Bag 1006, Gordon NSW 2072
T 02 9424 0000 F 02 9424 0001
DX 8703 Gordon TTY 02 9424 0875
E kmc@kmc.nsw.gov.au
W www.kmc.nsw.gov.au
ABN 86 408 856 411

PROPERTY DETAILS

Address: **556 Pacific Highway KILLARA NSW 2071**

Lot Description: **Lot 2 DP 535219, Lot 9 DP 3725, Lot C DP 329128, Lot 4 DP 404775, Lot B DP 412102**

CERTIFICATE DETAILS

Certificate No: **ePC2206/15** **Certificate Date:** **08/10/2015**

Certificate Type: **Section 149(2) & (5)**

APPLICANT'S DETAILS

REF: Kilara Golf Club PSI

Sesl Australia
16 Chilvers Road
THORNLEIGH NSW 2120

BACKGROUND INFORMATION

This certificate provides information on how a property (such as land, a house, a commercial building, etc.) may be used and the limits on its development. The certificate contains information Council is aware of through its records and environmental plans with data supplied by the State Government. The details contained in this certificate are limited to that required by Section 149 of the Environmental Planning and Assessment Act.

1. WHICH ENVIRONMENTAL PLAN RESTRICTS THE USE OF THIS PROPERTY?

(Including planning proposals and draft local environmental plans exhibited prior to 1 July 2009 pursuant to section 66(1) b of the E. P. & A. Act).

Ku-ring-gai Local Environmental Plan 2015 as published on the NSW Legislation Website on 5 March 2015.

Ku-ring-gai Planning Scheme Ordinance as prescribed in Government Gazette No.108 of 1 October 1971.

Draft Local Environmental Plan No.191 - Preservation of Trees.
Draft Local Environmental Plan No.195.
Draft Local Environmental Plan No.192 and Draft Development Control Plan No.46 - Exempt and Complying Development.

Draft Ku-ring-gai Local Environmental Plan 2013

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2. WHAT IS THE ZONING OF THIS PROPERTY and the relevant environmental plan?

(Zoning is a way of classifying land and limits the range of uses or activities that may be permitted on that land or property).

Part RE2 Private Recreation & Part R4 High Density Residential under the provisions of Ku-ring-gai Local Environmental Plan 2015 as published on the NSW Legislation Website on 5 March 2015 and

Residential 2(b) under the provisions of Ku-ring-gai Planning Scheme Ordinance as prescribed in Government Gazette No.108 of 1 October 1971.

---

3. WHAT DOES NOT REQUIRE DEVELOPMENT CONSENT under the above environmental plan(s)?

For that part zoned R4 High Density Residential - Home occupations.

For that part zoned RE2 Private Recreation - Nil.

Note: Please refer to the provisions for Exempt and Complying Development as described in Part 3 of Ku-ring-gai Local Environmental Plan 2015.

For that part zoned Residential 2(b) - Exempt Development as described in Schedule 1 of Development Control Plan No 46 - Exempt and Complying Development and Clause 24 of the Ku-ring-gai Planning Scheme Ordinance.

---

4. WHAT DOES REQUIRE DEVELOPMENT CONSENT under the above environmental plan(s)?

For that part zoned R4 High Density Residential - Attached dwellings; Bed and breakfast accommodation; Building identification sign, Business identification sign; Boarding houses; Child care centres; Community facilities; Dwelling houses; Environmental protection works; Exhibition homes; Flood mitigation works; Home-based child care; Home business; Home industry; Hostels; Multi dwelling housing; Neighbourhood shops; Places of public worship; Recreation areas; Residential flat buildings; Respite day care centres; Roads; Shop top housing.

For that part zoned RE2 Private Recreation - Bee keeping; Camping grounds; Car parks; Caravan parks; Child care centres; Community facilities; Electricity generating works; Emergency services facilities; Environmental facilities; Environmental protection works; Flood mitigation works; Forestry; Information and education facilities; Kiosks; Markets; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Respite day care centres; Roads; Signage; Water recycling facilities; Water supply systems.

For that part zoned Residential 2(b) - Demolition of a building or work (being demolition that is not exempt development). Development (other than exempt development) for the purpose of: dwelling-houses; home occupations. Any other development not permitted by 3 above or prohibited by 5 below.

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5. WHAT IS PROHIBITED under the above environmental plan(s)?

For that part zoned R4 High Density Residential - Any other development not specified in item 3 or 4.

For that part zoned RE2 Private Recreation - Any other development not specified in item 3 or 4.

For that part zoned Residential 2(b) - Development for the purposes of: advertisements; advertising structures; boarding-houses; brothels; bulk stores; caravan parks; car repair stations; clubs; commercial premises; emergency services facilities; gas holders; generating works; hotels; industries; institutions; junk yards; liquid fuel depots; mines; motels; motor showrooms; refreshment rooms; residential flat buildings; roadside stalls; sawmills; service stations; shops; stock and sale yards; transport terminals; warehouses.

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6. DO THE DIMENSIONS OF THE LAND PERMIT THE ERECTION OF A DWELLING HOUSE ON THIS PROPERTY under the above environmental plan(s)?

For that part zoned R4 High Density Residential - there are no provisions in Ku-ring-gai Local Environmental Plan 2015 that regulate minimum dimension sizes for the erection of a dwelling house on this property.

For that part zoned RE2 Private Recreation - not applicable, dwelling houses are not permitted within this zone.

For that part zoned Residential 2(b) – The Ku-ring-gai Planning Scheme Ordinance requires allotments for a new dwelling house within the Residential 2(b) zone to comply with the following dimensions:

a) a minimum area of 836 square metres.

b) for a rectangular shaped allotment the minimum width is 18.3 metres.

c) for an irregularly shaped allotment (other than a hatchet/battleaxe shaped allotment) the minimum width is 18.3 metres when measured at a distance of 12.19 metres from the street alignment.

d) for a hatchet/battleaxe shaped allotment the minimum area is 1170 square metres excluding the area of the access corridor. The minimum width for the access corridor of a hatchet/battleaxe lot is 4.6 metres.

e) if the property has frontage to a main road or county road (and is not a hatchet/battleaxe shaped allotment), the minimum width is 27.4 metres when measured at a distance of 12.19 metres from the street alignment.

Please note that the above standards do not prohibit the erection of a dwelling house on this property if the land existed as a separate parcel (that is, it was a separate lot in a Deposited Plan) on, or before, 1 October 1971. Contact your solicitor or conveyancer for more details on your land.

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7. WHAT IS THE PROPOSED ZONING OF THIS PROPERTY and the relevant proposed environmental plan?

(Zoning is a way of classifying land and limits the range of uses or activities that may be permitted on that land or property).

For that part zoned R4 High Density Residential and part zoned RE2 Private Recreation - there are no zoning changes under any proposed environmental plans applying to these parts of the land.

For that part zoned Residential 2(b) – RE2 Private Recreation under Draft Ku-ring-gai Local Environmental Plan 2013
