Aargus
AUSTRALIA

Environmental - Remediation - Engineering - Laboratories - Drilling

ENVIRONMENTAL SITE ASSESSMENT

SUMMARY

Properties

Northcote Street, Hilly Street, & Bennett Street, Mortlake, NSW

"Precincts 1-6"

Prepared for

Mortlake Consolidated Investments Pty Ltd

December 2010

HEAD OFFICE: PO Box 398 Drummoyne NSW 1470
Telephone: 1300 137 038 Facsimile: 1300 136 038 Email: admin@aargus.net Website: www.aargus.net
Aargus Pty Ltd ACN 063 579 313 Aargus Engineering Pty Ltd ACN 050 212 710 Aargus Laboratories Pty Ltd ACN 086 993 937

INTRODUCTION

This report has been prepared as a summary of various environmental assessments undertaken at Mortlake for Mortlake Consolidated Investments Pty Ltd. The reports refer to the following precincts within the proposed development as depicted within the indicative staging plan prepared by Cox Richardson, dated April 2007:

- Aargus Report Site 1 – precincts 2 & 6
- Aargus Report Site 2 – precincts 5
- Aargus Report Site 3 – precincts 1, 3 & 4

Each report provides an assessment of the land pertaining to the subject area. In total, the site is 39,340 m^2. NSW EPA Sampling Design Guidelines 1995 provides minimum sampling points sites of this size as 50 sampling locations. The sampling density relating to this concept plan has been provided as 69 sampling locations with 123 samples plus QA/QC. The site has therefore been adequately characterised for determination of suitability. It would be expected that during further works, further sampling and delineation would occur.

A further set of Acid Sulphate Soil reports have also been prepared in conjunction with works at the site. All reports are attached within this summary.

Site 1 – Precincts 2 & 6

Site 1 was known as the former paint factory situated on Bennett Street Mortlake. Precinct 6 relates to a series of houses which are upgradient and adjoint the paint factory along Edwin Street. The analysis of Laboratory results indicated levels of potential heavy metals, solvents (toluene, ethylbenzene, xylene), petroleum hydrocarbons (TPHs) and volatiles (VOC) contaminants exceeding regulatory requirements for samples BH3, BH7, BH10, BH11, BH13, BH17, BH19, & sample S1 as measured against HILs (Health-based Investigation Levels and Environmental Investigation Levels). Levels were measured against sensitive residential criteria with accessible soils. Samples underwent QA/QC interpretation and met relevant DQOs.

Based on the diameter hotspot as calculated using NSW EPA sampling design criteria (25.7m) for a site 27,431m^2, we were able to approximate the relative impact of each targeted hotspot. Part of the recommendations is to further delineate the extent of contamination either before or during the remediation process. The following areas and relative quantities are considered as requiring remediation as a minimum:

- BH3, ~140 tonnes of low level heavy metals
- BH5, BH15, BH19, ~240 tonnes of solvent impacted surface soils
- BH7, ~110 tonnes of low level heavy metals
- BH10, ~425 tonnes* of high level solvent and HC impact
- BH11, ~140 tonnes* of high level solvent and HC impact
- BH13, ~110 tonnes of low level heavy metals
- BH17, ~140 tonnes of high level solvents
- Sample S1 ~1 tonne of high level heavy metals

* denotes that this area is at the former solvent storage area and heavy impact has been witnessed. This area would have a far more widespread impact and to extrapolate locations BH10 & BH11 along the soil profile to areas to the south and west (hydraulic gradient) would expand the quantity to at least 1,000 tonnes.

The Site 1 investigation indicated that the vertical extent of contamination is limited to the upper fill layers and the rock face which is relatively shallow. This has restricted deeper penetration. It should be noted however that the rock may have also been impacted to a small degree.

Further to this, other areas requiring remediation were as follow:

- 1 x transformer area containing PCB liquids;
- 10 x Asbestos backed power boards and electrical substation boards;
- Asbestos floor tiles in most of the office buildings and stairwells;
- Asbestos in most of the building structures, roofing, walls and ceilings;
- Asbestos in the office ceilings;
- Asbestos underneath the resin plant on the roof and around associated piping (old boiler room);
- Asbestos within lagging in 15% of pipes found around the site (mostly near resin plant);
- 2 x Asbestos lined fume cupboards;
- Asbestos coating on 2% of AST tanks mostly near the resin plant;
- Lead paints on walls that were thin but may cause concern during demolition;
- ~35 x Mercury lamps;
- 3 x large water collection pits carrying ~20,000L of water;
- 1 x of the above pits containing sediment/sludge (400kg);
- 4 x 25kg class 6 full powder bags;
- 15% of all pipes had some sort of residue still inside;
- localised paint/resin spills over site;
- 30 x 5 & 1 litre paint containers;
- 100L of paint within containers on smaller site;
- 10 x 200L tanks still full around the site;
- 2 x USTs ~30,000L capacity (containing 100L of residual liquor); and
- 1 x bowser and vent pipe remaining with associated piping.

Groundwater was not considered problematic as no odours or olfactory evidence was witnessed. As the site has minimal exposure pathways, combined with the fact that no beneficial use exists, groundwater does not pose a concern for human or ecological exposure. It has been noticed that the catchment area is small for perched water but it would be expected that interaction within the vadose zone and surface and groundwater would be limited by the fact that the entire surface is concrete sealed and non-perched groundwater would exist within rock formations. The sampling for off site migration of groundwater is however proposed to be undertaken as part of the next phase of works to verify no downgradient impacts occur.

Areas of remedial works can be conducted separate from demolition works. It would be expected that an initial HAMAT assessment be conducted to provide a register of all hazardous materials to enable removal prior to demolition. Once demolition occurs and further delineation sampling has occurred nad based upon an appropriate Remedial Action Plan (RAP), the proposed methodology is noted as follows:

- Low level heavy metals – between 610 and 1,360 tonnes of low level wastes will be excavated and disposed of as General Solid Waste (reported as inert waste within report - based on confirmation of classification) to a facility licensed to accept such wastes.

- Industrial classified heavy metals – one tonne of industrial waste will be collected and disposed of at a facility licensed to accept such wastes under an excavate and dispose strategy.
- Class 6 poisons – approximately 100 tonnes will be required to be carefully collected from bags and taken to a scheduled waste disposal facility.
- PCB Waste – Approximately 500L of PCB oils classified as scheduled waste will require licensing and disposal at an appropriate facility.
- Mercury Lamps – 35 lamps must be removed and taken to a licensed waste disposal facility prior to demolition occurring.
- 2 x USTs – Must be decommissioned and removed in accordance with AS1940 & AIP (Australian Institute of Petroleum) standards and then validated. Groundwater monitoring is required as part of the NSW EPA regulatory auditor scheme.
- Solvent wastes – Bioremediation and on site landfarming will be conducted over at least a 16 week period. Soils will be excavated from their respective locations and placed in 500mm lifts. Soils will be treated with a chemical accelerant prior to turning at least every two weeks to promote volatilisation. The excavation pits will be validated and the residual soils and stockpile materials will be certified as clean prior to reinstatement or disposal.
- Liquor removal – Each water settling pit will require a licensed pump out for the 20,000L still remaining onsite.
- Removal of Asbestos and chemical residue removal has to be conducted in conjunction with the demolition phase to enable access to most parts of the site. Removal of floor tiles, roofing, guttering and ceilings on each floor is required to be conducted by a Workcover licensed Asbestos contractor. Many of the tanks and associated piping still contain residue and/or asbestos lagging (insulation). The demolition phase will enable sequential removal of each tank and pipe with appropriate disposal or destruction. Tanks and pipes that have lagging or coatings will be disposed of whilst all other tanks and pipes will be sent for recycling. Each floor and building will be dismantled accordingly and in accordance with Workcover practices. Piping that contains residue will be required to be removed to a facility licensed to accept each waste stream. The site floor will also be required to be removed to gain access to underlying impacted soils.

In order to appropriately characterise further impacts across the site, it is required that access be granted underneath floor slabs and sealed surfaces. To gather certainty that a detailed investigation could not achieve, it was proposed that the remedial works be conducted in two stages.

- Stage 1 – Demolition and removal of all surface structures to gain access to underlying soils for further classification and assessment.

- Stage 2 – Remediation and Validation of all impacted materials and comparison to any proposed development plans for the site.

In summary, it was proposed that further assessment works be conducted post demolition works to enable appropriate characterisation of underlying soils, services and migration potential.

Due to the uncertainty still remaining with respect to areas underlying sealed surfaces, the project should be conducted in the following stages:

1. A HAZMAT report conducted in preparation for demolition;
2. A clearance certificate provided;
3. Demolition works to commence;
4. A Remedial Action Plan (RAP) be developed to incorporate further sampling in areas not previously sampled or to verify the lateral and vertical extent of contamination;
5. A NSW DECCW accredited auditor review the RAP;
6. Remediation and Validation works to commence;
7. Preparation of a Validation Report; and
8. Final NSW EPA auditor sign off.

Site 2 – Precinct 5

Site 2 is known as 16-18 Bennett Street and 20-22 Bennett Street Mortlake. Based on the results of laboratory analysis heavy metals, total phenolic compounds (phenols), pesticides (OCPs) and Polychlorinated Biphenyls (PCBs) in the fill and natural material at 'Site 2' met NEPM HILs D and the more stringent NEPM HILs A guideline criteria. The subject site had a 95% confidence level that the concentrations of heavy metals, phenols, OCPs and PCBs met guideline criteria.

Laboratory analysis of fill and natural material for Total Petroleum Hydrocarbons (TPH) and solvents (BTEX), showed that the fill and natural material met NSW EPA Guidelines for Assessing Service Station Sites.

The concentration of Polycyclic Aromatic Hydrocarbons (PAH) and Benzo(a)Pyrene (B(a)P) exceeded NEPM HILs A and D criteria in the fill material, however the concentrations of PAHs and B(a)P met guideline criteria in the natural material. The concentrations of longer chain hydrocarbons as well as PAH and B(a)P are high in the fill sample at BH3. This is possibly associated with localised oil/diesel contamination, which has not entered the natural material.

The site lies on sandy/clayey fill material, which overlies sandy clays and clayey sands. Sandstone bedrock was encountered between 0.5 and 3.0m. Migration of contamination onto the site could pose a concern due to shallow nature of perched groundwater that may migrate from the adjoining Anzol Paint Factory (Site 1) although no evidence of impact was found in soil sampling.

No hazardous building materials, such as lead paint, or piping were identified on the site, nor was there evidence of any Underground Storage Tanks (USTs). It is believed that Asbestos roofing may be present on the site and as such a Hazardous Materials assessment should be undertaken prior to any works.

Soil conditions are always hard to determine underneath sealed surfaces. It was therefore recommended that the materials underlying sealed surfaces be examined post demolition to confirm the absence of any areas of environmental concern.

It is also understood that excavations are proposed for basement car parking and described within the Cox Richardson Concept Plan, dated April 2007. These

excavation works would include the removal from the site of superficial material, including fill identified at the site and some of the natural material underneath. Material excavated from the site would be classified in accordance with appropriate Waste Classification guidelines and disposed appropriately.

The adjoining Anzol Paint Factory does pose a migration concern and as the groundwater has not been examined in detail, it was proposed to review the water quality post demolition and fill examination stage once ground floor slabs have been removed. Preliminary assessment of the site shows no gross groundwater impact. We expect that due to the small catchment area, there is limited groundwater exposure scenarios and further groundwater investigations in later stages would verify this.

As the site has shown to contain limited surficial impacted fill material, it is recommended that a Remedial Action Plan be developed to manage soils being removed from the site and also confirm groundwater quality at the site.

In summary, it was considered that the risks to human health and the environment associated with soil contamination at the site were low in the context of the proposed medium to high density residential dwellings.

As soils may be planned to be removed from the site as part of development works or basement works, a Remedial Action Plan would be required. This RAP will also confirm the groundwater quality of the site.

Site 3 – Precincts 1, 3 & 4

Site 3 is known as 1 Northcote Street, 8 Hilly Street and 14-22 Hilly Street Mortlake. The analysis of laboratory results for 'Site 3' indicated levels of heavy metals had met regulatory requirements for fill and natural samples as measured against "NEPM HILs D" for residential dwellings with minimal opportunities for soil access and NEPM HILs E for recreational areas including open space. Fill and natural soil at 'Site 3' also met the more stringent "NEPM HILs A" for residential dwellings with accessible soil. Based on the laboratory results 'Site 3' has a 95% confidence level that heavy metals meet the afore mentioned Health based Investigation Levels.

The analysis of laboratory results indicated levels of total petroleum hydrocarbons (TPH) and solvents (BTEX) in fill and natural material had met NSW EPA Guidelines for Assessing Service Station Sites. The concentrations of phenolic compounds (Phenols), Polychlorinated Biphenyls (PCB's) and pesticides (OCP) contaminants, had met regulatory requirements, as measured against "NEPM HILs A and D" for fill and natural material. The concentration of Polycyclic Aromatic Hydrocarbons (PAH) across Site 3 also met NEPM HILs D criteria, however some discreet sample concentrations slightly exceed "NEPM HILs A.

The site lies on sandy fill material and silty clays overlying sandstone bedrock. Migration of contamination onto the site was not of concern due to the sealed nature of the entire site.

No hazardous building materials, such as lead paint, asbestos roofing or piping were identified on the sites, nor was there evidence of any Underground Storage Tanks (USTs).

Soil conditions are always hard to determine underneath sealed surfaces. It was therefore recommended that the materials underlying sealed surfaces be examined post demolition to confirm the absence of any areas of environmental concern.

It was also understood that excavations may be proposed for basement car parking. These excavation works would include the removal from the site of superficial material, including fill identified at the site and some of the natural material underneath. Material excavated from the site should be classified in accordance with appropriate waste classification guidelines and disposed of appropriately.

In summary, it was considered that the risks to human health and the environment associated with soil and/or groundwater contamination at the site were low in the context of the proposed medium to high density residential dwellings. The site was considered to be able to be made suitable for the proposed development.

Groundwater – Sites 1, 2 & 3

Groundwater was not considered problematic as no odours or olfactory evidence was witnessed. As all sites have minimal exposure pathways, combined with the fact that no beneficial use exists, groundwater does not pose a concern for human or ecological exposure. It has been noticed that the catchment area is small for perched water but it would be expected that interaction within the vadose zone and surface and groundwater would be limited by the fact that the entire surface for most sites are concrete sealed and non-perched groundwater would exist within rock formations. Upgradient groundwater flow may provide migration assistance from rainwater percolation into the perched water table. No soil sampling has noticed any gross odours or chemicals of concern during sampling and as such groundwater contamination is expected to be low. The sampling for on and off site migration of groundwater is however proposed to be undertaken as part of the next phase of works to verify no downgradient concerns arise and no impact to the waterway can pccur.

The former Anzol Paint Factory does pose a potential migration concern and as the groundwater has not been examined in detail, it is proposed to review the water quality post demolition and fill examination stage once ground floor slabs have been removed. Preliminary assessment of the site shows no gross groundwater impact. We expect that due to the small catchment area, there is limited groundwater exposure scenarios and further groundwater investigations in later stages would verify this as described above.

Site 3 would have minimal groundwater concerns from upgradient sources. It is expected that some tidal and river interaction would occur with the saturation zone of soils beneath shoreline sites. Salinity may also play a role within areas in close proximity to seawalls.

Acid Sulphate Soils – Sites 1, 2 & 3

Assessment of all sites for Acid Sulphate Soils (ASS & PASS) showed that it is unlikely that Actual Acid Sulphate Soils (AASS) exists on the site to a depth of 3.0m below ground level. Field observations and laboratory analysis indicated that Potential Acid Sulphate Soils (PASS) are likely to exist from 2.5 m on the site. Hence, if deep

excavations are to occur as part of the proposed development, it is recommended that an Acid Sulphate Soil Management Plan be prepared for areas containing deeper esturine clays.

For further information or details about any part of this summary, please refer to the subject Site Assessment attached.

For and on behalf of
Aargus Pty Ltd

Nick Kariotoglou
Managing Director

ATTACHMENTS

Aargus Pty Ltd

Reports
Site 1, 2 & 3

ENVIRONMENTAL SITE ASSESSMENT

Bennett Street, Mortlake, NSW

“SITE 1”

Prepared for

Mortlake Consolidated Investments Pty Ltd

June 2004

CONTROLLED DOCUMENT
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DOCUMENT HISTORY

Revision No.	Revision Date	Description
0	05/09/02	Initial Issue
1	20/06/04	Revision 1

Issued By: .....

Date: .....

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ANZECC (2000) Guidelines for Fresh and Marine Waters.
Public Works Department (Feb 1986) Lower Parramatta River Flood Study 94017.
National Environmental Protection Council (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPM).
NSW EPA (1994) "Guidelines for Assessing Service Station Sites".
NSW EPA (1995) "Sampling Design Guidelines".
NSW EPA (1997) "Guidelines for Consultants Reporting on Contaminated Sites".
NSW EPA (1998) "Guidelines for the NSW Site Auditor Scheme".
NSW EPA (1999) "Guidelines on Significant Risk of Harm from contaminated land and the duty to report".
NSW EPA (1999) "Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes".

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
DIPNR	Department of Infrastructure Planning and Natural Resources
DQO	Data Quality Objectives
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
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
UCL	Upper Confidence Limit
UST	Underground Storage Tank
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compounds
VHC	Volatile Halogenated Compounds

EXECUTIVE SUMMARY

Aargus Pty Ltd has been instructed by Mr Ian Edwards of Aust-Equity Properties to undertake an update of the Environmental Site Assessment (ESA) report for the property situated at 24-30 Bennett Street, Mortlake NSW.

The ESA will assess the site's environmental characteristics in comparison to regulatory criteria, in order to determine the site's suitability for the proposed redevelopment. The initial assessment was a limited version of this report conducted for due diligence as part of a property purchase. The revision has been conducted to meet council regulations for development works to commence.

The objectives of the ESA are to identify issues of ongoing pollution and non-compliance, identify the likelihood and extent of significant contamination, and recommend management strategies including any additional investigations or remedial actions.

In proposing recommendations and/or remediation criteria for the site, the published *NEPC 'D' Health-based Investigation Levels (High-density residential with minimal access to soils including high-rise apartments and flats)* were used. Supporting HIL A and EIL criteria were used also as low density housing has also been proposed.

The scope of work in preparing the ESA report included the review of existing information, filling information gaps, formulating and conducting sampling and analysis, interpretation of results/findings and report generation in accordance with NSW EPA "*Guidelines for Consultants Reporting on Contaminated Sites"*, 1997.

The analysis of Laboratory results indicated levels of potential heavy metals, solvents (toluene, ethylbenzene, xylene), petroleum hydrocarbons (TPHs) and volatiles (VOC) contaminants exceeding regulatory requirements for samples BH3, BH7, BH10, BH11, BH13, BH17, BH19, & sample S1 as measured against HILs (Health-based Investigation Levels and Environmental Investigation Levels). Levels were measured against sensitive residential criteria with accessible soils. Samples underwent QA/QC interpretation and met relevant DQOs. The integrity of samples is therefore justified.

Our investigation indicates that the vertical extent of contamination is limited to the upper fill layers and the rock face which is relatively shallow. This has restricted deeper penetration. It should be noted that the rock may have also been impacted to a small degree.

Groundwater was not considered problematic as no odours or olfactory evidence was witnessed. As the site has minimal exposure pathways, combined with the fact that no beneficial use exists, groundwater does not pose a concern for human or ecological exposure. The sampling for off site migration of groundwater is however proposed to be undertaken as part of the next phase of works.

In order to appropriately characterise further impacts across the site, it is a requirement that access be granted underneath floor slabs and sealed surfaces. To gather certainty

that a detailed investigation could not achieve, it is proposed that the remedial works be conducted in two stages.

- Stage 1 – Demolition and removal of all surface structures to gain access to underlying soils for further classification and assessment.

- Stage 2 – Remediation and Validation of all impacted materials and comparison to any proposed development plans for the site.

It is proposed that further assessment works be conducted post demolition works to enable appropriate characterisation of underlying soils, services and migration potential.

Due to the uncertainty still remaining with respect to areas underlying sealed surfaces, the project should be conducted in the following stages:

1. A HAZMAT report conducted in preparation for demolition
2. A Remedial Action Plan (RAP) be developed to incorporate further sampling in areas not previously sampled or to verify the lateral and horizontal extent of contamination.
3. An NSW EPA acreditor review the RAP
4. Demolition works to commence
5. Remediation and Validation works to commence
6. Preparation of a Validation Report
7. Final NSW EPA auditor sign off.

1.0 INTRODUCTION

Aargus Pty Ltd (Aargus) was initially requested by Ian Edwards of Aust-Equity Group (known for this report as Mortlake Consolidated Investments Pty Ltd) to undertake an Environmental Site Assessment (ESA) at a commercial site located at the corner of Northcote, Hilly & Bennett Street, Mortlake, NSW. The assessment was required to provide an assessment of the contamination status of the site, as an update on a due diligence report prepared in September 2002. The September 2002 report contains an abbreviated version of information contained within this report with only laboratory results and a brief description of site conditions listed. For this reason, the report is not furnished as a previous report but has rather been updated.

The site had most recently been used by Paint Industries (Aust) Pty Ltd which is owned by Anzol Pty Limited. During this time, it was mainly used for the manufacture of paints and resins.

It is understood that the site is proposed to be redeveloped for residential use, including medium to high density residential units in the northern part of the site and houses with gardens along the southern boundary of the site.

This assessment was commenced on 28 August 2002 and revision undertaken in June 2004. Fieldwork and reporting were conducted in general accordance with the Aargus proposal, Aargus environmental protocols and with reference to relevant environmental regulatory criteria including the guidelines issued or endorsed by the NSW EPA.

2.0 OBJECTIVES

The primary objective of this ESA was to assess the likelihood and/or extent of significant soil and groundwater contamination which may have resulted from past and present practices at the site. This information will be used for the preparation of a remediation action plan or recommendations for further works.

It is noted that at this stage, the final development plans, including extent of the areas to be excavated, location and depth of basement carpark and location of vegetated areas, are not known. The locations of the material which will stay at the site have also not been finalised. Therefore, it is not possible to assess the suitability for the proposed development with respect to contamination of the material which will stay at the site.

The other objectives of this ESA were to:

- Identify contamination which may be occurring at the site, and non-compliance with existing environmental regulations; and
- Recommend management strategies which may be required at the site, including additional investigations and/or remediation works.

The ESA will include the assessment of the following:

- Contaminant dispersion in air, surface water, groundwater, soil and dust;
- Potential effects of contaminants on human health, the environment and building structures; and
- The adequacy and completeness of the information available on the contamination status of the site.

3.0 SCOPE OF WORKS

In order to achieve the above objectives, the following scope of work was carried out:

- Collection of information for the site, including review of historical data and past site practices, site surveys, site records on waste management practices, NSW Land Titles Office records of ownership, aerial photographs and anecdotal information;
- A site visit to identify areas of environmental concern, on-site waste disposal practices, location of sewers, drains, holding tanks, Underground Storage Tanks, Aboveground Storage Tanks and pits, spills and ground discolouration;
- A targeted soil boring/sampling program, including drilling of 21 boreholes to a maximum depth of 3m;
- Laboratory analysis of selected samples for metals, TPH, BTEX, PAH, OCP, OPP, VHC and Asbestos;
- Review of Quality Assurance/Quality Control (QA/QC) data and comparison with Data Quality Objectives;
- Interpretation of results and findings; and
- Conclusions and recommendations.

4.0 SITE INFORMATION

4.1 Site Identification

The area referred to as "the site" is the area bounded by Bennett St to the west, Northcote St to the north, Hilly St to the east and Edwin St to the south in the suburb of Mortlake, NSW (refer to Figure 3 – Locality map in Appendix A) in the Local Government Area of Canada Bay, Parish of Concord County of Cumberland.
It is made of 20 adjoining parcels of land forming a trapeze, of approximately 10,000 m^2 in area, namely:

- Lots 1 to 5 in DP309043 5 parcels
- Lot 63 and 64 in DP1937 2 parcels
- Lot 8 in DP227984 1 parcel
- Lot 13 in DP747109 1 parcel
- Lots A and B in DP356064 2 parcels
- Lots 15 to 20 in DP1599 6 parcels
- Lots 3 and 4 in DP31644 2 parcels
- Lot 1 in DP588807 1 parcel

Lots 1 to 5 in DP309043 were used as residential dwellings while the other parcels were used for industrial purposes.

4.2 Site surroundings

The site surroundings are as follows:

To the north ⇒	Northcote St then commercial / light industrial buildings
To the east ⇒	Hilly St then commercial / light industrial buildings then Tennyson Rd then a former AGL gasworks site (now known as Breakfast Point)
To the south ⇒	Residential premises
To the west ⇒	Bennett Street then commercial/light industrial buildings

Adjoining and surrounding properties are mostly commercial and light industrial, with the exception of the residential properties along the southern boundary of the site.

4.3 Proposed Development

It is understood that the site is proposed to be redeveloped for mixed low and high density residential use, including medium to high density residential units in the northern part of the site and houses with gardens along the southern boundary of the site (Edwin St).

5.0 TOPOGRAPHY, GEOLOGY AND HYDROGEOLOGY

5.1 Topography

The site is located on a peninsula. The general topography of the area can be described as undulating hills, along the Parramatta River. The area surrounding the site has an approximate 5 degrees slope towards the west to northwest. The site itself has an approximate 7 to 8 degrees towards the northwest. There is a difference in height of 16m between the highest point and lowest point of the site.

5.2 Surface Waters

The entire site was sealed at the time of the assessment. Surface water flows into the gutters and drains on Bennett St along the western boundary. Some surface runoff may from time to time enter the site from the south (Edwin St); it was considered possible that the water which may run into the site may be impacted prior to entering the site by activities undertaken at some of the surrounding industrial sites.

The closest body of water is Majors Bay located approximately 150 m west of the site. Majors Bay is connected to Parramatta River which is one of the main waterways in Sydney, flowing into Port Jackson.

5.3 Geology

Review of the Sydney 1:100 000 Geological Sheet 9130 indicates that the area of the site is underlain by Hawkesbury Sandstone including medium to coarse-grained quartz sandstone, very minor shale and laminite lenses.

5.4 Hydrogeology

It is assumed that the groundwater flow follows the general topography of the site towards the west / north-west, but a hydrogeology study would be required to confirm this.

A groundwater well was found on the site located near Bennett Street adjacent to a UST and the groundwater in this well was found at approximately 3 m below ground level. The groundwater from this well was not found to have any particular odour.

5.5 Flooding

The document entitled "Public Works Department (Feb 1986) Lower Parramatta River Flood Study - Report 94017" details flood levels and discharges for the Lower Parramatta River. Based on the information provided by this document, it was found that the 1% Design Flood Level for the Ryde Road Bridge which is the nearest feature to the site referred in this document is 1.5 m A.H.D. The subject site is therefore not prone to flooding.

6.0 SITE HISTORY

6.1 Historical Search

A review of title documents held in the Land Titles Office of NSW was undertaken as part of this study (refer to Appendix G – Titles Documents). The following table lists the previous registered proprietors of the different parcels of the site.

Table 1: Registered ownership

Year	Description	Ownership
Lot 8 in DP227984		
1965-present	*CT: 8/227984* *HT: 10205/179*	Municipality of Concord
1954-1965	*V1083 F.13*	Tom Leslie Harris
1921-1954		Margaret Reese
1893-1921		Daniel Brennan
Lot A in DP356064		
2004	*CT: A/35606*	Mortlake Developments Pty Ltd
1964-2004	*V5705 F.68*	Paint Industries (Australia) Pty Ltd
1947-1964	*V776 F.39*	Daniel Brennan

Year	Description	Ownership
Lot B in DP356064		
2004-present	*CT: B/35606* *HT: B/35606*	Mortlake Developments Pty Ltd
1959-2004	*V5705 F.69*	Paint Industries (Australia) Pty Ltd
1947-1959	*V776 F.39*	Blanche Lean Singleton
Lot 1 in DP309043		
2004-present	*CT: 1/309043* *HT:1/309043*	Mortlake Developments Pty Ltd
1979-2004	*Vol 3299 Fol102*	George and Wanda Baracz
1951-1979		Jacob Zarucki
1929-1951		William and Frances Jarvis
1928-1929		Samuel, Frederick and Arthur Leslie
1922-1928		Michael Joseph Donohue
Lot 2 in DP309043		
2004-present	*CT: 2/309043* *HT:2/309043*	Mortlake Developments Pty Ltd
1966-2004	*Vol 2513 Fol 137*	Paint Industries (Australia) Pty Ltd
1914-1966		Charles and Francis Hancock
1914	*Vol 2468 Fol 98*	Henry George Busell
1913-1914	*Vol 3299 Fol 102*	Jordan and Albert Morgan
1912-1913		Alexander Moffat Turnball
1901-1912	*Vol 1362 Fol 133*	Fanny Holderness
Lot 3 in DP309043		
2004-present	*CT:3/309043* *HT:3/309043*	Mortlake Developments Pty Ltd
1965-2004	*Vol 3583 Fol 172*	Paint Industries (Australia) Pty Ltd
1924-1965	*Vol 2868 Fol 97*	Leslie William and Alice Beatrice Thew
1914-1924		Henry George Busell
1913-1914	*Vol 2372 Fol 47*	Jordan and Albert Morgan
1912-1913	*Vol 2239 Fol 196*	Alexander Moffat Turnball
1901-1912	*Vol 1362 Fol 133*	Fanny Holderness
Lot 4 in DP309043		
2004-present	*CT: 4/309043* *HT: 4/309043*	Mortlake Developments Pty Ltd
1953-2004	*Vol 5636 Fol 210*	Andrew and Margaret Whitelaw
1950-1953		Norman James Dunlop
1947-1950		Madeline Grace Trusler
1946-1947		Isabel Agnes Hudson
1914-1946	*Vol 2868 Fol 97*	Henry George Busell
1913-1914	*Vol 2372 Fol 47*	Jordan and Albert Morgan
1912-1913	*Vol 2239 Fol 196*	Alexander Moffat Turnball
1901-1912	*Vol 1362 Fol 133*	Fanny Holderness

Year	Description	Ownership
Lot 5 in DP309043		
2004-present	*CT: 5/309043* *HT: 5/309043*	Mortlake Developments Pty Ltd
1960-2004	*Vol 5558 Fol 194*	Raymond Joseph Monchtor
1951-1953		Jandre and Anna Arlou
1946-1951		Doris Vickers
1914-1946	*Vol 2868 Fol 97*	Henry George Busell
1913-1914	*Vol 2372 Fol 47*	Jordan and Albert Morgan
1912-1913	*Vol 2239 Fol 196*	Alexander Moffat Turnball
1901-1912	*Vol 1362 Fol 133*	Fanny Holderness
Lot 1 in DP588804		
2004-present	*CT: 1/588807* *HT: 1/588807*	Mortlake Developments Pty Ltd
1966-2004	*Vol 13296 Fol 54*	Paint Industries (Australia) Pty Ltd
1953-1966	*Vol 6632 Fol 66*	The Housing Commission of NSW
1948-1953	*Vol 5557 Fol 57*	W. James Paint Pty Ltd
1946-1948		Norman Bruce Hando
1899-1946	*Vol 1272 Fol 4*	Robert Hudson
Lots 17-20 in DP1599		
2004-present	*CT: 17-20/309043* *HT: 17-20/309043*	Owned by Mortlake Developments Pty Ltd
1953-2004	*Vol 5558 Fol 194*	Paint Industries (Australia) Pty Ltd
1949-1953		W. James Paint Pty Ltd
1946-1948	*Vol 5557 Fol 57*	Norman Bruce Hando
1899-1946	*Vol 1272 Fol 4*	Robert Hudson
Lot 16 in DP1599		
2004-present	*CT: 5/309043* *HT: 5/309043*	Mortlake Developments Pty Ltd
1961-2004	*Vol 1109 Fol 122*	Paint Industries (Australia) Pty Ltd
1948-1961		George & Lucy Freeman
1941-1948		Harriett and Frederick Ashton
1933-1941		Elizabeth Anne Ross
1920-1933		Maurine Shanahan
1916-1920		Laura Jane Jennings
1896-1916		Charles William Tanner
1893-1896		George Tanner
Lot 15 in DP1599		
2004-present	*CT: 5/1599* *HT: E/1599*	Mortlake Developments Pty Ltd
1959-2004	*V5705 F.69*	Title cancelled – Lost documents
Lot 3 in DP31644		
2004-present	*CT: 3/31644* *HT: 3/31644*	Mortlake Developments Pty Ltd
1967-2004	*Vol 8200 Fol 248*	Paint Industries (Australia) Pty Ltd
1953-1966	*Vol 6632 Fol 66*	The Housing Commission of NSW
1948-1953	*Vol 5557 Fol 57*	W. James Paint Pty Ltd
1946-1948		Norman Bruce Hando
1899-1946	*Vol 1272 Fol 4*	Robert Hudson

Year	Description	Ownership
Lot 4 in DP31644		
2004-present	*CT: 4/31644* *HT: 4/31644*	Owned by Mortlake Developments Pty Ltd
1967-2004	*Vol 8200 Fol 249*	Paint Industries (Australia) Pty Ltd
1953-1966	*Vol 6632 Fol 66*	The Housing Commission of NSW
1948-1953	*Vol 5557 Fol 57*	W. James Paint Pty Ltd
1946-1948		Norman Bruce Hando
1899-1946	*Vol 1272 Fol 4*	Robert Hudson
Lots 63 and 64 in DP 1937		
2004-present	*CT: 63 & 64/1937* *HT: 63 & 64/1937*	Mortlake Developments Pty Ltd
1966-2004	*Vol 4992 Fol 244*	Paint Industries (Australia) Pty Ltd
1941-1966		Frank Hancock
1931-1941		W. James Paint Pty Ltd
1908-1931	*Vol 5557 Fol 57*	Eliza Anderson

6.2 Review of aerial photographs

A review of the aerial photographs for the years 1930, 1951, 1961, 1970, 1978, 1986 and 1999 was also carried out as part of this study. In summary, the review of these aerial photographs indicates that prior to 1930, the site was used for residential purposes. A gas works plant started operating in the 1950's occupying most of the area near the site. Two smaller warehouses were built around the 1970's and no further changes occurred after this date.

6.3 Trade Waste Licenses

Sydney Water indicated that Anzol did have a Trade Waste Agreement, including the use of oily water separators.

6.4 NSW EPA records

A search of the NSW EPA records indicated that there is no investigation or remediation orders for this site.

6.5 WorkCover records

A search of WorkCover records for this site indicated that there were at least two USTs at the site including one which was abandoned.

6.6 Summary of site history

The title search and aerial photographs indicated that prior to 1950, the use of the site was mostly residential. After this time, Paint Industries (Australia) Pty Ltd, which operated a paint factory, owned a number of parcels of land. Paint Industries (Australia) Pty Ltd acquired further lots around the mid 1960's and the industrial activities were then expanded to these lots.

Lots 1 to 5 in DP309043 were never owned by Paint Industries (Australia) Pty Ltd, and the information reviewed as part of this study suggests that they were only used for residential purposes.

7.0 SITE WALKOVER – AREAS OF ENVIRONMENTAL CONCERN

7.1 Site Walkover

Prior to undertaking site investigations, a site walkover was carried out by Nick Kariotoglou, principal environmental scientist for Aargus (refer to Appendix J – Resumes Client Team) at the site. The following items were considered as part of this site walkover:

- 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;
- Former raw material transportation;
- Waste management practices and management of hazardous materials;
- Presence of Underground Storage Tanks or Above Ground Storage Tanks;
- Odour and noise; and
- Occupational health and safety.

At the time of the investigation, the site was occupied by a three-storey building and structures on the site were comprised of the following:

- Warehouse and generator facility;
- Water cooler and pump house;
- Distillate pump and tank x 2;
- Can store;
- Resin plant house;
- Tanks adjacent to resin plant;
- Hot cupboard;
- Finished goods warehouse (ground floor);
- Laboratory (first floor);
- Suite of offices (part of second floor);
- NATA Laboratory (part of second floor);
- Canteen (third floor);
- Storage Tanks (on roof);
- Paint manufacturing building;
- Tank washing place;
- Raw materials warehouse (ground floor);
- Laboratory (first floor);
- Generator place and switch room;
- Saveall and drum washing place;
- Solvent tank house (ground floor);
- Drum store (first floor);
- Raw materials warehouse;
- Vegetable oil tank;
- Maintenance workshop;

- Engineering workshop;
- Carparking area;
- Locker and store rooms; and
- Engineering offices.

At the time of the ESA, no modifications had been made to the buildings or concrete slabs on the site. A vertical cliff face of 3.7 m splits the site near the middle parallel to Bennett Street.

At the time of the investigation, a number of features were also observed at the site, particularly:

1. 10 AST tanks of approximately 15kL in volume underneath the warehouse raw material tank storage building;
2. 5 AST tanks of 15kL, 10kL and 5kL in volume next to the raw material area;
3. 13 AST tanks containing toluene and xylene;
4. 10 asbestos backed power boards and electrical boards;
5. 1 transformer likely to contain PCB;
6. asbestos at the following locations:
   - floor tiles in most of the office building and stairwells;
   - most of the building structures, roofs, walls and ceilings particularly office ceiling);
   - underneath the resin plant on the roof and around associated piping (old boiler room);
   - in 15% of pipes found around the site (mostly near resin plant) within lagging;
   - in 2 asbestos-lined fume cupboards; and
   - in 2% of AST tanks mostly near the resin plant, as asbestos coating;
7. Lead paints on walls that were thin but may cause concern during demolition;
8. approximately 35 mercury lamps;
9. 3 x large water collection pits containing in total approximately 20kL of water one of those containing approximately 400kg of sediment / sludge;
10. 1 AST gas tank near caustic area;
11. 12 x mill tanks ~ 5,000L capacity (ave);
12. 4 x 25kg class 6 full powder bags;
13. 15% of all pipes had some sort of residue still inside;
14. localised paint/resin spills over site;
15. 30 x 5 and 1L paint containers;
16. 100L of paint within containers on smaller site;
17. 10 AST hoppers and 5 others AST hoppers in a row;
18. 4 very large paint hoppers and 6 large hoppers in plant;
19. 4 approximately 15kL water treatment tanks;
20. 10 x 200L tanks still full of liquor across the site;
21. 1 large resin tank in the ground floor of the resin plant;
22. 2 UST of approximately 30kL in volume, containing approximately 100L of a liquid looking like laquor; and
23. 1 bowser, vent pipe and associated piping.

The groundwater well located downgradient of the UST showed no signs of Hydrocarbon odours or PSH (phase separated hydrocarbon).

7.2 Chemicals of Environmental Concern

The site is in close proximity to a former gas works site that has recently been remediated which is an activity known to generally impact the soil and/or groundwater.

The paint factory also provides many sources of chemicals mainly in the form of semi-volatile and volatile organic chemicals in relation to the use of paints, thinners, and other operational chemicals.

The most likely contaminants of concern associated with the use of the site are:

- Metals;
- Asbestos;
- PCBs;
- PAH;
- TPH and BTEX;
- Semi-volatiles; and
- Volatiles.

8.0 FIELD INVESTIGATIONS

8.1 Soil sampling

The field investigation included the drilling of twenty-one boreholes BH1 to BH20 and BH4a across the site to depths ranging from 0.5 m to 3.0 m below ground level with the aid of a hand auger. The boreholes were located to target potential areas of environmental concerns identified in the site history review and site walkover as well as to provide site coverage. This sampling density complies with the recommendations of the NSW EPA (1995) "Sampling design guidelines" which recommend that a minimum of 21 sampling locations should be collected and analysed for a site of 10,000 m^2 in area.

Between one to five samples were collected from each borehole in accordance with Aargus sampling protocols. As part of the assessment undertaken, staining or crusts were not sampled as they would provide expected positive readings. It was determined that samples should be taken just below the surface layers to determine if deeper penetration has occurred at these noted locations (see field descriptions and borehole logs).

9.0 QUALITY ASSURANCE QUALITY CONTROL

Soil samples were collected and submitted to a NATA accredited laboratory (Amdel Laboratories) for analysis on listed contaminants. Routine decontamination procedures were employed throughout the field investigation and standard chain-of-custody protocols observed at all times. For further details on methodologies used, please refer to Appendix F – Aargus Protocols.

Laboratory samples for validation sampling were collected for the analysis of:

ANALYTE	No of Samples (Incl. QA/QC)
Heavy metals - Arsenic (As), Cadmium (Cd), Chromium (Cr), Nickel (Ni), Lead (Pb), Mercury (Hg), Copper (Cu), and Zinc (Zn);	29
Heavy metals – Cobalt (Co), Manganese (Mn), Selenium (Se) and Tin (Sn);	7
PAHs, including Benzo(a)Pyrene;	4
Total Petroleum Hydrocarbons (TPHs);	26
Solvents – BTEX; and	26
Phenols	2
Volatiles –VOCs	8

Samples were placed in 250g clean glass jars, leaving no headspace, and closed using teflon-coated lids. These samples were then stored in an esky and transported to Amdel Laboratories under chain of custody (CoC) conditions (refer to Appendix C – Laboratory Results).

9.1 Quality Assurance/Quality Control (QA/QC)

Standard QA/QC procedures were followed. The decontamination of sampling equipment and the hand auger was achieved by washing the trowel and auger with phosphate-free detergent and tap water, followed by final rinsing with distilled water. This was conducted after the collection of samples at each borehole location and each sample interval.

One blind sample and one intralab sample was submitted for analysis in accordance with Aargus standard protocols to satisfy QA/QC determination. Below is a summary of the blind and intralab sample results, the parent sample and the resultant Relative Percentage Difference.

Table 2: QAQC results - RPD for metals

Analyte	Nature	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg
BH21 1.7m		<5	<0.5	8	<5	<2	16	42	<0.05
BH24 1.7m	Intra-lab dup	<5	<0.5	9	7	<2	63	73	0.06
RPD%		**nc**	**nc**	**12**	**>33**	**nc**	**119**	**59**	**>18**
BH25 0.8m		<5	<0.5	28	<5	2	32	73	<0.05
BH26 0.8m	Inter-lab dup	8	<0.5	33	<0.5	2	18	46	<0.05
RPD%		**>46**	**nc**	**16**	**nc**	**0**	**56**	**45**	**nc**

Table 3: QAQC results - RPD for TPH and BTEX

Analyte	Nature	TPH C6-C9	TPH C10-C36	Benzene	Toluene	Ethylbenzene	Xylene
BH21 1.7m		<2	<60	<0.1	<0.1	<0.3	<0.1
BH24 1.7m	Intra-lab dup	<2	<60	<0.1	<0.1	<0.3	<0.1
RPD%		0	0	0	0	0	0
BH25 0.8m		<2	<60	<0.1	<0.1	<0.3	<0.1
BH26 0.8m	Inter-lab dup	<20	<120	<0.5	<0.5	<0.5	<1.5
RPD%		0	0	0	0	0	0

The data for the samples presented five results that did not meet the recommended limits for Relative Percentage Differences set out in the Aargus Protocols (Appendix F). Zinc, Copper, Lead and Mercury results in samples BH21.1.7 and BH24.1.7 had elevated RPD being respectively 59%, 92%, 118% and 82%. Also the data for Lead between the intralab samples BH25.0.8 and BH26.0.8 indicated a RPD of 56%. This however does not affect data quality since the levels were at such low concentrations that regardless of the percentage difference, the upper limit of the concentration, when taking the relative difference into account, would not exceed guidelines for Zinc, Copper, Lead and Mercury. All other quality control data provided comparable results to the original samples, with the RPD values within the recommended limits of 30-50%. The samples have therefore met our Date Quality Objectives (DQOs) and the integrity of samples is justified.

Data Quality Objectives (DQOs) were created to produce quality assured, accurate and useful data for the sampling plan. Blind samples were split in the field for testing. Other areas reviewed are:

- Sampling methods;
- Decontamination procedures;
- Sample preservation;
- Container type;
- Headspace within containers;
- Disturbed or undisturbed sampling for organics;
- PQL's;
- Preparation of CoC forms;
- Review of laboratory surrogate and spike % returns;
- Review of Laboratory duplicate results;

- Document and data completeness; and
- Data comparability.

Reviews of sampling methods are consistent with our protocols, our sample preservation and decontamination procedures were found to meet criteria. Our other sample quality reviews of taking, transporting, holding and testing have all been also reviewed. In considering review of the above Data Quality Objectives, results have been shown to meet our requirements for integrity of sample interpretation. Thus, all samples have met Data Quality Objectives (DQOs) and the results can be used for this project.

For site assessments, the number of samples required relates to the acceptance criteria of the assessment. This in turn depends on how a contaminant distribution is to compare with an acceptable limit. Given the uncertain nature of sampling, site assessment is to occur using the arithmetic average concentration of the contaminant(s) which should be less than an acceptable limit, at a given confidence level. This gives a statistically unbiased result.

Calculation for determining the 95% upper confidence limit (UCL) of the arithmetic average concentration - reference: Procedure D, pp22 NSW EPA Contaminated Sites Sampling Design Guidelines, 1995

The method requires that the probable average concentration and standard deviation of the contaminant be known. This method is most applicable for site assessment sampling, where the mean concentration and the standard deviation can be estimated from sampling results.

Equation used

$$\textbf{UCL average} = \textbf{mean} + t_{\alpha,n-1} \frac{\textit{std deviation}}{\sqrt{n}}$$

Where

UCL average =	Upper confidence limit
n =	number of samples measurements
α =	The probability that the 'true' average concentration of the sampling area might exceed the UCL average determined by the above equation (0.05, i.e. 95%)
mean =	Arithmetic average of all sample measurements
$t_{\alpha,n-1}$ =	A test statistic (Student's t at an α level of significance and n-1 degrees of freedom)
std deviation =	Standard deviation of the sample measurements

This would mean that the diameter of the hot spot that could be detected with 95% confidence with seven sampling locations was approximately 24 metres.

10.0 SITE INVESTIGATION CRITERIA

10.1 Soil

To assess the contamination status of soils at a site, the NSW EPA generally refers to the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM), NEPC Schedule B series, 1999.

It is understood that the site is proposed to be redeveloped for residential use, including medium to high density residential units in the northern part of the site and houses with gardens along the southern boundary of the site. Therefore the contamination status of the soils in the area of the site which will be redeveloped as residential units will be assessed against the health investigation levels (HIL) of the above mentioned guidelines for residential sites with minimal access to the soil ("HIL D").

For residential sites with minimal access to the soil, the NSW EPA (1998) "*Guidelines for the NSW Site Auditor Scheme*" notes that concentrations in soil to be retained on-site not underneath buildings or slabs should also be assessed against the phytotoxic-based environmental investigation levels (EIL) as these parts of the site will be used for growing plants or grass. For areas of the site where low density housing or gardens prevail, the HIL A criteria and EILs will be investigated. As the appropriate plans have not been prepared, a general review will be conducted.

The NEPM 1999 does not include investigation levels for TPH and BTEX. For assessing TPH and BTEX contamination at sites used for sensitive land use, such as residential, the NSW EPA refers to the NSW EPA (1994) "*Guidelines for Assessing Services Station Sites*".

10.2 Groundwater

For assessing groundwater quality, it is first necessary to assess the beneficial uses of groundwater downgradient of the site being assessed. Potential uses of groundwater downgradient of the site could include:

- Groundwater extraction for industrial purposes at the site or by other industrial facilities in the vicinity of the site;
- Groundwater impact on the ecology or marine environment.

The threshold concentrations presented in the ANZECC (2000) Fresh and Marine Waters Quality Guidelines are considered applicable for the protection of aquatic ecosystems of the receiving waters. As these guidelines apply to receiving waters, it is generally conservative to apply these to groundwater discharging to receiving waters. It is important to note that these are not threshold values at which an environmental problem is likely to occur if exceeded, rather, of the trigger values are exceeded, then further action is required which may include either further site-specific investigations to assess whether or not there is an actual problem or a management / remedial action should be undertaken.

It is considered that marine water trigger values are applicable for investigating chemical concentrations in groundwater at the site, as the likely receiving body (Majors Bay) is a marine environment eventually discharging in Parramatta River.

It is understood that the EPA policy is that the trigger values for the protection of 95% of aquatic ecosystems should be used except where contaminants are potentially bioaccumulative in which case the trigger values for protection of 99% of species should be used.

Guidelines for irrigation and general water use are also presented in the ANZECC (2000) Fresh and Marine Waters Quality Guidelines (section 4.2 of the guidelines). The guidelines list long term trigger values (LTV) and short term trigger values (STV) depending fog he duration of use – up to 100 years for LTV and up to 20years for STV. LTV, which are more stringent that STV, have been adopted as investigation criteria.

Guidelines for the recreational water quality and aesthetics are also presented in the ANZECC (2000) Fresh and Marine Waters Quality Guidelines (section 5.2.3 of the guidelines). Mortlake is located in a semi-industrial area and is not expected to be used for recreational purposes, therefore Section 5 (Guidelines for recreational water quality and aesthetics) of the ANZECC (2000) Fresh and Marine Waters Quality Guidelines would not be applicable to assess groundwater quality downgradient to the site.

The site is located in a semi-industrial area currently being transformed into residential living and it is considered unlikely that groundwater at the site or in the vicinity of the site would be used for drinking; therefore the ANZECC (1996) Drinking Water Guidelines would not be applicable to assess groundwater quality at the site.

The site is not in a rural area and the groundwater in the vicinity of the site would not be used for stock watering purposes.

The peninsular at Mortlake has a very small catchment area and as such the recovery/recharge rates of groundwater would be considered too small to enable use of groundwater.

11.0 RESULTS

11.1 Subsurface conditions

The following subsurface conditions were encountered at the site:

- a concrete slab of thickness ranging between 25 to 30 mm was encountered at all boreholes locations, overlying
- fill, comprising of sand, ceramic fragments, rock particles and clay material. The base of this fill layer was found at depth ranging from 0.2 to 0.7 m below ground level across the site, overlying
- clay, overlying
- sandstone, found at depths ranging from 0.4 to 2.1 m BGL across the site.

Groundwater was not encountered during the investigations carried out at the site. Material with characteristics of Acid Sulphate Soils (ASS) or Potential Acid Sulphate

Soils (PASS) was not encountered during the investigations carried out at the site. It is however known that the adjoining property across Bennett Street near Majors Bay contains PASS at levels of 2.5 to 3 m deep. If such materials at depth or showing ASS/PASS indicators are found at the subject site, they should be analysed.

Surface samples were taken just below any staining or crust (caking or dried product on the surface) levels to determine potential migration impact. From the field observations, boreholes with resin or paint crust surfaces and/or strong surface odour and visible discoloration were found at boreholes BH5, BH10, BH11, BH15, BH17 and BH19.

Hydrocarbon odour was encountered at the following locations:

- BH5 between 0.1m BGL and the end of the borehole at 0.5m BGL; and
- BH19 between 0.2m BGL and the end of the borehole at 1.3m BGL.

Solvent odour was encountered at the following locations:

- BH10 between 0.2m BGL and the end of the borehole at 1.7m BGL;
- BH11 between 0.4m BGL and the end of the borehole at 0.6m BGL;
- BH15 between 0.5m BGL and the end of the borehole at 0.8m BGL; and
- BH17 between 0.4m BGL and the end of the borehole at 1.0m BGL.

11.2 Laboratory results

Laboratory transcripts for the samples analysed are presented in Appendix C – Laboratory Results, with a summary of results being presented in the following tables.

Table 4: Laboratory results – Metals

Analyte	Mn	Ni	Sn	Se	Zn	Hg	As	Cd	Cr	Co	Cu	Pb
PQL	**5**	**2**	**5**	**20**	**5**	**0.05**	**5**	**0.5**	**5**	**5**	**5**	**5**
BH1 0.4m	-	<2	-	-	<5	0.07	<5	<0.5	8		<5	<5
BH2 0.4m	65	2	<5	<20	8	0.07	<5	<0.5	12	<5	6	<5
BH3 0.5m	-	9	-	-	**470**	0.48	<5	2	30	-	29	**430**
BH4 0.4m	15	<2	<5	<20	43	0.05	<5	<0.5	11	5	<5	24
BH4 0.5m	-	2	-	-	75	0.06	<5	1	15	-	13	43
BH5 0.4m	-	16	-	-	<5	0.05	<5	1	21	-	6	13
BH6 0.5m	10	<2	<5	<20	23	0.08	<5	<0.5	18	<5	<5	15
BH6 0.8m	-	<2	-	-	19	<0.05	<5	<0.5	24	-	<5	12
BH7 0.4m	-	18	-	-	**410**	0.14	6	1	55	-	41	**1700**
BH7 1.6m	-	<2	-	-	38	0.08	<5	<0.5	18	-	6	30
BH8 0.4m	-	5	-	-	160	0.1	6	<0.5	27	-	17	110
BH9 0.3m	-	2	-	-	21	0.06	<5	<0.5	17	-	9	59
BH10 0.5m	38	4	<5	<20	41	0.05	<5	<0.5	12	<5	7	36
BH10 1.6m	-	<2	-	-	6	0.05	<5	<05	26	-	<5	8
BH11 0.5m	-	<2	-	-	7	0.06	<5	<0.5	19	-	<5	5
BH12 0.3m	-	<2	-	-	18	0.07	<5	<0.5	11	-	<5	17
BH13 0.4m	-	13	-	-	**330**	0.41	8	2	23	-	86	240
BH14 0.3m	-	5	-	-	25	0.5	<5	1	26	-	14	13
BH15 0.5m	-	<2	-	-	5	0.08	<5	<0.5	19	-	<5	<5
BH15 0.8m	-	<2	-	-	6	0.22	<5	<0.5	22	-	<5	<5
BH16 0.35m	17	<2	<5	<20	33	0.1	<5	<0.5	7	8	<5	22
BH17 0.5m	-	<2	-	-	78	<0.05	<5	<0.5	7	-	<5	12
BH17 1.0m	-	-	-	-	-	-	-	-	-	-	-	-
BH18 0.5m	24	<2	<5	<20	<5	<0.05	<5	<0.5	<5	<5	<5	<5
BH18 2.1m	-	<2	-	-	<5	<0.05	<5	<0.5	17	-	<5	<5

Analyte	Mn	Ni	Sn	Se	Zn	Hg	As	Cd	Cr	Co	Cu	Pb
PQL	**5**	**2**	**5**	**20**	**5**	**0.05**	**5**	**0.5**	**5**	**5**	**5**	**5**
BH19 0.3m	-	3	-	-	75	0.13	<5	<0.5	13	-	12	75
BH19 1.3m	-	<2	-	-	<5	0.09	<5	<0.5	18	-	<5	6
BH20 0.4m	-	<2	-	-	45	0.1	<5	2	9	-	8	37
BH21 0.5m	-	5	-	-	95	0.16	<5	<0.5	12	-	16	130
BH21 1.7m	-	<2	-	-	42	<0.05	<5	<0.5	8	-	<5	16
S1	-	23	-	-	**7800**	0.54	5	**4**	**600**	-	**830**	**450**
No of	7	35	7	7	35	35	35	35	35	7	35	35
Minimum	10	2	5	20	5	0.05	5	0.5	5	5	5	5
Maximum	85	23	5	20	7800	0.54	8	4	600	8	830	1700
Average	36	5	5	20	315	0.1	5	0.8	34	5	36	127
Std Dev	28	5.6	nc	nc	1311	0.14	0.5	0.7	99	1.1	139	310
95% UCL	57	7	nc	nc	689	0.17	5.3	1.0	62	6	7	215
HIL D	**6,000**	**2400**	**NSL**	**NSL**	**28,000**	**60**	**400**	**80**	**400**	**400**	**4,000**	**1,200**
HIL A	**1,500**	**600**	**NSL**	**NSL**	**7,000**	**15**	**100**	**20**	**100**	**100**	**1,000**	**300**
EIL	**500**	**60**	**NSL**	**NSL**	**200**	**1**	**20**	**3**	**1**	**NSL**	**100**	**600**

Notes:

- All data in mg/kg unless otherwise stated.
- PQL: Practical Quantitative Limit.
- NSL refers to No Set Limit
- -: not analysed

Table 5: Laboratory results – TPHs, BTEX, PAH, B(a)P, Phenols and VOC

Analyte	TPH C6-C9	TPH C10-C36	Benzene	Toluene	Ethyl benzene	Xylene	PAHs	B(a)P	Phenols	VOCs
PQL	2	60	0.1	0.1	0.1	0.3	3.1	0.06	41	75
BH1 0.4m							<3.1	<0.06		
BH2 0.4m	<2	<60	<0.1	<0.1	<0.1	<0.3				
BH4 0.4m							<3.1	<0.06	-	<75
BH5 0.4m	<2	260	<0.1	0.4	<0.1	<0.3				
BH6 0.5m	<2	<60	<0.1	<0.1	<0.1	<0.3				
BH6 0.8m	<2	<60	<0.1	<0.1	<0.1	<0.3			-	<75
BH7 0.4m	<2	<60	<0.1	<0.1	<0.1	<0.3				
BH8 0.4m	<2	<60	<0.1	<0.1	<0.1	<0.3				
BH10 0.5m	**5500**	**12000**	0.3	**1300**	**540**	**690**	**510**	<0.06	<41	**4600-**
BH10 1.6m	**350**	540	<0.1	**100**	**19**	**50**				
BH11 0.5m	**850**	140	0.3	**110**	**140**	**240**				
BH12 0.3m	8	<60	<0.1	<0.1	<0.1	<0.3			-	<75
BH14 0.3m	<2	<60	<0.1	<0.1	<0.1	0.5			-	<75
BH15 0.5m	<2	<60	<0.1	<0.1	<0.1	<0.3				
BH16 0.35m	<2	<60	<0.1	<0.1	<0.1	<0.3				
BH17 0.5m	10	<60	<0.1	**5.4**	<0.1	0.4			<41	5-80
BH17 1.0m	<2	<60	0.4	<0.1	<0.3	<0.1				
BH18 0.5m	<2	<60	<0.1	<0.1	<0.3	<0.1				
BH18 2.1m	<2	<60	<0.1	<0.1	<0.3	<0.1				
BH19 0.3m	<2	70-90	<0.1	<0.1	<0.3	<0.1				
BH19 1.3m	<2	<60	<0.1	<0.1	<0.3	<0.1			-	<75
BH21 0.5m	<2	<60	<0.1	<0.1	<0.3	<0.1				
BH21 1.7m	<2	<60	<0.1	<0.1	<0.3	<0.1				

Analyte	TPH C6-C9	TPH C10-C36	Benzene	Toluene	Ethyl benzene	Xylene	PAHs	B(a)P	Phenols	VOCs
PQL	**2**	**60**	**0.1**	**0.1**	**0.1**	**0.3**	**3.1**	**0.06**	**41**	**75**
S1	<2	<60	<0.1	<0.1	<0.3	<0.1				
No. of Samples	25	25	25	25	25	25	4	4	2	7
Minimum	2	60	0.1	0.1	0.1	0.1	3.1	0.06	41	75
Maximum	5500	12000	0.4	1300	540	690	510	0.5	41	4700
Average	270	569	0.1	61	28	39	131	0.17	41	729
Std Deviation	1104	2384	0.08	260	110	144	253	0.22		1729
95% UCL	648	1384	0.2	150	66	89	428	0.4	41	1999
Guideline	**65**	**1000**	**1**	**1.4/130**	**3.1/50**	**14/25**				
HIL A/D							**20/80**	**1/4**	**8500/34000**	**NSL**

Notes:

- All data in mg/kg unless otherwise stated.
- Guideline refers to Service Station Guidelines
- HIL A/D refers to NEPC health based investigation levels for low density and medium/high density residential dwellings
- PQL: Practical Quantitative Limit.
- NSL refers to No Set Limit
- -: not analysed

12.0 DISCUSSION

A summary of the results are as follows:

BH3 @ 0.5m zinc & lead above EIL but below HIL A criteria
BH7 @ 0.4m zinc & lead above EIL, lead above HIL D criteria
BH10 @ 0.5m PAHs, VOCs, TPHs & BTEX above all criteria
BH10 @ 1.6m TEX & TPHs (C6-C9) above all criteria
BH11 @ 0.5m TEX & TPHs (C6-C9) above all criteria
BH13 @ 0.4m zinc above EIL criteria but below HIL D criteria
BH17 @ 0.5m high toluene & VOCs above criteria
S1 @ surface Zn, Cr, Cu and Pb > EIL, Zn, Cr, Pb > HIL A, & Cr >HIL D

Note: boreholes BH21-BH25 are for the adjoining site at Bennett Street covered by a separate report. Laboratory results form part of this transcript.

13.0 CONCLUSIONS AND RECOMMENDATIONS

The analysis of Laboratory results indicated levels of potential heavy metals, solvents (toluene, ethylbenzene, xylene), petroleum hydrocarbons (TPHs) and volatiles (VOC) contaminants exceeding regulatory requirements for samples BH3, BH7, BH10, BH11, BH13, BH17, BH19, & sample S1 as measured against HILs (Health-based Investigation Levels and Environmental Investigation Levels). Levels were measured against sensitive residential criteria with accessible soils. Samples underwent QA/QC interpretation and met relevant DQOs. The integrity of samples is therefore justified.

Based on the diameter hotspot as calculated using NSW EPA sampling design criteria (25.7m), we were able to approximate the relative impact of each targeted hotspot. The following is only used as a guide but has been included within the report. Part of our recommendations is to further delineate the extent of contamination either before or during the remediation process. The following areas and relative quantities are considered as requiring remediation as a minimum:

- BH3, ~140 tonnes of low level heavy metals
- BH5, BH15, BH19, ~240 tonnes of solvent impacted surface soils
- BH7, ~110 tonnes of low level heavy metals
- BH10, ~425 tonnes* of high level solvent and HC impact
- BH11, ~140 tonnes* of high level solvent and HC impact
- BH13, ~110 tonnes of low level heavy metals
- BH17, ~140 tonnes of high level solvents
- Sample S1 ~1 tonne of high level heavy metals

* denotes that this area is at the former solvent storage area and heavy impact has been witnessed. This area would have a far more widespread impact and to extrapolate locations BH10 & BH11 along the soil profile to areas to the south and west (hydraulic gradient) would expand the quantity to at least 1,000 tonnes.

Our investigation indicates that the vertical extent of contamination is limited to the upper fill layers and the rock face which is relatively shallow. This has restricted deeper penetration. It should be noted that the rock may have also been impacted to a small degree.

Further to this, other areas requiring remediation are as follow:

- 1 x transformer area containing PCB liquids;
- 10 x Asbestos backed power boards and electrical substation boards;
- Asbestos floor tiles in most of the office buildings and stairwells;
- Asbestos in most of the building structures, roofing, walls and ceilings;
- Asbestos in the office ceilings;
- Asbestos underneath the resin plant on the roof and around associated piping (old boiler room);
- Asbestos within lagging in 15% of pipes found around the site (mostly near resin plant);
- 2 x Asbestos lined fume cupboards;
- Asbestos coating on 2% of AST tanks mostly near the resin plant;
- Lead paints on walls that were thin but may cause concern during demolition;
- ~35 x Mercury lamps;
- 3 x large water collection pits carrying ~20,000L of water;
- 1 x of the above pits containing sediment/sludge (400kg);
- 4 x 25kg class 6 full powder bags;
- 15% of all pipes had some sort of residue still inside;
- localised paint/resin spills over site;
- 30 x 5 & 1 litre paint containers;
- 100L of paint within containers on smaller site;
- 10 x 200L tanks still full around the site;
- 2 x USTs ~30,000L capacity (containing 100L of residual liquor); and
- 1 x bowser and vent pipe remaining with associated piping.

Groundwater was not considered problematic as no odours or olfactory evidence was witnessed. As the site has minimal exposure pathways, combined with the fact that no beneficial use exists, groundwater does not pose a concern for human or ecological exposure. The sampling for off site migration of groundwater is however proposed to be undertaken as part of the next phase of works.

13.1 Potential Impact

Areas of remedial works can be conducted separate from demolition works. The proposed methodology for each are as follow:

- Low level heavy metals – between 610 and 1,360 tonnes of low level wastes will be excavated and disposed of as inert waste (based on confirmation of classification) to a facility licensed to accept such wastes.

- Industrial classified heavy metals – one tonne of industrial waste will be collected and disposed of at a facility licensed to accept such wastes under an excavate and dispose strategy.
- Class 6 poisons – approximately 100 tonnes will be required to be carefully collected from bags and taken to a scheduled waste disposal facility.
- PCB Waste – Approximately 500L of PCB oils classified as scheduled waste will require licensing and disposal at an appropriate facility.
- Mercury Lamps – 35 lamps must be removed and taken to a licensed waste disposal facility prior to demolition occurring.
- 2 x USTs – Must be decommissioned and removed in accordance with AS1940 & AIP (Australian Institute of Petroleum) standards and then validated. Groundwater monitoring is required as part of the NSW EPA regulatory auditor scheme.
- Solvent wastes – Bioremediation and on site landfarming will be conducted over at least a 16 week period. Soils will be excavated from their respective locations and placed in 500mm lifts. Soils will be treated with a chemical accelerant prior to turning at least every two weeks to promote volatilisation. The excavation pits will be validated and the residual soils and stockpile materials will be certified as clean prior to reinstatement or disposal.
- Liquor removal – Each water settling pit will require a licensed pump out for the 20,000L still remaining onsite.
- Removal of Asbestos and chemical residue removal has to be conducted in conjunction with the demolition phase to enable access to most parts of the site. Removal of floor tiles, roofing, guttering and ceilings on each floor is required to be conducted by a Workcover licensed Asbestos contractor. Many of the tanks and associated piping still contain residue and/or asbestos lagging (insulation). The demolition phase will enable sequential removal of each tank and pipe with appropriate disposal or destruction. Tanks and pipes that have lagging or coatings will be disposed of whilst all other tanks and pipes will be sent for recycling. Each floor and building will be dismantled accordingly and in accordance with Workcover practices. Piping that contains residue will be required to be removed to a facility licensed to accept each waste stream. The site floor will also be required to be removed to gain access to underlying impacted soils. For this reason, the demolition phase and remediation phase cannot be separated.

In order to appropriately characterise further impacts across the site, it is a requirement that access be granted underneath floor slabs and sealed surfaces. To gather certainty that a detailed investigation could not achieve, it is proposed that the remedial works be conducted in two stages.

- Stage 1 – Demolition and removal of all surface structures to gain access to underlying soils for further classification and assessment.

- Stage 2 – Remediation and Validation of all impacted materials and comparison to any proposed development plans for the site.

In Summary

It is proposed that further assessment works be conducted post demolition works to enable appropriate characterisation of underlying soils, services and migration potential.

Due to the uncertainty still remaining with respect to areas underlying sealed surfaces, the project should be conducted in the following stages:

1. A HAZMAT report conducted in preparation for demolition;
2. A Remedial Action Plan (RAP) be developed to incorporate further sampling in areas not previously sampled or to verify the lateral and horizontal extent of contamination;
3. An NSW EPA acreditor review the RAP;
4. Demolition works to commence;
5. Remediation and Validation works to commence;
6. Preparation of a Validation Report; and
7. Final NSW EPA auditor sign off.

We would be pleased to provide further information on any aspects of this report.

For and behalf of
Aargus Pty Ltd

Nick Kariotoglou
Managing Director

14.0 LIMITATIONS OF ASSESSMENT

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue, although 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 are judgements which are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions.

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

ENVIRONMENTAL SITE ASSESSMENT

Properties

16-18 Bennett Street and 20-22 Bennett Street, Mortlake, NSW

"SITE 2"

Prepared for

Mortlake Consolidated Investments Pty Ltd

May 2005

CONTROLLED DOCUMENT
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DOCUMENT HISTORY

Revision No.	Revision Date	Description
0	11/5/2005	Initial Issue

Issued By: .....

Date: .....

Aargus

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REFERENCES

- Australian and New Zealand Environment and Conservation Council, (1992), "National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters".
- Douglas Partners Pty Ltd, (2002), "Report on Contamination Assessment – 20-22 Bennett Street, Mortlake"
- NSW Acid Sulphate Soils Management Advisory Committee, (1998) "Acid Sulfate Soils Assessment Guidelines", Wollongbar, NSW.
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- NSW Environment Protection Authority, (1994) "Guidelines for Assessing Service Station Sites" (1994), Sydney.
- NSW Environment Protection Authority, (1998) "Guidelines for the NSW Site Auditor Scheme", Sydney.
- NSW Environment Protection Authority, (1997), "Guidelines for Consultants Reporting on Contaminated Sites", Sydney.
- National Environment Protection Council, (1999), "National Environment Protection Measure Guideline on the Investigation Levels for Soil and Groundwater".
- National Environment Protection Council, (1999), "National Environmental Protection Measure Assessment of Site Contamination- Schedule B series".

ABBREVIATIONS

- AIP – Australian Institute of Petroleum Ltd
- ANZECC – Australian and New Zealand Environment Conservation Council
- AST – Aboveground Storage Tank
- ASS – Acid Sulphate Soils
- BGL – Below Ground Level
- BTEX - Benzene, Toluene, Ethyl benzene and Xylenes
- CoC – Chain of Custody
- DIPNR - Department of Infrastructure Planning and Natural Resources
- DQOs – Data Quality Objectives
- EIL – Ecological Investigation Level
- EPA- Environment Protection Authority
- ESA Environmental Site Assessment
- HIL – NSW EPA Health-based Investigation Levels as per "Guidelines for the NSW Site Auditor Scheme
- LGA – Local Government Area
- nd – non-detect
- NEHF – National Environmental Health Forum
- NEPC – National Environment Protection Council
- NHMRC – National Health and Medical Research Council
- OCP - Organochlorine Pesticides
- OPP – Organophosphorous Pesticides
- PAH - Polycyclic Aromatic Hydrocarbons
- PID - Photo Ionisation Detector
- ppm – parts per million
- PQL – Practical Quantitation Limits
- QA/QC - Quality Assurance, Quality Control
- RAC – Remediation Acceptance Criteria
- RAP - Remediation Action Plan
- RPD – Relative Percentage Difference
- SAC - Soil Assessment Criteria
- SVC – Site Validation Criteria
- SWL – Standing Water Level
- 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

EXECUTIVE SUMMARY

Aargus Pty Ltd has been instructed by Mr Andrew Simons on behalf of Mr Ian Edwards of Mortlake Consolidated Investments Pty Ltd to undertake an Environmental Site Assessment (ESA) of the properties situated at 16-18 Bennett St and 20-22 Bennett St, Mortlake, NSW. Collectively these sites are known as "Site 2".

The ESA will assess the site's environmental characteristics in comparison to regulatory criteria in order to determine the site's suitability for the proposed redevelopment, thereby meeting council regulations for development works.

The objectives of the ESA are to identify issues of ongoing pollution and non-compliance, identify the likelihood and extent of significant contamination, and recommend management strategies including any additional investigations or remedial costs.

In proposing recommendations and/or remediation criteria for the site, the published *NEPC 'D' Health-based Investigation Levels (High-density residential with minimal access to soils including high-rise apartments and flats)* were used. The more stringent *NEPC 'A' Health-based Investigation Levels (low-density residential)* were also included for prospective development purposes.

The scope of work in preparing the ESA report included the review of existing information, filling information gaps, formulating and implementing sampling and analysis, interpretation of results/findings and report generation in accordance with NSW EPA "*Guidelines for Consultants Reporting on Contaminated Sites*", 1997.

A review of records and a site inspection show that there are potential environmental concerns from past site operations. From the above information, site history and the site inspection, the areas of environmental concern were found to be:

- Potential fill of unknown origin;

- Adjoining upgradient Paint Factory; and
- Previous site usage as commercial/industrial premises.

Given these areas of environmental concern, a standard suite of chemicals were analysed, with significant contaminating chemicals targeted.

To assist in the site assessment process, soil samples including QA/QC blind and inter-laboratory samples were taken from drilled boreholes and submitted for analysis at a NATA accredited laboratory.

Analytes were tabulated and statistical analysis was undertaken to ascertain the 95% Upper Confidence Limit (UCL). The 95% UCL of the average concentration for the analysed contaminants were then compared with the *NEHF 'A'* and *NEHF 'D' Health-based Investigation Levels*, along with the NSW EPA *Guidelines for Assessing Service Station Sites*.

From our laboratory analysis of samples and interpretation of results, generally fill and natural material across the site has met Regulatory Acceptance Criteria and Data Quality Objectives for guidelines pertaining to medium to high density residential development (*NEHF 'D'*) and the more stringent low density residential (*NEPC 'A')*. The concentration of Polycyclic Aromatic Hydrocarbons (PAH) however exceeds both guideline criteria in the fill, but not natural material. Hence, some remediation of this surface material would be required.

Samples met regulatory requirements as set out in the NSW EPA *Guidelines for Assessing Service Station Sites, 1994*, for hydrocarbon impacted soils, ANZECC *"Guidelines for the Assessment and Management of Contaminated Sites"*.

If the proposed development is to involve deep excavations into the soil strata, consideration must be given to the existence of Acid Sulphate Soils. Field and laboratory analysis indicated that it is unlikely that Actual Acid Sulphate Soils (AASS) or Potential Acid Sulphate Soils (PASS) exist to a depth of 1.5 m on site. Sampling at 2.5 m however indicated that PASS is likely to exist from this depth. Hence if the

proposed development is to involve deep excavations, which disturb the underlying marine sediments, it is expected that an Acid Sulphate Soil Management Plan will be required.

The site size of 3,000 m^2 requires a sampling density (via NSW EPA Guidelines) of 9 sample locations. The sampling density conducted for the site equates to 11 sampling locations and 25 samples. The site has therefore been adequately characterised and it can be assumed that we do not expect any unexpected concerns to remain underground. Soil conditions are always hard to determine underneath sealed surfaces. It is therefore recommended that the materials underlying sealed surfaces be examined post demolition to confirm the absence of any areas of environmental concern.

It is also understood that excavations may be proposed for basement car parking. These excavation works would include the removal from the site of superficial material, including fill identified at the site and some of the natural material underneath. Material excavated from the site should be classified in accordance with the NSW EPA Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes, 1999 and disposed appropriately.

The adjoining Anzol Paint Factory does pose a migration concern and as the groundwater has not been examined in detail, we propose to review the water quality post demolition and fill examination stage once ground floor slabs have been removed.

As the site has shown to contain limited surficial impacted fill material, it is recommended that a Remediation Action Plan (RAP) be developed to manage soils being removed from the site and also confirm groundwater quality at the site.

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 medium to high density residential dwellings.

As soils may be planned to be removed from the site as part of development works or basement works, a RAP would be required. This RAP will also confirm the groundwater quality of the site.

If a change to a more sensitive land use was to be considered for the site, further assessment may be required. We would be pleased to provide further information on any aspects of this report.

1.0 INTRODUCTION

Aargus Pty Ltd (Aargus) was commissioned by Mr Andrew Simons on behalf of Mr Ian Edwards of Mortlake Consolidated Investments Pty Ltd, to prepare an Environmental Site Assessment (ESA) on the sites located at 16-18 Bennett Street and 20-22 Bennett Street, Mortlake, NSW. This assessment was performed between the April 2002 and the February 2005, in accordance with the Aargus proposal, NSW EPA regulatory guidelines, governing NEPC criteria (Appendix E) and Aargus Environmental Protocols (Appendix F). Most of the information relating to the portion of "Site 2" known as 20-22 Bennett Street has been extracted from a previous environmental report prepared by Douglas Partners in April 2002[1] and Aargus Report in September 2002.

This ESA serves to identify issues relating to the condition of the site as part of the level of assurance required for consent by Canada Bay Council to the Development Application (DA). At this stage it is understood that the proposed development at the site is for residential use, which will include the construction of medium-high density residential apartments with car parking. An ESA is required to verify whether the site is suitable for its intended purpose of the proposed development, and if not, provide quantitative estimates of remedial works.

2.0 OBJECTIVES

In accordance with our instructions, the purpose of this ESA is to:

- Identify issues of ongoing pollution and non-compliance, as compared to set regulatory criteria;
- Identify the likelihood and/or extent of significant contamination occurring from past and present practices on the site; and
- Recommend any further management strategies including any additional investigation and/or remediation costing.

[1] Douglas Partners, 2002, "Report on Contamination Assessment – 20-22 Bennett Street, Mortlake".

Specifically, the ESA will assess:

- Contaminant dispersal in air, surface water, groundwater, soil and dust;
- The potential effects of contaminants on public health, the environment and building structures;
- (where applicable) off-site impacts on soil, sediment and biota;
- The adequacy and completeness of all information available to be used in making decisions on remediation; and
- Ground Conditions including Acid Sulphate Soils.

3.0 SCOPE OF WORKS

In order to achieve the above objectives the following scope of work was carried out for the ESA.

- Collecting site information, review of historical information and past site practices, aerial photographs, EPA records search and site interviews.
- A site inspection to identifying all areas of environmental concern, on-site waste disposal practices and location of sewers, drains, holding tanks, Underground Storage Tanks, Aboveground Storage Tanks and pits, spills and ground discolouration, etc.
- A targeted soil boring/sampling investigative study – formulating and conducting a sampling plan and borehole investigation; the soil samples are taken and submitted for analysis on particular contaminants.
- Laboratory analysis and results from sample analysis – findings and 95% Upper Confidence Limit (UCL) calculation, compared to regulatory guidelines. Analysis includes TPHs, BTEX, PAHs, Heavy metals, pesticides (OCPs), PCBs, Phenols and POCAS.
- Interpretation of results and findings.
- Recommendations and final conclusions drawn from interpretation of the results.

4.0 SITE INFORMATION

4.1 Site Identification

The sites are known as 16-18 Bennett Street and 20-22 Bennett Street, Mortlake, NSW. The sites are situated in the Local Government Area of Canada Bay, Parish of Concord and the County of Cumberland (Refer to Appendix A – Locality Map and Site Plans). The subject properties are identified as being:

16-18 Bennett Street

- Lot 1 in Deposited Plan (DP) 124958

At the time of the investigation for 16-18 Bennett Street no title information was available from the Department of Lands - Land and Property Information NSW.

20-22 Bennett Street

- Lot 1 in Deposited Plan (DP) 812692

At the time of the investigation for 20-22 Bennett Street, AW and DW Donnelley Superannuation Fund Pty Ltd were the proprietors of the property, according to title documents held at the Department of Lands - Land and Property Information NSW.

4.2a Site Description 16-18 Bennett Street

16-18 Bennett Street occupies an area of approximately 1500 m^2. A warehouse style building brick in construction with concrete floor, comprises the majority of the site. The site slopes slightly in a westerly direction towards Majors Bay. The majority of the site is concrete sealed with a small part of land in the west corner being grassed with small shrubs. The site boundaries include:

Northern boundary ⇒ Commercial/light industrial properties

Southern boundary ⇒ Commercial/light industrial properties

Western boundary ⇒ Grassed foreshore then Majors Bay.

Eastern boundary ⇒ Bennett Street then former Anzol paint factory.

Adjacent sites to the north, south and east of the site are commercial/light industrial properties.

4.2b Site Description 20-22 Bennett Street

The site occupies an area of approximately 1400 m^2. The site is occupied by a light industrial/commercial premise. The site slopes downward from Bennett Street in a westerly direction at an angle of approximately 3^0. The main part of the site is concrete sealed with a small part of land in the west corner being vacant grassed area with small shrubs. The site boundaries include:

Northern boundary ⇒ New residential development.
Southern boundary ⇒ Commercial/light industrial properties
Western boundary ⇒ Grassed foreshore then Majors Bay.
Eastern boundary ⇒ Bennett Street then former Anzol Paint factory.

The surrounding sites in the immediate north, south and east are commercial/industrial properties with a new development.

4.3 Proposed Development

The proposed development for the site has not been confirmed, however it is expected that existing dwellings will be removed, in order to construct multi-level medium to high density residential dwellings.

Based on this knowledge and for the purposes of this report, EPA site assessment guidelines shall be measured against high density residential properties for the proposed land use, and due to the possibility of access to exposed soil, the more stringent low density residential guidelines will also be reviewed. These guidelines follow *Health-based Investigation Levels* (HILs) for developments, which includes dwellings with fully and permanently paved yard space such as high-rise apartments and flats (*NEPC 'D')* as well as guidelines for dwellings with accessible soil (*NEPC 'A')*. Refer to the *NSW EPA "Guidelines for the NSW Site Auditor Scheme", 1998* or *NEPC Schedule B(4) – "Guideline on Health Risk Assessment Methodology", 1999.* Reference will also be made to the *NSW EPA "Guidelines for Assessing Service*

Station Sites", 1994 when guideline limitations are required for soils potentially impacted with petroleum hydrocarbons.

5.0 SITE HISTORY

A review of historical title documents held in the Land Titles Office of NSW was undertaken to determine the previous land use and occupiers of the site. An aerial photograph search was also conducted for the subject site. Photos dating back to 1951 were viewed and any site changes were noted. This information has been extrapolated and Tables 1-5 shows a summary of our historical findings. Historic title documentation can be found in Appendix G.

5.1a Historical Search 16-18 Bennett Street

The site is situated in the Local Government Area of Canada Bay, Parish of Concord County of Cumberland. Table 1 lists the previous registered proprietors of the site.

Table 1 – Summary of Historical Land Titles for 16-18 Bennett Street

Lot 1 DP 124958 **Registered Proprietors 1881 to present**	
Historical Title information was not available at the time of the investigation	

5.1b Historical Search 20-22 Bennett Street

The site is situated in the Local Government Area of Canada Bay, Parish of Concord County of Cumberland. Tables 2-5 list the previous registered proprietors of the site

Table 2 – Summary of Historical Land Titles for 20-22 Bennett Street

Lot DP **Registered Proprietors 1881 to present**	
In relation to the part formerly comprised in Lot 4 DP 812692	
11/1974	The Maritime Services Board of NSW
6/1975	Sargent and Burton Pty Ltd. Possible site usage as commercial.
	Note: Volume 12605 issued in the name of the Maritime Services Board of NSW. The title prior to this was Volume 5018 Folio 1. Volume 5018 Folio 1 is a title for the harbour and its foreshores. This title contains around 100 pages. No investigation of this part of the title has been conducted prior to the issue of the said Volume 12605 Folio 205 – as the information is not site specific

Table 3 – Summary of Historical Land Titles for 20-22 Bennett Street

Lot 6 Section 3 DP 1559 **Registered Proprietors 1881 to present**	
April 1890	Edward Reeves – Civil Servant. Site use unknown, possibly residential
August 1922	Samuel Ashton – Bricklayer. Site use unknown, possibly residential
September1936	Mary Ashton – Widow of Samuel. Site use unknown, possibly residential
September1936	Frederick Samuel Ashton and Arthur Leslie Ashton – Mechanics. Site usage unknown, possibly commercial or residential

Table 4 – Summary of Historical Land Titles for 20-22 Bennett Street

Lot 5 Section 3 DP 1559 **Registered Proprietors to present**	
February 1899	Robert Hudson- Contractor. Site use unknown possibly residential
February 1943	Frederick Samuel Ashton and Arthur Leslie Ashton – Manufacturers/Engineers. Site usage unknown, possibly commercial or residential
February 1961	Clements Frank Sheldon – Builder. Site use unknown
September 1964	Sargent and Burton Pty Ltd – Site use unknown, possibly commercial

Table 5 – Summary of Historical Land Titles for 20-22 Bennett Street

Lot 1 DP 812692	
September 1981	Barry John Sargent and Nathella Ann Sargent . Site use unknown, possibly commercial
January 1988	Hotham Estates Pty Ltd. Site use unknown, possibly commercial
September 1994	AW and DW Donnelley Superannuation Fund Pty Ltd

Note: Information included in tables 2-5 was extracted from Douglas Partners Report (2002), title search prepared by Burkhart and Company Pty Ltd.

5.2a Aerial Photographs (1951-2002) 16-18 Bennett Street

The set of aerial photographs from the years 1930, 1951, 1970, 1994 and 2002 were viewed at the Sydney Map Shop – Land and Property Information. Table 6 is a summary of the information gathered from the review of the property 16-18 Bennett Street.

Table 6 – Summary of Historical Aerial Photographs 16-18 Bennett Street

Photograph	Description of Site	Neighbouring Properties
1930	Site appears to contain warehouse type buildings	The neighbouring properties to the south of the site appear to be warehouse buildings. To the east of the site appears to be vacant, with possibly some residential dwellings. To the north of the site is vacant. To the west of the site is Majors Bay.
1951	The site appears to contain a large building	The surrounding areas appear as above, however there appears to be more development to the north and east of the site.
1970	The site appears to have extended in size to the west, possibly due to the reclaimation of Majors Bay.	The surrounding areas now appear to be commercial-industrial buildings/warehouses
1994	The site appears to contain a major building in the middle of the site, possibly with some smaller structures to the west of the main building	The surrounding properties contain commercial/industrial buildings/warehouses.
2002	The site appears as above	The surrounding properties are as above

5.2b Aerial Photographs (1951-2002) 20-22 Bennett Street

The set of aerial photographs from the years 1930, 1951, 1970, 1994 and 2002 were viewed at the Sydney Map Shop – Land and Property Information. Table 7 is a summary of the information gathered from the review.

Table 7 – Summary of Historical Aerial Photographs 20-22 Bennett Street

Photograph	Description of Site	Neighbouring Properties
1930	Site appears to vacant	The surrounding properties to the north of the site appear to be vacant. The surrounding properties to the south of the site appear to be commercial/industrial/warehouses. To the east of the site appears to be vacant with some residential type buildings
1951	The majority of the site appears to be vacant, however a small building may be present on the western portion of the site	The surrounding properties appear as above
1970	The size of the site also appears to have grown in size to the west of the site, possibly due to the reclamation of Majors Bay	The surrounding properties appear to contain more commercial/industrial/warehouse type buildings.

Photograph	Description of Site	Neighbouring Properties
1994	There appears to be a sealed area on the eastern portion of the site with a large building occupying the centre of the site. A small portion on the western edge of the site (which fronts Majors Bay) appears to be grassed	The surrounding properties are as above
2002	The site is as above however trees occupy the formerly grassed area	The surrounding properties are as above

5.3 Council Records

The records held by Council for development or any environmental concerns for this site were not reviewed.

6.0 TOPOGRAPHY, GEOLOGY and HYDROGEOLOGY

6.1 Topography and Surface Waters

The general topography of the area can be described as undulating hills, forming the boundary with the Parramatta River. The localised topography slopes downward in a westerly direction at approximately $3\text{-}4^0$, following the regional slope and natural contours of the surrounding area. Regional water flow is directed west towards Majors Bay. We expect that potential concerns would not arise from surrounding land uses bearing waterborne contaminants onto the site as surface waters, for all drainage lines and stormwater controls are adequate.

6.2 Geology

Research was conducted on the geology of the area by reviewing the Sydney 1:100 000 Geological Sheet 9130. It was found that formations in this area belong to the Mesozoic Era of the Triassic Period. The site itself is located in geological formations of Hawkesbury Sandstone that include "*medium to coarse-quartz grained sandstone, very minor shale and laminate lenses*".

During soil boring investigations, fill material, sand, sandy/silty clays and sandstone were evident in all boreholes drilled to natural sandstone bedrock. The fill material encountered in during the borehole investigations was comprised of sand, clay and

crushed rock (including sandstone). Groundwater was encountered at varying depths across the site (refer to Appendix D – Borehole Logs).

6.3 Hydrogeology

Groundwater was encountered during this investigation at approximately 1.8 m on 16-18 Bennett Street in BH23 (refer to Appendix A Site Plan). This groundwater was found near the edge of the foreshore and would be assumed to comprise of marine waters and not local groundwater. The closest body of water is Majors Bay, located west of the site. Majors Bay is linked to the Parramatta River (one of the main waterways in Sydney), which eventually flows into Port Jackson. It is assumed that groundwater flows in this general direction (west), however in order to verify this a review of groundwater flow charts and a hydrological desk study would be required. The water quality of the Parramatta River is influenced by regional usage. Given the close proximity of the site to the Parramatta River, groundwater quality is not solely identifiable apart from localised water quality for it is influenced by the regional water quality of the Parramatta River system.

6.4 Ground Conditions

The ground conditions at Site 2 can be described as fill material to approximately 1 m overlying natural silty/sandy clays and clayey sand. Sandstone bedrock was found between 0.5m -3m across the site, with the depth at which the bedrock was found increasing in a westerly direction towards Majors Bay. Groundwater was encountered at one location at approximately 1.8 m, on the western portion of 16-18 Bennett Street. Although no evidence of Actual Acid Sulphate Soils was found on the site to 3.0 m, evidence was found that Potential Acid Sulphate Soils exist from 2.5 m at “Site 2”.

The geotechnical work to be prepared for “Site 2” will provide a more detailed interpretation of the ground conditions.

6.4a Ground Conditions 16-18 Bennett Street

A fill layer exists across the site from the surface to a depth of 0.6-0.8 m. Sand is then found beneath this layer. Groundwater was encountered on the western portion of the site a depth of approximately 1.8 m. Sandstone bedrock was encountered at varying depths from 0.6m to 3.0m across the site.

6.4b Ground Conditions 20-22 Bennett Street

A fill layer exists across the site from the surface to varying depths up to 1.3 m. Sandy clays and Clayey sands lie beneath the fill layer and on top of sandstone bedrock. Sandstone bedrock was encountered between 0.5m and 3.0m. No groundwater was encountered.

7.0 PREVIOUS ENVIRONMENTAL REPORTS

Douglas Partners prepared a "Report on Contamination Assessment - 20-22 Bennett Street, Mortlake" in April of 2002. The report found that fill material existed over the majority of the site to a depth of approximately 1.3 m, which was comprised of sandy clays, sand, gravely sands, clay with some ash and slag, bricks quartz and sandstone pebbles. Beneath the fill material lays natural gravely sand, sandy clay and clayey sands, which in turn overlay sandstone bedrock encountered between 0.5m and 3.0m.

The investigation found that analyte concentrations within deeper soils met relevant guideline criteria. Some localised areas of elevated nickel, zinc, toluene, TPH (C_{15}-C_{36}) and PAH were found in the fill layer. It was therefore recommended that if access to soils was to be part of the proposed development, then some minor remedial work would be required on the fill material.

The investigation also recommended that if the proposed development, involves excavations that are to extend deep into underlying clayey sands, then an Acid Sulphate Soil Management Plan would be required.

EPA Accredited Site Auditor E T C Johnstone of Johnstone Environmental Technology Pty Limited reviewed the Douglas Partners Report and concluded that in his opinion "the 20-22 Bennett Street, Mortlake NSW property is suitable for residential apartment use with minor remediation of the present ground surface".

Aargus Pty Ltd was commissioned by Prestige Building Services to undertake a due diligence Environmental Site Assessment (ESA) of the property situated at Bennett Street, Mortlake, NSW. The assessment was undertaken in September 2002 for two

sites being the Anzol Paint Factory situated to the east of the subject property and a limited assessment at the subject site. All results were incorporated into the 1 report. Whilst the Anzol Factory was shown to contain heavy contamination, the site at 16-18 Bennett Street held limited traces of contamination. Those results are within this report.

8.0 SITE INSPECTION

The site inspection took into account the surrounding environment and any further aesthetic issues pertaining to the site. A review of the site history and environmental documentation was undertaken to support any findings.

8.1 Site Walkover

Before the Aargus project team (refer to Appendix J – Resumes of Client Team) engaged in borehole drilling and soil sampling procedures for contamination detection, the strategy to walk through the site and note pertinent information for the environmental assessment was adopted. Aargus took into consideration the following points where they were necessary:

- Description and quality of the building structures;
- Adjoining operations;
- Prior functions and operations within the site;
- Surface water;
- Groundwater;
- Former industrial processes;
- Former raw materials;
- Former raw material transportation;
- Chemicals formerly used on the site;
- Trade waste;
- Hazardous operations;
- Waste Management Practices;
- Underground Storage Tanks;
- Above ground storage tanks;

- Review of former roof materials;
- Odour and noise quality; and
- Occupational health and safety.

From inspection of the above details, the following information was gathered with regard to the subject properties.

8.1a Site Walkover 16-18 Bennett Street

The existing buildings were in relatively good condition on their exterior surfaces. The concrete slabs covering the majority of the site were in good condition and approximately 150mm thick, all reinforced. No areas are visibly cracked or degraded. There was no evidence of localised stains or spills on sealed areas.

All drainage flowed in the associated guttering and stormwater drains. Upon visual inspection, all drainage to stormwater seemed to be free from blockage and abnormal stains and odours.

Adjoining and surrounding properties are commercial/industrial properties. Up gradient of the site is the former Anzol paint factory.

8.1b Site Walkover 20-22 Bennett Street

The existing buildings were in good condition on their exterior surfaces. A roof inspection of the buildings was conducted with no evidence of asbestos materials present. All other building materials consisted of materials classified as non-hazardous and are of no concern for this investigation.

The concrete slabs and bitumen covering the majority of the site were in good condition, with no areas visibly cracked or degraded. There was no evidence of localised stains or spills on sealed areas.

All drainage flowed in the associated guttering and stormwater drains. Upon visual inspection, all drainage to stormwater seemed to be free from blockage, with no abnormal stains or odours noted.

Adjoining and surrounding properties are commercial/industrial properties. Up gradient of the site is the former Anzol paint factory

8.2 Trade Waste

There is no trade waste notice held by the subject properties. The sites are not a scheduled premise under the Pollution Control and Waste regulations, thus did not warrant a license.

8.3 EPA Notices

Our inquiries with the EPA and Canada Bay Council have ascertained there are no outstanding pollution abatement or clean-up notices on the subject properties. Accordingly, the properties are not listed on the EPA's (now council) Notice Register under section 149 certificates.

8.4 Aesthetic Issues

The soil investigations exposed fill material and natural sandstone bedrock. Fill materials were consistent and no abnormal odours were noted. The fill material was limited to sandy material, some clay, crushed rock with sandstone inclusions. No visible plant stress was observed at the time of the investigation.

8.5 Areas of Environmental Concern

A review of records and a site inspection show that there are potential environmental concerns from past site operations. From the above information, site history and the site inspection, the areas of environmental concern were found to be:

- Potential fill of unknown origin;
- Adjoining upgradient Paint Factory; and
- Previous site usage as a commercial/industrial premises.

Bearing in mind these areas of environmental concern, a standard suite of chemicals was analysed, with significant contaminating chemicals targeted.

9.0 SOIL BORING AND SAMPLING

A concise soil sampling and analysis program was used to consolidate the nature and degree of potential contaminants present in the subsurface. Soil samples were taken at varying depth intervals across the site in a systematic manner. All fieldwork and borehole logging was conducted by qualified environmental staff. Refer to Appendix J for the project team.

To assist in the site assessment process, the following boreholes and samples were drilled for each site;

- 16-18 Bennett Street: three boreholes were drilled, with a set of five samples plus one QA/QC blind samples were taken and submitted for analysis at a NATA accredited laboratory. At three sample locations, the sealed concrete layer was cored to allow access to the materials below. Drilling using a stainless steel auger was used to investigate the subsurface extent of contamination.
- 20-22 Bennett Street: eighteen samples plus two intra laboratory blind samples were taken from eight drilled boreholes and submitted for analysis at a NATA accredited laboratory. Soil sampling was conducted using push tube methodology.

The combined area of the two sites is approximately 3000 m². The NSW EPA "Sampling Design Guidelines" (September 1995) shows the minimum number of sampling points for a site of approximate area of 3000 m^2 is nine. The sampling density achieved for the investigation is eleven thus giving a more certain outcome.

Soil samples were collected and submitted to NATA accredited laboratories (Amdel Laboratories and ALS) for analysis on listed contaminants. Routine decontamination procedures were employed throughout the field investigation and standard chain-of-custody protocols observed at all times. For further details on methodologies used, please refer to Appendix F – Aargus Environmental Protocols.

Laboratory samples were collected for the analysis of:

Table 8a – Laboratory Sample Analysis – 16-18 Bennett Street

Analyte	No. of Samples (Excl. QA/QC)
Heavy Metals: - Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn), Mercury (Hg).	5
Heavy Metals:-Cobalt (Co), Manganese (Mg), Selenium (Se), Tin (Sn)	1
Total Petroleum Hydrocarbons (TPHs).	3
Solvents – Benzene, Toluene, Ethyl benzene and Xylenes (BTEX).	3
Benzo(a)pyrene	1
Polycyclic Aromatic Hydrocarbons (PAHs	1

Table 8b – Laboratory Sample Analysis 20-22 Bennett Street

Analyte	No. of Samples (Incl. QA/QC)
Heavy Metals: - Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn), Mercury (Hg).	16
Total Petroleum Hydrocarbons (TPHs).	12
Solvents – Benzene, Toluene, Ethyl benzene and Xylenes (BTEX).	12
Pesticides – OCP.	10
Polychlorinated Biphenyls (PCBs)	10
Polycyclic Aromatic Hydrocarbons (PAHs)	10
Phenols	10
POCAS	3

Samples were placed in 125g clean glass jars, leaving no head space and closed using teflon-coated lids. These samples were then stored in an ice filled chest and transported to Amdel Laboratories under Chain of Custody conditions (refer to

Appendix C – Laboratory results). Samples were taken at depths as shown in the borehole logs (Appendix D).

9.1 Laboratory Analysis

The laboratory used, AMDEL Laboratories, is NATA registered for all Analytes to be tested. AMDEL Laboratory procedures used for each analyte tested for include:

Analyte	**Amdel internal method code**
Arsenic (As) by ICP-ES	method code E5910
Cadmium (Cd) by ICP- ES	method code E5910
Chromium (Cr) by ICP- ES	method code E5910
Copper (Cu) by ICP- ES	method code E5910
Nickel (Ni) by ICP- ES	method code E5910
Lead (Pb) by ICP- ES	method code E5910
Zinc (Zn) by ICP- ES	method code E5910
Mercury (Hg) by ICP- ES	method code E4950
Mercury (Hg) in Soil	method code E5950
TPH hydrocarbon fraction C_6-C_9	method code E1230
TPH hydrocarbon fraction C_{10}-C_{36}	method code E1221
BTEX	method code E1010
PAH	method code E1110
OCP	method code E1080
Total Phenolics as phenol	method code E1142
Total Metals by ICP-MS	method code E4970

9.2 Health & Safety

Standard Health and Safety procedures were observed. Rubber gloves were worn to minimise exposure to any potential contaminants. Breathing apparatus and PPE suits were supplied but not worn.

9.3 Quality Assurance/Quality Control (QA/QC)

Standard QA/QC procedures were followed. The decontamination of sampling equipment and the hand auger was achieved by washing the trowel and auger with

phosphate-free detergent and tap water, followed by final rinsing with distilled water. This was conducted after the collection of samples at each borehole location and each sample interval.

9.3a Quality Assurance/Quality Control (QA/QC) 16-18 Bennett Street

A blind duplicate sample was taken of BH21.1.7 was taken for QA/QC purposes. The intra laboratory sample was labelled BH24.1.7. These blind and inter-lab samples were subjected to the same analysis as the parent sample, with details of relative percentage differences given in the table below

Table 9a – Summary of QA/QC acceptance for Heavy Metals (mg/kg) 16-18 Bennett Street

Analyte	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**
BH21.1.7 (parent)	<5	<0.5	8	<5	<2	16	42	<0.05
BH24.1.7 (blind)	<5	<0.5	9	7	<2	63	73	0.06
RPD%	NC	NC	12	**92**	NC	**119**	**54**	**82**

- NC refers to Not Calculated. This is because the analyte concentrations are lower than the PQL of the laboratory.

Table 9b – Summary of QA/QC acceptance (mg/kg) 16-18 Bennett Street

Analytes	TPH C6-C9	TPH C10-C36	Benzene	Toluene	Ethyl benzene	Xylenes
BH21.1.7 (parent)	<2	<60	<0.1	<0.1	<0.3	<0.1
BH24.1.7 (blind)	<2	<60	<0.1	<0.1	<0.3	<0.1
RPD%	NC	NC	NC	NC	NC	NC

Generally the Relative Percentage Differences (RPDs) between samples BH21.1.7 and BH24.1.7 fall within the 30-50% bracket for soils. Where RPD's exceed this guide, analyte concentrations are less than the relevant guideline concentration.

9.3b Quality Assurance/Quality Control (QA/QC) 20-22 Bennett Street

Table 10a – Summary of QA/QC acceptance (mg/kg) 20-22 Bennett Street

Analyte	As	Cd	Cr	Cu	Pb	Zn	Hg
PQL	**5**	**1**	**5**	**2**	**5**	**2**	**0.01**
2/1.0 (parent)	<5	<1.0	8	4	15	42	<0.05
Z2 (blind)	<5	<1.0	8	4	9	12	<0.05
RPD%	NC	NC	NC	NC	50	112	NC
Intra-Lab							
5/0.1-0.2 (parent)	<5	<1.0	21	1300	<5	93	<0.05
Z5(Blind)	<5	<1.0	25	1100	<5	110	<0.05
RPD%	NC	NC	17	17	NC	17	NC

From the analysis undertaken, all samples analysed were within spike recovery acceptance levels, laboratory duplicate levels and surrogate % recovery levels or check recovery acceptance levels as set out in the USEPA 8270 criteria and the values are consistent with our DQOs. According to the USEPA methodology (USEPA 1986) the criteria for valid results for laboratory duplicates are that the RPDs are required to be <20% for waters and <35% for soil. Where the duplicate results are lower than 5 times the detection limit, the USEPA methodology indicates that the results are valid if the difference between the results for the duplicate soil sample is equal to or less than twice the detection limit. For samples split in the field, the Australian Standard provides a guide to the validity of the data obtained from duplicate samples. According to the Australian Standard an RPD of up to 50% is the acceptable criteria. Some RPDs calculated form heavy metal concentrations in soil were above the 35 % US and 50% Australian criteria but in most cases the total results were less than five times the detection limit and, accordingly, these variations do not contribute any significant concern for data interpretation

For site assessments, the number of samples required relates to the acceptance criteria of the assessment. This in turn depends on how a contaminant distribution is to compare with an acceptable limit. Given the uncertain nature of sampling, site assessment is to occur using the arithmetic average concentration of the contaminant(s)

which should be less than an acceptable limit, at a given confidence level. This gives a statistically unbiased result.

Calculation for determining the 95% upper confidence limit (UCL) of the arithmetic average concentration - reference: Procedure D, pp22 NSW EPA Contaminated Sites Sampling Design Guidelines, 1995

The method requires that the probable average concentration and standard deviation of the contaminant be known. This method is most applicable for site assessment sampling, where the mean concentration and the standard deviation can be estimated from sampling results.

Equation used

$$\text{UCL average} = \text{mean} + t_{\alpha,n-1} \frac{\textit{std deviation}}{\sqrt{n}}$$

Where

UCL average =	Upper confidence limit
n =	number of samples measurements
α =	The probability that the 'true' average concentration of the sampling area might exceed the UCL average determined by the above equation (0.05, i.e. 95%)
mean =	Arithmetic average of all sample measurements
$t_{\alpha,n-1}$ =	A test statistic (Student's t at an α level of significance and n-1 degrees of freedom)
std deviation =	Standard deviation of the sample measurements

This would mean that the diameter of the hot spot that could be detected with 95% confidence with eleven sampling locations was approximately 19.8 metres.

9.4 Data Quality Objectives

Data Quality Objectives (DQOs) were created to produce quality assured, accurate and useful data for the sampling plan. Blind samples were split in the field for testing. Other areas reviewed are:

- sampling methods;
- decontamination procedures;
- sample preservation;
- container type;
- headspace within containers;
- disturbed or undisturbed sampling for organics;
- PQL's;
- preparation of CoC forms;
- Review of laboratory surrogate and spike % returns;
- Review of Laboratory duplicate results;
- Document and data completeness; and
- Data comparability.

Reviews of sampling methods are consistent with our protocols, our sample preservation and decontamination procedures were found to meet criteria. Our other sample quality reviews of taking, transporting, holding and testing have all been also reviewed. In considering review of the above Data Quality Objectives, results have been shown to meet our requirements for integrity of sample interpretation. Thus, all samples have met Data Quality Objectives (DQOs) and the results can be used for this project.

9.4a Field Measurements 16-18 Bennett Street

At BH21 a 300mm thick reinforced concrete layer overlay sandy fill, then sand. No odours or groundwater were encountered, and the borehole was terminated at 1.3 m due to auger refusal on underlying sandstone bedrock.

At BH22 reinforced concrete overlay dry sand. Auger refusal occurred at 0.6m on sandstone bedrock. No odours or groundwater were encountered.

At BH23 reinforced concrete overlay sand to 3.0 m, where auger refusal occurred on underlying sandstone bedrock. Groundwater was encountered at 1.8 m, with a sulphurous odour noted at 3.0 m.

9.4b Field Measurements 20-22 Bennett Street

Based on the borehole logs of the Douglas Partners 2002 report:

At BH2 sandy fill material occurred to borehole termination at 1.0 m on sandstone bedrock. No groundwater or odours were encountered.

At BH3 concrete overlay fill comprised of sand, clay, ash, slag and gravel to 0.5m. Clay fill material then existed to 1.1 m whereby a clayey sand exists to borehole termination at 1.9 m on sandstone bedrock. No odours or groundwater were encountered.

At BH4 concrete overlay fill comprised of sandy clay and ash to 0.3m. Fill then existed to 0.6m, without ash. A sandy clay existed from 0.6m to 1.0 m, after which a clayey sand existed to 2.8 m. No odours or groundwater were encountered.

At BH5 concrete overlay a gravel clay fill layer with some ash to a depth of 0.4m. Fill without ash continued to 1.2 m, after which a clayey sand existed to borehole termination at 1.4 m on sandstone bedrock.

At BH6 concrete layer overlay fill comprised of sand clay and ash to a depth of 1.2 m. A sandy clay was found between 1.2 m and 1.5 m, after which a clayey sand existed to borehole termination at 3.0 m. A sulphur odour was noted at 2.5 m, while the borehole was terminated at 3.0 m due to sandstone bedrock. Groundwater was not encountered.

At BH7 bitumen overlay sandy, gravely, clayey fill to 0.5m, whereby the borehole was terminated due to sandstone bedrock. No odours or groundwater were encountered.

At BH8 bitumen overlay, sandy, gravely, clayey fill with traces of ash to 1.0m. A sandy clay then existed from 1.0 m to 1.3 m where the borehole was terminated due to sandstone bedrock. No odours or groundwater were encountered.

10.0 LABORATORY RESULTS

A number of analytes were selected for testing and the results of these tests are summarised below. A full set of analyte detection results are set out in Appendix C of this report, noting that results for BH21, BH22, BH23 and BH24 (duplicate sample) are the results relevant to the site at 16-18 Bennett Street, BH1-BH20 relate to the parcel of land opposite the 16-18 Bennett Street.

Table 11a – Summary of Laboratory Test Data – Heavy Metals

16-18 Bennett Street

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
BH21.0.5	5	<0.5	12	16	5	130	95	0.16	-	-	-	-
BH21.1.7	<5	<0.5	8	<5	<2	16	42	<0.05	-	-	-	-
BH22.0.4	<5	<0.5	14	10	3	59	560	0.12	-	-	-	-
BH23.0.5	5	0.7	25	44	14	**650**	370	0.25	-	-	-	-
BH23.1.4	<5	<0.5	9	21	14	94	78	0.08	<5	85	<5	<20
t-value @ 0.05	2.132	2.13	2.13	2.132	2.132	2.132	2.132	2.13	NC	NC	NC	NC
# Samples	5	5	5	5	5	5	5	5	1	1	1	1
Min Value	2.5	0.25	8	2.5	1	16	42	0.025	2.5	85	2.5	10
Max Value	5	0.7	25	44	14	650	560	0.25	2.5	85	2.5	10
Mean	3.50	0.34	13.60	18.70	7.40	189.8	229.0	0.13	2.50	85.00	2.50	10.0
Std Dev	1.37	0.20	6.80	15.74	6.19	260.7	226.5	0.08	NC	NC	NC	NC
95% UCL on Mean	4.81	0.53	20.09	33.70	13.30	438.3	444.92	0.21	NC	NC	NC	NC
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Notes to Table 11a:

- All data in mg/kg unless otherwise stated.
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- \- Refers Not Analysed
- PQL refers to Practical Quantitative Limit.
- NC refers to Not Calculated
- For the purposes of UCL calculations, any analyte concentration reported as less than the PQL half the PQL was used in the calculation of the UCL.
- NSL refers to No Set Limit.

Table 11b – Laboratory Test Data – TPHs and BTEX

16-18 Bennett Street

Heavy Metal	TPH C_6-C_9	TPH C_{10}-C_{14}	TPH C_{15}-C_{28}	TPH C_{29}-C_{36}	Benzene	Toluene	Ethyl Benzene	Xylenes	PAH	B(a)P
PQL	**2**	**20**	**20**	**20**	**0.1**	**0.1**	**0.1**	**0.3**		
BH21.0.5	<2	<20	<20	<20	<0.1	<0.1	<0.1	<0.3	-	-
BH21.1.7	<2	<20	<20	<20	<0.1	<0.1	<0.1	<0.3	-	-
BH23.0.5	<2	<20	<20	<20	<0.1	<0.1	<0.1	<0.3	6.3-7.5	0.5
t-value @ 0.05	2.920	2.920	2.920	2.920	2.920	2.920	2.920	2.920	NC	NC
No. of Samples	3	3	3	3	3	3	3	3	1	1
Minimum Value	1	10	10	10	0.05	0.05	0.05	0.15	7.5	0.5
Maximum Value	1	10	10	10	0.05	0.05	0.05	0.15	7.5	0.5
Mean	1.00	10.00	10.00	10.00	0.05	0.05	0.05	0.15	7.50	0.50
Std Deviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NC	NC
95% UCL on Mean	1.00	10.00	10.00	10.00	0.05	0.05	0.05	0.15	NC	NC
Guideline Level	**65***	**1000****			**1***	**1.4***	**3.1***	**1.4***	**-**	**-**
NEHF "A"	-	-	-	-	-	-	-	-	**20**	**1**
NEHF "D"	-	-	-	-	-	-	-	-	**80**	**4**

Notes for Table 11b:

- All data in mg/kg unless otherwise stated
- * Refers to guidelines for sensitive land use with soils potentially impacted with hydrocarbons (NSWEPA Guidelines for Assessing Service Station Sites) 1994
- ** Refers to guidelines for sensitive land use with soils potentially impacted with hydrocarbons (NSWEPA Guidelines for Assessing Service Station Sites) 1994. The guidleline limit is refers to the sum of C_{10}-C_{14}, C_{15}-C_{28}, C_{29}-C_{36}

Table 12a – Summary of Laboratory Test Data – Heavy Metals

20-22 Bennett Street

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg
PQL	**5**	**1**	**5**	**3**	**4**	**5**	**5**	**0.05**
1/0-0.4	<5	<1.0	5	4	<4	14	16	<0.05
2/0-0.3	7	1.0	19	250	26	160	650	0.06
2/1.0	<5	<1.0	8	4	<4	15	42	<0.05
3/0.1-0.4	6	<1.0	81	350	84	170	230	0.20
3/1.5	7	<1.0	10	17	<4	69	130	0.10
4/0.1-0.4	<5	<1.0	10	90	11	92	240	0.10
4/2.8	9	<1.0	10	<3	<4	<5	10	<0.05
5/0.1-0.2	<5	<1.0	21	**1300**	82	<5	93	<0.05
5/1.4	<5	<1.0	<5	<3	<4	<5	13	<0.05
6/0.1-0.4	<5	<1.0	21	59	62	130	140	0.1
6/1.5	<5	<1.0	9	3	<4	5	33	<0.05
7/0-0.3	<5	<1.0	**110**	27	98	13	85	<0.05
7/0.5	<5	<1.0	16	<3	<4	6	10	<0.05
8/0-0.3	6	<1.0	74	42	77	110	130	0.3
8/1.2	6	<1.0	21	8	10	22	69	0.08
t-value @ 0.05	1.761	1.76	1.761	1.761	1.761	1.761	1.761	1.76
# Samples	15	15	15	15	15	15	15	15
Min Value	2.5	0.05	2.5	1.5	2	2.5	10	0.02
Max Value	9	1	110	1300	98	170	650	0.3
Mean	4.23	0.11	27.83	143.9	30.93	54.23	126.07	0.08
Std Dev	2.31	0.25	32.66	335.8	37.54	61.97	163.03	0.08
95% UCL on Mean	5.28	0.22	42.69	296.6	48.01	82.41	200.21	0.11
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**NSL**

Notes to Table 12a:

- All results for 20-22 Bennett Street have been extracted from the Douglas Partners Report (2002)
- All data in mg/kg unless otherwise stated.
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- - Refers Not Analysed
- PQL refers to Practical Quantitative Limit.
- 'nd' refers to non detect, whereby the analyte concentration was less than the PQL
- For the purposes of UCL calculations, any analyte concentration reported as nd (non-detect) half the PQL was used in the calculation of the UCL.

Table 12b – Laboratory Test Data – TPHs and BTEX – 20-22 Bennett Street

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**20**	**20**	**20**	**20**	**0.1**	**0.1**	**0.1**	**0.1**
1/0-0.4	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
2/0-0.3	<20	<20	<20	<20	<0.1	5.0	<0.1	<0.1
2/1.0	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
3/0.1-0.4	<20	<20	**1400**	**1200**	<0.1	<0.1	<0.1	<0.1
3/1.5	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
4/0.1-0.4	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
5/0.1-0.2	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
6/0.1-0.4	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
6/1.5	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
7/0-0.3	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
8/0-0.3	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
8/1.2	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
t-value @ 0.05	1.796	1.796	1.796	1.796	1.796	1.796	1.796	1.796
No. of Samples	12	12	12	12	12	12	12	12
Minimum Value	10	10	10	10	0.05	0.05	0.05	0.05
Maximum Value	10	10	1400	1200	0.05	5	0.05	0.05
Mean	10.00	10.00	125.83	109.17	0.05	0.46	0.05	0.05
Std Deviation	0.00	0.00	401.26	343.52	0.00	1.43	0.00	0.00
95% UCL on Mean	10.00	10.00	333.86	287.26	0.05	1.20	0.05	0.05
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Notes for Table 12b:

- All results for 20-22 Bennett Street have been extracted from the Douglas Partners Report (2002)
- All data in mg/kg unless otherwise stated
- All guidelines are for sensitive land use with soils potentially impacted with hydrocarbons (NSWEPA Guidelines for Assessing Service Station Sites) 1994
- PQL refers to Practical Quantitative Limit.

Table 12c– Summary of Laboratory Test Data – OCP, Phenols, PAH and B(a)P – 20-22 Bennett Street

Analyte	OCP	Phenols	PAH	B(a)P	PCB
PQL	**1.2**	**0.5**	**0.2**	**0.5**	**0.9**
1/0-0.4	<1.2	<0.5	0	<0.05	<0.9
2/0-0.3	<1.2	<0.5	0.68	0.08	<0.9
2/1.0	-	<0.5	0	<0.05	-
3/0.1-0.4	<1.2	<0.5	**232.2**	**18**	<0.9
3/1.5	<1.2	<0.5	5.01	0.41	<0.9
4/0.1-0.4	<1.2	<0.5	7.8	0.57	<0.9
5/0.1-0.2	<1.2	<0.5	0	<0.05	<0.9
6/0.1-0.4	<1.2	<0.5	**42.49**	**2.7**	<0.9
6/1.5	-	<0.5	2.28	0.2	-
7/0-0.3	<1.2	<0.5	3.87	0.35	<0.9
8/0-0.3	<1.2	<0.5	**20.86**	**2.2**	<0.9
8/1.2	<1.2	<0.5	5.39	0.41	<0.9
t-value @ 0.05	1.833	1.796	1.796	1.796	1.833
No. of Samples	10	12	12	12	10
Minimum Value	0.6	0.25	0	0.025	0.45
Maximum Value	0.6	0.25	232.2	18	0.45
Mean	0.60	0.25	26.72	2.08	0.45
Std. Deviation	0.00	0.00	65.87	5.09	0.00
95% UCL on Mean	0.60	0.25	60.86	4.72	0.45
NEHF "A"	***270**	**8500**	**20**	**1**	**10**
NEHF "D"	***1080**	**34000**	**80**	**4**	**40**

Notes for Table 12c:

- All results for 20-22 Bennett Street have been extracted from the Douglas Partners Report (2002)
- * refers to criteria taken as the addition of guideline levels for Aldrin, Dieldrin, Chlordane, DDT, DDD, DDE and Heptachlor, taken from guidelines for Health-based Investigation Levels (HILs) for residential properties with minimal opportunity for soil access (NEPC Soil Investigation Levels - Exposure setting 'A' and 'D' 1999).
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- '-' Refers to Not Analysed.
- nsl-No Set Limit

Table 12d– Summary of Laboratory Test Data –Acid Sulphate Soils – POCAS Test Results – 20-22 Bennett Street

Analyte Tested	Result 4/1.5	Result 4/2.5	Result 6/3.0	Guidelines*
Peroxide Oxidisable Sulfur (%)	0.51	0.8	0.87	0.03
pH (KCl) extract	8	7.9	5.2	4
pH Peroxide extract (mol H^+/T)	4.5	2.1	2.3	3
Total Actual Acidity (mol H^+/T)	<0.05	<0.05	<0.05	0.88
Total Potential Acidity (mol H^+/T)	0.8	16	24	0.88
Total Sulfidic Acidiy (mol H^+/T)	0.8	16	24	0.88

- All POCAS results have been extracted from the Douglas Partners Report (2002)
- (*) Guidelines refers to levels imposed by NSW Acid Sulfate Soils Management Advisory Committee (1998) for 1-1000T disturbed material.
- Shaded areas refers to results which exceed guildeline values, therefore indicated the presence of Potential Acid Sulphate Soils

In summary, based on field observations and POCAS testing no signs of Actual Acid Sulphate Soils (AASS) were encountered to 3.0m at 20-22 Bennett Street. Evidence of Potential Acid Sulphate Soils (PASS) was encountered at depths of 2.5m to 3.0m at both sites. Encountered soils ranged texturally from sandy/clayey fill to sandy clays and clayey sands. No grey to greenish blue marine clays were encountered. A strong sulphurous smell was reported at borehole location BH23. Further detail pertaining to soil profile texture characteristics can be viewed in Appendix D – Borehole logs.

Table 13a – Summary of Laboratory Test Data – Heavy Metals – Site 2 - Fill

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
BH21.0.5	5	<0.5	12	16	5	130	95	0.16	-	-	-	-
BH22.0.4	<5	<0.5	14	10	3	59	560	0.12	-	-	-	-
BH23.0.5	5	0.7	25	44	14	**650**	370	0.25	-	-	-	-
BH23.1.4	<5	<0.5	9	21	14	94	78	0.08	<5	85	<5	<20
1/0-0.4	<5	<1.0	5	4	<4	14	16	<0.05	-	-	-	-
2/0-0.3	7	1.0	19	250	26	160	650	0.06	-	-	-	-
3/0.1-0.4	6	<1.0	81	350	84	170	230	0.20	-	-	-	-
4/0.1-0.4	<5	<1.0	10	90	11	92	240	0.10	-	-	-	-
5/0.1-0.2	<5	<1.0	21	**1300**	82	<5	93	<0.05	-	-	-	-
6/0.1-0.4	<5	<1.0	21	59	62	130	140	0.1	-	-	-	-
7/0-0.3	<5	<1.0	**110**	27	98	13	85	<0.05	-	-	-	-
7/0.5	<5	<1.0	16	<3	<4	6	10	<0.05	-	-	-	-
8/0-0.3	6	<1.0	74	42	77	110	130	0.3	-	-	-	-
t-value @ 0.05	1.782	1.78	1.782	1.782	1.782	1.782	1.782	1.782	NC	NC	NC	NC
No. of Samples	13	13	13	13	13	13	13	13	1	1	1	1
Minimum Value	2.5	0.25	5	1.5	2	2.5	10	0.025	2.5	85	2.5	10
Maximum Value	7	1	110	1300	98	650	650	0.3	2.5	85	2.5	10
Mean	3.77	0.50	32.08	170.3	36.92	125.4	207.46	0.11	2.50	85.00	2.50	10.00
Std Deviation	1.74	0.20	33.46	355.3	37.27	168.2	202.45	0.09	NC	NC	NC	NC
95% UCL on Mean	4.63	0.59	48.61	346.0	55.34	208.6	307.53	0.16	NC	NC	NC	NC
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Table 13b – Summary of Laboratory Test Data – Heavy Metals – Site 2 - Natural

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
Samples												
BH21.1.7	<5	<0.5	8	<5	<2	16	42	<0.05	-	-	-	-
2/1.0	<5	<1.0	8	4	<4	15	42	<0.05	-	-	-	-
3/1.5	7	<1.0	10	17	<4	69	130	0.10	-	-	-	-
4/2.8	9	<1.0	10	<3	<4	<5	10	<0.05	-	-	-	-
5/1.4	<5	<1.0	<5	<3	<4	<5	13	<0.05	-	-	-	-
6/1.5	<5	<1.0	9	3	<4	5	33	<0.05	-	-	-	-
8/1.2	6	<1.0	21	8	10	22	69	0.08	-	-	-	-
t-value @ 0.05	1.943	1.94	1.943	1.943	1.943	1.943	1.943	1.943	-	-	-	-
No. of Samples	7	7	7	7	7	7	7	7	-	-	-	-
Minimum Value	2.5	0.25	2.5	1.5	1	2.5	10	0.025	-	-	-	-
Maximum Value	9	0.5	21	17	10	69	130	0.1	-	-	-	-
Mean	4.57	0.46	9.79	5.36	3.00	18.86	48.43	0.04	-	-	-	-
Std Deviation	2.73	0.09	5.57	5.60	3.11	23.36	41.09	0.03	-	-	-	-
95% UCL on Mean	6.58	0.53	13.87	9.47	5.28	36.01	78.61	0.07	-	-	-	-
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Table 13c – Laboratory Test Data – TPHs and BTEX – Site 2 – Fill

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**5**	**10**	**50**	**50**	**0.2**	**1**	**1**	**3**
Samples								
BH21.0.5	<2	<20	<20	<20	<0.1	<0.1	<0.1	<0.3
BH23.0.5	<2	<20	<20	<20	<0.1	<0.1	<0.1	<0.3
1/0-0.4	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
2/0-0.3	<20	<20	<20	<20	<0.1	5.0	<0.1	<0.1
3/0.1-0.4	<20	<20	**1400**	**1200**	<0.1	<0.1	<0.1	<0.1
4/0.1-0.4	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
5/0.1-0.2	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
6/0.1-0.4	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
7/0-0.3	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
8/0-0.3	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
t-value @ 0.05	1.833	1.833	1.833	1.833	1.833	1.833	1.833	1.833
No. of Samples	10	10	10	10	10	10	10	10
Minimum Value	1	10	10	10	0.05	0.05	0.05	0.05
Maximum Value	10	10	1400	1200	0.05	5	0.05	0.15
Mean	8.20	10.00	149.00	129.00	0.05	0.55	0.05	0.07
Std Deviation	3.79	0.00	439.56	376.31	0.00	1.57	0.00	0.04
95% UCL on Mean Value	10.40	10.00	403.80	347.14	0.05	1.45	0.05	0.09
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Table 13d – Laboratory Test Data – TPHs and BTEX – Site 2 - Natural

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**5**	**10**	**50**	**50**	**0.2**	**1**	**1**	**3**
BH21.1.7	<2	<20	<20	<20	<0.1	<0.1	<0.1	<0.3
2/1.0	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
3/1.5	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
6/1.5	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
8/1.2	<20	<20	<20	<20	<0.1	<0.1	<0.1	<0.1
t-value @ 0.05	2.132	2.132	2.132	2.132	2.132	2.132	2.132	2.132
No. of Samples	5	5	5	5	5	5	5	5
Minimum Value	1	10	10	10	0.05	0.05	0.05	0.05
Maximum Value	10	10	10	10	0.05	0.05	0.05	0.15
Mean	8.20	10.00	10.00	10.00	0.05	0.05	0.05	0.07
Std Deviation	4.02	0.00	0.00	0.00	0.00	0.00	0.00	0.04
95% UCL on Mean Value	12.04	10.00	10.00	10.00	0.05	0.05	0.05	0.11
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Table 13e– Summary of Laboratory Test Data – OCP, Phenols, PAH, B(a)P, VHC and PCB – Site 2 - Fill

Analyte	OCP	Phenols	PAH	B(a)P	PCB
PQL	**1.2**	**0.2**	**0.2**	**0.5**	**1**
BH23.0.5	-	-	6.3-7.5	0.5	-
1/0-0.4	<1.2	<0.5	0	<0.05	<0.9
2/0-0.3	<1.2	<0.5	0.68	0.08	<0.9
3/0.1-0.4	<1.2	<0.5	**232.2**	**18**	<0.9
4/0.1-0.4	<1.2	<0.5	7.8	0.57	<0.9
5/0.1-0.2	<1.2	<0.5	0	<0.05	<0.9
6/0.1-0.4	<1.2	<0.5	**42.49**	**2.7**	<0.9
7/0-0.3	<1.2	<0.5	3.87	0.35	<0.9
8/0-0.3	<1.2	<0.5	**20.86**	**2.2**	<0.9
t-value @ 0.05	1.895	1.895	1.860	1.86	1.895
# Samples	8	8	9	9	8
Min Value	0.6	0.25	0	0.08	0.45
Max Value	0.6	0.25	232.2	18	0.45
Mean	0.60	0.25	35.04	2.77	0.45
Std. Dev	0.00	0.00	75.20	5.79	0.00
95% UCL on Mean	0.60	0.25	81.66	6.35	0.45
NEHF "A"	***270**	**8500**	**20**	**1**	**10**
NEHF "D"	***1080**	**34000**	**80**	**4**	**40**

Table 13f– Summary of Laboratory Test Data – OCP, Phenols, PAH, B(a)P, VHC and PCB – Site 2 - Natural

Analyte	OCP	Phenols	PAH	B(a)P	PCB
PQL	**1.2**	**0.2**	**0.2**	**0.5**	**1**
2/1.0	-	<0.5	0	<0.05	-
3/1.5	<1.2	<0.5	5.01	0.41	<0.9
6/1.5	-	<0.5	2.28	0.2	-
8/1.2	<1.2	<0.5	5.39	0.41	<0.9
t-value @ 0.05	6.314	2.353	2.353	2.35	6.314
# Samples	2	4	4	4	2
Min Value	0.6	0.25	0	0.2	0.45
Max Value	0.6	0.25	5.39	0.41	0.45
Mean	0.60	0.25	3.17	0.32	0.45
Std. Dev	0.00	0.00	2.53	0.11	0.00
95% UCL on Mean	0.60	0.25	6.14	0.45	0.45
NEHF "A"	***270**	**8500**	**20**	**1**	**10**
NEHF "D"	***1080**	**34000**	**80**	**4**	**40**

11.0 SOIL QUALITY CRITERIA

EPA policy on contaminated sites is based on the *1998 NSWEPA Health-based Investigation Levels*. The National Environmental Protection Measures (NEPM) has now been adopted, which use the same methodologies as NSW EPA. In addition, the *1994 NSW EPA Guidelines for Assessing Services Station Sites* are applicable to Hydrocarbon contaminated sites.

For contaminants not covered by these documents, Environmental Quality Objectives from the Netherlands (Dutch Guidelines) can be adopted. Guideline levels for organic and inorganic soil contaminants are summarised in Appendix E – Regulatory Criteria.

In addition, contaminant concentrations slightly in excess of the investigation levels do not pose an environmental or health hazard. At or below the investigation levels, the soil is not considered to pose an environmental or health hazard and the site is considered safe for any use. Domestic single dwelling use with accessible soils is considered to be the most sensitive land use and the investigation level guidelines are commonly adopted as limits for such sites.

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.

In proposing recommendations and/or remediation criteria for this site, the above factors will be considered and the published Health-based Investigation Levels (HILs) for a high density residential and low density residential with access to soil-(NEPC Soil Investigation Levels for an exposure setting 'D' and 'A')

12.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of laboratory analysis heavy metals, total phenolic compounds (phenols), pesticides (OCPs) and Polychlorinated Biphenyls (PCBs) in the fill and natural material at 'Site 2' have met NEPM HILs D and the more stringent NEPM HILs A guideline criteria. The subject site has a 95% confidence level that the concentrations of heavy metals, phenols, OCPs and PCBs met guideline criteria.

Laboratory analysis of fill and natural material for Total Petroleum Hydrocarbons (TPH) and solvents (BTEX), showed the fill and natural material met NSW EPA Guidelines for Assessing Service Station Sites.

The concentration of Polycyclic Aromatic Hydrocarbons (PAH) and Benzo(a)Pyrene (B(a)P) exceeds NEPM HILs A and D criteria in the fill material, however the concentrations of PAHs and B(a)P met guideline criteria in the natural material. The concentrations of longer chain hydrocarbons as well as PAH and B(a)P are high in the fill sample at BH3. This is possibly associated with localised oil/diesel contamination, which has not entered the natural material.

Samples underwent QA/QC interpretation and met relevant DQOs. The integrity of samples is therefore justified. The property was sampled using a targeted and systematic sampling pattern. This method is most appropriate in sampling a site in a non-biased manner. The site lies on sandy/clayey fill material, which overlies sandy clays and clayey sands. Sandstone bedrock was encountered between 0.5 and 3.0m. Migration of contamination onto the site could pose a concern due to shallow nature of groundwater that may migrate from the adjoining Anzol Paint Factory. No evidence of impact was found in soil sampling.

No hazardous building materials, such as lead paint, or piping were identified on the site, nor was there evidence of any Underground Storage Tanks (USTs). It is believed that Asbestos roofing may be present on the site located at 16-18 Bennett Street.

Assessment of the site for Acid Sulphate Soils (ASS) showed that it is unlikely that Actual Acid Sulphate Soils (AASS) exists on the site to a depth of 3.0m below ground level. Field observations and laboratory analysis indicate that Potential Acid Sulphate Soils (PASS) are likely to exist from 2.5 m on the site. Hence, if deep excavations are to occur as part of the proposed development, it is recommended that an Acid Sulphate Soil Management Plan be prepared.

The site size of 3,000 m^2 requires a sampling density (via NSW EPA Guidelines) of 9 sample locations. The sampling density conducted for the site equates to 11 sampling locations and 25 samples. The site is therefore been adequately characterised and it can be assumed that we do not expect any unexpected concerns to remain underground. Soil conditions are always hard to determine underneath sealed surfaces. It is therefore recommended that the materials underlying sealed surfaces be examined post demolition to confirm the absence of any areas of environmental concern.

It is also understood that excavations may be proposed for basement car parking. These excavation works would include the removal from the site of superficial material, including fill identified at the site and some of the natural material underneath. Material excavated from the site should be classified in accordance with

the NSW EPA Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes, 1999 and disposed appropriately.

The adjoining Anzol Paint Factory does pose a migration concern and as the groundwater has not been examined in detail, we propose to review the water quality post demolition and fill examination stage once ground floor slabs have been removed.

As the site has shown to contain limited surficial impacted fill material, it is recommended that a Remedial Action Plan be developed to manage soils being removed from the site and also confirm groundwater quality at the site.

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 medium to high density residential dwellings.

As soils may be planned to be removed from the site as part of development works or basement works, a Remedial Action Plan would be required. This RAP will also confirm the groundwater quality of the site.

If a change to a more sensitive land use was to be considered for the site, further assessment may be required. We would be pleased to provide further information on any aspects of this report

For and behalf of

Aargus Pty Ltd **Reviewed By:**

Hugh Selby
Environmental Scientist

Nick Kariotoglou
Managing Director

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Aargus

13.0 LIMITATIONS

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue, although 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 are judgements which are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions.

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

ENVIRONMENTAL SITE ASSESSMENT

Properties

1 Northcote Street, 8 Hilly Street, 14-22 Hilly Street, Mortlake, NSW

“SITE 3”

Prepared for

Mortlake Consolidated Investments Pty Ltd

May 2005

CONTROLLED DOCUMENT
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DOCUMENT HISTORY

Revision No.	Revision Date	Description
0	11/05/05	Initial Issue

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Date: .....

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REFERENCES

- Australian and New Zealand Environment and Conservation Council, (1992), "National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters".
- NSW Acid Sulphate Soils Management Advisory Committee, (1998) "Acid Sulfate Soils Assessment Guidelines", Wollongbar, NSW.
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- NSW Environment Protection Authority, (1997), "Guidelines for Consultants Reporting on Contaminated Sites", Sydney.
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ABBREVIATIONS

- AIP – Australian Institute of Petroleum Ltd
- ANZECC – Australian and New Zealand Environment Conservation Council
- AST – Aboveground Storage Tank
- ASS – Acid Sulphate Soils
- BGL – Below Ground Level
- BTEX - Benzene, Toluene, Ethyl benzene and Xylenes
- CoC – Chain of Custody
- DIPNR - Department of Infrastructure Planning and Natural Resources
- DQOs – Data Quality Objectives
- EIL – Ecological Investigation Level
- EPA- Environment Protection Authority
- ESA Environmental Site Assessment
- HIL – NSW EPA Health-based Investigation Levels as per "Guidelines for the NSW Site Auditor Scheme
- LGA – Local Government Area
- nd – non-detect
- NEHF – National Environmental Health Forum
- NEPC – National Environment Protection Council
- NHMRC – National Health and Medical Research Council
- OCP - Organochlorine Pesticides
- OPP – Organophosphorous Pesticides
- PAH - Polycyclic Aromatic Hydrocarbons
- PID - Photo Ionisation Detector
- ppm – parts per million
- PQL – Practical Quantitation Limits
- QA/QC - Quality Assurance, Quality Control
- RAC – Remediation Acceptance Criteria
- RAP - Remediation Action Plan
- RPD – Relative Percentage Difference
- SAC - Soil Assessment Criteria
- SVC – Site Validation Criteria
- SWL – Standing Water Level
- 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

EXECUTIVE SUMMARY

Aargus Pty Ltd has been instructed by Mr Andrew Simons on behalf of Mr Ian Edwards of Mortlake Consolidated Investments Pty Ltd to undertake an Environmental Site Assessment (ESA) of the properties situated at 1 Northcote Street/8 Hilly Street, 14 Hilly Street, 16-18 Hilly Street and 20-22 Hilly Street, Mortlake. Collectively these sites are known as 'Site 3'.

The ESA will assess the site's environmental characteristics in comparison to regulatory criteria, in order to determine the site's suitability for the proposed redevelopment, thereby meeting council regulations for development works.

The objectives of the ESA are to identify issues of ongoing pollution and non-compliance, identify the likelihood and extent of significant contamination, and recommend management strategies including any additional investigations or remedial costs.

In proposing recommendations and/or remediation criteria for the site, the published *NEPC 'D' Health-based Investigation Levels (High-density residential with minimal access to soils including high-rise apartments and flats)* were used. The more stringent *NEPC 'A' Health-based Investigation Levels (low-density residential)* were also incorporated for prospective development purposes.

The scope of work in preparing the ESA report included the review of existing information, filling information gaps, formulating and implementing sampling and analysis, the interpretation of results/findings and report generation in accordance with NSW EPA "*Guidelines for Consultants Reporting on Contaminated Sites"*, 1997.

A review of records and a site inspection show that there are potential environmental concerns from past site operations. From the above information, site history and the site inspection, the areas of environmental concern were found to be:

- Potential fill of unknown origin; and
- Previous site usage as commercial/industrial premises

Given these areas of environmental concern, a standard suite of chemicals were analysed and significant contaminating chemicals have been targeted.

To assist in the site assessment process, soil samples including QA/QC blind and inter-laboratory samples were taken from drilled boreholes and submitted for analysis at a NATA accredited laboratory.

Analytes were tabulated and statistical analysis was undertaken to ascertain the 95% Upper Confidence Limit (UCL). The 95% UCL of the average concentration for each analysed contaminant, was then compared with the *NEHF 'A'* and *NEHF 'D' Health-based Investigation Levels*, along with the NSW EPA *Guidelines for Assessing Service Station Sites*.

Based on our interpretation of the results from laboratory analysed samples, fill and natural material across the site has met Regulatory Acceptance Criteria and Data Quality Objectives for guidelines pertaining to medium to high density residential development (*NEHF 'D'*) and the more stringent low density residential (*NEPC 'A').*

Fill and natural samples have also met regulatory requirements as set out in the NSW EPA *Guidelines for Assessing Service Station Sites, 1994*, for hydrocarbon impacted soils, ANZECC *"Guidelines for the Assessment and Management of Contaminated Sites"*.

If the proposed development is to involve deep excavations into the soil strata, consideration must be given to the existence of Acid Sulphate Soils. Field and laboratory analysis indicated that it is unlikely that Actual Acid Sulphate Soils (AASS)

or Potential Acid Sulphate Soils (PASS) exist to a depth of 2.0m on site. Sampling at 2.5m however indicated that PASS is likely to exist from this depth. Hence if the proposed development is to involve deep excavations, which disturb the underlying marine sediments, it is expected that an Acid Sulphate Soil Management Plan will be required.

The site size of 4,000m2 requires a sampling density (via NSW EPA Guidelines) of 11 sample locations. The sampling density conducted for the site equates to 37 sampling locations and 73 samples. The site is therefore been adequately characterised and it can be assumed that we do not expect any environmental concerns to remain underground. Soil conditions are always hard to determine underneath sealed surfaces. It is therefore recommended that the materials underlying sealed surfaces be examined post demolition to confirm the absence of any areas of environmental concern.

It is also understood that excavations may be proposed for basement car parking. These excavation works would include the removal from the site of superficial material, including fill identified at the site and some of the natural material underneath. Material excavated from the site should be classified in accordance with the NSW EPA Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes, 1999 and disposed appropriately.

In Summary

Based on the results of this investigation is considered that the risks to human health and the environment associated with soil and/or groundwater contamination at the site are low in the context of the proposed medium to high density residential dwellings. The site is considered to be able to be made suitable for the proposed development.

If a change to a more sensitive land use was to be considered for the site, further assessment may be required.

1.0 INTRODUCTION

Aargus Pty Ltd (Aargus) was commissioned by Mr Ian Edwards of Mortlake Consolidated Investments Pty Ltd, to engage in an Environmental Site Assessment (ESA) on the sites located at 1 Northcote Street/8 Hilly Street, 14 Hilly Street, 16-18 Hilly Street and 20-22 Hilly Street, Mortlake, NSW. This assessment was performed between the 19th of February 2004 and the 20th of December 2004, in accordance with the Aargus proposal, NSW EPA regulatory guidelines, governing NEPC criteria (Appendix E) and Aargus Environmental Protocols (Appendix F).

This ESA serves to identify issues relating to the environmental condition of the site as part of the level of assurance expected for consent by Canada Bay Council to the Development Application (DA). At this stage it is understood that the proposed use for the site is residential, in the form of medium to high density residential dwellings with car parking. An ESA is required to verify whether the environmental condition of the site is suitable for the proposed development, and if not, provide quantitative estimates of remedial works.

2.0 OBJECTIVES

In accordance with our instructions, the purpose of this ESA is to:

- Identify issues of ongoing pollution and non-compliance, as compared to set regulatory criteria;
- Identify the likelihood and/or extent of significant contamination occurring from past and present practices on the site; and
- Recommend any further management strategies including any additional investigation and/or remediation costing.

Specifically, the ESA will assess:

- Contaminant dispersal in air, surface water, groundwater, soil and dust;

- The potential effects of contaminants on public health, the environment and building structures;
- (where applicable) off-site impacts on soil, sediment and biota; and
- The adequacy and completeness of all information available to be used in making decisions on remediation.
- Ground Conditions including Acid Sulphate Soils

3.0 SCOPE OF WORKS

In order to achieve the above objectives the following scope of work was carried out for the ESA:

- Collecting site information, reviewing historical information, past site practices and aerial photographs, EPA records search and site interviews.
- A site inspection to identify all areas of environmental concern, on-site waste disposal practices and location of sewers, drains, holding tanks, Underground Storage Tanks, Aboveground Storage Tanks and pits, spills and ground discolouration, etc.
- A targeted soil boring/sampling investigative study – including the formulation and implementation of a sampling plan and borehole investigations; whereby soil samples are taken and submitted for analysis at a NATA accredited laboratory on specified contaminants.
- Laboratory analysis/results from the sample analysis – findings and 95% Upper Confidence Limit (UCL) calculation, which is compared to regulatory guidelines. Analysis includes TPHs, BTEX, PAHs, Heavy metals, pesticides (OCPs), VHC's, Phenols and POCAS.
- Interpretation of results and findings.
- Recommendations and final conclusions drawn from the interpretation of results.

4.0 SITE INFORMATION

4.1 Site Identification

The sites are known as 1 Northcote Street/8 Hilly Street, 14 Hilly Street, 16-18 Hilly Street and 20-22 Hilly Street, Mortlake, NSW. The sites are situated in the Local Government Area of Canada Bay, Parish of Concord and the County of Cumberland (Refer to Appendix A – Locality Map and Site Plans). The subject properties are identified as being:

1 Northcote Street

- Lot 6 in Deposited Plan (DP) 210632.

8 Hilly Street

- Lot 1 in Deposited Plan (DP) 509509
- Lot 2 & 5 in Deposited Plan (DP) 210632

At the time of the investigation for 8 Hilly Street, Gian and Umberta Ricci were the registered proprietors of the property with a caveat held by Mortlake Developments Pty Ltd. For 1 Northcote Street, Mortlake Developments Pty Ltd was the registered proprietor of the property according to title documents held at the Department of Lands - Land and Property Information NSW.

14 Hilly Street

- Lot 101 in Deposited Plan (DP) 610982

At the time of the investigation for 14 Hilly Street, John Michael Corbett and John Michael Corbett Jnr were the registered proprietors of the property according to title documents held at the Department of Lands - Land and Property Information NSW.

16-18 Hilly Street

- Lot 21 in Deposited Plan (DP) 733003
- Lot 200 in Deposited Plan (DP) 774260

At the time of the investigation, the registered proprietor for the property at 16 Hilly Street was Mortlake Developments Pty Ltd, while the registered proprietor for 18 Hilly Street was Bright Electrical Pty Ltd, according to title documents held by the Department of Lands - Land and Property Information NSW. The current purchase of the site had not been entered onto the titles system.

20-22 Hilly Street

- Lot 102 in Deposited Plan (DP) 635035

At the time of the investigation for 20-22 Hilly Street, Frank Lawrence Hall and Walter James Hall were the registered proprietors of the property according to title documents held at the Department of Lands - Land and Property Information NSW.

The current zoning of the properties is registered with Canada Bay Council as commercial/industrial. The proposed zoning for the site is for medium to high density residential dwellings.

4.2A Site Description 1Northcote/8 Hilly Street

This portion of "site 3" occupies an area of approximately 4,000m^2. The site is occupied by a plastics manufacturing/warehouse on the eastern boundary known as 8 Hilly Street and an acrylic paint manufacturing/warehouse on the western boundary known as 1 Northcote Street. This portion of 'Site 3' slopes downward in a westerly direction at approximately 3-4^0. The majority of this area is concrete sealed, excluding a small parcel of land in the west corner fronting Majors Bay, which is grassed with small shrubs. The site boundaries include:

Northern boundary ⇒ Commercial/industrial properties

Southern boundary ⇒ Northcote Street then a new development and commercial/industrial properties

Western boundary ⇒ Grassed foreshore then Majors Bay.

Eastern boundary ⇒ Hilly Street then vacant commercial block.

Adjacent surrounding sites to the north, south and east are limited to commercial/industrial estate properties and a new development. We expect that the local surrounding land use could potentially contribute to areas of environmental concern due to the commercial/industrial nature of the surrounding businesses.

4.2B Site Description 14 Hilly Street

This portion of 'Site 3' occupies an area of approximately 1800m^2. It is contains light industrial/commercial premises, with a slope downward from Hilly Street in a westerly direction at approximately 5^0. The majority of the site is concrete sealed, aside from the small portion of grassed land fronting Majors. Two (2) brick buildings occupy the site, which contain light industrial/commercial operations and offices The site boundaries include:

Northern boundary ⇒ Commercial/light industrial properties and sealed carpark

Southern boundary ⇒ Commercial/light industrial properties

Western boundary ⇒ Grassed foreshore then Majors Bay.

Eastern boundary ⇒ Hilly Street then vacant block.

The adjacent sites to the north, south and east are limited to commercial/industrial estate properties. We expect that the local surrounding land use could potentially contribute to areas of environmental concern due to the commercial/industrial nature of the surrounding businesses.

4.2C Site Description 16-18 Hilly Street

16-18 Hilly Street occupies an area of approximately 6,964m$^{2.}$ The shape of the site is trapezoidal and runs adjacent to the grassed foreshore of Majors Bay. The site slopes in a westerly direction towards Majors Bay at approximately 5º. The entire site is concrete sealed with no vegetated areas. The site boundaries include:

Northern boundary ⇒ Commercial/industrial properties

Southern boundary ⇒ Commercial/industrial premises

Western boundary ⇒ Grassy foreshore of Majors Bay

Eastern boundary ⇒ Commercial properties

Currently the site consists of two (2) opposing warehouse/office premises with undercover carparking that fronts Hilly Street. A sealed concrete driveway is accessible from Hilly St that runs east-west along the length of the property and partitions the two (2) warehouse/office blocks. The warehouses occupy the majority of the property and consist solely of an undivided, concrete sealed, ground floor. The Bright Electrical Group currently occupy both warehouses where the assemblage of electrical goods is the primary operation. The single level office blocks are adjacent to the warehouses, located above car-parking facilities.

Surrounding sites in the immediate north and south are limited to commercial warehouse properties. Hilly St forms the immediate eastern boundary of the site, beyond which stand commercial warehouses. We expect that the local surrounding land use could potentially contribute to areas of environmental concern due to their commercial nature.

4.2D Site Description 20-22 Hilly Street

20-22 Hilly Street occupies an area of approximately 4,000m^2. The site is used as a small metal works factory. The site slopes sharply down away from Hilly Street at approximately 6° before flattening out towards Majors Bay. The vast majority of the site is concrete sealed. The site boundaries include:

Northern boundary ⇒ Medium to High Density residential dwellings properties

Southern boundary ⇒ Commercial/Light industrial premises

Western boundary ⇒ Grassed foreshore then Majors Bay.

Eastern boundary ⇒ Hilly Street then commercial premise.

The site is currently comprised of a manufacturing/warehouse covering the majority of the site, with offices at the street level of Hilly Street.

4.3 Proposed Development

The proposed development for the 'Site 3' is the demolition of existing dwellings in order to construct multi-level medium to high density residential dwellings.

Based on this information and for the purposes of this report, EPA site assessment guidelines shall be measured against high density residential properties as the proposed land use. Given there is the possibility of accessible soil, the more stringent low density residential guidelines have also been incorporated. Respectively, these guidelines follow *Health-based Investigation Levels* (HILs) for developments, which include dwellings with fully and permanently paved yard space such as high-rise apartments and flats (*NEPC 'D')* as well as guidelines for dwellings with accessible soil (*NEPC 'A').* Refer to the *NSW EPA "Guidelines for the NSW Site Auditor Scheme", 1998* or *NEPC Schedule B(4) – "Guideline on Health Risk Assessment Methodology", 1999.* Reference will also be made to the *NSW EPA "Guidelines for Assessing Service Station Sites", 1994* when guideline limitations are required for soils potentially impacted with petroleum hydrocarbons.

5.0 SITE HISTORY

A review of historical title documents held in the Land Titles Office of NSW was undertaken to determine the previous land use and occupiers of the site in the past. An aerial photograph search was also conducted for the subject site. Photos dating back to 1951 were viewed and any site changes were noted. This information has been extrapolated and Tables 1-12 show a summary of historical findings. Historic title documentation can be found in Appendix G.

5.1A Historical Search 1 Northcote/8 Hilly Street

The site is situated in the Local Government Area of Canada Bay, Parish of Concord County of Cumberland. Tables 1-4 lists the previous registered proprietors of the site.

Table 1 – Summary of Historical Land Titles for 8 Hilly Street

Lot 2 DP 210632 **Registered Proprietors 1881 to present**	
1994-present 25/2/2004 *CT: 2/210632* *HT: 2/210632*	The registered proprietors are Gian Ricci and Umberta Ricci. Commercial/light industrial land use in the form of a plastic manufacturer and warehouse
1965-1994 *V9185 F.198*	Registered proprietor is George Grundy Pty Ltd (George Grundy). Possible commercial/industrial land use
1951-1964 *PA43748*	Registered proprietor is the Woolwich-Elliot Chemical Company Pty Ltd. Possible commercial/industrial land use.
1947-1951 *PA43748*	Registered proprietor is Francis James Power Grassick. Possible commercial or residential land use
1922-1947 *PA43748*	Registered proprietor is William George Powell. Possible commercial or residential land use
1886-1922 *PA43748*	Registered proprietors are Ruth and George Hudson, George William Hudson, John Hunter and Ruth Hudson and Harold Stanley Hudson. Possible commercial or residential land use.
1881-1886 *PA43748*	Registered proprietor is George William Woolven. Possible residential land use.
1881 *PA43748*	Registered proprietor is John Bennett. Possible land use is residential

Table 2 – Summary of Historical Land Titles for 8 Hilly Street

Lot 5 DP 210632 **Registered Proprietors 1881 to present**	
1995-present 25/2/2004 *CT: 5/210632* *HT: 5/210632*	The registered proprietors are Gian Ricci and Umberta Ricci. Commercial/light industrial land use in the form of a plastic manufacturer and warehouse
1968-1995 *V9185 F.198*	Registered proprietor is George Grundy Pty Ltd (George Grundy). Possible commercial/industrial land use
1962-1968 *V9185 F.198*	Registered proprietor is George Grundy. Possible commercial land use.
1962 *PA43749*	Registered proprietors area David & Joyce Bennett. Possible commercial land use
1958-1962 *PA43749*	Registered proprietors are Code Constructions Pty Ltd. Possible commercial/industrial land use
1955-1958 *PA43749*	Registered proprietor is Robert Mitchell. Possible commercial or residential land use.
1951-1955 *PA43749*	Registered proprietor is R.G. Smallwood. Possible commercial or residential land use
1946-1951 *PA43749*	Registered proprietor is W.F. Whiteman. Possible commercial or residential land use
1886-1946 *PA43749*	Registered proprietors are George Hudson, John Hunter, Harold Stanley Hudson. Possible commercial land use.
1881-1886 *PA43749*	Registered proprietor is George William Woolven. Possible residential land use.
1881 *PA43749*	Registered proprietor is John Bennett. Possible land use is residential

Table 3 – Summary of Historical Land Titles for 8 Hilly Street

Lot 1 DP 509509 **Registered Proprietors from 1988 to present**	
1988-present 25/2/2004 *CT: 1/509509* *HT: 1/509509*	The registered proprietors are Gian Ricci and Umberta Ricci. Commercial/light industrial land use in the form of a plastic manufacturer and warehouse
	Title Cancelled- Records Lost

Table 4 – Summary of Historical Land Titles for 1 Northcote Street

Lot 6 DP 210632 **Registered Proprietors from 1973 to Present**	
2003-present 25/2/2004 *CT: 6/210632/* *HT: 6/210632/*	Registered proprietors are Mortlake Developments Pty Ltd. Commercial/light industrial land use in the form of a plastic manufacturer and warehouse.
1973-2003 *Vol 11994 Fol61*	Registered proprietors are David & Joyce Bennett. Possible commercial land use.
	Title Cancelled- Records Lost

5.1B Historical Search 14 Hilly Street

The site is situated in the Local Government Area of Canada Bay, Parish of Concord County of Cumberland. Table 5 lists the previous registered proprietors of the site.

Table 5 – Summary of Historical Land Titles for 14 Hilly Street

Lot 101 DP 610982 **Registered Proprietors 1887 to present**	
2004-Present *CT:101/610982* *HT:101/610982*	Registered proprietors are John Michael Corbett and John Michael Corbett Jnr. Land use was commercial
1985-1988 *Vol.14536 Fol.186*	Lease to Neartic Research Centre (Australia) Limited. Possible commercial land use
1981-1985 *Vol. 14536 Fol.186*	Lease to Metz and Company Pty Limited. Possible commercial land use
1963-1981 *Vol.5906 Fol.215*	Norman Pearce Staggs (Sales manager/manufacturer) and Dorothea Marie Staggs are the registered proprietors. Possible land usage for manufacturing
1959-1963 *Vol. 5906 Fol.215*	Registered proprietor is Catherine Bracey widow. Possible commercial land use
1940-1959 *Vol. 5906 Fol.215*	William Baden Powell Bracey (Varnish Maker) is now the registered proprietor. Possible commercial/industrial land use
1887-1940 *Vol.766 Fol. 32*	Frederick William Bracey (Sydney Engineer) is now the registered proprietor. Possible commercial/industrial land use.
-1887	Alexander M Donald (labourer) is the registered proprietor. Possible residential land use.

5.1C Historical Search 16-18 Hilly Street

The site is situated in the Local Government Area of Canada Bay, Parish of Concord County of Cumberland. Table 1 lists the previous registered proprietors of the site.

Table 6 – Summary of Historical Land Titles for 16-18 Hilly Street - Lot 21 in DP 733003

Registered Proprietors 1881 to present	
2003-present *(CT21/733003)*	Mortlake Developments is the registered proprietor. Land is used for current commercial/light industrial purposes.
1974-2003 *(CT21/733003)*	Vinter Apartments Pty Ltd purchase the land. During this period the company acquire adjacent lots of land and consolidate the property into a larger site.
1965-1974 *(PA 52625)*	The Woolwich-Elliott Chemical Company is liquidated and its assets sold. The Slater Walker Finance Corporation (formerly known as Drug Houses of Australia Ltd) purchases the land. The site is used for the manufacture of pharmaceutical drugs.
1951-1965 *(PA 52625)*	Woolwich-Elliott Chemical Company purchases the land. Industrial operations involving the manufacture of chemicals are possibly carried out on the land.
1949-1951 *(PA 52625)*	The registered proprietor is the Muralo Company (Australia) Pty Ltd. Possible commercial/light industrial land use.
1945-1949 *(PA 52625)*	The property is sold to Solomon Solomon who becomes the registered proprietor. Possible residential land use.
1940-1945 *(PA 52625)*	Alice Victoria May Thomas inherits an adjacent property and consolidates the site.
1935-1940 *(PA 52625)*	Alice Victoria May Thomas inherits the property from David Thomas and Lindsay Duncan Cameron. Possible residential land use.
1923-1935 *(PA 52625)*	Land ownership is transferred to David Thomas and Lindsay Duncan Cameron. Possible residential land use.
1886-1923 *(PA 52625)*	The registered proprietor is William James Barkas. Possible residential land use.
1881-1886 *(PA 52625)*	James Lamond is the registered proprietor. Possible residential land use.
Prior 1881 *(PA 52625)*	John Bennett is the registered proprietor. Possible residential land use.

Table 7 – Summary of Historical Land Titles for 16 – 18 Hilly Street - Lot 200 in DP 774260

Registered Proprietors 1999 to present	
1999-present *(CT200/774260)*	Bright Electrical (Properties) Pty Ltd is the registered proprietor of the land. The site is used for the assemblage of electrical goods, specifically PVC cables, data cables, power cables, ribbon cables and silicon cables.
2000-2003 *(CT200/774260)*	Entercorp Solutions lease office space from Bright Electrical.
Unknown-1999 (*Vol. 12221 Fol. 250; Vol. 14504 Fol. 16*)	Vinter Apartments own and operate on the land. Land is used for commercial/light industrial purposes. Previous land titles have been lost. End of titles search.

5.1D Historical Search 20-22 Hilly Street

The site is situated in the Local Government Area of Canada Bay, Parish of Concord County of Cumberland. Table 8 lists the previous registered proprietors of the site.

Table 8 – Summary of Historical Land Titles for 20-22 Hilly Street

Lot 102 DP 635035 Registered Proprietors 1945 to present	
1985-Present *CT:102/635035 HT:102/635035*	Frank Lawrence Hall and Walter James Hall are the registered proprietors. Site use is commercial/light industrial in the form of a small metal works factory.
1969-1985 *Vol.15180 Fol. 100*	Frank Lawrence Hall, Dorothy Ann Ross and Walter James Hall are the registered proprietors. Site use is commercial/light industrial in the form of a small metal works factory
1945-1969 *Vol.4168 Fol.153*	Lawrence William Hall (engineer) is the registered proprietor. Possible land use is commercial/light industrial.
-1945 *Vol.4168 Fol.153*	Registered proprietors are Christian Zoeller and Andrew Town (contractors). Possible commercial land use.
No further title information was available	

5.2A Aerial Photographs (1951-2002) 1 Northcote/8 Hilly Street

The set of aerial photographs from the years 1951, 1961, 1970, 1978, 1986, 1994 and 2002 were viewed at the Sydney Map Shop – Land and Property Information. Table 9 is a summary of the information gathered from the review.

Table 9 – Summary of Historical Aerial Photographs 1 Northcote and 8 Hilly Street

Photograph	Description of Site	Neighbouring Properties
1951	One large warehouse structure occupies the entire site.	Few building structures were present in the neighbourhood. The area in the west of the site was vacant. Two buildings were present in the area north of the site.
1961	The warehouse structure was present as in the previous photograph.	Two warehouse building structures were present in the area west of the site. Few building structures were present in the neighbouring areas. No changes were seen in the area north of the site.
1970	The warehouse structure was present as in the previous photograph.	Two warehouse buildings occupy the area in the west of the site. No changes were noticed in the area north of the site. Few buildings were present in the neighbourhood. The neighbourhood looked more developed.
1978	No major changes were noticed on the site.	One warehouse building structure occupies the area to the west of the site. Changes were noticed in the neighbourhood developments with more building structures.
1986	No major changes were noticed on the site.	A warehouse building structure and a car park occupied the area in the west of the site. The area in the north of the site had same building structures.
1994	No major changes were noticed on the site.	No major changes were seen in the area west of the site. The buildings in the north of the site were still present.
2002	No major changes were noticed in the building structure present on the site.	No major changes were noticed in the neighbouring areas compared to the previous photograph.

5.2B Aerial Photographs (1951-2002) 14 Hilly Street

The set of aerial photographs from the years 1994 and 2002 were viewed at the Sydney Map Shop – Land and Property Information. Table 10 is a summary of the information gathered from the review.

Table 10 – Summary of Historical Aerial Photographs 14 Hilly Street

Photograph	Description of Site	Neighbouring Properties
1994	The site appears to be sealed, with two building structures occupying the majority of the site.	The surrounding properties appear to be sealed, with warehouse type buildings occupying large proportions of the sites.
2002	No major changes were noticed on the site.	No major changes were noticed in the neighbouring areas compared to the previous photograph

5.1C Aerial Photographs (1951-2002) 16-18 Hilly Street

The set of aerial photographs from the years 1951, 1961, 1970, 1978, 1986, 1994 and 2002 were viewed at the Sydney Map Shop - Land and Property Information. Table 11 is a summary of the information gathered from the review.

Table 11 – Summary of Historical Aerial Photographs 16-18 Hilly Street

Photograph	Description of Site	Neighbouring Properties
1951	Few building structures were present on the site.	The neighbouring property to the north of the site had a small building structure in the middle of the site.
1961	No major changes were noticed compared to the previous photograph.	In the neighbouring property to the north of the site, another building was present along with the existing building structure in the middle of the site.
1970	No major changes were noticed on the site. Few trucks and cars were seen parked on the site.	No major changes were noticed on the neighbouring property located to the north of the site.
1978	Few changes were noticed on the land. New building structures occupied the site.	The neighbouring property to the north of the site had only one building structure in the middle of the site. The area appeared more developed compared to the previous photograph.
1986	The site had three warehouse buildings occupying the entire site.	The neighbouring property to the north of the site was completely vacant with the building structure removed.
1994	Many changes were noticed on the site. Two large warehouses and a driveway occupy the entire site. Few cars were seen parked in the driveway of the buildings.	The area appeared more developed compared to previous photograph.
2002	No changes to the building structures on the site. They were similar to the previous aerial photograph.	No major changes were noticed on the neighbouring areas of the site.

5.1D Aerial Photographs (1951-2002) 20-22 Hilly Street

The set of aerial photographs from the years 1994 and 2002 were viewed at the the Sydney map Shop – Land and Property Information. Table 12 is a summary of the information gathered from the review.

Table 12 – Summary of Historical Aerial Photographs 20-22 Hilly Street

Photograph	Description of Site	Neighbouring Properties
1994	The site is appears to be concrete sealed with a building structure running from a road at the front of the site close to the rear of the site	The surrounding properties appear to be sealed with building structures occupying the majority of the sites.
2002	No major changes were noticed on the site.	No major changes to the neighbouring properties to the south and east of the site, however the property to the north has become one structure.

5.3 Council Records

The records held by Council for development or any environmental concerns for this site were not reviewed.

5.4 Site Interviews

5.4A Site Interviews and Summary 1 Northcote/8 Hilly Street

A Review of historical information found that the site use was probably residential from 1881 until the mid 1940s. The major areas of potential environmental concern (based on the site history) arise from the change of land use to commercial/light industrial. Between 1951 and 1964 the land described as Lot 2 DP 210632 was owned by Woolwich-Elliott Chemical Company, which indicates that the site was potentially used for the manufacture and/or warehousing of chemicals. Lot 5 DP 210632 was owned by Code Constructions Pty Ltd between 1958-1962. Though the operations of this company aren't specified it is possible that machinery, as well as oil and grease related products may have been used and stored on site.

A site interview conducted with the current manager of the plastics warehouse at 8 Hilly Street, indicated that their operations had been in effect for approximately the past five years and that the historical site usage was unknown to him.

An interview with an employee of the acrylic paint manufacturing warehouse at 1 Northcote Street, indicated that the site had been in operation in its current state for approximately 18 years. He indicated that onsite storage tanks were only ever filled with water and never used for any other purpose to the best of his knowledge.

5.4B Site Interviews and Summary 14 Hilly Street

Based on a review of historical information for the site it is possible that the site has been used for commercial and light industrial since the early 1900's. The site has been used by engineers, varnish makers and manufacturers. No site interviews were possible.

5.4C Site Interviews and Summary 16- 18 Hilly Street

On review of historical information, it is possible that the site was utilised as residential land for the greater part of the late 19th and early 20th century. The major areas of potential environmental concern identified in the historical search, arise from the transition of the site usage to commercial/industrial activities. Between 1951 and 1965 the land was owned by Woolwich-Elliott Chemical Company and was potentially used for the manufacture of chemicals. Following liquidation of Woolwich-Elliott in 1965, Drug Houses of Australia operated off the site for 9 years manufacturing pharmaceuticals.

The land had no significant building structures until approximately 1978 when major development commenced. Thereafter, warehouses and commercial facilities were commissioned on the property under the long-term ownership of Vinter Apartments Pty Ltd. The site underwent its most recent transformation prior to 1994 when two warehouses and a concrete sealed driveway were constructed. Site interviews with current employees at Bright Electrical ascertained that construction of the two warehouse blocks took place within the last decade. No major land filling was evident from the review of site history documentation and most years of operation could be accounted for. Where information gaps existed in the land title records, information from the aerial photos was interpolated.

5.4D Site Interviews and Summary 20-22 Hilly Street

On review of historical information the site has been used for commercial and light industrial purposes since 1945.

An interview was conducted with Walter James Hall one of the registered proprietors of the site located at 20-22 Hilly Street. It was ascertained that the fill material on site had partially come from cut rock material on the eastern portion of the site, and had not come from the former gasworks located on Tennyson Road.

6.0 TOPOGRAPHY, GEOLOGY and HYDROGEOLOGY

6.1 Topography and Surface Waters

The general topography of the area can be described as undulating hills, forming the boundary with the Parramatta River. The localised topography slopes downward in a westerly direction at approximately $3\text{-}4^0$, following the regional slope and natural contours of the surrounding area. Regional water flow is directed west towards Majors Bay. We expect that potential concerns would not arise from surrounding land uses bearing waterborne contaminants onto the site as surface waters, for all drainage lines and stormwater controls are adequate.

6.2 Geology

Research was conducted on the geology of the area by reviewing the Sydney 1:100 000 Geological Sheet 9130. It was found that formations in this area belong to the Mesozoic Era of the Triassic Period. 'Site 3' is located in geological formations of Hawkesbury Sandstone that include "*medium to coarse-quartz grained sandstone, very minor shale and laminate lenses*".

During soil boring investigations, fill material, sandy/silty clays and sandstone were evident in all boreholes drilled to natural sandstone bedrock. The fill material encountered in during the borehole investigations was comprised of sand, clay and

crushed rock (including sandstone). Groundwater was encountered at varying depths across the site (refer to Appendix D – Borehole Logs).

6.3 Hydrogeology

There was groundwater encountered during this investigation at varying depths across 'Site 3'. At 1 Northcote/8 Hilly Street groundwater was encountered at BH6 at approximately 2.0m and at BH10 at approximately 1.3m. Groundwater was encountered at 14 Hilly Street in BH3 at approximately 2.2m and BH4 at approximately 2.5m. Groundwater was also encountered at 16-18 Hilly Street in BH12 at approximately 1.6m and BH13 at approximately 1.4m. Groundwater was not encountered at 20-22 Hilly Street. (refer to Appendix A Site Plan for borehole locations). The closest body of water is Majors Bay, located approximately 50m to the west of the site. Majors Bay is linked to the Parramatta River (one of the main waterways in Sydney), which eventually flows into Port Jackson. It is assumed that groundwater flows in a westerly direction, however in order to verify this a review of groundwater flow charts and a hydrological desk study would be required. The water quality of the Parramatta River is influenced by regional usage. Given the close proximity of the site to the Parramatta River, groundwater quality is not solely identifiable with localised water quality for it is influenced by the regional water quality of the Parramatta River system.

6.4 Ground Conditions

The ground conditions at 'Site 3' can be described as fill material to approximately 0.6m overlying natural silty/sandy clays. Sandstone bedrock was found between 0.2m - 0.6m on the eastern (Hilly Street) portion of the site, with the depth at which the sandstone bedrock was encountered increasing closer to Majors Bay. Groundwater was encountered between 1.3m-2.5m. No Actual Acid Sulphate Soils (AASS) were found to exist up to 2.5m on the site, however there was evidence of Potential Acid Sulphate Soils (PASS) at >2.5m on the site.

The geotechnical work to be prepared for 'Site 3' will provide a more detailed interpretation of the ground conditions.

6.4A Ground Conditions 1 Northcote/8 Hilly Street

A fill layer exists across 1Northcote/8Hilly Street site from the surface to a depth of 0.6-0.8m. Sandy/silty clays are then found beneath this layer. Groundwater was encountered in the middle of the site at 1.3m and 2.5m. Sandstone bedrock occurred from 0.6m across the site. No evidence of Actual Acid Sulphate Soils (AASS) or Potential Acid Sulphate Soils (PASS) was found to 2.3m. Evidence of PASS was found at a depth >2.5m on 1Northcote/8Hilly Street.

6.4B Ground Conditions 14 Hilly Street

A fill layer exists across 14 Hilly Street from the surface to a depth between 0.4-0.8m. Beneath the fill layer lies silty/sandy clays. Groundwater was encountered between 2.2m and 2.5m in the middle portion of the site. Sandstone bedrock was also encountered in some boreholes between 0.7-1.3m. No evidence of AASS or PASS was encountered to 2.2m.

6.4C Ground Conditions 16-18 Hilly Street

A fill layer existed across 16-18 Hilly Street to a depth of 0.6m. Sandy Clay exists below the fill layer. Sandstone bedrock was found at various locations from 0.6m. Groundwater was encountered between 1.4m and 1.6m in the middle portion of the site. No evidence of AASS or PASS was encountered to 1.8m at 16-18 Hilly Street.

6.4D Ground Conditions 20-22 Hilly Street

A fill layer exists to 0.8m, after which a silty/sandy clay was present. Sandstone bedrock was encountered at 0.2m close on the eastern portion of the site and increased with depth in a westerly direction (towards Majors Bay). Groundwater was not encountered. There was no evidence of ASS or PASS to 2.0m at 20-22 Hilly Street.

7.0 SITE INSPECTION

The site inspection took into account the surrounding environment and any further aesthetic issues pertaining to the site. A review of the site history and environmental documentation was undertaken to support any findings.

7.1 Site Walkover

Before the Aargus project team (refer to Appendix J – Resumes of Client Team) engaged in borehole drilling and soil sampling procedures for contamination detection, the strategy to walk through the site and note pertinent information for the environmental assessment was adopted. Aargus took into consideration the following points where they were necessary:

- Description and quality of the building structures;
- Adjoining operations;
- Prior functions and operations within the site;
- Surface water;
- Groundwater;
- Former industrial processes;
- Former raw materials;
- Former raw material transportation;
- Chemicals formerly used on the site;
- Trade waste;
- Hazardous operations;
- Waste Management Practices;
- Underground Storage Tanks;
- Above ground storage tanks;
- Review of former roof materials;
- Odour and noise quality; and
- Occupational health and safety.

From inspection of the above details, the following information was gathered with regard to the subject properties.

7.1A Site Walkover 1 Northcote/8 Hilly Street

The existing factory/warehouses, offices and were in relatively good condition on their interior and exterior surfaces. A roof inspection of the warehouse was conducted with no evidence of asbestos materials present. All other building resources consisted of materials classified as non-hazardous and are of no concern for this investigation.

The reinforced concrete slabs covering the majority of the site were in good condition and approximately 150mm thick. No areas are visibly cracked or degraded. There was no evidence of localised stains or spills on sealed areas.

All drainage flowed in the associated guttering and stormwater drains. Upon visual inspection, all drainage to stormwater seemed to be free from blockage and abnormal stains and odours.

Adjoining and surrounding properties are commercial/industrial properties. Up gradient of the site there is currently a vacant block. It is unlikely that waterborne contaminants originate from this site.

7.1B Site Walkover 14 Hilly Street

The existing buildings were in good condition on their exterior surfaces. A roof inspection of the buildings was conducted with no evidence of asbestos materials present. All other building resources consisted of materials classified as non-hazardous and are of no concern for this investigation.

The concrete slabs and bitumen covering the majority of the site were in good condition, with no areas visibly cracked or degraded. There was no evidence of localised stains or spills on sealed areas.

All drainage flowed in the associated guttering and stormwater drains. Upon visual inspection, all drainage to stormwater seemed to be free from blockage, with no abnormal stains or odours noted.

Adjoining and surrounding properties are commercial/industrial properties. Up gradient of the site there is a vacant block. It is unlikely that waterborne contaminants originate from this site.

7.1C Site Walkover 16-18 Hilly Street

The existing warehouses and offices were in good condition on their interior and exterior surfaces. Metal, vertical beams served as structural support for the facilities and were in excellent condition having and appeared to have only recently been installed. A roof inspection of the offices was conducted with no evidence of asbestos materials present. All other building resources consisted of materials classified as non-hazardous and are of no concern for this investigation.

The reinforced concrete slabs covering the majority of the site were in good condition and approximately 120mm thick. No areas are visibly cracked or degraded. There was no evidence of localised stains or spills on sealed areas.

All drainage flowed in the associated guttering and stormwater drains. Upon visual inspection, all drainage to stormwater seemed to be free from blockage and abnormal stains and odours.

Adjoining and surrounding sites are a mixture of commercial/industrial properties. Upgradient of the site there are commercial properties.

There was no evidence of Underground Storage Tanks (USTs) or Aboveground Storage Tanks (AGSTs) on site.

7.1D Site Walkover 20-22 Hilly Street

The existing warehouses and offices were brick in construction and were in good condition on their interior and exterior surfaces. A roof inspection of the offices was conducted with no evidence of asbestos materials present. All building resources consisted of materials classified as non-hazardous and are of no concern for this investigation.

The reinforced concrete slabs covering the majority of the site were in good condition and approximately 120mm thick. No areas are visibly cracked or degraded. There was little evidence of localised stains or spills on sealed areas.

All drainage flowed in the associated guttering and stormwater drains. Upon visual inspection, all drainage to stormwater seemed to be free from blockage and abnormal stains and odours.

Adjoining and surrounding sites are a mixture of commercial/industrial properties and medium to high density residential. Upgradient of the site are commercial buildings.

There was no evidence of Underground Storage Tanks (USTs) or Aboveground Storage Tanks (AGSTs) on site.

7.2 Chemical Storage

7.2A Chemical Storage - 1 Northcote/8 Hilly Street

Chemicals of concern originate from the use of the site for unspecified commercial and industrial services over the last forty years. As there are no specific details on the past operations on the site, from the search of the Land Titles Office, the fact that Woolwich-Elliot Chemical Company Pty Ltd was a registered owner of the site potentially indicates that operations of this company may be viewed as issues for environmental concern.

Chemicals found on the site of 8 Hilly Street at the time of the inspection were 20 x Daelim Poly Compound 25kg bags, 2 x 702kg Polyethylene Resin, 8 x 25kg Polyethylene (medium density), 2 x 25kg Polypropylene, 3 x 205l Renolin 68-empty oil drums, 2 x 1120kg Polypropylene and 4 x 200kg hydraulic oil from injection moulder-empty drums.

The nature of the operations conducted of 1 Northcote Street, as an acrylic paint manufacturing warehouse, it is assumed that chemical usage and storage may be of environmental concern.

7.2B Chemical Storage – 14 Hilly Street

At the time of investigation, access inside the site buildings was not possible.

7.2C Chemical Storage – 16-18 Hilly Street

Chemicals of concern originate from the occupancy of the site by Woolwich-Elliott Chemical Company and Drug Houses of Australia LTD. Woolwich-Elliott owned the site for 14 years and it can be assumed that industrial operations such as the manufacture of heavy chemicals took place here. However, no further information could be obtained as to the exact nature of the business and the variety of chemicals which were produced. Drug Houses of Australia were the subsequent proprietors of the land for the following 9 years. Their operations involved the manufacture of pharmaceuticals which possibly required a variety of solvents in the manufacturing process.

As a result of the site inspection the following chemicals were observed to be currently used and stored on the property;

1. 1 X 25L Industrial cleaner
2. 1 X 60L Acrylic lacquer paint thinner
3. 1 X 5L Soluble cutting oil
4. 6 X 130mL Glass enamel
5. Fluxcored arc welding wire (FCAW)

The following chemicals were found to have been previously used or stored on the property;

1. Bleach
2. Multipurpose degreaser
3. Solent cleaner
4. Turpentine mineral
5. Methylated spirits
6. Line-marking paint

Although current operations on the site are environmentally passive, previous usage of chemicals on site are an environmental concern.

7.2D Chemical Storage – 20-22 Hilly Street

There was little evidence of chemical storage on site.

7.3 Trade Waste

There is no trade waste notice held by any of the subject properties. The sites are not a scheduled premise under the Pollution Control and Waste regulations, thus did not warrant a license.

7.4 EPA Notices

Our inquiries with the EPA and Canada Bay Council have ascertained there are no outstanding pollution abatement or clean-up notices on the subject properties. Accordingly, the properties are not listed on the EPA's (now council) Notice Register under section 149 certificates.

7.5 Aesthetic Issues

The soil investigations exposed fill material, sandy/silty clays and natural sandstone bedrock. Fill materials were consistent and no abnormal odours were noted. The fill material was limited to sandy material, some clay, and crushed rock. No visible plant stress was observed at the time of the investigation.

7.6 Areas of Environmental Concern

A review of records and an inspection of the sites that constitute ‘Site 3’ show that there are potential environmental concerns from past site operations. From the above information, site history and the site inspection, the areas of environmental concern were found to be:

- Potential fill of unknown origin; and
- Previous site usage as a commercial/industrial premises

Bearing in mind these areas of environmental concern, a standard suite of chemicals will be analysed, with significant contaminating chemicals targeted.

8.0 SOIL BORING AND SAMPLING

A concise soil sampling and analysis program was used to consolidate the nature and degree of potential contaminants present in the subsurface. Soil samples were taken at varying depth intervals across the site in a systematic manner. All fieldwork and borehole logging was conducted by qualified environmental staff. Refer to Appendix J for the project team.

To assist in the site assessment process, the following boreholes and samples were drilled for each site;

- 1 Northcote/8 Hilly Street: eleven boreholes were drilled, with a set of eighteen samples plus two QA/QC blind samples and two inter-laboratory samples, taken and submitted for analysis at a NATA accredited laboratory. At ten sample locations, the sealed concrete layer was cored to allow access to the materials below. Drilling using a stainless steel auger was used to investigate the subsurface extent of contamination. In accordance with the NSW EPA "Sampling Design Guidelines" (September 1995) eleven sampling points were drilled, given that the minimum number of sampling points for a site of approximate area of 4,000m^2 is eleven.

- 14 Hilly Street: fifteen samples plus one intra laboratory blind and one inter laboratory QA/QC sample were taken from seven drilled boreholes and submitted for analysis at a NATA accredited laboratory. At four sample locations, the sealed concrete layer was cored to allow access to the materials below. Drilling using a stainless steel auger was used to investigate the subsurface extent of contamination. The NSW EPA "Sampling Design Guidelines" (September 1995) shows the minimum number of sampling points for a site of approximate area of 2000m^2 is seven.

- 16-18 Hilly Street: twenty one samples were submitted for analysis on the fill and natural soil layers. These samples included seventeen fill samples, four natural soil samples, and two blind QA/QC samples. Samples at two locations in the natural soil layer were duplicated and analysed for acid sulfate soils. At fourteen sample locations, the sealed concrete layer was cored to allow access to the materials below. Drilling using a stainless steel auger was used to investigate the subsurface extent of contamination. The NSW EPA "Sampling Design Guidelines" (September 1995) shows the minimum number of sampling points for a site of approximate area of 7,000m^2 is seventeen. This would mean that the diameter of the hotspot that could be detected with 95% confidence would be 23.9 metres

- 20-22 Hilly Street: nineteen samples were submitted for analysis on the fill and natural soil layers. These samples included ten fill samples, five natural soil samples, and two QA/QC samples. One sample was submitted for acid sulphate soil analysis. At five sample locations, the sealed concrete layer was cored to allow access to the materials below. Drilling using a stainless steel auger was used to investigate the subsurface extent of contamination. The NSW EPA "Sampling Design Guidelines" (September 1995) shows the minimum number of sampling points for a site of approximate area of 4,000m^2 is eleven. This would mean that the diameter of the hotspot that could be detected with 95% confidence would be 22.5 metres

Soil samples were collected and submitted to NATA accredited laboratories (Amdel Laboratories) for analysis on listed contaminants. Routine decontamination procedures were employed throughout the field investigation and standard chain-of-custody protocols observed at all times. For further details on methodologies used, please refer to Appendix F – Aargus Environmental Protocols.

Laboratory samples were collected for the analysis of:

Table 13a – Laboratory Sample Analysis – 1 Northcote and 8 Hilly Street

Analyte	No. of Samples (Excl. QA/QC)
Heavy Metals: - Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn), Mercury (Hg).	18
Heavy Metals:-Cobalt (Co), Manganese (Mg), Selenium (Se), Tin (Sn)	11
Total Petroleum Hydrocarbons (TPHs).	12
Solvents – Benzene, Toluene, Ethyl benzene and Xylenes (BTEX).	10
Pesticides – OCP.	3
Benzo(a)pyrene	11
Polycyclic Aromatic Hydrocarbons (PAHs)	11
Polychlorinated biphenyl's (PCB's)	3
Phenols	1

Table 13b – Laboratory Sample Analysis 14 Hilly Street

Analyte	No. of Samples (Incl. QA/QC)
Heavy Metals: - Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn), Mercury (Hg).	16
Heavy Metals:-Cobalt (Co), Manganese (Mg), Selenium (Se), Tin (Sn)	7
Total Petroleum Hydrocarbons (TPHs).	8
Solvents – Benzene, Toluene, Ethyl benzene and Xylenes (BTEX).	7
Pesticides – OCP.	2
Polychlorinated Biphenyls (PCBs)	4
Polycyclic Aromatic Hydrocarbons (PAHs)	11
Phenols	3

Table 13c – Laboratory Sample Analysis 16-18 Hilly Street

Analyte	No. of Soil Samples (incl QA/QC)	No. of Groundwater Samples (incl QA/QC)
Heavy Metals: - Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn), Mercury (Hg).	21	3
Total Petroleum Hydrocarbons (TPHs).	3	1
Solvents – Benzene, Toluene, Ethyl benzene and Xylenes (BTEX).	2	1
Phenols	3	1
Pesticides – OPP and OCP.	2	0
Volatile Halogenated Compounds (VHCs)	2	0
Polycyclic Aromatic Hydrocarbons (PAHs)	4	1

Table 13d – Laboratory Sample Analysis 20-22 Hilly Street

Analyte	No. of Samples (Incl. QA/QC)
Heavy Metals: - Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn), Mercury (Hg).	17
Heavy Metals:-Cobalt (Co), Manganese (Mg), Selenium (Se), Tin (Sn)	17
Total Petroleum Hydrocarbons (TPHs).	4
Solvents – Benzene, Toluene, Ethyl benzene and Xylenes (BTEX).	4
Pesticides – OCP.	4
Polychlorinated Biphenyls (PCBs)	2
Polycyclic Aromatic Hydrocarbons (PAHs)	9
Phenols	4
POCAS	1
VHC	1

Samples were placed in 125g clean glass jars, leaving no head space and closed using teflon-coated lids. These samples were then stored in an ice filled chest and transported to Amdel Laboratories under Chain of Custody conditions (refer to Appendix C – Laboratory results). Samples were taken at depths as shown in the borehole logs (Appendix D).

8.1 Laboratory Analysis

The laboratory used, AMDEL Laboratories, is NATA registered for all Analytes to be tested. AMDEL Laboratory procedures used for each analyte tested for include:

Analyte	Amdel internal method code
Arsenic (As) by ICP-ES	method code E5910
Cadmium (Cd) by ICP- ES	method code E5910
Chromium (Cr) by ICP- ES	method code E5910
Copper (Cu) by ICP- ES	method code E5910
Nickel (Ni) by ICP- ES	method code E5910
Lead (Pb) by ICP- ES	method code E5910
Zinc (Zn) by ICP- ES	method code E5910
Mercury (Hg) by ICP- ES	method code E4950
Mercury (Hg) in Soil	method code E5950
TPH hydrocarbon fraction C_6-C_9	method code E1230
TPH hydrocarbon fraction C_{10}-C_{36}	method code E1221
BTEX	method code E1010
PAH	method code E1110
OCP	method code E1080
Total Phenolics as phenol	method code E1142
VHC	method code E1270
Total Metals by ICP-MS	method code E4970

8.2 Health & Safety

Standard Health and Safety procedures were observed. Rubber gloves were worn to minimise exposure to any potential contaminants. Breathing apparatus and PPE suits were supplied but not worn.

8.3 Quality Assurance/Quality Control (QA/QC)

Standard QA/QC procedures were followed. The decontamination of sampling equipment and the hand auger was achieved by washing the trowel and auger with phosphate-free detergent and tap water, followed by final rinsing with distilled water. This was conducted after the collection of samples at each borehole location and each sample interval.

8.3A Quality Assurance/Quality Control (QA/QC) 1 Northcote /8 Hilly Street

Blind duplicate of the sample BH6.2.0 and BH7.2.0 were taken for QA/QC purposes. They intra lab samples were labelled BH6.2.0/2 and BH12.0.6 respectively. These were submitted to Amdel Laboratories, with samples BH6.2.0/3 and BH10.1.0 (parent sample was BH13.1.0) submitted to Australian Laboratory Services (ALS) for inter-lab analysis. These blind and inter-lab samples were subjected to the same analysis as the parent sample, with details of relative percentage differences given in the table below

Table 14a – Summary of QA/QC acceptance (mg/kg) 1 Northcote and 8 Hilly Street

Analyte	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**
BH6.2.0/1 (parent)	<5	<0.5	<5	<5	<2	<5	<5	<0.05
BH6.2.0/2 (blind)	<5	<0.5	<5	<5	<2	<5	<5	<0.05
RPD%	NC	NC	NC	NC	NC	NC	NC	NC
Intra-Lab								
BH6.2.0/1 (parent)	<5	<0.5	<5	<5	<2	<5	<5	<0.05
BH6.2.0/3 (blind)	4	<1	4	2	<1	4	5	<0.1
RPD%	46%	NC	46.2	22.2	NC	22.2	66.7	NC

- NC refers to Not Calculated, as the concentrations of the analytes were below the PQL of the laboratory

Table 14b – Summary of QA/QC acceptance (mg/kg) 1 Northcote and 8 Hilly St

Analyte	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
BH7.0.6 (parent)	nd	1.8	16	13	22	11	42	0.10	8	160	nd	nd
BH12.0.6 (blind)	nd	nd	16	11	36	nd	35	nd	9	210	nd	nd
RPD%	NC	151%	NC	17%	48%	191%	18%	120%	12%	27%	NC	NC

Table 14c – Summary of QA/QC acceptance (mg/kg) 1 Northcote and 8 Hilly St

Analyte	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**
Inter-Lab								
BH13.1.0 (parent)	20	4	18	nd	4	170	55	0.10
BH10.1.0 (ALS)	34	18	83	59	15	204	276	1.1
RPD%	52%	127%	129%	184%	116%	18%	134%	167%

Table 14d – Summary of QA/QC acceptance (mg/kg) 1 Northcote and 8 Hilly St

Analyte	TPH C6-C9	C10-C14	C15-C28	C29-C36
PQL	**2**	**50**	**100**	**100**
Inter-Lab				
BH13.1.0 (parent)	<5	<50	<100	<100
BH10.1.0 (ALS)	<4	<100	118	132
RPD%	NC	NC	81%	90%

Table 14e – Summary of QA/QC acceptance (mg/kg) 1 Northcote and 8 Hilly St

Analyte	TPH C6-C9	C10-C14	C15-C28	C29-C36
PQL	**2**	**50**	**100**	**100**
Inter-Lab				
BH7.0.6 (parent)	<2	<50	<100	<100
BH12.1.0 (Blind)	<2	<50	<100	<100
RPD%	NC	NC	NC	NC

Table 14f – Summary of QA/QC acceptance (mg/kg) 1 Northcote and 8 Hilly St

Analyte	Phenol	PAH	B(a)P
PQL	**0.2**	**0.2**	**0.5**
Inter-Lab			
BH7.0.6 (parent)	<0.2	<0.5	<0.5
BH12.0.6 (blind)	<0.2	<0.5	<0.5
RPD%	NC	NC	NC

Generally the Relative Percentage Differences (RPDs) between samples fall within the 30-50% bracket for soils. Where RPD's exceed this guide, analyte concentrations are generally less than the relevant guideline concentration.

8.3B Quality Assurance/Quality Control (QA/QC) 14 Hilly Street

Table 15 – Summary of QA/QC acceptance (mg/kg) 14 Hilly Street

Analyte	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**
BH2.1.3 (parent)	nd	nd	15	nd	nd	nd	6	nd
BH8.1.3 (blind)	nd	nd	13	nd	nd	nd	7	nd
RPD%	NC	NC	14%	NC	NC	NC	15%	NC
Intra-Lab								
BH2.1.3 (parent)	nd	nd	15	nd	nd	nd	6	nd
BH2.1.3 (ALS)	3	0.5	20	2	2	10	8	0.05
RPD%	18%	67%	29%	22%	67%	120%	29%	67%

Generally the Relative Percentage Differences (RPDs) between samples fall within the 30-50% bracket for soils. Where RPD's exceed this guide, analyte concentrations are generally less than the relevant guideline concentration

8.3C Quality Assurance/Quality Control (QA/QC) 16-18 Hilly Street

Table 16 – Summary of QA/QC acceptance (mg/kg) 16-18 Hilly Street

Analyte	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	PAHs
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**0.5**
BH12.2.3/1 (parent)	<5	<0.5	260	<5	<2	<5	7	<0.05	<7.5
BH12.3/2 (Blind)	<5	<0.5	270	<5	<2	<5	5	<0.05	<7.5
RPD%	NC	NC	4%	NC	NC	NC	33%	NC	NC
Inter-Lab									
BH12.2.3/1 (parent)	<5	<0.5	260	<5	<2	<5	7	<0.05	-
BH12.2.3/3 (ALS)	3	<1	280	<1	<1	3	15	<0.1	-
RPD%	18%	NC	7%	NC	NC	18%	73%	NC	-

Generally the Relative Percentage Differences (RPDs) between samples fall within the 30-50% bracket for soils. Where RPD's exceed this guide, analyte concentrations are generally less than the relevant guideline concentration

8.3D Quality Assurance/Quality Control (QA/QC) 20-22 Hilly Street

Table 17a – Summary of QA/QC acceptance (mg/kg) 20-22 Hilly Street

Analyte	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
BH10.0.2	nd	0.5	30	58	23	140	190	0.15	6	140	nd	nd
BH11.0.2	nd	1.4	8	170	9	100	150	0.12	13	100	nd	nd
RPD%	NC	95%	116%	98%	88%	33%	24%	22%	74%	33%	NC	NC

Table 17b – Summary of QA/QC acceptance (mg/kg) 20-22 Hilly Street

Analyte	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
BH6.1.2 (parent)	nd	nd	18	50	9	85	130	0.09	6	52	nd	6
BH6.1.2 (ALS)	<5	<1	13	35	5	165	95	0.1	<2	-	<5	<5
RPD%	NC	NC	32%	35%	57%	64%	31%	11%	32%	NC	NC	NC

Table 17c – Summary of QA/QC acceptance (mg/kg) 20-22 Hilly Street

Analyte	TPH C6-C9	C10-C14	C15-C28	C29-C36	PAH
PQL	**2**	**50**	**100**	**100**	
Inter-Lab					
BH6.1.2 (parent)	<2	<50	<100	<100	1.6
BH6.1.2 (ALS)	<2	<50	<100	<100	15.8
RPD%	NC	NC	NC	NC	163%

The variation in the concentration of PAHs between the parent sample at the primary laboratory (Amdel) and the inter-laboratory sample at the secondary laboratory (ALS), which resulted in the high RPD could be attributable to minute portions of ash being found in the ALS sample and not the Amdel sample. Based on statistical analysis (95% Upper Confidence Level) the concentrations of PAHs across the site met guideline criteria.

From the analysis undertaken, all samples analysed were within spike recovery acceptance levels, laboratory duplicate levels and surrogate % recovery levels or check recovery acceptance levels as set out in the USEPA 8270 criteria and the values are consistent with our DQOs. According to the USEPA methodology (USEPA 1986) the criteria for valid results for laboratory duplicates are that the RPDs are required to be <20% for waters and <35% for soil. Where the duplicate results are lower than 5 times the detection limit, the USEPA methodology indicates that the results are valid if the

difference between the results for the duplicate soil sample is equal to or less than twice the detection limit. For samples split in the field, the Australian Standard provides a guide to the validity of the data obtained from duplicate samples. According to the Australian Standard an RPD of up to 50% is the acceptable criteria. Some RPDs calculated form heavy metal concentrations in soil were above the 35 % US and 50% Australian criteria but in the majority of cases the total results were less than five times the detection limit and, accordingly, these variations do not contribute any significant concern for data interpretation

For site assessments, the number of samples required relates to the acceptance criteria of the assessment. This in turn depends on how a contaminant distribution is to compare with an acceptable limit. Given the uncertain nature of sampling, site assessment is to occur using the arithmetic average concentration of the contaminant(s) which should be less than an acceptable limit, at a given confidence level. This gives a statistically unbiased result.

Calculation for determining the 95% upper confidence limit (UCL) of the arithmetic average concentration - reference: Procedure D, pp22 NSW EPA Contaminated Sites Sampling Design Guidelines, 1995

The method requires that the probable average concentration and standard deviation of the contaminant be known. This method is most applicable for site assessment sampling, where the mean concentration and the standard deviation can be estimated from sampling results.

Equation used

$$\text{UCL average} = \text{mean} + t_{\alpha,n-1} \frac{\text{std deviation}}{\sqrt{n}}$$

Where

UCL average =	Upper confidence limit
n =	number of samples measurements

α =	The probability that the 'true' average concentration of the sampling area might exceed the UCL average determined by the above equation (0.05, i.e. 95%)
mean =	Arithmetic average of all sample measurements
$t_{\alpha,n-1}$ =	A test statistic (Student's t at an α level of significance and n-1 degrees of freedom)
std deviation =	Standard deviation of the sample measurements

This would mean that the diameter of the hot spot that could be detected with 95% confidence with six sampling locations was approximately 15.2 metres.

8.5 Data Quality Objectives

Data Quality Objectives (DQOs) were created to produce quality assured, accurate and useful data for the sampling plan. Blind samples were split in the field for testing. Other areas reviewed are:

- sampling methods
- decontamination procedures
- sample preservation
- container type
- headspace within containers
- disturbed or undisturbed sampling for organics
- PQL's
- preparation of CoC forms
- Review of laboratory surrogate and spike % returns
- Review of Laboratory duplicate results
- Document and data completeness
- Data comparability

Reviews of sampling methods are consistent with our protocols, our sample preservation and decontamination procedures were found to meet criteria. Our other sample quality reviews of taking, transporting, holding and testing have all been also

reviewed. In considering review of the above Data Quality Objectives, results have been shown to meet our requirements for integrity of sample interpretation. Thus, all samples have met Data Quality Objectives (DQOs) and the results can be used for this project.

8.4 Field Measurements

8.4A Field Measurements 1 Northcote /8 Hilly Streets

This section should be read in conjunction with the site plan in Appendix A for locations of boreholes.

At sample Location BH1, reinforced cement to 0.1m, a dry fill layer sandy brown in nature crushed rock with sandstone inclusions to a depth of 0.60m. Auger refusal occurred at this depth on sandstone bedrock. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample Location BH2, reinforced cement to 0.1m, a dry fill layer sandy brown in nature crushed rock with sandstone inclusions to a depth of 0.70m. Auger refusal occurred at this depth on sandstone bedrock. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample Location BH3, reinforced cement to 0.10m, a dry fill layer sandy grey in nature crushed rock with sandstone inclusions to a depth of 0.50m. Auger refusal occurred at this depth on sandstone bedrock. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample Location BH4, reinforced cement to 0.2m, a dry fill layer sandy brown in nature crushed rock with sandstone inclusions to a depth of 0.50m. Auger refusal occurred at this depth on sandstone bedrock. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample Location BH5, reinforced cement to 0.2m, a dry fill layer sandy grey in nature crushed rock with sandstone inclusions to a depth of 0.60m. Following was a

sandy clay, brown in colour, coarse grained sandstone inclusions to 1.1m. Auger refusal occurred at this depth on sandstone bedrock. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample location BH6, grassed surface then a dry fill layer, grey sandy in nature, crushed rocks and sandstone inclusions with grass root inclusions occurred to 0.4m. Following was a moist fine sandy loam, dark grey to grey/white in colour with organic odour occurring to 2.0m. The soil became wet at 1.5m. Borehole was terminated due to groundwater intervention at 2.0.

Sample location BH7, a 0.2m thick reinforced cement layer overlay a dry, grey/brown sandy fill layer with crushed rock inclusions to a depth of 0.6m. The borehole was terminated at 0.6m due to auger refusal on underlying rock.

Sample location BH8, a 0.2m thick reinforced cement layer, overlay yellow bedding sand to a depth of 0.5m. Beneath the bedding sand was mixed fill, containing tree roots, crushed rock and traces of ash. Auger refusal occurred at 1.0m on rock.

Sample location BH9 had a 0.2m reinforced concrete slab overlying fill material to a depth of 0.55m. The fill material was a mixture of yellow sand and white clay with red mottling. The borehole was terminated at a depth of 0.6m on underlying sandstone bedrock.

Sample location BH10 had a 0.2m thick concrete slab overlay dark grey/brown sandy fill to a depth of 0.8m. Between 0.8m and 1.0m the sandy fill was pink in colour. After 1.0m the fill turned to a dark brown/black silty clay, which remained until borehole termination at a depth of 2.9m. Groundwater was encountered at 1.3m, with a strong hydrogen sulphide odour noticed from 1.5m until borehole termination at 2.9m.

Sample location BH11 had a reinforced concrete layer to 0.2m. Beneath the concrete layer to a depth of 0.5m was dark grey/dark brown sandy fill to a depth of 0.5m. A dark grey silty clay with some ash inclusions existed to borehole termination at 0.6m.

8.4B Field Measurements 14 Hilly Street

At sample Location BH1, a dry, dark brown loamy sand topsoil was present from the surface to a depth of 0.5m. Between 0.5m and 0.8m a dark brown, dry sand layer was present. Auger refusal occurred at 0.8m on sandstone bedrock. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample Location BH2, a bitumen layer overlay dark brown loamy sand to a depth of 0.4. A yellow/orange dry sandy clay existed to a depth of 1.0m. Between 1.0m and 1.3m was a yellow/orange sandy clay with white mottling. Then to 1.4m a dark grey/brown silty clay layer with some orange mottling was present. The borehole was terminated at 1.4m. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample Location BH3, bitumen existed to a depth of 0.10m. Sandy fill material was found to a depth of 0.4m, which included crushed brick and sandstone. Yellow/orange sandy clay then existed to a depth of 1m. A yellow, moist, sandy clay was present to borehole termination at 2.2m. At 2.2m groundwater was encountered. No abnormal odours or discolouring was observed.

At sample Location BH4, a sandy fill material similar to that found in BH3 was present to a depth of 0.4m. A dry yellow sandy clay then existed to a depth of 1.0m. A moist yellow sandy clay (which increased in stiffness with depth) then existed to borehole termination at 2.5m. Ground water was encountered at 2.5m. No abnormal odours or soil discolouring was observed.

At sample Location BH5, a concrete slab was present to a depth of 0.1m. A dry, light grey sandy fill then existed to a depth of 0.8m. Beneath the fill material was dark dry, grey/black silty clay to a depth of 1.0m. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample location BH6, a grassed surface overlay dry, light grey sandy fill to a depth of 1.0m. Between 1.0m and borehole termination at 1.3m on sandstone bedrock, lay a

dark grey/black silty clay. No groundwater was encountered. No abnormal odours or discolouring was observed.

At sample location BH7, beneath the 0.1m thick concrete slab, light grey/yellow dry sandy fill with crushed brick existed to borehole termination on sandstone bedrock at 0.7m.

8.4C Field Measurements 16-18 Hilly Street

At sample Location BH1, reinforced concrete was followed by slightly coherent, brown clayey sand fill with sandstone inclusions and crushed rocks to a depth of 0.60m. Auger refusal occurred at this depth on hard sandstone. No abnormal odours or discolouring was observed.

At sample Location BH2, reinforced concrete was followed by stiff, brown clayey sand fill with sandstone inclusions and crushed rocks to a depth of 0.70m. Auger refusal occurred at this depth on hard sandstone. No abnormal odours or discolouring was observed.

At sample Location BH3, reinforced concrete was followed by stiff, brown clayey sand fill with sandstone inclusions and crushed rocks to a depth of 0.70m. Auger refusal occurred at this depth on hard sandstone. No abnormal odours or discolouring was observed.

At sample Location BH4, reinforced concrete was followed by grey, ash-like material with crushed rock to 0.60m. Auger refusal occurred at this depth on the sandstone bedrock. No abnormal odours or discolouring was observed.

At sample Location BH5, reinforced concrete was followed by grey, ash-like material with crushed rock to 0.60m. Auger refusal occurred at this depth on the sandstone bedrock. No abnormal odours or discolouring was observed.

At sample Location BH6, reinforced concrete was followed by stiff, brown clayey sand fill with brick inclusions and crushed rocks to a depth of 0.50m. Auger refusal occurred at this depth on hard sandstone. No abnormal odours or discolouring was observed.

At sample Location BH7, reinforced concrete was followed by stiff, brown clayey sand fill with brick inclusions and crushed rocks to a depth of 0.50m. Below this wet, grey sandy clay existed up to and beyond a depth of 2m. Groundwater was encountered at 1.4m. The borehole was terminated at 2m within the natural soil layer. No abnormal odours or discolouring was observed.

At sample Location BH8, reinforced concrete was followed by stiff, brown clayey sand fill with brick inclusions and crushed rocks to a depth of 0.50m. Below this wet, grey sandy clay existed up to and beyond a depth of 1.5m. Groundwater was encountered at 1.4m. The borehole was terminated at 1.5m within the natural soil layer. No abnormal odours or discolouring was observed.

At sample Location BH9, dark brown sandy backfill containing woodchips and tree roots existed until a depth of 0.70m. Crushed rocks and sandstone inclusions were also observed in the fill material. Auger refusal occurred at this depth on hard sandstone bedrock. No abnormal odours or discolouring was observed.

At sample Location BH10, dark brown sand fill existed to a depth of 0.7m with prominent sandstone inclusions and crushed rock. Auger refusal occurred at this depth on sandstone bedrock. No abnormal odours or discolouring was observed.

At sample Location BH11, reinforced concrete was followed by stiff, brown clayey sand fill with sandstone inclusions and crushed rocks to a depth of 0.60m. Auger refusal occurred at this depth on hard sandstone. No abnormal odours or discolouring was observed.

At sample Location BH12, reinforced concrete was followed by stiff, brown clayey sand fill with sandstone inclusions and crushed bricks and rock to a depth of 0.60m.

Below this wet, grey/white coloured, sandy clay existed up to a depth of 2.3m. Beyond this depth a profile of brown sandy clay was observed. Groundwater was encountered at 1.5m. The borehole was terminated at 2.4m within the natural soil layer. The colour of the groundwater was translucent brown and bore organic particulate matter. A strong odour of organic sulphur emanated from the water sample. Both, colour and odour characteristics are a result of natural biological processes and confirm that the state of the groundwater is biologically active.

At sample Location BH13, reinforced concrete was followed by stiff, brown clayey sand fill with crushed bricks to a depth of 0.50m. Beyond this existed grey/white, wet sandy clay unto a depth of 2.3m. Below this layer, brown sandy clay was observed. Groundwater was encountered at 1.4m. The borehole was terminated at 2.4m within the natural soil layer. A faint organic smell emanated from the groundwater.

At sample Location BH14, reinforced concrete was followed by stiff brown sand fill containing crushed rock to a depth of 0.6m. Auger refusal occurred at this depth on sandstone bedrock. No abnormal odours or discolouring was observed.

At sample Location BH15, reinforced concrete was followed by stiff brown clayey sand fill containing crushed rock to a depth of 0.7m. Auger refusal occurred at this depth on sandstone bedrock. No abnormal odours or discolouring was observed.

At sample Location BH16, reinforced concrete was followed by stiff brown clayey sand fill containing crushed rock to a depth of 0.7m. Auger refusal occurred at this depth on sandstone bedrock. No abnormal odours or discolouring was observed.

At sample Location BH17, reinforced concrete was followed by stiff brown clayey sand fill containing crushed rock to a depth of 0.5m. Auger refusal occurred at this depth on sandstone bedrock. No abnormal odours or discolouring was observed.

8.4C.1 Groundwater Well Construction and Sampling 16-18 Hilly Street

A targeted groundwater sampling and analysis program was conducted to verify the hydrogeological condition of the groundwater onsite. A groundwater well was

installed in BH12 in the down-gradient region of the site. The well was designed to collect any groundwater present in the fill material or underlying natural soils. During borehole investigations, water was encountered in the natural soils at approximately 1.5m depth. The groundwater well was therefore constructed deep enough to allow collection of a sufficient volume of groundwater and to permit screening across the expected groundwater level.

The groundwater monitoring well was constructed from the following materials:

- Class 18, 50 mm inside diameter PVC pressure pipe with hand sawn slots (every 50 mm) and blank casing;
- Well screen was covered with a filter sock;
- A filter pack comprising clean 2 mm graded sand;
- Bentonite seal overlain by cement/bentonite grout;
- Lockable well plug.

Steel hand augers were used to drill the well and due to the stable nature of the natural soil profile no support was necessary to hold the borehole walls while the well was installed. The casing was placed inside the finished hole, and the filter pack and subsequent bentonite seal was installed. This was achieved by slowly adding bentonite granules in a quantity sufficient to create a seal approximately 200 mm or greater in length. The purpose of this seal was to:

- provide a barrier to the vertical movement of water along the well; and
- inhibit the downward movement of overlying grout seal into the filter pack

Prior to commencing fieldwork, all groundwater sampling equipment was checked and calibrated. Decontamination procedures were followed in accordance with the Aargus QA/QC protocols.

8.4C.2 Groundwater Sampling 16-18 Hilly Street

The well was purged and then sampled over two consecutive days; the 19th and 20th of February, 2004. One (1) water sample was collected on each day, in addition to one (1) 'rinsate' sample (obtained to measure the effectiveness of decontamination procedures)

and analysed for suspected contaminants: heavy metals, TPHs PAHs, phenols and BTEX solvents – benzene, toluene, ethyl benzene and xylene. Samples were placed in appropriate sample containers with preservatives as follows:

- Light TPH fractions/ BTEX (40 ml glass vial with teflon-lined lid completely filled)
- Heavy TPH fractions (1 litre glass bottle acid washed and solvent rinsed)
- Metals (filtered sample, 250 ml plastic, nitric acid treated bottle).

For a complete summary of the analytes tested refer to Table 13c. Standard Health and Safety procedures were observed. Rubber gloves and full-length protective clothing were worn to minimise exposure to potential contaminants. Tyvec suits were supplied but not used.

8.4D Field Measurements 20-22 Hilly Street

This section should be read in conjunction with the site plan in Appendix A for locations of boreholes.

At sample location BH1, a brown loamy sand was found to a depth of 0.4m. No odours, soil staining or groundwater were encountered.

At sample location BH2 a brown, loamy sand was found to a depth of 0.4m. No odours, soil staining or groundwater were encountered.

At sample location BH3 a reinforced concrete layer overlay yellow/brown sandy fill with crushed rock inclusions. Auger refusal occurred at 0.3m. No odours, soil staining or groundwater were encountered.

At sample location BH4 a reinforced concrete layer overlay a yellow/brown sandy fill with crushed rock inclusions. The borehole was terminated at 0.6m when auger refusal occurred. No odours, soil staining or groundwater were encountered.

At sample location BH5, a reinforced concrete layer overlay 0.1m of yellow sandy fill. Beneath the sandy fill at 0.2m was sandstone bedrock. Auger refusal occurred on the sandstone bedrock. No odours, soil staining or groundwater were encountered.

At sample location BH6 a 0.1m reinforced concrete layer overlay yellow/brown sandy fill with crushed rock inclusions to a depth of 0.8m. Beneath the fill material was a dark brown/black, dry, silty clay. No odours, soil staining or groundwater were encountered.

At sample location BH7 a 0.1m thick reinforced concrete layer overlay brown sandy fill to a depth of 0.5m. The borehole was terminated due to auger refusal at 0.5m. No odours, soil staining or groundwater were encountered.

At sample location BH8 a 0.1m thick brown loamy sand overlay, yellow/brown sandy fill to a depth of 0.8m. Beneath the fill material was a dry brown/black silty clay to a depth of 1.3m. No odours, soil staining or groundwater were encountered.

At sample location BH9 a 0.1m thick reinforced concrete layer overlay, sandy fill material to 0.7m. Beneath the sandy fill layer was a brown, dry sandy clay to a depth of 2.4m. No odours, soil staining or groundwater were encountered.

At sample location BH10 a 0.1m thick dry, brown loamy sand overlay sandy fill to a depth of 0.8m. A dry, brown sandy clay was then present to a depth of 1.8m. No odours, soil staining or groundwater were encountered.

9.0 ACID SULPHATE SOILS

No Actual Acid Sulphate Soils (AASS) were found to exist up to 2.5m on the site, however there was evidence of Potential Acid Sulphate Soils (PASS) at 2.5m on the site.

Table 18a – Summary of Laboratory Test Data –Acid Sulphate Soils – Field Test Results – 1 Northcote/8 Hilly Street

Sample Number	Depth (m)	PH_F	EC_F (mS)	pH_{FOX} (duplicate)	Change in pH	Observed Reaction	Other Observations
BH3.0.2	0.2	7.4	0.08	5.8	-1.6	Nil to very mild	No jarosite mottling, odours or scalding
BH3.0.5	0.5	6.8	0.04	5.2	-1.6	Nil to very mild	No jarosite mottling, odours or scalding
BH5.0.3	0.3	6.8	0.07	5.2	-1.6	Nil to very mild	No jarosite mottling, odours or scalding
BH5.1.1	1.1	6.9	0.08	5.3	-1.6	Nil to very mild	No jarosite mottling, odours or scalding
BH10.1.5	1.5	6.4	0.21	5.1	-1.3	Mild effervescence	No jarosite mottling, odours or scalding
BH10.2.5	2.5	5.5	0.15	4.5	-1.0	Nil to very mild	No jarosite mottling, odours or scalding

Table 18b – Summary of Laboratory Test Data –Acid Sulphate Soils – POCAS Test Results – 1 Northcote/8 Hilly Street

Analyte Tested	Result BH10.2.3	Result BH10.2.5	Result BH13.1.5	Guidelines*
pH	6.0	5.5	6.4	-
Peroxide Oxidisable Sulfur (%)	0.05	0.55	0.02	0.1
pH (KCl) extract	6.3	5.2	6.3	-
pH Peroxide extract (mol H^+/T)	5.6	2.1	6.5	-
Total Actual Acidity (mol H^+/T)	<5	<5	<5	62
Total Potential Acidity (mol H^+/T)	<5	332	<5	62
Total Sulfidic Acidiy (mol H^+/T)	<5	327	<5	62

- (*) Guidelines refers to levels imposed by NSW Acid Sulfate Soils Management Advisory Committee (1998) for 1-1000T disturbed material.
- BH13.1.5=BH10.1.5

In summary, no signs of actual acid sulphate soils were encountered throughout this investigation at 1 Northcote and 8 Hilly Street. At sample location BH10 sample depth 2.5m POCAS tests showed the presence of a significant amount of sulphur in the soil, indicative of Potential Acid Sulphate Soils (PASS). POCAS tests at sample location

BH10 sample depth 2.3m were not indicative of PASS. All other sample locations were not indicative of PASS. Encountered soils ranged texturally from sandy fill material with crushed rock inclusions to silty/sandy clays. No grey to greenish blue marine clays were encountered. Further detail pertaining to soil profile texture characteristics can be viewed in Appendix D – Borehole logs. Soil and oxidised pH values did not differ from field pH values more than 1.6 pH units and oxidised soils were not suspiciously acidic (pH 4.5-5.0), except for BH10.2.5.

Table 18c – Summary of Laboratory Test Data –Acid Sulphate Soils Results – 14 Hilly Street

Sample Number	Depth (m)	pH_F	EC_F (mS)	pH_{FOX}	Change in pH	Observed Reaction	Other Observations
BH3.2.0	2.0	5.5	0.14	4.6	-0.9	Nil to very mild	No jarosite mottling, odour or scalding
BH4.2.5	2.5	5.5	0.18	4.3	-1.2	Very mild effervescence	No jarosite mottling, odour or scalding

Table 18d – Summary of Laboratory Test Data –Acid Sulphate Soils – POCAS Test Results – 14 Hilly Street

Analyte Tested	Result BH2.1.4	Result BH4.1.8	Result BH9.2.2	Result BH10.1.5	Result BH11.1.3	Guidelines*
pH	6.5	5.3	5.1	5.1	5.4	-
Peroxide Oxidisable Sulfur (%)	<0.01	<0.01	0.01	<0.01	<0.01	0.1
pH (KCl) extract	6.9	4.7	4.5	4.4	5.0	-
pH Peroxide extract (mol H^+/T)	5.9	4.1	5.3	4.9	4.5	-
Total Actual Acidity (mol H^+/T)	<5	12.5	18.4	20.7	6.1	62
Total Potential Acidity (mol H^+/T)	<5	21.2	5.1	11.3	16.4	62
Total Sulfidic Acidiy (mol H^+/T)	<5	9	<5	<5	10	62

- (*) Guidelines refers to levels imposed by NSW Acid Sulfate Soils Management Advisory Committee (1998) for 1-1000T disturbed material.
- BH9.2.2=BH3.2.2
- BH10.1.5=BH4.1.5
- BH11.1.3=BH6.1.3

In summary, based on field and POCAS testing no signs of Actual Acid Sulphate Soils (ASS) or Potential Acid Sulphate Soils (PASS) were encountered throughout this investigation at 14 Hilly Street. Encountered soils ranged texturally from sandy fill material with crushed rock inclusions to silty/sandy clays. No grey to greenish blue marine clays were encountered. Further detail pertaining to soil profile texture characteristics can be viewed in Appendix D – Borehole logs. Soil and oxidised pH values did not differ from field pH values more than 1.2 pH units and oxidised soils were not suspiciously acidic (pH 4.5-5.0).

Table 18e – Summary of Laboratory Test Data –Acid Sulphate Soils Results – 16-18 Hilly Street

Sample Number	Depth (m)	pH_F	EC_F (mS)	pH_{FOX}	Change in pH	Observed Reaction	Other Observations
BH12.0.2	0.2	7.2	0.09	5.5	-1.7	Nil to very mild	No jarosite mottling, odour or scalding
BH12.1.4	1.4	6.0	0.12	5.9	-0.1	Nil to very mild	No jarosite mottling, odour or scalding
BH13.0.3	0.3	7.0	0.11	5.7	-1.3	Nil to very mild	No jarosite mottling, odour or scalding
BH13.1.8	1.8	6.8	0.12	4.9	-0.8	Nil to very mild	No jarosite mottling, odour or scalding

In summary, based on field tests and observations no signs of Actual Acid Sulphate Soils (ASS) or Potential Acid Sulphate Soils (PASS) were encountered throughout the investigation at 16-18 Hilly Street. Encountered soils ranged texturally from sandy fill

material with crushed rock inclusions to silty/sandy clays. No grey to greenish blue marine clays were encountered. Further detail pertaining to soil profile texture characteristics can be viewed in Appendix D – Borehole logs. Soil and oxidised pH values did not differ from field pH values more than 1.7 pH units and oxidised soils were not suspiciously acidic (pH 4.5-5.0).

Table 18f – Summary of Laboratory Test Data –Acid Sulphate Soils – POCAS Test Results – 20-22 Hilly Street

Analyte Tested	Result BH9.2.0	Guidelines*
pH	5.4	-
Peroxide Oxidisable Sulfur (%)	0.16	0.1
pH (KCl) extract	6.3	-
pH Peroxide extract (mol H^+/T)	4	-
Total Actual Acidity (mol H^+/T)	<5	62
Total Potential Acidity (mol H^+/T)	23.2	62
Total Sulfidic Acidiy (mol H^+/T)	18	62

- (*) Guidelines refers to levels imposed by NSW Acid Sulfate Soils Management Advisory Committee (1998) for 1-1000T disturbed material.

In summary, POCAS testing no signs of Actual Acid Sulphate Soils (ASS) or Potential Acid Sulphate Soils (PASS) were encountered throughout this investigation at 20-22 Hilly Street. Encountered soils ranged texturally from sandy fill material with crushed rock inclusions to silty/sandy clays. No grey to greenish blue marine clays were encountered. Further detail pertaining to soil profile texture characteristics can be viewed in Appendix D – Borehole logs.

10.0 LABORATORY RESULTS

A number of analytes were selected for testing and the results of these tests are summarised below. A full set of analyte detection results are set out in Appendix C of this report.

Table 19a – Summary of Laboratory Test Data – Heavy Metals – 1 Northcote Street/8 Hilly Street

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
Samples												
BH1.0.2	nd	nd	22	51	20	140	220	0.23	8	200	nd	7
BH2.0.2	nd	nd	19	6	nd	14	36	nd	nd	11	nd	nd
BH2.0.8	nd	nd	19	nd	nd	nd	nd	nd	-	-	-	-
BH3.0.3	nd	nd	nd	nd	3	5	13	nd	23	48	nd	nd
BH4.0.3	nd	nd	15	nd	nd	34	47	nd	nd	12	nd	nd
BH5.0.3	nd	nd	nd	nd	nd	11	100	nd	nd	17	nd	nd
BH5.1.1	nd	nd	nd	nd	nd	9	95	nd	-	-	-	-
BH6.0.2	27	nd	12	nd	nd	6	40	nd	nd	nd	nd	nd
BH6.2.0	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-	-
BH7.0.6	nd	1.8	16	13	22	11	42	0.10	8	160	nd	nd
BH8.0.6	nd	25	230	1700	170	310	3500	0.11	44	350	8	39
BH9.0.5	nd	nd	nd	nd	nd	9	8	nd	nd	15	nd	nd
BH10.0.6	nd	nd	10	10	nd	35	24	0.15	nd	24	nd	nd
BH10.2.5	nd	nd	nd	nd	nd	7	33	nd	-	-	-	-
BH10.2.9	nd	nd	nd	nd	nd	9	22	0.08	-	-	-	-
BH11.0.4	nd	nd	7	21	8	29	67	1.01	nd	49	nd	nd
BH11.0.6	nd	nd	5	13	nd	13	27	0.09	-	-	-	-
BH13.1.0	20	4	18	nd	4	170	55	0.10	-	-	-	-
t-value @ 0.05	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.81	1.81	1.81	1.81
# Samples	18	18	18	18	18	18	18	18	11	11	11	11
Minimum	2.5	0.25	2.5	2.5	1	2.5	2.5	0.025	2.5	2.5	2.5	2.5
Maximum	27	25	230	1700	170	310	3500	1.01	44	350	8	39
Mean	4.83	1.92	21.7	102.3	13.3	45.4	240.8	0.12	9.14	80.77	3.00	6.23
Std Deviation	6.90	5.84	52.47	398.9	39.64	81.06	814.98	0.23	13.11	110.63	1.66	10.9
95% UCL on Mean	7.66	4.31	43.21	265.9	29.53	78.63	574.95	0.21	16.30	141.23	3.91	12.2
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Notes to Table 19a:

- All data in mg/kg unless otherwise stated.
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- - Refers Not Analysed
- PQL refers to Practical Quantitative Limit.
- 'nd' refers to non detect, whereby the analyte concentration was less than the PQL
- For the purposes of UCL calculations, any analyte concentration reported as nd (non-detect) half the PQL was used in the calculation of the UCL.
- NSL refers to No Set Limit.

Table 19b –Laboratory Test Data – TPHs and BTEX – 1 Northcote/8 Hilly Street

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**5**	**10**	**50**	**50**	**0.2**	**1**	**1**	**3**
Samples								
BH1.0.2	nd	nd	140	70	nd	nd	nd	nd
BH3.0.3	nd	nd	nd	nd	nd	nd	nd	nd
BH6.0.2	nd	nd	nd	nd	nd	nd	nd	nd
BH7.0.6	nd	nd	nd	nd	nd	nd	nd	nd
BH8.0.6	nd	nd	nd	80	nd	nd	nd	nd
BH9.0.5	nd	nd	nd	nd	nd	nd	nd	nd
BH10.0.6	nd	nd	280	nd	nd	nd	nd	nd
BH10.2.5	nd	nd	nd	nd	nd	nd	nd	nd
BH10.2.9	nd	nd	nd	nd	nd	nd	nd	nd
BH11.0.6	nd	nd	nd	nd	-	-	-	-
BH13.1.0	nd	nd	nd	nd	-	-	-	-
t-value @ 0.05	1.812	1.812	1.812	1.812	1.860	1.860	1.860	1.860
No. of Samples	11	11	11	11	9	9	9	9
Minimum Value	2.5	5	25	25	0.1	0.5	0.5	1.5
Maximum Value	2.5	5	280	80	0.1	0.5	0.5	1.5
Mean	2.50	5.00	58.64	34.09	0.10	0.50	0.50	1.50
Std Deviation	0.00	0.00	81.12	20.35	0.00	0.00	0.00	0.00
Upper Level 95% Confidence Limit on Mean Value	2.50	5.00	102.97	45.21	0.10	0.50	0.50	1.50
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Notes for Table 19b:

- All data in mg/kg unless otherwise stated
- All guidelines are for sensitive land use with soils potentially impacted with hydrocarbons (NSWEPA Guidelines for Assessing Service Station Sites) 1994

Table 19c – Summary of Laboratory Test Data – OCP, Phenols, PAH and B(a)P – 1 Northcote/8 Hilly Street

Analyte	OCP	Phenols	PAH	B(a)P	PCB
PQL	**1.2**	**0.2**	**0.2**	**0.5**	**1**
BH2.0.2	-	-	<0.5	-	-
BH5.0.3	-	-	<0.5	-	-
BH4.0.3	-	<0.2	-	-	-
BH6.0.2	<1.2	-	-	<0.1	-
BH7.0.6	-	<0.2	<0.5	<0.5	<1
BH8.0.6	0.2	<0.2	1.8	<0.5	<1
BH9.0.5	-	<0.2	<0.5	<0.5	<1
BH10.0.6	-	0.3	11	1.0	-
BH10.2.5	-	-	<0.5	<0.5	-
BH10.2.9	-	-	<0.5	<0.5	-
BH11.0.4	<1.2	-			-
BH11.0.6	-	-	1.2	<0.5	-
BH13.1.0	-	-	<0.5	<0.5	-
t-value @ 0.05	2.920	2.132	1.833	1.86	2.920
# Samples	3	5	10	9	3
Minimum Value	0.2	0.1	0.1	0.25	0.5
Maximum Value	0.6	0.3	11	1	0.5
Mean	0.47	0.14	1.47	0.33	0.50
Std. Deviation	0.23	0.09	3.40	0.25	0.00
95% UCL on Mean	0.86	0.23	3.44	0.49	0.50
NEHF "A"	***270**	**8500**	**20**	**1**	**10**
NEHF "D"	***1080**	**34000**	**80**	**4**	**40**

Notes for Table 19c:

- * refers to criteria taken as the addition of guideline levels for Aldrin, Dieldrin, Chlordane, DDT, DDD, DDE and Heptachlor, taken from guidelines for Health-based Investigation Levels (HILs) for residential properties with minimal opportunity for soil access (NEPC Soil Investigation Levels - Exposure setting 'A' and 'D' 1999).
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- '-' Refers to Not Analysed.

Table 20a – Summary of Laboratory Test Data – Heavy Metals – 14 Hilly Street

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
Samples												
BH1.0.4	57	nd	11	43	16	470	300	0.16	6	140	nd	5
BH1.0.8	6	nd	6	43	58	140	92	0.07	-	-	-	-
BH2.0.3	nd	nd	9	58	70	nd	29	nd	29	510	5	nd
BH2.1.3	nd	nd	15	nd	nd	nd	6	nd	-	-	-	-
BH3.0.3	nd	nd	6	6	7	11	24	nd	nd	79	nd	nd
BH3.1.0	nd	nd	6	6	nd	8	9	nd	-	-	-	-
BH3.2.2	nd	nd	24	nd	nd	nd	8	nd	-	-	-	-
BH4.0.5	nd	nd	6	7	nd	36	100	0.08	nd	10	nd	nd
BH4.1.5	nd	nd	nd	nd	nd	nd	11	nd	-	-	-	-
BH4.2.5	nd	nd	13	nd	nd	nd	6	nd	-	-	-	-
BH5.0.5	nd	nd	17	53	45	78	90	0.09	-	-	-	-
BH5.0.7	9	nd	13	39	22	200	170	0.19	nd	78	nd	nd
BH6.0.3	32	nd	20	29	7	140	140	0.20	nd	78	nd	nd
BH6.1.3	22	nd	21	27	4	190	110	0.11	-	-	-	-
BH7.0.5	nd	nd	12	17	14	62	64	0.08	7	100	nd	nd
t-value	1.761	1.761	1.761	1.761	1.761	1.761	1.761	1.761	1.943	1.943	1.943	1.943
# Samples	15	15	15	15	15	15	15	15	7	7	7	7
Minimum	2.5	0.25	2.5	2.5	1	2.5	6	0.025	2.5	10	2.5	2.5
Maximum	57	0.25	24	58	70	470	300	0.2	29	510	5	5
Mean	10.07	0.25	12.10	22.53	16.70	89.83	77.27	0.08	7.43	142.14	2.86	2.86
Std Dev	15.62	0.00	6.38	20.32	22.63	127.2	81.71	0.06	9.70	166.72	0.94	0.94
95% UCL	17.17	0.25	15.00	31.77	26.99	147.7	114.42	0.11	14.55	264.59	3.55	3.55
NEHF A	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF D	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Notes to Table 20a:

- All data in mg/kg unless otherwise stated.
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- - Refers Not Analysed
- PQL refers to Practical Quantitative Limit.
- 'nd' refers to non detect, whereby the analyte concentration was less than the PQL
- For the purposes of UCL calculations, any analyte concentration reported as nd (non-detect) half the PQL was used in the calculation of the UCL.

Table 20b – Laboratory Test Data – TPHs and BTEX – 14 Hilly Street

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**5**	**10**	**50**	**50**	**0.2**	**1**	**1**	**1**
Samples								
BH2.0.3	nd	nd	nd	nd	nd	nd	nd	nd
BH2.1.3	nd	nd	nd	nd	nd	nd	nd	nd
BH3.0.3	nd	nd	nd	nd	nd	nd	nd	nd
BH3.2.0	nd	nd	nd	nd	nd	nd	nd	nd
BH3.2.2	nd	nd	nd	nd	nd	nd	nd	nd
BH4.0.5	nd	nd	nd	nd	nd	nd	nd	nd
BH5.0.5	nd	nd	160	240	nd	nd	nd	nd
BH6.0.3	nd	nd	280	120	nd	nd	nd	nd
t-value @ 0.05	1.895	1.895	1.895	1.895	1.895	1.895	1.895	1.895
No. of Samples	8	8	8	8	8	8	8	8
Minimum	2.5	5	25	25	0.1	0.5	0.5	1.5
Maximum	2.5	5	280	240	0.1	0.5	0.5	1.5
Mean	2.50	5.00	73.75	63.75	0.10	0.50	0.50	1.50
Std Deviation	0.00	0.00	95.80	78.59	0.00	0.00	0.00	0.00
95% UCL on Mean Value	2.50	5.00	137.92	116.39	0.10	0.50	0.50	1.50
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Notes for Table 20b:

- All data in mg/kg unless otherwise stated
- All guidelines are for sensitive land use with soils potentially impacted with hydrocarbons (NSWEPA Guidelines for Assessing Service Station Sites) 1994
- PQL refers to Practical Quantitative Limit.

Table 20c – Summary of Laboratory Test Data – OCP, Phenols, PAH and B(a)P – 14 Hilly Street

Analyte	OCP	Phenols	PAH	B(a)P	PCB
PQL	**1.2**	**0.2**	**0.2**	**0.5**	**1**
Samples					
BH1.0.4	-	-	56	5	-
BH1.0.8	-	-	-	-	nd
BH2.0.3	-	-	nd	nd	-
BH2.1.3	-	-	nd	nd	-
BH3.2.2	-	-	nd	nd	-
BH4.0.5	nd	nd	-	-	nd
BH4.1.5	-	-	nd	nd	-
BH5.0.5	-	nd	34	4.2	-
BH5.0.7	-	-	14	1.4	-
BH6.0.3	-	-	80	7.4	nd
BH6.1.3	-	0.3	35	2.8	nd
BH7.0.5	nd	-	1.2	nd	
t-value @ 0.05	6.314	2.920	1.833	1.833	2.353
No. of Samples	2	3	10	10	4
Minimum Value	0.6	0.1	0.1	0.25	0.5
Maximum Value	0.6	0.3	80	7.4	0.5
Mean	0.60	0.17	22.06	2.21	0.50
Std. Deviation	0.00	0.12	28.38	2.56	0.00
95% UCL on Mean	0.60	0.36	38.51	3.69	0.50
NEHF "A"	***270**	**8500**	**20**	**1**	**10**
NEHF "D"	***1080**	**34000**	**80**	**4**	**40**

Notes for Table 20c:

- * refers to criteria taken as the addition of guideline levels for Aldrin, Dieldrin, Chlordane, DDT, DDD, DDE and Heptachlor, taken from guidelines for Health-based Investigation Levels (HILs) for residential properties with minimal opportunity for soil access (NEPC Soil Investigation Levels - Exposure setting 'A' and 'D' 1999).
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- '-' Refers to Not Analysed.
- nsl-No Set Limit

Table 21a – Summary of Laboratory Test Data – Heavy Metals – 16-18 Hilly St

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
	Samples											
BH1.0.3	<5	<0.5	9	50	5	14	26	0.16	10	-	-	-
BH2.0.3	<5	<0.5	5	11	37	<5	16	<0.05	22	-	-	-
BH3.0.2	<5	<0.5	16	25	71	9	36	<0.05	19	-	-	-
BH4.0.3	<5	<0.5	<5	5	5	6	18	<0.05	15	-	-	-
BH5.0.3	<5	7.2	6	14	3	7	18	0.12	39	-	-	-
BH6.0.3	<5	<0.5	8	<5	<5	10	6	<0.05	<5	-	-	-
BH7.0.2	<5	<0.5	67	16	9	400	100	0.56	9	-	-	-
BH7.2.0	<5	<0.5	62	12	3	460	53	0.58	-	-	-	-
BH8.0.3	<5	<0.5	110	<5	3	44	52	0.08	<5	-	-	-
BH8.1.4	<5	<0.5	19	<5	<2	11	23	<0.05	-	-	-	-
BH9.0.3	<5	<0.5	140	<5	<2	35	38	0.06	<5	-	-	-
BH10.0.2	<5	<0.5	13	10	4	21	48	0.08	<5	-	-	-
BH11.0.2	<5	<0.5	<5	<5	<2	6	8	0.14	11	-	-	-
BH12.0.3	<5	<0.5	160	8	3	45	58	0.14	<5	-	-	-
BH12.2.3	<5	<0.5	260	<5	<2	<5	7	<0.05	-	-	-	-
BH13.0.3	<5	<0.5	<5	<5	<2	8	10	<0.05	7	-	-	-
BH13.2.0	<5	<0.5	11	<5	<2	<5	<5	<0.05	-	-	-	-
BH14.0.2	5	<0.5	60	<5	2	250	48	0.10	<5	-	-	-
BH15.0.3	<5	1.4	9	5	<2	57	27	0.11	<5	-	-	-
BH16.0.3	<5	<0.5	<5	<5	<2	<5	<5	<0.05	9	-	-	-
BH17.0.3	<5	<0.5	6	<5	<2	13	15	<0.05	<5	-	-	-
# Samples	21	21	21	21	21	21	21	21	17	-	-	-
Minimum	5	0.5	5	5	2	5	5	0.05	5	-	-	-
Maximum	5	7.2	260	50	71	460	100	0.58	39	-	-	-
Mean	5.00	0.86	46.71	10.05	8.00	67.43	29.38	0.13	10.65	-	-	-
Std Deviation	0.00	1.47	67.95	10.51	16.30	131.99	23.94	0.15	9.00	-	-	-
95% UCL on Mean	5.00	1.41	72.29	14.00	14.13	117.11	38.39	0.18	14.46	-	-	-
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Notes to Table 21a:

- All data in mg/kg unless otherwise stated.
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- - Refers Not Analysed

- PQL refers to Practical Quantitative Limit.
- 'nd' refers to non detect, whereby the analyte concentration was less than the PQL
- For the purposes of UCL calculations, any analyte concentration reported as nd (non-detect) half the PQL was used in the calculation of the UCL.
- NSL refers to No Set Limit.

Table 21b –Laboratory Test Data – TPHs and BTEX – 16-18 Hilly Street

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**5**	**10**	**50**	**50**	**0.2**	**1**	**1**	**3**
Samples								
BH5.0.3	<5	<10	<50	<50	<0.2	<1	<1	<3
BH8.0.3	<5	<10	70	<50	<0.2	<1	<1	<3
BH12.0.3	<5	<10	60	<50	-	-	-	-
BH14.0.2	<5	<10	80	<50	<0.2	<1	<1	<3
No. of Samples	4	4	4	4	3	3	3	3
Minimum	5	10	50	50	0.2	1	1	3
Maximum	5	10	80	50	0.2	1	1	3
Mean	5.00	10.00	65.00	50.00	0.20	1.00	1.00	3.00
Std Deviation	0.00	0.00	12.91	0.00	0.00	0.00	0.00	0.00
95% UCL on Mean Value	5.00	10.00	80.19	50.00	0.20	1.00	1.00	3.00
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Notes for Table 21b:

- All data in mg/kg unless otherwise stated
- All guidelines are for sensitive land use with soils potentially impacted with hydrocarbons (NSWEPA Guidelines for Assessing Service Station Sites) 1994
- PQL refers to Practical Quantitative Limit.

Table 21c – Summary of Laboratory Test Data – OCP, Phenols, PAH, B(a)P and VHC – 16-18 Hilly Street

Analyte	OCP	Phenols	PAH	B(a)P	VHC
PQL	**1.2**	**0.2**	**0.2**	**0.5**	**1**
Samples					
BH4.0.3	-	-	nd	nd	-
BH5.0.3	-	<0.2	nd	nd	-
BH6.0.3	-	-	-	-	<2.6
BH9.0.3	<0.8	0.2	nd	nd	-
BH10.0.2	<0.8	-	-	-	-
BH11.0.2	-	<0.2	-	-	-
BH14.0.2	-	-	-	-	<2.6
BH16.0.3	-	-	nd	nd	-
t-value @ 0.05	-	-	-	-	-
No. of Samples	2	3	4	4	2
Minimum Value	0.8	0.2	3.75	0.25	2.6
Maximum Value	0.8	0.2	3.75	0.25	2.6
Mean	0.80	0.20	3.75	0.25	2.60
Std. Deviation	0.00	0.00	-	-	0.00
Upper level 95% Confidence Limit on Mean	0.80	0.20	3.75	0.25	2.60
NEHF "A"	***270**	**8500**	**20**	**1**	**10**
NEHF "D"	***1080**	**34000**	**80**	**4**	**40**

Notes for Table 21c:

- * refers to criteria taken as the addition of guideline levels for Aldrin, Dieldrin, Chlordane, DDT, DDD, DDE and Heptachlor, taken from guidelines for Health-based Investigation Levels (HILs) for residential properties with minimal opportunity for soil access (NEPC Soil Investigation Levels - Exposure setting 'A' and 'D' 1999).
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- '-' Refers to Not Analysed.
- nsl-No Set Limit

Table 21d – Summary of Laboratory Test Data for Groundwater- Heavy Metals – 16-18 Hilly Street

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg
PQL	**0.002**	**0.0005**	**0.005**	**0.005**	**0.005**	**0.002**	**0.01**	**0.05**
Samples								
GW1	0.033	0.001	0.303	<0.005	<0.005	0.033	0.10	<0.001
GW2	0.030	0.0005	0.325	<0.005	<0.005	0.036	0.20	<0.001
R1	<0.002	<0.0005	<0.005	<0.005	<0.005	<0.002	0.05	<0.001
No. of Samples	3	3	3	3	3	3	3	3
Minimum Value	0.03	0.0005	0.325	0.005	0.005	0.036	0.2	0.001
Maximum Value	0.002	0.0005	0.005	0.005	0.005	0.002	0.05	0.001
Mean	0.033	0.001	0.303	0.005	0.005	0.033	0.1	0.001
Std. Deviation	0.03	0.0005	0.325	0.005	0.005	0.036	0.2	0.001
UCL 95% on Mean	0.002	0.0005	0.005	0.005	0.005	0.002	0.05	0.001
Guideline	***50***	***2***	***50***	***5***	***15***	***5***	***50***	***0.1***

Notes for Table 21d:

- All data in µg/L unless otherwise stated.
- PQL refers to Practical Quantitative Limit.
- All guidelines are from threshold concentrations for the *Protection of Aquatic Ecosystems – 'Marine' settings* (*NSW EPA Guidelines for Assessing Service Station Sites*) 1994.
- PQL refers to Practical Quantitative Limit.

Table 21e – Summary of Laboratory Test Data for Groundwater- TPH, BTEX, PAH and Phenols – 16-18 Hilly Street

Analytes	TPH				BTEX				Phenols	PAHs
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Benzene	Toluene	Ethyl benzene	Xylene		
PQL	**20**	**20**	**100**	**100**	**0.5**	**1**	**1**	**3**	**0.01**	**17**
Samples										
GW1	37	<20	501	<100	2.4	<1	<1	<3	0.18	<17
No. of Samples	1	1	1	1	1	1	1	1	1	1
Guideline Level	***NSL***	***600¥***			***300***	***300***	***140***	***380****	***50***	***3***

Notes for Table 21e:

- All data in µg/L unless otherwise stated.
- PQL refers to Practical Quantitative Limit.
- All guidelines are from threshold concentrations for the *Protection of Aquatic Ecosystem - 'Marine' settings* (*NSW EPA Guidelines for Assessing Service Station Sites*) 1994.
- (¥) Refers to Dutch Mineral Oil Criteria in the $C_{10} - C_{36}$ range for total TPH.
- (*) Refers to the guideline from the *Netherland 1994 Maximum Permissible Concentration for xylenes.*
- NSL refers to no set limit.
- No statistics were performed on this data because only one sample was collected.

Table 22a – Summary of Laboratory Test Data – Heavy Metals – 20-22 Hilly St

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
Samples												
BH1.0.1	nd	0.5	16	93	8	190	300	0.11	nd	81	nd	9
BH2.0.1	nd	0.5	18	110	11	190	240	0.2	nd	120	nd	8
BH3.0.2	nd	nd	17	36	12	88	210	0.07	6	180	nd	nd
BH4.0.2	nd	nd	9	nd	3	22	24	nd	6	12	nd	nd
BH5.0.3	nd	nd	nd	nd	nd	nd	17	nd	nd	nd	nd	nd
BH6.0.4	nd	nd	9	91	5	220	190	0.07	nd	84	nd	39
BH6.1.2	nd	nd	18	50	9	85	130	0.09	6	52	nd	6
BH7.0.5	8	nd	13	10	13	130	97	0.06	nd	70	nd	nd
BH8.1.3	nd	nd	10	12	4	20	21	0.07	nd	25	nd	nd
BH9.0.4	nd	nd	11	88	7	75	160	0.05	nd	75	nd	10
BH9.1.3	nd	nd	8	150	8	28	73	0.05	8	190	nd	nd
BH9.2.4	8	1.0	22	57	27	92	54	nd	20	250	nd	5
BH9.2.4b	7	0.9	26	140	21	130	110	nd	7	110	nd	10
BH10.0.2	nd	0.5	30	58	23	140	190	0.15	6	140	nd	nd
BH10.1.8	13	4.2	42	350	84	210	170	0.08	11	140	nd	18
t-value @ 0.05	1.753	1.75	1.753	1.753	1.753	1.753	1.753	1.753	1.753	1.753	1.75	1.75
# Samples	16	16	16	16	16	16	16	16	16	16	16	16
Minimum	2.5	0.25	2.5	2.5	1	2.5	17	0.025	2.5	2.5	2.5	2.5
Maximum	13	4.2	42	350	84	220	300	0.2	20	250	2.5	39
Mean	4.13	0.70	16.22	88.75	15.31	107.7	133.50	0.08	6.28	101.97	2.50	7.81
Std Deviation	3.15	0.99	9.98	87.53	19.71	69.95	83.15	0.05	4.90	67.31	0.00	9.40
95% UCL on Mean	5.51	1.14	20.59	127.1	23.95	138.3	169.94	0.10	8.43	131.47	2.50	11.9
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Table 22b – Laboratory Test Data – TPHs and BTEX – 20-22 Hilly St

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**5**	**10**	**50**	**50**	**0.2**	**1**	**1**	**3**
Samples								
BH4.0.2	nd	nd	nd	nd	nd	nd	nd	nd
BH6.1.2	nd	nd	100	120	nd	nd	nd	nd
BH7.0.5	nd	nd	nd	nd	nd	nd	nd	nd
BH9.1.3	nd	nd	nd	nd	nd	nd	nd	nd
t-value @ 0.05	2.353	2.353	2.353	2.353	2.353	2.353	2.353	2.353
No. of Samples	4	4	4	4	4	4	4	4
Minimum Value	2.5	5	25	25	0.1	0.5	0.5	1.5
Maximum Value	2.5	5	100	120	0.1	0.5	0.5	1.5
Mean	2.50	5.00	43.75	48.75	0.10	0.50	0.50	1.50
Std Deviation	0.00	0.00	37.50	47.50	0.00	0.00	0.00	0.00
Upper Level 95% Confidence Limit on Mean Value	2.50	5.00	87.88	104.64	0.10	0.50	0.50	1.50
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Notes to Table 22a:

- All data in mg/kg unless otherwise stated.
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- - Refers Not Analysed
- PQL refers to Practical Quantitative Limit.
- 'nd' refers to non detect, whereby the analyte concentration was less than the PQL
- For the purposes of UCL calculations, any analyte concentration reported as nd (non-detect) half the PQL was used in the calculation of the UCL.
- NSL refers to No Set Limit.

Notes for Table 22b:

- All data in mg/kg unless otherwise stated
- All guidelines are for sensitive land use with soils potentially impacted with hydrocarbons (NSWEPA Guidelines for Assessing Service Station Sites) 1994
- PQL refers to Practical Quantitative Limit.

Table 22c – Summary of Laboratory Test Data – OCP, Phenols, PAH, B(a)P, VHC and PCB – 20-22 Hilly Street

Analyte	OCP	Phenols	PAH	B(a)P	VHC	PCB
PQL	**1.2**	**0.2**	**0.2**	**0.5**		**1**
Samples						
BH2.0.1	nd	-	-	-	-	-
BH4.0.2	nd	0.4	nd	nd	-	-
BH6.0.4	-	-	3.8	nd	-	-
BH6.1.2	-	0.8	1.6	nd	-	nd
BH7.0.5	-	0.3	1.4	nd	-	-
BH8.1.3	nd	-	32	3.4	-	-
BH9.1.3	-	-	nd	nd	-	-
BH9.2.4	-	0.8	nd	nd	-	nd
BH9b.2.4	-	-	nd	nd	-	-
BH10.1.8	nd	-	23	2	nd	nd
t-value @ 0.05	2.353	2.353	1.860	1.86	-	2.920
# Samples	4	4	9	9	1	3
Minimum	0.6	0.3	0.1	0.1	nd	0.5
Maximum	0.6	0.8	32	3.4	nd	0.5
Mean	0.60	0.58	6.91	0.68	nd	0.50
Std. Deviation	0.00	0.26	11.95	1.20	-	0.00
95% UCL on Mean	0.60	0.88	14.32	1.42	nd	0.50
NEHF "A"	***270**	**8500**	**20**	**1**		**10**
NEHF "D"	***1080**	**34000**	**80**	**4**		**40**

Notes for Table 22c:

- * refers to criteria taken as the addition of guideline levels for Aldrin, Dieldrin, Chlordane, DDT, DDD, DDE and Heptachlor, taken from guidelines for Health-based Investigation Levels (HILs) for residential properties with minimal opportunity for soil access (NEPC Soil Investigation Levels - Exposure setting 'A' and 'D' 1999).
- NEHF A refers to NEHF Health-based Soil Investigation Levels for "*standard residential with garden/accessible soil"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- NEHF D refers to NEHF Health-based Soil Investigation Levels for "*residential with minimal opportunities for soil access"* as published in the *National Environment Protection Measure (NEPC, 1999)*
- '-' Refers to Not Analysed.
- nsl-No Set Limit

Table 23a – Summary of Laboratory Test Data – Heavy Metals – Site 3 - Fill

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	5	0.5	5	5	2	5	5	0.05	5	5	5	5
Samples												
BH1.0.2	nd	nd	22	51	20	140	220	0.23	8	200	nd	7
BH2.0.2	nd	nd	19	6	nd	14	36	nd	nd	11	nd	nd
BH3.0.3	nd	nd	nd	nd	3	5	13	nd	23	48	nd	nd
BH4.0.3	nd	nd	15	nd	nd	34	47	nd	nd	12	nd	nd
BH5.0.3	nd	nd	nd	nd	nd	11	100	nd	nd	17	nd	nd
BH6.0.2	27	nd	12	nd	nd	6	40	nd	nd	nd	nd	nd
BH7.0.6	nd	1.8	16	13	22	11	42	0.10	8	160	nd	nd
BH8.0.6	nd	25	230	1700	170	310	3500	0.11	44	350	8	39
BH9.0.5	nd	nd	nd	nd	nd	9	8	nd	nd	15	nd	nd
BH10.0.6	nd	nd	10	10	nd	35	24	0.15	nd	24	nd	nd
BH11.0.4	nd	nd	7	21	8	29	67	1.01	nd	49	nd	nd
BH1.0.4	57	nd	11	43	16	470	300	0.16	6	140	nd	5
BH1.0.8	6	nd	6	43	58	140	92	0.07	-	-	-	-
BH2.0.3	nd	nd	9	58	70	nd	29	nd	29	510	5	nd
BH3.0.3	nd	nd	6	6	7	11	24	nd	nd	79	nd	nd
BH4.0.5	nd	nd	6	7	nd	36	100	0.08	nd	10	nd	nd
BH5.0.5	nd	nd	17	53	45	78	90	0.09	-	-	-	-
BH5.0.7	9	nd	13	39	22	200	170	0.19	nd	78	nd	nd
BH6.0.3	32	nd	20	29	7	140	140	0.20	nd	78	nd	nd
BH7.0.5	nd	nd	12	17	14	62	64	0.08	7	100	nd	nd
BH1.0.3	<5	<0.5	9	50	5	14	26	0.16	10	-	-	-
BH2.0.3	<5	<0.5	5	11	37	<5	16	<0.05	22	-	-	-
BH3.0.2	<5	<0.5	16	25	71	9	36	<0.05	19	-	-	-
BH4.0.3	<5	<0.5	<5	5	5	6	18	<0.05	15	-	-	-
BH5.0.3	<5	7.2	6	14	3	7	18	0.12	39	-	-	-
BH6.0.3	<5	<0.5	8	<5	<5	10	6	<0.05	<5	-	-	-
BH7.0.2	<5	<0.5	67	16	9	400	100	0.56	9	-	-	-
BH8.0.3	<5	<0.5	110	<5	3	44	52	0.08	<5	-	-	-
BH9.0.3	<5	<0.5	140	<5	<2	35	38	0.06	<5	-	-	-
BH10.0.2	<5	<0.5	13	10	4	21	48	0.08	<5	-	-	-
BH11.0.2	<5	<0.5	<5	<5	<2	6	8	0.14	11	-	-	-
BH12.0.3	<5	<0.5	160	8	3	45	58	0.14	<5	-	-	-
BH13.0.3	<5	<0.5	<5	<5	<2	8	10	<0.05	7	-	-	-
BH14.0.2	5	<0.5	60	<5	2	250	48	0.10	<5	-	-	-
BH15.0.3	<5	1.4	9	5	<2	57	27	0.11	<5	-	-	-
BH16.0.3	<5	<0.5	<5	<5	<2	<5	<5	<0.05	9	-	-	-
BH17.0.3	<5	<0.5	6	<5	<2	13	15	<0.05	<5	-	-	-
BH1.0.1	nd	0.5	16	93	8	190	300	0.11	nd	81	nd	9
BH2.0.1	nd	0.5	18	110	11	190	240	0.2	nd	120	nd	8
BH3.0.2	nd	nd	17	36	12	88	210	0.07	6	180	nd	nd

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
Samples												
BH4.0.2	nd	nd	9	nd	3	22	24	nd	6	12	nd	nd
BH5.0.3	nd	nd	nd	nd	nd	nd	17	nd	nd	nd	nd	nd
BH6.0.4	nd	nd	9	91	5	220	190	0.07	nd	84	nd	39
BH7.0.5	8	nd	13	10	13	130	97	0.06	nd	70	nd	nd
BH9.0.4	nd	nd	11	88	7	75	160	0.05	nd	75	nd	10
BH10.0.2	nd	0.5	30	58	23	140	190	0.15	6	140	nd	nd
t-value @ 0.05	1.679	1.68	1.679	1.679	1.679	1.679	1.679	1.679	1.681	1.706	1.71	1.71
No. of Samples	46	46	46	46	46	46	46	46	44	27	27	27
Minimum Value	2.5	0.25	2.5	2.5	1	2.5	2.5	0.025	2.5	2.5	2.5	2.5
Maximum Value	57	25	230	1700	170	470	3500	1.01	44	510	8	39
Mean	5.25	1.01	25.72	60.08	15.24	81.11	153.49	0.11	7.88	98.07	2.80	6.19
Std Deviation	9.64	3.77	45.66	248.8	29.14	108.7	510.63	0.16	9.74	113.23	1.15	9.71
Upper Level 95% Confidence Limit on Mean	7.64	1.95	37.02	121.7	22.45	108.0	279.93	0.15	10.34	135.24	3.17	9.37
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Table 23b – Summary of Laboratory Test Data – Heavy Metals – Site 3 - Natural

Heavy Metal	As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	Co	Mn	Se	Sn
PQL	**5**	**0.5**	**5**	**5**	**2**	**5**	**5**	**0.05**	**5**	**5**	**5**	**5**
Samples												
BH2.0.8	nd	nd	19	nd	nd	nd	nd	nd	-	-	-	-
BH5.1.1	nd	nd	nd	nd	nd	9	95	nd	-	-	-	-
BH6.2.0	nd	nd	nd	nd	nd	nd	nd	nd	-	-	-	-
Bh10.2.5	nd	nd	nd	nd	nd	7	33	nd	-	-	-	-
BH10.2.9	nd	nd	nd	nd	nd	9	22	0.08	-	-	-	-
BH11.0.6	nd	nd	5	13	nd	13	27	0.09	-	-	-	-
BH13.1.0	20	4	18	nd	4	170	55	0.10	-	-	-	-
BH2.1.3	nd	nd	15	nd	nd	nd	6	nd	-	-	-	-
BH3.1.0	nd	nd	6	6	nd	8	9	nd	-	-	-	-
BH3.2.2	nd	nd	24	nd	nd	nd	8	nd	-	-	-	-
BH4.1.5	nd	nd	nd	nd	nd	nd	11	nd	-	-	-	-
BH4.2.5	nd	nd	13	nd	nd	nd	6	nd	-	-	-	-
BH6.1.3	22	nd	21	27	4	190	110	0.11	-	-	-	-
BH7.2.0)	<5	<0.5	62	12	3	460	53	0.58	-	-	-	-
BH8.1.4	<5	<0.5	19	<5	<2	11	23	<0.05	-	-	-	-
BH12.2.3	<5	<0.5	260	<5	<2	<5	7	<0.05	-	-	-	-
BH13.2.0	<5	<0.5	11	<5	<2	<5	<5	<0.05	-	-	-	-
BH6.1.2	nd	nd	18	50	9	85	130	0.09	6	52	nd	6
BH8.1.3	nd	nd	10	12	4	20	21	0.07	nd	25	nd	nd
BH9.1.3	nd	nd	8	150	8	28	73	0.05	8	190	nd	nd
BH9.2.4	8	1.0	22	57	27	92	54	nd	20	250	nd	5
BH9.2.4b	7	0.9	26	140	21	130	110	nd	7	110	nd	10
BH10.1.8	13	4.2	42	350	84	210	170	0.08	11	140	nd	18
t-value @ 0.05	1.717	1.72	1.717	1.717	1.717	1.717	1.717	1.717	2.015	2.015	2.02	2.02
No. of Samples	23	23	23	23	23	23	23	23	6	6	6	6
Minimum Value	2.5	0.25	2.5	2.5	1	2.5	2.5	0.025	2.5	25	2.5	2.5
Maximum Value	22	4.2	260	350	84	460	170	0.58	20	250	2.5	18
Mean	5.00	0.65	26.59	36.93	7.74	63.57	44.80	0.07	9.08	127.83	2.50	7.33
Std Deviation	5.65	1.11	52.77	79.85	17.92	109.2	47.96	0.12	6.02	84.36	0.00	5.91
Upper Level 95% Confidence Limit on Mean	7.02	1.04	45.48	65.53	14.16	102.7	61.98	0.11	14.04	197.23	2.50	12.2
NEHF "A"	**100**	**20**	**100**	**1000**	**600**	**300**	**7000**	**15**	**100**	**1500**	**NSL**	**NSL**
NEHF "D"	**400**	**80**	**200**	**4000**	**2400**	**1200**	**28000**	**60**	**400**	**6000**	**NSL**	**NSL**

Table 23c – Laboratory Test Data – TPHs and BTEX – Site 3 – Fill

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**5**	**10**	**50**	**50**	**0.2**	**1**	**1**	**3**
Samples								
BH1.0.2	nd	nd	140	70	nd	nd	nd	nd
BH3.0.3	nd	nd	nd	nd	nd	nd	nd	nd
BH6.0.2	nd	nd	nd	nd	nd	nd	nd	nd
BH7.0.6	nd	nd	nd	nd	nd	nd	nd	nd
BH8.0.6	nd	nd	nd	80	nd	nd	nd	nd
BH9.0.5	nd	nd	nd	nd	nd	nd	nd	nd
BH10.0.6	nd	nd	280	nd	nd	nd	nd	nd
BH2.0.3	nd	nd	nd	nd	nd	nd	nd	nd
BH2.1.3	nd	nd	nd	nd	nd	nd	nd	nd
BH3.0.3	nd	nd	nd	nd	nd	nd	nd	nd
BH4.0.5	nd	nd	nd	nd	nd	nd	nd	nd
BH5.0.5	nd	nd	160	240	nd	nd	nd	nd
BH6.0.3	nd	nd	280	120	nd	nd	nd	nd
BH5.0.3	<5	<10	<50	<50	<0.2	<1	<1	<3
BH8.0.3	<5	<10	70	<50	<0.2	<1	<1	<3
BH12.0.3	<5	<10	60	<50	-	-	-	-
BH14.0.2	<5	<10	80	<50	<0.2	<1	<1	<3
BH4.0.2	nd	nd	nd	nd	nd	nd	nd	nd
BH7.0.5	nd	nd	nd	nd	nd	nd	nd	nd
t-value @ 0.05	1.734	1.734	1.734	1.734	1.740	1.740	1.740	1.740
No. of Samples	19	19	19	19	18	18	18	18
Minimum Value	2.5	5	25	25	0.1	0.5	0.5	1.5
Maximum Value	2.5	5	280	240	0.1	0.5	0.5	1.5
Mean	2.50	5.00	72.11	46.58	0.10	0.50	0.50	1.50
Std Deviation	0.00	0.00	83.54	53.46	0.00	0.00	0.00	0.00
Upper Level 95% Confidence Limit on Mean Value	2.50	5.00	105.34	67.85	0.10	0.50	0.50	1.50
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Table 23d –Laboratory Test Data – TPHs and BTEX – Site 3 - Natural

Analytes	TPH C6-C9	TPH C10-C14	TPH C15-C28	TPH C29-C36	Benzene	Toluene	Ethyl benzene	Xylenes
PQL	**5**	**10**	**50**	**50**	**0.2**	**1**	**1**	**3**
Samples								
BH10.2.5	nd	nd	nd	nd	nd	nd	nd	nd
BH10.2.9	nd	nd	nd	nd	nd	nd	nd	nd
BH13.1.0	nd	nd	nd	nd	-	-	-	-
BH2.1.3	nd	nd	nd	nd	nd	nd	nd	nd
BH3.2.0	nd	nd	nd	nd	nd	nd	nd	nd
BH3.2.2	nd	nd	nd	nd	nd	nd	nd	nd
BH6.1.2	nd	nd	100	120	nd	nd	nd	nd
BH9.1.3	nd	nd	nd	nd	nd	nd	nd	nd
t-value @ 0.05	1.895	1.895	1.895	1.895	1.943	1.943	1.943	1.943
No. of Samples	8	8	8	8	7	7	7	7
Minimum Value	2.5	5	25	25	0.1	0.5	0.5	1.5
Maximum Value	2.5	5	100	120	0.1	0.5	0.5	1.5
Mean	2.50	5.00	34.38	36.88	0.10	0.50	0.50	1.50
Std Deviation	0.00	0.00	26.52	33.59	0.00	0.00	0.00	0.00
Upper Level 95% Confidence Limit on Mean Value	2.50	5.00	52.14	59.37	0.10	0.50	0.50	1.50
Guideline Level	**65**	**1000**			**1**	**130**	**50**	**25**

Table 23e – Summary of Laboratory Test Data – OCP, Phenols, PAH, B(a)P, VHC and PCB – Site 3 - Fill

Analyte	OCP	Phenols	PAH	B(a)P	VHC	PCB
PQL	**1.2**	**0.2**	**0.2**	**0.5**		**1**
Samples						
BH2.0.2	-	-	<0.5	-		-
BH5.0.3	-	-	<0.5	-		-
BH4.0.3	-	<0.2	-	-		-
BH6.0.2	<1.2	-	-	<0.1		-
BH7.0.6	-	<0.2	<0.5	<0.5		<1
BH8.0.6	0.2	<0.2	1.8	<0.5		<1
BH9.0.5	-	<0.2	<0.5	<0.5		<1
BH10.0.6	-	0.3	11	1.0		-
BH11.0.4	<1.2	-				-
BH1.0.4	-	-	56	5		-
BH1.0.8	-	-	-	-		nd
BH2.0.3	-	-	nd	nd		-
BH4.0.5	nd	nd	-	-		nd
BH5.0.5	-	nd	34	4.2		-
BH5.0.7	-	-	14	1.4		-
BH6.0.3	-	-	80	7.4		nd
BH7.0.5	nd	-	1.2	nd		-
BH4.0.3	-	-	nd	nd	-	
BH5.0.3	-	<0.2	nd	nd	-	
BH6.0.3	-	-	-	-	<2.6	
BH9.0.3	<0.8	0.2	nd	nd	-	
BH10.0.2	<0.8	-	-	-	-	
BH11.0.2	-	<0.2	-	-	-	
BH14.0.2	-	-	-	-	<2.6	
BH16.0.3	-	-	nd	nd	-	
BH2.0.1	nd	-	-	-	-	-
BH4.0.2	nd	0.4	nd	nd	-	-
BH6.0.4	-	-	3.8	nd	-	-
BH7.0.5	-	0.3	1.4	nd	-	-
t-value @ 0.05	1.860	1.796	1.734	1.74	6.314	2.015
No. of Samples	9	12	19	18	2	6
Minimum Value	0.2	0.1	0.1	0.25	2.6	0.5
Maximum Value	0.6	0.4	80	7.4	2.6	0.5
Mean	0.56	0.17	10.75	1.24	2.60	0.50
Std. Deviation	0.13	0.11	22.16	2.08	0.00	0.00
Upper level 95% Confidence Limit on Mean	0.64	0.22	19.56	2.09	2.60	0.50
NEHF "A"	***270**	**8500**	**20**	**1**		**10**
NEHF "D"	***1080**	**34000**	**80**	**4**		**40**

Table 23f – Summary of Laboratory Test Data – OCP, Phenols, PAH, B(a)P, VHC and PCB – Site 3 - Natural

Analyte	OCP	Phenols	PAH	B(a)P	VHC	PCB
PQL	**1.2**	**0.2**	**0.2**	**0.5**		**1**
Samples						
BH10.2.5	-	-	<0.5	<0.5		-
BH10.2.9	-	-	<0.5	<0.5		-
BH11.0.6	-	-	1.2	<0.5		-
BH13.1.0	-	-	<0.5	<0.5		-
BH2.1.3	-	-	nd	nd		-
BH3.2.2	-	-	nd	nd		-
BH4.1.5	-	-	nd	nd		-
BH6.1.3	-	0.3	35	2.8		nd
BH6.1.2	-	0.8	1.6	nd	-	nd
BH8.1.3	nd	-	32	3.4	-	-
BH9.1.3	-	-	nd	nd	-	-
BH9.2.4	-	0.8	nd	nd	-	nd
BH9b.2.4	-	-	nd	nd	-	-
BH10.1.8	nd	-	23	2	nd	nd
t-value @ 0.05	6.314	2.920	1.771	1.77	-	2.353
No. of Samples	2	3	14	14	1	4
Minimum Value	0.6	0.3	0.1	0.25	nd	0.5
Maximum Value	0.6	0.8	35	3.4	nd	0.5
Mean	0.60	0.63	6.69	0.78	nd	0.50
Std. Deviation	0.00	0.29	12.88	1.09	-	0.00
Upper level 95% Confidence Limit on Mean	0.60	1.12	12.79	1.30	nd	0.50
NEHF "A"	***270**	**8500**	**20**	**1**		**10**
NEHF "D"	***1080**	**34000**	**80**	**4**		**40**

11.0 SOIL QUALITY CRITERIA

EPA policy on contaminated sites is based on the *1998 NSWEPA Health-based Investigation Levels*. The National Environmental Protection Measures (NEPM) has now been adopted, which use the same methodologies as NSW EPA. In addition, the *1994 NSW EPA Guidelines for Assessing Services Station Sites* are applicable to Hydrocarbon contaminated sites.

For contaminants not covered by these documents, Environmental Quality Objectives from the Netherlands (Dutch Guidelines) can be adopted. Guideline levels for organic and inorganic soil contaminants are summarised in Appendix E.

In addition, contaminant concentrations slightly in excess of the investigation levels do not pose an environmental or health hazard. At or below the investigation levels, the soil is not considered to pose an environmental or health hazard and the site is considered safe for any use. Domestic single dwelling use with accessible soils is considered to be the most sensitive land use and the investigation level guidelines are commonly adopted as limits for such sites.

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.

In proposing recommendations and/or remediation criteria for this site, the above factors will be considered and the published Health-based Investigation Levels (HILs) for high density residential dwellings and low density residential dwellings with access to soil-(NEPC Soil Investigation Levels for an exposure setting 'D' and 'A') will be incorporated.

12.0 CONCLUSIONS AND RECOMMENDATIONS

The analysis of laboratory results for 'Site 3' indicated levels of heavy metals have met regulatory requirements for fill and natural samples as measured against "NEPM HILs D" for residential dwellings with minimal opportunities for soil access. Fill and natural soil at 'Site 3' has also met the more stringent "NEPM HILs A" for residential dwellings with accessible soil. Based on the laboratory results 'Site 3' has a 95% confidence level that heavy metals meet the afore mentioned Health based Investigation Levels.

The analysis of laboratory results indicated levels of total petroleum hydrocarbons (TPH) and solvents (BTEX) in fill and natural material have met NSW EPA Guidelines for Assessing Service Station Sites. The concentrations of phenolic compounds (Phenols), Polychlorinated Biphenyls (PCB's) and pesticides (OCP) contaminants, have met regulatory requirements, as measured against "NEPM HILs A and D" for fill and natural material. The concentration of Polycyclic Aromatic Hydrocarbons (PAH) across Site 3 has met NEPM HILs D criteria, however some discreet sample concentrations slightly exceed "NEPM HILs A.

Samples underwent QA/QC interpretation and met relevant DQOs. The integrity of samples is therefore justified.

The property was sampled using a targeted and systematic sampling pattern. This method is most appropriate in validating a site in a non-biased manner. The site lies on sandy fill material and silty clays overlying sandstone bedrock. Migration of contamination onto the site is not of concern due to the sealed nature of the entire site.

No hazardous building materials, such as lead paint, asbestos roofing or piping were identified on the sites, nor was there evidence of any Underground Storage Tanks (USTs).

Assessment of the site for Actual Acid Sulphate Soils (AASS) showed that it is unlikely AASS exists on the site to a depth of 2.5m below ground level. Assessment of the site for Potential Acid Sulphate Soils (PASS) indicated that PASS is unlikely to exist up to 2.0m in depth, however POCAS tests indicated that PASS may exist at 2.5m. Hence, if deep excavations are to occur an Acid Sulphate Soil Management Plan is likely to be required

The site size of 4,000m2 requires a sampling density (via NSW EPA Guidelines) of 11 sample locations. The sampling density conducted for the site equates to 37 sampling locations and 73 samples. The site is therefore been adequately characterised and it can be assumed that we do not expect any environmental concerns to remain underground. Soil conditions are always hard to determine underneath sealed surfaces. It is therefore recommended that the materials underlying sealed surfaces be examined post demolition to confirm the absence of any areas of environmental concern.

It is also understood that excavations may be proposed for basement car parking. These excavation works would include the removal from the site of superficial material, including fill identified at the site and some of the natural material underneath. Material excavated from the site should be classified in accordance with the NSW EPA Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes, 1999 and disposed appropriately.

In Summary

Based on the results of this investigation is considered that the risks to human health and the environment associated with soil and/or groundwater contamination at the site are low in the context of the proposed medium to high density residential dwellings. The site is considered to be able to be made suitable for the proposed development.

If a change to a more sensitive land use was to be considered for the site, further assessment may be required.

We would be pleased to provide further information on any aspects of this report.

For and behalf of

Aargus Pty Limited

Reviewed By:

Hugh Selby
Environmental Scientist

Nick Kariotoglou
Managing Director

LIMITATIONS

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue, although 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 are judgements which are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions.

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