Aargus

Environmental - Remediation - Engineering - Laboratories - Drilling

PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT

5-7 and 9 Croydon Street, Lakemba NSW

Prepared for

Pinestreet Development

March 2013

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REFERENCES

- Australian and New Zealand Environment and Conservation Council (ANZECC) (1996) – *Drinking Water Guidelines*.
- Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) – *Guidelines for Fresh and Marine Waters*.
- Department of Urban Affairs and Planning – EPA (1998) "*Managing Land Contamination – Planning Guidelines – SEPP 55 – Remediation of Land*".
- National Environmental Protection Council (NEPC) (1999) – *National Environmental Protection (Assessment of Site Contamination) Measure.*
- NSW EPA (1994) "*Guidelines for Assessing Service Station Sites*".
- NSW EPA (1995) "*Sampling Design Guidelines*".
- NSW EPA (2011) "*Guidelines for Consultants Reporting on Contaminated Sites*".
- NSW DEC (2006) "*Guidelines for the NSW Site Auditor Scheme*".
- NSW EPA (2009) "*Guidelines on Significant Risk of Harm from contaminated land and the duty to report*".
- NSW DECC "Waste Classification Guidelines, Part 1: Classifying Waste" (2009). Department of Environment and Climate Change NSW, Sydney

ABBREVIATIONS

AIP	Australian Institute of Petroleum Ltd
ANZECC	Australian and New Zealand Environment and Conservation Council
AST	Aboveground Storage Tank
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
COC	Chain of Custody
DA	Development Approval
DP	Deposited Plan
DQOs	Data Quality Objectives
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health-Based Soil Investigation Level
LGA	Local Government Area
NEHF	National Environmental Health Forum
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photo Ionisation Detector
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance, Quality Control
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SVC	Site Validation Criteria
TCLP	Toxicity Characteristics Leaching Procedure
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VHC	Volatile Halogenated Compounds
VOC	Volatile Organic Compounds

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EXECUTIVE SUMMARY

Aargus Pty Ltd (Aargus) was appointed by Mr Jason Youssef of Pinestreet Developments to undertake a Preliminary Environmental Site Assessment (PESA), Phase 1, for the properties situated at 5-7 and 9 Croydon Street, Lakemba NSW ("the site") (Figure 1 in Appendix A –Site Plans). The subject site comprises existing residential buildings which are to be demolished for the construction of three (3) multi-storey residential unit blocks.

This PESA has been requested by the current developer of the site, on behalf of the site owner, to determine the potential for onsite contamination arising from any areas of concern located within the site and its surrounding area. This report shall provide a preliminary assessment of any site contamination and, if required, provide a basis for a more detailed investigation.

A number of potential areas of environmental concerns were identified at the site, particularly:

- Where pesticides were potentially utilised within the site;
- Imported fill materials;
- Carpark areas / driveways where leaks and spills from cars may have occurred; and
- Asbestos / Fibro within site features.

All concerns are considered of minimal (low) environmental concern for the following reasons:

- Pesticides are not persistent in the environment and the occurrence of pesticides within the school is considered low.
- Imported fill materials appeared to be minimal within the site and below the site assessment criteria.

- Car parking was on the concrete and grass surfaces, which were all in good condition. Furthermore, no contamination was identified beneath these surfaces.
- Asbestos / Fibro would be in a bonded form within the features and, if present, to be removed by a qualified asbestos contractor during demolition. Asbestos in a bonded form is considered non-friable and as such the building materials are considered safe.

Laboratory results for the soil samples analysed were all lower than the relevant regulatory guideline criteria adopted for this development (HIL 'D', HIL 'E' and NSW EPA Service Station).

In Summary

Based on the results of this investigation is considered that the risks to human health and the environment associated with soil contamination at the site are low in the context of the proposed use of the site. The site is therefore considered ***to be suitable*** for the proposed residential development.

It is recommended that a Hazardous Materials Assessment (HAZMAT) is carried out prior to redevelopment of the site.

Any soils proposed for removal from the site should initially be classified in accordance with the "*Waste Classification Guidelines, Part 1: Classifying Waste*" NSW DECC (2009).

Reference should be made to Section 11.0 of the report and Appendix G, which set out details of the limitations of the assessment.

1.0 INTRODUCTION

Aargus Pty Ltd (Aargus) was appointed by Mr Jason Youssef of Pinestreet Developments to undertake a Preliminary Environmental Site Assessment (PESA), Phase 1, for the properties situated at 5-7 and 9 Croydon Street, Lakemba NSW ("the site") (Figure 1 in Appendix A –Site Plans). The subject site comprises existing residential buildings which are to be demolished for the construction of three (3) multi-storey residential unit blocks.

This PESA has been requested by the current developer of the site, on behalf of the site owner, to determine the potential for onsite contamination arising from any areas of concern located within the site and its surrounding area. This report shall provide a preliminary assessment of any site contamination and, if required, provide a basis for a more detailed investigation.

A site visit was undertaken on 23rd November 2010. Fieldwork and reporting was conducted in general accordance with the Aargus proposal and with reference to relevant regulatory criteria and Aargus protocols (Appendix I – Aargus Fieldwork Protocols).

2.0 OBJECTIVE

The objective of this PESA was to assess the potential for the soils at the site to have been impacted by previous and current activities undertaken at or adjacent to the site and to assess the site suitability for the proposed development.

This report may also recommend additional investigations and / or remediation works and possible strategies for the management of the site.

3.0 SCOPE OF WORKS

The scope of works for this PESA included:

- Research and review of the information available, including previous environmental investigations, past and current titles, aerial photographs, EPA records, council records and anecdotal evidence, site survey, site records on waste management practices;

- Site walkover, including research of the location of sewers, drains, holding tanks and pits, spills, patches of discoloured vegetation, etc;

- Limited soil sampling; and

- Quality Assurance/Quality Control (QA/QC): work will be undertaken in accordance with the Aargus Protocols, which comply with regulations and are consistent with industry standards.

4.0 REVIEW OF INFORMATION AVAILABLE

4.1 Site identification, zoning

The site is located at 5-7 and 9 Croydon Street, Lakemba NSW. (Refer to Appendix A –Site Plans). The site comprises of Lot A and B in DP357959, Lot B in DP365853. Lot 1 in DP 974686 and Lot 2 in DP 971844 in the Local Government Area of Canterbury. The site is approximately L shaped and is approximately 0.6 hectares in size, and is bound by commercial properties to the north and northwest, Croydon Street then low density residential to the east, medium density residential to the south, and open parkland to the west.

4.2 Local geology, hydrogeology, surface waters

The Geological Map of Sydney (Geological Series Sheet 9130, Scale 1:100,000, 1983), published by the Department of Mineral Resources indicates the residual soils within the site to be underlain by Triassic Age Shale of the Wianamatta Group, comprising black to dark grey shale and laminite.

Based on a search of the NSW Natural Resource Atlas website database, the closest bore was located within a 1km west of the site. A search of the Department of Natural Resources (DNR) borehole database information identified approximately three (3) registered groundwater bores within a 1km radius of the site. The groundwater bore GW105393 is approximately 1km directly west of the site, and is mainly used for domestic purposes with each a recorded depth of 5.5m and no recorded standing water level. The groundwater bore GW107854 is approximately 2km due west of the site , and is mainly used for domestic purposes, has a recorded depth of 234.50m and a recorded standing water level of 36m. The groundwater bore GW109515 is approximately 2km due east of the site, is mainly used for monitoring purposes with a recorded depth of 6.5m and no recorded standing water level.

The nearest surface water body is Cook River approximately 3.5km to the north east. Stormwater from the local and surrounding areas would flow towards this water body.

4.3 Review of aerial photographs

A number of aerial photographs obtained from the NSW Department of Lands were reviewed as part of this PESA. Copies of the aerial photographs are kept in the offices of Aargus and are available for examination upon request. The results of this review are presented in the following table:

Table 1: Review of Aerial Photographs

Year	Site		Surrounding areas
1930	Residential	The site appears to be occupied by a number of low density residential properties within the site, photograph is of poor quality.	The surrounding properties appear to be occupied by the following: N: Low Density Residential S: Low Density Residential E: Low Density Residential W: Low Density Residential The photograph is of poor quality.
1970	Residential	There seems to have been significant modifications to some of the residential properties onsite with some dwellings demolished leaving open grass areas.	The surrounding areas have changed their land use as follows: N: Commercial Properties S: Medium Density Residential Properties E: Medium Density Residential Properties W: Commercial & Medium Density Properties
1986	Residential	The site appears to be unchanged from the 1970 aerial photograph.	There appears to have been no major modifications within the surrounding area with the exception of a new commercial property to the north of the site.
1998	Residential	The site appears to be unchanged from the 1986 aerial photograph.	There appears to have been no major modifications within the surrounding area with the exception of a new commercial properties to the west of the site new medium density residential properties to the south of the site.
2010	Residential	The buildings onsite appear to have been demolished leaving only a concrete slab covering the whole of site.	There appears to have been no major modifications within the surrounding area with the exception of modifications to commercial properties to the north and northwest of the site.

In summary, the aerial photographs reveal that the site has been residential since the 1930's, while the surrounding properties have been predominantly residential and commercial since the 1970's.

4.4 Title search

A review of historical documents held at the NSW Department of Lands offices was undertaken to characterise the previous land use and occupiers of the site. Reference should be made to Appendix C – Land Title Information for a summary of the historical land titles information obtained by Aargus.

As reported above, the site is located at 5-7 and 9 Croydon Street, Lakemba NSW. (Refer to Appendix A –Site Plans). The site comprises of Lot A and B in DP357959, Lot B in DP365853, Lot 1 in DP 974686 and Lot 2 in DP 971844 in the Local Government Area of Canterbury.

Table 2: Historical land title data

Year	AC 8327 - 250
2008 - Current	Samstone Pty Ltd and Sam Harb Pty Ltd
1964 - 2008	The Presbyterian Church (NSW) Property Trust
	Vol 3262 Fol 197
1924 - 1964	Susanna Jane Merrick
1921 - 1924	John Pearce Lakemba Engineer
	Vol 2217 Fol 20
1912 - 1921	George Pearce
1831	Originally Granted to John Wall

Year	Vol 7237 Fol 34
1959	The Presbyterian Church (NSW) Property Trust
1957 - 1959	Isabel Henrietta Little
	Vol 6129 Fol 243
1950	Raymond Charles Seaton Smith

Year	Vol 7237 Fol 36
1959	The Presbyterian Church (NSW) Property Trust
	Vol 5816 Fol 191
1956 - 1959	Isabel Henrietta Little and Gwen Poppy Sims
1948 - 1956	Raymond Charles Seaton Smith

Year	Vol 5517 Fol 191
1945 - 1948	Raymond Charles Seaton Smith
	Vol 1717 Fol 40
1907 - 1945	Alma Janet Galloway and Dorothy Galloway
Prior 1907	Thomas Arthur Hale

In summary, the site has recently auto consolidated. The parcels of land are listed in the current title. The site has been owned by the Presbyterian Church from 1960 to 2008. Prior to the late 1950's the site was owned by a number of private land users. The land was originally granted to John Wall in 1831.

4.5 WorkCover records

No WorkCover search was undertaken for the site.

4.6 NSW DECCW records

The NSW DECCW publishes records of contaminated sites under Section 58 of the Contaminated Land Management (CLM) Act 1997. The notices relate to investigation and/or remediation of site contamination considered to pose a significant risk of harm under the definition in the CLM Act.

A search of the database revealed that the subject site is not listed. However, there are five (5) listed sites within the Canterbury City Council area. These properties have 4 current and 4 former notices relating to them, however, are not located near the site, therefore are not considered a cause of concern to the site.

It should be noted that the DECCW record of Notices for Contaminated Land does not provide a record of all contaminated land in NSW.

Copies of the records are included in Appendix D – DECCW Notice Summary.

4.7 Anecdotal evidence

Information provided by the current owner of the site, indicates that:

- The buildings were mainly used for low income residential since the 1930’s
- No major modifications to the existing buildings since 1970’s

4.8 Summary of site history

In summary:

- The site has recently auto consolidated. The parcels of land are listed in the current title. The site has been owned by the Presbyterian Church from 1960 to 2008. Prior to the late 1950's the site was owned by a number of private land users. The land was originally granted to John Wall in 1831.
- The aerial photographs reveal that the site has been residential since the 1930's, while the surrounding properties have been predominantly residential and commercial since the 1970's.
- Anecdotal information indicated that the site has been used for low income residential since the 1930's.

4.9 Proposed development

The site is proposed to be redeveloped into three (3) multi-storey residential unit blocks.

Copies of the proposed development plans are included in Appendix J.

5.0 SITE VISIT

5.1 General

The site was visited on 23rd November 2010 by Con Kariotoglou to inspect the site for any potential sources of contamination. (CVs are presented in Appendix H – Project Team).

The following items were considered as part of the site visit:

- Description of the building structures;
- Site surroundings;
- Present and past industrial processes and operations at the site;
- Surface water, groundwater, stormwater and sewer;
- Present and past storage of chemicals and wastes associated with site use and their on-site location;
- Waste management practices and management of hazardous materials;
- Presence of Underground Storage Tanks or Above Ground Storage Tanks;
- Odour; and
- Occupational health and safety.

5.2 Site observations

The site is located at 5-7 and 9 Croydon Street, Lakemba NSW, in the Canterbury City municipality.

At the time of the site visit the following observations were made:

- The site was approximately L shaped in dimension.
- The site comprises of existing residential buildings with open grass areas between building structures.
- There were no signs of soil staining, plant distress or any other visible indicators of potential contamination.
- There were no olfactory indicators of potential contamination.

- No chemical storage was noted within the site.
- There were no visual indicators of underground storage tanks (past or present).
- The only site discharges include stormwater and sewer. Stormwater run-off from the site is collected by collection drains towards the western boundary of the site. Sewer is connected to the regional network.

The site was a gentle slope towards the west and south west. The regional topography is generally towards the east towards the Cook River.

These site features are reported on Figure 2 in Appendix A – Site Plans and site photographs are presented in Appendix B – Site Photographs.

5.3 Surrounding areas

Surrounding land use was identified as follows:

North	Commercial
South	Medium Density Residential
East	Croydon Street, then Low Density Residential
West	Open Parkland and Playground

The district consists of a mixture of residential and commercial land uses.

6.0 AREAS OF ENVIRONMENTAL CONCERNS

Based on the above information, site history and site walkover, the areas of environmental concern (AEC) or associated chemicals of concern (CoC) for the site were identified. These are summarised in the following table.

Table 3: Summary of potential areas and chemicals of concerns

Potential AEC	Description of potentially contaminating activity	CoC	Likelihood of contamination	Remarks
Whole site	Potential for pesticides to have been sprayed or injected on or underneath and around houses and within garden beds.	OCP	Low	If this has occurred, the impact is likely to have been localised.
Whole Site	Imported Fill	Various	Low	The source of the fill is unknown; however, minimal fill was encountered.
Car park areas / driveways	Vehicles may have leaked oil, petrol and other chemicals over time.	Metals, TPH, BTEX	Low	No significant staining was noted on any of the sealed / unsealed surfaces.
Existing Buildings	Asbestos / Fibro Features	Asbestos	Low	To be removed by a qualified contractor

7.0 SITE ASSESSMENT CRITERIA

Regulatory criteria – soil

To assess the contamination status of soils at a site, the NSW EPA refers to the document entitled National Environmental Protection Council (1999) *National Environmental Protection (Assessment of Site Contamination) Measure* (NEPM).

The site is proposed to be redeveloped into a new residential development of three (3) multi-storey residential unit blocks.

With respect to human health, the analytical results are assessed against risk based health investigation (HIL) guidelines appropriate for the site as follows:

- **(HIL 'D') -** *Residential with minimal opportunities for soil access, including high-rise, apartments and flats.*
- **(HIL 'E')** – *Parks, recreational open space, playing fields including secondary schools.*

The NEPM 1999 does not include investigation levels for TPH and BTEX. For assessing contamination by these compounds at sites used for sensitive land use, such as residential, the NSW EPA refers to the NSW EPA (1994) "*Guidelines for Assessing Service Station Sites*". The NSW EPA has recommended that these threshold values should also be used to assess the suitability of sites for less stringent uses, such as residential with minimal access to the soil or parklands.

The adopted assessment criteria are presented in the following table.

Table 4: Site Assessment Criteria

Contaminant	Assessment Criteria mg/Kg			Source
	HIL 'D'	HIL 'E'	NSW EPA	
Inorganics				
Arsenic	400	200	-	NEPM, 1999
Cadmium	80	100	-	NEPM, 1999
Chromium	48%/400	24%/200	-	NEPM, 1999
Copper	4,000	2000	-	NEPM, 1999
Lead	1,200	600	-	NEPM, 1999
Zinc	28,000	14000	-	NEPM, 1999
Nickel	2400	600	-	NEPM, 1999
Mercury	60	30	-	NEPM, 1999
Organics				
TPH/BTEX				
C_6 to C_9 Fraction	-	-	65	NSW EPA, 1994
C_{10} to C_{36}	-	-	1,000	NSW EPA, 1994
Benzene	-	-	1	NSW EPA, 1994
Toluene	-	-	1.4	NSW EPA, 1994
Ethylbenzene	-	-	3.1	NSW EPA, 1994
Total Xylenes	-	-	14	NSW EPA, 1994
PAH				
Benzo(a)pyrene	4	2	-	NEPM, 1999
Total PAH	80	40	-	NEPM, 1999
OCP				
Aldrin + Dieldrin	40	20	-	NEPM, 1999
Chlordane	200	100	-	NEPM, 1999
DDT+DDD+DD	800	400	-	NEPM, 1999
Heptachlor	40	20	-	NEPM, 1999
PCB (Total)	40	20	-	NEPM, 1999
Total Phenols	34,000	17000	-	NEPM, 1999
Cyanides	1,000	500	-	NEPM, 1999

The EPA guidelines indicate that the assessment of soil test results and comparison with defined soil criteria should include consideration of a number of factors such as:

1. Land uses, e.g. residential, agricultural/horticultural, recreation or commercial/industrial.
2. Potential child occupancy.
3. Potential environmental effects including leaching into groundwater.

4. Single or multiple contaminants.
5. Depth of contamination.
6. Level and distribution of contamination.
7. Bioavailability of contaminant(s), e.g. Related to speciation, route of exposure.
8. Toxicological assessment of the contaminant(s), e.g. Toxicokinetics, carcinogenicity, acute and chronic toxicity.
9. Physico-chemical properties of the contaminant(s).
10. State of the site surface, e.g. paved or grassed exposed.
11. Potential exposure pathways.
12. Uncertainties with the sampling methodology and toxicological assessment.

Regulatory criteria – export of fill

To assess the waste classification of materials to be disposed of off-site, the NSW DECC refers to the NSW DECC "Waste Classification Guidelines, Part 1: Classifying Waste" (2009).

8.0 SOIL SAMPLING AND ANALYSIS

Samples were recovered from six (6) locations within the site. These locations were selected to detect any contamination that may have originated from past and present activities.

The locations of the boreholes and surface samples are shown in Appendix A –Site Plans and details of the boreholes are presented in Appendix E – Borehole Logs.

Based on information from all boreholes, the surface and sub-surface profile across the site is generalised as follows:

- Grass;
- Fill, comprising silty clay, grey with a traces of gravel and brick underlain by;
- Natural, Silty Clay, medium plasticity, orang-brown. .

Selected samples were dispatched under chain of custody (CoC) conditions to SGS Environmental (SGS). The samples were selected for analysis based on the sample location and the material encountered. The laboratory information for the samples collected is shown in the following table below.

Table 5: Summary of sample information

Sample	Depth (m)	Soil Description	Rational	Analytes
S1	0.4	Fill	General Coverage	Met 8, OCP
S2	0.3	Fill	General Coverage	Met 8, PAH
S3	0.4	Fill	General Coverage	Met 8, TPH, BTEX, PAH
S4	0.5	Fill	General Coverage	Met 8, TPH, BTEX
S5	0.3	Fill	General Coverage	Met 8, TPH, BTEX
S6	0.5	Fill	General Coverage	Met 8, OCP

Notes:

- Met 8: Ar, Cd, Cr, Cu, Pb, Hg, Ni, Zn.

9.0 RESULTS

The original laboratory test results certificates are presented in Appendix F – Laboratory Test Results. A summary of the test results together with the assessment criteria adopted are presented in Tables 6, 7 and 8 below followed by a discussion of the test data.

Table 6: Heavy Metals Test Result

Analyte		METALS (mg/kg)							
Sample Reference	Depth(m)	ARSENIC	CADMIUM	CHROMIUM	COPPER	NICKEL	LEAD	ZINC	MERCURY
S1	0.4	6	<0.3	13	12	7.8	38	43	<0.05
S2	0.3	6	0.4	14	16	6	84	54	<0.05
S3	0.4	9	<0.3	12	5.6	1.5	14	26	<0.05
S4	0.5	6	0.5	12	25	4.5	56	110	0.06
S5	0.3	7	0.3	9.9	19	4.5	40	99	0.05
S6	0.5	11	0.4	12	21	4.1	72	160	0.28
Practical Quantitation Limits (PQL)		3	0.3	0.3	0.5	0.5	1	0.5	0.05
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)									
HIL 'D' [a]		400	80	48%/400	4000	2400	1200	28000	40/60
HIL 'E' [b]		200	40	24%/200	2000	600	600	14000	20/30

Notes
a: Residential with minimal opportunities for soil access, including high- rise, apartments and flats
b: Parks, recreational open space and playing fields, including secondary schools
c: 48% (480000mg/kg) for Chromium (+3) and 400mg/kg for Chromium (+6) for HIL 'D'.
d: 24% (240000mg/kg) for Chromium (+3) and 200mg/kg for Chromium (+6) for HIL 'E'.
e: 40mg/kg for Methyl Mercury and 60mg/kg for Inorganic Mercury for HIL 'D'.
f: 20mg/kg for Methyl Mercury and 30mg/kg for Inorganic Mercury for HIL 'E'.

As shown in Table 6, the metal concentrations were well below the adopted assessment guidelines, those being the HIL 'D' and 'E'.

Table 7: TPH & BTEX Test Result

Analyte		TPH (mg/kg)					BTEX (mg/kg)			
Sample Location	Depth (m)	C6-C9	C10-C14	C15-C28	C29-C36	C10-C36[b]	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES
S3	0.4	<20	<20	<50	<50	<120	<0.1	<0.1	<0.1	<0.3
S4	0.5	<20	<20	<50	<50	<120	<0.1	<0.1	<0.1	<0.3
S5	0.3	<20	<20	<50	<50	<120	<0.1	<0.1	<0.1	<0.3
Practical Quantitation Limits (PQL)		20	20	50	50	NA	0.1	0.1	0.1	0.3
EPA Levels [a]		65	C10-C36 =1000				1	1.4	3.1	14

Notes
a: Contaminated Sites: "Guidelines for Assessing Service Station Sites", 1994, EPA
b: C10- C36 = (C10- C14) + (C15- C28) + (C29- C36); concentrations less than PQL are assumed equal to PQL.
NA: Not Applicable

As indicated in Table 7, the concentrations of TPH & BTEX were well below the NSW EPA Service Station guidelines.

Table 8: PAH Test Result

Sample Location	Depth (m)	BENZO(a)PYRENE (mg/kg)	TOTAL PAH (mg/kg)
S2	0.3	<0.1	<1.8
S3	0.4	<0.1	<1.8
Practical Quantitation Limit (PQL)		0.1	NA
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)			
HIL 'D' [a]		4	80
HIL 'E' [b]		2	40

Notes
a: Residential with minimal opportunities for soil access, including high-rise, apartments and flats
b: Parks, recreational open space and playing fields, including secondary schools
NA: Not Applicable

As shown in Table 8, the benzo(a)pyrene and Total PAH concentrations were well below the adopted assessment guidelines, those being the HIL 'D' and 'E'.

Table 9: Organochlorine Pesticides Test Result

Analyte		Organochlorine Pesticides (mg/kg)						
Sample Location	Depth (m)	HEPTACHLOR	ALDRIN	DIELDRIN	DDD	DDE	DDT	CHLORDANE (trans & cis)
S1	0.4	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
S6	0.5	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2
Practical Quantitation Limits (PQL)		0.1	0.1	0.1	0.2	0.2	0.2	0.2
NATIONAL ENVIRONMENT PROTECTION MEASURE (1999)								
HIL 'D' [a]		40	40	40		800		200
HIL 'E' [b]		20	20	20		400		100

Notes
- a: Residential with minimal opportunities for soil access, including high-rise,
- b: Parks, recreational open space and playing fields, including secondary schools
- c: Commercial or industrial development
- d: Aldrin + Dieldrin
- e: Total of DDD + DDE + DDT

As shown in Table 9, the Organochlorine Pesticides concentrations were well below the adopted assessment guidelines, those being the HIL 'D' and 'E'.

10.0 CONCLUSION AND RECOMMENDATIONS

A number of potential areas of environmental concerns were identified at the site, particularly:

- Where pesticides were potentially utilised within the site;
- Imported fill materials;
- Carpark areas / driveways where leaks and spills from cars may have occurred; and
- Asbestos / Fibro in site features.

All concerns are considered of minimal (low) environmental concern for the following reasons:

- Pesticides are not persistent in the environment and the occurrence of pesticides within the school is considered low.
- Imported fill materials appeared to be minimal within the site and below the site assessment criteria.
- Car parking was on the concrete and grass surfaces, which were all in good condition. Furthermore, no contamination was identified beneath these surfaces.
- Asbestos / Fibro would be in a bonded form within the features and, if present, to be removed by a qualified asbestos contractor during demolition. Asbestos in a bonded form is considered non-friable and as such the building materials are considered safe.

Laboratory results for the soil samples analysed were all lower than the relevant regulatory guideline criteria adopted for this development (HIL ‘D’ and ‘E’ and NSW EPA Service Station).

<u>In Summary</u>

Based on the results of this investigation is considered that the risks to human health and the environment associated with soil contamination at the site are low in the context of the proposed use of the site. The site is therefore considered ***to be suitable*** for the proposed residential development.

It is recommended that a Hazardous Materials Assessment (HAZMAT) is carried out prior to redevelopment of the site.

Any soils proposed for removal from the site should initially be classified in accordance with the *"Waste Classification Guidelines, Part 1: Classifying Waste"* NSW DECC (2009).

If during any potential site works, significant odours and / or evidence of gross contamination not previously detected are encountered, or any other significant unexpected occurrence, site works should cease in that area, at least temporarily, and the environmental consultant should be notified immediately to set up a response to this unexpected occurrence.

Thank you for the opportunity of undertaking this work. We would be pleased to provide further information on any aspects of this report.

For and on behalf of
Aargus Pty Ltd

Con Kariotoglou
Project Manager

Reviewed By

Mark Kelly

Mark Kelly
Environmental Manager

11.0 LIMITATIONS

To the best of our knowledge information contained in this report is accurate at the date of issue, however, subsurface conditions, including groundwater levels and contaminant concentrations, can change in a limited time. This should be borne in mind if the report is used after a protracted delay.

There is always some disparity in subsurface conditions across a site that cannot be fully defined by investigation. Hence it is unlikely that measurements and values obtained from sampling and testing during environmental works carried out at a site will characterise the extremes of conditions that exist within the site.

There is no investigation that is thorough enough to preclude the presence of material that presently or in the future, may be considered hazardous at the site. Since regulatory criteria are constantly changing, concentrations of contaminants presently considered low may, in the future, fall under different regulatory standards that require remediation.

Opinions expressed herein are judgements and are based on our understanding and interpretation of current regulatory standards and should not be construed as legal opinions.

Appendix G – Important information about your environmental site report should also be read in conjunction with this report.

APPENDIX A

LOCALITY MAP & SITE PLAN

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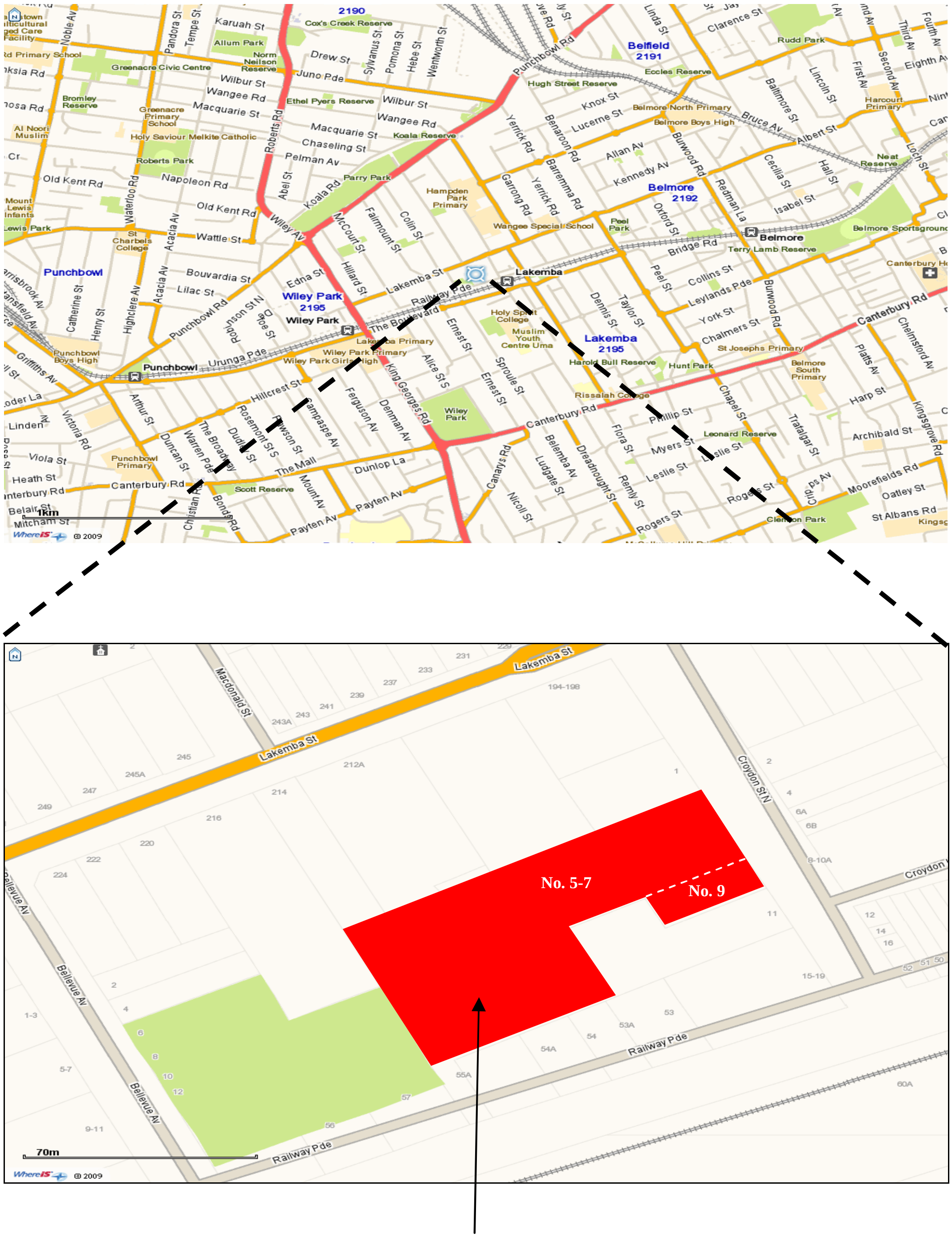
LOCALITY MAP



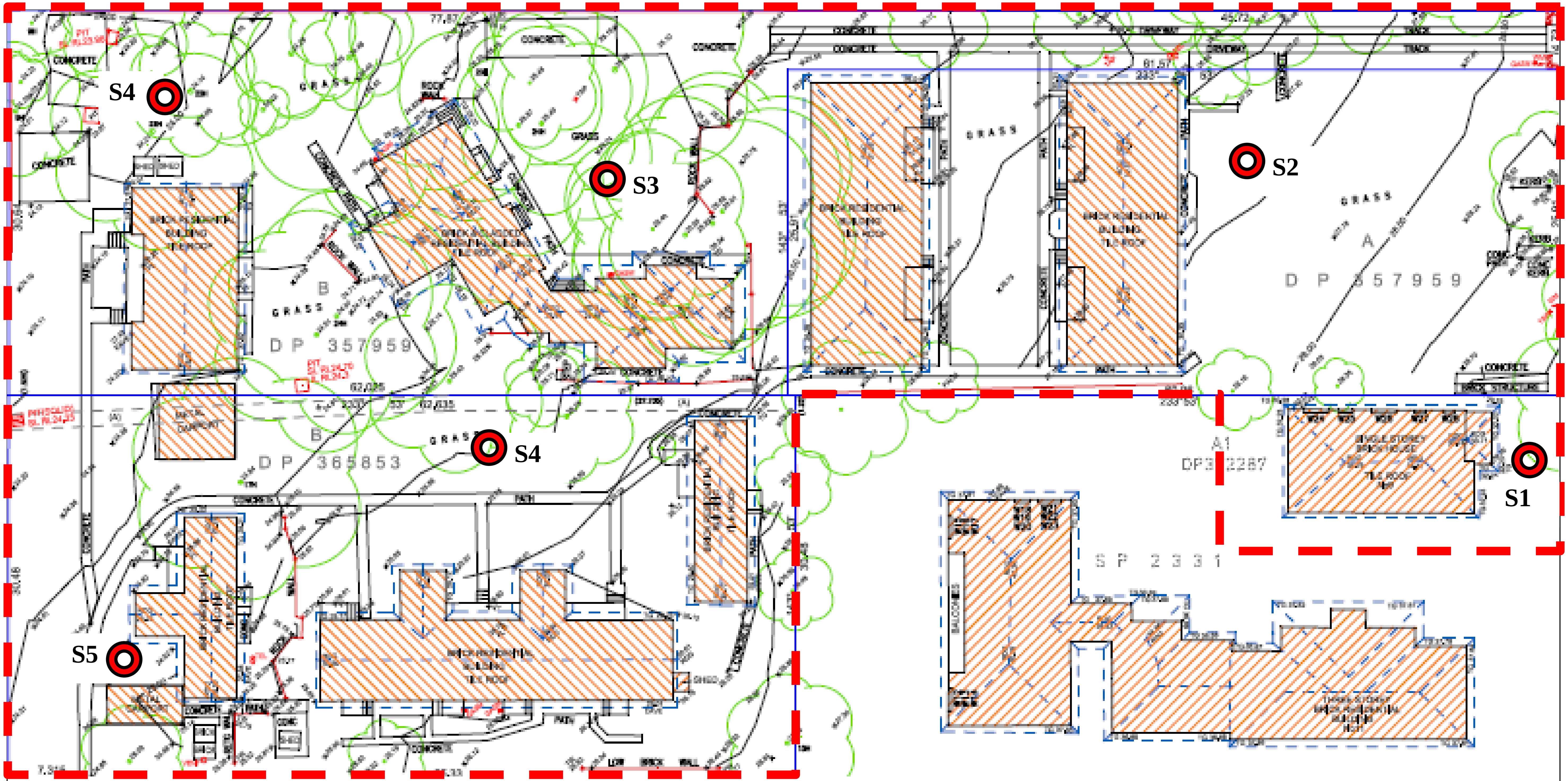
Site Location

Reference: Google (2010)

ABN 46 063 579 313 | Aargus Pty Limited | Environment – Chemicals – Business Development

Drawn	MK	**Preliminary Environmental Site Assessment Pinestreet Developments 5-7 and 9 Croydon Street, Lakemba NSW**	Figure 1
Approved	mk		
Date	23/11/10		
Scale	N/A		Job No: ES3897

SITE PLAN



Legend

Sample Location

N

ABN 46 063 579 313 Aargus Pty Limited Environment – Remediation – Geotechnical Engineering

Drawn	MK	**Preliminary Environmental Site Assessment** **Pinestreet Developments** **5-7 and 9 Croydon Street,** **Lakemba NSW**	Fig 2
Approved	MK		
Date	23/11/10		Ref: ES3897
Approx Scale	NTS		

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AUSTRALIA

APPENDIX B

SITE PHOTOGRAPHS

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SITE PHOTOGRAPHS

Client	Pinestreet Developments
Project	Preliminary Environmental Site Assessment
Location	5-7 and 9 Croydon Street, Lakemba
Job No.	ES3897
Checked By	MK

Aargus
AUSTRALIA

Photograph N^{o} 1

View of 5-7 Croydon Street
looking west from Croydon Street

Photograph N^{o} 2

View of 9 Croydon Street
looking west from Croydon Street

Photograph N^{o} 3

View of 5-7 Croydon Street
looking east from western boundary

Photograph N^{o} 4

Showing typical brick residential building

Photograph N^{o} 5

Showing typical brick residential building

Photograph N^{o} 6

Showing typical brick residential building

APPENDIX C

LAND TITLE INFORMATION

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AARGUS PTY LTD

LAND TITLE SEARCH SUMMARY

5-7 and 9 Croydon Street, Lakemba NSW

Ref No: ES3897
Current Owner: Samstone Pty Ltd
Site Identification: Lot A and B in DP357959, Lot B in DP365853, Lot 1 in DP 974686 and Lot 2 in DP 971844
Local Government Area: Canterbury City Council
County: Cumberland
Parish: St George

Year	**AC 8327 - 250**
2008 - Current	Samstone Pty Ltd and Sam Harb Pty Ltd
1964 - 2008	The Presbyterian Church (NSW) Property Trust
	Vol 3262 Fol 197
1924 - 1964	Susanna Jane Merrick
1921 - 1924	John Pearce Lakemba Engineer
	Vol 2217 Fol 20
1912 - 1921	George Pearce
1831	Originally Granted to John Wall

Year	**Vol 7237 Fol 34**
1959	The Presbyterian Church (NSW) Property Trust
1957 - 1959	Isabel Henrietta Little
	Vol 6129 Fol 243
1950	Raymond Charles Seaton Smith

Year	**Vol 7237 Fol 36**
1959	The Presbyterian Church (NSW) Property Trust
	Vol 5816 Fol 191
1956 - 1959	Isabel Henrietta Little and Gwen Poppy Sims
1948 - 1956	Raymond Charles Seaton Smith

Year	**Vol 5517 Fol 191**
1945 - 1948	Raymond Charles Seaton Smith
	Vol 1717 Fol 40
1907 - 1945	Alma Janet Galloway and Dorothy Galloway
Prior 1907	Thomas Arthur Hale

APPENDIX D

DECCW NOTICE SUMMARY

Aargus

Environment, Climate Change & Water

Search results

Your search for: LGA: Canterbury City Council

Matched 8 notices relating to 5 sites.

Search Again Refine Search

Suburb	Address	Site Name	Notices related to this site
Campsie	403 Canterbury Road	Cheapa Petrol, Campsie	1 current
Campsie	60 Charlotte Street	Sunbeam Factory	3 former
Canterbury	13-19 Canterbury Road	Metro Petroleum Service Station	2 current
Hurlstone Park	618 New Canterbury Road	Speedway Fuels	1 current
Marrickville	Thornley Street/Wanstead Avenue	Sewer Aqueduct - Cooks River	1 former

Page 1 of 1

1 December 2010

APPENDIX E

BOREHOLE LOGS

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BOREHOLE & GROUNDWATER WELL LOG

CLIENT	Pinestreet Developments	**BOREHOLE NO.**	**BH1/S1**
PROJECT	Preliminary Environmental Site Assessment	**DATE.**	**23.11.2010**
LOCATION	5-7 and 9 Croydon Street, Lakemba	**JOB NO.**	**ES3897**
METHOD	Hand Auger	**SURFACE ELEV.**	**N/A**
LOGGED BY	CK	**CHECKED BY**	**MK**

Aargus AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Plasticity, particle characteristics, colour, moisture, etc)	Observations	Well Construction	Design
0.5				F	FILL: Silty Clay, low plasticity, grey with a traces of gravel and brick			
1				CI	NATURAL: Silty CLAY, medium plasticity, orange brown			
1.5					**Borehole Terminated @ 1.0m in CLAY**			
2								
2.5								
3								
3.5								
4								
4.5								
5								
5.5								
6								

Log Symbols

Standing groundwater level in borehole

Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth

S - Surface water sample

GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers

M Moist - Does not run freely but no free water visible on soil surface

W Wet - Free water visible on soil surface

Soil Classification

Clay	- Particle size less than 0.002mm
Silt	- Particle size between 0.002 and 0.06mm
Sand	- Particle size between 0.06 and 2.0mm
Gravel	- Particle size between 2.0 and 60mm

Strength

VS	Very Soft	- Unconfined compressive strength less than 25kPa
S	Soft	- Unconfined compressive strength 25-50kPa
F	Firm	- Unconfined compressive strength 50-100kPa
St	Stiff	- Unconfined compressive strength 100-200kPa
VSt	Very Stiff	- Unconfined compressive strength 200-400kPa
H	Hard	- Unconfined compressive strength greater than 400kPa

BOREHOLE & GROUNDWATER WELL LOG

CLIENT	Pinestreet Developments	**BOREHOLE NO.**	**BH2/S2**
PROJECT	Preliminary Environmental Site Assessment	**DATE.**	**23.11.2010**
LOCATION	5-7 and 9 Croydon Street, Lakemba	**JOB NO.**	**ES3897**
METHOD	Hand Auger	**SURFACE ELEV.**	**N/A**
LOGGED BY	CK	**CHECKED BY**	**MK**

Aargus AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Plasticity, particle characteristics, colour, moisture, etc)	Observations	Well Construction	Design
0.5				F	FILL: Silty Clay, low plasticity, grey with a traces of gravel and brick			
1				CI	NATURAL: Silty CLAY, medium plasticity, orange brown			
1.5					**Borehole Terminated @ 1.0m in CLAY**			
2								
2.5								
3								
3.5								
4								
4.5								
5								
5.5								
6								

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay	- Particle size less than 0.002mm
Silt	- Particle size between 0.002 and 0.06mm
Sand	- Particle size between 0.06 and 2.0mm
Gravel	- Particle size between 2.0 and 60mm

Strength

VS	Very Soft	- Unconfined compressive strength less than 25kPa
S	Soft	- Unconfined compressive strength 25-50kPa
F	Firm	- Unconfined compressive strength 50-100kPa
St	Stiff	- Unconfined compressive strength 100-200kPa
VSt	Very Stiff	- Unconfined compressive strength 200-400kPa
H	Hard	- Unconfined compressive strength greater than 400kPa

BOREHOLE & GROUNDWATER WELL LOG

Aargus AUSTRALIA

CLIENT	Pinestreet Developments	BOREHOLE NO.	BH3/S3
PROJECT	Preliminary Environmental Site Assessment	DATE.	23.11.2010
LOCATION	5-7 and 9 Croydon Street, Lakemba	JOB NO.	ES3897
METHOD	Hand Auger	SURFACE ELEV.	N/A
LOGGED BY	CK	CHECKED BY	MK

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Plasticity, particle characteristics, colour, moisture, etc)	Observations	Well Construction	Design
0.5				F	FILL: Silty Clay, low plasticity, grey with a traces of gravel and brick			
1				CI	NATURAL: Silty CLAY, medium plasticity, orange brown			
1.5					**Borehole Terminated @ 1.0m in CLAY**			
2								
2.5								
3								
3.5								
4								
4.5								
5								
5.5								
6								

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE & GROUNDWATER WELL LOG

CLIENT	Pinestreet Developments	**BOREHOLE NO.**	**BH4/S4**
PROJECT	Preliminary Environmental Site Assessment	**DATE.**	**23.11.2010**
LOCATION	5-7 and 9 Croydon Street, Lakemba	**JOB NO.**	**ES3897**
METHOD	Hand Auger	**SURFACE ELEV.**	**N/A**
LOGGED BY	CK	**CHECKED BY**	**MK**

Aargus AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Plasticity, particle characteristics, colour, moisture, etc)	Observations	Well Construction	Design
0.5				F	FILL: Silty Clay, low plasticity, grey with a traces of gravel and brick			
1				CI	NATURAL: Silty CLAY, medium plasticity, orange brown			
1.5					**Borehole Terminated @ 1.0m in CLAY**			
2								
2.5								
3								
3.5								
4								
4.5								
5								
5.5								
6								

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE & GROUNDWATER WELL LOG

CLIENT	Pinestreet Developments	**BOREHOLE NO.**	**BH5/S5**
PROJECT	Preliminary Environmental Site Assessment	**DATE.**	**23.11.2010**
LOCATION	5-7 and 9 Croydon Street, Lakemba	**JOB NO.**	**ES3897**
METHOD	Hand Auger	**SURFACE ELEV.**	**N/A**
LOGGED BY	CK	**CHECKED BY**	**MK**

Aargus
AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Plasticity, particle characteristics, colour, moisture, etc)	Observations	Well Construction	Design
0.5				F	FILL: Silty Clay, low plasticity, grey with a traces of gravel and brick			
1				CI	NATURAL: Silty CLAY, medium plasticity, orange brown			
1.5					**Borehole Terminated @ 1.0m in CLAY**			
2								
2.5								
3								
3.5								
4								
4.5								
5								
5.5								
6								

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

BOREHOLE & GROUNDWATER WELL LOG

CLIENT	Pinestreet Developments	**BOREHOLE NO.**	**BH6/S6**
PROJECT	Preliminary Environmental Site Assessment	**DATE.**	**23.11.2010**
LOCATION	5-7 and 9 Croydon Street, Lakemba	**JOB NO.**	**ES3897**
METHOD	Hand Auger	**SURFACE ELEV.**	**N/A**
LOGGED BY	CK	**CHECKED BY**	**MK**

Aargus AUSTRALIA

Depth (m)	Sample	Graphic Symbol	Ground Water	Classification Symbol	Soil Description (Plasticity, particle characteristics, colour, moisture, etc)	Observations	Well Construction	Design
0.5				F	FILL: Silty Clay, low plasticity, grey with a traces of gravel and brick			
1				CI	NATURAL: Silty CLAY, medium plasticity, orange brown			
1.5					**Borehole Terminated @ 1.0m in CLAY**			
2								
2.5								
3								
3.5								
4								
4.5								
5								
5.5								
6								

Log Symbols

Standing groundwater level in borehole
Water seepage in borehole (wet)

Samples

BH1.0.5 - Soil sample taken at indicated depth
S - Surface water sample
GW/W - Groundwater sample/water sample

Moisture Condition

D Dry - Runs freely through fingers
M Moist - Does not run freely but no free water visible on soil surface
W Wet - Free water visible on soil surface

Soil Classification

Clay - Particle size less than 0.002mm
Silt - Particle size between 0.002 and 0.06mm
Sand - Particle size between 0.06 and 2.0mm
Gravel - Particle size between 2.0 and 60mm

Strength

VS Very Soft - Unconfined compressive strength less than 25kPa
S Soft - Unconfined compressive strength 25-50kPa
F Firm - Unconfined compressive strength 50-100kPa
St Stiff - Unconfined compressive strength 100-200kPa
VSt Very Stiff - Unconfined compressive strength 200-400kPa
H Hard - Unconfined compressive strength greater than 400kPa

APPENDIX F

LABORATORY RESULTS

Aargus

ANALYTICAL REPORT

30 November 2010

Aargus Pty Ltd
446 Parramatta Road
PETERSHAM
NSW 2049

Attention: **Con Kariotoglou**

Your Reference: ES3897 - Lakemba

Our Reference: SE83441

Samples: 6 Soils
Received: 24/11/2010

Preliminary Report Sent: Not Issued

These samples were analysed in accordance with your written instructions.

For and on Behalf of:
SGS ENVIRONMENTAL SERVICES

Sample Receipt:	Angela Mamalicos	AU.SampleReceipt.Sydney@sgs.com
Production Manager:	Huong Crawford	Huong.Crawford@sgs.com

Results Approved and/or Authorised by:

Ly Kim Ha
Organics Signatory

Huong Crawford
Metals Signatory

MBTEX in Soil Our Reference: Your Reference Depth Sample Matrix Date Sampled	UNITS ------------- ------------	SE83441-3 S3 0.4 Soil 23/11/2010	SE83441-4 S4 0.5 Soil 23/11/2010	SE83441-5 S5 0.3 Soil 23/11/2010
Date Extracted (MBTEX)		26/11/2010	26/11/2010	26/11/2010
Date Analysed (MBTEX)		27/11/2010	27/11/2010	27/11/2010
Methyl-tert-butyl ether (MtBE)	mg/kg	<0.1	<0.1	<0.1
Benzene	mg/kg	<0.1	<0.1	<0.1
Toluene	mg/kg	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	<0.1	<0.1	<0.1
Total Xylenes	mg/kg	<0.3	<0.3	<0.3
BTEX Surrogate (%)	%	90	94	86

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TRH in soil with C6-C9 by P/T Our Reference: Your Reference Depth Sample Matrix Date Sampled	UNITS ------------- ------------	SE83441-3 S3 0.4 Soil 23/11/2010	SE83441-4 S4 0.5 Soil 23/11/2010	SE83441-5 S5 0.3 Soil 23/11/2010
Date Extracted (TRH C6-C9 PT)		26/11/2010	26/11/2010	26/11/2010
Date Analysed (TRH C6-C9 PT)		27/11/2010	27/11/2010	27/11/2010
TRH C_6 - C_9 P&T	mg/kg	<20	<20	<20
Date Extracted (TRH C10-C36)		26/11/2010	26/11/2010	26/11/2010
Date Analysed (TRH C10-C36)		26/11/2010	26/11/2010	26/11/2010
TRH C_{10} - C_{14}	mg/kg	<20	<20	<20
TRH C_{15} - C_{28}	mg/kg	<50	<50	<50
TRH C_{29} - C_{36}	mg/kg	<50	<50	<50

PAHs in Soil Our Reference: Your Reference Depth Sample Matrix Date Sampled	UNITS ------------- ------------	SE83441-2 S2 0.3 Soil 23/11/2010	SE83441-3 S3 0.4 Soil 23/11/2010
Date Extracted		26/11/2010	26/11/2010
Date Analysed		26/11/2010	26/11/2010
Naphthalene	mg/kg	<0.10	<0.10
2-Methylnaphthalene	mg/kg	<0.10	<0.10
1-Methylnaphthalene	mg/kg	<0.10	<0.10
Acenaphthylene	mg/kg	<0.10	<0.10
Acenaphthene	mg/kg	<0.10	<0.10
Fluorene	mg/kg	<0.10	<0.10
Phenanthrene	mg/kg	<0.10	<0.10
Anthracene	mg/kg	<0.10	<0.10
Fluoranthene	mg/kg	<0.10	<0.10
Pyrene	mg/kg	<0.10	<0.10
Benzo[*a*]anthracene	mg/kg	<0.10	<0.10
Chrysene	mg/kg	<0.10	<0.10
Benzo[*b,k*]fluoranthene	mg/kg	<0.20	<0.20
Benzo[*a*]pyrene	mg/kg	<0.10	<0.10
Indeno[*123-cd*]pyrene	mg/kg	<0.10	<0.10
Dibenzo[*ah*]anthracene	mg/kg	<0.10	<0.10
Benzo[*ghi*]perylene	mg/kg	<0.10	<0.10
Total PAHs (sum)	mg/kg	<1.8	<1.8
Nitrobenzene-d5	%	121	108
2-Fluorobiphenyl	%	107	96
p -Terphenyl-*d14*	%	106	98

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OC Pesticides in Soil Our Reference: Your Reference Depth Sample Matrix Date Sampled	UNITS ------------- ------------	SE83441-1 S1 0.4 Soil 23/11/2010	SE83441-6 S6 0.5 Soil 23/11/2010
Date Extracted		26/11/2010	26/11/2010
Date Analysed		26/11/2010	26/11/2010
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC (Lindane)	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
o,p-DDE	mg/kg	<0.1	<0.1
alpha-Endosulfan	mg/kg	<0.1	<0.1
trans-Chlordane *(gamma)*	mg/kg	<0.1	<0.1
cis-Chlordane *(alpha)*	mg/kg	<0.1	<0.1
trans-Nonachlor	mg/kg	<0.1	<0.1
p,p-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
o,p-DDD	mg/kg	<0.1	<0.1
o,p-DDT	mg/kg	<0.1	<0.1
beta-Endosulfan	mg/kg	<0.1	<0.1
p,p-DDD	mg/kg	<0.1	<0.1
p,p-DDT	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Endrin Ketone	mg/kg	<0.1	<0.1
2,4,5,6-Tetrachloro-m-xylene *(Surrogate*	%	123	126

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Environmental Services Unit 16/33 Maddox Street Alexandria NSW 2015 Australia
t +61 (0)2 8594 0400 f + 61 (0)2 8594 0499 www.au.sgs.com

Metals in Soil by ICP-OES Our Reference: Your Reference Depth Sample Matrix Date Sampled	UNITS ------------- ------------	SE83441-1 S1 0.4 Soil 23/11/2010	SE83441-2 S2 0.3 Soil 23/11/2010	SE83441-3 S3 0.4 Soil 23/11/2010	SE83441-4 S4 0.5 Soil 23/11/2010	SE83441-5 S5 0.3 Soil 23/11/2010
Date Extracted (Metals)		29/11/2010	29/11/2010	29/11/2010	29/11/2010	29/11/2010
Date Analysed (Metals)		29/11/2010	29/11/2010	29/11/2010	29/11/2010	29/11/2010
Arsenic	mg/kg	6	6	9	6	7
Cadmium	mg/kg	<0.3	0.4	<0.3	0.5	0.3
Chromium	mg/kg	13	14	12	12	9.9
Copper	mg/kg	12	16	5.6	25	19
Lead	mg/kg	38	84	14	56	40
Nickel	mg/kg	7.8	6.0	1.5	4.5	4.5
Zinc	mg/kg	43	54	26	110	99

Metals in Soil by ICP-OES Our Reference: Your Reference Depth Sample Matrix Date Sampled	UNITS ------------- ------------	SE83441-6 S6 0.5 Soil 23/11/2010
Date Extracted (Metals)		29/11/2010
Date Analysed (Metals)		29/11/2010
Arsenic	mg/kg	11
Cadmium	mg/kg	0.4
Chromium	mg/kg	12
Copper	mg/kg	21
Lead	mg/kg	72
Nickel	mg/kg	4.1
Zinc	mg/kg	160

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Mercury Cold Vapor/Hg Analyser						
Our Reference:	UNITS	SE83441-1	SE83441-2	SE83441-3	SE83441-4	SE83441-5
Your Reference	-------------	S1	S2	S3	S4	S5
Depth	------------	0.4	0.3	0.4	0.5	0.3
Sample Matrix		Soil	Soil	Soil	Soil	Soil
Date Sampled		23/11/2010	23/11/2010	23/11/2010	23/11/2010	23/11/2010
Date Extracted (Mercury)		29/11/2010	29/11/2010	29/11/2010	29/11/2010	29/11/2010
Date Analysed (Mercury)		29/11/2010	29/11/2010	29/11/2010	29/11/2010	29/11/2010
Mercury	mg/kg	<0.05	<0.05	<0.05	0.06	0.05

Mercury Cold Vapor/Hg Analyser		
Our Reference:	UNITS	SE83441-6
Your Reference	-------------	S6
Depth	------------	0.5
Sample Matrix		Soil
Date Sampled		23/11/2010
Date Extracted (Mercury)		29/11/2010
Date Analysed (Mercury)		29/11/2010
Mercury	mg/kg	0.28

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Moisture Our Reference: Your Reference Depth Sample Matrix Date Sampled	UNITS ------------- ------------	SE83441-1 S1 0.4 Soil 23/11/2010	SE83441-2 S2 0.3 Soil 23/11/2010	SE83441-3 S3 0.4 Soil 23/11/2010	SE83441-4 S4 0.5 Soil 23/11/2010	SE83441-5 S5 0.3 Soil 23/11/2010
Date Analysed (moisture)		26/11/2010	26/11/2010	26/11/2010	26/11/2010	26/11/2010
Moisture	%	14	16	15	17	16

Moisture Our Reference: Your Reference Depth Sample Matrix Date Sampled	UNITS ------------- ------------	SE83441-6 S6 0.5 Soil 23/11/2010
Date Analysed (moisture)		26/11/2010
Moisture	%	17

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Method ID	Methodology Summary
SEO-018	BTEX / C6-C9 Hydrocarbons - Soil samples are extracted with methanol, purged and concentrated by a purge and trap apparatus, and then analysed using GC/MS technique. Water samples undergo the same analysis without the extraction step. Based on USEPA 5030B and 8260B.
SEO-020	Total Recoverable Hydrocarbons - determined by solvent extraction with dichloromethane / acetone for soils and dichloromethane for waters, followed by instrumentation analysis using GC/FID. Where applicable Solid Phase Extraction Manifold technique is used for aliphatic / aromatic fractionation.
SEO-030	Polynuclear Aromatic Hydrocarbons - determined by solvent extraction with dichloromethane / acetone for soils and dichloromethane for waters, followed by instrumentation analysis using GC/MS SIM mode.
SEO-005	OC/OP/PCB - Determination of a suite of Organchlorine Pesticides, Chlorinated Organo-phosphorus Pesticides and Polychlorinated Biphenyls (PCB's) by liquid-liquid extraction using dichloromethane for waters, or mechanical extraction using acetone / hexane for soils, followed by instrumentation analysis using GC/ECD. Based on USEPA 8081/8082.
SEM-010	Determination of elements by ICP-OES following appropriate sample preparation / digestion process. Based on USEPA 6010C / APHA 21st Edition, 3120B.
SEM-005	Mercury - determined by Cold-Vapour AAS following appropriate sample preparation or digestion process. Based on APHA 21st Edition, 3112B.
AN002	Preparation of soils, sediments and sludges undergo analysis by either air drying, compositing, subsampling and 1:5 soil water extraction where required. Moisture content is determined by drying the sample at 105 ± 5°C.

QUALITY CONTROL MBTEX in Soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (MBTEX)				26/11/10	[NT]	[NT]	LCS	26/11/10
Date Analysed (MBTEX)				27/11/10	[NT]	[NT]	LCS	27/11/10
Methyl-tert-butyl ether (MtBE)	mg/kg	0.1	SEO-018	<0.1	[NT]	[NT]	LCS	109%
Benzene	mg/kg	0.1	SEO-018	<0.1	[NT]	[NT]	LCS	114%
Toluene	mg/kg	0.1	SEO-018	<0.1	[NT]	[NT]	LCS	113%
Ethylbenzene	mg/kg	0.1	SEO-018	<0.1	[NT]	[NT]	LCS	114%
Total Xylenes	mg/kg	0.3	SEO-018	<0.3	[NT]	[NT]	LCS	121%
BTEX Surrogate (%)	%	0	SEO-018	122	[NT]	[NT]	LCS	130%

QUALITY CONTROL TRH in soil with C6-C9 by P/T	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (TRH C6-C9 PT)				26/11/10	[NT]	[NT]	LCS	26/11/10
Date Analysed (TRH C6-C9 PT)				27/11/10	[NT]	[NT]	LCS	27/11/10
TRH C_6 - C_9 P&T	mg/kg	20	SEO-018	<20	[NT]	[NT]	LCS	129%
Date Extracted (TRH C10-C36)				26/11/10	[NT]	[NT]	LCS	26/11/10
Date Analysed (TRH C10-C36)				26/11/10	[NT]	[NT]	LCS	26/11/10
TRH C_{10} - C_{14}	mg/kg	20	SEO-020	<20	[NT]	[NT]	LCS	106%
TRH C_{15} - C_{28}	mg/kg	50	SEO-020	<50	[NT]	[NT]	LCS	126%
TRH C_{29} - C_{36}	mg/kg	50	SEO-020	<50	[NT]	[NT]	LCS	105%

QUALITY CONTROL PAHs in Soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				26/11/2010	[NT]	[NT]	LCS	26/11/2010
Date Analysed				26/11/2010	[NT]	[NT]	LCS	26/11/2010
Naphthalene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	LCS	109%
2-Methylnaphthalene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	[NR]	[NR]
1-Methylnaphthalene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	[NR]	[NR]
Acenaphthylene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	LCS	112%
Acenaphthene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	LCS	110%
Fluorene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	[NR]	[NR]
Phenanthrene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	LCS	103%
Anthracene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	LCS	121%
Fluoranthene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	LCS	127%
Pyrene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	LCS	129%
Benzo[*a*]anthracene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	[NR]	[NR]
Benzo[*b,k*]fluoranthene	mg/kg	0.2	SEO-030	<0.20	[NT]	[NT]	[NR]	[NR]
Benzo[*a*]pyrene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	LCS	109%
Indeno[*123-cd*]pyrene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	[NR]	[NR]
Dibenzo[*ah*]anthracene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	[NR]	[NR]
Benzo[*ghi*]perylene	mg/kg	0.1	SEO-030	<0.10	[NT]	[NT]	[NR]	[NR]
Total PAHs (sum)	mg/kg	1.8	SEO-030	<1.8	[NT]	[NT]	[NR]	[NR]
Nitrobenzene-d5	%	0	SEO-030	103	[NT]	[NT]	LCS	95%
2-Fluorobiphenyl	%	0	SEO-030	99	[NT]	[NT]	LCS	92%
p -Terphenyl-*d* 14	%	0	SEO-030	106	[NT]	[NT]	LCS	108%

QUALITY CONTROL OC Pesticides in Soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				26/11/2010	[NT]	[NT]	LCS	26/11/2010
Date Analysed				26/11/2010	[NT]	[NT]	LCS	26/11/2010
HCB	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
gamma-BHC (Lindane)	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Heptachlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	85%
Aldrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	79%
beta-BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
delta-BHC	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	71%
Heptachlor Epoxide	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
o,p-DDE	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-Endosulfan	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
trans-Chlordane *(gamma)*	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
cis-Chlordane *(alpha)*	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
trans-Nonachlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
p,p-DDE	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Dieldrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	89%
Endrin	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	101%
o,p-DDD	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
o,p-DDT	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-Endosulfan	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
p,p-DDD	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
p,p-DDT	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	LCS	82%
Endosulfan Sulphate	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Methoxychlor	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Ketone	mg/kg	0.1	SEO-005	<0.1	[NT]	[NT]	[NR]	[NR]
2,4,5,6-Tetrachloro-m-xylene *(Surrogate*	%	0	SEO-005	96	[NT]	[NT]	LCS	95%

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QUALITY CONTROL Metals in Soil by ICP-OES	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Metals)				29/11/2010	[NT]	[NT]	LCS	29/11/2010
Date Analysed (Metals)				29/11/2010	[NT]	[NT]	LCS	29/11/2010
Arsenic	mg/kg	3	SEM-010	<3	[NT]	[NT]	LCS	101%
Cadmium	mg/kg	0.3	SEM-010	<0.3	[NT]	[NT]	LCS	106%
Chromium	mg/kg	0.3	SEM-010	<0.3	[NT]	[NT]	LCS	106%
Copper	mg/kg	0.5	SEM-010	<0.5	[NT]	[NT]	LCS	105%
Lead	mg/kg	1	SEM-010	<1	[NT]	[NT]	LCS	104%
Nickel	mg/kg	0.5	SEM-010	<0.5	[NT]	[NT]	LCS	104%
Zinc	mg/kg	0.5	SEM-010	<0.5	[NT]	[NT]	LCS	106%

QUALITY CONTROL Mercury Cold Vapor/Hg Analyser	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted (Mercury)				29/11/2010	[NT]	[NT]	LCS	29/11/2010
Date Analysed (Mercury)				29/11/2010	[NT]	[NT]	LCS	29/11/2010
Mercury	mg/kg	0.05	SEM-005	<0.05	[NT]	[NT]	LCS	108%

QUALITY CONTROL Moisture	UNITS	LOR	METHOD	Blank
Date Analysed (moisture)				[NT]
Moisture	%	1	AN002	<1

Result Codes

[INS] : Insufficient Sample for this test
[NR] : Not Requested
[NT] : Not tested
[LOR] : Limit of reporting
[RPD] : Relative Percentage Difference
* : Not part of NATA Accreditation
[N/A] : Not Applicable

Report Comments

Samples analysed as received. Solid samples expressed on a dry weight basis.
Date Organics extraction commenced:
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Air-toxics and Dioxins/Furans*)
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Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.au.sgs.com/sgs-mp-au-env-qu-022-qa-qc-plan-en-09.pdf

SAMPLE RECEIPT ADVICE (SRA)

24 November 2010

Client Details			**Laboratory Details**		
Requested By	:	**Con Kariotoglou**			
Client	:	Aargus Pty Ltd	Laboratory	:	SGS Environmental Services
Contact	:	Administration Manager	Manager	:	Edward Ibrahim
Address	:	446 Parramatta Road PETERSHAM NSW 2049	Address	:	Unit 16, 33 Maddox Street Alexandria NSW 2015
Email	:	admin@aargus.net	Email	:	au.samplereceipt.sydney@sgs.com
Telephone	:	1300 137 038	Telephone	:	61 2 8594 0400
Facsimile	:	1300 136 038	Facsimile	:	61 2 8594 0499
Project	:	ES3897 - Lakemba	Report No	:	**SE83441**
Order Number	:		No. of Samples	:	6
Samples	:	6 Soils	Due Date	:	30/11/2010

Date Instructions Received : 24/11/2010
Sample Receipt Date : 24/11/2010

Samples received in good order	:	YES	Samples received in correct containers	:	YES
Samples received without headspace	:	YES	Sufficient quantity supplied	:	YES
Upon receipt sample temperature	:	Cool	Cooling Method	:	Ice Pack
Sample containers provided by	:	SGS	Samples clearly Labelled	:	YES
Turnaround time requested	:	Standard	Completed documentation received	:	YES

Samples will be held for 1 month for water samples and 3 months for soil samples from date of receipt of samples, unless otherwise instructed.

Comments

The signed chain of custody will be returned to you with the original report.

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Member of the SGS Group (SGS SA)

SAMPLE RECEIPT ADVICE (SRA) - continued

Client	:	Aargus Pty Ltd	Report No	:	SE83441
Project	:	ES3897 - Lakemba			

Summary of Samples and Requested Analysis

The table below represents SGS Environmental Service's understanding and interpretation of the customer supplied sample request.

Please indicate ASAP if your request differs from these details.

Testing shall commence immediately as per this table, unless the customer intervenes with a correction prior to testing.

Note that a small X in the table below indicates some testing has not been requested in the package.

Sample No.	Description	Metals Prep & Inorganics - All	MBTEX in Soil	TRH in soil with C6-C9 by P/T	PAHs in Soil	OC Pesticides in Soil	Metals in Soil by ICP-OES	Mercury Cold Vapor/Hg Analyser	Moisture
1	S1	X				X	X	X	X
2	S2	X			X		X	X	X
3	S3	X	X	X	X		X	X	X
4	S4	X	X	X			X	X	X
5	S5	X	X	X			X	X	X
6	S6	X				X	X	X	X

Sample No.	Description
1	S1
2	S2
3	S3
4	S4
5	S5
6	S6

Revised CoC.
24/11/10
CR

AARGUS PTY LTD

Laboratory Test Request / Chain of Custody Record

446 Parramatta Road
PETERSHAM NSW 2049
P O Box 398
DRUMMOYNE NSW 1470
Tel: 1300 137 038
Fax: 1300 136 038
email: admin@aargus.net

Page 1 of 1

TO: SGS AUSTRALIA PTY LTD
UNIT 16
33 MADDOX STREET
ALEXANDRIA NSW 2015

PH: 02 8594 0400 FAX: 02 8594 0499
ATTN:

Sampling Date: 23.11.2010
Sampled By: CK
Project Manager: CK
Job No: ES3897
Project: Lakemba
Location: Lakemba

Results required by: Tuesday, 30 - 11 - 2010 by 4pm

	Sampling details: Location	Depth (m)	Sample type: Soil	Sample type: Water	Heavy Metals As, Cd, Cr, Cu, Pb, Hg, Ni and Zn	TPH / BTEX	PAH	OCP						KEEP SAMPLE
1	S1	0.4	DSG		✓			✓						YES
2	S2	0.3	DSG		✓		✓							YES
3	S3	0.4	DSG		✓	✓	✓							YES
4	S4	0.5	DSG		✓	✓								YES
5	S5	0.3	DSG		✓	✓								YES
6	S6	0.5	DSG		✓			✓						YES

SGS
Received 24/11/2010
By Angela
Time 1:35 pm
Sample intact Yes
Yes
5°C
SS30-S3
SE 83441

Relinquished by: Name	Signature	Date	Received by: Name	Signature	Date
Con Kariotoglou	CK	23.11.2010	Angela	Angela	24/11/2010 @ 1:35pm

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sample (glass jar)	DSP	Disturbed soil sample (small plastic bag)
WP	Water sample, plastic bottle	DSG	Disturbed soil sample (glass jar)	✓	Test required

@ mole H^+/tonne

APPENDIX G

IMPORTANT INFORMATION ABOUT YOUR ENVIRONMENTAL REPORT

IMPORTANT INFORMATION ABOUT YOUR ENVIRONMENTAL SITE ASSESSMENT

These notes have been prepared by Aargus (Australia) Pty Ltd and its associated companies using guidelines prepared by ASFE (The Association) of Engineering Firms Practising in the Geo-sciences. They are offered to help you in the interpretation of your Environmental Site Assessment (ESA) reports.

REASONS FOR CONDUCTING AN ESA

ESA's are typically, though not exclusively, carried out in the following circumstances:

- as pre-acquisition assessments, on behalf of either purchaser or vender, when a property is to be sold;
- as pre-development assessments, when a property or area of land is to be redeveloped or have its use changed for example, from a factory to a residential subdivision;
- as pre-development assessments of greenfield sites, to establish "baseline" conditions and assess environmental, geological and hydrological constraints to the development of, for example, a landfill; and
- as audits of the environmental effects of an ongoing operation.

Each of these circumstances requires a specific approach to the assessment of soil and groundwater contamination. In all cases however, the objective is to identify and if possible quantify the risks that unrecognised contamination poses to the proposed activity. Such risks may be both financial, for example, cleanup costs or limitations on site use, and physical, for example, health risks to site users or the public.

THE LIMITATIONS OF AN ESA

Although the information provided by an ESA could reduce exposure to such risks, no ESA, however, diligently carried out can eliminate them. Even a rigorous professional assessment may fail to detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled.

AN ESA REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

Your environmental report should not be used:

- when the nature of the proposed development is changed, for example, if a residential development is proposed instead of a commercial one;
- when the size or configuration of the proposed development is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership
- or for application to an adjacent site.

To help avoid costly problems, refer to your consultant to determine how any factors, which have changed subsequent to the date of the report, may affect its recommendations.

ESA "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of contamination, its likely impact on the proposed development and appropriate remediation measures. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to help minimise its impact. For this reason owners should retain the services of their consultants through the development stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Natural processes and the activity of man change subsurface conditions. As an ESA report is based on conditions, which existed at the time of subsurface exploration, decisions should not be based on an ESA report whose adequacy may have been affected by time. Speak with the consultant to learn if additional tests are advisable.

ESA SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Every study and ESA report is prepared in response to a specific brief to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Other persons should not use a report for any purpose, or by the client for a different purpose. No individual other than the client should apply a report even apparently for its intended purpose without first conferring with the consultant. No person should apply a report for any purpose other than that originally contemplated without first conferring with the consultant.

AN ESA REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when design professionals develop their plans based on misinterpretations of an ESA. To help avoid these problems, the environmental consultant should be retained to work with appropriate design professionals to explain relevant findings and to review the adequacy of their plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final borehole or test pit logs are developed by environmental scientists, engineers or geologists based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final logs customarily included in our reports. These logs should not under any circumstances be redrawn for inclusion in site remediation or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimise the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To reduce the likelihood of boring log misinterpretation, the complete report must be available to persons or organisations involved in the project, such as contractors, for their use. Those who o not provide such access may proceed under the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing all the available information to persons and organisations such as contractors helps prevent costly construction problems and the adversarial attitudes that may aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because an ESA is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in transmittals. These are not exculpatory clauses designed to foist liabilities onto some other party. Rather, they are definitive clauses that identify where your consultant's responsibilities begin and end. Their use helps all parties involved recognise their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your ESA report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

APPENDIX H

PROJECT TEAM

Aargus

C O N   K A R I O T O G L O U

DATE OF BIRTH 10th December 1962

EDUCATIONAL
Bachelor of Science
Sydney University, Sydney Australia
Advanced Certificate, Graphic Design
Billy Blue School of Graphic Arts

ADDITIONAL COURSES
Certificate, Building Business Management
Certificate, Desktop Publishing

FIELDS OF SPECIAL COMPETENCY
Occupational Health & Safety. Hazardous Materials Assessment. Management, technical advice, planning, data evaluation, coordinating and supervision of environmental/contaminated site assessments including preliminary and detailed assessments.

EXPERIENCE:

2007-present ....**Project Manager**, *Aargus Pty Ltd, Sydney*

2002-2007.......................................**Creative Director**, *Howling Media*

1996-2002.......................................**Senior Environmental Manager**, *EnviroSciences*

1990-1996.......................................**OH&S Officer,** *EnviroSciences*

1988-1990.......................................**Scientific Officer**, *Sydney Diagnostic Services*

1986-1988.......................................**Technical Officer,** *Douglas Laboratories*

PROJECT EXPERTISE

Air Quality Monitoring – Levels of volatile gases were monitored to determine Occupational Health and Safety (OH&S) compliance within an enclosed work environment.

Acid Sulphate Soil Assessment – Development areas within potential Acid Sulphate Soil regions were assessed to determine the presence, absence or extent of Acid Sulphate Soils. Duties included site surveys, soil sampling, chemical testing of soils, preparation of borehole logs, liaising with clients and regulatory authorities and report generation.

Asbestos Monitoring – Dust emissions from the demolition of a building and excavation of soil with known asbestos contamination were monitored in order to measure effects on the neighbouring properties. Duties included the use of technical equipment, liaising with site personnel, analysis of data and report generation.

Asbestos Removal – Work involved monitoring the removal and delineating the extent of contamination of bonded asbestos waste from an excavation site.

Classification of Excavation Material, NSW – Involvement in classifying excavated material from development sites for removal to an appropriate landfill or assessing suitability for use within a proposed development. Duties included liaising with site personnel / contractors, soil sampling and descriptions, QA/QC and report generation.

Dust Monitoring – Dust emissions from construction sites were collected over a period of time in order to assess the specific amount of particulate matter escaping the construction area onto neighbouring properties.

Environmental Management Plans – Preparation of how the earthworks program are to be undertaken during the development works, the environmental procedures to be followed during operation and includes an Occupation Health & Safety (OH&S) plan.

Ground Water Well Monitoring – Work involved instructing contractors on where to drill monitoring wells, construction and interpretation of survey data of the wells, measurements of groundwater levels, measurement of the rate of groundwater infiltration, sampling of groundwater, QA/QC, determining groundwater flow direction and report generation

Hazardous Materials Assessment – Structures proposed for demolition were surveyed for hazardous material such as asbestos, lead and other substances known to be harmful to human health and the environment. Duties included liaising with contractors and regulatory authorities, identification of hazardous materials, sampling of potential hazardous materials and report generation.

Lead Assessment – Buildings were surveyed for lead paint, dust and soils and assessed to determine if they were harmful to human health and the environment. Duties included liaising with government, regulatory authorities, identification of lead based materials, sampling of these materials and report generation.

Phase 1 Environmental Site Assessments (desktop) – Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

Phase 2 Environmental Site Assessments – Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

Remedial Action Plans – Options for the remediation of known contaminated sites were prepared in order to determine the most efficient methods of remediation. Duties included reviewing of previous environmental assessments, data analysis, design and costing of potential remedial options.

Site Based Management Plans – includes detailed management practices, and procedures for all identified environmental issues for every environmentally relevant activity (ERA) within the site. The plans provide the environmental procedures to be followed during operation and are to safeguard the way in which waste is managed.

Soil Vapour Survey – Soil vapours originating from beneath an apartment block development containing known contamination were monitored to assess the affects on human health. Duties included operation of technical equipment, sampling of soil vapours, QA/QC, analysis of data and report generation.

Targeted Environmental Site Assessments – Duties included historical searches, analysing aerial photographs, liaising with authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

Underground Storage Tank Removal – Removal of underground storage tanks in order to satisfy regulatory requirements for the redevelopment of sites. Duties included historical searches, liaising with contractors and regulatory authorities, sampling and analysis design, soil and groundwater sampling, decontamination, QA/QC, data analysis and report generation.

M A R K K E L L Y

DATE OF BIRTH	25th October 1975
EDUCATIONAL QUALIFICATIONS	BAppSc (Geology) (Hons) University of New South Wales, Sydney, Australia Majoring in Soil and Groundwater Resources and Remediation
ADDITIONAL COURSES	Groundwater Hydrology Hydrogeochemistry Analysis and Interpretation of Hydrogeochemical Data Physical Aspects of Contaminated Groundwater Interpretation of Aeromagnetics Structural Interpretation and Analysis
PROFESSIONAL MEMBERSHIP	Geological Society of Australia (GSA)
PROFESSIONAL LICENCES	Senior First Aid Certificate (2006) X-ray Fluorescence (XRF) Metal Detector Operation License (EPA License No 24430) Energy Australia Passport (Service No. 7728)
PROFESSIONAL TRAINING	Asbestos Removal Course (TAFE NSW) XRF Training Course Energy Australia inductions, electrical safety rules, environmental training, safety training, first aid training, CPR training, low voltage release and rescue training and courses, substation entry & safely working near live power cables in EA network courses
FIELDS OF SPECIAL COMPETENCY	**Contaminated Land Assessment and Site Remediation –** management, technical advice, planning, data evaluation, coordinating and supervision of environmental/contaminated site assessments including preliminary and detailed assessments, contaminated site remediation and validation with particular reference to soil, water and groundwater. Acid sulphate soils, salinity and hazardous materials assessments.

EXPERIENCE:

2007 – Present	Senior Environmental Geologist – Aargus Pty Ltd
2006 - 2007	Senior Environmental Geologist – Geotechnique Pty Ltd
1999 – 2006	Environmental Geologist – Geotechnique Pty Ltd

PRACTICAL EXPERIENCE (Office)

- Project management, scheduling laboratory chemical analysis, data evaluation and reporting on environmental/contaminated site investigations including preliminary, detailed assessments, remediation and validation
- Preparation of waste classification, including biosolids from sewage treatment plants
- Salinity Assessments
- Preparation of proposals
- Occupational Health & Safety Issues
- Environmental Management Plans
- Coordinating and corresponding with Principal/Senior Environmental Engineers, Environmental Engineers, field staff, management, clients and contractors
- Liaising and negotiating with relevant government departments, statutory authorities
- Basic Turbocad skills

PRACTICAL EXPERIENCE (Field)

- Site inspections
- Soil and water sampling
- Installation of groundwater monitoring wells
- Assessing the contamination status of land/water
- Site remediation and validation
- Site management including remediation, asbestos removal
- PID calibration and use
- Hazardous material assessment
- Salinity indicators
- Service station works including underground storage tank removal
- Gas monitoring

SITES

Investigations have been carried out on a number of sites across the Sydney Metropolitan area, the greater Sydney area, rural NSW and interstate. The types of sites assessed include:

- Rural residential properties including active and former agricultural (market gardens, orchards, nursery, poultry) lands, farming lands, vacant lands etc

- Residential Properties including residential, townhouse and units

- Commercial / Industrial including activities such as tanneries, printing, tyre storage and manufacture, paint storage and manufacture, metal works, foundries, wheat processing and storage, scrap metal yards, metal recyclers etc

- Service Station Sites including small scale operations to larger sites operated by BP, Caltex etc.

- Schools including pre-development, re-development, refurbishing, hazardous materials assessment.

- Childcare Facilities

- Energy Australia facilities including active sites and decommissioning of sites.

- Sewage Treatment Plants including the assessment of biosolids, installation works and initialization of site management plans and inspections.

PROJECT EXPERTISE

Air Quality Monitoring – Levels of volatile gases were monitored to determine Occupational Health and Safety (OH&S) compliance within an enclosed work environment.

Acid Sulphate Soil Assessment – Development areas within potential Acid Sulphate Soil regions were assessed to determine the presence, absence or extent of Acid Sulphate Soils. Duties included site surveys, soil sampling, chemical testing of soils, preparation of borehole logs, liaising with clients and regulatory authorities and report generation.

Asbestos Monitoring – Dust emissions from the demolition of a building and excavation of soil with known asbestos contamination were monitored in order to measure effects on the neighbouring properties. Duties included the use of technical equipment, liaising with site personnel, analysis of data and report generation.

Asbestos Removal – Work involved monitoring the removal and delineating the extent of contamination of bonded asbestos waste from an excavation site.

Buried Chicken Carcass Removal – Work involved monitoring the removal and delineating the extent of buried of chicken carcasses within an existing poultry farm.

Classification of Excavation Material, NSW – Involvement in classifying excavated material from development sites for removal to an appropriate landfill or assessing suitability for use within a proposed development. Duties included liaising with site personnel / contractors, soil sampling and descriptions, QA/QC and report generation.

Dilapidation Assessment –The assessment entailed a site visit and a written and photographic documentation of all structural cracks on walls, ceilings, pavements, grates and road surfaces in the vicinity of the site. The purpose is to establish the pre-existing condition of the buildings so that any claim made for defects that occur during or after construction can be validated. Duties included liaising with site personnel / contractors, site inspection and report generation.

Due Diligence Reports – Carried out in relation to property acquisition and due diligence. Duties varied from report reviews, comments, costing, desktop studies, sampling and assessment, and reporting.

Dust Monitoring – Dust emissions from construction sites were collected over a period of time in order to assess the specific amount of particulate matter escaping the construction area onto neighbouring properties.

Effluent Disposal – Work was undertaken to assess the suitability of soil material for the construction of an effluent treatment and disposal system. Duties included soil sampling, preparation of borehole logs, calculation of permeability and flow rates and report generation.

Environmental Management Plans – Preparation of how the earthworks program are to be undertaken during the development works, the environmental procedures to be followed during operation and includes an Occupation Health & Safety (OH&S) plan.

Ground Water Well Monitoring – Work involved instructing contractors on where to drill monitoring wells, construction and interpretation of survey data of the wells, measurements of groundwater levels, measurement of the rate of groundwater infiltration, sampling of groundwater, QA/QC, determining groundwater flow direction and report generation

Hazardous Materials Assessment – Structures proposed for demolition were surveyed for hazardous material such as asbestos, lead and other substances known to be harmful to human health and the environment. Duties included liaising with contractors and regulatory authorities, identification of hazardous materials, sampling of potential hazardous materials and report generation.

Lead Assessment – Buildings were surveyed for lead paint, dust and soils and assessed to determine if they were harmful to human health and the environment. Duties included liaising with government, regulatory authorities, identification of lead based materials, sampling of these materials and report generation.

Phase 1 Environmental Site Assessments (desktop) – Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

Phase 2 Environmental Site Assessments – Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

Remedial Action Plans – Options for the remediation of known contaminated sites were prepared in order to determine the most efficient methods of remediation. Duties included reviewing of previous environmental assessments, data analysis, design and costing of potential remedial options.

Remediation Validation – The collection of data to assess the efficacy of remediation works in decontaminating sites. Duties included liaising with clients, contractors and regulatory authorities, field sampling, QA/QC, data analysis and report generation.

Salinity Assessments – Duties included historical searches, analysing aerial photographs, liaising with authorities, identification of potential contaminants, sampling and analysis design, soil sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

Sampling and Testing Plans – Preparation of sampling location, sampling density and testing program for ESA's and RemVal's that are sent to the Site Auditor for approval.

Site Audit Responses – replying to comments made by NSW Site Auditors on selected jobs to meet final requirements for a full clearance of a site after remedial works have taken place.

Site Based Management Plans – includes detailed management practices, and procedures for all identified environmental issues for every environmentally relevant activity (ERA) within the site. The plans provide the environmental procedures to be followed during operation and are to safeguard the way in which waste is managed.

Soil Vapour Survey – Soil vapours originating from beneath an apartment block development containing known contamination were monitored to assess the affects on human health. Duties included operation of technical equipment, sampling of soil vapours, QA/QC, analysis of data and report generation.

Targeted Environmental Site Assessments – Duties included historical searches, analysing aerial photographs, liaising with authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

Underground Storage Tank Removal – Removal of underground storage tanks in order to satisfy regulatory requirements for the redevelopment of sites. Duties included historical searches, liaising with contractors and regulatory authorities, sampling and analysis design, soil and groundwater sampling, decontamination, QA/QC, data analysis and report generation.

MAJOR PROJECTS

- Auburn Hospital - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- Australian Defence Industries site, St Marys – Former defence force lands. An extensive sampling program was managed and the results of soil analysis were reviewed with respect to human heath risk and potential ecological impact. Reports endorsed by accredited site auditor.

- Auburn Catholic Club - Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- Barter & Sons - Former poultry farm, scheduled for industrial / commercial development. Responsible for cost estimating, project management and co-ordination of site investigation works. Included a review of available site history, and contamination assessment of soils, targeting heavy metals, pesticides and asbestos. Remediation recommended landfill disposal (industrial and solid waste category).

- Brown Consulting (NSW) Group - Newbury Estate, Stanhope Gardens - Former market garden and grazing site developed for low density residential purposes. Responsible for cost estimating, project management and co-ordination of site investigation works, remediation and validation. Included review of site history information, contamination assessment of soils waters and sediment. Remediation recommendations included Landfill disposal and land farming. Reported on site investigations, remediation options (Remediation Action Plan), and validation. Reports endorsed by accredited site auditor.

- Columban Mission Institute, North Turramurra - Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

- Cronulla Sewage Treatment Plant – Classification of biosolids for disposal off site to other land uses or to landfills.

- Deicorp Pty Ltd – Coulson Street, Erskineville – Former clothing factory and workshops with a UST to be redeveloped into a number of multi-storey residential apartment blocks. The collection of data to assess the efficacy of remediation works in decontaminating the site. Duties included liaising with clients, contractors and regulatory authorities, field sampling, QA/QC, data analysis and report generation. Reports endorsed by accredited site auditor.

- Department of Commerce – Assessment of a number of Department of Housing sites for potential hazardous materials within active housing commission units.

- Department of Housing – Lilyfield - Development of a residential area. Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

- Department of Lands – Redfern - Development of a major residential area. Duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

- Duffy Kennedy Constructions – Cronulla – A former service station site. Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- EG Property Group / Funds Management –Port Adelaide, SA, Summer Hill and Five Dock, NSW –Active transport company, wheat production plant and silos, former bowling greens, former railway lines, land filling activities, land reclamation. Reports for due diligence and full environmental site assessments, duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil and groundwater sampling, preparation of borehole logs, decontamination, QA/QC and report generation.

- Energy Australia Substations - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- Event Project Management - Bundaleer Street, Belrose – An active nursery to be redeveloped as part of extension works to the Covenant Christian School. A Phase 1 and Phase 2 contaminated land investigation with recommendations for remediation techniques and costs.

- Exceland Property Group (NSW) Pty Ltd – The Castellorizian Club at Kingsford. Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

- Glasson Family Group – Wolli Creek – A large development site comprising a number of industrial properties including factories, warehouses, car yards etc. Conducting sampling and reporting on ASS/PASS and potential management techniques during future development.

- Glenbrook Sewer Installation - Environmental Representative for sewer installation contracts in Glenbrook. Responsible for the preparation of Environmental Management Plans (EMP) and work method statements. Monitored the works undertaken by the contractor, ensuring adequate environmental safeguards are in place and maintained. Prepared inspection reports and EMP status reports for Sydney Water.

- Granville Boys High School – assessment of soils and supervision of remedial works within an existing playing field. Remedial works included removal of soils contaminated with asbestos to an EPA licensed landfill.

- Group Development Services – Carrying out full assessments, from Stage 1 to Stage 4, on numerous rural residential sites in north western Sydney.

- International Speedway, Granville – Assessment of an existing spectator mound for asbestos and other soils analytes and recommendations for capping on-site.

- IWD Pty Ltd - Lyons Road, Drummoyne – A former service station with numerous UST's. The assessment included tank and line tests, gross pollution review, soil sampling, groundwater sampling, historical review and final data interpretation. Remediation of contaminated soils after the tanks were removed, soil classification and final validating of site surfaces. Reports endorsed by accredited site auditor.

- JK Williams Contracting Pty Ltd - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- John Morony Correctional Complex, Berkshire Park – assessment of soils and preparation of remedial costs prior to extension works to the existing prison.

- Landcom - Archbold Road, Eastern Creek and McIver Avenue, Middleton Grange – Former farming lands purchased by Landcom for residential subdivision, school developments, parklands and town centre (shopping facilities etc). Responsible for cost estimating, project management and co-ordination of site investigation works. Preparation of a preliminary RAP and recommendations in remediation techniques and costs.

- Liverpool City Council – Former park lands. Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

- Mann Group - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- Manson Group – Kogarah – Former glass factory with an UST. Preparation of a Remedial Action Plan (RAP), followed by remediation and validation of the site including project management, liaising with contractors and clients, sampling, soil classification and assessment, and final report generation.

- Narwee Boys High School – Preparation of a hazardous materials (HAZMAT) assessment. Analysis involved identifying asbestos materials from lagging, roofing guttering, floor tiles, electricity backing boards, mercury switches, mercury/cadmium lamps, synthetic mineral fibres, lead paint etc.

- Parramatta City Council - Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- Paynter Dixon Constructions Pty Ltd – Homebush – Teachers Credit Union site. Duties included historical searches, analysing aerial photographs, liaising with authorities (WorkCover, Council's, EPA etc), identification of potential contaminants and report generation.

- Penrith City Council - Claremont Meadows Stage 2 – South Western Precinct – Masterplan. Full environmental and salinity assessments were carried out to address the Claremont Meadows Stage 2 DCP - Performance Standards for which is currently under consideration by the Council for the Stage 1 Subdivision Plan of the properties provides for creation of residential allotments, dedication of a Public

Reserve, construction and dedication of new roads and creation of residue lots for future development.

- Proust & Gardner Consulting - Carrying out full assessments, from Stage 1 to Stage 4, on numerous rural residential and residential sites in both the local Sydney and Central Coast regions. Sites included vacant lands, farming lands, market gardens, poultry farms, residential properties and schools.

- Reefway Waste Services – Alexandria and Auburn – Active waste receivers and recyclers. Management of soil quality by analysing soils for reuse. Discussion with DECC on providing a 'gateway' mechanism for removing bona fide resource recovery from the waste regulatory framework.

- Richard Crookes Constructions Pty Ltd – Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

- Robert Moore & Asscoiates - Carrying out full assessments, from Stage 1 to Stage 4, on numerous rural residential and residential sites across Sydney. Sites included vacant lands, farming lands, market gardens and residential properties.

- Royal Botanical Gardens, Sydney – Former works depot. Managing removal of UST's and associated pipelines, sampling and soil classification of soils to an EPA inert and solid waste licensed landfill.

- Sam the Paving Man - Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- Stocklands Mall, Merrylands - Former carpark area. Sampling and soil classification of soils, followed by onsite management of the disposal of the soils to licensed landfills.

- SPAD Pty Ltd – Former chemical factory. Report for full environmental site assessment, duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil sampling, preparation of borehole logs, decontamination, QA/QC and report generation. Preparation of a RAP, managing remedial works and issuing final validation report.

- Sydney Airport Corporation – Soil classification and leachate management for an EPA solid licensed landfill.

- Telstra Depot, Rooty Hill - Report for full environmental site assessment, duties included desktop study, liaising with clients, contractors and regulatory authorities, identification of potential contaminants, sampling and analysis design, soil sampling, preparation of borehole logs, decontamination, QA/QC and report generation. Preparation of a RAP, managing remedial works and issuing final validation report.

- THG Resource – Kingston, QLD –Active scraps metal and car recycler. Duties included detailing management practices, outlining procedures for all identified environmental issues and providing a plan during operation to safeguard the way in which waste is managed.

- University of Sydney - Various soil classifications and leachate management for an EPA inert and solid licensed landfill.

APPENDIX I

AARGUS FIELDWORK PROTOCOLS

Fieldwork Protocols

February 2008

TABLE OF CONTENTS

LIST OF TABLES

1.0 OBJECTIVE AND SCOPE

The objective of Aargus Pty Ltd (Aargus) Protocols is to ensure that the methodology followed during environmental works is adequate to provide data which is usable and representative of the conditions actually encountered at the site.

The scope of these protocols is to:

- Outline the methods and procedures for the field investigations during an environmental assessment or remediation and validation program; and
- Specify methods and procedures which ensure that soil and groundwater samples recovered are representative of the actual subsurface conditions at the site, as well as ensuring that the risk of introducing external contamination to samples and to the environment is minimised.

These protocols must be adhered to by Aargus personnel and by sub-contractors involved in field investigations. Any deviations from these protocols should be explained within the Environmental Report to which they are attached.

2.0 SOIL SAMPLING

2.1 Collection methods

Possible collection methods

Soil samples are generally collected by drilling or excavating the subsurface, using one of the following drilling / excavating technique:

- Rotary air hammer
- Hand auger
- Solid or hollow auger
- Backhoe or Excavator

Rotary Air Hammer

The air hammer technique requires the use of synthetic blend lubricants to prevent potential contamination of the borehole if a leak were to occur. In addition, micro-filters are installed into the drilling airline to avoid contamination by hydrocarbons present in the compressed air.

Samples of rock are generally not collected. Where rock samples are needed, specialised techniques are used.

Hand auger

A hand auger is generally used to investigate subsurface conditions of unconsolidated materials at shallow depths or in areas difficult to access with other equipment. Samples are recovered from the hand auger, taking care to avoid cross contamination, especially between samples from the same hole but at different depths. Sampling equipment is to be thoroughly cleaned between sampling events, in accordance with the procedures outlined in Section 2.5 Equipment decontamination.

Solid or Hollow auger

Solid and hollow auger drilling techniques are well suited to unconsolidated materials. The main advantage of the hollow auger technique is that the drill rods allow access of sampling equipment at specified depths within the annulus of the drill rods.

Samples of soil are recovered using a split spoon sampler at specific depth intervals. The split spoon sampler is driven into the soil by the drill rig whilst attached to the end of the drill rods. The retrieved sample is then split lengthways into two halves when duplicate samples are required. A few centimetres of soil from the top of the split spoon sampler is discarded. Samples for volatile analysis are collected first, without mixing.

Test pits and trenches excavated with a backhoe or an excavator

Test Pit and Trenches excavated with a backhoe/excavator are used to collect relatively shallow (i.e. less than 3.5m depth) soil samples on occasions where:

- Access multiple sample locations at a site are needed;
- A description of the subsurface soil profile to approximately 3.5 m depth is required (generally in unsaturated conditions);
- The investigated site is free from known underground services and access problems;
- The investigated site is free from impenetrable surface or near surface layers including concrete and asphalt pavements; and
- Undisturbed soil samples are required, usually at multiple depths.

Backfilling

On completion of drilling / test pitting, the investigated locations are backfilled with cuttings and compacted. Excess drill cuttings are disposed of appropriately. If the sampling location is located in an area used for the circulation of people or vehicles, the top of the sampling location should be sealed with mortar.

2.2 Soil logging

The lithological logging of soil samples and subsurface conditions is undertaken by environmental scientists / engineers. The soil characteristics are logged in accordance with the Australian Standard *AS1726-1993 Geotechnical Site Investigations.* This includes description of grain size, visible staining, odour and colour, and of the clues which may suggest that the soil may be contaminated. Descriptions of soils are made using the Northcote method.

2.3 Collecting soil samples

The soil sample is collected using a stainless steel trowel, or directly with the hand if the sampler wears disposable gloves. Soils are quickly transferred into 250g clean amber glass jars, which have been acid washed and solvent rinsed. The jars are sealed with a screw-on teflon lined plastic lid, labelled, and placed for storage in an ice filled chest.

2.4 Labelling of soil samples

Samples are labelled with the following information:

- Job number;
- Date of sample collection;
- Name of the environmental scientist / engineer who collected the sample; and
- Sample number: the letters used to label the samples are BH, C, SS, SP, TP and V which refer respectively to borehole samples, composite samples, surface samples, stockpile samples, test pit samples and validation samples. For borehole samples, BH3 1.0m is the sample taken from borehole 3 at 1.0m below ground level. For stockpile samples, SP1/1 is the first sample from stockpile 1. TP1 2.0m is the sample taken from testpit 1 at a depth of 2.0 metres below ground level. V3/F is the validation sample taken from location V3, the letters F N, S, E and W refer to the floor, north, south, east and west walls of an excavation; if some contamination is found in the validation sample, then chasing out of the contamination is required and in this case, the label of the sample is

changed by adding /1 or /2 according to the number of times the contamination has been chased out. B stands for blind.

2.5 Equipment decontamination

The drilling and sampling equipment are cleaned using an appropriate surfactant (e.g. phosphate-free detergent or Decon 90), then rinsed with tap water prior to final rinsing with distilled water.

The following procedures shall be followed for decontamination of drilling and sampling equipment:

- buckets or tubs used for decontamination shall be cleaned with tap water and detergent and rinsed with tap water before sampling commences;
- fill first bucket or tub with tap water, and phosphate free detergent;
- fill second bucket or tub with tap water;
- clean equipment thoroughly in detergent water, using a stiff brush; rinse equipment in tap water;
- dry equipment with disposable towels;
- rinse equipment by thoroughly spraying with tap water, then final rinse with distilled water;
- allow equipment to dry; and
- change water and detergent solution between sampling event.

Sampling decontaminated equipment should be kept in a clean area to prevent cross-contamination. Equipment that cannot be thoroughly decontaminated using the detergent wash and water rinse should be cleaned with steam or high pressure water or if a cleaner is not available, not used for further sampling (and labelled clearly "not decontaminated") or discarded. Equipment decontaminated using the high pressure steam cleaner will be treated as described above. Any equipment that cannot be thoroughly decontaminated shall be discarded and replaced.

A new pair of latex gloves is used to handle each sample. Contaminated materials such as disposable clothing should be disposed of in accordance with environmental best practice.

2.6 Surveying of sampling locations

Sampling locations are generally located by reference to existing ground features, e.g. fences, buildings.

If the survey for location and elevation is required, it should be done by a licensed surveyor, or alternatively by an Aargus environmental engineer / scientist if the level of precision required can be obtained by the use of Aargus field equipment. Aargus has GPS equipment and level meters.

If the location is given by a licensed surveyor, it is generally given to the nearest 0.1m and referenced to the Australian Map Grid (AMG) coordinates.

3.0 GROUNDWATER SAMPLING

3.1 Groundwater Sampling Objectives

The primary objective of any groundwater (quality) sampling is to produce groundwater samples that are representative of groundwater in the aquifer and will remain representative until analytical determination or measurements are made.

3.2 Groundwater well construction

Typically wells are installed to gain access to the groundwater to be sampled. Well construction details will depend on hydrogeological setting of the site, for example the depth to groundwater strata present. Relevant information regarding of the hydrogeological setting will have been obtained prior the development of any groundwater sampling program.

The preferred drilling methods will depend on the hydrogeological setting of the site and the objectives of the groundwater sampling program. For example, shallow wells in unconsolidated materials, such as sand, may be drilled using a hand auger. Drill rigs using solid of hollow flight augers may be used to drill deeper wells or through semi consolidated materials, such as stiff clay. Rotary air hammer drilling may be used were well is to be drilled through consolidated materials, such as rock. Soil samples may also be collected during drilling (see Section 2.0 SOIL SAMPLING).

Drilling methods and materials must not have an unacceptable impact on the groundwater to be sampled. For example, if groundwater from the wells is to be tested for organic analytes, petroleum based lubricants are not to be used and oil traps must be installed on compressed air lines. Drilling techniques should also minimise compaction or smearing of the boreholes wells and transport of material into different zones, in particular, when drilling through potentially contaminated material to access groundwater.

Drill cuttings accumulated over a hole are to be removed as drilling progresses so as to prevent fallback of cuttings into the hole. Samples may be collected at a range of depths in the borehole profile during drilling.

The depth of groundwater well depends of the purpose of the investigation on the soil profile and the regional geology of the area. If the borehole location is covered by concrete, coring of the superficial hard layer is undertaken first.

Petroleum based lubricants are not used on drilling and sampling equipment, instead, Teflon based greases are used where appropriate. An Aargus environmental scientist/engineer monitors and records drilling activities, procedures adopted, materials used, progress of the stages of well construction (including (i.e. screen location - standpipe lens, placement, of sand filters and well seals, and general completion details), as well as the lithology of the subsurface, visible staining, unusual odours and colours (if any).

The use of a rotary air hammer rig has many advantages for consolidated material (e.g. rock), including:

- Large diameter to allow precise placement of groundwater monitoring equipment;
- No injection of drilling fluids into the formation with resulting benefits in ensuring integrity of recovered samples, and therefore no need to dispose 0ff-site drilling fluids;
- Rapid penetration in consolidated material; and
- Provision of reliable indications of saturated conditions whilst drilling.

Drill cuttings accumulated over a hole are removed as drilling progresses so as to prevent fallback of cuttings into the hole. Samples are taken at a range of depths in the borehole profile.

Construction of the monitoring well may be carried out by the Aargus environmental scientist/engineer or the drilling contractor under the direct supervision of the Aargus environmental scientist/engineer. Typically on completion of drilling, slotted heavy duty PVC pipe (generally 50mm in diameter for the installation of monitoring well) is inserted into the drilled hole. The base of the pipe is capped prior to insertion in order to prevent natural soils entering the well from below. The drilled area surrounding the pipe screen is filled with coarse-grained sand. Bentonite or cement grout seal plugs may be placed above the screen depending on the hydrogeological setting of the site and sand cement mix. Excess drill cuttings are disposed of in accordance with environmental best practice.

The Aargus environmental scientist/engineer will monitor and record drilling activities, and materials encountered during drilling (including visible staining, unusual odours and colours (if any)). They will log the procedures adopted, materials used, and well construction (i.e. location of the screen, placement of sand packs and well seals and general completion details).

3.3 Development of monitoring wells

Development is the process of removing fine sand silt and clay from the aquifer around the well screen in order to maximise the hydraulic connection between the bore and the formation.

Development involves removal of fluids that may have been introduced during drilling operations as well as fines from the sand filter and screens. Well development generally involves actively agitating the water column in the well then pumping water out until, ideally, water pumped comes out visibly clean and of constant quality. Development can be undertaken immediately after installation of the groundwater well or after sufficient time has been allowed for bentonite / grout seals to consolidate.

Bores used for groundwater quality monitoring should be developed after drilling, then left for a period until bore chemistry can be demonstrated to have stabilised, any where between 24 hours and 7 days.

3.4 Purging of monitoring well

In most groundwater monitoring wells, there is a column of stagnant water above the screen that remains standing in the bore between sampling rounds. Stagnant water is generally not representative of formation water because it is in contact with bore construction materials for extended periods, is in direct contact with the atmosphere and is subject to different chemical equilibria.

Purging is the process of removing this water from the well prior to sampling. In newly installed wells, the disturbance cause by drilling may also affect water present in the well, and purging may be carried out concurrently with well development. Ideally wells should be purged at the lowest rate practicable until stable water chemistry is achieved.

Purging is to be performed less than 24 hours before sample collection, but usually it is performed just before sampling. The default procedure for purging a groundwater monitoring well is as follows:

- If required, measure the concentration of volatile organic vapours in the well standpipe headspace.
- Measure the depth to the standing water level in the well standpipe and the total depth of the well relative to a reference mark (generally the top of the groundwater pipe). The depth of any light non-aqueous phase liquids (LNAPL) floating on the standing water should be recorded if present using an interface probe or other suitable device.
- Calculate the volume of the groundwater in the well standpipe. The internal diameter of the well casing and the diameter of the drill hole are used to calculate the volume of water to be removed during development (nominally a minimum of three well volumes, including water present in the sand pack, should be abstracted during purging).
- Samples of water are collected generally following development/purging of each well volume. The samples are measured immediately in the field for water quality parameters, pH, electrical conductivity, redox potential and temperature. Water quality measurement probes are to be calibrated against stock standards on regular basis and decontaminated between wells.
- Pump/bail groundwater from the well until the water quality parameters have stabilised (i.e. within 10% of the previous reading) or the well is pumped/bailed dry. Collect all purged water into an appropriate volume measurement vessel. Purged water is disposed of appropriately.
- Record all appropriate development details on the well development and sampling sheet.
- Decontaminate all equipment used in the purging procedure.

3.5 Groundwater sampling

For each sampling event, starting water levels, purging times and volumes, water quality parameters and sample details are recorded on well development and sampling sheets.

At each groundwater monitoring well, a polyethylene sheet or Eski lid is placed beside the well head and firmly fixed into position. Sampling equipment is placed onto the sheet to avoid cross contamination between the ground surface and the groundwater in the well.

Groundwater samples are collected in a bailer (Stainless Steel or disposable polymer) fitted with a stainless steel emptying device. The bailer is decontaminated prior to use. All groundwater samples are retrieved at an appropriate rate in order for turbulence (which leads to cloudy samples) to be minimised.

When collecting a water sample the bailer is lowered gently into the well, until it is within the screened interval. The bailer is then steadily withdrawn, to minimise agitation of water in the well and disturbance of the surrounding sand filter material.

The procedure for using the bailer is:

- Slowly lower the bailer into the water and allow it to sink and fill with a minimum of disturbance;
- Empty the first bailer sample into a container in order to measure the volume of bailed water and to rinse the bailer with well water;
- Emptying the bailer through the bottom-emptying device (BED) collects the samples. The sample is discharged down the side of the sample bottle to minimise entry turbulence;
- Collect samples for volatile organics first, followed by semi-volatiles, other organics and then inorganics;
- The flow from the BED is adjusted so that a relatively low flow rate is maintained.

3.6 Low flow purging

Purging large volumes of water can be impractical, hazardous or may adversely affect the contaminant distribution in the sub-surface (e.g. through dilution). Low-flow purging involves minimal disturbance of the water column and aquifer ad is preferable to the removal of a number of bore volumes. This method removes only small volumes of water, typically at rates of 0.1 to 1.0L/min, at a discrete depth within the bore.

Low-flow purging consists essentially of the following steps:

- The pump inlet is carefully and slowly placed in the middle or slightly above the middle of the screened interval at the point where the contaminant concentration is required (dedicated pumps are ideal for low-flow sampling). Placement of the pump inlet too close to the bottom of the bore can cause increased entrainment of solids, which have collected in the bore over time.
- Purging begins, typically at a rate of 0.1 to 1.0L/min, although higher rates may be possible provident the rate of purging does not cause significant draw down in the bore.

- During purging, groundwater stabilisation parameters should be measured and recorded to determine when they stabilise.

- When parameters have stabilised, the sample may be collected, at a rate slower or equal to purge rate.

3.7 Field measurements

Field measurement of groundwater parameters provides a rapid means of assessing certain aspects of water quality. They are generally taken to:

- Ensure that formation water is being sampled

- Provide on-site measurements for water quality parameters that are sensitive to sampling and may change rapidly (e.g. temperature, pH, redox and dissolved oxygen (DO)).

- Compare with laboratory measurements of these parameters to assist in the interpretation of analytical results of other parameters (e.g. check for chemical changes due to holding time, preservation and transport).

Field measurements may be taken either in-situ or after groundwater has been extracted from a bore. Field measurements should be taken immediately before collecting each sample.

pH and dissolved oxygen meters need to be calibrated before every use, in accordance with the manufacturer's instructions. If field meters are to be used over several hours, periodic readings of a reference solution must be made to ensure calibration is stable.

3.8 Labelling of water samples

The water samples are identified with the same information than soil samples. GW4/2 is the sample collected from well GW4, and 2 refers to the sample number from this well, i.e. second time the well is sampled.

3.9 Sampling containers

Water samples are generally collected in bottles and containers provided by the laboratory who will analyse the samples. These are generally plastic bottles for inorganic analysis, and amber glass bottles for organic analysis. Vials are used to collect samples to be analysed for volatile organics. Sampling containers have appropriate preservatives added.

The bottles are filled to overflowing so as to remove air bubbles as much as possible prior to firmly screwing on the container cap. When performing purge and trap analyses, the vials are filled to 100% of their capacity. For headspace analyses, the vials are filled to approximately 75% of their capacity.

3.10 Well surveying

If the survey for location and elevation of a groundwater well is required, it should be done by a licensed surveyor, or alternatively by an Aargus environmental engineer / scientist if the level of precision required can be obtained by the use of Aargus field equipment.

If the location is given by a licensed surveyor, it is generally given to the nearest 0.1m and referenced to the Australian Map Grid (AMG) coordinates.

If the elevation is given by a licensed surveyor, the top of the standpipe and the ground surface adjacent to the standpipe are generally given to the nearest 0.01m and may be referenced to the Australian Height Datum (AHD). Relative levels (RLs) can be used if general contours are required.

4.0 SURFACE WATERS AND STORMWATER SAMPLING

4.1 Surface waters

Surface water samples are collected by hand, using automatic samplers, batch samplers or continuous samplers which can be installed to take samples at discrete time intervals or continuously. For well mixed surface water samples (up to 1m depth) a sample bottle is immersed by hand covered by a glove below the surface. Samples are also taken with sample poles that have extension arms so that more representative samples can be taken. For areas where access is difficult, samples can be collected using a retractable sample extension pole (sample bottle on the end) or in a bucket and transferred to sample bottles immediately following collection. Other methods such as pumping systems, depth samplers, automatic samplers, and integrating systems are all relatively similar with water samples being supplied to a discharge point where samples can be collected in appropriate bottles.

4.2 Stormwater

The monitoring of stormwater quality is generally required prior to reject waters into stormwater drains. Field measurements are generally carried out using a Hanna Multiprobe prior to the discharge of the water to stormwater. The water parameters measured include pH, electrical conductivity (EC, in mS/cm) and Total Dissolved Solids (TDS).

If sampling is required, samples to be analysed for inorganic compounds are collected in plastic bottles, and samples to be analysed for organic compounds are collected in amber glass bottles. The bottles are filled to overflowing so as to remove air bubbles as much as possible prior to firmly screwing on the container cap. Sample containers may have preservatives added, in accordance with the laboratory recommendations.

Vials are used for volatile organic analysis. When performing purge and trap analysis, the vials should be filled to 100% of their capacity, whereas for headspace measurements, the vials should be filled to approximately 75% of their capacity..

4.3 Filtration devices

Water filtration devices may be required to filter surface water before it is discharged to the stormwater network, in order to remove suspended solids in water. One of the most simple and commonly used filtration device consists of between two to four retention sedimentation bays with a geotextile covering the inlet and outlet hoses.

Litter traps (wire or plastic grids or netting) may also be used to remove larger particles or debris. Other techniques to reduce the amount of suspended matter in water include wet basins, artificial wetlands, infiltration trenches and basins, sand filters and porous pavements. Some of these latter methods are also likely to reduce the bacterial levels in water.

The use of these filtration devices does not preclude carrying out monitoring of water quality following treatment and prior to discharge, particularly to the stormwater system.

5.0 PHOTO IONISATION DETECTOR (PID)

Photo Ionisation Detector (PID) measurements are used to provide indicative field measurements of the amount of ionisable vapours released from a soil or water sample into the head space above the sample.

The procedure for field screening of samples using the PID is as follows:

- Prior to testing commencing, the PID is calibrated using standard laboratory calibration gas. The battery of the PID should also be sufficiently charged for the duration of the testing;

- The background concentrations of total ionisable compounds in the ambient air in the vicinity of the work area are established prior to the commencement of site activities. Background measurements are normally taken approximately 5 to 10m upwind of the work area. The readings are observed before and after each measurement of a sample to ensure that the PID is operating correctly. The maximums, fluctuations and other relevant comments are recorded.

- A glass sample jar is filled with the soil sample to be tested. The jar should not be filled more than 3/4 full;
- The jar is sealed with aluminium foil or plastic wrap and the lid is screwed;
- At least 20 minutes after placing the sample into the sampling jar, check that the PID reading is constant and similar to the background. Insert the top of the PID through the foil or plastic wrap in order to measure the ionisable vapour concentrations in the airspace above the sample;
- Monitor and record the PID readings noting fluctuations and maximum readings;
- Monitor the readings after returning the PID to a location with background concentrations. Interchangeable, clean, in-line filters for the PID probe are available to allow rapid decontamination of the unit in the field if background readings measured by the instrument are significantly greater than the background air concentration initially established;
- If perforations are present in the aluminium foil prior to analysis reseal the jar and test after having waited again for at least 20minutes.

An alternative acceptable method is to place the soil to be tested in a disposable zip loc plastic bag and test the sample by punching a hole in the bag with the PID tube to sample the gas from the bag.

6.0 ACID SULFATE SOILS

6.1 Desktop Classification

An initial review of Acid Sulphate Soils (ASS) Planning Maps is undertaken to identify the likelihood and risk of ASS being present at the site. The following geomorphic conditions of the site are also checked as an indication of the presence of ASS: sediments of recent geological age (Holocene) ~ 6000 to 10 000 years old; soil horizons less than 5m AHD (Australian Height Datum); marine or estuarine sediments and tidal lakes; coastal wetlands or back swamp areas; waterlogged or scalded areas; inter-dune swales or coastal sand dunes; areas where the dominant vegetation is mangroves, reeds, rushes and other swamp tolerant and marine vegetation; areas identified in geological descriptions or in maps bearing sulfide minerals, coal deposits or former marine shales/sediments; and deeper older estuarine sediments >10m below the ground surface.

6.2 Site Walkover

The presence on site of hydrogen sulphide odours, acid scalds, flocculated iron, monosulfidic sludges, salt crusts, stressed vegetation, corrosion of concrete and/or steel structures and water logged soils are noted as cues for the presence of ASS.

6.3 Visual Classification

Visual indicators taken into account for the presence of ASS are the presence of jarosite (pale yellow colour) horizons or mottling, unripe muds (waterlogged, soft, blue grey or dark greenish grey in colour), silty sands and sands (mid to dark grey in colour) and the presence of shells.

6.4 Sample Collection

Samples are collected to at least one metre below the depth of the proposed excavation or estimated drop in the water table, or two metres below ground level, whichever is deepest. Samples are collected from every soil horizon or every 0.25m. Large shells, stones and fragments of wood, charcoal and other matter are noted, but removed from the sample. Small roots are not removed from the sample. If laboratory analysis is required, samples are sent for laboratory testing within 24 hours of sampling.

6.5 Field Testing

The field pH peroxide test (pH_{FOX}) is used to obtain an indication of the presence of oxidisable sulphur in the soil. The procedure for this test is as follows:

- A small sample of soil (<100g) is collected in a glass jar and split into two sub-samples. One sub-sample is made into a 1:5 (soil : deionised water) solution in order to measure field soil pH and electrical conductivity (EC) analysis. If the resulting pH is less than 4 (pH_F<4), the sample is identified as actual acid sulphate soil (AASS)

- The second sub-sample is made into a 1:5 (soil : Hydrogen Peroxide) solution to measure pH of oxidised soil. Sodium Hydroxide (NaOH)-adjusted analytical (30%) grade Hydrogen Peroxide (H_2O_2) is used as the soil oxidising agent. A mobile electronic pH/EC probe is used to measure soil pH.

- The presence of oxidisable sulphides, organic matter or manganese in the sample, will trigger a chemical reaction. The type of effervescence and any colour change is noted with the final pH measured to give an indication of the potential change in pH should the soil remain exposed to oxygen. If the resulting pH is less than 3 (pH_{FOX}<3) or if pH_{FOX} is at least one unit less than the $pH_{F,}$ this suggests that the soil tested is potential acid sulfate soil (PASS).

6.6 Laboratory Testing

When the field test suggests that the material tested contains ASS or PASS, this should be confirmed by laboratory analysis (POCAS/SPOCAS or TOS testing).

7.0 NOISE MONITORING

Measurements are taken at a range of times during the day in order to assess the trends in noise emission over time. Noise is measured using a hand-held Rion NA-29 Sound Level Meter with digital microphone. Some noise meters change and appropriate equioment which is calibrated is used for all monitoring. The reference level of the meter is checked before and after the measurements using a Rion NC-73 Sound Level Calibrator to ensure there is no significant drift. Noise measurements are made over a 15-minute interval using the “fast” response of the sound level meter. 5dB would be added if the noise is substantially tonal or impulsive in character. Measurements should be adapted to the type of noise being measured i.e. construction, occupation, club, etc.

8.0 DUST MONITORING

Sampling is conducted at locations of potential concern. The deposit gauge static sampler contains a glass funnel measuring approximately 150mm with the angle of the cones sides being 60 degrees, placed into a rubber stoppers in the mouth of a five-litre glass receptacle. The deposit gauge is placed in a stand so that the height of the funnel of the deposit gauge is between 1.8 and 2.2m above ground level. A quantity of 7.8g copper sulfate pentahydrate dissolved in water is placed in the glass receptacle in order to prevent algal growth.

Exposure periods vary depending on the purpose of the investigation but typically the period is 30 ±2 days. Samples are usually analysed for measured soils: total solids, insoluble solids, ash and combustible solids.

Dust can also be measured using a High Volume Air Sampler. Such sampler should be located at least 2 metre away from any structures so that an undisturbed sample can be collected. HVASs can be used indoors or outdoors.

9.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

9.1 Introduction

Inaccuracies in sampling and analytical programs can result from many causes, including collection of unrepresentative samples, unanticipated interferences between elements during laboratory analyses, equipment malfunctions and operator error. Inappropriate sampling, preservation, handling, storage and analytical techniques can also reduce the precision and accuracy of results.

The Australian Standard AS4482.1-2005 *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds* has documented procedures for quality assurance (QA) and quality control (QC) for sampling and analysis to ensure that the required degree of accuracy and precision is obtained. The Australian Standard also recommends the use of two laboratories for the implementation of a QA program for the analyses in addition to the QC procedures followed by the primary laboratory.

9.2 Field QAQC samples

General

Procedures for duplicate sampling should be identical to those used for routine sampling and duplicate samples will be despatched for analysis for the same parameters using the same methods as the routine samples. No homogenisation of samples which may induce the loss of volatile compounds (such as BTEX) should occur. Whenever possible, the selection of samples for duplicate analyses should be biased towards samples believed to contain the contaminant of concern.

Intra-laboratory duplicates

Intra-laboratory duplicate samples, also referred to as Blind duplicates, are used to assess the variation in analyte concentration between samples collected from the same sampling point and / or also the repeatability of the laboratory analyses. Samples are split in the field to form a primary sample and a QC duplicate (intra-laboratory replicate) sample. The intra-laboratory duplicates are taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action, and divided into two vessels. These samples are submitted to the laboratory as two individual samples without any indication to the laboratory that they have been duplicated.

Intra-laboratory duplicate samples should be collected at a rate of approximately 1 in 20 soil samples and analysed for the full suite of analytes. At least one intra-laboratory duplicate sample should be included in each batch of samples.

Inter-laboratory duplicates

Inter-laboratory duplicate samples, also referred to as Split duplicates, provide a check on the analytical proficiency of the laboratories. The samples are taken from a larger than normal quantity of soil collected from the same sampling point, removed from the ground in a single action, and divided into two vessels. One sample from each set is submitted to a different laboratory for analysis. The same analytes should be determined by both laboratories using the same analytical methods.

Inter-laboratory duplicates should be collected at a rate of approximately 1 in 20 soil samples and analysed for the full suite of analytes. At least one inter-laboratory duplicate sample should be included in each batch of samples.

Blanks

Rinsate Blanks

Rinsate blank samples provide information on the potential for cross-contamination of substances from the sampling equipment used. Rinsate blanks are collected where cross-contamination of samples is likely to impact on the validity of the sampling and assessment process (e.g. when the investigation level of a contaminant is close to the detection limit for this contaminant). They are prepared in the field using empty bottles and the distilled water used during the final rinse of sampling equipment. After completion of the decontamination process, fresh distilled water is poured over the sampling equipment and collected. The distilled water is exposed to the air for approximately the same time the sample would be exposed. The collected water is then transferred to an appropriate sample bottle and the proper preservative added, if required.

One rinsate blank par day and / or one per piece of sampling equipment are collected during the decontamination process, and analysed for the analytes of interest. At least one rinsate blank should be included in each batch of samples. One rinsate blank should be collected for every 50 samples collected and analysed for the full suite of analytes.

Trip Blanks / Spikes

Trip blanks / spikes are a check on the sample contamination originating or lost from sample transport, handling, and shipping. These are samples of soil or water prepared by the laboratory with a zero or known concentration of analytes.

Field Blanks

Field blanks are a check on sample contamination originating from sample transport, handling, shipping, site conditions or sample containers. These are similar to trip blanks except the water is transferred to sample containers on site.

9.3 Laboratory quality assurance / quality control

The laboratories undertake the analyses utilising their own internal procedures and their test methods (for which they are NATA, or equivalent, accredited) and in accordance with their own quality assurance system which forms part of their accreditation.

Laboratory duplicate samples

Laboratory duplicate samples measure precision. These samples are taken from one sample submitted for analytical testing in a batch. The rate of duplicate analysis will be according to the requirements of the laboratory's accreditation but should be at least one per batch. Precision is reported as standard deviation SD or Relative Percent Difference %RPD, being:

$$\%RPD = \frac{(D1 - D2)}{(D1 + D2)} \times 200$$

where: D1: sample concentration and D2: duplicate sample concentration

Replicate data for precision is expected to be less than 30% RPD at concentration levels greater than ten times the EQL, or less than 50% RPD at concentration levels less than ten times the EQL. Sample results with a RPD exceeding 100% require specific discussion. Note that certain methods may allow for threshold limits outside of these limits.

Matrix Spiked Samples

Matrix spiked samples are used to monitor the performance of the analytical methods used, and to assess whether the sample matrix has an effect of on the extraction and analytical techniques. A sample is spiked by adding an aliquot of known concentration of the target analyte(s) to the sample matrix prior to sample extraction and analysis. These samples should be analysed at a rate of approximately 5% of all analyses, or at least one per batch. Matrix spikes are reported as a percent recovery %R, being:

$$\%R = \frac{(SSR - SR)}{SA} \times 100$$

where: SSR: spiked sample result, SR: sample result (blank) and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory (generally ranging between 70% and 130%) and referenced to US EPA SW-846 method guidelines values.

Laboratory Blank

Laboratory blanks are used to correct for possible contamination resulting from the preparation or processing of the samples. These are usually an organic or aqueous solution that is as free as possible of analyte and contains all the reagents in the same volume as used in the processing of the samples. Laboratory blanks must be carried through the complete sample preparation procedure and contain the same reagent concentrations in the final solution as in the sample solution used for analysis. Laboratory blanks should be analysed at a rate of once per process batch, and typically at a rate of 5% of all analyses.

Laboratory Control Samples

Laboratory Control Samples, also referred to as Quality Control Check Samples, are used to assess the repeatability and long term accuracy of the laboratory analysis. These are externally prepared and supplied reference material containing representative analytes under investigation. Recovery check portions should be fortified at concentrations that are easily quantified but within the range of concentrations expected for real samples. Laboratory Control samples should be analysed at a rate of one per process batch, and typically at a rate of 5% of analyses. Laboratory control samples are reported as a percent recovery %R, being:

$$\%R = \frac{(SSR-SR)}{SA} \times 100$$

where: SSR: spiked sample result, SR: sample result (blank) and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory and referenced to US EPA SW-846 method guidelines values. Ideally, all calculated recovery values should be within the acceptable limits. However, in the event that control limit outliers are reported, professional judgement is used to assess the extent to which such results may affect the overall usability of data.

Surrogates

Surrogates are used to provide a means of checking, for every analysis, that no gross errors have occurred at any stage of the procedure leading to significant analyte losses. Surrogate are quality control monitoring spikes, which are added to all fields and QAQC samples at the beginning of the sample extraction process in the laboratory. Surrogates are closely related to the sample analytes being measured (particularly with regard to extraction, recovery through cleanup procedures and response to chromatography) and are not normally found in the natural environment.

Surrogate spikes will not interfere with quantification of any analytes of interest and may be separately and independently quantified by virtue of, for example, chromatographic separation or production of different mass ions in a GC/MS system. Surrogates are measured as Percent Recovery %R expressed as:

$$\%R = \frac{(SSR)}{SA} \times 100$$

where: SSR: spiked sample result and SA: spike added

Recovery data for accuracy is described by control limits specified by the laboratory and referenced to US EPA SW-846 method guidelines values.

10.0 DATA QUALITY OBJECTIVES

10.1 General

Data Quality Objectives (DQOs) are defined to ensure that the data is sufficiently accurate and precise to be used for the purpose of the environmental works. DQOs are defined for a number of areas including:

- sampling methods;
- decontamination procedures;
- sample storage (including nature of the containers) and preservation;
- laboratory analysis, including PQL, recoveries (surrogates, spikes), duplicates;
- preparation of CoC forms;
- document and data completeness; and
- data comparability.

The NSW DEC Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd Ed) 2006 also provide a seven step process for Data Quality Objectives (DQOs). These are as follows:

- State the problem

- Identify the decisions
- Identify inputs to the decision
- Define the study boundaries
- Develop a decision rule
- Specify limits on decision errors
- Optimise the design for obtaining data

DQOs must be adopted for all assessments and remediation programmes. The DQO process must be commenced before any investigative works begin on a project.

10.2 Field DQOs

The DQOs for sampling methods, decontamination procedures, sample storage (including nature of the containers) and preservation, preparation of CoC forms, and document and data completeness are the Aargus protocols which have been described in the previous sections of this document.

10.3 Assessment of RPD values for field duplicate samples

The criteria used to assess RPD values for field duplicate samples is based on discussion reported in AS4482.1 1997, a summary of which is presented below:

Table 1: RPD acceptance criteria

Sample type	Typical acceptable RPD
Intra-laboratory duplicate (blind duplicate)	30-50°% (*)
Inter-laboratory duplicate (split duplicate)	30-50% (*)

It is noted that other factors such as sampling technique, sample variability, absolute concentration relative to criteria and laboratory performance should also be considered when evaluating RPD values.

The Australian Standard also states that the variation can be expected to be higher for organic analytes than for inorganics, and for low concentrations of analytes (lower than five times the detection limit). Based on Aargus Pty Ltd experience, RPD up to 70% are considered to be acceptable for organic species. RPD of 100% or more are generally considered to demonstrate poor correlation and should be discussed.

10.4 Laboratory Data Quality Objectives (DQO)

General

Labmark is the Aargus-preferred laboratory for the analysis of primary samples. Labmark is accredited by the National Association of Testing Authorities (NATA).

The laboratory generally used by Aargus for analysing inter-duplicate samples is SGS.

Analytical methods including detection limits are provided on each laboratory report and are checked as part of the data review process.

Laboratory QA/QC

Specific to Labmark, standard QA/QC data includes LCS, MB, CRM (CRM metals only), Laboratory Duplicate (1 in first 5-10 samples, then every tenth sample) and Spike sample (1 in first 5-20 samples, then every 20th sample), and surrogate recovery's (target organics). All QA/QC is reviewed by a senior chemist prior to customer release and includes a DQO comment on final report. Additional QA/QC maybe performed on batches less than 10 samples; however additional charges shall apply at the appropriate analytical rate/sample.

Laboratory analyses DQOs

The following table summarises Labmark laboratory analyses DQOs.

Table 2: Labmark Data Quality Objectives (DQOs)

Laboratory QA/QC Testing	Laboratory QA/QC Acceptance Criteria
Method Blanks	For all inorganic analytes the Method Blanks must be less than the LOR. For organics Method Blanks must contain levels less than or equal to LOR.
Surrogate Spikes	At least two of three routine level soil sample Surrogate Spike recoveries are to be within 70-130% where control charts have not been developed and within the estimated control limited for charted surrogates. Matrix effects may void this as an acceptance criteria. Any recoveries outside these limits will have comment. Water sample Surrogates Spike recoveries are to within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criteria. Any recoveries outside these limits will have comment.
Matrix Spikes	Sample Matrix Spike duplicate recovery RPD to be <30%. In the event that the matrix spike has been applied to samples whose matrix or contamination is problematic to the method then these acceptance criteria apply to the Control Matrix Spike.

Laboratory QA/QC Testing	Laboratory QA/QC Acceptance Criteria
Laboratory Control Samples	Control standards must be 80-120% of the accepted value. Control standard recoveries are to be within established control limits or as a default 60-140% unless compound specific limits apply.
Laboratory Duplicate Samples	For Inorganics laboratory duplicates RPD to be <15%. For Organics Laboratory duplicates must have a RPD <30%.
Calibration of Chromatography Equipment	The calibration check standards must be within +/-15%. The calibration check blanks must be less than the LOR.

Non-compliances

Exceedances of QAQC results outside the DQO should be thoroughly investigated and discussed with the laboratories concerned, and the outcomes of these investigations should be recorded in the project files.

11.0 USE AND CALCULATION OF THE 95% UCL FOR SITE VALIDATION PURPOSE

Validation of a site at the completion of remediation works should comply with the recommendations of the applicable guidelines. For a site to be considered uncontaminated or successfully remediated, the typical minimum requirement is that the 95% upper confidence limit (UCL) of the arithmetic average concentration of the contaminant(s) is less than an acceptable limit, eg the threshold value of an health-based investigation level.

The calculation of the 95% UCL of the arithmetic average concentration method requires that the probable average concentration and standard deviation of the contaminant be known. This method is most applicable for validation sampling, where the mean concentration and the standard deviation can be estimated from sampling results. The 95% UCL is calculated as follows:

$$\mathbf{95\%\ UCL = mean + t_{\propto,n-1} \frac{STDEV}{\sqrt{n}}}$$

where

mean arithmetic average of all sample measurements

$t_{\propto,n-1}$ A test statistic (Student's t at an $\propto$ level of significance and n-1 degrees of freedom)

$\propto$	The probability (in that case chosen to be 0.05) that the 'true' average concentration of the sampling area might exceed the UCL average determined by the above equation
STDEV	Standard deviation of the sample measurements
n	number of samples measurements

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13.0 ABBREVIATIONS

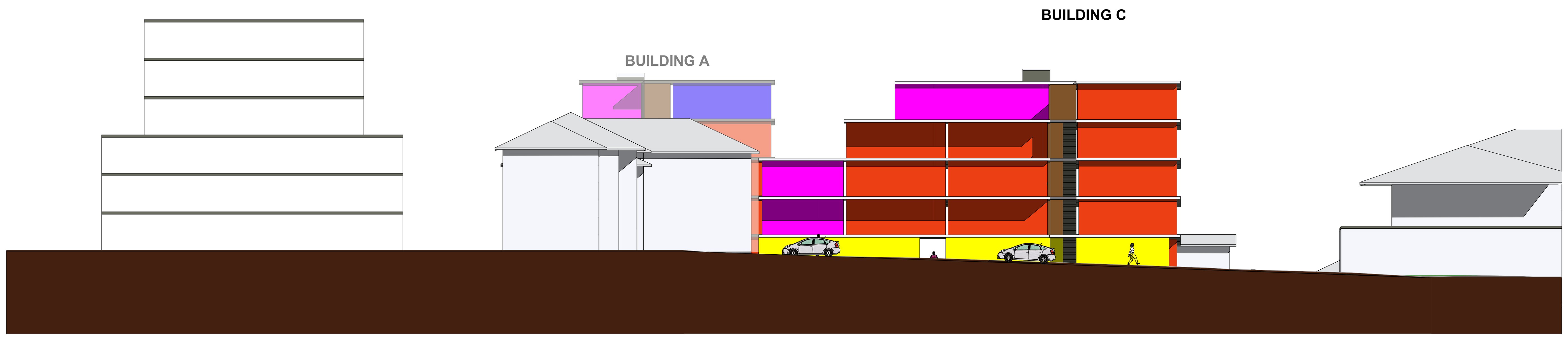
ANZECC	Australian and New Zealand Environment and Conservation Council
ASS	Acid Sulfate Soil
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl benzene and Xylene
CoC	Chain of Custody
DEC	Department of Conservation (formerly EPA)
DIPNR	Department of Infrastructure Planning and Natural Resources
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health-Based Soil Investigation Level
LGA	Local Government Area
NEHF	National Environmental Health Forum
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measure
NHMRC	National Health and Medical Research Council
NSL	No Set Limit
OCP/OPP	Organochlorine Pesticides /Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbon
PASS	Potential Acid Sulfate Soil
PCB	Polychlorinated Biphenyl
PID	Photo Ionisation Detector
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance, Quality Control
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SVC	Site Validation Criteria
SWL	Standing Water Level
TCLP	Toxicity Characteristics Leaching Procedure
TESA	Targeted Environmental Site Assessment
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
VHC	Volatile Halogenated Compounds
VOC	Volatile Organic Compounds

14.0 REFERENCES

- ANZECC (1992) – *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites.*
- ANZECC (1996) – *Drinking Water Guidelines.*
- ANZECC (2000) – *Guidelines for Fresh and Marine Waters.*
- Land and Biodiversity committee (2003) – *Minimum Construction requirements for water bores in Australia.*
- National Environment Protection Council (NEPC) (1999) – *National Environmental Protection (Assessment of Site Contamination) Measure.*
- Netherlands Ministry of Spatial Planning, Housing and the Environment (1994 rev. 2000) – *Environmental Quality Objectives in the Netherlands.*
- New South Wales Environment Protection Authority (1994) – *Guidelines for Assessing Service Station Sites.*
- New South Wales Environment Protection Authority (1995) – *Sampling Design Guidelines.*
- New South Wales Environment Protection Authority (1997) – *Guidelines for Consultants Reporting on Contaminated Sites.*
- New South Wales Environment Protection Authority (1998) – *Guidelines for the NSW Site Auditor Scheme.*
- New South Wales Department of Environment & Conservation (2006) – *Guidelines for the NSW Site Auditor Scheme (2nd Ed).*
- New South Wales Environment Protection Authority (1999) – *Guidelines on Significant Risk of Harm from contaminated land and the duty to report.*
- New South Wales Environment Protection Authority (1999) – *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes.*
- New South Wales Environment Protection Authority (2005) – *Guidelines for assessing former orchards and market gardens.*
- QLD Department of Environment (DoE) (1998) – *Draft Guidelines for the Assessment & Management of Contaminated Land in Queensland.*
- QLD EPA – Waste Management Branch, Contaminated Land Section – *Details about investigation thresholds and sampling – sent to Aargus on 14 Nov 2000.*
- Standards Australia AS1726-1993 (1993) – *Geotechnical Site Investigations.*
- Standards Australia AS4482.1-1997 (1997) – *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-Volatile and Semi-Volatile Compounds.*
- Standards Australia AS5667.11-1998 (1998) – *Water Quality Sampling: Guidance on the Sampling of Groundwaters.*
- Victorian EPA (2000) – *Groundwater Sampling Guidelines*

APPENDIX J

PROPOSED DEVELOPMENT PLANS



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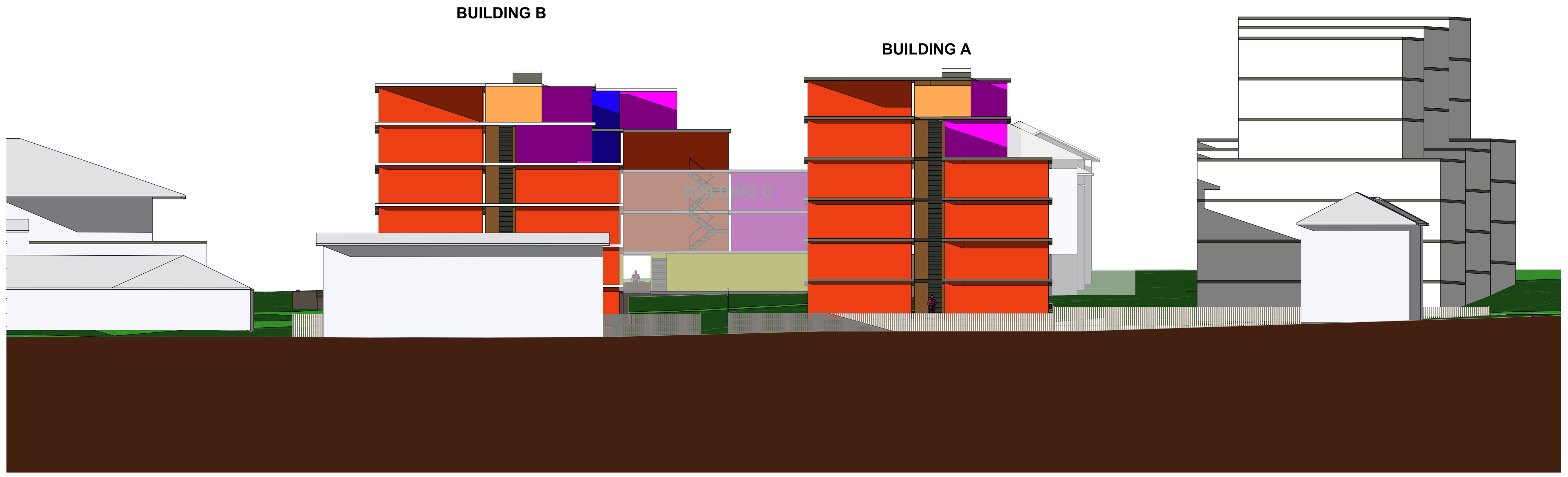

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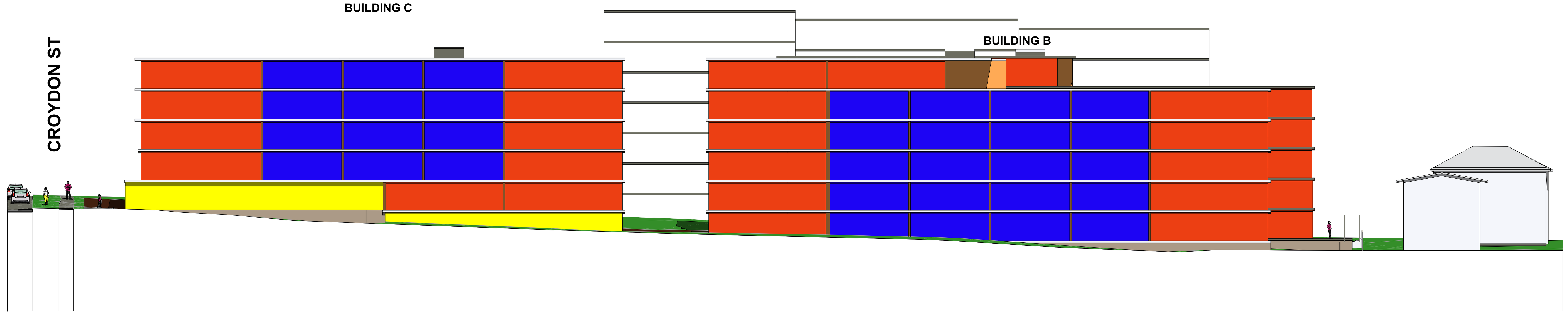

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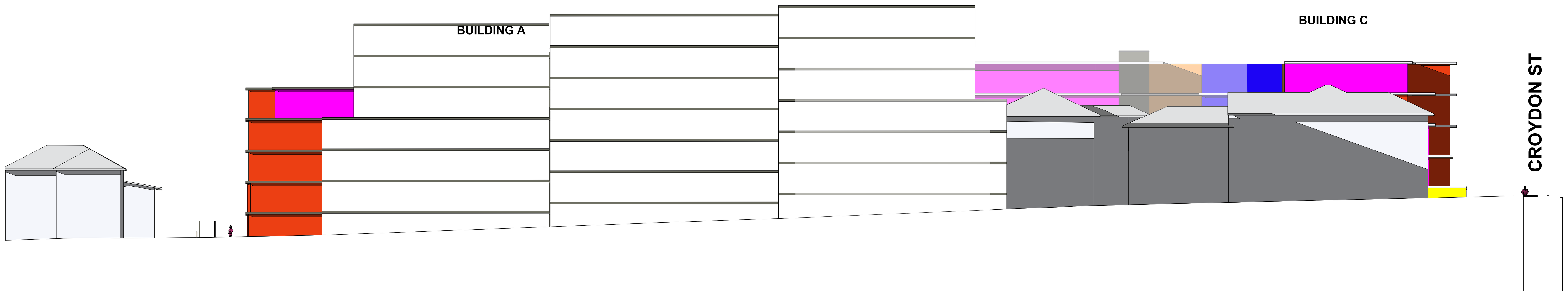

3 Southern Elevation

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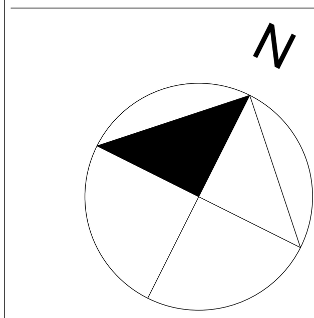
Client
SAMSTONE
Job:
Multi-residential Development
5-9 Croydon St North, Lakemba.

Drawing Title:
Elevations - Elevations

Northern Elevation, Southern Elevation, Eastern Elevation, Western Elevation



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Drawn:	Checked By:
A.S	D.M
Plot Date:	5/02/2013

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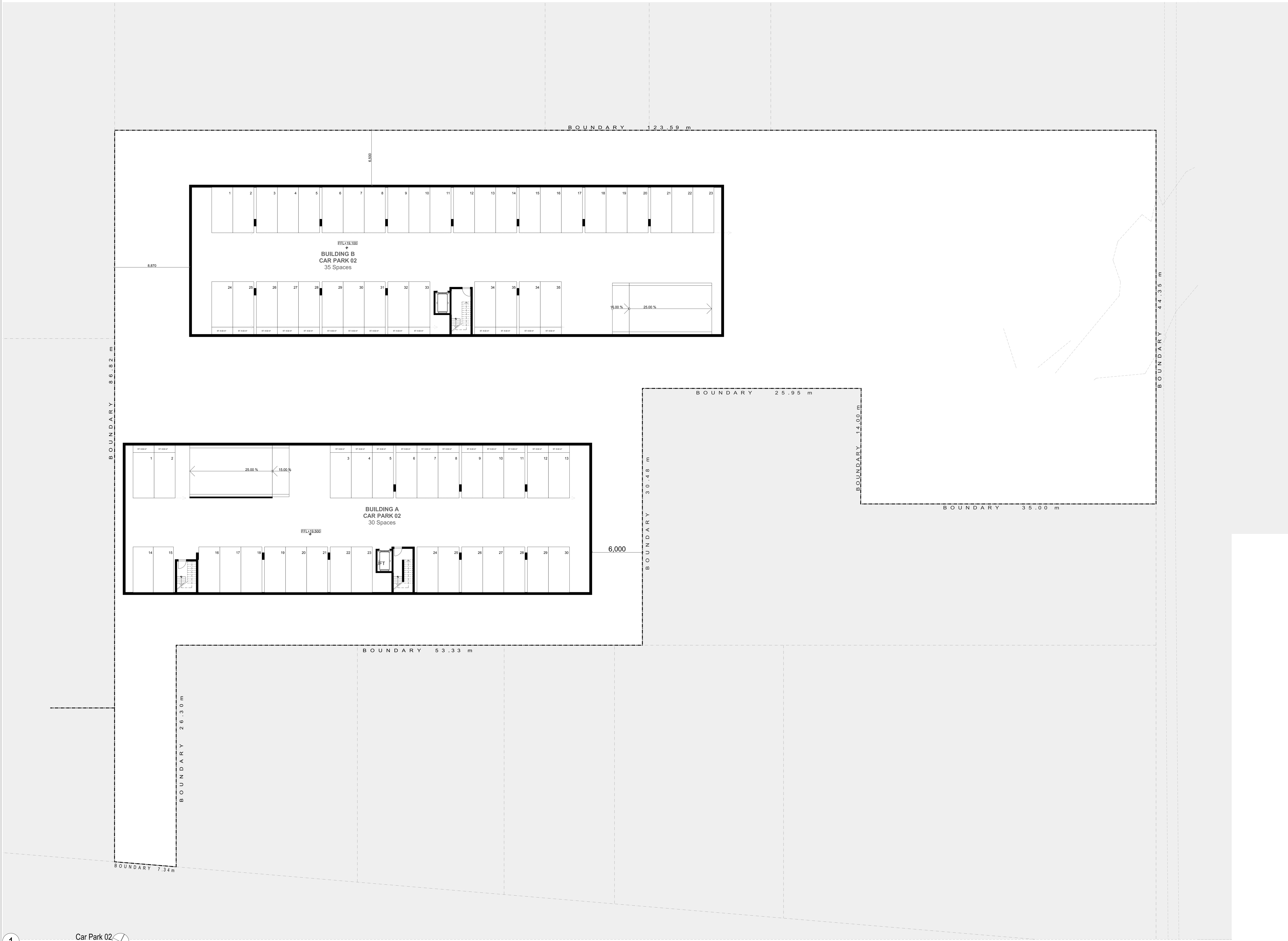

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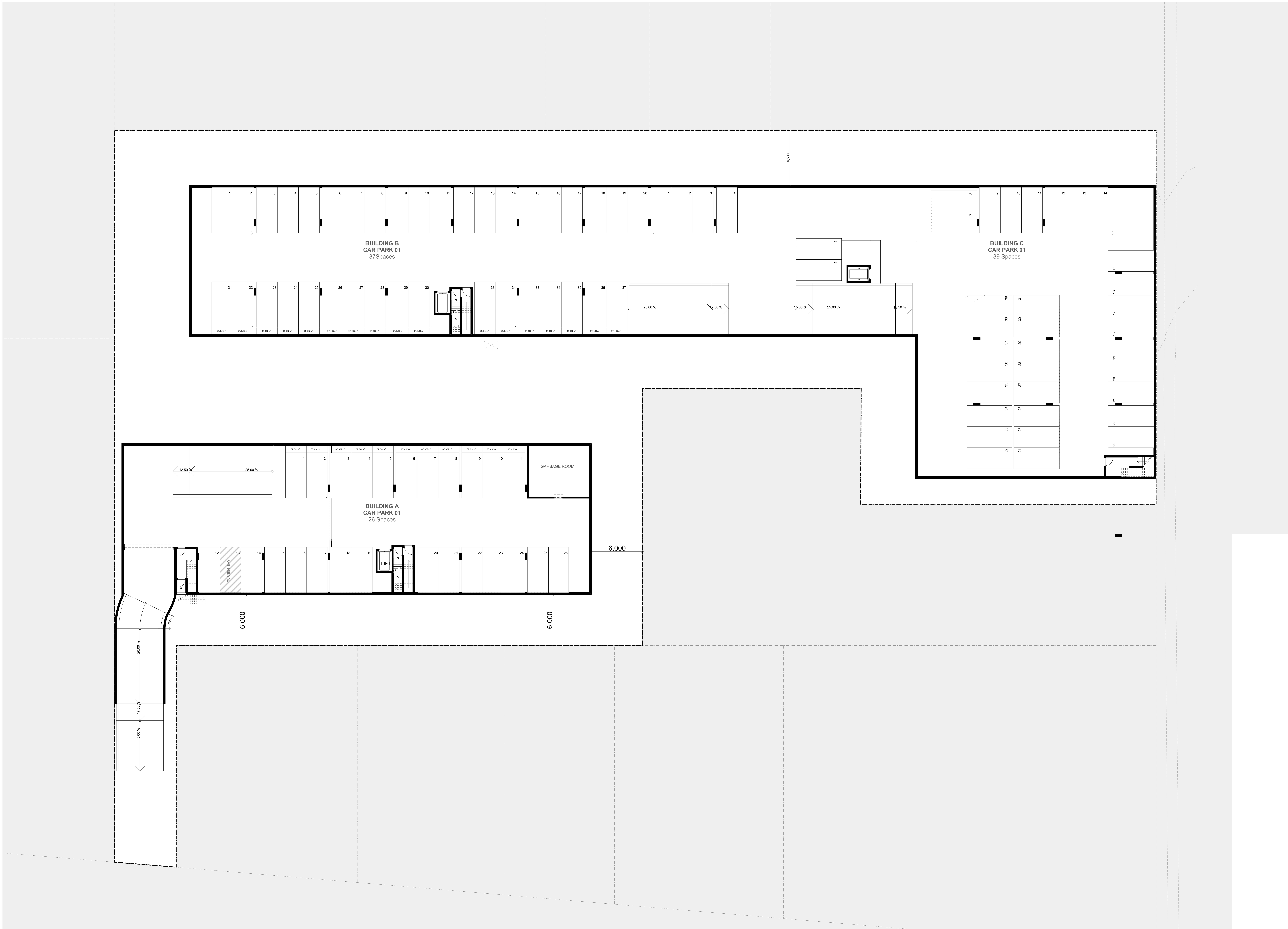

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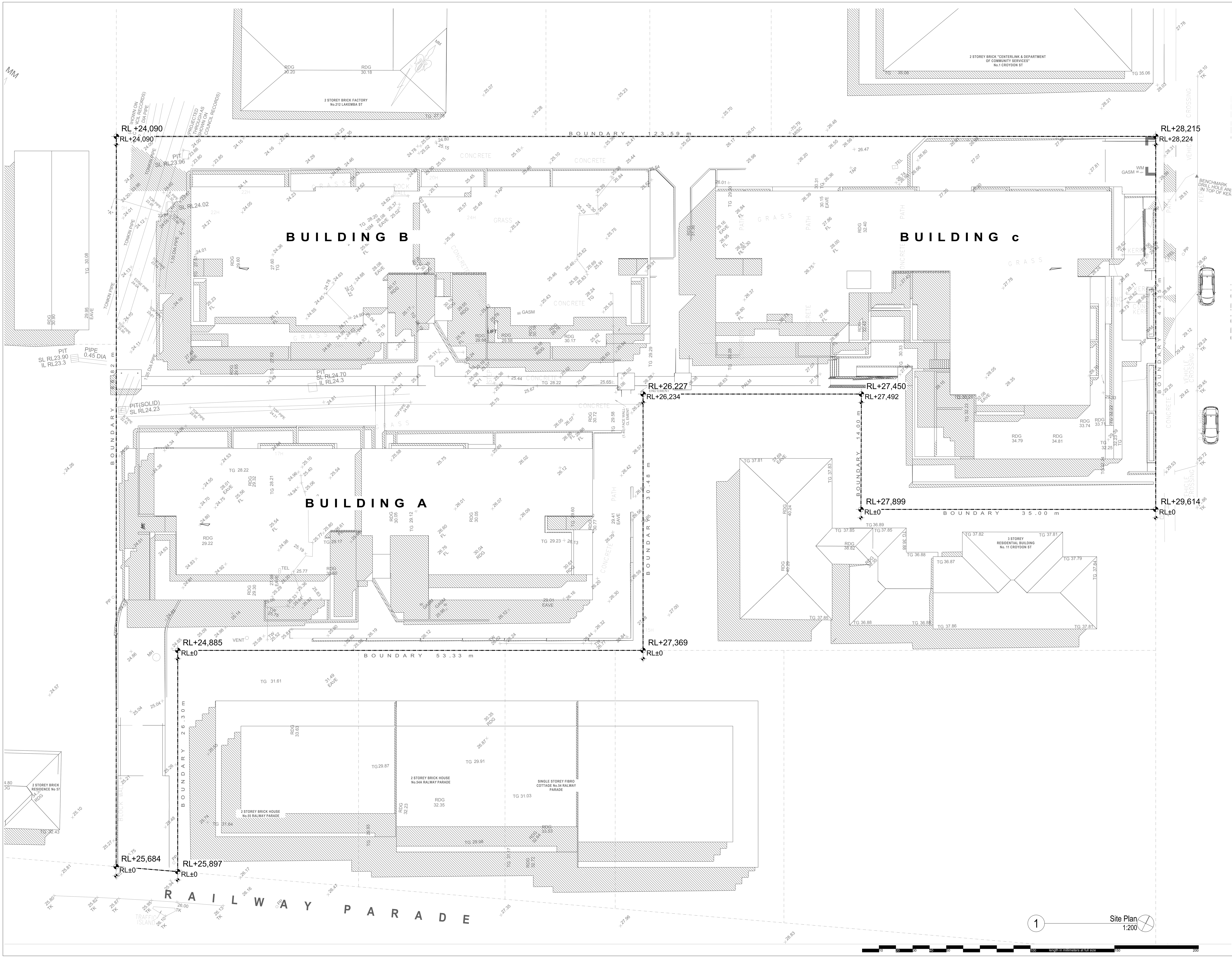
1:200


2 STOREY BRICK FACTORY
No.212 LAKEMBA ST
2 STOREY BRICK "CENTERLINK & DEPARTMENT OF COMMUNITY SERVICES"
No.1 CROYDON ST
RL+24,090
BOUNDARY 123.59 m
RL+28,215
6,500
2BDRM UNIT
A: 78.92 m2
1BDRM UNIT
A: 50.88 m2
1BDRM UNIT
A: 50.88 m2
1BDRM UNIT
A: 50.88 m2
1BDRM UNIT
A: 50.88 m2
2BDRM UNIT
A: 78.96 m2
7,800
2BDRM UNIT
A: 78.13 m2
2BDRM UNIT
A: 78.13 m2
BUILDING C
CAR PARK 01
28 Spaces
2BDRM UNIT
A: 79.04 m2
2BDRM UNIT
A: 78.18 m2
LOBBY
FFL+25,100
1BDRM UNIT
A: 50.20 m2
2BDRM UNIT
A: 77.13 m2
1BDRM UNIT
A: 55.58 m2
BOUNDARY 86.82 m
BOUNDARY 44.35 m
CROYDON ST
6,140
12,000
RL+26,194
BOUNDARY 25.95 m
RL+27,450
1 in 14 ramp
14.00 m
6,460
1BDRM UNIT
A: 57.10 m2
1BDRM UNIT
A: 50.88 m2
1BDRM UNIT
A: 50.88 m2
2BDRM UNIT
A: 78.18 m2
2BDRM UNIT
A: 73.23 m2
6,000
BOUNDARY 30.48 m
3,000
RL+27,899
BOUNDARY 35.00 m
RL+29,614
LOBBY
3BDRM UNIT
A: 89.57 m2
1BDRM UNIT
A: 50.20 m2
1BDRM UNIT
A: 50.20 m2
2BDRM UNIT
A: 76.17 m2
3 STOREY
RESIDENTIAL BUILDING
No. 11 CROYDON ST
6,000
6,000
RL+27,369
RL+24,885
BOUNDARY 53.33 m
6,000
BOUNDARY 26.30 m
NEIGHBOURING BUILDING
NEIGHBOURING BUILDING
NEIGHBOURING BUILDING
2 STOREY BRICK
RESIDENCE No 57
RL+25,684
RL+25,897
BOUNDARY 7.34 m
RAILWAY PARADE
1
LEVEL +25,100
1:200



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Client: SAMSTONE

Job: **Multi-residential Development**
5-9 Croydon St North, Lakemba.

Drawing Title: **Plans - Roof Plan**
Survey x-REF, Site Plan, Basement, Site Levels

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