

BELMORGAN PROPERTY DEVELOPMENT PTY LTD
**PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT AND
GEOTECHNICAL INVESTIGATION**
CORNER OF BURELLI, CROWN AND CORRIMAL STREETS
WOLLONGONG, NSW

E14497/3-AE
19 July 2005



E14497/3-AE CCH;ro
19 July 2005

Belmorgan Property Development Pty Ltd
PO Box 498
WARRAWONG NSW 2502

Attention: Mr Nick Kordas

Dear Sir,

**RE: PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT AND
GEOTECHNICAL INVESTIGATION
CORNER OF CROWN, CORRIMAL AND BURELLI STREETS
WOLLONGONG, NSW**

We are pleased to present our report on the Preliminary Environmental Site Assessment and Geotechnical Investigation carried out at the above site.

We draw your attention to the attached sheet titled "Important Information about your Coffey Preliminary Environmental Site Assessment and Geotechnical Investigation". This sheet should be read in conjunction with this report.

Should you have any questions in relation to the report, please do not hesitate to contact the undersigned.

For and on behalf of

COFFEY GEOSCIENCES PTY LTD



LAURIE FOX

Associate

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3 copies to Belmorgan Property Development Pty Ltd



EXECUTIVE SUMMARY

Coffey Geosciences Pty Ltd (Coffey) was commissioned by Belmorgan Property Development Pty Ltd (Belmorgan) to carry out a Preliminary Environmental Site Assessment (ESA) and Geotechnical Investigation on the corner of Corrimal, Crown and Burelli Streets, Wollongong, NSW. The work was carried out in accordance with the relevant sections of our proposal E14497/3P-AA, dated 8 March 2005. This report presents the results of the preliminary ESA and geotechnical investigation.

The site has an area of about 4,182m² and is currently occupied by several buildings including the Oxford Hotel and car park, an ice creamery, a kebab fast food outlet and a former service station and non-operational mechanical repair workshop. We have previously completed an ESA for the service station site (Report Ref: E14497/2-AC, dated 19 April 2005). A Phase 2 ESA was carried out of the service station site as part of the current work.

We understand that the proposed development for the site will comprise a multi-level commercial/residential building with two or three basement levels. We further understand the purpose of the investigation is to provide Belmorgan with geotechnical and environmental information that will accompany a Development Application submission to Wollongong City Council (Council).

The objectives of the Preliminary ESA and geotechnical investigation and the Phase 2 ESA are to:

- Assess the general subsurface conditions below the site, including depth to rock, rock type and strength, excavation conditions, soil conditions and presence of groundwater;
- Provide a report on the preliminary findings including groundwater levels, excavation conditions, soil and rock types, rock strength and foundation conditions;
- Provide preliminary information on the presence of contamination on the Oxford Tavern portion of the site from past or present activities;
- Provide additional information on contamination in the former service station; and
- Make recommendations on the need for further investigation and or remediation, should contamination be present.

To meet the above objective, the following scope of work was carried out:

Environmental Site Assessment

- A site history study including a review of aerial photographs, a search of historical land titles, a review of published geological maps of the area, a check of NSW EPA notices, a search of Wollongong City Council records, a site walkover, and interviews with people familiar with the site;
- Drilling five boreholes at the Oxford Tavern portion of the site and further four boreholes within the former service station, to a maximum depth of 7.7m from which the subsurface conditions were logged and soil samples collected for chemical and geotechnical testing;
- Installation of two groundwater monitoring wells and collection of groundwater samples on the former service station site. Additional site history information also collected for this portion of the site;
- Laboratory analysis of soil samples for a suite of chemicals of concern including Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, Xylene (BTEX), heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), Polycyclic Aromatic Hydrocarbons (PAH), Organochlorine Pesticides (OCP) and Polychlorinated Biphenyls (PCB); and
- Laboratory analysis of two groundwater samples for TPH, BTEX, PAH and lead.

Geotechnical Assessment

- Advancing three boreholes to 'V' bit and 'TC' bit refusal on rock, including Standard Penetrometer Tests at intervals of about 1m to refusal;
- Advancing three of these boreholes to at least 3m into rock using rotary core drilling techniques to assess the foundation conditions; and
- Laboratory testing of four suitable soil samples for Atterberg limit tests, Point Load Tests Unconfined Compressive Strength Tests on suitable rock core samples.
- Preparation of a combined geotechnical and environmental report summarising previous investigations and site history, results of the fieldwork, presentation and interpretation of analytical results and findings, and geotechnical and environmental recommendations as required to meet the objectives of the investigation.

Environmental Issues

Former Service Station Site

Vapour and adsorbed phase soil contamination and dissolved phase groundwater contamination was identified in the former service station site. Vapour and adsorbed phase soil contamination was identified in the former UST excavation within the fill soils in the form of TPH fractions C₆-C₉ and C₁₀-C₃₆, benzene and xylenes. The contamination appears to extend to the base of the excavation, 2.5m to 3m below the ground surface.

Soil contamination was identified at borehole locations downslope of the former UST excavation, in the eastern and southeastern directions of the excavation. The contamination appeared to be confined to fill material in the upper 1m of the soil profile. Dissolved phase groundwater contamination was also identified at MW3, east of the excavation. Observations made of groundwater inflows at other monitoring wells suggests that groundwater at MW3 may be perched and influenced by elevated groundwater levels in the former UST excavation.

This contamination was identified at locations 1.5m from the eastern boundary and 4.5m from the southeastern boundary. Given the close proximity of this contamination to the respective downgradient boundaries of the site and contaminant concentrations recorded, there is a likelihood that the contamination may have migrated beyond the site boundary, in particular beyond the eastern boundary. This may constitute a Significant Risk of Harm under Section 60 of the CLM Act 1997. Further investigation is recommended to assess the impacts to the regional groundwater and to assess the extent of contamination beyond the site boundary.

The former service station has significant levels of petroleum hydrocarbon contamination and requires remediation. Remediation of the contaminated soil would be required prior to the removal of overburden and rock for the basement construction. The general steps in the remediation would be similar to those previously described in the Remediation and Validation Plan (RVP) for the site (Report Ref: E14497/1-AB, dated 24 November 2003). It is recommended that the RVP be revised to include the Stage 2 assessment information and be expanded to include other areas of the site assessed to have contamination, not only the USTs.

The remedial steps would include:

1. Removal of remaining underground infrastructure such as the hoist, oil/water interceptor and fuel lines;
2. Removal of contaminated soil around these structures including the area where the former USTs were located and downslope of these locations;

3. Validation sampling and analysis including the preparation of a validation report; and
4. Classification and offsite disposal of contaminated soils and other spoil generated from the site activities.

Oxford Tavern/Hotel and Car Park

The site history study indicates that a hotel has occupied the northeastern portion of the site since 1870. Lot 2 (west of the service station and hotel) was generally vacant throughout the years except for the hotel expansion and other minor structures.

The investigation identified two main AECs, namely:

- AEC 1 – the former carwash; and
- AEC 2 – fill of unknown quality and origin.

Field and laboratory results indicate that there is a low likelihood for significant contamination to exist within two AECs identified in the Oxford Tavern/Hotel portion of the site. Should evidence of contamination such as odours or staining be encountered within other areas of the site during earthworks, a suitably qualified consultant should be contacted.

It is recommended that when the Oxford Tavern/Hotel is demolished further sampling of the fill soils be carried out to complete the characterisation of the site in accordance with the NSW EPA Sampling Design Guidelines.

Geotechnical Issues

The site is underlain by fill, which is in turn underlain by clay soils that vary in depth over the site from around 4.4m to 7.7m. Below the fill and residual soil, generally moderately weathered to slightly weathered rock was encountered.

Locally deeper fill or disturbed soils may be expected where building footings or buried services occur or if underground storage tanks or buried structures are present.

Excavations to about 5m to 6m depth should be feasible with a large (30t) excavator. Excavations beyond 5m to 6m depth are likely to require a large excavator with rock hammer and/or rock saw or other equivalent rock excavation equipment. Difficult excavation conditions would be expected in the slightly weathered to fresh rock with slow production rates. Presplitting of rock by the use of small charges or chemicals may be possible, however the risks of vibration damage to the nearby buildings would need to be considered.

Excavations away from the cut batters could be considered using a D10 bulldozer with rock rippers. The selection of appropriate earthmoving equipment would depend on access for equipment and control of groundwater inflows and it is recommended that the earthworks contractor view the subsurface information in this report and make their own assessment of rock excavation before construction commences.

Basement excavations will need to be battered or will require structural support.

Based on the borehole logs, the lower basement floor (assuming three basement levels) would be founded in 'moderately to slightly weathered rock' or 'slightly weathered to fresh rock'. Suitable footing types would include:

- Pads for column loads founded at a nominal embedment depths into the rock;
- Beams for wall loads founded at a nominal embedment depths into the rock;

- Bored piles socketed into the appropriate rock unit. It is noted also that bored piles would also be required for parts of the structure outside of the building footprint.

Serviceability and ultimate bearing pressures have been recommended based on the Classification System presented in the 1998 Paper by Pells et. al.^a and taking into account the potential for clay bands underlying the footing base. If higher bearing pressures are required additional investigation should be undertaken to assess the length of socket required to penetrate significant clay bands. A geotechnical engineer should be engaged to inspect footing excavations to assess whether the material exposed in the base of footings is consistent with the geotechnical model and assumed bearing pressures.

The Table below provides a summary of bearing capacities for the various soil and rock conditions encountered in the boreholes. It is noted that generally footings will need to be founded on at least the highly weathered rock (or less weathered rock).

SUMMARY OF BEARING CAPACITIES

Description	Serviceability End Bearing Capacity ⁽²⁾	Ultimate End Bearing Capacity	Ultimate Shaft Adhesion ^{(1) (2)}	Elastic Modulus	Rock Classification ^{(5)b}
XW Sandstone Soil Strength - Very Stiff to Hard	150kPa	N/A	N/A	N/A	N/A
HW/MW/SW Sandstone Low to High strength, defect spacing 10mm to 100mm	1000kPa	3000kPa	100kPa	100MPa	Class IV Shale ⁽⁴⁾
SW/FR Sandstone High to Very High Strength, defect spacing >100mm	3500kPa	20000kPa	800kPa	300MPa	Class III Shale ⁽⁴⁾

Notes to above Table :

1. End bearing pressure for bored piles should result in settlement less than 1% of the minimum footing width or pile diameter.
2. Adopt shaft adhesion values only where the embedded length into the relevant bearing stratum is at least 3 pile diameters.
3. For bored piles, the surface of the pile shaft should be cleaned of clay smear and roughened using a suitable tool fitted to the pile boring rig. Augers and drilling buckets do not clean and roughen sockets adequately unless they are fitted with tools that protrude laterally from the sides of the auger or bucket.
4. Higher bearing capacity rock was encountered below 9.6m in CGBH9, and higher bearing capacity rock may also be encountered at shallower depths beneath the existing Oxford Hotel (towards the northern parts of the site) or at depths greater than the investigation depths commissioned for this investigation.
5. The rock has been described as a fine grained Sandstone, but has been classified in accordance with the Pells Classification System for a Shale due to the fine grained nature of the rock.

^a Pells et al. (1998) 'Foundations on Sandstone and Shale in the Sydney Region' Barton: Australian Geomechanics Society

^b Pells et al. (1998) 'Foundations on Sandstone and Shale in the Sydney Region' Barton: Australian Geomechanics Society

A geotechnical strength reduction factor (Φ_g) of 0.75 should be applied when designing footings for ultimate limit state.

The bases of bored piles or footings should be cleaned, dewatered and concreted within 24 hours of excavation to reduce the risk of deterioration of the weathered sandstone or softening of the clay soils. Alternatively, the base of bored piles or footings should be cleaned, dewatered and a blinding layer of concrete should be applied to protect the base if concreting is to be delayed.

The footings should be cleaned and dewatered again prior to concreting if seepage from the sides of the footing occurs after placement of the blinding layer. We note that the hard clays or extremely weathered rock may soften significantly if exposed to excess moisture.

It is recommended that additional geotechnical information, comprising at least two cored boreholes, be drilled in the northern parts of the site following demolition of the existing buildings. This should be done to assess the properties and depth to the various geotechnical units in areas that were not accessible during our investigation. The rock at the site is relatively variable and during construction a geotechnical engineer should be engaged to assess the rock in all footing excavations.

The standing groundwater level was measured at between about 1.5m to 3m below current ground surface at this site. Based on the results of our investigation, basement excavations will likely encounter groundwater inflows.

The site would need to be effectively dewatered during the excavation and construction phase. The rate of groundwater pumping and aquifer draw-down on nearby structures will need to be considered during the design phase for the building and before earthworks commences.

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- E. Geotechnical Laboratory Reports
- F. Data Validation Reports



1. INTRODUCTION

1.1 General

Coffey Geosciences Pty Ltd (Coffey) was commissioned by Belmorgan Property Development Pty Ltd (Belmorgan) to carry out a Preliminary Environmental Site Assessment (ESA) and Geotechnical Investigation on the corner of Corimal, Crown and Burelli Streets, Wollongong, NSW. The work was carried out in accordance with the relevant sections of our proposal E14497/3P-AA, dated 8 March 2005. This report presents the results of the preliminary ESA and geotechnical investigation.

The site has an area of about 4,182m² and is currently occupied by several buildings including the Oxford Hotel and car park, an ice creamery, a kebab fast food outlet and a former service station and non-operational mechanical repair workshop. We have previously completed an ESA for the service station site (Report Ref: E14497/2-AC, dated 19 April 2005). A Phase 2 ESA was carried out of the service station site as part of the current work.

We understand that the proposed development for the site will comprise a multi-level commercial/residential building with two or three basement levels. We further understand the purpose of the investigation is to provide Belmorgan with geotechnical and environmental information that will accompany a Development Application submission to Wollongong City Council (Council).

The objectives of the Preliminary ESA and geotechnical investigation and the Phase 2 ESA are to:

- Assess the general subsurface conditions below the site, including depth to rock, rock type and strength, excavation conditions, soil conditions and presence of groundwater;
- Provide a report on the preliminary findings including groundwater levels, excavation conditions, soil and rock types, rock strength and foundation conditions;
- Provide preliminary information on the presence of contamination on the Oxford Tavern portion of the site from past or present activities;
- Provide additional information on contamination in the former service station; and
- Make recommendations on the need for further investigation and or remediation, should contamination be present.

1.2 Scope Of Work

To meet the above objective, the following scope of work was carried out:

1.2.1 Environmental Site Assessment

- A site history study including a review of aerial photographs, a search of historical land titles, a review of published geological maps of the area, a check of NSW EPA notices, a search of Wollongong City Council records, a site walkover, and interviews with people familiar with the site;
- Drilling five boreholes at the Oxford Tavern portion of the site and further four boreholes within the former service station, to a maximum depth of 7.7m from which the subsurface conditions were logged and soil samples collected for chemical and geotechnical testing;
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- Laboratory analysis of soil samples for a suite of chemicals of concern including Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, Xylene (BTEX), heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), Polycyclic Aromatic Hydrocarbons (PAH), Organochlorine Pesticides (OCP) and Polychlorinated Biphenyls (PCB); and
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1.2.2 Geotechnical Assessment

- Advancing three boreholes to 'V' bit and 'TC' bit refusal on rock, including Standard Penetrometer Tests at intervals of about 1m to refusal;
- Advancing three of these boreholes to at least 3m into rock using rotary core drilling techniques to assess the foundation conditions; and
- Laboratory testing of four suitable soil samples for Atterberg limit tests, Point Load Tests Unconfined Compressive Strength Tests on suitable rock core samples.
- Preparation of a combined geotechnical and environmental report summarising previous investigations and site history, results of the fieldwork, presentation and interpretation of analytical results and findings, and geotechnical and environmental recommendations as required to meet the objectives of the investigation.

2 SITE LANDUSE AND DESCRIPTION

2.1 Site Location and Landuse

The site is located on the corner of Crown, Corrimal and Burelli Streets, Wollongong, NSW. The site is identified as Lot 10 DP848550, Lot A and Lot B DP396278, Lot 1 DP71070 and Lot 2 DP 70662 within the local government area of Wollongong, Parish of Wollongong and County of Camden.

The site lies within a retail / commercial area close to the Wollongong Central Business District (CBD) (See Figure 1). The site is zoned 3(c) Regional Business under the Wollongong City Council Local Environmental Plan (LEP, 1990).

The site is bounded to the north by Crown Street, to the east by Corrimal Street, to the south by Burelli Street and to the west by Town Hall lane and commercial businesses (bookstore and cafe).

The site forms an approximately rectangular shaped block with approximate dimensions of 41m x 102m and has an area of about 4,182m². The site layout is shown in Figure 2, where it can be seen that the Oxford Tavern and Oxford Hotel occupy nearly half the site.

2.2 Topography and Drainage

Reference to the Wollongong-Port Hacking 1:100 000 soil landscape series sheet 9029-9129, published by the Department of Conservation and Land Management in 1990 indicates that the site is located on the slopes of the Illawarra Escarpment with isolated rises of the Wollongong plains.

Reference to the Wollongong 1:25,000 Topographic Map indicates that the site lies at an elevation less than 10m above Australian Height Datum (AHD) and is estimated to be at an elevation of about 5m AHD. The site is relatively flat with a gentle slope towards the southeast.

Surface water runoff from the site would flow from the higher northwestern parts of the site to the lower southeastern parts of the site. There are no defined watercourses on or within close proximity to the site.

The site is located approximately 650m west of the Tasman Sea.

2.3 Local Geology, Hydrogeology and Groundwater Use

Reference to the Wollongong 1:50,000 Geological Sheet (1974) prepared by the Geological Survey of NSW, Department of Mines Sydney, indicates that the site is located close to a geological contact between Quaternary Alluvium and Budgong Sandstone.

A previous investigation at the site (See Section 3) and the current investigation has encountered relatively shallow fill soils overlying residual clay soils and rock, suggesting that the site is underlain by the Budgong Sandstone.

A survey of groundwater bores within a 2 kilometre radius of the site registered with Department of Infrastructure, Planning and Natural Resources (DIPNR) indicated that there is one registered bore located approximately 1.4km (GW024238) northwest of the site. Based on the topography of the area, this bore is inferred to be hydraulically up gradient of the site.

The groundwater bore was installed on 1 January 1966 to a depth of 6.00m and is registered for commercial/industrial purposes. The work summary sheet further indicates that the groundwater salinity from this bore is 'very salty'. No water bearing details, water levels or chemical data were included in the work summary sheets for this bore. The work summary sheets and groundwater bore locations are presented in Appendix A.

Based on observations made of the site, surrounding topography and previous investigations on portions of the site, groundwater is expected to be located within about 5m from the ground surface and flow in a southeasterly direction.

2.4 Acid Sulfate Soil Occurrence

Reference to the Wollongong 1:25,000 Acid Sulfate Soil Risk Map (1997) edition 2, prepared by the DLWC, indicates that the site is located in an area where acid sulfate soils are not known or expected to occur. The map indicates that land management activities are not likely to be affected by acid sulfate soil material. Approximately 100m south of the site is an area described as Aeolian sandplain with an elevation of between 2m and 4m above Australian Height Datum (AHD) where there is a low probability of occurrence of ASS between about 1m and 3m below the ground surface.

3 PREVIOUS INVESTIGATIONS

Two previous investigations have been carried out on a portion of the site occupied by the former service station. A Remediation Action Plan (RAP) has also been prepared for this part of the site. Documents prepared for this portion of the site are listed below:

- *EJ Armstrong and Associates Pty Ltd, Preliminary Hydrocarbon Investigation (Report Ref: 19426, dated 23 August 2001);*
- *Coffey Geosciences Pty Ltd, Remediation and Action Plan, Lot 10 DP848550 and Lot B DP396278 Corrimal Street, Wollongong (Ref: E14497/1-AB, dated 24 November 2003).*

- Coffey Geosciences Pty Ltd, *Environmental Site Assessment, Lot 10 DP848550 and Lot B DP396278 Corrimal Street, Wollongong* (Ref: E14497/2-AC, dated 19 April 2005).

A summary of the relevant information from these reports is presented in the following sections

3.1 Preliminary Hydrocarbon Investigation (2001)

E. J. Armstrong and Associates Pty Ltd carried out a Preliminary Hydrocarbon Investigation in August 2001 at the service station site (Report Ref: 19426, dated 23 August 2001). The previous owner of the site provided Coffey with a copy of this report.

Although not stated in the report, we assume that the objective of that investigation was to assess the presence of hydrocarbon contamination arising from the use of USTs on the site. Two boreholes (BH1 and BH2) were drilled at assumed down gradient locations of the USTs, within the former service station area from which soil samples were collected. The approximate location of the boreholes is shown in Figure 2.

The former service station site was described in the previous investigation as containing four USTs, five bowsers, four vent pipes and a concrete paved forecourt.

A site plan presented in the previous investigation indicates the presence of four USTs. The report indicated that, at the time of the previous investigation one of the tanks had been filled with water, possibly abandoned. The tank details as shown on the figure from this previous report and are summarised below.

Super	2,295 litres
Unknown (Filled with water)	2,300 litres
Diesel	4,975 litres
Unleaded	14,580 litres

The subsurface conditions encountered during the preliminary investigation were concrete pavement to depths of 0.13m, overlying fill soils described as moist-wet grey sands to depths of 0.26m, overlying residual soils described as moist silty clays mottled grey, yellow and brown to depths between 5.5m and 6.5m, overlying weathered rock to depths greater than 7.20m.

The previous investigation indicated that no odours or visible staining were observed in BH1. Strong odours and visible staining of soil were observed within the upper 0.7m in BH2. Two soil samples collected from BH2 at depths of 1.0m and 3.0m were analysed for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene and Xylene (BTEX) and lead. Concentrations of TPH and BTEX were below the laboratory reporting limits and lead concentrations were below the NSW EPA (1998) *Guidelines for the NSW Site Auditor Scheme* for industrial and commercial land uses. Groundwater was not intersected at the site during the investigation.

The report concluded that field observations and laboratory testing suggested that hydrocarbon contamination was confined to the upper 1m due to the presence of high plasticity clays and that localised hydrocarbon contamination will exist in the vicinity below the bowsers and / or fuel lines. The report further indicated that contamination of soils was not expected to have occurred at depths down slope of the UST area.

3.2 Remediation and Action Plan (2003) and Environmental Site Assessment (2005)

Coffey has previously prepared a Remediation and Validation Plan (RVP) for the remediation and validation works associated with the removal of the four known Underground Storage Tanks (USTs), associated pipework and appurtenances in report Ref: E14497/1-AB, dated 24 November 2003 for Duncasto Pty Ltd (Duncasto). The objectives of the RVP were to:

- identify areas within the site to be addressed in the remediation;
- select the remediation goals;
- outline the procedures for remediation, validation, and environmental controls to be implemented during remediation works; and
- provide a basis on which the construction specifications for site remediation activities can be based.

Subsequent to writing the RVP, contractors (ANC Foster Pty Ltd) engaged by Duncasto removed the USTs from the site and backfilled the resulting excavations. An environmental consultant was not engaged to carry out validation sampling and analysis as described in the RVP.

An Environment Site Assessment (ESA) was subsequently carried out for Duncasto. The objective of the ESA was to assess the potential for contamination to exist on the site (excluding the area where the USTs had been removed) from its use as service station and other historical activities. The ESA did not include validation sampling of the walls and base of the former excavation resulting from the removal of USTs and associated infrastructure and would be carried out at a later stage.

The site history study indicated that prior to 1966, two cottages were present on the site. These cottages were demolished and a service station and muffler shop were constructed. An AST, used for the storage of oils, was located where the current kebab shop now stands. Anecdotal evidence indicates that a former car wash was located on the adjoining property (Lot B DP 396278), adjacent to the northern boundary of the site.

Site history information indicated that an oil/water interceptor pit located in the workshop was probably installed at the time the service station and workshop were constructed. The pit was apparently cleaned regularly and contents were placed in the AST, however the workshop floor was never cleaned and dry powder was used to soak up any spills that occurred. Apparently degreasers were not used, with car parts being washed in a wash tank. The contents of the wash tank were apparently disposed with the waste oil in the AST. Apparently it was common practice over ten years ago for engines to be cleaned outside the workshop. In recent years, this practice has become unacceptable and had been discontinued.

Site history information indicated that the UST was reported as being filled with water, previously stored Super petrol. This UST was decommissioned approximately five months prior to the property being sold, which was approximately December 2001. The UST was decommissioned as it began 'sucking' in water, however no fuel was apparently lost. The leak was understood to be in the underground pipelines between the tank and bowser.

The service station ceased operation in 2003. ANC Foster Pty Ltd was engaged to remove the USTs from the site in 2004 by Duncasto. The estimated capacities of the four USTs were 2,500L, 5,000L, 1,200L and 17,200L. Prior to removal, approximately 3,500L of water and product (fuel) were removed from the USTs. Soils excavated to facilitate the removal of the USTs were noted to have strong odours. These soils along with 63.04 tonne of fine quarry dust imported from Pioneer Quarry were placed back into the excavation.

The assessment indicated four main potential AECs within the site, which included:

- AEC 1: The areas near the USTs, fuel lines and former bowzers, east and southeast of the service station building, outside the former excavation area;
- AEC 2: The former workshop from storage and use of fuels, oils and lubricants and mechanical repairs. Includes areas near the oil/water interceptor, underground hoist, banded oil stained area and engine washing area east of the workshop;
- AEC 3: Areas downslope of former carwash located immediately north of the site from the potential leakage of wastewaters; and
- AEC 4: The majority of the site from the potential presence of fill soils of unknown quality and origin.

In summary, the report concluded that:

- The site history study has suggested that the main potentially contaminating activity at the site has been the service station, which operated from approximately 1966 to 2001;
- Soils contaminated with petroleum hydrocarbons were identified downslope of the former USTs (AEC1) near the southern boundary of the Lot 10 and near the former hoist and oil/water interceptor pit (AEC2), within the upper soil profile;
- Evidence of contamination was generally not encountered in the other potential AECs at the site;
- For a larger scale residential development, it was recommended that the contamination at the site be remediated. The general steps in the remediation would be similar to those previously described in the Remediation and Validation Plan (RVP) for the site. It was recommended that the RVP be revised to include the new assessment information and be expanded to include other areas of the service station site assessed to have contamination.
- Additional investigations should be carried out to better assess the likely extent of contaminated soils, estimate soil volumes and estimate the likely remedial costs.

4 SITE HISTORY AND OBSERVATIONS

Information on the site history was obtained from:

- A site walk over by an environmental scientist and senior environmental engineer to observe site conditions and potential sources of contamination;
- A historical land title search to review previous landowners and possible past uses of the site;
- Review of aerial photographs;
- A search of NSW EPA and Wollongong City Council records;
- Interviewing available persons with knowledge of the site; and
- Collation of the above.

The site history information is presented in Appendix A and a summary is provided below.

4.1 Summary of Site History

4.1.1 Additional Site History of the Former Service Station

A WorkCover search of the Stored Chemical Information Database (SCID) for licenses to keep dangerous goods was carried out to check for the presence of additional UST located within other areas of this portion of the site.

The WorkCover search indicated that a license was obtained in 1966. A plan showed the layout of the service station which comprised an irregular shaped structure in the western part of the Lot 10 DP 848550. The workshop building, in the northern portion of the structure, features a wash bay, lube bay and oil store. An interceptor trap is located to the southeast of the workshop building. Six bowzers are shown in the central part of the site with three underground storage tanks (USTs) to the south of the bowzers. WorkCover records suggest that three tanks had capacities of about 4,500 litres, 9,000 litres and 13,600 litres. Note that the volumes have been converted from gallons to litres.

A site plan dated 1966 shows the following USTs:

- 2 x 10,000 litre USTs in the southeast corner of Lot 10 DP 848550 (petrol);
- 1 x 5,000 litre UST in the southwest corner of Lot 10 DP 848550 (super); and
- 1 x 2,000 litre UST in-between the office and the southern side of the bowzers (super).

This plan also shows a 600L waste oil tank to the west of the service station building, and oil drums located in the northwestern corner of the workshop.

A Site plan dated 1982 displays four USTs in similar positions to the 1966 plan. In the 1982 plan however, the 10,000 litre petrol USTs and 2,000 litre kerosene UST are labelled as unleaded, diesel and super USTs, respectively. The WorkCover records dangerous goods renewal form dated 2000 indicates that the diesel UST has been deleted from the register. The WorkCover records also indicate that the tanks were regularly inspected since 1966.

A letter, dated 23/11/03, from the former proprietor of the service station to WorkCover New South Wales indicates that the property is no longer used as a service station and the new owners intend to remove the existing UST's as soon as possible.

4.1.2 Oxford Tavern/Hotel and Car Park

Title records indicate that this area of the site Lot B DP396278, Lot 1 DP71070 and Lot 2 DP70662 was owned by various people and companies since 1870 including wife of hotel keeper, wife of mechanic, mechanic, Total Oil Products (Australia) Ltd, Taveband Pty Ltd and Airport Retail Enterprises Pty Ltd, Duncasto Pty Ltd, Lacorby Pty Ltd, Doipolo Pty Ltd, Tooth & Co Ltd.

Site history information indicates that the Hotel has been located at the site since 1870 and has been operating as the Oxford Hotel since 1916. The hotel appears to have retained a similar shape during this time. Title drawings indicate several structures (possibly sheds) positioned adjacent to the southern, eastern and western boundaries of Lot 1 DP71070.

The main bar was situated on the corner of Crown and Corrimal Streets until the late 1970's/early 1980's, when it was relocated to the northern portion of Lot 2 DP 70662. A narrow laneway was situated between the structure (later the Oxford Tavern) in Lot 2 and the Oxford Hotel until additions to the structure linked the two buildings sometime between 1982 and 1993. Prior to this time, Lot 2 was generally vacant. The title plans indicate a large iron shed positioned adjacent to the western boundaries of Lots A and B in 1956. This information appears inconsistent with aerial photographs of the site around this time.

The carwash located in Lot B DP 396278 was constructed after 1957 and removed prior to 1982. The car wash featured a grease trap on the northern wall of the carwash building. The remainder of Lot B and the southern portion of Lot 2 DP70662 have been vacant or used for a car park.

The WorkCover search of the Stored Chemical Information Database (SCID) for licenses to keep dangerous goods indicated that there were no records pertaining to this portion of the site.

There is no EPA notice for the site under the Environmentally Hazardous Chemicals Act (1985) or the Contaminated Land Management Act (1997).

4.2 Site Observations

An environmental scientist made observations on the 1 June 2005 at the time of the fieldwork. A summary of the relevant observations made is described below, with the site layout and relevant features shown in Figure 2.

4.2.1 Former Service Station

At the time of fieldwork, the interior of the workshop was not inspected as the workshop has not been in use since site observations were made during previous investigations (see Coffey report E14497/2-AC).

Lot A DP396278 and Lot 10 DP848550 contains a former service station building and a mobile takeaway food van and is mainly concrete paved. The workshop building is 'L' shaped, which was formerly used as an Ampol Service Station and a muffler workshop. An irregular shaped area in the southern part of the site is asphalt paved and corresponds to the area where the former USTs had been removed.

The workshop has a canopy which extends over two former bowser islands. The small mobile takeaway kebab shop is located south of the former service station building. The concrete pavement was generally observed to be in good condition with no major cracking observed.

This area of the site has remained relatively unchanged since the previous investigation carried out at the site.

4.2.2 Oxford Tavern/Hotel and Car Park

Lot 2 DP 70662 consists of a concrete paved car park in the south of the Lot, and the Oxford tavern in the northern portion. The concrete appears in good condition. A paved and concreted alfresco dining area is located between the tavern and Crown Street. No evidence of contamination was noted however the interior of the tavern was not observed during the time of fieldwork.

The majority of Lot A is a concrete paved car park. The northern portion of the Lot features a drive through liquorshop. The concrete appears in good condition was no evidence of major staining or defects.

Lot 2 DP 70662 consists of the Oxford hotel, currently under renovation, and associated commercial businesses (such as the ice creamery). No observations were made inside the premises. No evidence or potential sources of contamination could be observed around the exterior of the building during the time of fieldwork

5 POTENTIAL AREAS OF ENVIRONMENTAL CONCERN (AEC) AND CHEMICALS OF CONCERN (COC)

5.1 Potential Areas of Environmental Concern

Based on the previous investigations, site history information and site observations, two main potential Areas of Environmental Concern (AEC) have been identified at the Oxford Tavern/Hotel portion of the site as follows:

AEC 1: The former carwash bay on Lot A DP396278 from the potential leakage of wastewaters; and

AEC 2: The majority of the Oxford Tavern/Hotel portion site from the potential presence of fill soils of unknown quality and origin.

The AECs have been presented in Figure 3.

Four AECs were previously identified at the former service station site and these are further discussed in report E14497/2-AC, dated 19 April 2005.

5.2 Chemicals of Concern

The likely chemicals of concern associated with the past activities, as identified by the site observations and site history study include:

- Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene and Xylene (BTEX) Polycyclic Aromatic Hydrocarbons (PAH) and heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) from the potential removal of grease and lubricants in AEC 1;
- TPH, BTEX, PAH, heavy metals, OCP and Polychlorinated biphenyl's (PCB) from potential presence of fill of unknown origin and quality (AEC 2).

6 SAMPLING AND ANALYSIS PLAN

6.1 Preliminary ESA – Oxford Tavern / Hotel Portion

The site sampling and analysis plan was designed to target soil contamination at the site within each of the AEC's. To characterise a site with an area of 3,450m² with respect to contamination, the NSW EPA (1995) Sampling Design Guidelines recommend a minimum of about 10 sampling locations. For this investigation five sampling locations were selected to assess the potential for contamination to exist in the main AECs.

A judgemental sampling strategy was therefore adopted to target the AECs, which generally comprised the following:

- Drilling boreholes near identified AECs to check for potential petroleum hydrocarbon contamination;
- Installation of two groundwater monitoring wells directions inferred to be downslope of the USTs to check the quality of groundwater potentially leaving the site;

6.2 Stage 2 ESA – Former Service Station

For the previous investigation eight sampling locations were selected to assess the service station portion of the site.

The purpose of the Stage 2 ESA was to target the backfilled excavation where the former USTs were located. Two boreholes were drilled within the former excavation to check for the presences of contamination within the backfill material. Another two boreholes were drilled outside the excavation to assess the extent of contamination in soil identified in the Stage 1 ESA.

Table 1 presents the soil sampling and analysis schedule implemented for the investigation.

TABLE 1: SAMPLING AND ANALYSIS PLAN

AEC	Description	Sampling Locations	No. of Laboratory Samples Analysed	Analysis						
				TPH	BTEX	PAH	Metals	Lead	OCP	PCB
1	Former carwash	CGBH8	1	1	1	1	1	1	-	-
2	Majority of site from the presence of fill soils	CGBH1 to CGBH9	19	19	19	14	9	17	6	6

Notes:

TPH Total Petroleum Hydrocarbons

BTEX Benzene, Toluene, Ethylbenzene, Xylene

PAH Polycyclic Aromatic Hydrocarbons

Lead Lead Only

OCP Organochlorine Pesticides

PCB Polychlorinated Biphenyls

Metals heavy metals (As, Cd, Cr, Cu, Hg, Pb, Ni, Zn)

In addition to the above chemical testing program, the following tests were carried out to better assess the geotechnical properties of the soil and rock. All geotechnical testing was carried out at NATA registered laboratories operated by Coffey:

- Two Atterberg Limit tests (including Linear Shrinkage) on soil samples;
- Five Uniaxial Compressive Strength (UCS) tests on rock core samples;
- Six Point Load Strength Index tests on rock core samples;

7 ASSESSMENT CRITERIA

7.1 Soil Vapour Criteria

For the purposes of this report the generalised soil vapour criteria presented in Table 2 have been used as a guide to the potential for hydrocarbon contamination. These criteria have been developed by Coffey based on our experience (where monitoring for volatile organic compounds has occurred) to assist in the assessment of hydrocarbon contamination levels in soil. It is important to note that these generalised criteria are only a guide and that the PID has a different response to different chemicals.

TABLE 2: GENERALISED SOIL GAS CRITERIA

PID reading as ppm isobutylene	Generalised soil gas content description relating to petroleum hydrocarbon contamination
<20 ppm	NEGLIGIBLE
20 to 60 ppm	LOW
60 - 300 ppm	MODERATE
>300 ppm	SIGNIFICANT

7.2 Soil Investigation Levels (SILs)

In order to assess the degree of contamination in soils on the site, the results of soil analyses were compared with guidelines in the following references:

- NSW EPA (1998) Guidelines for the NSW Site Auditor Scheme and the National Environment Protection (Assessment of Contamination) Measure (NEPM);
- NSW EPA (1994), Guidelines for Assessing Service Station Sites.

The NSW EPA (1998) Guidelines for the NSW Site Auditor Scheme and the NEPM summarises the National Environmental Health Forum (NEHF) investigation levels^a for protection of human health for different landuses and also provide guidelines for provisional phytotoxicity investigation levels (referred to as environmental investigation levels in the NEPM) for a range of contaminants in soils.

The results have been compared to NEHF F criteria and NEHF D criteria should the site be proposed for commercial/residential use. Phytotoxicity criteria for the protection of plants are generally not be applicable for a high-rise residential development where the majority of soils would be removed.

The NSW EPA (1994) guidelines provide acceptable cleanup levels at Service Station Sites, which are to be redeveloped for a sensitive use such as residential. The NSW EPA also recommends the use of these guidelines for assessing hydrocarbon contaminants for sites with less sensitive landuses. Thus, these criteria are used to supplement the NEHF commercial/industrial investigation levels.

The SILs are summarised in Table 5 (Section 10.5.1).

7.3 Groundwater Investigation Levels (GILs)

For assessing water quality, it is first necessary to assess the beneficial uses of water (surface water and groundwater) downgradient of the site being assessed.

It is considered that the principal beneficial use of the groundwater is maintenance of the integrity of aquatic ecosystems when it discharges into the Tasman Sea, located approximately 650m east of the site.

^a In Imray and Langley (1994). Health Based Soil Investigation Levels. (In: The Health Risk Assessment and management of Contaminated Sites - Proceedings of the Third National Workshop on the Health Risk Assessment and Management of Contaminated Sites. Contaminated Sites Monograph Series No.5, 1996. South Australian Department of Health and Family Services/Commonwealth EPA.

The groundwater bore search results did not suggest that groundwater in the nearby downslope area (within 2km) was being used for a beneficial use.

The threshold concentrations presented in the ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* 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 also apply these to groundwater discharging to receiving waters.

ANZECC (2000) advocates a site-specific approach to developing guideline trigger values based on such factors as local biological affects data, the current level of disturbance of the ecosystem etc. The guidelines present 'low risk guidelines trigger values' which are defined as concentrations of key performance parameters below which there is a low risk that adverse biological affects will occur. It is important to note that these are not threshold values at which an environmental problem is likely to occur if exceeded. Rather, if 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 management/remedial action.

Low risk trigger values are provided for the protection of 80-99% of species in marine and fresh waters (presented in Table 3.4.1 of the guidelines), with the trigger value depending on the 'health of the receiving waters'.

Background groundwater quality can be used as a basis for management decisions rather than reliance solely on the exceedence of default trigger values. This approach is consistent with the ANZECC/ARMCANZ (2000) Guidelines which places greater emphasis on the assessment of local background water quality data rather than the use of generic trigger values.

Marine water trigger values are considered applicable for protection of ecosystems in the receiving water bodies for this site. It is understood that the EPA's 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. Therefore, we have selected trigger values for protection of 95% of fresh water species for the majority of contaminants, and 99% of fresh water species for bioaccumulative contaminants for initial comparison purposes.

For some heavy metals (cadmium, copper, lead, nickel and zinc) a hardness correction factor can be applied to the default trigger values, as an increase in the hardness of the water makes the metals less bio-available.

ANZECC (2000) states that there is currently insufficient data to derive high reliability trigger values for various contaminants. For these contaminants, low reliability trigger values have been adopted.

ANZECC (2000) state that there is currently insufficient data to derive a high reliability trigger value for TPH but propose a low reliability trigger value for TPH of 7µg/L. This guideline is generally considered by industry to be overly conservative and is also well below the TPH detection limit, which most laboratories can achieve. Another commonly internationally used guideline for TPH is contained in Dutch (1994), which present a target, and intervention values for mineral oils. The average of the target and intervention values (325µg/L) is commonly used as an investigation level for TPH and will be adopted for this assessment.

Threshold concentrations for drinking water are provided by NHMRC/ARMCANZ in their publication *Australian Drinking Water Guidelines* (1996). These guidelines provide threshold levels based on assumptions of 2L of drinking water everyday for a 70 year life. Guidelines for irrigation and general water use are presented in Section 4.2 of ANZECC (2000). Guidelines for the recreational water use are presented in Table 5.2.3 of ANZECC (2000).

The adopted GILs are summarised in Table 6 (Section 10.6.1).

8 FIELD INVESTIGATIONS

The fieldwork for both the preliminary ESA and the Stage 2 ESA was carried out between the 1 June and 10 June 2005 in the full time presence of an environmental scientist and a geologist from our Wollongong office. The approximate sampling locations were measured relative to existing site features and are shown in Figure 2. Engineering logs of the boreholes are included in Appendix B.

Five boreholes designated CGBH2, CGBH3 and CGBH7 to CGBH9 were drilled at the Oxford Tavern Hotel and Car Park. Boreholes CGBH2 and CGBH3 were drilled with a trailer mounted drilling rig fitted with 100mm solid flight augers to a maximum depth of 3.0m. Boreholes CGBH7 to CGBH9 were drilled using a Fox truck mounted drilling to slow or very slow progress with 100mm solid flight augers. CGBH7 to CGBH9 were then advanced using diamond bit coring techniques to a maximum depths of between 10.52m and 10.95m. Piezometers were installed in CGBH7 and CGBH8. Piezometers were installed in CGBH7 and CGBH8.

Four boreholes designated CGBH1, and CGBH4 to CGBH6 were drilled at the former service station portion of the site with a trailer mounted drilling rig fitted with 100mm solid flight augers to a maximum depth of 7.70m. Two groundwater monitoring wells were also installed.

8.1 Soil Sampling

During drilling in boreholes CGBH2 to CGBH4 and CGBH6 to CGBH9, soil samples were generally collected directly off the augers within the upper 0.5m thereafter with an SPT tube sampler. Due to the relatively shallow water inflow in CGBH1 and CGBH5 causing slumping of the borehole, SPT tube samplers were not used, and soil samples were collected directly from the auger. Soil from higher in the soil profile was initially carved off the augers using a stainless steel scraper, washed in phosphate free detergent and rinsed in distilled water. Between sampling locations the augers were washed with a high pressure hose followed by brush scrubbing with a phosphate free detergent and finally rinsed with potable water. The SPT tube sampler and auger scraping equipment were also washed with a phosphate free detergent, rinsed with potable water followed by rinsing with distilled water between sampling locations. Soil samples were collected with a new pair of latex gloves between sampling locations.

Soil samples were generally collected within the fill materials at the surface or below the pavements, where there was visual or olfactory evidence of contamination or at major changes in stratigraphy. The soil was placed into clean 250mL glass jars, which were sealed with Teflon lined caps, labelled and placed directly into ice-cooled chests.

For each of the samples collected into jars, a sample was collected in duplicate and tightly sealed in a plastic bag with an elastic band. The headspace air above each sample was measured using a Mini Rae 2000 photoionisation detector (PID) fitted with a 10.6eV lamp calibrated with isobutylene gas at a concentration of 100ppm. This instrument allows rapid semi quantitative analysis of volatile contaminants in soil. The results of headspace testing are presented in Appendix C.

8.2 Installation and Sampling of Groundwater Monitoring Well

Two groundwater monitoring wells, designated MW2 and MW3 were installed at the former service station portion (in borehole CGBH4 and CGBH6, respectively) on 1 June 2005, using a trailer mounted drill rig. Two Piezometers were installed in CGBH7(P) and CGBH8(P) on 10 June 2005 and 9 June 2005 respectively. The location for MW2 and MW3 were selected as they were in an inferred down slope direction of the USTs and other site infrastructure. The wells were installed using 100mm solid stem augers fitted with a V-Bit. The use of hollow flight augers was not possible due to the presence of stiff clays.

The groundwater monitoring wells were installed to depths of 2.9m and 7.7m. Generally the lower (below 1.5m) section of the wells were screened with 50mm machine slotted, Class 18, threaded PVC. Blank (unslotted) Class 18 PVC was used to case the well to ground surface. Coarse sand was placed within the well annulus to a level ranging between 0.56m and 0.28m above the top of the slotted screen, followed by an annular seal of granular bentonite pellets. Concrete was then placed to the surface. The top of the well was sealed with a lockable steel protective cover. The logs of the wells, along with well completion details, are summarised in Table 3 and included in Appendix B.

MW2 and MW3 were developed where approximately 45L and 6L of water was removed, respectively. The wells were allowed to recover and stabilise for 6 days prior to sampling. Prior to sampling the wells were purged by removing between 4L and 40L of water equivalent to about 3 well volumes, until field pH and conductivity measurements became consistent or until the wells were effectively dry. The wells were then sampled with disposable bailers. The groundwater samples were placed into appropriately preserved containers supplied by the contract laboratory. The groundwater samples for heavy metals analysis were filtered in the field with a 45µm filter. The groundwater samples were immediately stored in a chest cooled with ice.

CGBH7(P) and CGBH8(P) were installed to depths of 10.52m and 10.60m respectively. The lower (below 1.5m) section of the wells were screened with 40mm hand slotted, Class 8 PVC. Unslotted Class 8 PVC was used to case the well to ground surface. Coarse sand was placed within the well annulus to approximately 0.5m above the slotted screen followed by an annular seal of granular bentonite pellets. Concrete was then placed to the surface. The top of the piezometer was sealed with a steel protective cover. The logs of the piezometers, along with piezometer completion details, are summarised in Table 3 and included in Appendix B.

The Piezometers installed in CGBH7(P) and CGBH8(P) were not developed after installation, however water levels in the piezometers were left to stabilise for approximately 40 days after installation before standing water level was measured. Standing water level was measured as 2.93m (below ground surface) in CGBH7(P) and 2.8m in CGBH8(P) on 19 July 2005.

TABLE 3: MONITORING WELL AND PIEZOMETER COMPLETION DETAILS

Monitoring Well	Date Completed	Total Well Depth (m BGL)	Screen Interval From - To (m BGL)	Diameter (mm) & Type of Casing
CGBH4/MW2	1-06-05	7.7	7.7-1.7	50mm Class 18
CGBH6/MW3	1-06-05	2.9	2.9-1.13	50mm Class 18
CGBH7 (P)	10-06-05	10.52	10.52-1.5	40mm Class 8
CGBH8 (P)	9-06-05	10.6	10.6-1.5	40mm Class 8

Note:

BGL = Below Ground Level

8.3 Field Quality Control Procedures

The field quality control consisted of the following:

- Collection of one blind coded duplicate soil sample from location CGBH2/0.2-0.5m and designated QA1;
- Collection of one blind coded duplicate groundwater sample from location MW2 and designated X1;
- Collection of a wash blank sample from the SPT tube sampler to check the effectiveness of equipment decontamination, designated WB1;
- Calibration of field instruments in accordance with manufactures instructions; and
- Carrying into the field one laboratory prepared trip spike and trip blank sample including despatch to the laboratory for analysis of volatile contaminants to check the potential for cross contamination or loss of volatile contaminants during transport and sample preparation at the laboratory.

Samples were transported in ice-cooled chests to Amdel in Sydney, NSW who is NATA accredited for the analysis performed, under chain of custody conditions. A copy of the chain of custody is included in Appendix D.

9 LABORATORY ANALYTICAL PROGRAMME

Original laboratory sheets and analytical procedures for the chemical analysis are included in Appendix D. The analysis schedule performed on the samples is presented in Table 1.

Original laboratory result sheets for the geotechnical testing are included in Appendix E.

10 RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

10.1 Subsurface Conditions

The generalised subsurface conditions encountered across the site from the boreholes are summarised below:

PAVEMENT	Concrete	Reinforced concrete varied in thickness between 100mm and 140mm and was encountered at CGBH2 to CGBH4 and CGBH6, CGBH7 and CGBH9. Two different concrete slabs were encountered during drilling of CGBH8, and the base of the second concrete slab was encountered at 0.36m at this location.
	Asphalt	Asphalt pavement of 50mm thickness encountered in CGBH1 and CGBH5
FILL	Mixed fill (some Subbase fill)	Silty CLAY / Gravelly Silty CLAY / Clayey SAND / SAND / Silty GRAVEL: fine to medium grained, subangular to angular gravel, high plasticity clays, Base of unit encountered at between 0.25m and 0.65m in the boreholes.
		A Gravelly SILT / Silty GRAVEL coalwash layer was noted between 0.14m and 0.65m in CGBH3.

(Continued)

Backfill sand	Silty CLAY / SAND: medium to high plasticity clays, fine to medium grained, subangular to angular and subrounded to rounded.
RESIDUAL	Sandy CLAY / Silty CLAY: medium to high plasticity, fine to medium grained, firm to stiff, base of unit encountered at depths of between 2.2m and 3.5m.
XW SANDSTONE	Silty CLAY: medium to high plasticity clays. The consistency was initially stiff and became very stiff to hard towards the base of the unit. The base of unit was encountered at depths of between 4.4m and 7.7m. Unit encountered at borehole locations CGBH4 and CGBH7 to CGBH9.
HW SANDSTONE	Sandstone: fine grained, pale brown to orange brown, base of unit encountered at depths of between 4.60m and 6.00m, low to medium strength.
MW/SW SANDSTONE	Sandstone: fine grained, grey with orange brown staining and mottling, medium to high strength rock with some clay seams up to 90mm thick. Base of unit encountered at depths of between 7.0m in CGBH7 and greater than 10.6m in CGBH8.
SW/FR SANDSTONE	Sandstone: fine to medium grained, grey, massive, some orange brown staining, high to very high strength, base of unit not intersected in the cored boreholes – bases of the cored boreholes ranged between 10.52m and 10.95m.

Notes:

XW: Extremely Weathered; HW: Highly Weathered; MW: Moderately Weathered; SW: Slightly Weathered; FR: Fresh

Slight to moderate hydrocarbon odours were noted in soils from boreholes CGBH1 and CGBH5 at depths between 0.6m and 3.0m, and at CGBH6 at depths between 0.2m and 1.25m.

Groundwater inflows were recorded in boreholes CGBH1, CGBH4, CGBH5 and CGBH6 at depths of 0.7m, 5.9m, 0.9m and 1.6m, respectively, during drilling. The standing water level were measured in boreholes CGBH4 and CGBH6 at depths of 2.19m and 1.77m below the ground surface, several hours after drilling. Due to slumping of fill material in the boreholes, standing water levels were not recorded in CGBH1 and CGBH5.

The groundwater monitoring well (MW1) was measured to have a standing water depth of 1.94m below the ground surface 14 days after being installed.

Apart from the fill, the subsurface conditions encountered are consistent with the published geological information.

10.2 Results of Geotechnical Testing

The full results of the geotechnical testing are presented in Appendix E.

Two Atterberg Limit tests were carried out on soil samples collected from CGBH8/1.5-1.95m and from CGBH9/3.0-3.45m. The results of the Atterberg Limit testing indicate that the soils are medium plasticity clays with natural moisture contents about 8.5% to 11% above the plastic limit of the soils.

Uniaxial Compressive Strength (UCS) testing was carried out on five samples of rock core retrieved from between 7.3m and 10.7m below current ground surface level. One UCS result from CGBH9/8.29m-8.43m returned a UCS of 11.1 MPa, however this sample failed along an ironstained defect within the sandstone core specimen. The remaining four samples returned UCS results of between 47.6 and 94.2 MPa. Point Load Strength Index tests were carried out on six samples of rock core retrieved from between 4.67m and 10.95m below current ground surface level. Two of the six diametral tests and one of the six axial tests failed along defects in the rock core. The $I_{s(50)}$ results from the rock core where failure did not occur through defects ranged between 0.64MPa to 5.42MPa. These results indicate that the rock is generally high to very high strength (with some medium strength), however somewhat lower strengths may be expected if the rock fails along defects.

10.3 Standing Water Levels

Table 4 summarises the Standing Water Levels (SWL) measured in the groundwater monitoring wells and standpipe piezometers installed at the site.

TABLE 4: SUMMARY OF STANDING WATER LEVELS

Monitoring Well	Date Measured	Water Depth from Ground Level (m)
MW1	3/2/04	2.020
	19/7/05	2.170
MW2	8/6/04	2.138
	19/7/05	2.170
MW3	8/6/04	1.548
	19/7/05	Could not be measured due to blockage in casing
CGBH7 (P)	19/7/05	2.930
CGBH8 (P)	19/7/05	2.800

Groundwater inflows were recorded in boreholes CGBH1, CGBH4, CGBH5 and CGBH6 at depths of 0.7m, 5.9m, 0.9m and 1.6m, respectively, during drilling. Water inflows in CGBH7 to CGBH9 were not observed above 5.8m, 4.45m and 4.8m respectively. It was not possible to observe water inflow levels below these depths as water flush coring techniques were used.

Standing water levels were measured in boreholes CGBH4 and CGBH6 at depths of 2.19m and 1.77m below the ground surface, several hours after drilling. Standing water levels were measured in CGBH7 and CGBH8 at 2.93m and 2.8m below the ground surface, approximately 40 days after drilling. Due to slumping of fill material, standing water levels were not recorded in CGBH1 and CGBH5. The standing water level was measured in boreholes BH1, BH3 and BH4 at depths of 8.1m, 8.15m, 8.45m below the ground surface, 24 to 48 hours after drilling.

10.4 Soil Vapour

Results of the soil gas headspace measurements are presented in Appendix C.

Moderate PID readings of 284ppm, 284ppm and 165ppm were recorded in soil samples CGBH1/1.4-1.83m, CGBH5/2.0-2.3m and CGBH6/0.2-0.5m, respectively. A moderate PID reading of 91.7ppm was also recorded in CGBH7/0.8-0.9m. The remaining soil samples tested recorded negligible PID readings ranging between 0.0ppm and 5.1ppm. This is generally consistent with field observations and the laboratory-tested soil samples.

Downhole vapour readings in CGBH6 recorded significant PID readings of 1212ppm to 429ppm, a depth of 1.0m and 2.0m, respectively. Due to shallow water inflow levels and associated borehole slumping in CGBH1 and CGBH5, downhole vapour testing could not be carried out on these boreholes. Soil vapour tests carried out at borehole locations CGBH2 to CGBH4 recorded negligible to low PID readings ranging between 0.1ppm and 0.8ppm.

10.4.1 Quality Assurance/Quality Control

We have assessed the field and laboratory quality control data in the form of percentage recoveries of spikes, surrogate spikes, matrix spikes, Relative Percent Differences (RPDs) of field and laboratory duplicates and blank samples. A data validation report was prepared by Coffey as part of the quality assurance programme and is included in Appendix F.

The QA/QC results indicate that the laboratory data is generally useable and adequately represents concentrations of contaminants at the sampling locations with the following comments:

- In some soil samples, Relative Percent Differences (RPDs) above the control limit of 50% and inconsistencies were recorded for Heavy Metals (Cr, Pb, Zn and Hg), between the field primary and duplicate samples. This is considered to be attributed to the heterogeneous nature of contaminant distribution throughout the soil/fill matrix. Some variability in these contaminant concentrations can therefore be expected.
- In soil samples, some higher recoveries outside the upper control limits were recorded for TPH and BTEX. These results may suggest that in some cases slightly higher concentrations of these chemicals may have been recorded than what was actually present.
- The laboratory indicated that soil duplicates for toluene, ethylbenzene and o-xylene were outside the laboratory's recommended acceptance criteria. The laboratory indicated this is due to heterogeneity of the soil sample.
- In soil samples, some low recoveries outside the lower control limits were recorded for m, p & o xylenes. These results may suggest that in some cases slightly lower concentrations of these chemicals may have been recorded than what was actually present.
- In groundwater samples, some higher recoveries outside the upper control limits were recorded for TPH C6-C9 and BTEX. These results may suggest that in some cases slightly higher concentrations of these chemicals may have been recorded than what was actually present. This is not considered significant for benzene, ethylbenzene, m,o & p xylenes and TPH C6-C9, as concentrations of these chemicals in groundwater samples are either well above adopted SILs or below the practical quantitation limits (PQL's)

10.5 Soil Contamination

10.5.1 Comparison of Result to Soil Investigation Levels

Soil laboratory test results are summarised in Table 5. The following exceedences, above the adopted SILs were noted:

10.5.1.1 Former Service Station

- Soil samples CGBH1/1.4-1.85 and CGBH6/0.2-0.5 recorded TPH concentrations of TPH for the fractions C₆-C₉ of 1,000mg/kg and 450mg/kg, respectively, which exceed the adopted SIL of 65mg/kg;
- Soil sample CGBH1/1.4-1.85 recorded TPH concentrations of TPH for the fractions C₁₀-C₃₆ 2,500mg/kg, which exceed the adopted SIL of 1,000mg/kg;
- Soil sample CGBH1/1.4-1.85 recorded Total Xylene concentrations of 254mg/kg, which exceed the adopted SIL of 25mg/kg; and
- Soil sample CGBH6/0.2-0.5 recorded Benzene concentrations of 3.2mg/kg, which exceed the adopted SIL of 1mg/kg.

Concentrations of OCP and PCB were below the laboratory detection limits and other chemicals of concern were below the adopted SILs.

10.5.1.2 Oxford Tavern/Hotel and Car Park

There were no exceedences of the adopted SILs in samples collected from the Oxford Tavern/Hotel and car park portion of the site.

TABLE 5:
SUMMARY OF LABORATORY RESULTS FOR SOIL SAMPLES
Heavy Metals, TPH, BTEX, PAH, OCP and PCB
(All results in mg/kg)

Sample ID	THRESHOLD CONCENTRATIONS		CGBH1	CGBH1	CGBH2	CGBH3	CGBH4	CGBH6	CGBH6	CGBH7	CGBH7	CGBH8	CGBH9	
Material			Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	
Date of Sampling			6/1/2005	1-Jun-2005	1-Jun-2005	1-Jun-2005	1-Jun-2005	1-Jun-2005	1-Jun-2005	1-Jun-2005	9-Jun-2005	9-Jun-2005	9-Jun-2005	10-Jun-2005
Depth (m)			1.4-1.85	3.0-3.35	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	1.3-1.5	0.13-0.25	0.7-1.0	0.32-0.4	0.3-0.5
HEAVY METALS														
Arsenic	400 ¹	500 ²	-	-	<5	<5	-	-	-	<5	<5	<5	10	
Cadmium	80 ¹	100 ²	-	-	<0.5	<0.5	-	-	-	<0.5	<0.5	1.4	<0.5	
Chromium (IV)	200 ¹	500 ²	-	-	9	11	-	-	-	17	11	7	19	
Copper	4000 ¹	5000 ²	-	-	38	41	-	-	-	99	6	39	40	
Mercury	60 ¹	75 ²	-	-	0.21	<0.05	-	-	-	<0.05	<0.05	0.06	0.05	
Lead	1200 ¹	1500 ²	-	-	560	24	-	-	-	7	40	82	110	
Nickel	2400 ¹	3000 ²	-	-	11	14	-	-	-	14	4	7	12	
Zinc	28000 ¹	35000 ²	-	-	350	72	-	-	-	46	35	180	170	
TOTAL PETROLEUM HYDROCARBONS														
C6 - C9 Fraction		65 ³	1000	<5	<5	-	<5	450	<5	<5	-	<5	-	
C10 - C14 Fraction			1300	<10	<10	-	<10	220	<10	<10	-	<10	-	
C15 - C28 Fraction			1200	<50	120	-	<50	80	<50	<50	-	<50	-	
C29 - C36 Fraction			<50	<50	<50	-	<50	<50	<50	<50	-	<50	-	
Total C10-C36		1000 ³	2500	ND	ND	-	ND	300	ND	ND	-	ND	-	
BTEX														
Benzene		1 ³	<1	<0.2	<0.2	-	<0.2	3.2	<0.2	<0.2	-	<0.2	-	
Toluene		130 ³	20	<1	<1	-	<1	<1	<1	<1	-	<1	-	
Ethylbenzene		50 ³	33	<1	<1	-	<1	2	<1	<1	-	<1	-	
meta- & para-Xylene			190	<2	<2	-	<2	3	<2	<2	-	<2	-	
ortho-Xylene			64	<1	<1	-	<1	<1	<1	<1	-	<1	-	
Total Xylene		25 ³	254	ND	ND	-	ND	3	ND	ND	-	ND	-	
POLYCYCLIC AROMATIC HYDROCARBONS														
Naphthalene			13.0	-	<0.5	<0.5	-	7.0	-	<0.5	-	<0.5	<0.5	
Acenaphthylene			<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	
Acenaphthene			<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	
Fluorene			1.8	-	<0.5	<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	
Phenanthrene			2.4	-	2.0	1.4	-	0.6	-	<0.5	-	0.6	1.2	
Anthracene			<0.5	-	1.8	1.2	-	<0.5	-	<0.5	-	<0.5	1.2	
Fluoranthene			<0.5	-	3.2	<0.5	-	<0.5	-	<0.5	-	0.8	2.0	
Pyrene			<0.5	-	3.4	<0.5	-	<0.5	-	<0.5	-	0.8	2.0	
Benzo(a)anthracene			<0.5	-	1.8	0.6	-	<0.5	-	<0.5	-	<0.5	0.8	
Chrysene			<0.5	-	1.2	<0.5	-	<0.5	-	<0.5	-	<0.5	0.8	
Benzo(b)&(k)fluorant			<1	-	2.0	<1	-	<1	-	<1	-	<1	2.0	
Benzo(a)pyrene	4 ¹	5 ²	<0.5	-	1.6	<0.5	-	<0.5	-	<0.5	-	<0.5	1.2	
Indeno(123-cd)pyrene			<0.5	-	0.9	<0.5	-	<0.5	-	<0.5	-	<0.5	0.9	
Dibenz(ah)anthracene			<0.5	-	<0.5	<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	
Benzo(ghi)perylene			<0.5	-	0.9	<0.5	-	<0.5	-	<0.5	-	<0.5	0.8	
Total PAHs	80 ¹	100 ²	17.2	-	18.8	3.2	-	7.6	-	ND	-	2.2	12.9	
ORGANOCHLORINE PESTICIDES														
Heptachlor	40 ¹	50 ²	-	-	<0.1	-	-	-	-	-	<0.1	-	<0.1	
Heptachlor epoxide			-	-	<0.1	-	-	-	-	-	<0.1	-	<0.1	
Chlordane-Trans	200 ¹	250 ²	-	-	<0.1	-	-	-	-	-	<0.1	-	<0.1	
Aldrin + Dieldrin	40 ¹	50 ²	-	-	<0.1	-	-	-	-	-	<0.1	-	<0.1	
DDT + DDE + DDD	800 ¹	1000 ²	-	-	<0.1	-	-	-	-	-	<0.1	-	<0.1	
Other OCP			-	-	ND	-	-	-	-	-	ND	-	ND	
TOTAL PCB														
	40 ¹	50 ²	-	-	<1	-	-	-	-	-	<1	-	<1	

NOTES:

Bold

Concetrative exceeds the respective threshold concentration

¹ Based on NSW EPA (1998), Guidelines for the NSW Site Auditor Scheme and NEPM (1999) (Residential with minimal access to soil - NEHF - D)

² Based on NSW EPA (1998), Guidelines for the NSW Site Auditor Scheme and NEPM (1999) (Commercial/Industrial - NEHF-F)

³ Based on NSW EPA (1994), Guidelines for Assessing Service Station Sites

ND Not Detected

^{*} Not Analysed

See original laboratory reports for detection limits

10.6 Groundwater Contamination

10.6.1 Comparison of Results to Groundwater Investigation Levels

The laboratory test results for groundwater are summarised in Table 6. The following exceedences, above the adopted GILs were noted:

- Groundwater sample MW3 recorded TPH concentrations of TPH for the fractions C₁₀-C₃₆ of 1,505µg/L which exceeds the adopted GIL of 325µg/L;
- Groundwater sample MW3 recorded naphthalene, phenanthrene and fluoranthene at concentrations which exceeded the respectively GILs.

The groundwater at MW2 and MW3 recorded a pH of 6.90 and 6.93, respectively, which is outside the recommended range of 8 to 8.4 for discharge to a marine environment. The pH recorded could be associated with the natural background conditions in the area. It should be noted that electrical conductivity recorded in MW3 was approximately half the EC values recorded in MW1 and MW2. This result indicates the water from this monitoring well was less saline than groundwater from MW1 and MW2 and possibly influence from the perched groundwater in the former excavation.

TABLE 6:
SUMMARY OF FIELD AND LABORATORY RESULTS FOR GROUNDWATER
 (All results in ug/L, unless otherwise stated)

Sample ID	THRESHOLD CONCENTRATION	MW1	MW2	MW3
Material		Groundwater	Groundwater	Groundwater
Date of Sampling		3-Feb-04	8-Jun-05	8-Jun-05
HEAVY METALS				
Lead	4.4 ¹	<1	<1	<1
TOTAL PETROLEUM HYDROCARBONS				
C6 - C9 Fraction		<20	<20	840
C10 - C14 Fraction		<50	<20	1100
C15 - C28 Fraction		<100	<100	405
C29 - C36 Fraction		<50	<100	<100
Total C6-C36	325 ²	ND	ND	1505
BTEX				
Benzene	500 ¹	<1	<1	610
Toluene	180 ^{1a}	<2	<1	7
Ethylbenzene	80 ^{1a}	<2	<1	<5
meta- & para-Xylene	275 ^{1a}	<2	<2	<10
ortho-Xylene	350 ^{1a}	<2	<1	<5
Total Xylene		ND	ND	ND
POLYCYCLIC AROMATIC HYDROCARBONS				
Naphthalene	50 ¹	<1	<1	75
Acenaphthylene		<1	<1	<1
Acenaphthene		<1	<1	<1
Fluorene		<1	<1	<1
Phenanthrene	0.6 ^{1a}	<1	<1	2
Anthracene	0.01 ^{1a}	<1	<1	<1
Fluoranthene	1 ^{1a}	<1	<1	2
Pyrene		<1	<1	<1
Benzo(a)anthracene		<1	<1	<1
Chrysene		<1	<1	<1
Benzo(b)&(k)fluorant		<2	<2	<2
Benzo(a)pyrene	0.1 ^{1a}	<1	<1	<1
Indeno(123-cd)pyrene		<1	<1	<1
Dibenz(ah)anthracene		<1	<1	<1
Benzo(ghi)perylene		<1	<1	<1
Total PAHs		ND	ND	79
FIELD MEASUREMENTS				
pH (Units)	8.0-8.4 ¹	6.55	6.90	6.93
Electrical conductivity (uS/cm)		4,070	3,490	1,590
Temp (oC)		21.7	23.1	23.4

NOTES:

Bold

Concentration exceeds the Threshold Criteria

¹ Based on ANZECC/ARMCANZ (2000), Australian and New Zealand Guidelines For Fresh and Marine Water Quality (Marine water, South Eastern Australia, slightly to moderately disturbed system, 95%-99% of species protected)

^{1a} Low reliability trigger values

² Based on Dutch Ministry of Housing, Spatial Planning and the Environment (1994) Investigation levels for mineral oils

ND Not Detected

See original laboratory reports for detection limits

11 DISCUSSION

11.1 Environmental Issues

11.1.1 Former Service Station

The results of field and laboratory investigations have indicated petroleum hydrocarbon contamination in the form of TPH, Benzene and Xylene within and downslope of the former UST excavation.

In the subsurface environment, liquid hydrocarbons partition into one or more of the following four main phases:

- Free phase;
- Vapour phase contamination in soil;
- Adsorbed phase contamination in soils;
- Dissolved phase contamination in groundwater.

The Stage 2 investigation did not encounter any free phase contamination. Adsorbed and vapour phase soil contamination was identified at locations CGBH1, CGBH5 and CGBH6. This contamination is in addition to soil contamination identified at borehole CBH6 to CBH8 in the previous investigation. Dissolved phase contamination was also identified in groundwater at location CGBH6/MW3.

The site previously contained four USTs located in the southern portion of the service station. These USTs were subsequently removed and the resulting excavation backfilled. Soils excavated to facilitate the removal of the USTs were noted to have strong odours; these soils along with imported fill (quarry product) were used to backfill the excavation. The excavation area was not directly targeted during the previous investigation.

Two boreholes (CGBH1 and CGBH5) were drilled through the former excavation. Significant vapour phase contamination in the form of volatile TPH fractions C_6 - C_9 (1,000mg/kg) and total xylene was identified at borehole CGBH1 at a depth interval of 1.4m to 1.85m. Adsorbed phase soil contamination in the form of TPH fractions C_{10} - C_{36} was also identified at this location at a similar depth interval. This result was consistent with field observations which indicated evidence of moderate petroleum hydrocarbon odours. Field observations indicate that the contamination appears to be within the fill material between a depth interval of about 0.3m and 3m below the ground surface. Similar field observations were noted at borehole CGBH5 with moderate petroleum hydrocarbon odours and PID readings recorded from at depth of 1.3m. This contamination appears to extend to the base of the fill material to about 2.3m.

Vapour phase soil contamination was also identified at borehole CGBH6 in the form of volatile TPH fractions C_6 - C_9 and benzene at a depth interval of 0.2m and 0.5m. This result is consistent with field observations with moderate petroleum hydrocarbon odours noted and significant PID readings (1,212ppm) recorded in the upper 1m of the soil profile. Based on the field observations the petroleum hydrocarbon contamination appears to be mainly located in the fill and possibly in the upper part of the underlying residual clay soils (to approximately 1m depth). Similar field and laboratory results were recorded at CBH6 carried out in the previous investigation.

The source of this type of contamination identified at these borehole locations is consistent with the historical use of the former USTs and fuel lines. The contaminated soil within the former UST excavation may also be contributing to contamination identified at locations CBH6 and CGBH6.

An additional two groundwater monitoring wells (MW2 and MW3) were positioned east and southwest of the former UST excavation which is an inferred downgradient direction. Dissolved phase contamination was identified in groundwater at location CGBH6/MW3 in the form of TPH fractions C₁₀-C₃₆, benzene, naphthalene, phenanthrene and fluoranthene. Groundwater inflow was encountered at about 1.6m at this location, which is much higher than water inflows encountered at MW1 and MW2 that were 5m and 5.9m, respectively. The groundwater inflows were noted in boreholes CGBH1 and CGBH5 at depths of 0.7m and 0.9m, respectively. It would appear that groundwater at location MW3 is perched and possibly influenced by the accumulation of water within the more permeable fill material in the former UST excavation.

The lateral extent of the petroleum hydrocarbon soil contamination in the downslope direction was not confirmed during this investigation. Boreholes CGBH6 and CBH6 are within close proximity of the inferred downslope boundaries (eastern and southeastern boundaries) of the site, about 1.5m and 4m, respectively. The contamination identified at these locations, along with groundwater contamination identified at MW3 suggests that it is likely that contamination may extend beyond the site boundaries within the upper fill and perched groundwater.

11.1.2 Significant Risk of Harm

Under Section 60 of the Contaminated Land Management Act 1997 (CLM 1997), an operator or owner of a land with contamination that may pose a significant risk harm to human health or the environment has a duty to notify the Department of Environment and Conservation (DEC) as soon as practicable that the land may pose a significant risk of harm. The duty applies to the owner regardless of whether the contamination that is causing the significant risk of harm occurred before or during their ownership of the land

The identification of soil and groundwater contamination in the form of vapour, adsorbed and dissolved phase, near the downslope boundary and potentially migrating through service pits/trenches along the adjoining footpath is considered to be a significant issue. There may be a duty for the site owner to report the identified contamination to the DEC under Section 60 of the CLM Act. The DEC has indicated that contamination migrating off a site boundary or having potential to migrate offsite may be recognised as presenting a significant risk of harm.

Based on the available data it would appear that the backfilled excavation is acting as a reservoir for both soil and groundwater contamination. Perched groundwater, within the excavation, appears to be impacting areas outside of the excavation, in the vicinity of the eastern boundary. At this stage there is insufficient information to suggest that the regional groundwater has been affected. Further investigation is therefore recommended to assess if the regional groundwater has been impacted and assess the extent and contamination beyond the boundary.

11.1.3 Oxford Tavern/Hotel and Car Park

AEC 1 – Former Carwash

Site history information indicated a former carwash was located immediately north of the northern boundary of the service station and was constructed after 1957 and removed prior to 1982. Two boreholes (CBH4 and CBH5) were drilled downslope of the former carwash as part of the previous investigation and one borehole was drilled within the former carwash area. Field observations and laboratory results did not show evidence of petroleum hydrocarbon contamination at the locations tested.

Detectable concentrations of PAHs were recorded at CGBH8 at a depth interval 0.32m to 0.4m. The concentrations recorded were well below the adopted SILs.

AEC 2 – Fill

Fill soils were encountered at each borehole location (except CGBH1 and CGBH5) and varied in depth between 0.3m and 1.0m. The fill generally comprised sandy clays, sand and gravels, some of which comprised a base for the pavement and the underlying fill could potentially comprise some natural disturbed ground or former topsoil. Coalwash fill was encountered at one location (CGBH3) at a depth interval 0.14m and 0.65m.

Six soils samples were selected for analysis from fill soils, which included five soil samples for metals, four samples for TPH/BTEX/PAH and two sample for OCP and PCB. In general the field and laboratory results indicated that there were no obvious signs of significant contamination.

Although well below the adopted SILs, detectable concentrations of PAH, including Benzo(a)pyrene were recorded in borehole CGBH2 at a depth interval of about 0.2m and about 0.5m within fill soils. The source of the PAH was not clear at the time of the field investigation. Site history information indicated sheds were formerly located in the vicinity of CGBH2. It is unknown what the sheds stored or were used for.

11.2 Geotechnical Issues

11.2.1 Excavation Conditions

The site is underlain by fill, which is in turn underlain by clay soils that vary in depth over the site from around 4.4m to 7.7m. Locally deeper fill or disturbed soils may be expected where building footings or buried services occur or if underground storage tanks or buried structures are present.

Below the fill and residual soil, generally moderately weathered to slightly weathered rock was encountered.

The moderately to slightly weathered rock was generally medium to high strength and contained some clay seams up to 90mm thick and some fine to medium grained gravelly bands up to 70mm thick. The defect spacing of the moderately to slightly weathered rock unit ranged between 10mm and 100mm. The base of the unit was encountered at depths of 7.0m in CGBH7, 9.6m in CGBH9 and was not encountered in CGBH8 (termination depth 10.6m).

The slightly weathered to fresh rock was generally high to very high strength. The defect spacing of this unit was generally greater than 100mm. The base of this unit was not intersected in the cored boreholes (the bases of the cored boreholes ranged between 10.52m and 10.95m).

Excavations to about 5m to 6m depth should be feasible with a large (30t) excavator. Excavations beyond 5m to 6m depth are likely to require a large excavator with rock hammer and/or rock saw or other equivalent rock excavation equipment. Difficult excavation conditions would be expected in the slightly weathered to fresh rock with slow production rates. Presplitting of rock by the use of small charges or chemicals may be possible, however the risks of vibration damage to the nearby buildings would need to be considered.

Excavations away from the cut batters could be considered using a D10 bulldozer with rock rippers. The selection of appropriate earthmoving equipment would depend on access for equipment and control of groundwater inflows and it is recommended that the earthworks contractor view the subsurface information in this report and make their own assessment of rock excavation before construction commences.

ment excavations will need to be battered or will require structural support.

Building Footings

ing that the building will have at least three basement levels below existing ground surface level, the basement level will be founded at a depth of about 9m below current surface levels. Based on the logs, the lower basement floor would be founded in 'moderately to slightly weathered rock' or 'slightly red to fresh rock'. Suitable footing types would include:

Pads for column loads founded at a nominal embedment depths into the rock;

Beams for wall loads founded at a nominal embedment depths into the rock;

Bored piles socketed into the appropriate rock unit. It is noted also that bored piles would also be required for parts of the structure outside of the building footprint.

ility and ultimate bearing pressures have been recommended based on the Classification System in the 1998 Paper by Pells et. al.^a and taking into account the potential for clay bands underlying the base. If higher bearing pressures are required additional investigation should be undertaken to the length of socket required to penetrate significant clay bands. A geotechnical engineer should be to inspect footing excavations to assess whether the material exposed in the base of footings is with the geotechnical model and assumed bearing pressures.

ow provides a summary of bearing capacities for the various soil and rock conditions encountered in the site. It is noted that generally footings will need to be founded on at least the highly weathered (moderately to slightly weathered rock).

SUMMARY OF BEARING CAPACITIES

Description	Serviceability End Bearing Capacity ⁽²⁾	Ultimate End Bearing Capacity	Ultimate Shaft Adhesion ^{(1) (2)}	Elastic Modulus	Rock Classification ^{(5)b}
stone					
h - Very hard	150kPa	N/A	N/A	N/A	N/A
SW ne	1000kPa	3000kPa	100kPa	100MPa	Class IV Shale ⁽⁴⁾
rength, 10mm					
n					

Foundations on Sandstone and Shale in the Sydney Region' Barton: Australian Geomechanics Society
Foundations on Sandstone and Shale in the Sydney Region' Barton: Australian Geomechanics Society



TABLE 8: SUMMARY OF BEARING CAPACITIES (CONTINUED)

SW/FR Sandstone	3500kPa	20000kPa	800kPa	300MPa	Class III Shale ⁽⁴⁾
High to Very High Strength, defect spacing >100mm					

Notes to Table 7:

1. End bearing pressure for bored piles should result in settlement less than 1% of the minimum footing width or pile diameter.
2. Adopt shaft adhesion values only where the embedded length into the relevant bearing stratum is at least 3 pile diameters.
3. For bored piles, the surface of the pile shaft should be cleaned of clay smear and roughened using a suitable tool fitted to the pile boring rig. Augers and drilling buckets do not clean and roughen sockets adequately unless they are fitted with tools that protrude laterally from the sides of the auger or bucket.
4. Higher bearing capacity rock was encountered below 9.6m in CGBH9, and higher bearing capacity rock may also be encountered at shallower depths beneath the existing Oxford Hotel (towards the northern parts of the site) or at depths greater than the investigation depths commissioned for this investigation.
5. The rock has been described as a fine grained Sandstone, but has been classified in accordance with the Pells Classification System for a Shale due to the fine grained nature of the rock.

A geotechnical strength reduction factor (Φ_g) of 0.75 should be applied when designing footings for ultimate limit state.

The bases of bored piles or footings should be cleaned, dewatered and concreted within 24 hours of excavation to reduce the risk of deterioration of the weathered sandstone or softening of the clay soils. Alternatively, the base of bored piles or footings should be cleaned, dewatered and a blinding layer of concrete should be applied to protect the base if concreting is to be delayed.

The footings should be cleaned and dewatered again prior to concreting if seepage from the sides of the footing occurs after placement of the blinding layer. We note that the hard clays or extremely weathered rock may soften significantly if exposed to excess moisture.

It is recommended that additional geotechnical information, comprising at least two cored boreholes, be drilled in the northern parts of the site following demolition of the existing buildings. This should be done to assess the properties and depth to the various geotechnical units in areas that were not accessible during our investigation.

The rock at the site is relatively variable and during construction a geotechnical engineer should be engaged to assess the rock in all footing excavations.

11.2.3 Groundwater

The standing groundwater level was measured at between about 1.5m to 3m below current ground surface at this site. Based on the results of our investigation, basement excavations will likely encounter groundwater inflows.

The site would need to be effectively dewatered during the excavation and construction phase. The rate of and impacts from groundwater pumping and aquifer draw-down on nearby structures will need to be considered during the design phase for the building and before earthworks commences.

12 CONCLUSIONS AND RECOMMENDATIONS

12.1 Environmental Issues

The site history study indicates that a hotel has occupied the northeastern portion of the site since 1870. A residential dwelling occupied the southern portion of the site until about 1966 where it was redeveloped into a service station. The service station was operation until about 2001. Lot 2 (west of the service station and hotel) was generally vacant throughout the years except for the hotel expansion and other minor structures.

The investigation identified two main AECs, namely:

- AEC 1 – the former carwash; and
- AEC 2 – fill of unknown quality and origin.

12.1.1 Former Service Station Site

Vapour and adsorbed phase soil contamination and dissolved phase groundwater contamination was identified in the former service station site. Vapour and adsorbed phase soil contamination was identified in the former UST excavation within the fill soils in the form of TPH fractions C₆-C₉ and C₁₀-C₃₆, benzene and xylenes. The contamination appears to extend to the base of the excavation, 2.5m to 3m below the ground surface.

Soil contamination was identified at borehole locations downslope of the former UST excavation, in the eastern and southeastern directions of the excavation. The contamination appeared to be confined to fill material in the upper 1m of the soil profile. Dissolved phase groundwater contamination was also identified at MW3, east of the excavation. Observations made of groundwater inflows at other monitoring wells suggests that groundwater at MW3 may be perched and influenced by elevated groundwater levels in the former UST excavation.

This contamination was identified at locations 1.5m from the eastern boundary and 4.5m from the southeastern boundary. Given the close proximity of this contamination to the respective downgradient boundaries of the site and contaminant concentrations recorded, there is a likelihood that the contamination may have migrated beyond the site boundary, in particular beyond the eastern boundary. This may constitute a Significant Risk of Harm under Section 60 of the CLM Act 1997. Further investigation is recommended to assess the impacts to the regional groundwater and to assess the extent of contamination beyond the site boundary.

The former service station has significant levels of petroleum hydrocarbon contamination and requires remediation. Remediation of the contaminated soil would be required prior to the removal of overburden and rock for the basement construction. The general steps in the remediation would be similar to those previously described in the Remediation and Validation Plan (RVP) for the site (Report Ref: E14497/1-AB, dated 24 November 2003). It is recommended that the RVP be revised to include the Stage 2 assessment information and be expanded to include other areas of the site assessed to have contamination, not only the USTs.

The remedial steps would include:

- Removal of remaining underground infrastructure such as the hoist, oil/water interceptor and fuel lines;
- Removal of contaminated soil around these structures including the area where the former USTs were located and downslope of these locations;
- Validation sampling and analysis including the preparation of a validation report; and
- Classification and offsite disposal of contaminated soils and other spoil generated from the site activities.

12.1.2 Oxford Tavern/Hotel and Car Park

Field and laboratory results indicate that there is a low likelihood for significant contamination to exist within two AECs identified in the Oxford Tavern/Hotel portion of the site. Should evidence of contamination such as odours or staining be encountered within other areas of the site during earthworks, a suitably qualified consultant should be contacted.

It is recommended that when the Oxford Tavern/Hotel is demolished further sampling of the fill soils be carried out to complete the characterisation of the site in accordance with the NSW EPA Sampling Design Guidelines.

12.2 Geotechnical Issues

The site is underlain by fill, which is in turn underlain by clay soils that vary in depth over the site from around 4.4m to 7.7m. Below the fill and residual soil, generally moderately weathered to slightly weathered rock was encountered.

Locally deeper fill or disturbed soils may be expected where building footings or buried services occur or if underground storage tanks or buried structures are present.

Excavations to about 5m to 6m depth should be feasible with a large (30t) excavator. Excavations beyond 5m to 6m depth are likely to require a large excavator with rock hammer and/or rock saw or other equivalent rock excavation equipment. Difficult excavation conditions would be expected in the slightly weathered to fresh rock with slow production rates. Presplitting of rock by the use of small charges or chemicals may be possible, however the risks of vibration damage to the nearby buildings would need to be considered.

Excavations away from the cut batters could be considered using a D10 bulldozer with rock rippers. The selection of appropriate earthmoving equipment would depend on access for equipment and control of groundwater inflows and it is recommended that the earthworks contractor view the subsurface information in this report and make their own assessment of rock excavation before construction commences.

Basement excavations will need to be battered or will require structural support.

Based on the borehole logs, the lower basement floor (assuming three basement levels) would be founded in 'moderately to slightly weathered rock' or 'slightly weathered to fresh rock'. Suitable footing types would include:

- Pads for column loads founded at a nominal embedment depths into the rock;
- Beams for wall loads founded at a nominal embedment depths into the rock;

- Bored piles socketed into the appropriate rock unit. It is noted also that bored piles would also be required for parts of the structure outside of the building footprint.

Serviceability and ultimate bearing pressures have been recommended based on the Classification System presented in the 1998 Paper by Pells et. al.^a and taking into account the potential for clay bands underlying the footing base. If higher bearing pressures are required additional investigation should be undertaken to assess the length of socket required to penetrate significant clay bands. A geotechnical engineer should be engaged to inspect footing excavations to assess whether the material exposed in the base of footings is consistent with the geotechnical model and assumed bearing pressures.

Table 7 below provides a summary of bearing capacities for the various soil and rock conditions encountered in the boreholes. It is noted that generally footings will need to be founded on at least the highly weathered rock (or less weathered rock).

TABLE 7: SUMMARY OF BEARING CAPACITIES

Description	Serviceability End Bearing Capacity ⁽²⁾	Ultimate End Bearing Capacity	Ultimate Shaft Adhesion ^{(1) (2)}	Elastic Modulus	Rock Classification ^{(5)b}
XW Sandstone Soil Strength - Very Stiff to Hard	150kPa	N/A	N/A	N/A	N/A
HW/MW/SW Sandstone Low to High strength, defect spacing 10mm to 100mm	1000kPa	3000kPa	100kPa	100MPa	Class IV Shale ⁽⁴⁾
SW/FR Sandstone High to Very High Strength, defect spacing >100mm	3500kPa	20000kPa	800kPa	300MPa	Class III Shale ⁽⁴⁾

Notes to Table 7:

1. End bearing pressure for bored piles should result in settlement less than 1% of the minimum footing width or pile diameter.
2. Adopt shaft adhesion values only where the embedded length into the relevant bearing stratum is at least 3 pile diameters.
3. For bored piles, the surface of the pile shaft should be cleaned of clay smear and roughened using a suitable tool fitted to the pile boring rig. Augers and drilling buckets do not clean and roughen sockets adequately unless they are fitted with tools that protrude laterally from the sides of the auger or bucket.

^a Pells et al. (1998) 'Foundations on Sandstone and Shale in the Sydney Region' Barton: Australian Geomechanics Society

^b Pells et al. (1998) 'Foundations on Sandstone and Shale in the Sydney Region' Barton: Australian Geomechanics Society

4. Higher bearing capacity rock was encountered below 9.6m in CGBH9, and higher bearing capacity rock may also be encountered at shallower depths beneath the existing Oxford Hotel (towards the northern parts of the site) or at depths greater than the investigation depths commissioned for this investigation.
5. The rock has been described as a fine grained Sandstone, but has been classified in accordance with the Pells Classification System for a Shale due to the fine grained nature of the rock.

A geotechnical strength reduction factor (Φ_g) of 0.75 should be applied when designing footings for ultimate limit state.

The bases of bored piles or footings should be cleaned, dewatered and concreted within 24 hours of excavation to reduce the risk of deterioration of the weathered sandstone or softening of the clay soils. Alternatively, the base of bored piles or footings should be cleaned, dewatered and a blinding layer of concrete should be applied to protect the base if concreting is to be delayed.

The footings should be cleaned and dewatered again prior to concreting if seepage from the sides of the footing occurs after placement of the blinding layer. We note that the hard clays or extremely weathered rock may soften significantly if exposed to excess moisture.

It is recommended that additional geotechnical information, comprising at least two cored boreholes, be drilled in the northern parts of the site following demolition of the existing buildings. This should be done to assess the properties and depth to the various geotechnical units in areas that were not accessible during our investigation. The rock at the site is relatively variable and during construction a geotechnical engineer should be engaged to assess the rock in all footing excavations.

The standing groundwater level was measured at between about 1.5m to 3m below current ground surface at this site. Based on the results of our investigation, basement excavations will likely encounter groundwater inflows.

The site would need to be effectively dewatered during the excavation and construction phase. The rate of groundwater pumping and aquifer draw-down on nearby structures will need to be considered during the design phase for the building and before earthworks commences.

13 LIMITATIONS

The findings contained in this report are the result of discrete/specific methodologies used in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

This report does not address issues relating to potentially hazardous building materials or services which may be present on the site.

14 REFERENCES

1. ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*
2. E. J. Armstrong and Associates Pty Ltd (2001), *Preliminary Hydrocarbon Investigation – Report No. 19426, dated 23 August 2001*

3. Coffey Geosciences Pty Ltd (2003), *Remediation and Validation Plan – Report Ref: E14497/1-AB, dated 24 November 2003*
4. Coffey Geosciences Pty Ltd (2005), *Environmental Site Assessment – Report Ref: E14497/2-AC, dated 19 April 2005*
5. NEPC (1999), *National Environment Protection (Assessment of Site Contamination) Measure*
6. NSW EPA (1994), *Guidelines for Assessing Service Station Sites*
7. NSW EPA (1995), *Sampling Design Guidelines*
8. NSW EPA (1997), *Guidelines for Consultants Reporting on Contaminated Sites*
9. NSW EPA (1998), *Guidelines for the NSW Auditor Scheme*
10. NSW EPA (1999), *Guidelines on Significant Risk of Harm from contaminated Land and the Duty to Report*

For and on behalf of

COFFEY GEOSCIENCES PTY LTD

S. Morrison

LF

LAURIE FOX

Associate

Information

Important information about your **Coffey** Environmental Site Assessment



Coffey

Uncertainties as to what lies below the ground on potentially contaminated sites can lead to remediation costs blow outs, reduction in the value of land and to delays in the redevelopment of land. These uncertainties are an inherent part of dealing with land contamination. The following notes have been prepared by Coffey to help you interpret and understand the limitations of your environmental site assessment report.

Your report has been written for a specific purpose

Your report has been developed on the basis of a specific purpose as understood by Coffey and applies only to the site or area investigated. For example, the purpose of your report may be:

- To assess the environmental effects of an on-going operation.
- To provide due diligence on behalf of a property vendor.
- To provide due diligence on behalf of a property purchaser.
- To provide information related to redevelopment of the site due to a proposed change in use, for example, industrial use to a residential use.
- To assess the existing baseline environmental, and sometimes geological and hydrological conditions or constraints of a site prior to an activity which may alter the sites environmental, geological or hydrological condition.

For each purpose, a specific approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible, quantify risks that both recognised and unrecognised contamination pose to the proposed activity. Such risks may be both financial (for example, clean up costs or limitations to the site use) and physical (for example, potential health risks to users of the site or the general public).

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man and may change with time. For example, groundwater levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project and/or on the property.

Interpretation of factual data

Environmental site assessments identify actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from indirect field measurements and sometimes other reports on the site are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, can

reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of Coffey through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered with redevelopment or on-going use of the site. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. In particular, a due diligence report for a property vendor may not be suitable for satisfying the needs of a purchaser. Your report should not be applied for any purpose other than that originally specified at the time the report was issued.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other professionals who are affected by the report. Have Coffey explain the report implications to professionals affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

Important information about your **Coffey** Environmental Site Assessment



Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, laboratory data, drawings etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel), field testing and laboratory evaluation of field samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Contact Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to land development and land use. It is common that not all approaches will be necessarily dealt with in your environmental site assessment report due to concepts proposed at that time. As a project progresses through planning and design toward construction and/or maintenance, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Environmental reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

Information

Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by

earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.



Important information about your Coffey Report

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

Data should not be separated from the report*

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, drawings etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

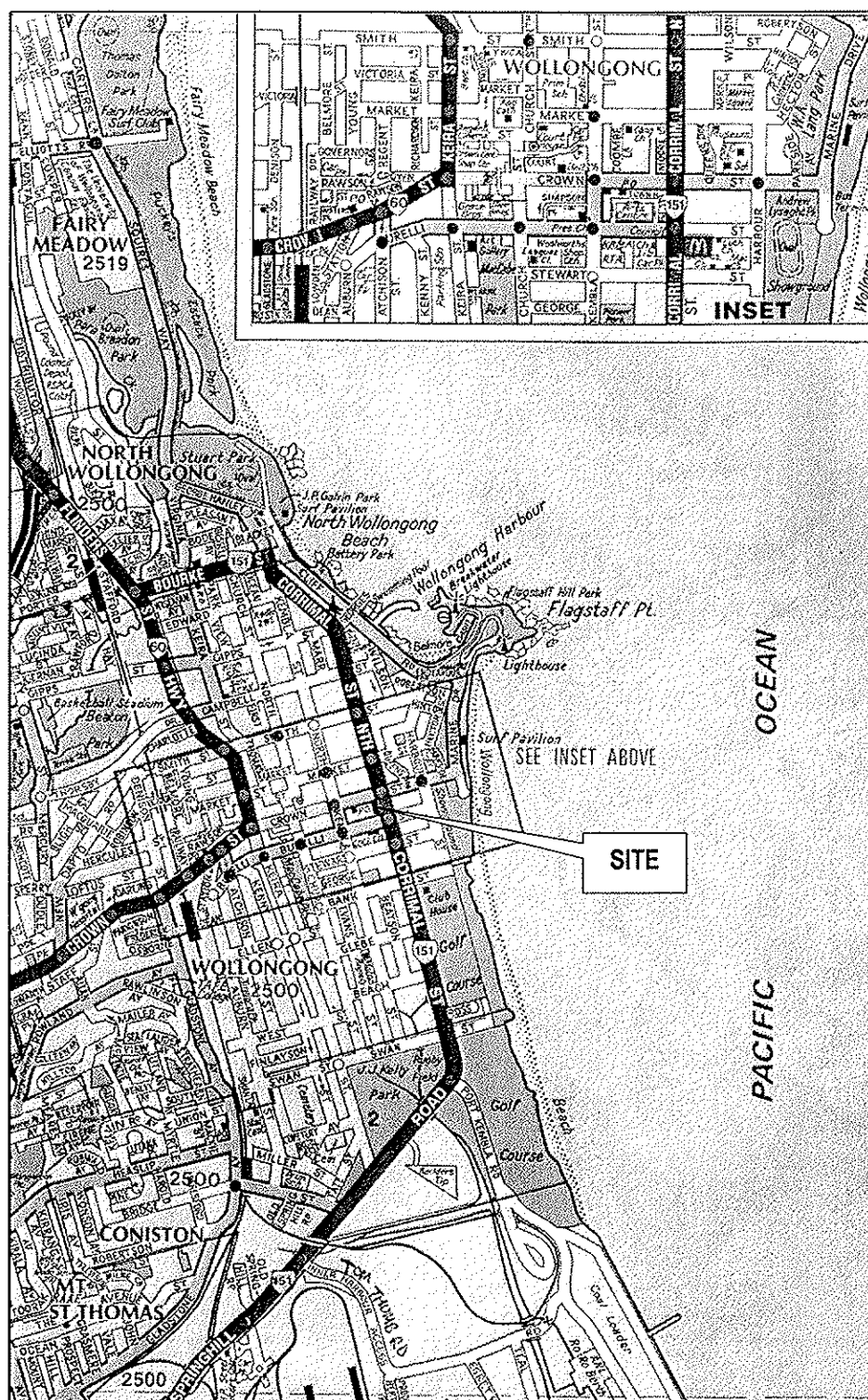
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design toward construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

** For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by the Institution of Engineers Australia, National Headquarters, Canberra, 1987.*





REF: GREGORY'S WOLLONGONG STREET DIRECTORY 14TH ed, MAP 7(1993) UNIVERSAL PRESS PTY LTD (PUBLISHER).

Coffey Geosciences Pty Ltd ACN 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

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Approved	LPT
Date	18/7/05
Scale	1:33 000

BELMORGAN PTY LTD
PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT AND GEOTECHNICAL INVESTIGATION
CORNER OF CROWN, CORRIMAL AND BURELLI STREETS, WOLLONGONG, NSW
SITE LOCALITY PLAN

Drawing no:

FIGURE 1

Job no: E14497/3-AE

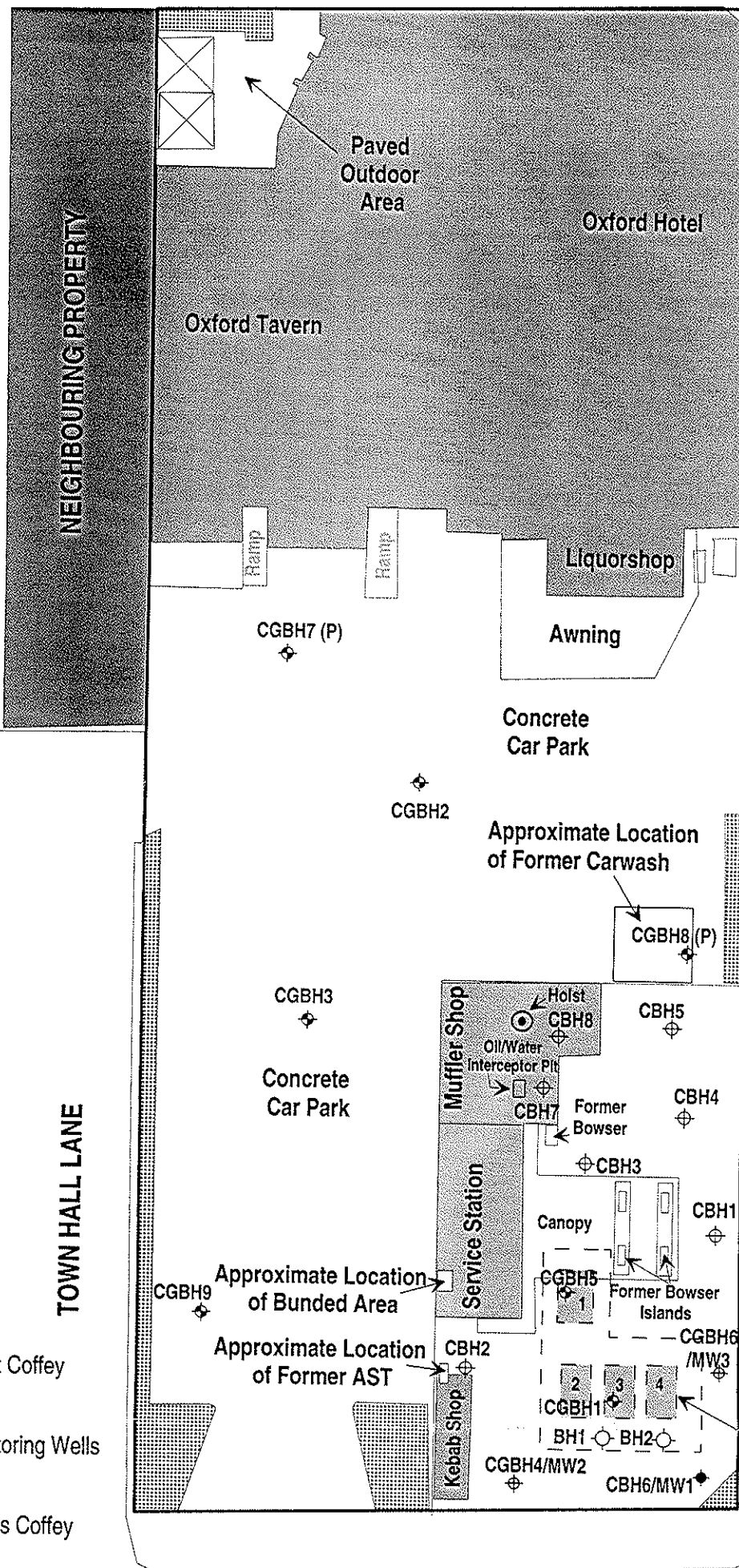


CROWN STREET

CORRIMAL STREET

TOWN HALL LANE

BURELLI STREET



UST SCHEDULE

1. Super
2. Water
3. Diesel
4. Unleaded

LEGEND

- Approximate Location of Boreholes (Current Coffey Investigation June 2005)
- Approximate Location of Groundwater Monitoring Wells (Current Coffey Investigation June 2005)
- Approximate Location of Boreholes (Previous Coffey Investigation, January 2004)
- Approximate Location of Groundwater Monitoring Wells (Previous Coffey Investigation, January 2004)
- Approximate Location of Boreholes (E.J. Armstrong & Associates Pty Ltd, Preliminary Hydrocarbon Investigation August 2001)
- Grassed Area
- Site Boundary
- (P) Piezometer Installed

REF: MODIFIED FROM DETAIL SURVEY, OXFORD TAVERN SITE, CROWN, CORRIMAL AND BURELLI STREETS, WOLLONGONG (Drawing No. 106852/405). BY K.F. WILLIAMS & ASSOCIATES APRIL 2005

Coffey Geosciences Pty Ltd

ABN 57 056 335 516
ACN 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

Drawn	JB
Approved	<i>[Signature]</i>
Date	18/7/05
Scale	1:400 (Approx)

BELMORGAN PTY LTD
PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT AND
GEOTECHNICAL INVESTIGATION
CORNER OF CROWN, CORRIMAL AND BURELLI STREETS, WOLLONGONG
SITE LAYOUT PLAN WITH APPROXIMATE SAMPLING LOCATIONS

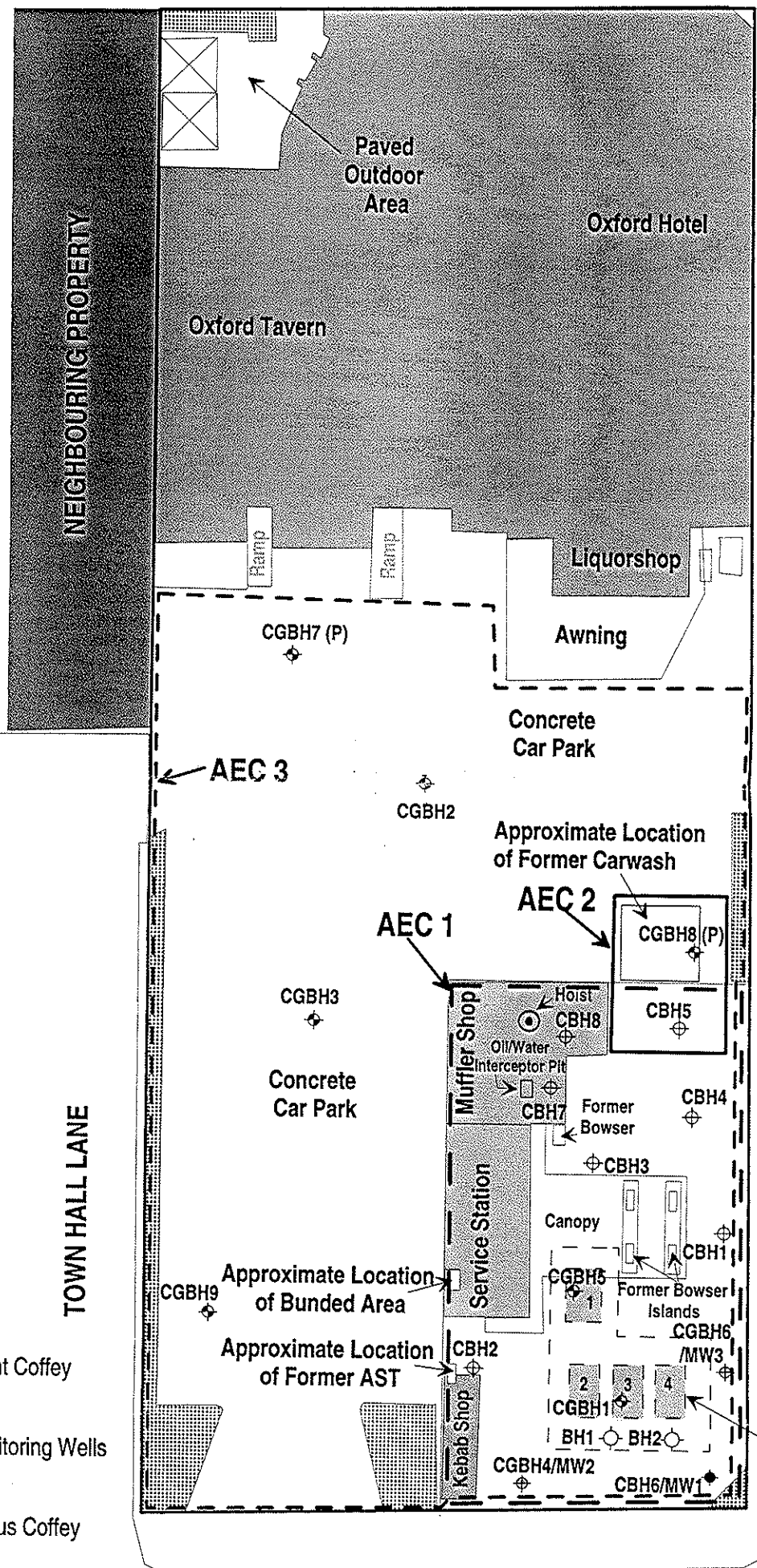
FIGURE 2

Job No. E14497/3-AE



CROWN STREET

CORRIMAL STREET



UST SCHEDULE

1. Super
2. Water
3. Diesel
4. Unleaded

LEGEND

- CGBH1 Approximate Location of Boreholes (Current Coffey Investigation June 2005)
- CGBH6/MW3 Approximate Location of Groundwater Monitoring Wells (Current Coffey Investigation June 2005)
- CBH1 Approximate Location of Boreholes (Previous Coffey Investigation, January 2004)
- CGBH6/MW1 Approximate Location of Groundwater Monitoring Wells (Previous Coffey Investigation, January 2004)
- BH1 Approximate Location of Boreholes (E.J. Armstrong & Associates Pty Ltd, Preliminary Hydrocarbon Investigation August 2001)

- Grassed Area
- Site Boundary
- (P) Piezometer Installed

BURELLI STREET

REF: MODIFIED FROM DETAIL SURVEY, OXFORD TAVERN SITE, CROWN, CORRIMAL AND BURELLI STREETS, WOLLONGONG (Drawing No. 106852/405). BY K.F. WILLIAMS & ASSOCIATES APRIL 2005

Coffey Geosciences Pty Ltd		ABN 57 056 335 516 ACN 056 335 516	Geotechnical Resources Environmental Technical Project Management
Drawn	JB	BELMORGAN PTY LTD PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT AND GEOTECHNICAL INVESTIGATION CORNER OF CROWN, CORRIMAL AND BURELLI STREETS, WOLLONGONG POTENTIAL AREAS OF ENVIRONMENTAL CONCERN (AEC's)	
Approved	<i>[Signature]</i>		
Date	18/7/05		
Scale	1:400 (Approx)		
			FIGURE 3
			Job No. E14497/3-AE

E14497/3-AE
19 July 2005

APPENDIX A

Site History

Coffey 

A.1 LAND TITLE SEARCH

A search through land titles dating back to 1870 was carried out by Advance Legal Search Pty Ltd at the Lands Title Office, for Lot A and Lot B DP396278, Lot 1 DP 71070, Lot 2 DP 70662 and Lot 10 DP 848550. Please Note that at some stage between 1979 and 2004, the titles of Lot A and Lot B DP 396278 have been swapped. For the purposes of this report, Lot B is the southern Lot of DP 396278, and Lot A is the northern Lot. The results of the title search are summarised in Table A1.

TABLE A1 – SUMMARY OF REGISTERED PROPRIETORS

Lot B DP 396278		Lot A DP 396278		Lot 10 DP 848550	
2002 – to date	Airport Retail Enterprises Pty Ltd	1981 – to date	Airport Retail Enterprises Pty Ltd	2002 – to date	Airport Retail Enterprises Pty Ltd
1981 – 2002	Taveband Pty Ltd	1981-1981	Lacorby Pty Ltd	1995 – 2002	Taveband Pty Ltd
1965 – 1981	Total Oil Products (Australia) Ltd	1974-1981	Anthony Vereker (Solicitor), James Vereker (Butcher)	Lot 2 DP 300278	
				1981 – 1995	Taveband Pty Ltd
				1965 – 1981	Total Oil Products (Australia) Ltd
1961 – 1965	Bertram Vincent Tanko, Mechanic	1973-1973	Joan Vereker, (Widow) Anthony Vereker (Solicitor), James Vereker (Butcher)	1951 – 1965	Katie Annie Eileen Bourke, Married Woman
1961 – 1961	Public Trustee	1956-1973	Benedict Vereker, (Butcher)	1921 – 1951	Edith Beatson, Married Woman
Part Allotments 1 & 2 Section 10 Town of Wollongong					
1920 – 1956 (Lot A), 1961 (Lot B)		Hilda May Tanko, wife of mechanic		1920 – 1957	Hilda May Tanko, wife of mechanic
1870 – 1920		Rebecca Makin, wife of retired hotel keeper		1870 – 1920	Rebecca Makin, wife of retired hotel keeper

Lot 1 DP71070		Lot 2 DP 70662	
1981 – to date	Duncasto Pty Ltd	1981 – to date	Duncasto Pty Ltd
1981 - 1981	Lacorby Pty Ltd	1981 - 1981	Lacorby Pty Ltd
1977 - 1981	Boipolo Pty Ltd	1977 - 1981	Boipolo Pty Ltd
1926-1977	<i>Various publican leases</i>	1926-1977	<i>Various publican leases</i>
1919 - 1977	Tooth & Co Ltd	1919 - 1977	Tooth & Co Ltd
Part Allotments 2 & 3 Section 10 & other lands Town of Wollongong		Part Allotments 1 & 2 Section 10 Town of Wollongong, Area 1 Rood 0, $\frac{3}{4}$ Perches	
1893 - 1914	Walter Graham Robertson, trustee Catherine Graham, widow William McNamara, trustee	1915-1918	Tooth & Co Ltd
		1878-1915	Percy Owen, trustee Henry Percy Owen, Ernest William Owen
1889-1893	Archibald Graham		

A2 AERIAL PHOTOGRAPH REVIEW

Aerial photographs dating back to 1948, held by Wollongong City Council were viewed by Coffey on the 29th May 2005. Table A1 summarises the observations made:

TABLE A2 – AERIAL PHOTOGRAPH REVIEW

DATE	OBSERVATIONS
29/10/1948 (black & white)	Lot 10 DP848550 and Lot A DP 396278, the site of the former service station, appears to be occupied by two medium sized structures, namely one medium square structure and one small rectangular structure. The northern structure appears to be a house and the southern structure is a smaller building with a circular structure (possibly a water tank or tree) located adjacent to the northern side. The remaining areas of the lots appear to be grassed covered and vacant. Lot 2 DP 70662 and Lot B DP 396278 appear to be grass covered or bitumen paved (possible car parking areas). The large rectangular building occupying the eastern portion of Lot 1 DP 71070 is similar in appearance to the building which currently occupies this location (The Oxford Hotel). A rectangular shaped building, similar in shape to the eastern portion of the Oxford Tavern, occupies the eastern perimeter of Lot 1 DP 71070, and is separated from the Oxford Hotel by a vacant strip. Areas to the south, west and east of the site are generally vacant or parkland. Structures to the north of the site appear to be commercial and/or residential.
17-1-1955 (black & white)	Lot 10 DP848550 and Lot A DP 396278 appear mostly unchanged from the previous aerial photograph, however the circular structure observed adjacent to the southern building is no longer evident. Adjacent to the north-eastern corner of the southern building appears to be two trees. The northern building appears to have a light coloured roof. The remaining areas of the lots still appear vacant and grass covered. Lots 2 DP 70662, Lot 1 DP 71070 and Lot B DP 396278 appear similar to the previous aerial photograph, with the exception of two small extensions adjoining the eastern and western portions of the southern side of the Oxford hotel. Areas to the south and east of the site appear to have undergone some development with some structures now evident. Some of these structures appear to be houses and commercial buildings. Areas to the north and west of the site appear similar to the previous aerial photograph.
20-1-1966 (black & white)	Lot 10 DP848550 and Lot A DP 396278 appear to be occupied by a service station building. The service station building appears to be a 'T' shaped structure, with the awning extending east from the main service station building. North of the service station building is a medium sized irregular shaped structure (muffler shop). South of the service station is a small square structure. The remaining areas of the site appear concrete paved. Lot B DP 396278 appears to be occupied by a small square structure. The remainder of this lot appears to be used for carparking. Lot 2 DP 70662 appears vacant with vegetation visible along the western perimeter. The buildings in Lot 1 DP 71070 are similar to the previous aerial photograph. A car yard (Dwyers) is located east of the site. South of the car yard is still being used for housing. South of the site appears to be a bitumen paved carpark and was apparently used for monthly markets. Commercial buildings are present to the north of

E14497/3-AE

19 July 2005

	the site, and semi-vacant land (possibly large residential lots), are present to the south west of the site.
--	--

Coffey 

TABLE A2 (CONTINUED) – AERIAL PHOTOGRAPH REVIEW

DATE	OBSERVATIONS
29/8/1977 (Colour)	Lot 10 DP848550 and Lot A DP 396278 appears mostly unchanged from the previous aerial photograph, except for the small square building south of the service station building is no longer evident. The small building which occupied Lot B DP 396278 is no longer evident. However, there appears to be a new building of similar size located adjacent to the north-eastern corner of the muffler shop building. Lot 2 DP 70662 appears completely paved and used for a car park. The former extensions along the southern wall of the Oxford Hotel building are no longer evident. The remainder of Lot 1 DP 71070 is similar to the previous aerial photograph. The car yard east of the site appears to have expanded south, replacing existing houses. A medium sized 'T' shaped building which appears to be a service station is evident south of the site. Two rectangular shaped buildings are visible is the property immediately to the west of the site. The area to the north of the site is similar to the previous aerial photograph.
31/7/1982 (Colour)	Lot 10 DP848550 and Lot A DP 396278 appear unchanged from the previous aerial photograph. The service station building appears to have a white roof. The small square building in Lot B DP 396278 is no longer evident. Extensions (possibly awnings) are evident on the southern sides of the Oxford Hotel and Oxford Tavern buildings. Lot 2 DP 70662 appears similar to the previous aerial photograph. Areas to the east, north and south of the site appear unchanged from the previous aerial photograph. The property to the west of the site appears paved.
8/1993 (Colour)	Lot 10 DP848550 and Lot A DP 396278 appear unchanged from the previous aerial photograph. The awning of the service station building appears to have changed to green. Lot B DP 396278 and Lot 2 DP 70662 appear similar to the previous aerial photograph. An extension linking the Oxford tavern and Oxford Hotel is evident in Lot 1 DP 71070, and the remainder of the lot appears similar to the previous aerial photograph. Areas east and north of the site appear relatively unchanged from the previous aerial photograph. The service station south of the site also appears unchanged. Southwest of the service station appears to be a multistorey development (possibly Council Chambers). A large multistorey building (Illawarra Performing Arts Centre) has been constructed in the property to the west of the site. A paved lane (Town Hall lane) separates the IPAC building from the site.
27/3/2001 (Colour)	The service station building and muffler shop appear to be one building with no clear break between the formerly two buildings. The awning extending from the service station building appears to be blue. South of the service station building is a small rectangular structure (possibly the Kebab Shop) adjacent to the western boundary of the site. Areas to the north, east and west appear relatively unchanged from the previous aerial photograph. The T-shaped service station to the south of the site has been replaced by a car sales yard.

A.3 COUNCIL RECORDS

A number of records pertaining to Lot B DP 396278, Lot 2 DP 70662, and Lot 1 DP 71070 were held by Wollongong City Council and reviewed by an environmental scientist on the 8th June 2005. Lot A DP 396278 & Lot 10 DP 848550 was reviewed on the 19th January 2004 and has undergone no significant changes since that time.

The Council records indicated the following development applications (DA) and building applications (BA) were submitted:

Lot A DP 396278 & Lot 10 DP 848550

1. DA in 1963 for a service station;
2. BA in 1966 for a service station;
3. DA in 1969 for a service station and mechanical repairs;
4. DA in 1981 for a additions;
5. DA in 1990 for a mobile food van;
6. DA in 25/11/2003 for the removal of 4x10, 000L USTs by Mr T Cullip, Oxford Hotel.

Another DA was submitted in 2003, which was under assessment. No further details were provided on the Council database.

Lot B DP 396278, Lot 2 DP 70662, and Lot 1 DP 71070

Several DA's and BA's, majority of which pertained to building additions / renovations, were submitted for these Lots. Notable DA's/BA's include:

1. Construction Certificate in 1957 for Building of Car Wash within Lot B;
2. DA in 1975 for alterations to Carwash;
3. Several DA's between 1977 and 1982 for alterations and additions to the Hotel and Tavern, and the construction of the drive-through bottleshop; and
4. DA's since 1982 relating to issues such as construction of a Beer Garden, installation of an advertising sign, construction of an amenities room, etc.

Council records indicated that the site was NOT affected by the following:

1. Flooding or bushfire hazards;
2. Filling;
3. Road Widening;
4. Unstable land; and

Council Records indicated that Lot 10 DP 848550 and Lot 2 DP 70662 and could potentially contain acid sulfate soils.

There were no listings of the site under the Contaminated Land Management Act 1997. However, due to the presence of the service station on the site, the Council has been classed Lot 10 and Lot B as potentially contaminated land under the Council's Development Control Plan (DCP).

Council records also indicated that the property is zoned 3(c) Regional Business.

A.4 INTERVIEWS

Three interviews were carried out with people familiar with the history of the site on the 25th May 2005 and on the 1st June 2005. A summary of the relevant information from each interview is summarised below. Refer to Figure 2 for the approximate location of site features.

Mr Terry Cullip (Manager of Oxford Hotel)

Mr Cullip has been involved with the site for about 18 years. During this time the site operated as a service station and muffler workshop. The workshop was large and specialised in steering and muffler replacement. Occasionally the workshop would undertake mechanical repairs. Disused oils were apparently placed in 44 Gallon drums and stored near the kebab stand, south of the service station building. Mr Cullip indicated that the workshop had a mobile hoist and stored mufflers. Mr Cullip was unaware of the storage of other chemicals such as degreasers. Mr Cullip was also unable to confirm when the oil/water interceptor was installed and assumed that it was part of the original building construction.

Mr Cullip indicated that the service station had been operational for at least 25 years and had no knowledge site conditions prior to the service station.

The aerial photographs indicated that a square shaped building was located immediately north of the workshop. Mr Cullip was unable to confirm what this building was used for.

Mr Cullip indicated that the Oxford hotel has been on site for approximately 60 years, before which the site was probably just houses. The tavern/pub was formerly located on the corner of Corrimal and Crown street.

Mr Greg Williams (Employee of Oxford Hotel)

Mr Williams has been involved with the Oxford Hotel for approximately 20 years. Mr Williams indicated Lot 2 DP 70662 has always been used as a car park and has been paved as long as he can remember. Mr Williams indicated that a driveway was located off Crown Street, and running in-between the Oxford Hotel and Oxford Tavern. Mr Williams indicated that the car wash used to be in the central eastern portion of the site, and the Oxford Hotel has remained similar with the exception of minor renovations.

A.5 EPA NOTICES

A phone search of the contaminated lands register through the pollution line on the 13th July 2005, indicated that there were no listings for the site under the, Environmentally Hazardous Chemicals Act (1985) or Contaminated Land Management Act (1997).

A.6 WORKCOVER SEARCH

A search of Work cover Dangerous Goods licences was carried out.

A plan showed the layout of the service station which comprised an irregular shaped structure in the western part of the Lot 10 DP 848550 which consisted of the service station building, toilets and workshop building. The workshop building, in the northern portion of the structure, features a wash bay, lube bay and oil store. An interceptor trap is located to the southeast of the workshop building. Six bowzers are shown in the central part of the site with three underground storage tanks (USTs) to the south of the bowzers. Records suggest that three tanks had capacities of about 4,500 litres, 9,000 litres and 13,600 litres. Note that the volumes have been converted from gallons to litres.

E14497/3-AE

19 July 2005

A site plan dated 1966 shows the following USTs:

- 2 x 10,000 litre USTs in the southeast corner of Lot 10 DP 848550 (petrol);
- 1 x 5,000 litre UST in the southwest corner of Lot 10 DP 848550 (super); and
- 1 x 2,000 litre UST in-between the office and the southern side of the bowsers (super).

This plan also shows a 600L waste oil tank to the west of the service station building, and oil drums located in the northwestern corner of the workshop.

A Site plan dated 1982 displays four USTs in similar positions to the 1966 plan. In the 1982 plan however, the 10,000 litre petrol USTs and 2,000 litre kerosene UST are labelled as unleaded, diesel and super USTs, respectively. The WorkCover records dangerous goods renewal form dated 2000 indicates that the diesel UST has been deleted from the register. The WorkCover records also indicate that the tanks were regularly inspected since 1966.

A letter, dated 23/11/03, from the former proprietor of the service station to WorkCover New South Wales indicates that the property is no longer used as a service station and the new owners intend to remove the existing UST's as soon as possible.

The results to the WorkCover search are attached at the end of this Appendix.

Coffey 

Date/Time :27-Jan-2004 01:17 PM
 User :STANNER
 Report :RMGW001D.QRP
 Executable :S:\G5\PROD32\Ground.exe
 Exe Date :27-Oct-2003
 System :Groundwater
 Database :DIwep

DEPARTMENT OF INFRASTRUCTURE, PLANNING AND NATURAL RESOURCES

Work Summary

GW024238

Converted From HYDSYS

License :10BL018655		Authorised Purpose(s) COMMERCIAL	Intended Purpose(s) INDUSTRIAL
Work Type :Well			
Work Status :Supply Obtained			
Construct. Method :(Unknown)			
Owner Type :Private			
Commenced Date :	Final Depth :	6.00 m	
Completion Date :01-Jan-1966	Drilled Depth :	0.00	
Contractor Name :			
Driller :			
Property : - N/A		Standing Water Level :	
GWMA :603 - SYDNEY BASIN		Salinity :	V.Salty
GW Zone : -		Yield :	

Site Details

Site Chosen By	County Form A :CAMDEN Licensed :CAMDEN	Parish WOLLONGONG WOLLONGONG	Portion/Lot DP 9 LT DP
Region :10 - SYDNEY SOUTH COAST		CMA Map :9029-2S	WOLLONGONG
River Basin :214 - WOLLONGONG COAST		Grid Zone :56/1	Scale :1:25,000
Area / District :			
Elevation :		Northing :6190080	Latitude (S) :34° 24' 45"
Elevation Source :(Unknown)		Easting :306150	Longitude (E) :150° 53' 27"
GS Map :0075D2	AMG Zone :56	Coordinate Source :GD.,ACC.MAP	

Construction

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

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1	1	Casing	Concrete Cylinder	0.00	0.00	1066			(Unknown)

Water Bearing Zones

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

(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
----------	--------	--------------	----------------------	---------------------	----------

(No Drillers Log Details Found)

Pumping Tests - Summaries

Pumping Test Type	Date	Duration (hr)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By
Single-Rate Pumping Test	01-Jan-1966		3.00				(Unknown)			

Pumping Tests - Readings

Pumping Test Type	Date	Time (mins)	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Intake Depth (m)	Test Method	To Measure Water Level	To Measure Discharge	Tested By
-------------------	------	-------------	------------	------------	-------------	------------------	-------------	------------------------	----------------------	-----------

(No Pumping Test Reading Details Found)

Chemical Treatment

Treatment	Method	Duration	Success
-----------	--------	----------	---------

(No Chemical Treatment Details Found)

Development

Method	Time Taken	Other Development Method
--------	------------	--------------------------

(No Development Details Found)

Remarks

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

DEPARTMENT OF INFRASTRUCTURE, PLANNING AND NATURAL RESOURCES

Work Summary

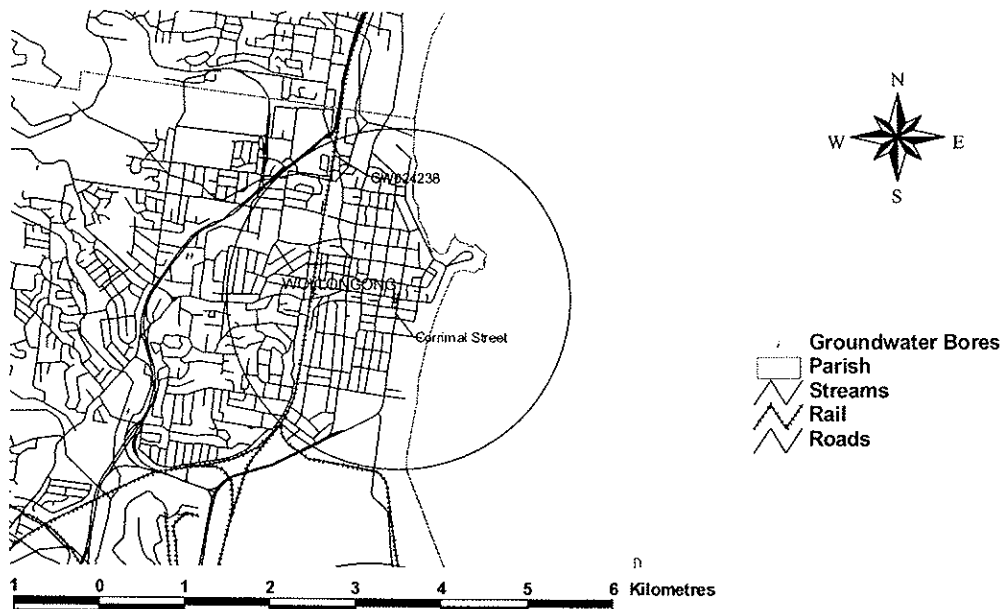
GW024238

Converted From HYDSYS

*** End of GW024238 ***

*** End of Report ***

Bores 2km radius near Corrimal Street - Wollongong
dated 27/01/2004



ADVANCE LEGAL SEARCH PTY LIMITED

(ACN 077 067 068)
ABN 49 077 067 068

PO Box 149
Yagoona NSW 2199

Telephone: (02) 9754 1590
Mobile: 0412 169 809
Facsimile: (02) 9754 1364
Email: alsearch@optusnet.com.au

03 June 2005

COFFEY GEOSCIENCES Pty Ltd
PO Box 346
UNANDERRA NSW 2526

Attention Colee Hawkins

Coffey Geosciences Pty Ltd Wollongong RECEIVED	
- 6 JUN 2005	
Job No:	Action:
Res/By:	CH

RE: Cnr Burrelli, Corrimal & Crown Streets
Wollongong
Ref: E14497/3
Purchase Order: 63984

Note 1: Folio Identifier 1/71070
Note 2: Folio Identifier 2/70662
Note 3: Folio Identifier B/396278

Note 1:

Current Search

Folio Identifier 1/71070 (attached)
DP 71070 (attached)
Dated 03 June 2005
Registered Proprietor:
DUNCASTO PTY LIMITED

Title Tree
Lot 1 DP 71070

Folio Identifier 1/71070

Certificate of Title Volume 14336 Folio 28

Certificate of Title Volume 2839 Folio 235

P A 21070

Conveyance BK 1073 No. 913

Summary of Proprietor(s)
Lot 1 DP 71070

Year	Proprietor
------	------------

	(Lot 1 DP 71070)
1988 – todate	Duncasto Pty Limited
(2002 – todate)	<i>(Lease to Robert Bertram Sellers of shop 1, Oxford tavern, 47-51 Crown St, Wollongong)</i>
(1991 – todate)	<i>(Various Commercial Leases see Historical Folio 1/71070)</i>
	(Lot 1 DP 71070 - CT Vol 14336 Fol 28)
1981 – 1988	Duncasto Pty Limited
1981 – 1981	Lacorby Pty Limited
	(Lot 1 DP 71070- CT Vol 2839 Fol 235)
1981 – 1981	Lacorby Pty Limited
1977 – 1981	Boipolo Pty Limited
1918 – 1977	Tooth & Co Limited
(1926 – 1977)	<i>(Various licensed publican leases)</i>
	(Part Allotments 1 & 2 Section 10 Town Wollongong Area 1 Rood 0 ¼ Perches)
1915 – 1918	Tooth & Co Limited
1878 – 1915	Percy Owen, trustee Henry Percy Owen, muster in equity Ernest William Owen, gentleman

Note 2:

Current Search

Folio Identifier 2/70662 (attached)
DP 70662 (attached)
Dated 03 June 2005
Registered Proprietor:
DUNCASTO PTY LIMITED

Title Tree
Lot 2 DP 70662

Folio Identifier 2/70662

Certificate of Title Volume 15463 Folio 52

Certificate of Title Volume 2742 Folio 216

P A 20662

Conveyance BK 1099 No. 806

Summary of Proprietor(s) Lot 2 DP 70662

Year	Proprietor
	(Lot 2 DP 70662)
1988 – todate	Duncasto Pty Limited
(2002 – todate)	<i>(Lease to Robert Bertram Sellers of shop 1, Oxford tavern, 47-51 Crown St, Wollongong)</i>
(1991 – todate)	<i>(Various Commercial Leases see Historical Folio 1/71070)</i>
	(Lot 2 DP 70662- CT Vol 15463 Fol 52)
1986 – 1988	Duncasto Pty Limited
(1988 – 1991)	<i>(Various commercial leases see CT Vol 14336 Fol 28)</i>
	(Lot 2 DP 70662- CT Vol 2742 Fol 216)
1981 – 1986	Duncasto Pty Limited
(1986 – 1988)	<i>(Lease to Robert Selles & Verelle Selles, of part being Shop 4, 47-51 Crown St, Wollongong)</i>
1981 – 1981	Lacorby Pty Limited
1977 – 1981	Boipolo Pty Limited
1917 – 1977	Tooth & Co Limited
(1943 – 1977)	<i>(Various licensed publican leases)</i>
	(Part Allotments 2 & 3 Section 10 Town of Wollongong Area 2 Roods 1 ½ Perches)
1916 – 1917	Tooth & Company Limited
1914 – 1916	Walter Graham Robertson, trustee Catherine Graham, widow William Macnamara, trustee
	(Part Allotment 2 & 3 Section 10 & other lands Town of Wollongong)
1893 - 1914	Walter Graham Robertson, trustee Catherine Graham, widow William Macnamara, trustee
1889 - 1893	Archibald Graham (the elder)

Note 3:

Current Search

Folio Identifier B/396278 (attached)
DP 396278 (attached)
Dated 03 June 2005
Registered Proprietor:
AIRPORT RETAIL ENTERPRISES PTY LIMITED

Title Tree
Lot B DP 396278

Folio Identifier B/396278

Certificate of Title Volume 7345 Folio 238

Certificate of Title Volume 3118 Folio 185

Certificate of Title Volume 3037 Folio 123

P A 21327

* * * * *

* * * * *

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Title Search

EziSearch
An Approved LPI NSW
Information Broker

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 1/71070

SEARCH DATE	TIME	EDITION NO	DATE
25/5/2005	7:36 PM	10	17/5/2005

LAND

LOT 1 IN DEPOSITED PLAN 71070
LOCAL GOVERNMENT AREA: WOLLONGONG
PARISH OF WOLLONGONG COUNTY OF CAMDEN
TITLE DIAGRAM: DP71070

FIRST SCHEDULE

DUNCASTO PTY LIMITED (T S630193)

SECOND SCHEDULE (4 NOTIFICATIONS)

1. RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2. S354535 COVENANT
3. W181521 MORTGAGE TO AUSTRALIA AND NEW ZEALAND BANKING GROUP LIMITED
4. 8490311 LEASE TO ROBERT BERTRAM SELLES BEING SHOP 1, OXFORD TAVERN, 47-51 CROWN STREET, WOLLONGONG. EXPIRES: 30/6/2004. OPTION OF RENEWAL: TWO YEARS.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Coffey - Corrimal ALSP

PRINTED ON 25/5/2005

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Title Search

EziSearch
An Approved LPI NSW
Information Broker

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 2/70662

SEARCH DATE	TIME	EDITION NO	DATE
25/5/2005	7:41 PM	10	17/5/2005

LAND

LOT 2 IN DEPOSITED PLAN 70662
AT WOLLONGONG
LOCAL GOVERNMENT AREA: WOLLONGONG
PARISH OF WOLLONGONG COUNTY OF CAMDEN
TITLE DIAGRAM: DP70662

FIRST SCHEDULE

DUNCASTO PTY LIMITED

SECOND SCHEDULE (4 NOTIFICATIONS)

1. RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2. S354535 COVENANT
3. W181521 MORTGAGE TO AUSTRALIA AND NEW ZEALAND BANKING GROUP LIMITED
4. 8490311 LEASE TO ROBERT BERTRAM SELLES BEING SHOP 1, OXFORD TAVERN, 47-51 CROWN STREET, WOLLONGONG. EXPIRES: 30/6/2004. OPTION OF RENEWAL: TWO YEARS.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

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Title Search

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LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: B/396278

SEARCH DATE	TIME	EDITION NO	DATE
25/5/2005	7:42 PM	1	2/5/2002

LAND

LOT B IN DEPOSITED PLAN 396278
LOCAL GOVERNMENT AREA: WOLLONGONG
PARISH OF WOLLONGONG COUNTY OF CAMDEN
TITLE DIAGRAM: DP396278

FIRST SCHEDULE

AIRPORT RETAIL ENTERPRISES PTY LIMITED (T 8555742)

SECOND SCHEDULE (1 NOTIFICATION)

1. RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Coffey - Corrimal ALSP

PRINTED ON 25/5/2005

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Historical Search

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LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

25/5/2005 7:39PM

FOLIO: 1/71070

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 14336 FOL 28

Recorded	Number	Type of Instrument	C.T. Issue
21/8/1988		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
2/12/1988		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
8/2/1990	Y784880	VARIATION OF MORTGAGE	EDITION 1
20/12/1991	E148284	LEASE	EDITION 2
17/8/1992	E681715	VARIATION OF MORTGAGE	EDITION 3
21/7/1994	U459693	LEASE	EDITION 4
16/1/1996	O842058	LEASE	EDITION 5
9/10/1997	3476164	DISCHARGE OF MORTGAGE	EDITION 6
23/7/1998	5146895	DISCHARGE OF MORTGAGE	EDITION 7
23/3/2001	7492154	DEPT DEALING TO UPLIFT CT	EDITION 8
8/4/2002	8490311	LEASE	EDITION 9
17/5/2005	AB483890	REQUEST	EDITION 10

*** END OF SEARCH ***

00886

011s2 /Req:SR7743C /CT 15463-052



15463

NEW SOUTH WALES

First Title Old System

Prior Title Vol. 2742 Fol.216



Vol. 15463 Fol. 52

EDITION
ISSUED 29 9 1988

I certify that the person named in the First Schedule is the registered proprietor of an estate in fee simple (or such other estate or interest as is set out below) in the land described subject to the recordings appearing in the Second Schedule and to the provisions of the Real Property Act, 1900.

CANCELLED

Registrar General.

SEE AUTO FOLIOLAND REFERRED TO

Lot 2 in DP70662 at Wollongong in the City of Wollongong Parish of Wollongong County of Camden.

Title Diagram: DP70662

FIRST SCHEDULE

DUNCASTO PTY. LIMITED.

S630193

SECOND SCHEDULE

1. Reservations and conditions in the Crown Grant.
2. S354535P Covenant.
3. W144027P Mortgage to A.N.Z. Pensions Pty. Limited.
4. W181521P Mortgage to Australia and New Zealand Banking Group Limited.
5. W455804P Lease to Robert Selles and Verelle Selles as joint tenants of part being Shop 4 of premises 47-51 Crown Street, Wollongong and reserving rights. Expires 18-9-1988. Option of renewal 3 years.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

(Page 1) Vol.

15463 Fol. 52

GRY
22
MY
L

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



L.O. 55

FIRST SCHEDULE (continued)
REGISTERED PROPRIETOR

Registrar General

CANCELLED

SEE AUTO FOLIO

SECOND SCHEDULE (continued)

PARTICULARS

Registrar General CANCELLATION

L W728685P Lease to Atimet Pty Limited of premises being Shop 2
of premises at 51 Crown Street Wollongong together with and reserving
rights expires 1-8-1989 with an option of renewal for 3 years.

Registered 5-2-1987.

U W144017P Mortgage X440873 Transfer of Mortgage to The Equity Trustees
Executors and Agency Company Limited. Registered 24.3.1988.

MX X594693P MORTGAGE TO WESTAR BANKING CORPORATION. Registered
7.7.1988.



NOTATIONS AND UNREGISTERED DEALINGS

W728685L
X440873M
X594693M

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

DP 70662

D.P. 70662

Wollongong
62

CROWN

(411' 9")

(47' 9")

(478' 1/2")

(9' 48' 9")

ST

ST

PLAN

3
Sec. 10 Town of Wollongong
Wollongong County of Camden
Scale 40 Feet to 1 inch

Sec. 10.

F.P.
2 1/2

Miss M.A. & H.H. Moran OWRS & OCCRS.

Mrs Rebecca Makin Owr
A.C. Makin occr

No Overhanging
Tooth & Co OWRS

unoccupied
brick

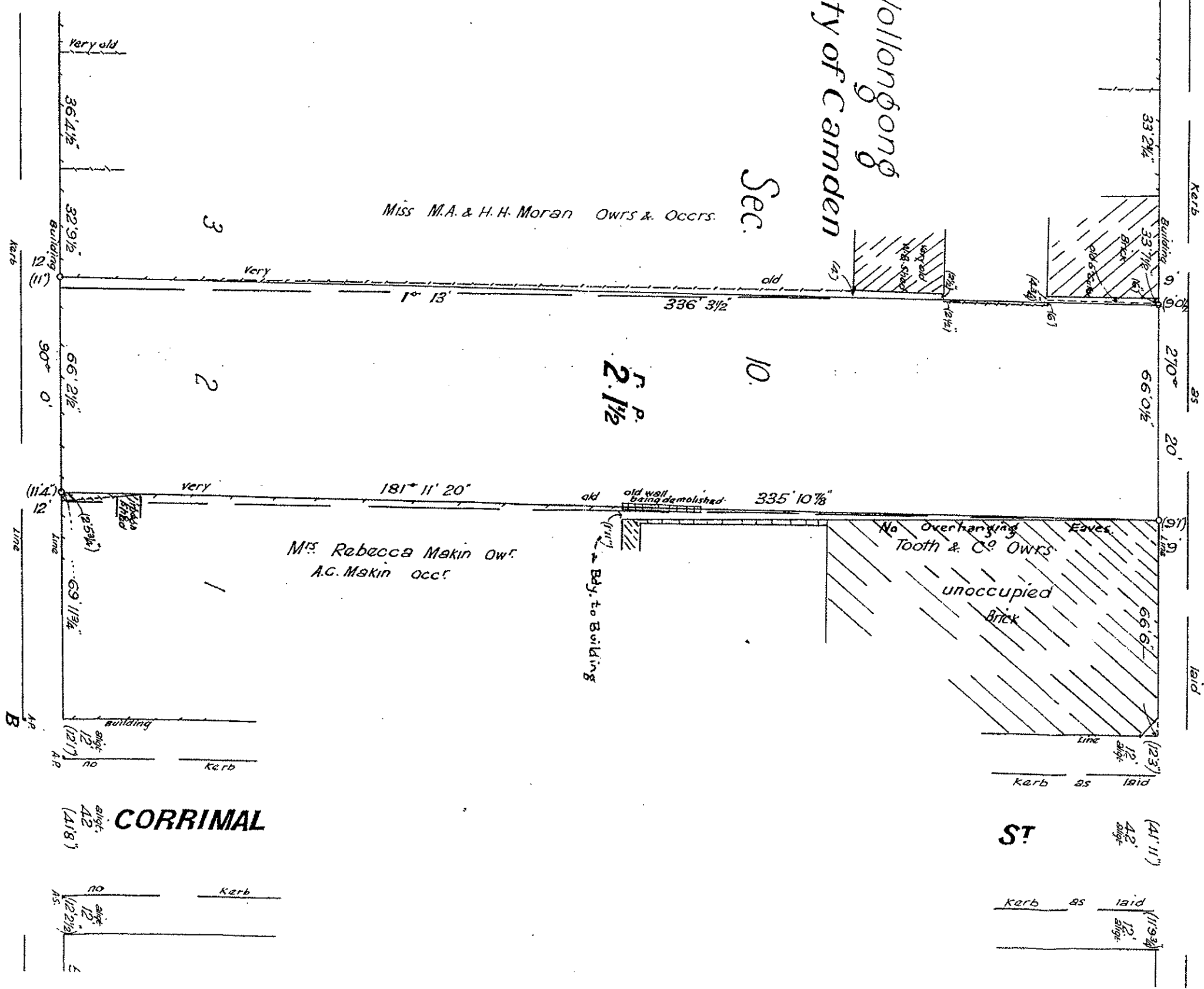
CORRIMAL

BURELLI

(411' 9")

(12' 42' 12")

ST



I, Edward Henry Cowdery of Sydney, licensed Surveyor, specially licensed under the Real Property Act, do hereby solemnly and sincerely declare that the boundaries and measurements shown in this plan are correct for the purposes of the said Act

KEMBLA

ST

1

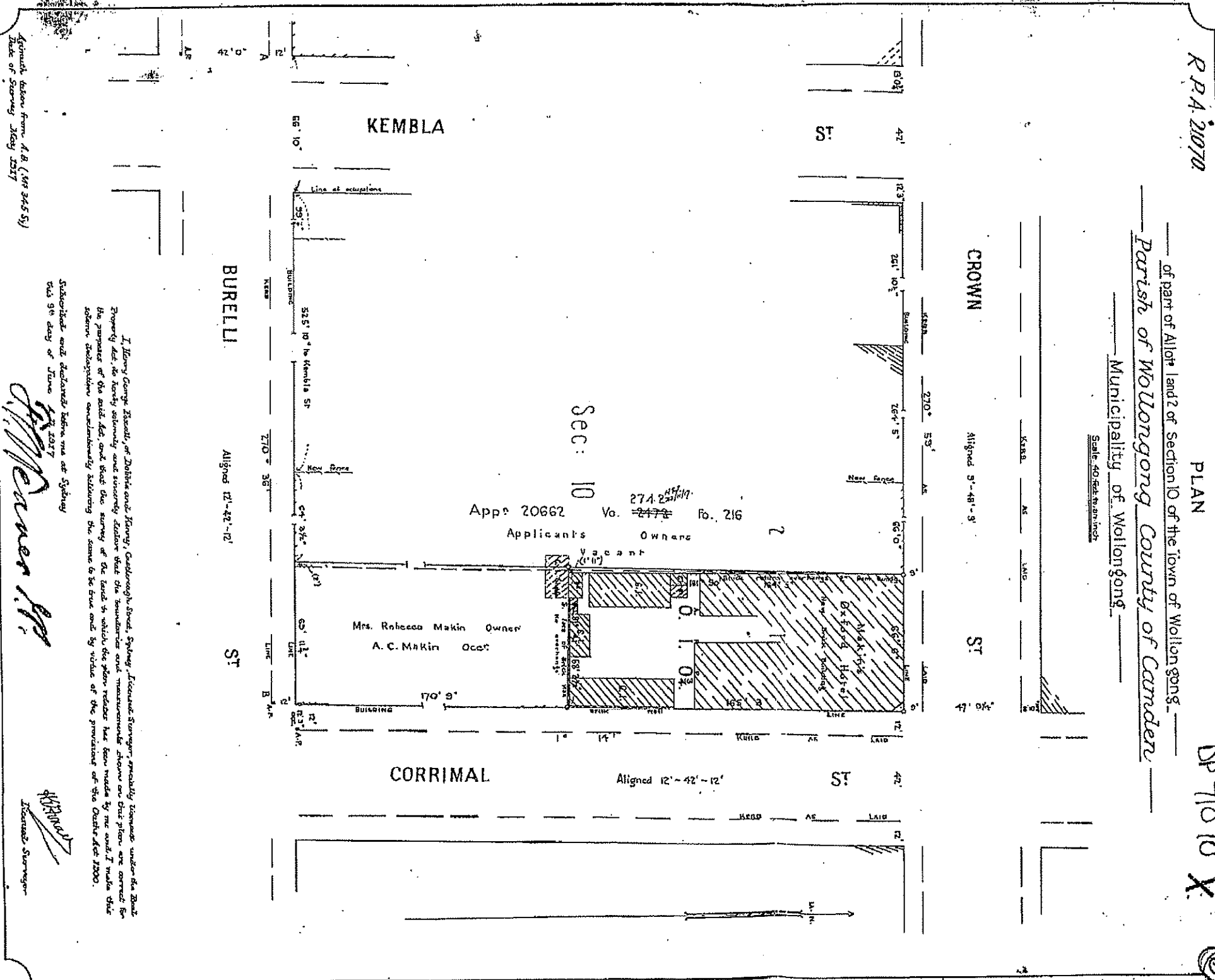
07015

Agenda taken from A.B. (192 2455)

Subscribed and declared before me at Sydney
this 9th day of June 1981
Bruce Richard Davies
Under Secretary

I, Henry George Isaacs, of Justice and Equity, Castle Street, Sydney, Licensed Surveyor, specially licensed under the Roads
Property Act, to land, situate and situate, declare that the boundaries and measurements shown on this plan are correct for
the purposes of the said Act, and that the survey of the land to which the plan relates has been made by me and I make this
solemn declaration accordingly, bearing the same to be true and by virtue of the provisions of the Roads Act 1900.

Bruce Richard Davies
Under Secretary



CONVERSION TABLE ADDED IN
REGISTRAR GENERAL'S DEPARTMENT

DP 71070

FEET	INCHES	METRES
1	2	0.651
1	11	0.584
2		0.610
6	9 3/4	2.076
8	10 3/4	2.711
9		2.743
12		3.658
12	3	3.734
13	0 3/4	3.981
36		10.973
41		12.497
42		12.802
47	9 1/4	14.561
48		14.620
64	3 1/2	19.596
66		20.117
66	6	20.269
66	10	20.371
68	2 1/2	20.790
69	11 3/4	21.330
91		27.737
99		30.328
164		50.114
165		50.368
170		52.045
261	10 1/2	79.820
264		80.594
525	10	160.274

AC RO F SQ M
- 1 3/4 1031

AMENDMENTS AND/OR ADDITIONS NOTED ON
PLAN IN REGISTRAR GENERAL'S OFFICE.

Table of mm

I, Bruce Richard Davies, Under Secretary for Lands and
Registrar General for New South Wales, certify that this
negative is a photograph made as a permanent record of a
document in my custody this 3rd December, 1981

Bruce Richard Davies

0.071070
DP 71070 X

ADVANCE LEGAL SEARCH PTY LIMITED

(ACN 077 067 068)

ABN 49 077 067 068

PO Box 149
Yagoona NSW 2199

Telephone: (02) 9754 1590

Mobile: 0412 169 809

Facsimile: (02) 9754 1364

Email: alsearch@optusnet.com.au

08 June 2005

COFFEY GEOSCIENCES Pty Ltd

PO Box 346

UNANDERRA NSW 2526

Attention James Boyle

Coffey Geosciences Pty Ltd Wollongong RECEIVED	
10 JUN 2005	
Job No:	Action
Ready:	JB

RE:

Cnr Burrelli, Corrimal & Crown Streets

Wollongong

Ref: E14497/3

Purchase Order: 63984

Current Search

Folio Identifier A/396278 (attached)

DP 396278 (attached)

Dated 07 June 2005

Registered Proprietor:

DUNCASTO PTY LIMITED

Title Tree

Lot A DP 396278

Folio Identifier A/396278

Certificate of Title Volume 7226 Folio 74

Certificate of Title Volume 3118 Folio 185

Certificate of Title Volume 3037 Folio 123

P A 21327

Summary of Proprietor(s) Lot A DP 396278

Year	Proprietor
	(Lot A DP 396278)
2002 – todate	Duncasto Pty Limited
(2002 – 2004)	<i>(Lease to Robert Bertram Selles, shop 1 Oxford Tavernen, 47-51 Crown St, Wollongong)</i>
	(Lot A DP 396278- CT Vol 7226 Fol 74)
1981 – 2002	Duncasto Pty Limited
1981 – 1981	Lacorby Pty Limited
1974 – 1981	James Richard Vereker, butcher Anthony Vereker, solicitor
1973 – 1973	Joan Gwendolyn Vereker, widow Anthony Vereker, solicitor James Richard Vereker, butcher
1956 – 1973	Benedict Vereker, butcher
	(Allotments 1 & Part 2 Section 10 Town of Wollongong Area 26 ½ Perches- CT Vol 3118 Fol 185)
1920 – 1956	Hilda May Tanko, wife of mechanic
	(Allotments 1 & Part 2 Section 10 Town of Wollongong)
1920 – 1920	Rebecca Makin, wife of retired hotel keeper
	(Allotments 1 & Part 2 Section 10 Town of Wollongong Area 1 Rood 3 ¾ Perches)
1870 – 1920	Joseph Makin, hotel keeper Rebecca Makin

Information Provided Through
Advance Legal Search Pty Ltd
Ph. 0297541590 Fax. 0297541364

Title Search

EziSearch
An Approved LPI NSW
Information Broker

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: A/396278

SEARCH DATE	TIME	EDITION NO	DATE
-----	----	-----	----
7/6/2005	7:20 PM	5	8/4/2002

LAND

LOT A IN DEPOSITED PLAN 396278
LOCAL GOVERNMENT AREA: WOLLONGONG
PARISH OF WOLLONGONG COUNTY OF CAMDEN
TITLE DIAGRAM: DP396278

FIRST SCHEDULE

DUNCASTO PTY LIMITED (T S630193)

SECOND SCHEDULE (3 NOTIFICATIONS)

1. RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2. W181521 MORTGAGE TO AUSTRALIA AND NEW ZEALAND BANKING GROUP LIMITED
3. 8490311 LEASE TO ROBERT BERTRAM SELLES BEING SHOP 1, OXFORD TAVERN, 47-51 CROWN STREET, WOLLONGONG. EXPIRES: 30/6/2004. OPTION OF RENEWAL: TWO YEARS.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Coffey - Wollongong ALSP

PRINTED ON 7/6/2005

1 G 479762

Areas under one acre as stated
In this plan have not been checked
In this Department.

Plan Form №6 (for transfers, leases, etc.)

Municipality of
Shire of
City of Greater Wollongong



RPM
PLAN

FP396278

OF SUBDIVISION OF THE WHOLE OF THE LAND COMPRISED IN
CERTIFICATE OF TITLE VOLUME 3118 FOLIO 185

Parish of Wollongong County of Camden

Scale 40 feet to an inch

CROWN -

STREET

Misc. Play of Sublin. (R.P.)
Regd. 96278.

Recd. 96278

H. E. R. No. Jan 20

This is the plan marked "X" referred to in Memorandum of Transfer
Dated 6/3/56

Dated 6/3/56

EUR 511

STREET

Robert Dineen

01... Crown Street... Wellington

Approved by Council and covered by Council
Officer Certificate

[illegible]

(Signature) Kate St. Havers
Surveyor registered under the Surveyors Act, 1920-40

(Signature) Kathleen Kellers
Surveyor registered under the Surveyors Act, 1920-46

Datum Line of Azimuth, θ_4

negative out either (1) or (2).

FINAL DATA OF SURVEY.

Copy of plan filed as

16/5/56.

37500 L



CONVERSION TABLE ADDED IN
DEPARTMENT OF LANDS

DP 39627:

FEET INCHES

METRES

1	1	0.028
1	7/8	0.046
1	3 1/4	0.082
1	11	0.584
11	9 1/4	3.588
11	10 1/2	3.622
12	-	3.658
12	1 1/2	3.698
12	3 1/8	3.732
12	4 3/8	3.768
12	4 3/4	3.778
12	5	3.788
20	-	6.098
32	8 5/8	9.972
33	0 1/8	10.062
33	2 1/4	10.116
42	-	12.802
43	7 1/4	13.292
43	7 1/2	13.292
44	-	13.411
44	5	13.538
52	-	15.850
52	3 3/4	15.942
53	4 3/4	16.272
53	8 3/4	16.372
54	-	16.458
57	11 3/8	17.662
62	5 5/8	19.040
64	5 5/8	19.630
65	6 1/2	19.972
65	11 5/8	20.102
66	1 1/8	20.142
66	4 5/8	20.232
66	5 5/8	20.262
66	6	20.262
68	1 1/4	20.758
68	7 3/8	20.914
68	7 7/8	20.922
69	3	21.102
69	11 5/8	21.322
69	11 3/4	21.330
99	0 3/8	30.182
120	-	36.572
165	3	50.368
165	4	50.392
200	-	60.960
253	4 3/4	77.232
520	-	158.492
580	-	176.782
660	-	291.168
4400	-	1341.120

AC RD P	SG M
- - 13	328.8
- - 13 1/4	335.1

1, Bruce Richard Davies, Registrar General for New South Wales, certify that this negative is a photograph made as a permanent record of a document in my custody this 7th day of May, 1979

Benjamin

1

Information Provided Through
Advance Legal Search Pty Ltd
Ph. 0297541590 Fax. 0297541364

Historical Search

EziSearch
An Approved LPI NSW
Information Broker

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

7/6/2005 7:22PM

FOLIO: A/396278

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 7226 FOL 74

Recorded	Number	Type of Instrument	C.T. Issue
2/9/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
19/1/1990		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
8/2/1990	Y784880	VARIATION OF MORTGAGE	EDITION 1
17/8/1992	E681715	VARIATION OF MORTGAGE	EDITION 2
9/10/1997	3476164	DISCHARGE OF MORTGAGE	EDITION 3
23/7/1998	5146895	DISCHARGE OF MORTGAGE	EDITION 4
8/4/2002	8490311	LEASE	EDITION 5

*** END OF SEARCH ***

Coffey - Wollongong ALSP

PRINTED ON 7/6/2005

* ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF TITLE. WARNING. THE INFORMATION APPEARING UNDER NOTATIONS HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER. ADVANCE LEGAL SEARCH PTY LTD CERTIFIES THAT THE INFORMATION CONTAINED IN THIS DOCUMENT HAS BEEN PROVIDED ELECTRONICALLY BY THE REGISTRAR-GENERAL IN ACCORDANCE WITH SECTION 96B(2) OF THE REAL PROPERTY ACT, 1900.



Our Ref: D05/027584
Your Ref: Colee Hawkins

23 June 2005

Attention:- Ms Colee Hawkins
Coffey Geosciences Pty Ltd
PO Box 346
UNANDERRA NSW 2526

Coffey Geosciences Pty Ltd	
RECEIVED	
27 JUN 2005	
Job No	SEARCH
Ref	

Dear Madam

RE SITE: Lot 1 DP 71070 & Lot 2 DP 70662 (47-51 Crown Street)
WOLLONGONG NSW 2500

I refer to your search request of 22 June 2005 requesting information on licenses to Keep Dangerous Goods for the above site.

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

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


Brent Jones
Team Leader
Dangerous Goods

WorkCover. **Watching out for you.**

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

WC1216LH

Our Ref: D05/027585
Your Ref: Colee Hawkins

24 June 2005

Attention:- Ms Colee Hawkins
Coffey Geosciences Pty Ltd
PO Box 346
UNANDERRA NSW 2526

Dear Madam

RE SITE: Lot B DP 396278 (132-134 Corrimal Street) WOLLONGONG NSW
2500

I refer to your search request of 22 June 2005 requesting information on a Licence to Keep Dangerous Goods on the above site.

Enclosed are copies of the documents, which WorkCover holds on Dangerous Goods Licence **35/009234**, relating to the storage of dangerous goods at the abovementioned premises as listed on the Stored Chemical Information Database (SCID).

If you have any further queries, please contact WorkCover's Dangerous Goods Licensing staff on (02) 4321 5500.


Brent Jones
Team Leader
Dangerous Goods

WorkCover. **Watching out for you.**

PRECISION STEERING AND MUFFLER CENTRE

November 23, 2003

WorkCover New South Wales
Dangerous Goods Licensing Section
Locked Bag 2906
LISAROW NSW 2252

Dear Sir or Madam:

Concerning Dangerous Goods Licence no 35/009234. I have spoke to WorkCover about this matter. We no longer own these premises at 132 Corrimal Street Wollongong and the new owners do intend to remove the existing tanks in the ground as soon as possible. The property is no longer used as a service station.

Yours Sincerely,

Geoff Boyd
Proprietor

342 KANAHOOKA ROAD, BROWNSVILLE • NSW • 2530
PHONE:[W] (02) 42617095 [M] 0438298452 • FAX: (02) 42615032



201
220

WorkCover New South Wales, 400 Kent Street, Sydney 2000, Tel: 9370 5000 Fax: 9370 5999 ALL MAIL TO G.P.O. BOX 5364 SYDNEY 2001
Licence No. 35/009234



APPLICATION FOR RENEWAL OF LICENCE TO KEEP DANGEROUS GOODS

ISSUED UNDER AND SUBJECT TO THE PROVISIONS OF THE DANGEROUS GOODS ACT, 1975 AND REGULATION THEREUNDER

DECLARATION: Please renew licence number 35/009234 to 6/09/2001. I confirm that all the licence details shown below are correct (amend if necessary).


.....
(Signature)
for: BOYD G N

GEOFF BOYD
.....
(Please print name)

7-8-00
.....
(Date signed)

THIS SIGNED DECLARATION SHOULD BE RETURNED TO: (please do not fax)

WorkCover New South Wales
Dangerous Goods Licensing Section
GPO BOX 5364
SYDNEY 2001

Enquiries: ph (02) 9370 5187
fax (02) 9370 6104

Details of licence on 24 July 2000

Licence Number 35/009234 Expiry Date 6/09/2000

Licensee BOYD G N
PRECISION STEERING & MUFFLER CENTRE

Postal Address: PRECISION STEERING & MUFFLER CENTRE 132 CORRIMAL ST & BURELLI ST
WOLLONGONG NSW 2500

Licensee Contact GEOFF BOYD Ph. 042 29 8452 Fax.

Premises Licensed to Keep Dangerous Goods
BOYD G N PRECISION STEERING & MUFFLER CENTRE
132 CORRIMAL ST & BURELLI ST WOLLONGONG 2500

Nature of Site AUTOMOTIVE FUEL RETAILING

Major Supplier of Dangerous Goods AUSTRALIAN (AMPOL)

Emergency Contact for this Site GEOFF BOYD A.H. 042 61 3864 Ph. 042 29 8452

Site staffing 10 HRS 5 DAYS + HALF DAY

Details of Depots

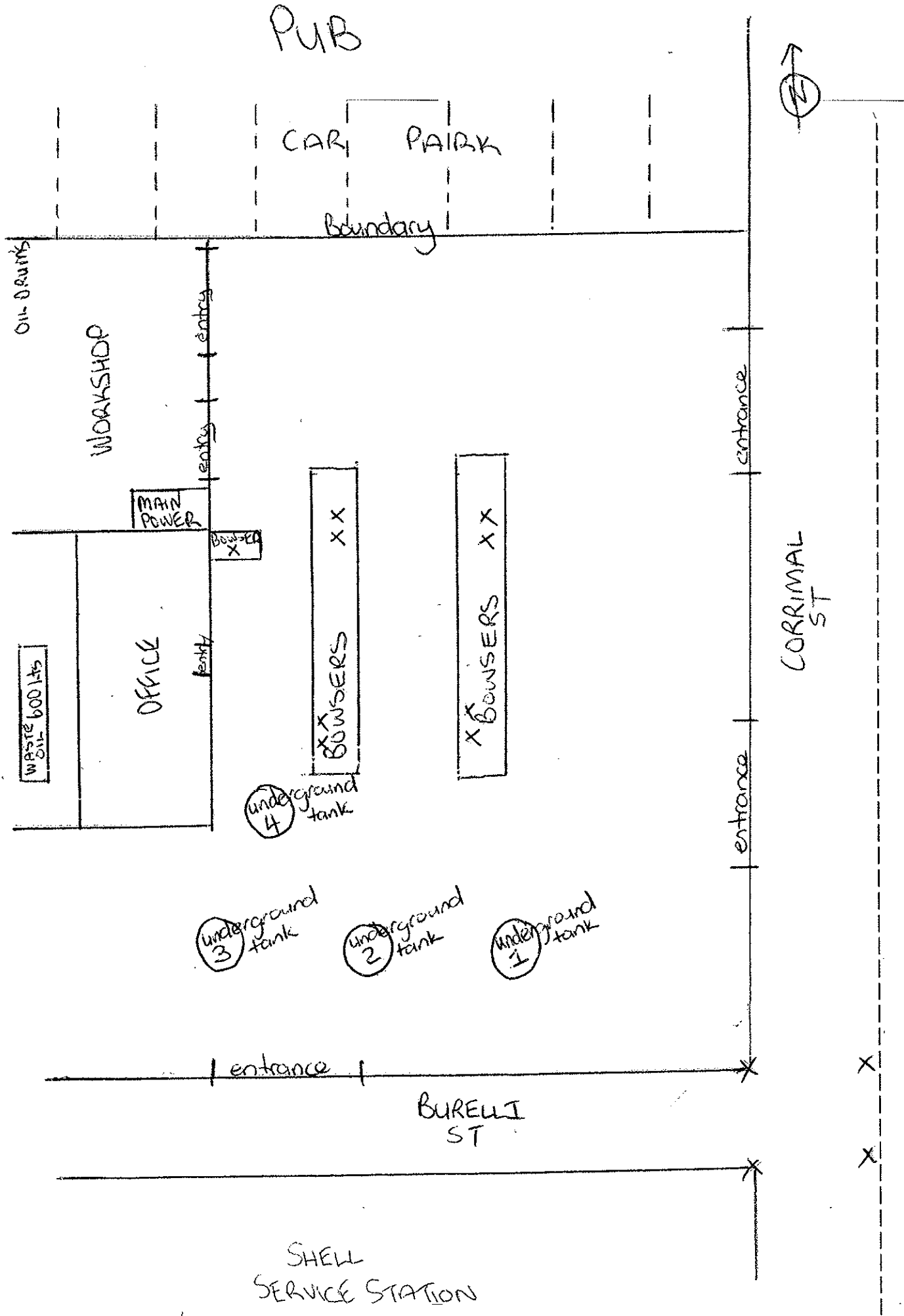
Depot No.	Depot Type	Goods Stored in Depot	Qty
1	UNDERGROUND TANK	Class 3	10000 L
	UN 1203 PETROL		10000 L
3	UNDERGROUND TANK	Class 3	5000 L
	UN 1203 PETROL		4500 L
4	UNDERGROUND TANK	Class 3	2000 L
	UN 1203 PETROL		1500 L

PART B

35-009234

Site Sketch

Please carefully read the instructions in Part B of the guide before sketching the site.



CHEMICAL STORAGE

Depot number	Type of depot	Class	Licensed maximum storage capacity
1	UNDERGROUND TANK	3	10 000 Ltrs

UN number	Shipping name	Pkg. Class Group	EPG	Product or common name	Typical quantity	Uniteg. L, kg, m³
1203	Petrol MOTOR SPIRIT	3	11	3A1 EPG UNLEADED PETROL	10000	Ltr

Depot number	Type of depot	Class	Licensed maximum storage capacity
2	UNDERGROUND TANK		10 000

UN number	Shipping name	Pkg. Class	Group	EPG	Product or common name	Typical quantity	Unit, g, kg, m
	AUTOMOTIVE DIESEL				DISTILLATE	9000	Ltr
	OIL	C	1	-			
	*delete No 2						

Depot number	Type of depot	Class	Licensed maximum storage capacity
3	UNDERGROUND TANK	3	5000

UN number	Shipping name	Pkg. Class	Pkg. Group	EPG	Product or common name	Typical quantity	Unit of measure L, kg, m
1203	Petrol MOTOR SPIRIT	3	11	3A1 EPG	SUPER PETROL	4500	L

Depot number	Type of depot	Class	Licensed maximum storage capacity	
4	UNDERGROUND TANK	3	2000	

UN number	Shipping name	Pkg. Class	Group EPG	Product or common name	Typical quantity	Units L, kg, m
1203	Petrol MOTOR SPIRIT	3	II	3A1 EPA SUPER PETROL	1500	Lts

16/9 Michael Andrew A 9234
 TRADING AS Total (Corrimal) Service Station
 ADDRESS WOLLONGONG 2500, Corrimal & Burelli Streets,
 CALLING Service Station Proprietor, POSTAL ADDRESS
 NATURE OF PREMISES Service Station \$ 450.89
 Total

Depot No.	Construction of depot			Mineral spirit	Mineral oil	Dangerous goods			
	Walls	Roof	Floor	Gallons	Gallons	Class 1 Gallons	Class 2 Gallons		
1	Underground tank			2000		(1/3000 restricted)			
2	"	"	"	1000		(1/2000 restricted)			
3	"	"	"	750		(1/1000 restricted)			
4	"	"	"		250	(1/500 restricted)			

Date	Receipt No.	Year ending	Date	Receipt No.	Year ending	Remarks
12.8.68	7728	15.9.69				Prev. Lammerink J. B. D.
11.9.69	4169	15.9.70				
18.9.70	4695	1971				
18.8.71	5992	15.9.72				

Application is hereby made for — ^{949 30/04/82 03A}
*a licence (or amendment of the licence) for the keeping of dangerous goods in or on the
premises described below. *the transfer of the licence

(*delete whichever is not required)

FEE: \$10.00 per Depot

40.00

Name of Applicant in full (see over)	Surname <u>BOYD</u>	Given Names <u>GEOFFREY NEVILLE</u>
Trading name or occupier's name (if any)	<u>TF PRECISION STEERING & HUFFLEIR CENTRE</u>	
Postal address	<u>132 CORRIHAL STREET WOLLONGONG</u> Postcode <u>2500</u>	
Telephone number of applicant	STD Code <u>042</u>	Number <u>298452</u>
Address of the premises in or on which the depot or depots are situated (including street number, if any)	<u>132 CORRIHAL STREET WOLLONGONG</u> Postcode <u>2500</u>	
Nature of premises (see over)		

PLEASE ATTACH SITE PLAN

Particulars of type of depots and maximum quantities of dangerous goods to be kept at any one time.

Depot number	Type of depot (see over)	Storage capacity	Dangerous goods	
			Product being stored	C & C Office use only
1	<u>UNDERGROUND TANK</u>	<u>3240 L (15,000 L) / 5</u>		
2	<u>✓</u>	<u>2150 L (10,000 L) / 5</u>		
3	<u>✓</u>	<u>1010 L (5000 L) / 5</u>		
4	<u>✓</u>	<u>510 L (1500 L)</u>		
5				
6				
7				
8				
9				
10				
11				
12				

Name of company supplying flammable liquid (if any) TOTAL

Have premises previously been licensed? yes

If known, state name of previous occupier F.J. OLIVEIRA

Licence No. 250092343

Signature of applicant x J. Boyd

Date 16-4-82

For external explosives magazine(s), please fill in side 2.

LICENCE No.

FOR OFFICE USE ONLY
CERTIFICATE OF INSPECTION

I, Wallace R.D. being an Inspector under the Dangerous Goods Act, 1975, do hereby certify that the premises described above do comply with the requirements of the Dangerous Goods Act, 1975 and the Dangerous Goods Regulation with regard to their situation and construction for the keeping of dangerous

Application for Registration of Premises or Store Licence under Division B or for the transfer alteration or amendment of any such Registration or Licence, for the keeping of Inflammable Liquid and/or Dangerous Goods, in accordance with the provisions of the Inflammable Liquid Act, 1915 (as amended), for the ensuing year.

DIRECTIONS

- Applications must be forwarded to the Chief Inspector of Inflammable Liquid, Explosives Department, Box R.216, Royal Exchange Sydney, N.S.W. 2000 and must be accompanied by the prescribed fee, as set out hereunder:
Registration of Premises (Fee \$4.50 p.a.) - For quantities not exceeding 300 gallons of mineral oil and 100 gallons of mineral spirit, if kept together; or 800 gallons of mineral oil and 100 gallons of mineral spirit, if kept in separate depots; or 500 gallons of mineral spirit, if kept in an underground tank depot; or 800 gallons of mineral oil and 500 gallons of mineral spirit, if mineral spirit is kept in an underground tank depot.
In addition to, or in lieu of the above, similar quantities of Dangerous Goods of Classes 1 and 2 may be kept under the like conditions; reading Dangerous Goods of Class 1 for the words Mineral Spirit and Dangerous Goods of Class 2 for the words Mineral Oil
Store Licence, Div. A (Fee, \$9.00 p.a.) - For quantities in excess of those stated above, but not exceeding 4,000 gallons mineral oil and/or mineral spirit, and/or Dangerous Goods of Classes 1, 2 and 9.
Store Licence, Div. B (Fee, See Regulation 7) - For quantities exceeding 4,000 gallons of mineral spirit, and/or dangerous goods of Classes 1 and 2, and/or dangerous goods of Class 3.
For the keeping of Dangerous Goods of Classes 3 and/or 4. (\$18.00 p.a.)
Fees for the keeping of inflammable liquid and dangerous goods in excess of the above stated quantities and also for Liquid Petroleum Gas storage are set out in Regulation 7.

Fee payable \$18.00

1. Name of occupier including full christian names.	DE OLIVEIRA , Francisco Jose
2. Trading Name (if any)	Total (Corrimal) Service Station
3. Locality of the premises in which the depot or depots are situated	No. or Name corner
	Street Corrimal & Burelli Streets,
	Town WOLLONGONG
4. Postal address	Postcode 2500
5. Occupation	service station proprietors
6. Nature of premises (dwelling, garage etc.)	service station
7. Particulars of construction of depots and maximum quantities of inflammable liquid and/or Dangerous Goods to be kept at any one time.	

PLEASE ATTACH PLAN OF PREMISES

Depot No.	Construction of depots *			Inflammable liquid		Dangerous goods					
	Walls	Roof	Floor	Mineral spirit gallons	Mineral oil gallons	Class 1 gallons	Class 2 gallons	Class 3 lb	Class 4 cu ft	Class 5A water gal	Class 9 gallons
1	underground tank			3000							
2				2000							
3				1000							
4					500						
5											
6											
7											
8											
9											
10											

* If product is kept in tanks describe depots as underground or aboveground tanks.

Signature of applicant

Date of application, 19

CERTIFICATE OF INSPECTION

being an Inspector under the Inflammable

Application for Registration of Premises or Store License under Division A. or for the transfer, alteration or amendment of any such Registration or License, for the keeping of Inflammable Liquid and/or Dangerous Goods, in accordance with the provisions of the Inflammable Liquid Act, 1915 (as amended), for the ensuing year.

EXPLANATORY

Inflammable Liquid—

Mineral Oil—includes kerosene, mineral turpentine and white spirit (for cleaning), and compositions containing same.
Mineral Spirit—includes petrol, benzene, benzolene, benzol and naphtha, and compositions containing same.

Dangerous Goods—

- Class 1.—Acetone, amyl acetate, butyl acetate, carbon bisulphide; any combination of substances of an inflammable character suitable for use as an industrial solvent and having a true flashing point of less than 73 degrees Fahrenheit.
Class 2.—Nitro-cellulose (also known as "pyroxylin" and "collodion cotton") moistened with an alcohol, butyl alcohol (also known as "butanol"), methylated spirits, vegetable turpentine; and any liquid or solid containing methylated spirits, having a true flashing point of less than 150 degrees Fahrenheit.
Class 3.—Nitro-cellulose product.
Class 4.—Compressed or dissolved acetylene contained in a porous substance.

DIRECTIONS

1. Applications must be forwarded to the Chief Inspector of Inflammable Liquid, Explosives Department, Department of Mines, Sydney, and must be accompanied by the prescribed fee, as set out hereunder:—

Registration of Premises (Fee, p.a.).—For quantities not exceeding 300 gallons of mineral oil and 100 gallons of mineral spirit, if kept together; or 800 gallons of mineral oil and 100 gallons of mineral spirit, if kept in separate depots; or 500 gallons of mineral spirit, if kept in an underground tank depot; or 800 gallons of mineral oil and 500 gallons of mineral spirit, if mineral spirit is kept in an underground tank depot.

In addition to, or in lieu of the above, similar quantities of Dangerous Goods of Classes 1 and 2 may be kept under the like conditions; reading Dangerous Goods of Class 1 for the words Mineral Spirit and Dangerous Goods of Class 2 for the words Mineral Oil.

Store License, Div. A (Fee, p.a.).—For quantities in excess of those stated above, but not exceeding 4,000 gallons mineral oil and/or mineral spirit, and/or Dangerous Goods of Classes 1 and 2.

Store License, Div. B (Fees, See Regulation 7).—For quantities exceeding 4,000 gallons of mineral and/or mineral spirit, and/or dangerous goods of Classes 1 and 2, and/or dangerous goods of Class 3.

For the keeping of Dangerous Goods of Classes 3 and/or 4. (..... p.a.).

2. The certificate of inspection at foot hereof must be signed by an Inspector under the Inflammable Liquid Act, 1915 (as amended), or Police Officer, or other officer duly authorised in that behalf, and where the premises are situated outside the Metropolitan Area of Sydney, it is requested that such certificate be obtained prior to forwarding application.

1. Name in full of occupier ... BRIGHT: ALLAN CHARLES AND
... BRIGHT: COLLEEN MAY
2. Occupation ... SERVICE STATION PROP.
3. Locality of the premises in which the depot or depots are situated ...
No. or Name TOTAL SERVICE STATION
Street CORRIMAL STREET
Town WOLLONGONG
4. Nature of premises (Dwelling, Garage, Store, etc.) ... GARAGE
5. Will mineral spirit be kept in a prescribed underground tank depot? ... YES

6. Particulars of construction of depots and maximum quantities of inflammable liquid and/or Dangerous Goods to be kept at any one time.

Depot No.	Construction of Depots			Inflammable Liquid		Dangerous Goods			
	Walls	Roof	Floor	Mineral Spirit Gallons	Mineral Oil Gallons	Class 1 Gallons	Class 2 Gallons	Class 3 lb.	Class 4 cub. ft.
1	<u>CONCRETE BLOCK</u>	<u>CONCRETE</u>	<u>CONCRETE</u>	<u>2000</u>		<u>(1/3000 total)</u>			
2	<u>Underground</u>		<u>Tank</u>	<u>1000</u>		<u>(1/1000)</u>			
3				<u>1000</u>		<u>(1/1000)</u>			
4				<u>250</u>	<u>250</u>	<u>(1/1500)</u>			
5									
6									
7									
8									
9									
10									

Signature of Applicant A. Bright
Date of Application 2nd September 19 66 Postal Address Corrimal - Borells Stn
Wollongong.

CERTIFICATE OF INSPECTION

I, Eric Olson being an Inspector under the Inflammable Liquid Act, 1915 (as amended), do hereby certify that the premises or store herein referred to and described is suitable with regard to its situation and construction for the safe keeping of inflammable liquid and/or dangerous goods in quantity

Make Rough Sketches showing—

Ground plans of premises showing position of depot or depots and adjacent buildings, also distances separating depots and buildings.

BURELL ST

Sketch of depot or depots showing provision made for ventilation, also inside dimensions (length, width, and depth) of the pit or for portion, designed to prevent outflow.

This sketch is not required for underground tanks.

CORNER BLOCK

OIL TANK

OIL TANK

OIL TANK

OIL TANK

SERVICE STATION

BUILDING

VACANT BLOCK

TABLES SHOWING DISTANCES WHICH UNDER LICENSE MUST SEPARATE PROTECTED WORKS FROM DEPOTS

Table I.—Where Mineral Spirit and/or Dangerous Goods of Class 1 (with or without Mineral Oil and/or Dangerous Goods of Class 2) are kept or to be kept:—

or to be kept.—			
In an underground Tank Depot, in quantity exceeding 500 gallons, but not exceeding—	In an aboveground Tank Depot or other Depot, separated from protected works by a screen wall, in quantity exceeding 100 gallons, but not exceeding—	In an aboveground Tank Depot or other Depot not separated from protected works by a screen wall, in quantity exceeding 100 gallons, but not exceeding—	Distance not less than—
Gallons	Gallons	Gallons	Feet
2,000	1,000	250	10
2,400	1,200	300	11
2,800	1,400	350	12
3,200	1,600	400	13
3,600	1,800	450	14
4,000	2,000	500	15
4,400	2,200	550	16
4,800	2,400	600	17
5,200	2,600	650	18
5,600	2,800	700	19
6,000	3,000	750	20
6,400	3,200	800	21
6,800	3,400	850	22
7,200	3,600	900	23
7,600	3,800	950	24
8,000	4,000	1,000	25
8,400	4,200	1,050	26
8,800	4,400	1,100	27
9,200	4,600	1,150	28
9,600	4,800	1,200	29
10,000	5,000	1,250	30
10,400	5,200	1,300	31
10,800	5,400	1,350	32
11,200	5,600	1,400	33
11,600	5,800	1,450	34
12,000	6,000	1,500	35
12,400	6,200	1,550	36
12,800	6,400	1,600	37
13,200	6,600	1,650	38
13,600	6,800	1,700	39
14,000	7,000	1,750	40
14,400	7,200	1,800	41
14,800	7,400	1,850	42
15,200	7,600	1,900	43
15,600	7,800	1,950	44
16,000	8,000	2,000	45
16,400	8,200	2,050	46
16,800	8,400	2,100	47
17,200	8,600	2,150	48
17,600	8,800	2,200	49
18,000	9,000	2,250	50
18,400	9,200	2,300	51
18,800	9,400	2,350	52
19,200	9,600	2,400	53
19,600	9,800	2,450	54
20,000	10,000	2,500	55
20,400	10,200	2,550	56
20,800	10,400	2,600	57
21,200	10,600	2,650	58
21,600	10,800	2,700	59
22,000	11,000	2,750	60
22,400	11,200	2,800	61
22,800	11,400	2,850	62
23,200	11,600	2,900	63
23,600	11,800	2,950	64
24,000	12,000	3,000	65
24,400	12,200	3,050	66
24,800	12,400	3,100	67
25,200	12,600	3,150	68
25,600	12,800	3,200	69
26,000	13,000	3,250	70
26,400	13,200	3,300	71
26,800	13,400	3,350	72
27,200	13,600	3,400	73
27,600	13,800	3,450	74
28,000	14,000	3,500	75
28,400	14,200	3,550	76
28,800	14,400	3,600	77
29,200	14,600	3,650	78
29,600	14,800	3,700	79
30,000	15,000	3,750	80
30,400	15,200	3,800	81
30,800	15,400	3,850	82
31,200	15,600	3,900	83
31,600	15,800	3,950	84
32,000	16,000	4,000	85
32,400	16,200	4,050	86
32,800	16,400	4,100	87
33,200	16,600	4,150	88
33,600	16,800	4,200	89
34,000	17,000	4,250	90
34,400	17,200	4,300	91
34,800	17,400	4,350	92
35,200	17,600	4,400	93
35,600	17,800	4,450	94
36,000	18,000	4,500	95
36,400	18,200	4,550	96
36,800	18,400	4,600	97
37,200	18,600	4,650	98
37,600	18,800	4,700	99
38,000	19,000	4,750	100
38,400	19,200	4,800	101
38,800	19,400	4,850	102
39,200	19,600	4,900	103
39,600	19,800	4,950	104
40,000	20,000	5,000	105
40,400	20,200	5,050	106
40,800	20,400	5,100	107
41,200	20,600	5,150	108
41,600	20,800	5,200	109
42,000	21,000	5,250	110
42,400	21,200	5,300	111
42,800	21,400	5,350	112
43,200	21,600	5,400	113
43,600	21,800	5,450	114
44,000	22,000	5,500	115
44,400	22,200	5,550	116
44,800	22,400	5,600	117
45,200	22,600	5,650	118
45,600	22,800	5,700	119
46,000	23,000	5,750	120
46,400	23,200	5,800	121
46,800	23,400	5,850	122
47,200	23,600	5,900	123
47,600	23,800	5,950	124
48,000	24,000	6,000	125
48,400	24,200	6,050	126
48,800	24,400	6,100	127
49,200	24,600	6,150	128
49,600	24,800	6,200	129
50,000	25,000	6,250	130
50,400	25,200	6,300	131
50,800	25,400	6,350	132
51,200	25,600	6,400	133
51,600	25,800	6,450	134
52,000	26,000	6,500	135
52,400	26,200	6,550	136
52,800	26,400	6,600	137
53,200	26,600	6,650	138
53,600	26,800	6,700	139
54,000	27,000	6,750	140
54,400	27,200	6,800	141
54,800	27,400	6,850	142
55,200	27,600	6,900	143
55,600	27,800	6,950	144
56,000	28,000	7,000	145
56,400	28,200	7,050	146
56,800	28,400	7,100	147
57,200	28,600	7,150	148
57,600	28,800	7,200	149
58,000	29,000	7,250	150
58,400	29,200	7,300	151
58,800	29,400	7,350	152
59,200	29,600	7,400	153
59,600	29,800	7,450	154
60,000	30,000	7,500	155
60,400	30,200	7,550	156
60,800	30,400	7,600	157
61,200	30,600	7,650	158
61,600	30,800	7,700	159
62,000	31,000	7,750	160
62,400	31,200	7,800	161
62,800	31,400	7,850	162
63,200	31,600	7,900	163
63,600	31,800	7,950	164
64,000	32,000	8,000	165
64,400	32,200	8,050	166
64,800	32,400	8,100	167
65,200	32,600	8,150	168
65,600	32,800	8,200	169
66,000	33,000	8,250	170
66,400	33,200	8,300	171
66,800	33,400	8,350	172
67,200	33,600	8,400	173
67,600	33,800	8,450	174
68,000	34,000	8,500	175
68,400	34,200	8,550	176
68,800	34,400	8,600	177
69,200	34,600	8,650	178
69,600	34,800	8,700	179
70,000	35,000	8,750	180
70,400	35,200	8,800	181
70,800	35,400	8,850	182
71,200	35,600	8,900	183
71,600	35,800	8,950	184
72,000	36,000	9,000	185
72,400	36,200	9,050	186
72,800	36,400	9,100	187
73,200	36,600	9,150	188
73,600	36,800	9,200	189
74,000	37,000	9,250	190
74,400	37,200	9,300	191
74,800	37,400	9,350	192
75,200	37,600	9,400	193
75,600	37,800	9,450	194
76,000	38,000	9,500	195
76,400	38,200	9,550	196
76,800	38,400	9,600	197
77,200	38,600	9,650	198
77,600	38,800	9,700	199
78,000	39,000	9,750	200
78,400	39,200	9,800	201
78,800	39,400	9,850	202
79,200	39,600	9,900	203
79,600	39,800	9,950	204
80,000	40,000	10,000	205
80,400	40,200	10,050	206
80,800	40,400	10,100	207
81,200	40,600	10,150	208
81,600	40,800	10,200	209
82,000	41,000	10,250	210
82,400	41,200	10,300	211
82,800	41,400	10,350	212
83,200	41,600	10,400	213
83,600	41,800	10,450	214
84,000	42,000	10,500	215
84,400	42,200	10,550	216
84,800	42,400	10,600	217
85,200	42,600	10,650	218
85,600	42,800	10,700	219
86,000	43,000	10,750	220
86,400	43,200	10,800	221
86,800	43,400	10,850	222
87,200	43,600	10,900	223
87,600	43,800	10,950	224
88,000	44,000	11,000	225
88,400	44,200	11,050	226
88,800	44,400	11,100	227
89,200	44,600	11,150	228
89,600	44,800	11,200	229
90,000	45,000	11,250	230
90,400	45,200	11,300	231
90,800	45,400	11,350	232
91,200	45,600	11,400	233
91,600	45,800	11,450	234
92,000	46,000	11,500	235
92,400	46,200	11,550	236
92,800	46,400	11,600	237
93,200	46,600	11,650	238
93,600	46,800	11,700	239
94,000	47,000	11,750	240
94,400	47,200	11,800	241
94,800	47,400	11,850	242
95,200	47,600	11,900	243
95,600	47,800	11,950	244
96,000	48,000	12,000	245
96,400	48,200	12,050	246
96,800	48,400	12,100	247
97,200	48,600	12,150	248
97,600	48,800	12,200	249
98,000	49,000	12,250	250
98,400	49,200	12,300	251
98,800	49,400	12,350	252
99,200	49,600	12,400	253
99,600	49,800	12,450	254
100,000 and over	50,000 and over	400,000 and over	150

EXPLANATORY

Inflammable Liquid—

Mineral Oil—includes kerosene, mineral turpentine and white spirit (for cleaning), and compositions containing same.
Mineral Spirit—includes petrol, benzene, benzolene, benzol and naphtha, and compositions containing same.

Dangerous Goods—

- Class 1.—Acetone, amyl acetate, butyl acetate, carbon bisulphide; any combination of substances of an inflammable character suitable for use as an industrial solvent and having a true flashing point of less than 73 degrees Fahrenheit.
Class 2.—Nitro-cellulose (also known as "pyroxylin" and "collodion cotton") moistened with an alcohol, butyl alcohol (also known as "butanol"), methylated spirits, vegetable turpentine; and any liquid or solid containing methylated spirits, having a true flashing point of less than 150 degrees Fahrenheit.
Class 3.—Nitro-cellulose product.
Class 4.—Compressed or dissolved acetylene contained in a porous substance.

DIRECTIONS

1. Applications must be forwarded to the Chief Inspector of Inflammable Liquid, Explosives Department, Department of Mines, Sydney, and must be accompanied by the prescribed fee, as set out hereunder:—

Registration of Premises (Fee \$ 3.00 p.a.)—For quantities not exceeding 300 gallons of mineral oil and 100 gallons of mineral spirit, if kept together; or 800 gallons of mineral oil and 100 gallons of mineral spirit, if kept in separate depots; or 500 gallons of mineral spirit, if kept in an underground tank depot; or 800 gallons of mineral oil and 500 gallons of mineral spirit, if mineral spirit is kept in an underground tank depot.

In addition to, or in lieu of the above, similar quantities of Dangerous Goods of Classes 1 and 2 may be kept under the like conditions; reading Dangerous Goods of Class 1 for the words Mineral Spirit and Dangerous Goods of Class 2 for the words Mineral Oil.

Store License, Div. A (Fee, \$ 6.50 p.a.)—For quantities in excess of those stated above, but not exceeding 4,000 gallons mineral oil and/or mineral spirit, and/or Dangerous Goods of Classes 1 and 2.

Store License, Div. B (Fees, See Regulation 7)—For quantities exceeding 4,000 gallons of mineral and/or mineral spirit, and/or dangerous goods of Classes 1 and 2, and/or dangerous goods of Class 3.
For the keeping of Dangerous Goods of Classes 3 and/or 4. (\$ 15.00 p.a.).

2. The certificate of inspection at foot hereof must be signed by an Inspector under the Inflammable Liquid Act, 1915 (as amended), or Police Officer, or other officer duly authorised in that behalf, and where the premises are situated outside the Metropolitan Area of Sydney, it is requested that such certificate be obtained prior to forwarding application.

1. Name in full of occupier	ANDREW, MICHAEL
2. Occupation	S. STATION PROPRIETOR
3. Locality of the premises in which the depot or depots are situated	No. or Name TOTAL (CORRIMAL ST.) SERVICE STATION Street CORRIMAL + BURELLI STS. Town WOLLONGONG 2500.
4. Nature of premises (Dwelling, Garage, Store, etc.)	SERVICE STATION
5. Will mineral spirit be kept in a prescribed underground tank depot?	YES

6. Particulars of construction of depots and maximum quantities of inflammable liquid and/or Dangerous Goods to be kept at any one time.

Depot No.	Construction of Depots			Inflammable Liquid		Dangerous Goods			
	Walls	Roof	Floor	Mineral Spirit Gallons	Mineral Oil Gallons	Class 1 Gallons	Class 2 Gallons	Class 3 lb.	Class 4 cub. ft.
1	Underground Tank			2000		(1/3000	rest d)		
2		/	/	1000		(1/2000	rest d)		
3		/	/	750		(1/1000	")		
4		/	/		250	(1/500	")		
5									
6									
7						elig	6 50		
8							12	18/68	
9								7228	
10									

Date of Application 1st August 1968 Signature of Applicant A. Michael
Postal Address AS ABOVE

CERTIFICATE OF INSPECTION

I, Eric Olson being an Inspector under the Inflammable Liquid Act, 1915 (as amended), do hereby certify that the premises or store herein referred to and described is suitable with regard to its situation and construction for the safe keeping of inflammable liquid and/or dangerous goods in quantity and nature specified.

Place Wollongong Signature of Inspector Olson
Date 16/10/68

EXPLANATORY

to 2/9/68

Signature of Inspector:

Application for Registration of Premises or Store License under Division 17 or for the transfer, alteration or amendment of any such Registration or License, for the keeping of Inflammable Liquid and/or Dangerous Goods, in accordance with the provisions of the Inflammable Liquid Act, 1915 (as amended), for the ensuing year.

EXPLANATORY

Inflammable Liquid—

Mineral Oil—includes kerosene, mineral turpentine and white spirit (for cleaning), and compositions containing same.
Mineral Spirit—includes petrol, benzene, benzolene, benzol and naphtha, and compositions containing same.

Dangerous Goods—

- Class 1.—Acetone, amyl acetate, butyl acetate, carbon bisulphide; any combination of substances of an inflammable character suitable for use as an industrial solvent and having a true flashing point of less than 73 degrees Fahrenheit.
Class 2.—Nitro-cellulose (also known as "pyroxylin" and "collodion cotton") moistened with an alcohol, butyl alcohol (also known as "butanol"), methylated spirits, vegetable turpentine; and any liquid or solid containing methylated spirits, having a true flashing point of less than 150 degrees Fahrenheit.
Class 3.—Nitro-cellulose product.
Class 4.—Compressed or dissolved acetylene contained in a porous substance.

DIRECTIONS

1. Applications must be forwarded to the Chief Inspector of Inflammable Liquid, Explosives Department, Department of Mines, Sydney, and must be accompanied by the prescribed fee, as set out hereunder:—

Registration of Premises (Fee, p.a.).—For quantities not exceeding 300 gallons of mineral oil and 100 gallons of mineral spirit, if kept together; or 800 gallons of mineral oil and 100 gallons of mineral spirit, if kept in separate depots; or 500 gallons of mineral spirit, if kept in an underground tank depot; or 800 gallons of mineral oil and 500 gallons of mineral spirit, if mineral spirit is kept in an underground tank depot.

In addition to, or in lieu of the above, similar quantities of Dangerous Goods of Classes 1 and 2 may be kept under the like conditions; reading Dangerous Goods of Class 1 for the words Mineral Spirit and Dangerous Goods of Class 2 for the words Mineral Oil.

Store License, Div. A (Fee, p.a.).—For quantities in excess of those stated above, but not exceeding 4,000 gallons mineral oil and/or mineral spirit, and/or Dangerous Goods of Classes 1 and 2.

Store License, Div. B (Fees, See Regulation 7).—For quantities exceeding 4,000 gallons of mineral and/or mineral spirit, and/or dangerous goods of Classes 1 and 2, and/or dangerous goods of Class 3.

For the keeping of Dangerous Goods of Classes 3 and/or 4. (..... p.a.).

2. The certificate of inspection at foot hereof must be signed by an Inspector under the Inflammable Liquid Act, 1915 (as amended), or Police Officer, or other officer duly authorised in that behalf, and where the premises are situated outside the Metropolitan Area of Sydney, it is requested that such certificate be obtained prior to forwarding application.

- Name in full of occupier
- Occupation
- Locality of the premises in which the depot or depots are situated
- Nature of premises (Dwelling, Garage, Store, etc.)
- Will mineral spirit be kept in a prescribed underground tank depot?

BAREND FROLICH

JOHANNES LAMMERINK

SERVICE STATION PROPRIETORS

No. or Name

Street CORRIMAL + BURELLI STS.

Town WOLLONGONG 2500

GARAGE

YES

6. Particulars of construction of depots and maximum quantities of inflammable liquid and/or Dangerous Goods to be kept at any one time.

Depot No.	Construction of Depots			Inflammable Liquid		Dangerous Goods			
	Walls	Roof	Floor	Mineral Spirit Gallons	Mineral Oil Gallons	Class 1 Gallons	Class 2 Gallons	Class 3 lb.	Class 4 cub. ft.
1	<u>Underground</u>	<u>tank</u>		<u>8000</u>		<u>(1/3000 needed)</u>			
2	<u>"</u>	<u>"</u>	<u>"</u>	<u>1000</u>		<u>(1/500)</u>			
3	<u>"</u>	<u>"</u>	<u>"</u>	<u>1000</u>		<u>(1/1000)</u>			
4	<u>"</u>	<u>"</u>	<u>"</u>		<u>250</u>	<u>(1/500 sub.)</u>			
5									
6			<u>2</u>	<u>00</u>			<u>Chg</u>	<u>200</u>	
7									
8				<u>6/15/67</u>				<u>30/3/67</u>	
9					<u>9736</u>			<u>1175</u>	
10									

Signature of Applicant

Date of Application

22. 3. 1967

Postal Address CORRIMAL + BURELLI STS.
WOLLONGONG 2500

CERTIFICATE OF INSPECTION

I, Bruce Olson being an Inspector under the Inflammable Liquid Act, 1915 (as amended), do hereby certify that the premises or store herein referred to and described is suitable with regard to its situation and construction for the safe keeping of inflammable liquid and/or dangerous goods in quantity and nature specified.

Boyd, Geoffrey Neville
Michael A. FRANCISCO JERRY DE GRIVEM A
0010/00220

INSPECTION RECORD

~~Fredrick B. & Lammertink J.~~

Licence No. ^{B.} 9234

Licensee:

~~Bright A. & Co. Ltd.~~

1/20 Total Ser Str

Address:

Bar Corrinial & Burelli St Wellington

Storage licensed:

1/2000 (1/3000 m/s)	1/3000 m/s
1/1000 (1/2000 ")	1/2000 ✓
1/750 (1/1000 ")	1/1000 ✓
1/250 (1/500 ")	1/500 m/o.

TOTAL

Sketch of Premises (Dimensions of depot and distance of same from adjoining "protected works" to be shown).

XXX.

Garage &
Service Station

1/1000
1/2000
1/3000

1/500 M.O.

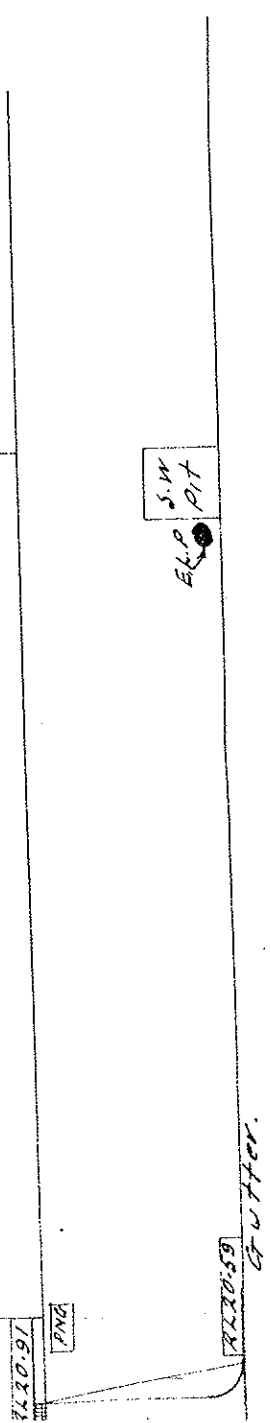
Burelli St

Corrinial St

Inspected	Initials	Requisitions made or state of depot
18/10/66	RL	Set New license
4/10/67	RL	Set trough effected
20/12/67	RL	Set " "
15.10.72	RL	TRANSFER EFFECTED.
20.6.74	RL	Set.

68'-7 7/8" B.C.
 16'-0"
 HOIST
 SEE C935.

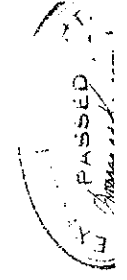
1'-0"
 4" G.F.W. PIPE LINE
 TO STREET W/TABLE OR
 AS DIRECTED BY LOCAL COUNCIL.
 CANOPY OVER
 SEE DWG B1640



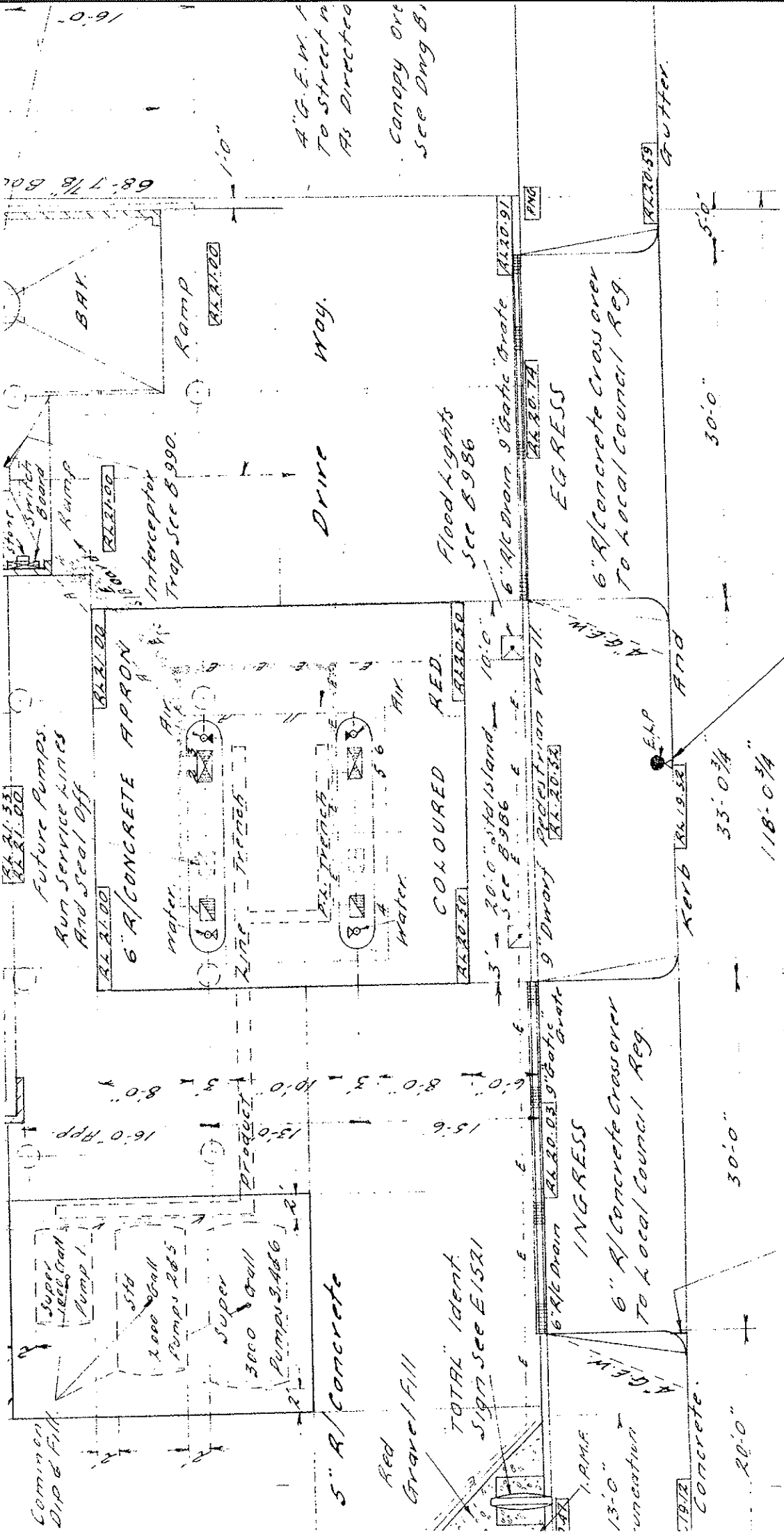
- B1633. WORKING DWG & ENGINEERING
- B1634. RAFT SLAB
- B1636. STRUCTURAL STEEL DETAILS
- B1637. CONSTRUCTION DETAILS
- B1638. JOINERY & CUPBOARD DETAILS
- B1640 CANOPY DETAILS
- D1429-30 W/GROUND TANKS.
- B986 . PUMP ISLAND DETAILS
- E1598 . DSI. CLIP DETAIL.

REFER

-E-E-E-
 -A-A-A-



7.



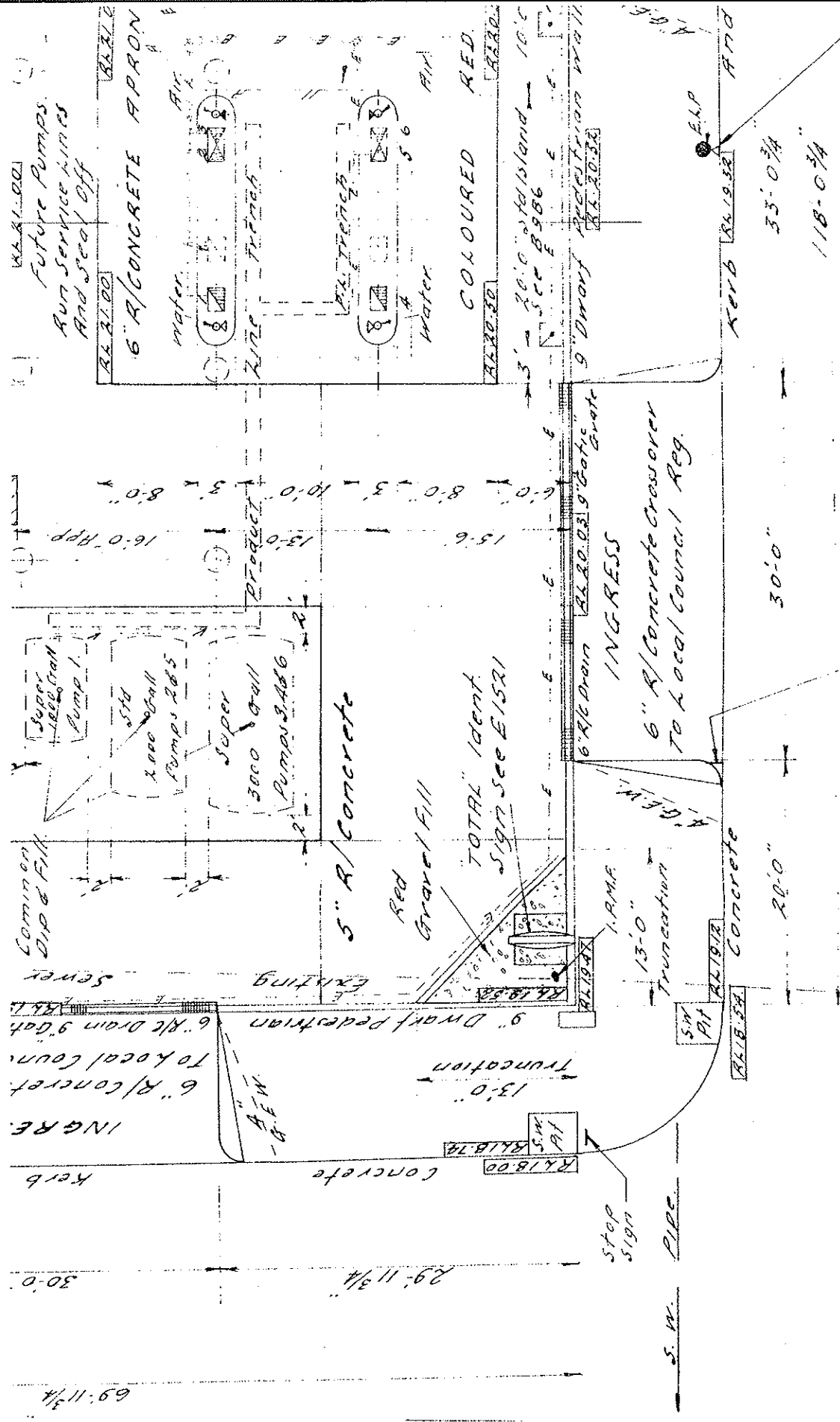
No standing Sign
To Be Removed.

B.M. on Kerb
At Pole.
R220.00

CORRIMAL STREET.

STREET.

BURELLI



No Standing Sign
To Be Removed.

CORRIMAL

S.M. ON A
AT POL
R220.00

69-1134

30-0-0

119'-9⁷/₈' Boundary

12-0
opening.

Flood Light
See 8986

86 1" Vents From
Up/ground Tanks.

6" R/concrete slab
over tanks. 2'-0" MIN.
Cover.

10/11/1907

Supergraph

4" R/concrete path

Future Pumps:
Run Service Lines
And Seal Off

RE 21.00

UAC

FOR DE
BU/LDIN
B1633. W
B1634. 1
B1636. 2
B1637. C

4079

40157
see C935.

Footings for Future
Multi-Story Building.

27-0-

116 Point.

226

blm

2001-01-12/45

OFFICE

Desk:

53745

05/27/50

2000

11153

1

1177

6176

1

1

1



Search results

Your search for: LGA: Wollongong City Council

Matched 16 notices relating to 9 sites.

Suburb	Address	Site Name	Notices related to this site
Bulli	7 Molloy Street	Scrapmetal Yard	1 current
Dapto	Kanahooka Road	Slag Dump	3 current
Fairy Meadow	46-58 Montague Street	Former Caltex Fuel Depot	1 current
Lysaghts	Springhill Road	BHP Area 21	1 current
Lysaghts	2 Five Islands Road	BHP No.2 Steelworks (Flat Products)	1 current and 1 former
Port Kembla	Flinders Street	Port Kembla Bunkering Facility	1 current
Port Kembla	Military and Darcy Roads	Port Kembla Copper and part of Orica IC Assets	2 current
Stanwell Tops	Plateau Road	Christian Conference Centre	1 current
Yallah	Tallawarra Road	Tallawarra Power Station	1 current and 3 former

Page 1 of 1

18 July 2005

E14497/3-AE
19 July 2005

APPENDIX B

Engineering Logs of Boreholes and Groundwater Monitoring Wells

Coffey 

Soil Description

Explanation Sheet (1 of 2)

DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with the Unified Soil Classification (UCS) as shown in the table on Sheet 2.

PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 µm to 2.36 mm
	medium	200 µm to 600µm
	fine	75 µm to 200 µm

MOISTURE CONDITION

Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.
Moist	Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH s_u (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 – 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 – 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 – 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 – 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	–	Crumbles or powders when scraped by thumbnail.

DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 – 35
Medium Dense	35 – 65
Dense	65 – 85
Very Dense	Greater than 85

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: < 5% Fine grained soils: <15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 – 12% Fine grained soils: 15 – 30%

SOIL STRUCTURE

ZONING		CEMENTING	
Layers	Continuous across exposure or sample.	Weakly cemented	Easily broken up by hand in air or water.
Lenses	Discontinuous layers of lenticular shape.	Moderately cemented	Effort is required to break up the soil by hand in air or water.
Pockets	Irregular inclusions of different material.		

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely weathered material	Structure and fabric of parent rock visible.
Residual soil	Structure and fabric of parent rock not visible.

TRANSPORTED SOILS

Aeolian soil	Deposited by wind.
Alluvial soil	Deposited by streams and rivers.
Colluvial soil	Deposited on slopes (transported downslope by gravity).
Fill	Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.
Lacustrine soil	Deposited by lakes.
Marine soil	Deposited in ocean basins, bays, beaches and estuaries.

Explanation Sheet (2 of 2) – Soil Description

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60 mm and basing fractions on estimated mass)					USC	PRIMARY NAME	
COARSE GRAINED SOILS More than 50% of material less than 63 mm is larger than 0.075 mm	(A 0.075 mm particle is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than 2.0 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	GRAVEL	
				Predominantly one size or a range of sizes with more intermediate sizes missing.	GP	GRAVEL	
			GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)	GM	SILTY GRAVEL	
				Plastic fines (for identification procedures see CL below)	GC	CLAYEY GRAVEL	
		SANDS More than half of coarse fraction is smaller than 2.0 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes missing.	SW	SAND	
				Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	SAND	
			SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).	SM	SILTY SAND	
				Plastic fines (for identification procedures see CL below).	SC	CLAYEY SAND	
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm	(A 0.075 mm particle is about the smallest particle visible to the naked eye)	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm.					
		SILTS & CLAYS Liquid limit less than 50	DRY STRENGTH	DILATANCY	TOUGHNESS		
			None to Low	Quick to slow	None	ML	SILT
			Medium to High	None	Medium	CL	CLAY
		SILTS & CLAYS Liquid limit greater than 50	Low to medium	Slow to very slow	Low	OL	ORGANIC SILT
			Low to medium	Slow to very slow	Low to medium	MH	SILT
			High	None	High	CH	CLAY
		Medium to high	None	Low to medium	OH	ORGANIC CLAY	
HIGHLY ORGANIC SOILS	Readily identified by colour, odour, spongy feel and frequently by fibrous texture.			PI	PEAT		
• Low plasticity – Liquid Limit W_L less than 35%. • Medium plasticity – W_L between 35% and 50%.							

• Low plasticity – Liquid Limit W_L less than 35%. • Medium plasticity – W_L between 35% and 50%.

COMMON DEFECTS IN SOIL

TERM	DEFINITION	DIAGRAM
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.	
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed. The term 'fissure' may be used for irregular joints <0.2m in length.	
SHEARED ZONE	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect	

TERM	DEFINITION	DIAGRAM
SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter	
TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	
INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open joints.	

Rock Description

Explanation Sheet (1 of 2)



Colfeys

The descriptive terms used by Colfeys are given below. They are broadly consistent with Australian Standard AS1726-1993.

DEFINITIONS: Rock substance, defect and mass are defined as follows:

Rock Substance	In engineering terms rock substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or water. Other material is described using soil descriptive terms. Effectively homogenous material, may be isotropic or anisotropic.
Defect	Discontinuity or break in the continuity of a substance or substances.
Mass	Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.

SUBSTANCE DESCRIPTIVE TERMS:

ROCK NAME	Simple rock names are used rather than precise geological classification
PARTICLE SIZE	Grain size terms for sandstone are:
Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mm to 0.6mm
Fine grained	Mainly 0.06mm (just visible) to 0.2mm
FABRIC	Terms for layering or penetrative fabric (eg. bedding, cleavage etc.) are:
Massive	No layering or penetrative fabric.
Indistinct	Layering or fabric just visible. Little effect on properties.
Distinct	Layering or fabric is easily visible. Rock breaks more easily parallel to layering or fabric.

ROCK SUBSTANCE STRENGTH TERMS

Term	Abbreviation	Point Load Index, I_{p50} (MPa)	Field Guide
Very Low	VL	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be pried with a knife; pieces up to 30mm thick can be broken by finger pressure.
Low	L	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm blows of a pick point; has a dull sound under hammer. Pieces of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	H	1 to 3	A piece of core 150mm long by 50mm can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	3 to 10	Hand specimen breaks after more than one blow of a pick; rock rings under hammer.
Extremely High	EH	More than 10	Specimen requires many blows with geological pick to break; rock rings under hammer.

CLASSIFICATION OF WEATHERING PRODUCTS

Term	Abbreviation	Definition
Residual Soil	RS	Soil derived from the weathering of rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely Weathered Material	XW	Material is weathered to such an extent that it has soil properties, ie. it either disintegrates or can be remoulded in water. Original rock fabric still visible.
Highly Weathered Rock	HW	Rock strength is changed by weathering. The whole of the rock substance is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Some minerals are decomposed to clay minerals. Porosity may be increased by leaching or may be decreased due to the deposition of minerals in pores.
Moderately Weathered Rock	MW	The whole of the rock substance is discoloured, usually by iron staining or bleaching, to the extent that the colour of the fresh rock is no longer recognisable.
Slightly Weathered Rock	SW	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance (usually by limonite) has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.
Fresh Rock	FR	Rock substance unaffected by weathering.

Notes on Weathering:

- AS1726 suggests the term "Distinctly Weathered" (DW) to cover the range of substance weathering conditions between XW and SW. For projects where it is not practical to delineate between HW and MW or it is judged that there is no advantage in making such a distinction, DW may be used with the definition given in AS1726.
- Where physical and chemical changes were caused by hot gasses and liquids associated with igneous rocks, the term "altered" may be substituted for "weathering" to give the abbreviations XA, HA, MA, SA and DA.

Notes on Rock Substance Strength:

- In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy.
- The term "extremely low" is not used as a rock substance strength term. While the term is used in AS1726-1993, the field guide therein makes it clear that materials in that strength range are soils in engineering terms.
- The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fail across the planar anisotropy) is typically 10 to 25 times the point load index (I_{p50}). The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.

Explanation Sheet (2 of 2) – Rock Description



Coffey

COMMON DEFECTS IN ROCK MASSES

Term **Definition**

Parting A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering (eg bedding) or a planar anisotropy in the rock substance (eg, cleavage). May be open or closed.

Diagram

Map Symbol

Graphic Log (Note 1)

DEFECT SHAPE TERMS

Planar The defect does not vary in orientation

Curved The defect has a gradual change in orientation

Undulating The defect has a wavy surface

Stepped The defect has one or more well defined steps

Irregular The defect has many sharp changes of orientation

Note: The assessment of defect shape is partly influenced by the scale of the observation.

ROUGHNESS TERMS

Slickensided Grooved or striated surface, usually polished

Polished Shiny smooth surface

Smooth Smooth to touch. Few or no surface irregularities

Rough Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.

Very Rough Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.

COATING TERMS

Clean No visible coating

Stained No visible coating but surfaces are discoloured

Veneer A visible coating of soil or mineral, too thin to measure; may be patchy

Coating A visible coating up to 1mm thick. Thicker soil material is usually described using appropriate defect terms (eg, infilled seam). Thicker rock strength material is usually described as a vein.

BLOCK SHAPE TERMS

Blocky Approximately equidimensional

Tabular Thickness much less than length or width

Columnar Height much greater than cross section

Joint A surface or crack across which the rock has little or no tensile strength but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.

Sheared Zone (Note 3) Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.

Sheared Surface (Note 3) A near planar, curved or undulating surface which is usually smooth, polished or slickensided.

Crushed Seam (Note 3) Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.

Infilled Seam Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint. Infilled seams less than 1mm thick may be described as veneer or coating on joint surface.

Extremely Weathered Seam Seam of soil substance, often with gradational boundaries. Formed by weathering of the rock substance in place.

Notes on Defects:

1. Usually borehole logs show the true dip of defects and face sketches and sections the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.
3. Sheared zones, sheared surfaces and crushed seams are faults in geological terms.

Borehole No. **CGBH2****Engineering Log - Borehole**Sheet 1 of 1
Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **1.6.2005**

Principal:

Date completed: **1.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **JB**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drill model and mounting: GEMCO 210B TRAILER Easting: slope: -90° R.L. Surface: NOT MEASURED
 hole diameter: 100 mm Northing bearing: datum:

drilling information					material substance																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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BOREHOLE E14497/3 BH.GPJ COFFEY.GDT 18.07.05

Form GEO 5.3 Issue 3 Rev.2

Engineering Log - Piezometer

Sheet 1 of 1

Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **1.6.2005**

Principal:

Date completed: **1.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **JB**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drilling information				material substance			
method	penetration	support	notes	well details	depth	material	structure and additional observations
1 2 3			samples, tests, etc	RL	metres	soil type: plasticity or particle characteristics, colour, secondary and minor components.	
ADVPT		N				CONCRETE:	PAVEMENT
			E			FILL: Sand: fine to coarse grained, dark brown	FILL
						FILL: Clayey SAND/Sandy CLAY: fine to medium grained, dark brown, high plasticity clays	no odour
			SPT 1,2,2 N*=4		1	CH Silty CLAY: high plasticity, grey/dark brown, trace of rootlets noted	RESIDUAL
						becoming grey/brown/orange mottled from 0.9m	no odour
					2	CH Silty CLAY: high plasticity, grey/orange mottled, with traces of fine to medium grained angular ironstone gravel, trace of rootlets noted	no odour
			SPT 1,3,2 N*=5		3	CH Silty CLAY: high plasticity, grey with trace of orange staining	XW SANDSTONE
					4		
			SPT 3,6,8 N*=14		5	CL Silty CLAY: medium plasticity, grey/orange/red with trace of fine to medium grained subangular to angular ironstone gravel	VSu/H
						Silty CLAY: high plasticity, grey	
					6	CH Silty CLAY: high plasticity, grey/orange, with some fine to medium grained gravel sand	VSu/H
			SPT 4,8,7 N*=15		7	CL-CH Silty CLAY: medium to high plasticity, dark grey/orange with some red staining and fine to medium grained, angular ironstone gravel	VSt
					8	SANDSTONE: fine grained, orange/grey, low to medium strength	HW SANDSTONE
						Borehole terminated at 7.7m	

method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
AS auger screwing*	C casing N nil	U ₅₀ undisturbed sample 50mm diameter		VS very soft
AD auger drilling*		D disturbed sample		S soft
RR roller/tricone		N standard penetration test (SPT)		F firm
W washbore		N* SPT - sample recovered		St stiff
CT cable tool		Nc SPT with solid cone		VSt very stiff
HA hand auger		V vane shear (kPa)		H hard
DT diatube		P pressure meter		Fb friable
B blank bit		Bs bulk sample		VL very loose
V V bit		R refusal		L loose
T TC bit		E environmental sample		MD medium dense
*bit shown by suffix		PID PID measurement		D dense
e.g. ADT		WS water sample		VD very dense
		PZ piezometer		

penetration	water
1 2 3 4	
	no resistance ranging to refusal
	10/1/98 water level on date shown
	water inflow
	water outflow

moisture
D dry
M moist
W wet
Wp plastic limit
WL liquid limit

PIEZOMETER E14497-3 BH.GPJ COFFEY.GDT 18.07.05

Form GEO 5.10 Issue 3 Rev.0

Engineering Log - Borehole

Client: **BELMORGAN PROPERTY DEVELOPMENT**

Date started: 1.6.2005

Principal:

Date completed: 1.6.2005

Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**

Logged by: **JB**

Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**

Checked by:

drill model and mounting:	GEMCO 210B TRAILER	Easting:	slope:	-90°	R.L. Surface:	NOT MEASURED
hole diameter:	100 mm	Northing	bearing:		datum:	

drilling information							material substance									
method	penetration			support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type; plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations	
	1	2	3											100 200 300 400		
ADVT				N							CONCRETE:				PAVEMENT	
						E					FILL: Sand: fine to coarse grained, dark brown FILL: Clayey SAND/Sandy CLAY: fine to medium grained, dark brown, high plasticity clays	M >Wp	MD F		FILL no odour	
						SPT 1,2,2 N*=4		1		CH	Silty CLAY: high plasticity, grey/dark brown, trace of rootlets noted becoming grey/brown/orange mottled from 0.9m	>Wp	F		RESIDUAL no odour	
								2		CH	Silty CLAY: high plasticity, grey/orange mottled, with traces of fine to medium grained angular ironstone gravel, trace of rootlets noted	<Wp	F		no odour	
						SPT 1,3,2 N*=5		3		CH	Silty CLAY: high plasticity, grey with trace of orange staining	<Wp	St	X	XW SANDSTONE	
								4								
						SPT 3,6,8 N*=14		5		CL CH	Silty CLAY: medium plasticity, grey/orange/red with trace of fine to medium grained subangular to angular ironstone gravel Silty CLAY: high plasticity, grey	<Wp <Wp	VSt/H	X		
								6		CH	Silty CLAY: high plasticity, grey/orange, with some fine to medium grained gravel sand	>Wp/W	VSt/H	X		
						SPT 4,8,7 N*=15		7		CL-CH	Silty CLAY: medium to high plasticity, dark grey/orange with some red staining and fine to medium grained, angular ironstone gravel	W<Wp	VSt	X		
								8			SANDSTONE: fine grained, orange/grey, low to medium strength Borehole CGBH4/MW2 terminated at 7.7m				HW SANDSTONE	

method	support	notes, samples, tests	classification symbols and soil description based on unified classification system	consistency/density index
AS auger screwing*	M mud N nil	U ₅₀ undisturbed sample 50mm diameter	moisture D dry M moist W wet Wp plastic limit W _L liquid limit	VS very soft
AD auger drilling*	C casing	U ₆₃ undisturbed sample 63mm diameter		S soft
RR roller/tricone		D disturbed sample		F firm
W washbore	penetration 1 2 3 4	N standard penetration test (SPT)		St stiff
CT cable tool	no resistance ranging to refusal	N* SPT - sample recovered		VSt very stiff
HA hand auger	water	Nc SPT with solid cone		H hard
DT diatube	10/1/98 water level on date shown	V vane shear (kPa)		Fb friable
B blank bit	water inflow	P pressuremeter		VL very loose
V V bit	water outflow	Bs bulk sample		L loose
T TC bit		E environmental sample		MD medium dense
*bit shown by suffix e.g., ADT		R refusal	D dense	
				VD very dense

Borehole No. **CGBH5****Engineering Log - Borehole**Sheet 1 of 1
Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **1.6.2005**

Principal:

Date completed: **1.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **JB**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations
1	2	3							soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
ADV		N		E		1			ASPHALT: FILL: Sandy GRAVEL: fine to medium grained, angular, dark grey, sand fine to medium grained	M	MD		PAVEMENT FILL
									FILL: SAND: fine to medium grained, grey	W	LMD		slight hydrocarbon odour
				SPT 1,3,5 N*=8					FILL: Silty CLAY: high plasticity, grey with some sand FILL: SAND: fine to medium grained, grey	>Wp W	F LMD		moderate hydrocarbon odour
						2			FILL: Silty CLAY: high plasticity, grey, with some fine to medium grained sand FILL: SAND: fine to medium grained, grey	>Wp	F		
				E		3		CH	Silty CLAY: high plasticity, grey, with a trace of orange staining and green discolouration becoming grey with orange staining from 2.5m green discolouring noted from 2.5-3.1m	>Wp	S/F		RESIDUAL faint hydrocarbon odour no odour from 2.5m
				E		4		CH	Silty CLAY: high plasticity, grey/orange	>Wp	St/VSt		XW SANDSTONE no odour
						5			Borehole CGBH5 terminated at 4m				
						6							
						7							
						8							

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT dialube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water 10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Form GEO 5.3 Issue 3 Rev.2 BOREHOLE E14497-3 BH.GPJ COFFEY.GDT 18.07.05

Engineering Log - Borehole

Client: **BELMORGAN PROPERTY DEVELOPMENT**

Principal:

Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**

Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**

drill model and mounting:		GEMCO 210B TRAILER		Easting:		slope: -90°		R.L. Surface: NOT MEASURED					
hole diameter:		100 mm		Northing		bearing:		datum:					
drilling information					material substance								
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro- meter kp a 100 200 300 400	structure and additional observations
1	2	3											
ADT		N							CONCRETE				PAVEMENT
				E					FILL: SAND: fine to medium grained, dark brown FILL: Silty CLAY: high plasticity, black, dark grey	M <Wp	VD F		FILL moderate hydrocarbon odour
				SPT 1,2,2 N*=4		1		CH	Silty CLAY: high plasticity, brown/grey with trace of orange staining organic matter and brown staining noted from 1.15-1.25m	>Wp <Wp	F St		RESIDUAL slight hydrocarbon odour no odour from 1.25m
				SPT 1,1,1 N*=2		2			becoming grey/orange from 2.0m	>Wp	F		
						3		CH	Silty CLAY: high plasticity, grey with pale orange staining, with some fine to medium grained sand	>Wp/W	F/St		
						4			Borehole CGBH6/MW3 terminated at 3m				
						5							
						6							
						7							
						8							
method		support		N nil		notes, samples, tests		classification symbols and soil description based on unified classification system		consistency/density index			
AS AD RR W CT HA DT B V T *bit shown by suffix e.g. ADT		M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow				U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal		moisture D dry M moist W wet Wp plastic limit W _L liquid limit		VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense			

Engineering Log - Piezometer

Sheet 1 of 1

Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **1.6.2005**

Principal:

Date completed: **1.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **JB**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drilling information				material substance			
method	penetration	support	notes	well details	depth	material	structure and additional observations
1 2 3			samples, tests, etc	RL	metres	soil type: plasticity or particle characteristics, colour, secondary and minor components.	
ADV		N				CONCRETE	PAVEMENT
			E			FILL: SAND: fine to medium grained, dark brown	FILL
			SPT 1,2,2 N*=4			FILL: Silty CLAY: high plasticity, black, dark grey	moderate hydrocarbon odour
					1	Silty CLAY: high plasticity, brown/grey with trace of orange staining	RESIDUAL
						organic matter and brown staining noted from 1.15-1.25m	slight hydrocarbon odour
			SPT 1,1,1 N*=2		2	becoming grey/orange from 2.0m	no odour from 1.25m
					3	Silty CLAY: high plasticity, grey with pale orange staining, with some fine to medium grained sand	
						Borehole terminated at 3m	
					4		
					5		
					6		
					7		
					8		

method	support	notes, samples, tests	classification symbols and soil description	consistency/density index
AS auger screwing*	C casing N nil	U ₅₀ undisturbed sample 50mm diameter	VS very soft	
AD auger drilling*		D disturbed sample	S soft	
RR roller/tricone		N standard penetration test (SPT)	F firm	
W washbore		N* SPT - sample recovered	St stiff	
CT cable tool		Nc SPT with solid cone	VSt very stiff	
HA hand auger		V vane shear (kPa)	H hard	
DT dialube		P pressure meter	Fb friable	
B blank bit		Bs bulk sample	VL very loose	
V V bit		R refusal	L loose	
T TC bit		E environmental sample	MD medium dense	
*bit shown by suffix		PID PID measurement	D dense	
e.g. ADT		WS water sample	VD very dense	
		PZ piezometer		

PIEZOMETER E14497-3 BH.GPJ COFFEY.GDT 18.07.05

Form GEO 5.10 Issue 3 Rev.0

Borehole No. **CGBH7****Engineering Log - Borehole**Sheet 1 of 3
Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **10.6.2005**

Principal:

Date completed: **10.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drilling information				material substance								
method	penetration	support	water	notes samples, tests, etc	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations
1	2	3			RL			soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
AD		N						CONCRETE: (reinforced)	W	L		PAVEMENT
								FILL: Sandy GRAVEL: fine to coarse grained gravel, fine to coarse grained sand, subangular to subrounded				FILL No odour
							CH	Silty CLAY: high plasticity, grey to orange-brown mottled, some rootlets	>Wp	F		RESIDUAL No odour
					1					St		
					2					VSt		
					3		CH	Silty CLAY: high plasticity, grey to orange-brown mottled, some fine grained sand	>Wp	VS/H		XW SANDSTONE
					4							
					5		CH	Silty Sandy CLAY: pale grey to orange-brown banded	M	VS/H		XW SANDSTONE (trace HW bands)
					6			SANDSTONE: fine grained, pale brown, low to medium strength				HW SANDSTONE
					7			Borehole CGBH7 continued as cored hole				
					8							

method	support	notes, samples, tests	classification symbols and soil description based on unified classification system	consistency/density index
AS AD RR W CT HA DT B V T *bit shown by suffix e.g. ADT	M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	moisture D dry M moist W wet Wp plastic limit WL liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

BOREHOLE E14497/3 BH.GPJ COFFEY.GDT 18.07.05

Form GEO 5.3 Issue 3 Rev.2

Borehole No. **CGBH7**

Sheet 2 of 3
Office Job No.: **E14497/3**

Engineering Log - Cored Borehole

Client: **BELMORGAN PROPERTY DEVELOPMENT**

Date started: 10.6.2005

Principal:

Date completed: **10.6.2005**

Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**

Logged by: **DH**

Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**

Checked by:

drill model & mounting: FOX TRUCK										Easting:		slope: -90°		R.L. Surface:		NOT MEASURED	
hole diameter: 100 mm Drilling fluid:										Northing:		bearing:		datum:			
drilling information										material substance				rock mass defects			
method	core-lift	water	RL	depth metres	graphic log	core recovery	material	weathering alteration	estimated strength	IS ₅₀₀ MPa	D- diam- etral	A- axial	defect spacing mm	defect description			
							rock type; grain characteristics, colour, structure, minor components		VL L M H VH EH				30 100 300 1000 3000	particular	general		
				1													
				2													
				3													
				4													
				5													
				6			Continued from non-cored borehole										
				7			NO CORE: 5.80m to 6.0m										
				8			SANDSTONE: fine grained, grey, orange-brown and pale grey, some staining, some clay bands up to 30mm, some gravel bands up to 10mm	MW/SW									
				9			SANDSTONE: fine grained, grey, trace orange-brown staining	SW/FR									
				10													
				11													
				12													
				13													
				14													
				15													
				16													
				17													
				18													
				19													
				20													
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				37													
				38													

Borehole No. **CGBH7****Engineering Log - Cored Borehole**

Sheet 3 of 3

Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **10.6.2005**

Principal:

Date completed: **10.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drill model & mounting: FOX TRUCK				Easting:		slope: -90°		R.L. Surface: NOT MEASURED					
hole diameter: 100 mm Drilling fluid:				Northing:		bearing:		datum:					
drilling information				material substance				rock mass defects					
method	core-lift	water	RL	depth metres	graphic log core recovery	material	weathering alteration	estimated strength	IS ₍₅₀₎ MPa	D-diam- etral A-axial	RQD %	defect spacing mm	defect description
						rock type; grain characteristics, colour, structure, minor components		VL L M H VH EH			30 100 300 1000 3000		particular general
NMLC	NONE			9		SANDSTONE: fine grained, grey, trace orange-brown staining (<i>continued</i>)	SW/FR				42		
				10									
				11		CGBH7 terminated at 10.52m							
				12									
				13									
				14									
				15									
				16									

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift  casing used  barrel withdrawn graphic log/core recovery  core recovered  - graphic symbols indicate material  no core recovered	water  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss  water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE E14497-3 BH.GPJ COFFEY.GDT 18.07.05

Form GEO 5.5 Issue 3 Rev. 3

Coffey

Borehole No. **CGBH7****Engineering Log - Piezometer**Sheet 1 of 2
Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **10.6.2005**

Principal:

Date completed: **10.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drilling information				material substance						
method	penetration	support	water	notes samples, tests, etc	well details	depth metres	material	moisture condition	consistency/density index	structure and additional observations
1	2	3					soil type: plasticity or particle characteristics, colour, secondary and minor components.			
ADMT		N		E		1	CONCRETE: (reinforced)	W	L	PAVEMENT
				E		1	FILL: Sandy GRAVEL: fine to coarse grained gravel, fine to coarse grained sand, subangular to subrounded	>Wp	F	RESIDUAL
				E		1	Silty CLAY: high plasticity, grey to orange-brown mottled, some rootlets			No odour
						2			St	
						3	CH Silty CLAY: high plasticity, grey to orange-brown mottled, some fine grained sand	>Wp	VS/H	XW SANDSTONE
						4				
						5	CH Silty Sandy CLAY: pale grey to orange-brown banded	M	VS/H	XW SANDSTONE (trace HW bands)
						6	SANDSTONE: fine grained, pale brown, low to medium strength			HW SANDSTONE
						6	NO CORE: 5.80m to 6.0m			
						7	SANDSTONE: fine grained, grey, orange-brown and pale grey, some staining, some clay bands up to 30mm, some gravel bands up to 10mm			
						7	SANDSTONE: fine grained, grey, trace orange-brown staining			
						8				

method	support	notes, samples, tests	classification symbols and soil description based on unified classification system	consistency/density index
AS AD RR W CT HA DT B V T *bit shown by suffix e.g. ADT	auger screwing* auger drilling* roller/tricone washbore cable tool hand auger diatube blank bit V bit TC bit	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	U ₅₀ D N N* Nc V P Bs R E PID WS PZ undisturbed sample 50mm diameter disturbed sample standard penetration test (SPT) SPT - sample recovered SPT with solid cone vane shear (kPa) pressure meter bulk sample refusal environmental sample PID measurement water sample piezometer	VS S F St VSt H Fb VL L MD D VD very soft soft firm stiff very stiff hard friable very loose loose medium dense dense very dense

Borehole No. **CGBH7****Engineering Log - Piezometer**

Sheet 2 of 2

Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **10.6.2005**

Principal:

Date completed: **10.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**

Checked by:

drill model & mounting: FOX TRUCK				Easting:		slope: -90°		R.L. Surface: NOT MEASURED					
hole diameter: 100				Northing:		bearing:		datum:					
drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/ density index	structure and additional observations
NMLC							9			SANDSTONE: fine grained, grey, trace orange-brown staining (continued)			
							10						
							11			Borehole terminated at 10.52m			
							12						
							13						
							14						
							15						
							16						

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER E14497-3 BH.GPJ COFFEY.GDT 19.07.05

Form GEO 5.10 Issue 3 Rev.0

Borehole No. **CGBH8**

Sheet 1 of 3
Office Job No.: **E14497/3**

Engineering Log - Borehole

Client: **BELMORGAN PROPERTY DEVELOPMENT**

Date started: 9.6.2005

Principal:

Date completed: **9.6.2005**

Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**

Logged by: **DH/CCH**

Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**

Checked by: 

drilling information										material substance									
method	penetration	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/ density index	pocket penetro- meter kPa	structure and additional observations						
1	2	3							soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400							
AD		N		E					CONCRETE: Reinforced 5mm				PAVEMENT						
				E					FILL: Gravelly SAND: fine to coarse grained, dark grey with fragments of glass and decaying wood. Gravel is coarse subangular and subrounded	W	L		FILL						
				SPT 1,1,2 N*=3		1		CH	CONCRETE: Reinforced 5mm	M	MD		no odour or staining						
									FILL: Gravelly SAND: coarse grained, black and white particles, Gravel fine grained subangular	>Wp	F		PAVEMENT						
									FILL: Sandy CLAY: medium plasticity, dark brown/black with a trace of fine grained gravel subrounded, Sand fine to medium grained	>Wp	St		FILL (ASH)						
									Silty CLAY: high plasticity, brown/orange mottled with some rootlets				FILL						
				SPT 2,2,2 N*=4		2							no odour						
													RESIDUAL						
													no odour						
				SPT 3,5,6 N*=11		3		CH	Silty CLAY: high plasticity, brown/orange mottled	<Wp	VSt		(2 samples collected 0.5m-0.7m & 0.7m-0.95m)						
				SPT 4,6,7 N*=13		4		CL-CH	Silty Sandy CLAY: pale grey, medium to high plasticity, sand is fine to medium grained, some fine grained gravel, orange-brown bands	<Wp	VSt/H								
									SANDSTONE: fine to medium grained, low to medium strength				HW SANDSTONE						
									Borehole CGBH8 continued as cored hole										
						5													
						6													
						7													
						8													

method

AS auger screwing*

AD auger drilling*

RR roller/tricone

W washbore

CT cable tool

HA hand auger

DT diatube

B blank bit

V V bit

T TC bit

*bit shown by suffix e.g. ADT

support

M mud

C casing

penetration

1 2 3 4

no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U₅₀ undisturbed sample 50mm diameter

U₆₃ undisturbed sample 63mm diameter

D disturbed sample

N standard penetration test (SPT)

N* SPT - sample recovered

Nc SPT with solid cone

V vane shear (kPa)

P pressuremeter

Bs bulk sample

E environmental sample

R refusal

consistency/symbols and soil description based on unified classification system

moisture

D dry

M moist

W wet

Wp plastic limit

W_L liquid limit

consistency/density index

VS very soft

S soft

F firm

St stiff

VSt very stiff

H hard

Fb friable

VL very loose

L loose

MD medium dense

D dense

VD very dense

E14497/3

**BELMORGAN PROPERTY DEVELOPMENT
ENVIRONMENTAL SITE ASSESSMENT AND GEOTECHNICAL INVESTIGATION
CNR BURELLI, CORRIMAL AND CROWN STREETS, WOLLONGONG**

CGBH8 4.45m – 10.60m



Borehole No. **CGBH8****Engineering Log - Cored Borehole**

Sheet 2 of 3

Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **9.6.2005**

Principal:

Date completed: **9.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH/CCH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drill model & mounting: FOX TRUCK				Easting:		slope: -90°		R.L. Surface: NOT MEASURED			
hole diameter: 100 mm Drilling fluid:				Northing:		bearing:		datum:			
drilling information				material substance				rock mass defects			
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength	IS ₅₀ MPa D-diam- etral A- axial	defect spacing mm	defect description type, inclination, planarity, roughness, coating, thickness
				1							
				2							
				3							
				4							
				5		Continued from non-cored borehole NO CORE: 4.45m-4.6m SANDSTONE: fine grained, grey with orange-brown staining and mottling, swaley bedding, clay seams up to 90mm thick, some fine to medium grained gravelly bands up to 70mm thick	MW		D A 1.85 1.89	34	- SM @ 0-10deg, PL, RO, CO - SM @ 45deg, PL, RO, CO - SM @ 0-10deg, PL, RO, CO
				6						10	- SM @ 0-10deg, PL, RO, CO
				7							
				8		NO CORE: 7.1m-7.15m SANDSTONE: fine grained, grey, swaley bedding, some orange-brown staining	SW			10	

method

DT diatube
AS auger screwing
AD auger drilling
RR roller/tricone
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core-lift

 casing used
 barrel withdrawn

graphic log/core recovery

 core recovered
 - graphic symbols indicate material
 no core recovered

water

 10/1/98 water level on date shown
 water inflow
 partial drill fluid loss
 complete drill fluid loss

 water pressure test result (lugeons) for depth interval shown

weathering

FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

strength

VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type

JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity

PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness

VR very rough
RO rough
SO smooth
SL slickensided

coating

CN clean
SN stained
VN veneer
CO coating

CORED BOREHOLE E14497-3 BH.GPJ COFFEY.GDT 18.07.05

Form GEO 5.5 Issue 3 Rev. 3

Borehole No. **CGBH8****Engineering Log - Cored Borehole**

Sheet 3 of 3

Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **9.6.2005**

Principal:

Date completed: **9.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH/CCH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drill model & mounting: FOX TRUCK				Easting:		slope: -90°		R.L. Surface: NOT MEASURED			
hole diameter: 100 mm				Drilling fluid:		Northing:		bearing:			
drilling information		material substance				rock mass defects					
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength VL L M H VH EH	is ₍₅₀₎ MPa D-diam- etral A-axial	defect spacing mm 30 100 300 1000 3000	defect description type, inclination, planarity, roughness, coating, thickness
NMLC	NONE			9		SANDSTONE: fine grained, grey, swaley bedding, some orange-brown staining (continued)	SW				particular JT @ 80 deg, PL, RO, SN
				10			MW		D A 1.220.92	10	— JT @ 90deg, PL, RO, SN
				11		CGBH8 terminated at 10.6m					
				12							
				13							
				14							
				15							
				16							

method DT AS AD RR CB NMLC NQ, HQ, PQ	diatube auger screwing auger drilling roller/tricone claw or blade bit NMLC core wireline core	core-lift  casing used  barrel withdrawn graphic log/core recovery  core recovered  - graphic symbols  indicate material  no core recovered	water  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss  water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
--	--	--	---	---	--

CORED BOREHOLE E14497-3 BH GPJ COFFEY.GDT 18.07.05

Form GEO 5.5 Issue 3 Rev. 3

Borehole No. **CGBH8**

Sheet 1 of 2
Office Job No.: **E14497/3**

Engineering Log - Piezometer

Client: **BELMORGAN PROPERTY DEVELOPMENT**

Date started: 9.6.2005

Principal:

Date completed: **9.6.2005**

Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**

Logged by: **DH/CCH**

Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**

Checked by: 

drill model & mounting: FOX TRUCK				Easting:		slope: -90°		R.L. Surface: NOT MEASURED				
hole diameter: 100				Northing:		bearing:		datum:				
drilling information				material substance								
method	penetration	support	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
1	2	3										
ADV		N							CONCRETE: Reinforced 5mm			PAVEMENT
			E						FILL: Gravelly SAND: fine to coarse grained, dark grey with fragments of glass and decaying wood. Gravel is coarse subangular and subrounded	W	L	FILL
			F						CONCRETE: Reinforced 5mm	M	MD	no odour or staining
			SPT 1,1,2 N*=3			1		CH	FILL: Gravelly SAND: coarse grained, black and white particles. Gravel fine grained subangular	>Wp	F	PAVEMENT
									FILL: Sandy CLAY: medium plasticity, dark brown/black with a trace of fine grained gravel subrounded. Sand fine to medium grained	>Wp	St	FILL (ASH)
			SPT 2,2,2 N*=4			2			Silty CLAY: high plasticity, brown/orange mottled with some rootlets			no odour
												RESIDUAL
			SPT 3,5,6 N*=11			3		CH		<Wp	VSt	no odour
												(2 samples collected 0.5m-0.7m & 0.7m-0.95m)
			SPT 4,6,7 N*=13			4		CL-CH	Silty Sandy CLAY: pale grey, medium to high plasticity, sand is fine to medium grained, some fine grained gravel, orange-brown bands	<Wp	VSt/H	XW SANDSTONE
NMLC						5			SANDSTONE: fine to medium grained, low to medium strength			HW SANDSTONE
									NO CORE: 4.45m-4.6m			
						6			SANDSTONE: fine grained, grey with orange-brown staining and mottling, swaley bedding, clay seams up to 90mm thick, some fine to medium grained gravelly bands up to 70mm thick			
						7						
									NO CORE: 7.1m-7.15m			
						8			SANDSTONE: fine grained, grey, swaley bedding, some orange-brown staining			

method

AS auger screwing*

AD auger drilling*

RR roller/tricone

W washbore

CT cable tool

HA hand auger

DT dialube

B blank bit

V V bit

T TC bit

*bit shown by suffix e.g. ADT

support

C casing

N nil

penetration

1 2 3 4

no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U₅₀ undisturbed sample 50mm diameter

D disturbed sample

N standard penetration test (SPT)

N* SPT - sample recovered

Nc SPT with solid cone

V vane shear (kPa)

P pressure meter

Bs bulk sample

R refusal

E environmental sample

PID PID measurement

WS water sample

P7 piezometer

classification symbols and soil description based on unified classification system

moisture

D dry

M moist

W wet

Wp plastic limit

W_L liquid limit

consistency/density index

VS very soft

S soft

F firm

St stiff

VSt very stiff

H hard

Fb friable

VL very loose

L loose

MD medium dense

D dense

VD very dense

Borehole No. **CGBH8****Engineering Log - Piezometer**Sheet 2 of 2
Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **9.6.2005**

Principal:

Date completed: **9.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH/CCH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: **Coffey**

drill model & mounting: FOX TRUCK				Easting:		slope: -90°		R.L. Surface: NOT MEASURED					
hole diameter: 100				Northing:		bearing:		datum:					
drilling information				material substance									
method	penetration	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/ density index	structure and additional observations
1	2	3								soil type: plasticity or particle characteristics, colour, secondary and minor components.			
NMLC							9			SANDSTONE: fine grained, grey, swaley bedding, some orange-brown staining (continued)			
							10						
							11			Borehole terminated at 10.6m			
							12						
							13						
							14						
							15						
							16						
method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT dialtube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT				support C casing N nil penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow		notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer		classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit		consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense			

PIEZOMETER E14497-3 BH.GPJ COFFEY.GDT 19.07.05

Form GEO 5.10 Issue 3 Rev.0

Borehole No. **CGBH9****Engineering Log - Borehole**

Sheet 1 of 3

Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **10.6.2005**

Principal:

Date completed: **10.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drilling information				material substance									
method	penetration	support	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations	
1	2	3						soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400		
ADT		N	E		1		CH	CONCRETE: Reinforced FILL: Gravelly SAND: fine to coarse grained, gravel is fine to coarse grained, subangular to subrounded FILL: Gravelly Sandy CLAY: high plasticity, brown Silty CLAY: high plasticity, grey to orange-brown mottled, some rootlets	W	L		PAVEMENT	
			E						>Wp	F		FILL	
									>Wp	F		no odour	
			SPT 1,2,2 N*=4		2							FILL	
												no odour	
			SPT 2,2,3 N*=5							St		RESIDUAL	
												no odour	
			SPT 2,2,3 N*=5		3		CH	Silty CLAY: high plasticity, grey to orange-brown mottled, some fine grained sand	>Wp	VSt		XW SANDSTONE	
			SPT 2,4,4 N*=8		4		CL-CH	Silty Sandy CLAY: pale grey to orange-brown banded	M	VSt/H		XW SANDSTONE (trace HW bands)	
			SPT 9,R,- N*=R		5			Borehole CGBH9 continued as cored hole				SPT Bouncing @ 4.73m, 9.10/80mm, R	
					6								
					7								
					8								

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT dial tube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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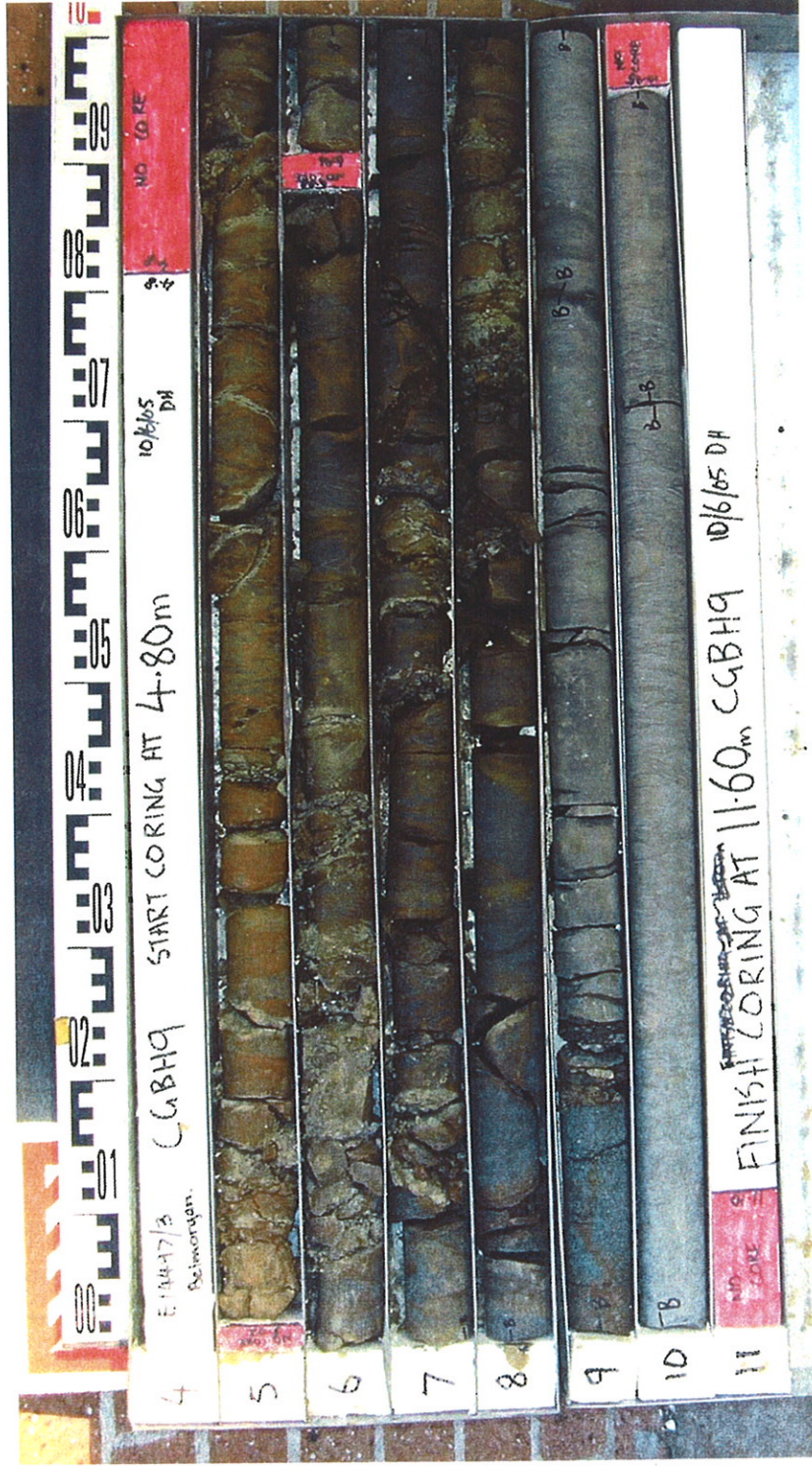
BOREHOLE E14497-3 BH.GPJ COFFEY.GDT 18.07.05

Form GEO 5.3 Issue 3 Rev.2

E14497/3

**BELMORGAN PROPERTY DEVELOPMENT
ENVIRONMENTAL SITE ASSESSMENT AND GEOTECHNICAL INVESTIGATION
CNR BURELLI, CORRIMAL AND CROWN STREETS, WOLLONGONG**

CGBH9 4.80m – 11.60m



Borehole No. **CGBH9****Engineering Log - Cored Borehole**

Sheet 2 of 3

Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **10.6.2005**

Principal:

Date completed: **10.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drill model & mounting: FOX TRUCK				Easting:		slope: -90°		R.L. Surface: NOT MEASURED				
hole diameter: 100 mm				Drilling fluid:		Northing:		bearing:				
drilling information				material substance				rock mass defects				
method	core-lift	water	RL	depth metres	graphic log core recovery	material	weathering alteration	estimated strength	IS ₅₀ MPa	D-diam- etral A-axial	defect spacing mm	defect description
						rock type; grain characteristics, colour, structure, minor components		VL L M H VH EH			30 100 300 1000 3000	particular
												general
				1								
				2								
				3								
				4								
				5		Continued from non-cored borehole NO CORE: 4.80m to 5.02m						
				6		SANDSTONE: fine grained, swaley cross bedded @ 0-20deg, orange-brown and grey mottled and stained some gravel and clay bands	MW/SW					— JT @ 55 deg, PL, RO, VN
				7		SANDSTONE: fine grained, swaley cross bedded @ 0-20deg, grey, with orange-brown staining some gravelly and clayey bands up to 30mm NO CORE: 6.88m to 6.91m SANDSTONE: fine grained, swaley cross bedded @ 0-20deg, grey, with orange-brown staining some gravelly and clayey bands up to 30mm	MW/SW			0.46 0.64		— SM @ 30 deg, CN, RO, CO
				8								— JT @ 45 deg, PL, RO, VN
												— JT @ 55 deg, PL, RO, SN

Form GEO 5.5 Issue 3 Rev. 3
 CORED BOREHOLE E14497-3 BH.GPJ COFFEY.GDT 18.07.05

JT, PT, SM @ 10mm-100mm
 PL, RO, VN, CN, SN, CO
 from 5.02m to 9.65m

method
 DT auger drilling
 AS auger screwing
 AD roller/tricone
 RR claw or blade bit
 CB NMLC core
 NMLC NMLC core
 NQ, HQ, PQ wireline core

core-lift
 casing used
 barrel withdrawn
graphic log/core recovery
 core recovered
 - graphic symbols indicate material
 no core recovered

water
 10/1/98 water level on date shown
 water inflow
 partial drill fluid loss
 complete drill fluid loss
 water pressure test result (lugeons) for depth interval shown

weathering
 FR fresh
 SW slightly weathered
 MW moderately weathered
 HW highly weathered
 XW extremely weathered
 DW distinctly weathered (covers MW and HW)
strength
 VL very low
 L low
 M medium
 H high
 VH very high
 EH extremely high

defect type
 JT joint
 PT parting
 SM seam
 SZ sheared zone
 SS sheared surface
 CS crushed seam
roughness
 VR very rough
 RO rough
 SO smooth
 SL slickensided
planarity
 PL planar
 CU curved
 UN undulating
 ST stepped
 IR irregular
coating
 CN clean
 SN stained
 VN veneer
 CO coating

Borehole No. **CGBH9****Coffey****Engineering Log - Cored Borehole**Sheet 3 of 3
Office Job No.: **E14497/3**Client: **BELMORGAN PROPERTY DEVELOPMENT**Date started: **10.6.2005**

Principal:

Date completed: **10.6.2005**Project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**Logged by: **DH**Borehole Location: **CNR OF CORRIMAL & BURELLI STREETS, WOLLONGONG**Checked by: 

drill model & mounting: FOX TRUCK				Easting:		slope: -90°		R.L. Surface: NOT MEASURED			
hole diameter: 100 mm Drilling fluid:				Northing:		bearing:		datum:			
drilling information				material substance				rock mass defects			
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength	Is ₅₀ MPa D-diam- etral A-axial	defect spacing mm	defect description type, inclination, planarity, roughness, coating, thickness
NMLC						SANDSTONE: fine grained, swaley cross bedded @ 0-20deg, grey, with orange-brown staining some gravelly and clayey bands up to 30mm (continued)	MW/SW			25	- JT @ 45 deg, CU, RO, SN
	NONE			9		SANDSTONE: fine to medium grained, massive, grey, with some orange-brown staining	SW/FR				- SM @ 0-70 deg, PL, RO, CO
				10		SANDSTONE: fine grained, grey, swaley cross bedded @ 0-20deg				55	
				11		CGBH9 terminated at 10.95m					
				12							
				13							
				14							
				15							
				16							

method	core-lift	water	weathering	defect type	roughness
DT AS AD RR CB NMLC NQ, HQ, PQ	diatube auger screwing auger drilling roller/tricone claw or blade bit NMLC core wireline core	10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss	FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW)	JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam	VR very rough RO rough SO smooth SL slickensided
	graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water pressure test result (lugeons) for depth interval shown	strength VL very low L low M medium H high VH very high EH extremely high	planarity PL planar CU curved UN undulating ST stepped IR irregular	coating CN clean SN stained VN veneer CO coating

Form GEO 5.5 Issue 3 Rev. 3 CORED BOREHOLE E14497-3 BH.GPJ COFFEY.GDT 18.07.05

E14497/3-AE
19 July 2005

APPENDIX C

Results of Soil Vapour Testing

Coffey 



form E5.1 - photoionisation detector results

client: **BELMORGAN PROPERTY DEVELOPMENT PTY/LTD**

Office: **SOUTH COAST**

principal:

Date: **1/6/05**

project: **PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION**

By: **JB**

location: **CNR CORRIMAL & BURELLI STREETS, WOLLONGONG**

Checked By: **[Signature]**

PID serial number: **MINI RAE 2000 110-008460**

lamp voltage: **10.6eV**

last checked/calibrated: **1/6/05**

calibration gas type/concentration: **Isobutylene/100ppm**

location number	test type*	bore or sample probe depth (m)	duration (mins)	background reading (ppm)	last reading (ppm)	maximum reading (ppm)	notes
CGBH1	HS	0.2-0.5	1	2.7	3.9	3.0	Slow Rise - No Odour
CGBH1	HS	1.4-1.83	1	0.0	280	284	Rapid Rise - Moderate Odour
CGBH1	HS	3.0-3.35	1	0.0	2.1	2.1	Slow Rise - No Odour
CGBH2	HS	1.0	1	0.7	0.7	0.9	Slow Rise
CGBH2	HS	3.0	1	0.0	0.0	0.1	Slow Rise
CGBH2	HS	0.2-0.5	1	0.0	0.1	0.2	Slow Rise - No Odour
CGBH2	HS	2.0-2.45	1	0.0	0.1	0.2	Slow Rise - No Odour
CGBH3	BH	1.0	1	0.0	0.7	0.8	Slow Rise
CGBH3	BH	1.5	1	0.0	0.1	0.1	Slow Rise
CGBH3	BH	3.0	1	0.0	0.0	0.1	Slow Rise
CGBH3	HS	0.85-1.15	1	0.0	0.0	0.0	Slow Rise - No Odour
CGBH4	BH	2.0	1	0.0	0.2	0.3	Slow Rise
CGBH4	HS	0.2-0.5	1	0.0	0.4	0.5	Slow Rise
CGBH4	HS	1.0-1.45	1	0.0	0.3	0.3	Slow Rise - No Odour
CGBH4	HS	4.5-4.95	1	0.0	0.4	0.4	Slow Rise - No Odour
CGBH5	HS	0.1-0.5	1	0.7	1.2	1.8	Slow Rise - No Odour
CGBH5	HS	1.0-1.3	1	0.5	4.9	5.0	Slow Rise - Slight Odour
CGBH5	HS	2.0-2.3	1	0.8	190	284	Slow Rise - Moderate Odour
CGBH5	HS	3.2-3.5	1	0.7	2.3	3.2	Slow Rise - No Odour
CGBH5	HS	3.8-4.0	1	1.2	4.8	5.1	Slow Rise - No Odour
CGBH6	BH	1.0	1	0.0	1212	1212	Slow Rise - No Odour

*Fill in the test type as follows:-

BH () = soil gas probe sample; (soil type - unified classification system in parentheses)
HS () = headspace sample (with soil type-unified classification system in parentheses)

form E5.1 - photoionisation detector results

[illegible]

BH () = soil gas probe sample; (soil type - unified classification system in parentheses)
 HS () = headspace sample (with soil type-unified classification system in parentheses)



form E5.1 - photoionisation detector results

client:	BELMORGAN PROPERTY DEVELOPMENT PTY/LTD	Office:	Wollongong
principal:		Date:	12/7/05
project:	PRELIMINARY ESA & GEOTECHNICAL INVESTIGATION	By:	DH
location:	CNR CORRIMAL & BURELLI ST'S WOLLONGONG	Checked By:	<i>[Signature]</i>

PID serial number:	MINI RAE 2000 110-008460	lamp voltage:	10.6eV
last checked/calibrated:	12/7/05	calibration gas type/concentration:	Isobutylene/100ppm

location number	test type*	bore or sample probe depth (m)	duration (mins)	background reading (ppm)	last reading (ppm)	maximum reading (ppm)	notes
CGBH7	HS	0.13-0.25	1	0.1	0.1	0.1	Slow rise, no odour
CGBH7	HS	0.70-1.0	1	0.1	0.1	0.2	Slow rise, no odour
CGBH8	HS	0.12-0.17	1	0.1	0.2	0.2	Slow rise, no odour
CGBH8	HS	0.32-0.40	1	0.1	0.1	0.1	Slow rise, no odour
CGBH8	HS	0.50-0.70	1	0.1	0.1	0.1	Slow rise, no odour
CGBH8	HS	0.70-0.95	1	0.1	0.1	0.1	Slow rise, no odour
CGBH8	HS	2.50-2.95	1	0.1	0.1	0.1	Slow rise, no odour
CGBH8	HS	3.50-3.95	1	0.1	0.1	0.1	Slow rise, no odour
CGBH9	HS	0.12-0.30	1	0.1	0.1	0.1	Slow rise, no odour
CGBH9	HS	0.30-0.50	1	0.1	0.1	0.1	Slow rise, no odour
CGBH9	HS	1.0-1.45	1	0.1	0.1	0.1	Slow rise, no odour
CGBH9	HS	2.0-2.45	1	0.1	0.1	0.1	Slow rise, no odour
CGBH9	HS	4.5-4.73	1	0.1	0.1	0.1	Slow rise, no odour

*Fill in the test type as follows:-

BH () = soil gas probe sample; (soil type - unified classification system in parentheses)
HS () = headspace sample (with soil type-unified classification system in parentheses)

E14497/3-AE
19 July 2005

APPENDIX D

Chemical Laboratory Reports

Coffey 

ANALYTICAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:

PO Box 331

HUNTER REGIONAL MAIL

CENTRE NSW 2310

99 Mitchell Rd

CARDIFF NSW 2285

Telephone: (02) 4902 4800

Facsimile: (02) 4902 4899

CERTIFICATE OF ANALYSIS

Contents :

1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External
(if applicable)
5. Chain of Custody (if applicable)

Report No. : 5E2047

Attention : Mr Manuel Fernandez

Client : Coffey Geosciences Pty Ltd
: Unit 1/222 Berkeley Road
: UNANDERRANSW 2526

Samples : 26

Reference/Order : E14497/3/30656-7

Project : E14497/3

Received Samples : 02/06/05

Instructions : 02/06/05

Date Reported : 17/06/05

PLEASE SEE FOLLOWING PAGES FOR METHOD LISTING AND RESULTS

RESULTS

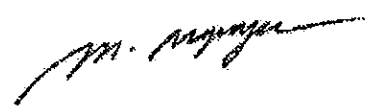
All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "#", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been authorized by the NATA signatories listed in the method descriptions section on the following page.



Darrel Luck Ass. Dip. Applied Sc.(Chem.)
Team Leader - Metals



Peter Keyte B.Sc.(Chem.)
Senior Chemist - Inorganics



Minh Nguyen B.Sc.(App. Chem.), MSC (Env. Tox.)
Senior Chemist - Organics



Report No. : 5E2047

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.

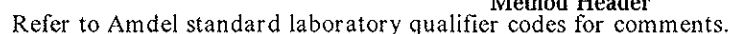
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

<u>Method</u>	<u>Description</u>	<u>Extracted</u>	<u>Analysed</u>	<u>Authorised</u>
E0230	TPH C6-C9 by purge & trap	03/06/05	03/06/05	GTO 094
E0221	TPH (C10-C36)	03/06/05	06/06/05	GTO 094
E0010	Benzene, Toluene, Ethylbenzene & Xylene	03/06/05	03/06/05	GTO 094
E4970	Total Metals by ICP-MS	08/06/05	09/06/05	DLU 093
E4950	Mercury	08/06/05	08/06/05	DLU 093
E7500	Moisture (%w/w)	06/06/05	07/06/05	ZSI 096
E1230	TPH C6-C9 by Purge & Trap	06/06/05	11/06/05	GTO 094
E1221	TPH (C10-C36)	06/06/05	14/06/05	GTO 094
E1010	Benzene, Toluene, Ethylbenzene & Xylene	06/06/05	11/06/05	GTO 094
E5910	Metals by ICP-AES	09/06/05	09/06/05	DLU 093
E5950	Mercury in Soil	07/06/05	07/06/05	DLU 093
E1110	Polycyclic Aromatic Hydrocarbons	06/06/05	07/06/05	MFA 095
E1081	Organochlorine Pesticides and total PCBs	06/06/05	09/06/05	MFA 095



NATA Signatory

<u>Initials</u>	<u>Name</u>	<u>Sections/Methods</u>
MNG	Minh Nguyen	094, 095
MFA	Mark Fahmy	094, 095
DJA	Dilanthi Jayamanne	094
GTO	Greg Towers	094
GPE	Geoff Peterson	095
DLU	Darrel Luck	093
MAV	Merrin Avery	101
DBL	Dianne Blane	101
NCO	Nathan Cooper	101
AGR	Alison Graham	101
PKE	Peter Keyte	101
ZSI	Zoe Sin	096, 097, 098



Project : E14497/3

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plus Cover Page

[illegible]

PQL = Practical Quantitation Limit
 LNR = Samples Listed not Received
 nd = < PQL
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

Project : E14497/3

Page 3 of 7
plus Cover Page

[illegible]

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = < PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 5E2047

Client : Coffey Geosciences Pty Ltd

Reference : E14497/3/30656-7

Project : E14497/3

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plus Cover Page

Analyte	Lab No	E201498	E201499	E201501		
		CGBH6/	CGBH6/	QA1		
	Sample Id	0.2-0.5	1.3-1.5	1.6.05		
	PQL					
E7500 Moisture (%w/w) in Soil						
Moistures test performed at 105oC						
Moisture Content	1	23%	26%	24%		
E1230 TPH in Soil by Purge & Trap/GC-MS						
C6-C9 Fraction	5	450	nd	nd		
E1221 TPH in Soil						
C10-C14 Fraction	10	220	nd	nd		
C15-C28 Fraction	50	80	nd	90		
C29-C36 Fraction	50	nd	nd	nd		
E1010 BTEX (P&T) in Soil						
Benzene	0.2	3.2	nd	nd		
Toluene	1	nd	nd	nd		
Ethylbenzene	1	2	nd	nd		
m&p-Xylene	2	3	nd	nd		
o-Xylene	1	nd	nd	nd		
4-Bromofluorobenzene-SURROGATE	1	116%	104%	93%		

PQL = Practical Quantitation Limit
 LNR = Samples Listed not Received
 nd = < PQL
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 5E2047
 Client : Coffey Geosciences Pty Ltd
 Reference : E14497/3/30656-7
 Project : E14497/3

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 plus Cover Page

Analyte	Lab No	E201484	E201486	E201488	E201498	E201501
		CGBH1/	CGBH2/	CGBH3/	CGBH6/	QA1
	Sample Id	1.4-1.85	0.2-0.5	0.2-0.5	0.2-0.5	1.6.05
	PQL					
E1110 Priority PAH's in Soil						
Naphthalene	0.5	13	nd	nd	7.0	nd
Acenaphthylene	0.5	nd	nd	nd	nd	nd
Acenaphthene	0.5	nd	nd	nd	nd	nd
Fluorene	0.5	1.8	nd	nd	nd	nd
Phenanthrene	0.5	2.4	2.0	1.4	0.6	1.6
Anthracene	0.5	nd	1.8	1.2	nd	1.4
Fluoranthene	0.5	nd	3.2	nd	nd	2.4
Pyrene	0.5	nd	3.4	nd	nd	2.4
Benz(a)anthracene	0.5	nd	1.8	0.6	nd	1.4
Chrysene	0.5	nd	1.2	nd	nd	1.0
Benzo(b) & (k)fluoranthene	1	nd	2	nd	nd	2
Benzo(a)pyrene	0.5	nd	1.6	nd	nd	1.2
Indeno(1,2,3-cd)pyrene	0.5	nd	0.9	nd	nd	0.6
Dibenz(a,h)anthracene	0.5	nd	nd	nd	nd	nd
Benzo(g,h,i)perylene	0.5	nd	0.9	nd	nd	0.7
Total USEPA Priority PAHs	0.5	17	19	3.0	7.6	14
2-Fluorobiphenyl-SURROGATE	1	92%	85%	89%	90%	85%
Anthracene-d10-SURROGATE	1	85%	86%	83%	88%	87%
p-Terphenyl-D14-SURROGATE	1	84%	86%	85%	86%	87%

PQL = Practical Quantitation Limit
 LNR = Samples Listed not Received
 nd = < PQL
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 5E2047

Client : Coffey Geosciences Pty Ltd

Reference : E14497/3/30656-7

Project : E14497/3

Page 7 of 7

plus Cover Page

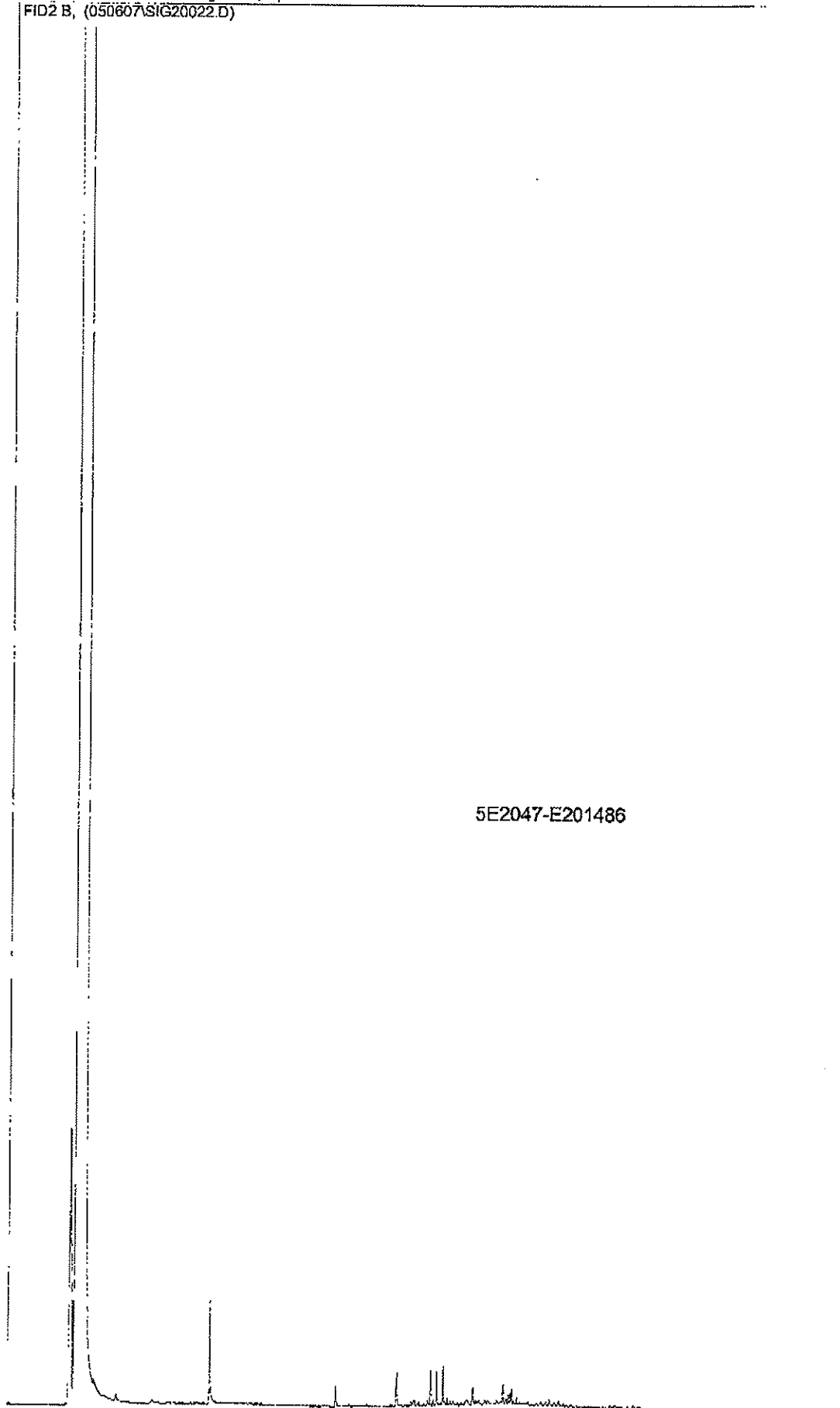
Analyte	Lab No	E201486	E201501			
		CGBH2/	QA1			
	Sample Id	0.2-0.5	1.6.05			
	PQL					
E1081 OC's & Total PCB's in Soil						
HCB	0.1	nd	nd			
a-BHC	0.1	nd	nd			
g-BHC	0.1	nd	nd			
Heptachlor	0.1	nd	nd			
Aldrin	0.1	nd	nd			
b-BHC	0.1	nd	nd			
d-BHC	0.1	nd	nd			
Oxychlorane	0.1	nd	nd			
Heptachlor epoxide	0.1	nd	nd			
Endosulfan 1	0.1	nd	nd			
Chlordane-Trans	0.1	nd	nd			
Chlordane-Cis	0.1	nd	nd			
trans-Nonachlor	0.1	nd	nd			
DDE	0.1	nd	nd			
Dieldrin	0.1	nd	nd			
Endrin	0.1	nd	nd			
DDD	0.1	nd	nd			
Endosulfan 2	0.1	nd	nd			
DDT	0.1	nd	nd			
Endosulfan sulfate	0.1	nd	nd			
Methoxychlor	0.1	nd	nd			
Total Polychlorinated biphenyl	1	nd	nd			
2,4,5,6-TCMX-SURROGATE	1	99%	90%			

PQL = Practical Quantitation Limit
 LNR = Samples Listed not Received
 nd = < PQL
 -- = Not Applicable

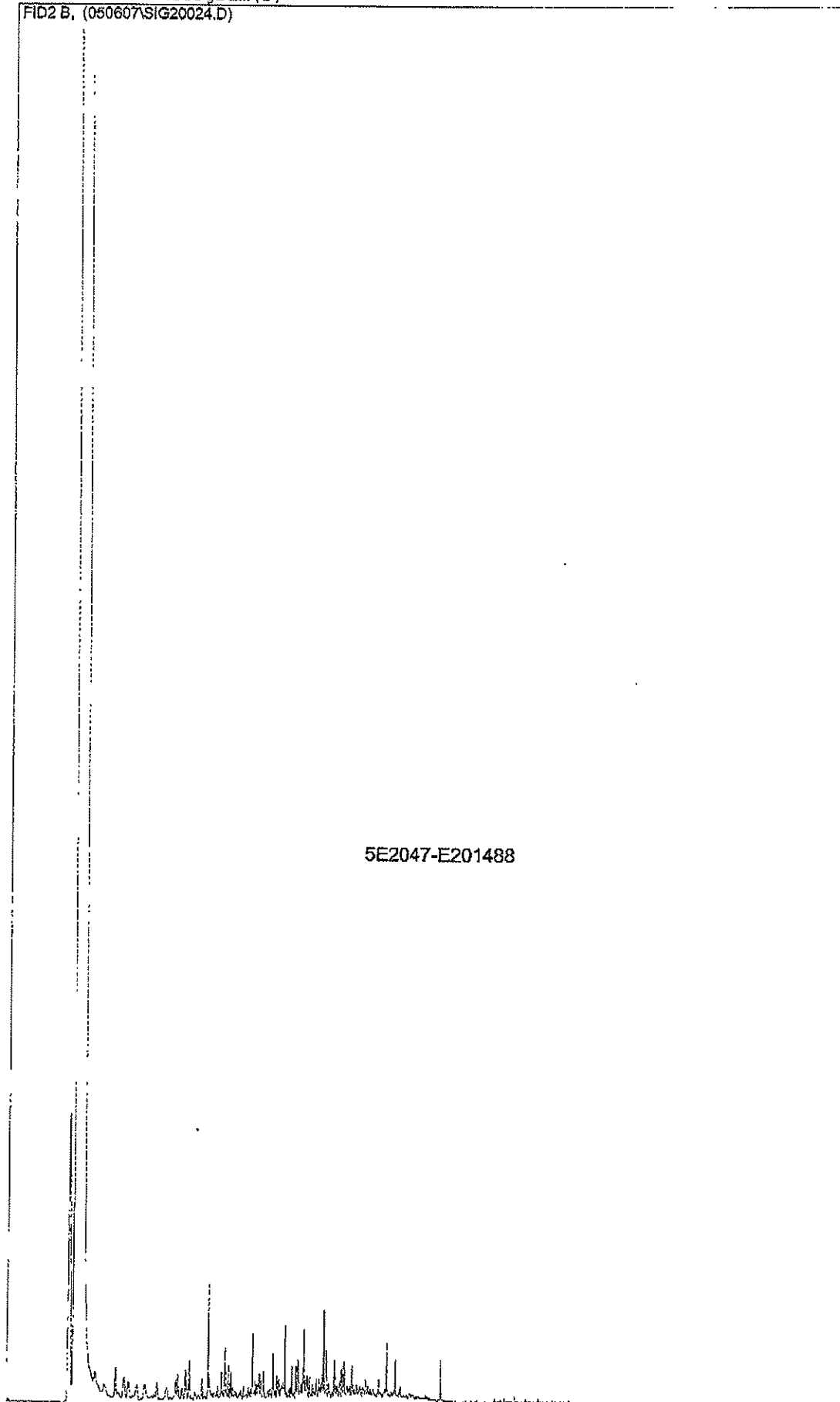
Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

Current Chromatogram(s)
FID2 B, (050607.SIG20022.D)



Current Chromatogram(s)
FID2 B, (050607)SIG20024.D)



Current Chromatogram(s)
FID2 B, (0506075(G20026.D)

5E2047-E201501



AMDEL INTERNAL QUALITY ASSURANCE REVIEW.

Page 1

Job No. 5E2047

General

1. Laboratory QA/QC including Method Blanks, Duplicates, Matrix Spikes, Laboratory Control Samples or CRM's are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results are available upon request.
3. PQLs are matrix dependent and are increased accordingly where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spike or surrogate recoveries.
5. Where 3 and 2 significant figures are reported for $> 10x$ PQL and $< 10x$ PQL respectively, the last figure is uncertain and is provided for statistical purposes only.
6. Samples duplicated or spiked are from this job only and are identified in the following QA/QC report.
7. SVOC analyses on waters are performed on homogenized, unfiltered samples, unless noted otherwise.

Maximum Holding Times for Soils, Sediments and Waters

Parameter	Holding Times
<u>Soils</u>	
Volatile and Semi-Volatile Organic Analysis.	Extracted in 14 days, analysed within 40 days.
Metals	Extracted and analysed within 28 days-6 months.
Inorganics*	Extracted and analysed within 7-28 days.
TCLPs*	Extracted and analysed within 14 days, (Zero Headspace-TCLP 7 days).
<u>Waters</u>	
Volatile Organic Analysis	Analysed within 7 days (USEPA requires 14 days).
Semi-Volatile Organic Analysis	Extracted in 7 days, analysed within 40 days.
Inorganics*	Analysed within 24 hrs-28 days.
Metals (dissolved metals should be supplied field filtered)	Prepared and analysed within 28 days.

* Please refer to 'Preservation Information Chart for Soils, Sediments & Waters' for further information. (ISFORM.098). Holding times may be extended with the use of preservation bottles and/or freezing samples. Holding times can be calculated from dates reported in the body of the report. Tests clearly exceeding holding times will be noted when sufficient information is provided.
Reference: USEPA SW846 and AMDEL SPM-01 (incorporating NEPM Guidelines).

Chain of Custody and Sample Integrity

Yes/NO/NA

Chain of Custody / instructions received with samples	Yes
Custody seals were received intact, if used	NA
Samples were received chilled and in good condition	Yes
Samples received appropriately preserved for all tests	Yes
VOC/SVOC samples were received in teflon lined containers	Yes
Samples received with Zero Headspace	No
Chain of Custody completed and attached (if applicable)	Yes

Chromatography Calibration/Acceptance Criteria (if applicable)

Retention time window meets acceptance criteria (+/-2%)	Yes
Reference standard meets acceptance criteria (+/-10%)	Yes
Recalibration standard meets acceptance criteria (+/-15%)	Yes
Internal standard recovery acceptable.	Yes

AMDEL INTERNAL QUALITY ASSURANCE REVIEW Cont..

Page 2

Amdel QA/QC Compliance Assessment

Compliance

Surrogates performed on all appropriate GC analyses and meet acceptance limits (70% - 130% recovery*).

Please see body
of report

Matrix Spikes performed once per process batch and at least 1 in 20 samples (Results meet acceptance limits - 70% - 130% recovery* or 80% - 120% recovery* for inorganics in water.)

Please see body
of report

Laboratory Control samples performed once per process batch and at least 1 in 20 samples (Results meet acceptance limits - 70% - 130% recovery* in soil or 70%-130%/90-110% recovery* for waters.)

Yes

Laboratory Duplicate samples performed once per process batch and at least 1 in 10 samples

Yes

Laboratory duplicates meet acceptance criteria
< 4 PQL - +/- 2 PQL
4-10 PQL - 25-50 or 50% RPD
> 10 PQL - 10-30 or 30% RPD

Please see body
of report

Method Blanks performed once per process batch and at least 1 in 20 samples (Results not detected at the PQL).

Yes

N/A=Not Applicable.

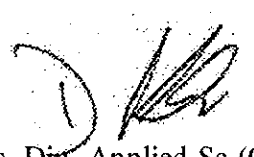
- * Phenols 50% - 130% recovery
- * SVOCs 60% - 130% recovery
- * Phenoxy Acid Herbicides 60% - 140% recovery

QA/QC Appendix

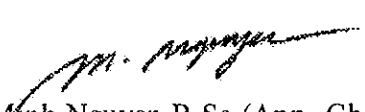
Please refer to the following pages for the QA/QC data.
For further information on samples or non-conformance in QC protocols please see notations in the body of the report plus comments on the following page.

Additional Comments

WB1 was received with 150mL headspace.


Darrel Luck Ass. Dip. Applied Sc.(Chem.)
Team Leader - Metals


Peter Keyte B.Sc.(Chem.)
Senior Chemist - Inorganics


Minh Nguyen B.Sc.(App. Chem.), MSC (Env. Tox.)
Senior Chemist - Organics

AMDEL STANDARD LABORATORY QUALIFIER CODES.

Page 3

Job NO. 5E2047

Qualifier Codes

Description

*	PQLs are raised due to matrix interference.
@	PQLs are raised due to insufficient sample provided for analysis.
\$	The mass imbalance indicates the presence of other ions not measured as part of this procedure.
nd	< PQL
--	Not applicable
LNR	The sample was listed on the COC, but not received.
IS	Insufficient sample was supplied to conduct this analysis.
AN	The analysis indicates the presences of an analyte that has been 'tentatively' identified, and the associated numerical value represents it's approximate concentration.
A	Sample results are reported on an 'as received' basis (not moisture corrected).
B	The sample was not received in a suitable timeframe to allow completion within the recommended holding time.
C	This sample was received with headspace.
D	This sample was received with the incorrect preservation for this analysis.
E	The raw data indicates the absence of 0.055g of Copper Sulphate in the sample.
F	This sample contained significant amounts of solids and was therefore analysed by settling and decanting the aqueous phase to avoid including the solid in the analysis portion.
G	This test was performed outside the recommended holding time.
H	This sample contained significant material > 5mm which was removed prior to analysis.
ISD	Insufficient sample was supplied to conduct duplicate analyses.
ISM	Insufficient sample was supplied to conduct matrix spike analyses.
W	The spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.
J	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause.
K	The matrix spike concentration is less than five times the background concentration in the sample, and therefore the spike recovery can not be determined.
L	The surrogate recovery is outside of the recommended acceptance criteria, due to matrix interference.
M	The surrogate recovery is outside of the recommended acceptance criteria. Insufficient sample remains to perform re-analysis.
N	Results are expressed in mg/L (ppm) due to the high concentration of the analyte.
O	The results reported are 'recoverable organics' for this fraction, as the chromatogram and peak shape indicates the presence of a significant concentration of polar compounds.
P	The concentration reported is mainly due to a single peak.
Q	This samples contains volatile halogenated oxygenated or other compounds that are included and quantitated as part of TPH C6-9.
R	Theoretically the total result should be greater or equal to the dissolved concentration. However the difference reported is within the uncertainty of the individual tests.
S	The mass imbalance was equal to or less than 0.2 milli-equivalents.
T	During Kjeldahl digestion, nitrate (> 10mg/L) can oxidise ammonia resulting in a negative TKN interference, which may have occurred for this sample.
U	Theoretically the TKN result should be greater or equal to ammonia concentration. However the difference reported is within the uncertainty of the individual tests.
V	This sample contained significant amounts of sediment which was included in the analysis portion as requested.
SUR	Surrogate recoveries could not be determined due to the dilution required to quantify the analyte.

QAQC : Method Blank(s)

[illegible]

PQL = Practical Quantitation Limit
nd = < PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

QAQC : Matrix Spike(s)

[illegible]

PQL = Practical Quantitation Limit
nd = < PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

The number in brackets after the method header identifies the sample tested.

QAQC : Laboratory Duplicate(s)

[illegible]

PQL = Practical Quantitation Limit
nd = < PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

The number in brackets after the method header identifies the sample tested.



QAQC : Method Blank(s)

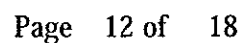
PQL = Practical Quantitation Limit
nd = < PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

The number in brackets after the method header identifies the sample tested.

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

The number in brackets after the method header identifies the sample tested.

[illegible]

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

[illegible]

QAQC : Laboratory Control Sample(s)

[illegible]

PQL = Practical Quantitation Limit
 -- = Not Applicable
 nd = < PQL

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

QAQC : Laboratory Duplicate(s)

[illegible]

PQL = Practical Quantitation Limit
nd = < PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

The number in brackets after the method header identifies the sample tested.



Job Number : 5E2047

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QAQC : Method Blank(s)

ANALYTE	Sample ID PQL	Blank1	Blank2	Blank3	Blank4	Blank5
E1110 Priority PAH's in Soil						
Naphthalene	0.5	nd				
Acenaphthylene	0.5	nd				
Acenaphthene	0.5	nd				
Fluorene	0.5	nd				
Phenanthrene	0.5	nd				
Anthracene	0.5	nd				
Fluoranthene	0.5	nd				
Pyrene	0.5	nd				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	nd				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1.2.3-cd)pyrene	0.5	nd				
Dibenz(a,h)anthracene	0.5	nd				
Benzo(g,h,i)perylene	0.5	nd				

PQL = Practical Quantitation Limit
nd = < PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified



Job Number : 5E2047

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QAQC : Laboratory Control Sample(s)

Analyte	Level	Level Detected			Recovery Details		
		Result1	Result2	Result3	Rec 1 (%)	Rec 2 (%)	Rec 3 (%)
E1081 OC's & Total PCB's in Soil							
HCB		0.5					
a-BHC	0.5	0.5			100%		
g-BHC	0.5	0.5			102%		
Heptachlor	0.5	0.5			104%		
Aldrin	0.5	0.5			104%		
b-BHC	0.5	0.6			114%		
d-BHC	0.5	0.5			104%		
Oxychlorane		0.5					
Heptachlor epoxide	0.5	0.5			104%		
Endosulfan 1	0.5	0.5			104%		
Chlordane-Trans	0.5	0.5			102%		
Chlordane-Cis	0.5	0.5			104%		
trans-Nonachlor		0.5					
DDE	1.0	1.0			100%		
Dieldrin	0.5	0.5			104%		
Endrin	0.5	0.6			114%		
DDD	1	1.0			98%		
Endosulfan 2	0.5	0.5			104%		
DDT	1.0	1.2			120%		
Endosulfan sulfate	0.5	0.5			106%		
Methoxychlor	0.5	0.6			120%		
Total Polychlorinated biphenyl		--					

PQL = Practical Quantitation Limit
 -- = Not Applicable
 nd = < PQL

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/L (ppm) unless otherwise specified



Job Number : 5E2047

Page 18 of 18

QAQC : Method Blank(s)

ANALYTE	Sample ID PQL	Blank1	Blank2	Blank3	Blank4	Blank5
E1081 OC's & Total PCB's in Soil						
HCB	0.1	nd				
a-BHC	0.1	nd				
g-BHC	0.1	nd				
Heptachlor	0.1	nd				
Aldrin	0.1	nd				
b-BHC	0.1	nd				
d-BHC	0.1	nd				
Oxychlor dane	0.1	nd				
Heptachlor epoxide	0.1	nd				
Endosulfan 1	0.1	nd				
Chlordane-Trans	0.1	nd				
Chlordane-Cis	0.1	nd				
trans-Nonachlor	0.1	nd				
DDE	0.1	nd				
Dieldrin	0.1	nd				
Endrin	0.1	nd				
DDD	0.1	nd				
Endosulfan 2	0.1	nd				
DDT	0.1	nd				
Endosulfan sulfate	0.1	nd				
Methoxychlor	0.1	nd				
Total Polychlorinated biphenyl	1	nd				

PQL = Practical Quantitation Limit
 nd = < PQL
 -- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/L (ppm) unless otherwise specified

Coffey Geosciences Pty Ltd ACH 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

Unit 1/222 Berkeley Road
Unanderra NSW 2526 Australia
PO Box 346 Unanderra
NSW 2526 Australia
Telephone +61 2 4272 6071
Facsimile +61 2 4272 6075
Email wolgang@coffey.com.au

Coffey

Facsimile Transmission

To	Amdel	From	James Boyle
Attention	Sample Receipt	Date	2/6/05
Facsimile number	49024899	Our Reference	E14497/3-AD
cc	Number of pages including this page 3		
Subject:	COC - ANALYSIS SCHEDULE		

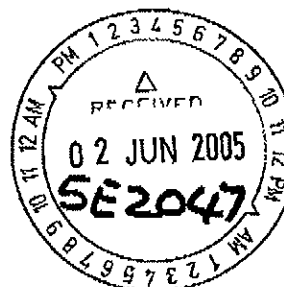
Note. If you do not receive all pages please telephone COFFEY on the above number as soon as possible. Important. The contents of this facsimile (including attachments) may be privileged and confidential. Any unauthorised use of the contents is expressly prohibited. If you have received the document in error, please advise us by telephone (reverse charges) immediately and then shred the document. Thank you.

Liz

Please find attached the COC with analysis schedule for soil samples. Samples should arrive at the Cardiff Laboratory sometime today. We required a TAT of 5 days.

Regards

JAMES BOYLE



F:\DATA\Environ\E14450-14499\E14497-3\E14497.3-AD.Doc

Sheet 2 of 2

Coffey 

COAT

Courier Service: *M and B Carriers*

Consignment Note No: 109436

Time

A circular 'RECEIVED' stamp from the FBI Memphis office. The outer ring contains the text 'FBI MEMPHIS' at the top and 'JUN 2 2005' at the bottom. The center of the stamp contains the word 'RECEIVED' in a bold, sans-serif font. Below 'RECEIVED' is the date '02 JUN 2005' and the handwritten file number '522047'. The stamp is oriented horizontally. $^x \text{As, Cd, Cu, Cr, Ni, Pb, Hg, Zn}$

U

JOB NUMBER MUST BE
REFERENCED ON ALL
SUBSEQUENT PAGES

Chain of Custody

No: 30656

Laboratory Citation / Order No: IT/COFFEY QUOTE

Job No: E1447/3

Sheet 1 of 2

Dispatch to: **Amel, Unit 19, 277 Lancaster Road**
(Address & Phone No) **North Bay, NSW, 2113**

Sampled by:

James Boyle

Consigning Officer: **South Coast**

Date Dispatched: **2/8/05**

Attention:

Sample Receipt

Project Manager:
(report results to)

Michael Kennedy

Courier Service: **Mynd & Courier**

Consignment Note No:

104436

Coffey

Relinquished by:

James Boyle

Date: **7/8/05** Time: **18:00** Received by:

Date:

Time:

Comments

Sample Matrix

Container Type and Preservative

Sample No.

Date Sampled

PAHs
TPHs
MIX - BTEX
Metals: **X**
PCP
PCB

Analysis Required

Sample Condition on Receipt

SOIL Glass jar +1a

CG-1/2-2-0.5

1/8/05

Hold

CG-1/1-4-1.85

1/8/05

Hold

CG-2/2-0.5

1/8/05

Hold

CG-2/1-0.5-1.45

1/8/05

Hold

CG-2/3-0.5

1/8/05

Hold

CG-2/4-0.2-0.5

1/8/05

Hold

CG-2/4-1-0-1.45

1/8/05

Hold

CG-2/4-4.5-4.95

1/8/05

Hold

CG-2/5-0.1-0.5

1/8/05

Hold

CG-2/5-2.5-2.5

1/8/05

Hold

CG-2/5-3.3-3.5

1/8/05

Hold

CG-2/6-0.2-0.5

1/8/05

Hold

CG-2/6-1.3-1.5

1/8/05

Hold

Special Laboratory Instructions:

*** As, Cd, Cu, Cr, Ni, Pb, Hg, Zn**

Detection Limits:

Turnaround Required:

Copies: WHITE: Sign-off release. YELLOW: If dispatched to external lab, lab to sign on receipt and fax back to Coffey. BLUE: To be returned with results.

JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGES



3055Z

Job No. 6447/3

Sheet of 2

Sampled by: James Boyle

Consigning Officer: *S. Smith - East*
Date Dispatched: *2/6/65*

Project Manager:
(report results to):

Sample	Leaf
1	1
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100	100

Alfred Kennedy

Courier Service: Med 8 Forvis
Consignment Note No: 10802

Coffey 

Relinquished by:

Grades Book

Date:	Time:	Received by:
-------	-------	--------------

6-17-71

Date: _____ Time: _____

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analyses Required			
					PAHs	TPHs	MAHs = BTEX	Metals:
E201483	Soil	Criss for +12	CG811/0-2-0.5	11/6/05				
84			CG811/1.4-1.85					
85			CG811/3.0-3.50					
86			CG812/0-2-0.5					
87			CG812/1.05-1.45					
88			CG813/0-2-0.5					
89			CG813/0.85-1.15					
90			CG814/0-2-0.5					
91			CG814/1.0-1.45					
92			CG814/2.6-3.05					
93			CG814/4.5-4.95					
94			CG815/0.1-0.5					
95			CG815/1.0-1.45					
96			CG815/2.5-2.5					
97			CG815/3.3-3.5					
98			CG816/0-2-0.5					
99			CG816/1.3-1.5					

2 JUL 2005
562297

Sample Condition on Receipt

Special Laboratory Instructions: **IC Forensic T2A**

Deletion Limits:

Turnaround Required:

Copies: WHITE: Sign on letters. YELLOW: If assigned to interview lab, lab to sign on report and faxed to College. BLUE: To be returned with results.

JOB NUMBER MUST BE
REFERENCED ON ALL
SUBSEQUENT PAGES

20059/11-01

Chain of Custody

No: 30657

Laboratory Quotation / Order No: **IT/ceffer**

Job No: **E1499773**

Sheet 2 of 2

Dispatch to: **Enviro, Unit 7b, 2777 Foxdale Road**

Sampled by:

Consigning Office: **SOUTH COAST**

Address & Phone No:

Atchell, Leigh, MS4, 2773

James Boyle

Date Dispatched: **27/6/05**

Attention:

Project Manager (report results to):

Courier Service: **M and B Couriers**

Sample Group

Michael Kennedy

Consignment Note No: **109436**

Relinquished by:

Date:

Time:

Received by:

Date:

Time:

James Boyle

16/05 18:00

Empty

21/6 12:00

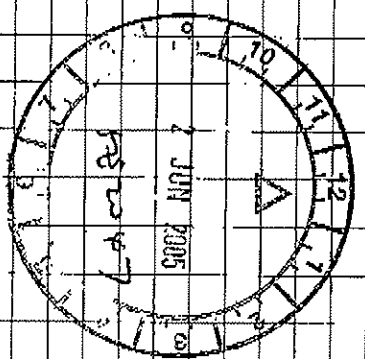
Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	PAHs	TPHs	MAHs = BTEX	Metals:	Analyses Required	Sample Condition on Receipt
E20500										
01	30Lk. Glass jar + ice		Q41	16/05					TPH C-19 BTEX	
02			Q42							
03			Q44							
04			Q45							
05			Q46							
06	Water 2 x 1.5L, 1 x 0.5L		W41							
07	1 x 200ml		W42							
08	1 x 200ml		W43							

Special Laboratory Instructions: **Analyses to be carried by PPK**

Detection Limits:

Turnaround Required:

Copies: **WHITE**: Sign on release. **YELLOW**: If dispatched to interested Lab, Lab to sign on receipt and fax back to Coffey. **BLUE**: To be returned with results.



JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGES



AMDEL LTD

INDUSTRIAL AND ENVIRONMENTAL SERVICES DIVISION

Amdel Limited

ABN 38 0081 27 802

Correspondence to:

99 Mitchell Rd

PO BOX 331

CARDIFF NSW 2285

HUNTER REGIONAL MAIL

Telephone: (02) 4902 4800

CENTRE NSW 2310

Facsimile: (02) 4902 4899

SAMPLE RECEIPT ACKNOWLEDGMENT

TO: Coffey Geosciences Pty Ltd

ATTN: Mr Manuel Fernandez

FAX NO: (02) 4272 6075

FROM: Client Services Cardiff

DATE: 02/06/05

PAGES: 1 of 1

If you have any queries or wish to make any adjustments to analyses performed, please contact this laboratory immediately.

Reference/Order:

E14497/3/30656-7

Project:

E14497/3

Our Reference Number :

SE2047

Date Received by Amdel :

02/06/05

ANALYSIS REQUESTED	AMDEL METHOD CODE	NUMBER OF SAMPLES	ESTIMATED REPORT DATE (CO)
TPH C6-C9 by purge & trap	E0230	2	
TPH (C10-C36)	E0221	1	
Benzene, Toluene, Ethylbenzene & Xylene	E0010	3	
Total Metals by ICP-MS	E4970	1	
Mercury	E4950	1	
Moisture (%w/w)	E7500	8	
Polycyclic Aromatic Hydrocarbons	E1110	5	
TPH C6-C9 by Purge & Trap	E1230	7	
TPH (C10-C36)	E1221	7	
Benzene, Toluene, Ethylbenzene & Xylene	E1010	7	
Metals by ICP-AES	E5910	3	
Mercury in Soil	E5950	3	
Organochlorine Pesticides and total PCB E1081		2	
Samples on Hold (Soil)	E7600	15	

WB1 WAS RECEIVED WITH 150ML HEADSPACE.

Sample integrity upon receipt

* Samples were received chilled/chilling (refer to COC for temperature records(if space provided)).	YES
* Samples received in good condition and appropriately preserved for all tests.	YES
* VOC/SVOC samples were received in teflon lined lids.	YES
* VOC samples were received with Zero Headspace.	NO
* Samples were recieved in sufficient time to allow us to meet holding time requirements.	YES

** We have received the samples referenced above and they are now being processed in our laboratory. Samples received after 4pm are considered as recieved the next working day for turnaround purposes. Surcharges for urgent turn-around requests may apply.

UNLESS ADVISED OTHERWISE - Sample analysis will be commenced regardless of integrity issues. Any non-conformance will be recorded on the final report.

AMDEL LTD**INDUSTRIAL AND ENVIRONMENTAL SERVICES DIVISION**

Amdel Limited
Correspondence to:
PO BOX 331
HUNTER REGIONAL MAIL
CENTRE NSW 2310

ABN 38 0081 27 802
99 Mitchell Rd
CARDIFF NSW 2285
Telephone: (02) 4902 4800
Facsimile: (02) 4902 4899

SAMPLE RECEIPT ACKNOWLEDGMENT

TO: Coffey Geosciences Pty Ltd

ATTN: Mr Manuel Fernandez

FAX NO: (02) 4272 6075

FROM: Client Services Cardiff

DATE: 02/06/05

PAGES: 1 of 1

If you have any queries or wish to make any adjustments to analyses performed, please contact this laboratory immediately.

Reference/Order: E14497/3/30656-7
Project: E14497/3
Our Reference Number : 5E2047
Date Received by Amdel : 02/06/05

ANALYSIS REQUESTED	AMDEL METHOD CODE	NUMBER OF SAMPLES	ESTIMATED REPORT DATE (COI
Australian GST	GST		

WB1 WAS RECEIVED WITH 150ML HEADSPACE.

Sample integrity upon receipt

- | | |
|---|-----|
| * Samples were received chilled/chilling (refer to COC for temperature records(if space provided)). | YES |
| * Samples received in good condition and appropriately preserved for all tests. | YES |
| * VOC/SVOC samples were received in teflon lined lids. | YES |
| * VOC samples were received with Zero Headspace. | NO |
| * Samples were recieved in sufficient time to allow us to meet holding time requirements. | YES |

** We have received the samples referenced above and they are now being processed in our laboratory. Samples received after 4pm are considered as recieved the next working day for turnaround purposes. Surcharges for urgent turn-around requests may apply.

UNLESS ADVISED OTHERWISE - Sample analysis will be commenced regardless of integrity issues. Any non-conformance will be recorded on the final report.

Coffey Geosciences Pty Ltd ACN 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

Unit 1/222 Berkeley Road
 Unanderra NSW 2526 Australia
 PO Box 346 Unanderra
 NSW 2526 Australia
 Telephone +61 2 4272 6071
 Facsimile +61 2 4272 6075
 Email walgong@coffey.com.au

Coffey**Facsimile Transmission**

To	Amdel	From	James Boyle
Attention	Sample Receipt	Date	2/6/05
Facsimile number	49024899	Our Reference	E14497/3-AD
cc	Number of pages including this page 3		
Subject:	COC - ANALYSIS SCHEDULE		

Note. If you do not receive all pages please telephone COFFEY on the above number as soon as possible. Important. The contents of this facsimile (including attachments) may be privileged and confidential. Any unauthorised use of the contents is expressly prohibited. If you have received the document in error, please advise us by telephone (reverse charges) immediately and then shred the document. Thank you.

Liz

Please find attached the COC with analysis schedule for soil samples. Samples should arrive at the Cardiff Laboratory sometime today. We required a TAT of 5 days.

Regards

JAMES BOYLE



F:\DATA\Environ\E14450-14489\E14497-3\E14497.3-AD.Doc

Chain of Custody

Laboratory Quotation / Order No: 11/10/05

Job No: 60447/3

No: 30656

Sheet 1 of 2



NO. 1897 P. 4/5

Dispatch to: Police Unit 19, 277 Lawton Road (Address & Phone No) North Ryde NSW, 2113		Sampled by: James Doyle		Project Manager: Michael Fairhead (report results to)		Consigning Officer: Sevyn Carr		Date Dispatched: 2/6/05		Courier Service: Mail 8 Lewis		Consignment Note No: 104436	
Attention: Sample Room		Date: 1/6/05		Time: 13.00		Received by: Emily		Date: 2/6		Time: 12.00		Relinquished by: James Doyle	
Comments: E201483		Sample Matrix: SOIL		Container Type and Preservative: Class for 11a		Sample No.: 20		Date Sampled: 4/1/05		PAHs		TPHs	
84		85		86		87		88		89		90	
91		92		93		94		95		96		97	
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Chain of Custody

Laboratory Quotation / Order No: **IT/COFFY**

Job No:

£1449713No: 30651
Sheet 2 of 2Dispatch to: **Amadel 11.1 76, 277 Newcastle Road**
(Address & Phone No.)

Sampled by:

James BoyleConsigning Officer: **South Coast**Date Dispatched: **2/6/05**

Attention:

Compia CourtProject Manager:
(report results to)**Marcel Fernandez**Courier Service: **M and B Couriers**

Consignment Note No:

109436

Relinquished by:

James Boyle

Date:

1/6/05

Time:

18:00

Received by:

Bonny C.

Date:

2/6

Time:

12:00

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analysis Required					Sample Condition on Receipt
					PAHs	TPHs	MAHs = BTEX	Metals:		
E20500	soil	Class jar + ice	001	16/6/05						1
01			001							
02			002							
03			003							
04			004							
05			005							
06			006							
07			007							
08			008							

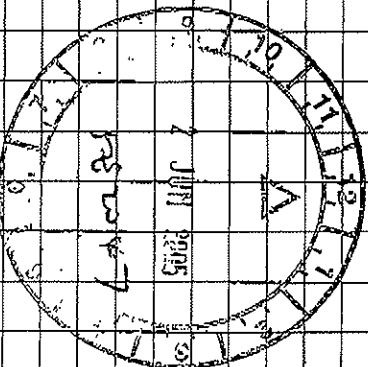
Special Laboratory Instructions:

Analysis to be carried by Fey

Detection Limits:

Turnaround Required:

Copies: WHITE: Sign on release. YELLOW: If dispatched to Interstate Lab, Lab to sign on receipt and fax back to Colley. BLUE: To be returned with results.

JOB NUMBER MUST BE
REFERENCED ON ALL
SUBSEQUENT PAGES

Coffey

Chain of Custody

No: 30657

Laboratory Qualification / Order No: IT/COFFEY

Job No: E144973

Sheet 2 of 2

Dispatch to: Ande, Unit 7B, 277 Lawrence Road

Sampled by:

Consigning Officer: South Coast

Address:

North Ryde, NSW 2113

James Boyle

Date Dispatched: 2/6/05

Attention:

Sample Receipt

Project Manager:

Manuel Fernandez

Courier Service: M and B Cams

Consignment Note No: 109436

Coffey

Relinquished by:

James Boyle

Date:

1/6/05

Time:

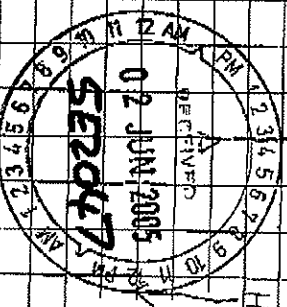
12:00

Received by:

Date:

Time:

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analyses Required				Sample Condition on Receipt
					PAHs	TPHs	Metals	Other	
	Soil	Glass jar + ice	6846/2-02-05	21/6/05	/	/	/	TPH G-1 BTEX Cd/Pb	Hold
			Q.A.1		/	/	/		
			Q.A.2		/	/	/		
			Q.A.4		/	/	/		
			Q.A.5		/	/	/		
			Q.A.6		/	/	/		
	Water	2x vials, 1x red, 1x orange	WQ1		/	/	/		
		2x vials	Top Blank	27/5/05	/	/	/		
		1x vial	Top Spike	" "	/	/	/		



Special Laboratory Instructions:

* As, Cd, Cu, Cr, Ni, Pb, Hg, Zn

Detection Limits:

Turnaround Request:

5 days

Copy: WHITE: Sign on release. YELLOW: If dispatched in ice to lab, lab to sign on receipt and bar back to Coffey. BLUE: To be retained with lab.

JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGES

Chain of Custody

No: 30657

Laboratory Quotation / Order No:

1116001

Job No:

E144473

Sheet

2 of 2

Dispatch to: Enoch, U.S. 76 277, Lowville, N.Y.

Sampled by:

James Boyle

Consigning Officer:

South Coast

Attention:

Sample Group

Project Manager (report results to):

Michael Fernandez

Courier Service:

M and B Cares

Consignment Note No:

109436

Relinquished by:

James Boyle

Date:

11/06/05 18:00

Received by:

Emily

Date:

26 Nov 05

Time:

12:00

Comments

Sample Matrix

Container Type and Preservative

Sample No.

Date Sampled

PAHs

TPHs

MAHs = BTEX

Metals:

TPH C-1, BTEX

Analyses Required

Sample Condition on Receipt

E20500

sol. Glass jar + ice

10/6/05 2:02 PM

Sample Condition on Receipt

01

02

03

04

05

06

07

08

09

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Special Laboratory Instructions:

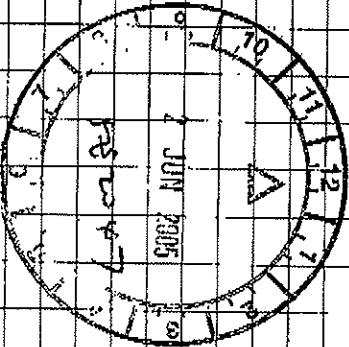
Analyses to be advised by fax

Detection Limits:

Turnaround Required:

Copies: WHITE: Sign on release. YELLOW: If dispatched to reference lab, last to sign on receipt and fax back to Coffey. BLUE: To be returned with results.

JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGES



Unit 1/222 Berkeley Road
Unanderra NSW 2526 Australia
PO Box 346 Unanderra
NSW 2526 Australia
Telephone +61 2 4272 6071
Facsimile +61 2 4272 6075
Email wolfgang@coffey.com.au

Facsimile Transmission

To	Arndel	From	James Boyle
Attention	Sample Receipt	Date	2/6/05
Facsimile number	49024899	Our Reference	E14497/3-AD
cc	Number of pages including this page 3		
Subject	COC - ANALYSIS SCHEDULE		

Note, If you do not receive all pages please telephone COFFEY on the above number as soon as possible. Important. The contents of this facsimile (including attachments) may be privileged and confidential. Any unauthorised use of the contents is expressly prohibited. If you have received the document in error, please advise us by telephone (reverse charges) immediately and then shred the document. Thank you.

Liz

Please find attached the COC with analysis schedule for soil samples. Samples should arrive at the Cardiff Laboratory sometime today. We required a TAT of 5 days.

Regards

JAMES BOYLE





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ANALYTICAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:

PO Box 331

HUNTER REGIONAL MAIL

CENTRE NSW 2310

99 Mitchell Rd

CARDIFF NSW 2285

Telephone: (02) 4902 4800

Facsimile: (02) 4902 4899

CERTIFICATE OF ANALYSIS

Contents :

1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External
(if applicable)
5. Chain of Custody (if applicable)

Report No. : 5E2151

Attention : Mr Manuel Fernandez

Client : Coffey Geosciences Pty Ltd
: Unit 1/222 Berkeley Road
: UNANDERRA NSW 2526

Samples : 3

Reference/Order : E14497/3/30554

Project : E14497/3

Received Samples : 09/06/05 Instructions : 09/06/05

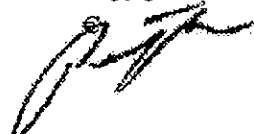
Date Reported : 17/06/05

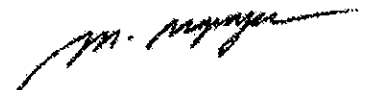
PLEASE SEE FOLLOWING PAGES FOR METHOD LISTING AND RESULTS

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "#", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for < 10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been authorized by the NATA signatories listed in the method descriptions section on the following page.


Darrel Luck Ass. Dip. Applied Sc.(Chem.)
Team Leader - Metals


Peter Keyte B.Sc.(Chem.)
Senior Chemist - Inorganics


Minh Nguyen B.Sc.(App. Chem.), MSC (Env. Tox.)
Senior Chemist - Organics



Report No. : 5E2151

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

<u>Method</u>	<u>Description</u>	<u>Extracted</u>	<u>Analysed</u>	<u>Authorised</u>
E0230	TPH C6-C9 by purge & trap	14/06/05	16/06/05	GTO 094
E0221F	TPH (C10-C36)	14/06/05	15/06/05	GTO 094
E0010	Benzene, Toluene, Ethylbenzene & Xylene	14/06/05	16/06/05	GTO 094
E4870	Dissolved Metals by ICP-MS	15/06/05	15/06/05	DLU 093
E0110	Polycyclic Aromatic Hydrocarbons	14/06/05	15/06/05	MFA 095



NATA Signatory

<u>Initials</u>	<u>Name</u>	<u>Sections/Methods</u>
MNG	Minh Nguyen	094, 095
MFA	Mark Fahmy	094, 095
DJA	Dilanthi Jayamanne	094
GTO	Greg Towers	094
GPE	Geoff Peterson	095
DLU	Darrel Luck	093
MAV	Merrin Avery	101
DBL	Dianne Blane	101
NCO	Nathan Cooper	101
AGR	Alison Graham	101
PKE	Peter Keyte	101
ZSI	Zoe Sin	096, 097, 098



Job Number : 5E2151

Client : Coffey Geosciences Pty Ltd

Reference : E14497/3/30554

Project : E14497/3

Page 1 of 2

plus Cover Page

Analyte	Lab No	E203124	E203125	E203126		
		MW2	MW3	X1		
	Sample Id	8.6.05	8.6.05	8.6.05		
	PQL					
E0230 TPH in Water by P&T/GC-MS (ug/L)						
C6-C9 Fraction	20	nd	840	nd		
E0221 TPH in Water (ug/L)						
C10-C14 Fraction	20	nd	1100	nd		
C15-C28 Fraction	100	nd	405	nd		
C29-C36 Fraction	100	nd	nd	nd		
E0010 BTEX (P&T) in Water (ug/L)						
Benzene	0.5	nd	610	nd		
Toluene	1	nd	7	nd		
Ethylbenzene	1	nd	* < 5	nd		
m&p-Xylene	2	nd	* < 10	nd		
o-Xylene	1	nd	* < 5	nd		
4-Bromofluorobenzene-SURROGATE	1	104%	119%	103%		
E4870 Dissolved Metals in Waters						
Lead	0.001	nd	nd	nd		

PQL = Practical Quantitation Limit
 LNR = Samples Listed not Received
 nd = < PQL
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 5E2151

Client : Coffey Geosciences Pty Ltd

Reference : E14497/3/30554

Project : E14497/3

Page 2 of 2

plus Cover Page

Analyte	Lab No	E203124	E203125	E203126		
		MW2	MW3	X1		
	Sample Id	8.6.05	8.6.05	8.6.05		
	PQL					
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	nd	75	nd		
Acenaphthylene	1	nd	nd	nd		
Acenaphthene	1	nd	nd	nd		
Fluorene	1	nd	nd	nd		
Phenanthrene	1	nd	2	nd		
Anthracene	1	nd	nd	nd		
Fluoranthene	1	nd	2	nd		
Pyrene	1	nd	1	nd		
Benz(a)anthracene	1	nd	nd	nd		
Chrysene	1	nd	nd	nd		
Benzo(b) & (k)fluoranthene	2	nd	nd	nd		
Benzo(a)pyrene	1	nd	nd	nd		
Indeno(1.2.3-cd)pyrene	1	nd	nd	nd		
Dibenz(a,h)anthracene	1	nd	nd	nd		
Benzo(g,h,i)perylene	1	nd	nd	nd		
Total USEPA Priority PAHs	1	nd	79	nd		
2-Fluorobiphenyl-SURROGATE	1	97%	70%	90%		
Anthracene-D10-SURROGATE	1	99%	70%	96%		
p-Terphenyl-D14-SURROGATE	1	99%	70%	99%		

PQL = Practical Quantitation Limit
 LNR = Samples Listed not Received
 nd = < PQL
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



AMDEL INTERNAL QUALITY ASSURANCE REVIEW.

Page 1

Job No. 5E2151

General

1. Laboratory QA/QC including Method Blanks, Duplicates, Matrix Spikes, Laboratory Control Samples or CRM's are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results are available upon request.
3. PQLs are matrix dependent and are increased accordingly where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spike or surrogate recoveries.
5. Where 3 and 2 significant figures are reported for $> 10x$ PQL and $< 10x$ PQL respectively, the last figure is uncertain and is provided for statistical purposes only.
6. Samples duplicated or spiked are from this job only and are identified in the following QA/QC report.
7. SVOC analyses on waters are performed on homogenized, unfiltered samples, unless noted otherwise.

Maximum Holding Times for Soils, Sediments and Waters

Parameter	Holding Times
<u>Soils</u>	
Volatile and Semi-Volatile Organic Analysis.	Extracted in 14 days, analysed within 40 days.
Metals	Extracted and analysed within 28 days-6 months.
Inorganics*	Extracted and analysed within 7-28 days.
TCLPs*	Extracted and analysed within 14 days, (Zero Headspace-TCLP 7 days).
<u>Waters</u>	
Volatile Organic Analysis	Analysed within 7 days (USEPA requires 14 days).
Semi-Volatile Organic Analysis	Extracted in 7 days, analysed within 40 days.
Inorganics*	Analysed within 24 hrs-28 days.
Metals (dissolved metals should be supplied field filtered)	Prepared and analysed within 28 days.

* Please refer to 'Preservation Information Chart for Soils, Sediments & Waters' for further information. (ISFORM.098). Holding times may be extended with the use of preservation bottles and/or freezing samples. Holding times can be calculated from dates reported in the body of the report. Tests clearly exceeding holding times will be noted when sufficient information is provided.
Reference: USEPA SW846 and AMDEL SPM-01 (incorporating NEPM Guidelines).

Chain of Custody and Sample Integrity

Yes/NO/NA

Chain of Custody / instructions received with samples	Yes
Custody seals were received intact, if used	NA
Samples were received chilled and in good condition	Yes
Samples received appropriately preserved for all tests	Yes
VOC/SVOC samples were received in teflon lined containers	Yes
Samples received with Zero Headspace	Yes
Chain of Custody completed and attached (if applicable)	Yes

Chromatography Calibration/Acceptance Criteria (if applicable)

Retention time window meets acceptance criteria (+/-2%)	Yes
Reference standard meets acceptance criteria (+/-10%)	Yes
Recalibration standard meets acceptance criteria (+/-15%)	Yes
Internal standard recovery acceptable.	Yes

AMDEL INTERNAL QUALITY ASSURANCE REVIEW Cont..

Page 2

Amdel QA/QC Compliance Assessment

Compliance

Surrogates performed on all appropriate GC analyses and meet acceptance limits (70% - 130% recovery*).

Please see body of report

Matrix Spikes performed once per process batch and at least 1 in 20 samples (Results meet acceptance limits - 70% - 130% recovery* or 80% - 120% recovery* for inorganics in water.)

Please see body of report

Laboratory Control samples performed once per process batch and at least 1 in 20 samples (Results meet acceptance limits - 70% - 130% recovery* in soil or 70%-130%/90-110% recovery* for waters.)

Yes

Laboratory Duplicate samples performed once per process batch and at least 1 in 10 samples

Yes

Laboratory duplicates meet acceptance criteria

< 4 PQL - +/- 2 PQL
4-10 PQL - 25-50 or 50% RPD
> 10 PQL - 10-30 or 30% RPD

Please see body of report

Method Blanks performed once per process batch and at least 1 in 20 samples (Results not detected at the PQL).

Yes

N/A = Not Applicable.

* Phenols 50% - 130% recovery
* SVOCs 60% - 130% recovery
* Phenoxy Acid Herbicides 60% - 140% recovery

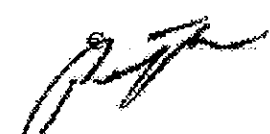
QA/QC Appendix

Please refer to the following pages for the QA/QC data.
For further information on samples or non-conformance in QC protocols please see notations in the body of the report plus comments on the following page.

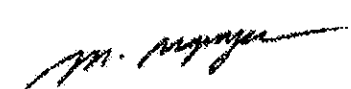
Additional Comments



Darrel Luck Ass. Dip. Applied Sc.(Chem.)
Team Leader - Metals



Peter Keyte B.Sc.(Chem.)
Senior Chemist - Inorganics



Minh Nguyen B.Sc.(App. Chem.), MSC (Env. Tox.)
Senior Chemist - Organics



AMDEL STANDARD LABORATORY QUALIFIER CODES.

Page 3

Job NO. 5E2151

<u>Qualifier Codes</u>	<u>Description</u>
*	PQLs are raised due to matrix interference.
@	PQLs are raised due to insufficient sample provided for analysis.
\$	The mass imbalance indicates the presence of other ions not measured as part of this procedure.
nd	< PQL
--	Not applicable
LNR	The sample was listed on the COC, but not received.
IS	Insufficient sample was supplied to conduct this analysis.
AN	The analysis indicates the presences of an analyte that has been 'tentatively' identified, and the associated numerical value represents it's approximate concentration.
A	Sample results are reported on an 'as received' basis (not moisture corrected).
B	The sample was not received in a suitable timeframe to allow completion within the recommended holding time.
C	This sample was received with headspace.
D	This sample was received with the incorrect preservation for this analysis.
E	The raw data indicates the absence of 0.055g of Copper Sulphate in the sample.
F	This sample contained significant amounts of solids and was therefore analysed by settling and decanting the aqueous phase to avoid including the solid in the analysis portion.
G	This test was performed outside the recommended holding time.
H	This sample contained significant material > 5mm which was removed prior to analysis.
ISD	Insufficient sample was supplied to conduct duplicate analyses.
ISM	Insufficient sample was supplied to conduct matrix spike analyses.
W	The spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.
J	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause.
K	The matrix spike concentration is less than five times the background concentration in the sample, and therefore the spike recovery can not be determined.
L	The surrogate recovery is outside of the recommended acceptance criteria, due to matrix interference.
M	The surrogate recovery is outside of the recommended acceptance criteria. Insufficient sample remains to perform re-analysis.
N	Results are expressed in mg/L (ppm) due to the high concentration of the analyte.
O	The results reported are 'recoverable organics' for this fraction, as the chromatogram and peak shape indicates the presence of a significant concentration of polar compounds.
P	The concentration reported is mainly due to a single peak.
Q	This samples contains volatile halogenated oxygenated or other compounds that are included and quantitated as part of TPH C6-9.
R	Theoretically the total result should be greater or equal to the dissolved concentration. However the difference reported is within the uncertainty of the individual tests.
S	The mass imbalance was equal to or less than 0.2 milli-equivalents.
T	During Kjeldahl digestion, nitrate (> 10mg/L) can oxidise ammonia resulting in a negative TKN interference, which may have occurred for this sample.
U	Theoretically the TKN result should be greater or equal to ammonia concentration. However the difference reported is within the uncertainty of the individual tests.
V	This sample contained significant amounts of sediment which was included in the analysis portion as requested.
SUR	Surrogate recoveries could not be determined due to the dilution required to quantify the analyte.



Job Number : 5E2151

Page 1 of 4

QAQC : Laboratory Control Sample(s)

Analyte	Level	Level Detected			Recovery Details		
		Result1	Result2	Result3	Rec 1 (%)	Rec 2 (%)	Rec 3 (%)
E0230 TPH in Water by P&T/GC-MS (ug/L)							
C6-C9 Fraction	200	200			105%		
E0221 TPH in Water (ug/L)							
C15-C28 Fraction	5500	4660			85%		
E0010 BTEX (P&T) in Water (ug/L)							
Benzene	10	10			104%		
Toluene	10	12			115%		
Ethylbenzene	10	11			110%		
m&p-Xylene	20	23			115%		
o-Xylene	10	12			121%		
E4870 Dissolved Metals in Waters							
Lead	0.100	0.104			104%		

PQL = Practical Quantitation Limit
 -- = Not Applicable
 nd = < PQL

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/L (ppm) unless otherwise specified



Job Number : 5E2151

Page 2 of 4

QAQC : Method Blank(s)

ANALYTE	Sample ID PQL	Blank1	Blank2	Blank3	Blank4	Blank5
E0230 TPH in Water by P&T/GC-MS (ug/L)						
C6-C9 Fraction	20	nd				
E0221 TPH in Water (ug/L)						
C15-C28 Fraction	100	nd				
E0010 BTEX (P&T) in Water (ug/L)						
Benzene	0.5	nd				
Toluene	1	nd				
Ethylbenzene	1	nd				
m&p-Xylene	2	nd				
o-Xylene	1	nd				
E4870 Dissolved Metals in Waters						
Lead	0.001	nd				

PQL = Practical Quantitation Limit
nd = < PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified



Job Number : 5E2151

Page 4 of 4

QAQC : Method Blank(s)

ANALYTE	Sample ID PQL	Blank1	Blank2	Blank3	Blank4	Blank5
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	nd				
Acenaphthylene	1	nd				
Acenaphthene	1	nd				
Fluorene	1	nd				
Phenanthrene	1	nd				
Anthracene	1	nd				
Fluoranthene	1	nd				
Pyrene	1	nd				
Benz(a)anthracene	1	nd				
Chrysene	1	nd				
Benzo(b) & (k)fluoranthene	2	nd				
Benzo(a)pyrene	1	nd				
Indeno(1,2,3-cd)pyrene	1	nd				
Dibenz(a,h)anthracene	1	nd				
Benzo(g,h,i)perylene	1	nd				

PQL = Practical Quantitation Limit
 nd = < PQL
 -- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/L (ppm) unless otherwise specified

AMDEL LTD

INDUSTRIAL AND ENVIRONMENTAL SERVICES DIVISION

Amdel Limited
Correspondence to:
PO BOX 331
HUNTER REGIONAL MAIL
CENTRE NSW 2310

ABN 38 0081 27 802
99 Mitchell Rd
CARDIFF NSW 2285
Telephone: (02) 4902 4800
Facsimile: (02) 4902 4899

SAMPLE RECEIPT ACKNOWLEDGMENT

TO: Coffey Geosciences Pty Ltd
ATTN: Mr Manuel Fernandez
FROM: Client Services Cardiff
DATE: 09/06/05

Coffey Geosciences Pty Ltd Wellington RECEIVED	
14 JUN 2005	
Job No:	Action:
Rec'd by:	

FAX NO: (02) 4272 6075

PAGES: 1 of 1

If you have any queries or wish to make any adjustments to analyses performed, please contact this laboratory immediately.

Reference/Order: E14497/3/30554
Project: E14497/3
Our Reference Number : 5E2151
Date Received by Amdel : 09/06/05

ANALYSIS REQUESTED	AMDEL METHOD CODE	NUMBER OF SAMPLES	ESTIMATED REPORT DATE (COI)
Polycyclic Aromatic Hydrocarbons	E0110	3	
TPH C6-C9 by purge & trap	E0230	3	
TPH (C10-C36)	E0221F	3	
Benzene, Toluene, Ethylbenzene & Xylene	E0010	3	
Dissolved Metals by ICP-MS	E4870	3	
Australian GST	GST		

Sample integrity upon receipt

- * Samples were received chilled/chilling (refer to COC for temperature records(if space provided)). YES
- * Samples received in good condition and appropriately preserved for all tests. YES
- * VOC/SVOC samples were received in teflon lined lids. YES
- * VOC samples were received with Zero Headspace. YES
- * Samples were received in sufficient time to allow us to meet holding time requirements. YES

** We have received the samples referenced above and they are now being processed in our laboratory. Samples received after 4pm are considered as received the next working day for turnaround purposes. Surcharges for urgent turn-around requests may apply.

UNLESS ADVISED OTHERWISE - Sample analysis will be commenced regardless of integrity issues. Any non-conformance will be recorded on the final report.


Coffey
No: 30554

Job No: 64997/3 Sheet 1 of 1

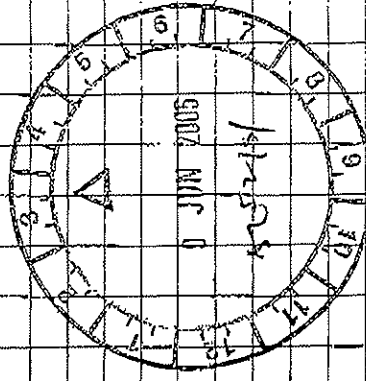
Laboratory Quotation / Order No: 17/COFFEY

Chain of Custody

Dispatch to: AMDEL Ltd 76, 777 Lane (Address & Phone No.)	Sampled by: James Boyle	Consigning Officer: Scott (0051)
Attention: Sample Security	Project Manager: (report results to) Michael Fernandez	Date Dispatched: 8/6/05
		Courier Service: on and 8 lanes
		Consignment Note No: 159439

Requisitioned by: James Boyle	Date: 8/6	Received by: James Boyle	Date: 8/6	Time: 3.10
--------------------------------------	------------------	---------------------------------	------------------	-------------------

Comments	Sample Matrix	Container Type and Preservative	Sample No.	Date Sampled	Analyses Required				Sample Condition on Receipt
					PAHs	TPHs	MMPs = BTEX	Metals:	
6203124	Water	Sampled in 2x 250ml bottles in 2x 100ml bottles	203124	8/6/05	/	/	/	/	
↓ 25			203125	8/6/05	/	/	/	/	
↓ 26			203126	8/6/05	/	/	/	/	



Special Laboratory Instructions:

Detection Limits:

 Turnaround Required: **5 days**

JOB NUMBER MUST BE REFERENCED ON ALL SUBSEQUENT PAGE



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ANALYTICAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:

PO Box 331

HUNTER REGIONAL MAIL

CENTRE NSW 2310

99 Mitchell Rd

CARDIFF NSW 2285

Telephone: (02) 4902 4800

Facsimile: (02) 4902 4899

CERTIFICATE OF ANALYSIS

Contents :

1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External
(if applicable)
5. Chain of Custody (if applicable)

Report No. : 5E2205

Attention : Mr Manuel Fernandez

Client : Coffey Geosciences Pty Ltd
: Unit 1/222 Berkeley Road
: UNANDERRA NSW 2526

Samples : 15

Reference/Order : E14497/3/30557

Project : E14497/3

Received Samples : 16/06/05 Instructions : 16/06/05

Date Reported : 22/06/05

PLEASE SEE FOLLOWING PAGES FOR METHOD LISTING AND RESULTS

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "#", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been authorized by the NATA signatories listed in the method descriptions section on the following page.

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Team Leader - Metals

Peter Keyte B.Sc.(Chem.)
Senior Chemist - Inorganics

Minh Nguyen B.Sc.(App. Chem.), MSC (Env. Tox.)
Senior Chemist - Organics



Report No. : 5E2205

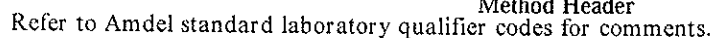
Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

<u>Method</u>	<u>Description</u>	<u>Extracted</u>	<u>Analysed</u>	<u>Authorised</u>
E7500	Moisture (%w/w)	17/06/05	20/06/05	ZSI 096
E1230	TPH C6-C9 by Purge & Trap	17/06/05	18/06/05	GTO 094
E1221	TPH (C10-C36)	17/06/05	20/06/05	GTO 094
E1010	Benzene, Toluene, Ethylbenzene & Xylene	17/06/05	18/06/05	GTO 094
E5910	Metals by ICP-AES	21/06/05	21/06/05	DLU 093
E5950	Mercury in Soil	21/06/05	21/06/05	DLU 093
E1110	Polycyclic Aromatic Hydrocarbons	17/06/05	20/06/05	MNG 095
E1081	Organochlorine Pesticides and total PCBs	17/06/05	20/06/05	MNG 095



NATA Signatory

<u>Initials</u>	<u>Name</u>	<u>Sections/Methods</u>
MNG	Minh Nguyen	094, 095
MFA	Mark Fahmy	094, 095
DJA	Dilanthi Jayamanne	094
GTO	Greg Towers	094
GPE	Geoff Peterson	095
DLU	Darrel Luck	093
MAV	Merrin Avery	101
DBL	Dianne Blane	101
NCO	Nathan Cooper	101
AGR	Alison Graham	101
PKE	Peter Keyte	101
ZSI	Zoe Sin	096, 097, 098





Job Number : 5E2205

Client : Coffey Geosciences Pty Ltd

Reference : E14497/3/30557

Project : E14497/3

Page 2 of 4

plus Cover Page

[illegible]

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = < PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Method Header
Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 5E2205

Client : Coffey Geosciences Pty Ltd

Reference : E14497/3/30557

Project : E14497/3

Page 3 of 4

plus Cover Page

Analyte	Lab No	E203785	E203787	E203794		
		CGBH7/	CGBH8/	CGBH9/		
	Sample Id	0.13-.25	0.32-0.4	0.3-0.5		
	PQL					
E1110 Priority PAH's in Soil						
Naphthalene	0.5	nd	nd	nd		
Acenaphthylene	0.5	nd	nd	nd		
Acenaphthene	0.5	nd	nd	nd		
Fluorene	0.5	nd	nd	nd		
Phenanthrene	0.5	nd	0.6	1.2		
Anthracene	0.5	nd	nd	1.2		
Fluoranthene	0.5	nd	0.8	2.0		
Pyrene	0.5	nd	0.8	2.0		
Benz(a)anthracene	0.5	nd	nd	0.8		
Chrysene	0.5	nd	nd	0.8		
Benzo(b) & (k)fluoranthene	1	nd	nd	2		
Benzo(a)pyrene	0.5	nd	nd	1.2		
Indeno(1,2,3-cd)pyrene	0.5	nd	nd	0.9		
Dibenz(a,h)anthracene	0.5	nd	nd	nd		
Benzo(g,h,i)perylene	0.5	nd	nd	0.8		
Total USEPA Priority PAHs	0.5	nd	2.2	13		
2-Fluorobiphenyl-SURROGATE	1	96%	96%	95%		
Anthracene-d10-SURROGATE	1	106%	100%	95%		
p-Terphenyl-D14-SURROGATE	1	97%	97%	95%		

PQL = Practical Quantitation Limit
 LNR = Samples Listed not Received
 nd = < PQL
 -- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
 Waters : mg/L (ppm) unless otherwise specified in Method Header
 Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



Job Number : 5E2205

Client : Coffey Geosciences Pty Ltd

Reference : E14497/3/30557

Project : E14497/3

Page 4 of 4

plus Cover Page

Analyte	Lab No	E203786	E203794			
		CGBH7/	CGBH9/			
	Sample Id	0.7-1.0	0.3-0.5			
	PQL					
E1081 OC's & Total PCB's in Soil						
HCB	0.1	nd	nd			
a-BHC	0.1	nd	nd			
g-BHC	0.1	nd	nd			
Heptachlor	0.1	nd	nd			
Aldrin	0.1	nd	nd			
b-BHC	0.1	nd	nd			
d-BHC	0.1	nd	nd			
Oxychlordane	0.1	nd	nd			
Heptachlor epoxide	0.1	nd	nd			
Endosulfan 1	0.1	nd	nd			
Chlordane-Trans	0.1	nd	nd			
Chlordane-Cis	0.1	nd	nd			
trans-Nonachlor	0.1	nd	nd			
DDE	0.1	nd	nd			
Dieldrin	0.1	nd	nd			
Endrin	0.1	nd	nd			
DDD	0.1	nd	nd			
Endosulfan 2	0.1	nd	nd			
DDT	0.1	nd	nd			
Endosulfan sulfate	0.1	nd	nd			
Methoxychlor	0.1	nd	nd			
Total Polychlorinated biphenyl	1	nd	nd			
2,4,5,6-TCMX-SURROGATE	1	102%	105%			

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = < PQL

-- = Not Applicable

Soils

Waters

Leachates

: mg/kg (ppm) dry weight unless otherwise specified
: mg/L (ppm) unless otherwise specified in Method Header
: mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.



AMDEL INTERNAL QUALITY ASSURANCE REVIEW.

Page 1

Job No. 5E2205

General

1. Laboratory QA/QC including Method Blanks, Duplicates, Matrix Spikes, Laboratory Control Samples or CRM's are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results are available upon request.
3. PQLs are matrix dependent and are increased accordingly where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spike or surrogate recoveries.
5. Where 3 and 2 significant figures are reported for > 10x PQL and < 10x PQL respectively, the last figure is uncertain and is provided for statistical purposes only.
6. Samples duplicated or spiked are from this job only and are identified in the following QA/QC report.
7. SVOC analyses on waters are performed on homogenized, unfiltered samples, unless noted otherwise.

Maximum Holding Times for Soils, Sediments and Waters

Parameter	Holding Times
<u>Soils</u>	
Volatile and Semi-Volatile Organic Analysis.	Extracted in 14 days, analysed within 40 days.
Metals	Extracted and analysed within 28 days-6 months.
Inorganics*	Extracted and analysed within 7-28 days.
TCLPs*	Extracted and analysed within 14 days, (Zero Headspace-TCLP 7 days).
<u>Waters</u>	
Volatile Organic Analysis	Analysed within 7 days (USEPA requires 14 days).
Semi-Volatile Organic Analysis	Extracted in 7 days, analysed within 40 days.
Inorganics*	Analysed within 24 hrs-28 days.
Metals (dissolved metals should be supplied field filtered)	Prepared and analysed within 28 days.

* Please refer to 'Preservation Information Chart for Soils, Sediments & Waters' for further information. (ISFORM.098). Holding times may be extended with the use of preservation bottles and/or freezing samples. Holding times can be calculated from dates reported in the body of the report. Tests clearly exceeding holding times will be noted when sufficient information is provided.
Reference: USEPA SW846 and AMDEL SPM-01 (incorporating NEPM Guidelines).

Chain of Custody and Sample Integrity

Yes/NO/NA

Chain of Custody / instructions received with samples	Yes
Custody seals were received intact, if used	NA
Samples were received chilled and in good condition	Yes
Samples received appropriately preserved for all tests	Yes
VOC/SVOC samples were received in teflon lined containers	Yes
Samples received with Zero Headspace	Yes
Chain of Custody completed and attached (if applicable)	Yes

Chromatography Calibration/Acceptance Criteria (if applicable)

Retention time window meets acceptance criteria (+/-2%)	Yes
Reference standard meets acceptance criteria (+/-10%)	Yes
Recalibration standard meets acceptance criteria (+/-15%)	Yes
Internal standard recovery acceptable.	Yes



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AMDEL INTERNAL QUALITY ASSURANCE REVIEW Cont..

Page 2

Amdel QA/QC Compliance Assessment

Compliance

Surrogates performed on all appropriate GC analyses and meet acceptance limits (70% - 130% recovery*).

Please see body
of report

Matrix Spikes performed once per process batch and at least 1 in 20 samples (Results meet acceptance limits - 70% - 130% recovery* or 80% - 120% recovery* for inorganics in water.)

Please see body
of report

Laboratory Control samples performed once per process batch and at least 1 in 20 samples (Results meet acceptance limits - 70% - 130% recovery* in soil or 70%-130%/90-110% recovery* for waters.)

Yes

Laboratory Duplicate samples performed once per process batch and at least 1 in 10 samples

Yes

Laboratory duplicates meet acceptance criteria
< 4 PQL - +/- 2 PQL
4-10 PQL - 25-50 or 50% RPD
> 10 PQL - 10-30 or 30% RPD

Please see body
of report

Method Blanks performed once per process batch and at least 1 in 20 samples (Results not detected at the PQL).

Yes

N/A = Not Applicable.

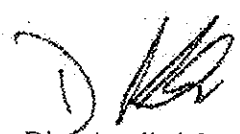
- * Phenols 50% - 130% recovery
- * SVOCs 60% - 130% recovery
- * Phenoxy Acid Herbicides 60% - 140% recovery

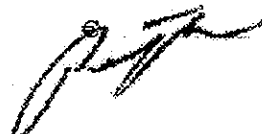
QA/QC Appendix

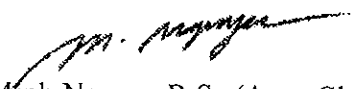
Please refer to the following pages for the QA/QC data.

For further information on samples or non-conformance in QC protocols please see notations in the body of the report plus comments on the following page.

Additional Comments


Darrel Luck Ass. Dip. Applied Sc.(Chem.)
Team Leader - Metals


Peter Keyte B.Sc.(Chem.)
Senior Chemist - Inorganics


Minh Nguyen B.Sc.(App. Chem.), MSC (Env. Tox.)
Senior Chemist - Organics



AMDEL STANDARD LABORATORY QUALIFIER CODES.

Page 3

Job NO. 5E2205

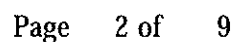
<u>Qualifier Codes</u>	<u>Description</u>
*	PQLs are raised due to matrix interference.
@	PQLs are raised due to insufficient sample provided for analysis.
\$	The mass imbalance indicates the presence of other ions not measured as part of this procedure.
nd	< PQL
--	Not applicable
LNR	The sample was listed on the COC, but not received.
IS	Insufficient sample was supplied to conduct this analysis.
AN	The analysis indicates the presences of an analyte that has been 'tentatively' identified, and the associated numerical value represents it's approximate concentration.
A	Sample results are reported on an 'as received' basis (not moisture corrected).
B	The sample was not received in a suitable timeframe to allow completion within the recommended holding time.
C	This sample was received with headspace.
D	This sample was received with the incorrect preservation for this analysis.
E	The raw data indicates the absence of 0.055g of Copper Sulphate in the sample.
F	This sample contained significant amounts of solids and was therefore analysed by settling and decanting the aqueous phase to avoid including the solid in the analysis portion.
G	This test was performed outside the recommended holding time.
H	This sample contained significant material > 5mm which was removed prior to analysis.
ISD	Insufficient sample was supplied to conduct duplicate analyses.
ISM	Insufficient sample was supplied to conduct matrix spike analyses.
W	The spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.
J	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause.
K	The matrix spike concentration is less than five times the background concentration in the sample, and therefore the spike recovery can not be determined.
L	The surrogate recovery is outside of the recommended acceptance criteria, due to matrix interference.
M	The surrogate recovery is outside of the recommended acceptance criteria. Insufficient sample remains to perform re-analysis.
N	Results are expressed in mg/L (ppm) due to the high concentration of the analyte.
O	The results reported are 'recoverable organics' for this fraction, as the chromatogram and peak shape indicates the presence of a significant concentration of polar compounds.
P	The concentration reported is mainly due to a single peak.
Q	This samples contains volatile halogenated oxygenated or other compounds that are included and quantitated as part of TPH C6-9.
R	Theoretically the total result should be greater or equal to the dissolved concentration. However the difference reported is within the uncertainty of the individual tests.
S	The mass imbalance was equal to or less than 0.2 milli-equivalents.
T	During Kjeldahl digestion, nitrate (> 10mg/L) can oxidise ammonia resulting in a negative TKN interference, which may have occurred for this sample.
U	Theoretically the TKN result should be greater or equal to ammonia concentration. However the difference reported is within the uncertainty of the individual tests.
V	This sample contained significant amounts of sediment which was included in the analysis portion as requested.
SUR	Surrogate recoveries could not be determined due to the dilution required to quantify the analyte.

QAQC : Laboratory Control Sample(s)

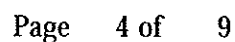
[illegible]

PQL = Practical Quantitation Limit
 -- = Not Applicable
 nd = <PQL

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified



(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified

[illegible]

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified



Job Number : 5E2205

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QAQC : Laboratory Control Sample(s)

Analyte	Level	Level Detected			Recovery Details		
		Result1	Result2	Result3	Rec 1 (%)	Rec 2 (%)	Rec 3 (%)
E1110 Priority PAH's in Soil							
Naphthalene	5	4.6			92%		
Acenaphthylene	5	4.6			90%		
Acenaphthene	5	4.6			90%		
Fluorene	5	4.6			90%		
Phenanthrene	5	4.6			92%		
Anthracene	5	4.4			90%		
Fluoranthene	5	4.6			91%		
Pyrene	5	4.6			92%		
Benz(a)anthracene	5	4.6			91%		
Chrysene	5	4.4			87%		
Benzo(b) & (k)fluoranthene	10	9			90%		
Benzo(a)pyrene	5	4.6			93%		
Indeno(1,2,3-cd)pyrene	5	4.6			93%		
Dibenz(a,h)anthracene	5	4.8			95%		
Benzo(g,h,i)perylene	5	4.6			94%		

PQL = Practical Quantitation Limit
 -- = Not Applicable.
 nd = < PQL

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/L (ppm) unless otherwise specified

The number in brackets after the method header identifies the sample tested.



Job Number : 5E2205

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QAQC : Method Blank(s)

ANALYTE	Sample ID PQL	Blank1	Blank2	Blank3	Blank4	Blank5
E1110 Priority PAH's in Soil						
Naphthalene	0.5	nd				
Acenaphthylene	0.5	nd				
Acenaphthene	0.5	nd				
Fluorene	0.5	nd				
Phenanthrene	0.5	nd				
Anthracene	0.5	nd				
Fluoranthene	0.5	nd				
Pyrene	0.5	nd				
Benz(a)anthracene	0.5	nd				
Chrysene	0.5	nd				
Benzo(b) & (k)fluoranthene	1	nd				
Benzo(a)pyrene	0.5	nd				
Indeno(1,2,3-cd)pyrene	0.5	nd				
Dibenz(a,h)anthracene	0.5	nd				
Benzo(g,h,i)perylene	0.5	nd				

PQL = Practical Quantitation Limit
nd = < PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/L (ppm) unless otherwise specified



Job Number : 5E2205

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QAQC : Laboratory Control Sample(s)

Analyte	Level	Level Detected			Recovery Details		
		Result1	Result2	Result3	Rec 1 (%)	Rec 2 (%)	Rec 3 (%)
E1081 OC's & Total PCB's in Soil							
HCB		--					
a-BHC	0.5	0.4			88%		
g-BHC	0.5	0.4			88%		
Heptachlor	0.5	0.4			88%		
Aldrin	0.5	0.4			88%		
b-BHC	0.5	0.5			90%		
d-BHC	0.5	0.4			84%		
Oxychlorthane		--					
Heptachlor epoxide	0.5	0.4			88%		
Endosulfan I	0.5	0.4			88%		
Chlordane-Trans	0.5	0.4			88%		
Chlordane-Cis	0.5	0.4			88%		
trans-Nonachlor		--					
DDE	1.0	0.9			86%		
Dieldrin	0.5	0.4			88%		
Endrin	0.5	0.4			82%		
DDD	1	0.9			85%		
Endosulfan 2	0.5	0.4			86%		
DDT	1.0	0.8			80%		
Endosulfan sulfate	0.5	0.5			106%		
Methoxychlor	0.5	0.5			90%		
Total Polychlorinated biphenyl		--					

PQL = Practical Quantitation Limit
 -- = Not Applicable
 nd = < PQL

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/L (ppm) unless otherwise specified



Job Number : 5E2205

Page 9 of 9

QAQC : Method Blank(s)

ANALYTE	Sample ID PQL	Blank1	Blank2	Blank3	Blank4	Blank5
E1081 OC's & Total PCB's in Soil						
HCB	0.1	nd				
a-BHC	0.1	nd				
g-BHC	0.1	nd				
Heptachlor	0.1	nd				
Aldrin	0.1	nd				
b-BHC	0.1	nd				
d-BHC	0.1	nd				
Oxychlordane	0.1	nd				
Heptachlor epoxide	0.1	nd				
Endosulfan 1	0.1	nd				
Chlordane-Trans	0.1	nd				
Chlordane-Cis	0.1	nd				
trans-Nonachlor	0.1	nd				
DDE	0.1	nd				
Dieldrin	0.1	nd				
Endrin	0.1	nd				
DDD	0.1	nd				
Endosulfan 2	0.1	nd				
DDT	0.1	nd				
Endosulfan sulfate	0.1	nd				
Methoxychlor	0.1	nd				
Total Polychlorinated biphenyl	1	nd				

PQL = Practical Quantitation Limit
 nd = < PQL
 -- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/L (ppm) unless otherwise specified

AMDEL LTD

INDUSTRIAL AND ENVIRONMENTAL SERVICES DIVISION

Amdel Limited
Correspondence to:
PO BOX 331
HUNTER REGIONAL MAIL
CENTRE NSW 2310

ABN 38 0081 27 802
99 Mitchell Rd
CARDIFF NSW 2285
Telephone: (02) 4902 4800
Facsimile: (02) 4902 4899

SAMPLE RECEIPT ACKNOWLEDGMENT

TO: Coffey Geosciences Pty Ltd

ATTN: Mr Manuel Fernandez

FAX NO: (02) 4272 6075

FROM: Client Services Cardiff

DATE: 16/06/05

PAGES: 1 of 1

If you have any queries or wish to make any adjustments to analyses performed, please contact this laboratory immediately.

Reference/Order: E14497/3/30557
Project: E14497/3
Our Reference Number : 5E2205
Date Received by Amdel : 16/06/05

ANALYSIS REQUESTED	AMDEL METHOD CODE	NUMBER OF SAMPLES	ESTIMATED REPORT DATE (COB)
Moisture (%w/w)	E7500	4	
Polycyclic Aromatic Hydrocarbons	E1110	3	
TPH C6-C9 by Purge & Trap	E1230	2	
TPH (C10-C36)	E1221	2	
Benzene, Toluene, Ethylbenzene & Xylene	E1010	2	
Metals by ICP-AES	E5910	4	
Mercury in Soil	E5950	4	
Organochlorine Pesticides and total PCB E1081		2	
Samples on Hold (Soil)	E7600	11	
Australian GST	GST		

Sample integrity upon receipt

- * Samples were received chilled/chilling (refer to COC for temperature records(if space provided)). YES
- * Samples received in good condition and appropriately preserved for all tests. YES
- * VOC/SVOC samples were received in teflon lined lids. YES
- * VOC samples were received with Zero Headspace. YES
- * Samples were received in sufficient time to allow us to meet holding time requirements. YES

** We have received the samples referenced above and they are now being processed in our laboratory. Samples received after 4pm are considered as received the next working day for turnaround purposes. Surcharges for urgent turn-around requests may apply.

UNLESS ADVISED OTHERWISE - Sample analysis will be commenced regardless of integrity issues. Any non-conformance will be recorded on the final report.

E14497/3-AE
19 July 2005

APPENDIX E

Geotechnical Laboratory Reports

Coffey 

test resultsclient : **BELMORGAN PROPERTY DEVELOPMENT**job no : **E14497/3**

principal :

laboratory : **WOLLONGONG**project : **ENVIRONMENTAL ASSESSMENT & GEOTECHNICAL INVESTIGATION**report date : **July 06, 2005**location : **CNR CROWN, CORRIMAL & BURELLI STREETS, WOLLONGONG**test report : **SCL05/396-01**test procedure : **AS1289 2.1.1, 3.1.1, 3.2.1, 3.3.1, 3.4.1**test date : **27/6/05****ATTERBERG LIMITS RESULTS****Coffey Sample No.:****CW05-0533****Sample Identification:****CGBH8 1.5-1.95m****Liquid Limit:** %**45****Plastic Limit:** %**17****Plasticity Index:** %**28****Linear Shrinkage:** %**9.5****Natural Moisture Content:** %**28.3****Sample Preparation History:****Oven Dried / Dry Sieved**remarks : **Silty CLAY - pale/dark brown**

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NATA Accredited Laboratory
No. 431

Authorised Signature:

ANTHONY HUGHES
LABORATORY MANAGER

Date :

6/7/05

test resultsclient : **BELMORGAN PROPERTY DEVELOPMENT**job no : **E14497/3**

principal :

laboratory : **WOLLONGONG**project : **ENVIRONMENTAL ASSESSMENT & GEOTECHNICAL INVESTIGATION**report date : **July 06, 2005**location : **CNR CROWN, CORRIMAL & BURELLI STREETS, WOLLONGONG**test report : **SCL05/396-02**test procedure : **AS1289 2.1.1, 3.1.1, 3.2.1, 3.3.1, 3.4.1**test date : **27/6/05****ATTERBERG LIMITS RESULTS****Coffey Sample No.:****CW05-0534****Sample Identification:****CGBH9 3.0-3.45m****Liquid Limit:** %**50****Plastic Limit:** %**19****Plasticity Index:** %**31****Linear Shrinkage:** %**7****Natural Moisture Content:** %**27.5****Sample Preparation History:****Oven Dried / Dry Sieved**remarks : **Silty CLAY - dark brown**

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NATA Accredited Laboratory No. 431
Authorised Signature:
ANTHONY HUGHES
LABORATORY MANAGER

Date :

6/7/05

Job No **E14497/3**Sheet **1** of **1**

Point Load Strength Index Test Results

Client **BELMORGAN PTY LTD**Office **WOLLONGONG**

Principal

Date **21-Jun-05**Project **ENVIRO ASSESSMENT AND GEOTECH INVESTIGATION**By **DH**Location **CNR CROWN, CORRIMAL AND BURELL ST'S, WOLLONGONG**Checked **for**Test Method **AS 4133.4.1 - 1993 Methods of Testing Rocks for Engineering Purposes,**

Selected from boreholes

Sampling Date **9/6/05 - 10/6/05**

Determination of Point Load Strength Index

Coffey Wollongong office indoor core storage area

Testing Date **21/6/2005**Test Machine **Green Impell Tester**

Natural

Tested By **DH**Calibration Date **2/9/2004**

< 15 seconds

Rock Type	Location	Depth (m)	Diametral Tests				Axial, Block, and Irregular Lump Tests							Strength Classification	
			D (mm)	L (mm)	P (kN)	I _{s(50)} (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	I _s (MPa)	I _{s(50)} (MPa)		Failure Mode
SANDSTONE, Swaley bedding	CGBH9	10.7-10.95	50	250	7.48	2.99	Parallel to bedding	50	50	-	16.33	5.13	5.42	Through substance	H / VH
SANDSTONE, Swaley bedding	CGBH9	6.56-6.69	50	130	1.15	0.46	Along defect	50	45	-	1.79	0.62	0.64	Through substance	M
SANDSTONE, Swaley bedding	CGBH8	4.67-4.86	50	190	4.63	1.85	Parallel to bedding	50	45	-	5.26	1.84	1.89	Along defect	H
SANDSTONE, Swaley bedding	CGBH8	9.12-9.22	50	100	3.05	1.22	Along defect	90	40	-	3.68	0.8	0.92	Parallel to bedding	M / H
SANDSTONE, Swaley bedding	CGBH7	7.0-7.18	50	180	7.48	2.99	Parallel to bedding	50	50	-	10.64	3.34	3.53	Through substance	H / VH
SANDSTONE, Swaley bedding	CGBH7	10.02-10.16	50	140	7.48	2.99	Parallel to bedding	50	50	-	7.79	2.45	2.58	Through substance	H

test resultsclient : **BELMORGAN Pty Ltd**job no : **E 14497/3**

principal :

laboratory : **Sydney**project : **ENVIRON ASSESSMENT & GEOTECH INVESTIGATION**report date : **30 June 2005**location : **Cnr. Crown, Corrimal, & Burelli Streets WOLLONGONG**test report : **RT 0 035**test procedure : **AS 4133.4.2: AS 4133.1.1.1**test date : **28 June 2005**

Sample Identification	UNIAXIAL COMPRESSIVE STRENGTH	
	ROCK CORE TEST RESULTS	
Borehole No.	CGBH 7	CGBH 7
Depth m	7.34 to 7.50	10.38 to 10.52
Date Tested	28 June 2005	28 June 2005
Number of Specimens tested	5	5
Average Diameter mm	51.4	51.3
Height mm	153	143
UNIAXIAL COMPRESSIVE STRENGTH MPa	68.3	94.2
Wet Density t/m ³	2.50	2.51
Moisture Content %	4.0	9.0
Time to Failure min	13.05	20.83
Mode of Failure	shear	cone & shear
Sample Description	sandstone	sandstone
Height:Diameter Ratio	2.97:1	2.79:1
Note: The average Uniaxial Compressive Strength for the five samples supplied was 59.3 MPa		
remarks : The samples were delivered by courier on 24 June 2005, wrapped in plastic, and in a moist state. They were kept in this condition until they were tested. A Wykeham Farrance/Civilab 1500kN compression machine was used.		



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NATA Accredited Laboratory
No. 431
Authorised Signature:

Date: **30 June 2005**

azbark

test results

client : BELMORGAN Pty Ltd

job no : E 14497/3

principal :

laboratory : Sydney

project : ENVIRON ASSESSMENT & GEOTECH INVESTIGATION

report date : 30 June 2005

location : Cnr. Crown, Corrimal, & Burelli Streets WOLLONGONG

test report : RT 0 036

test procedure : AS 4133.4.2: AS 4133.1.1.1

test date : 27 & 28 June 2005

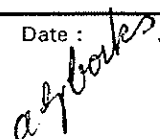
Sample Identification	UNIAXIAL COMPRESSIVE STRENGTH		
	ROCK CORE TEST RESULTS		
Borehole No.	CGBH 9	CGBH 9	CBH 9
Depth m	8.29 to 8.43	9.80 to 9.95	10.55 to 10.70
Date Tested	27 June 2005	28 June 2005	28 June 2005
Number of Specimens tested	5	5	5
Average Diameter mm	51.4	51.4	51.4
Height mm	136	153	146
UNIAXIAL COMPRESSIVE STRENGTH MPa	11.1	47.6	75.2
Wet Density t/m ³	2.37	2.49	2.54
Moisture Content %	6.2	3.8	2.9
Time to Failure min	8.02	23.5	13.7
Mode of Failure	defect	shear	shear
Sample Description	sandstone with ironstained def'ts	sandstone	sandstone
Height:Diameter Ratio	2.66:1	2.99:1	2.83:1
<i>Note: The average Uniaxial Compressive Strength for the five samples supplied was - 59.3 MPa</i>			
remarks : The samples were delivered by courier on 24 June 2005, wrapped in plastic, and in a moist state. They were kept in this condition until they were tested. A Wykeham Farrance/Civilab 1500kN compression machine was used.			



This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory
No. 431
Authorised Signature:
Alan Cocks
Senior Technical Officer

Date : 30 June 2005



APPENDIX F

Data Validation Report



Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2047



I. SAMPLE HANDLING

1. Were the sample **holding times** met?
2. Were the samples in **proper custody** between the field and reaching the laboratory?
3. Were the samples **properly and adequately** preserved?
This includes keeping the samples chilled, where applicable.
4. Were the samples received by the laboratory in good condition?

Yes	No (Comment below)
☒	☐
☒	☐
☐	☒
☒	☐

COMMENTS:

- The laboratory indicated that a semi-volatile water sample (WB1) was received with 150mL headspace.

Sample Handling was:

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2047



II PRECISION/ACCURACY ASSESSMENT

1. Was a NATA registered laboratory used?
2. Did the laboratory perform the requested tests?
3. Were the laboratory methods adopted NATA endorsed?
4. Were the appropriate test procedures followed?
5. Were the reporting limits satisfactory?
6. Was the NATA Seal on the reports?
7. Were the reports signed by an authorised person?

Yes	No (Comment below)
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐

COMMENTS:

Precision/Accuracy of the Laboratory Report

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2047



5. TRIP BLANKS

A. Were an Adequate Number of trip blanks collected?

B. Were the Trip Blanks free of contaminants?

(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
☒	☐
☒	☐

6. WASH BLANKS

A. Were an adequate number of Wash Blanks collected?

B. Were the Wash Blanks free of contaminants?

(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
☒	☐
☒	☐

COMMENTS:

- A laboratory prepared trip spike sample (spiked with BTEX) was taken into the field and transported with the laboratory samples. The recoveries of the trip spike sample ranged between 70% and 98%, which are within the control limits of 60% and 110%. This result indicates that volatiles were not lost at significant quantities during transit or sample preparation.

Field QA/QC was:

☐ Satisfactory

☐ Unsatisfactory

☒ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2047



IV LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Types and Number of QA/QC Samples

	SOIL	WATER
Laboratory Blanks/Reagent Blanks	☒	NA
Matrix Spikes/Matrix Spike Duplicates	☒	NA
Laboratory Duplicates	☒	NA
Surrogates	☒	NA

2. Were the laboratory blanks/reagents blanks free of contamination?

3. Were the spike recoveries within control limits?

a. Organics (60% to 110%)

b. Metals/Inorganic (70% to 130%)

4. Were the RPDs of the laboratory duplicates within control limits?

5. Were the surrogate recoveries within control limits?

Yes	No (Comment below)
☒	☐
☐ ☒	☒ ☐
☒	☐
☐	☒

COMMENTS:

- Volatile TPH/BTEX compound surrogates recorded recoveries of 112% and 116% for soil samples CGBH1/3.0-3.35m and CGBH6/0.2-0.5m respectively, which is outside the upper control limit of 110%. This result can be disregarded as the concentrations of these chemicals in sample CGBH1/3.0-3.35m were below the PQL. This may indicate that slightly higher concentrations of these chemicals may have been recorded for CGBH6/0.2-0.5m than what was actually present in the sample.
- The laboratory indicated that the volatile TPH/BTEX recovery for soil sample CGBH1/1.4-1.85m could not be determined due to the dilution required to quantify the analyte.
- The laboratory indicated that the matrix spike concentrations for lead and zinc were less than five times the background concentration in the sample, and therefore the spike recovery cannot be determined.
- In the batch QA/QC, a laboratory control spike recorded recoveries ranging between 112% and 122% for benzene, toluene and ortho, meta & para-xylene, which is outside the upper control limit of 110%. This result can be disregarded for the trip blank and wash blank, as concentrations of these analytes in the wash blank and trip blank were below the PQL. However, this result may indicate slightly higher concentrations of these chemicals may have been recorded than what was actually present in the trip spike sample.

Continued...

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2047



- In the batch QA/QC, a laboratory control spike recorded a recovery of 149%, which is outside the upper control limit of 110%, for toluene. This result may indicate slightly higher concentrations of toluene may have been recorded than what was actually present in soil samples. This is not considered significant as the concentrations of toluene in soil samples were below the adopted soil investigation levels (SILs).
- In the batch QA/QC, a laboratory control spike recorded b-HC, Endrin, DDT and Methoxychlor recoveries ranging between 114% and 120%, which is outside the upper control limit of 110%. This result can be disregarded as the concentrations of these analytes in this batch were below the PQL.
- In the batch QA/QC, matrix spikes recorded recoveries of 33% and 40% for meta & para-xylene and ortho-xylene (outside the lower control limit of 60%). This result may indicate slightly lower concentrations of these analytes may have been recorded than what was actually present in soil samples.
- In the batch QA/QC, the laboratory indicated that the PQL's of a matrix spike and laboratory control sample for benzene was raised due to matrix interference.
- In the batch QA/QC, RPD's of laboratory duplicates for toluene, ethylbenzene and o-xylene were outside the laboratory's recommended acceptance criteria. The laboratory indicated this is due to heterogeneity of the soil sample.

5. The laboratory internal QA/QC was:

☐ Satisfactory

☐ Unsatisfactory

☒ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2047



V. DATA USABILITY

1. Data Directly Usable ☐
2. Data Usable with the following corrections/modifications (see comment below) ☒
3. Data Not Usable. ☐

COMMENTS:

An inconsistency and several RPD's above the control limit were recorded between the duplicate and primary soil sample for heavy metals (Cr, Pb, Zn and Hg). This is considered to be attributed to the heterogeneous nature of contaminant distribution throughout the soil/fill matrix. Some variability in Cr, Pb, Zn and Hg concentrations can therefore be expected.

Some higher control spike and surrogate recoveries were recorded in some soil and trip spike samples for xylenes, benzene, toluene and volatile TPH, indicating slightly higher concentrations of these analytes may have been recorded than what was actually present.

Matrix spikes recorded recoveries below the lower control limit for meta & para-xylene and ortho-xylene. This result may indicate slightly lower concentrations of o, m & p-xylene may have been recorded than what was actually present in soil samples.

The laboratory indicated that duplicates for toluene, ethylbenzene and o-xylene were outside the laboratory's recommended acceptance criteria. The laboratory indicated this is due to heterogeneity of the soil sample.

QA/QC Report Prepared by

QA/QC Report Reviewed by:

James Boyle

A handwritten signature in black ink, appearing to read "J. Boyle", written over a horizontal line. Below the line, the text "(Project Manager)" is printed.

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2151



I. SAMPLE HANDLING

1. Were the sample **holding times** met?
2. Were the samples in **proper custody** between the field and reaching the laboratory?
3. Were the samples **properly and adequately** preserved?
This includes keeping the samples chilled, where applicable.
4. Were the samples received by the laboratory in good condition?

Yes	No (Comment below)
☒	☐
☒	☐
☒	☐
☒	☐

COMMENTS:

Sample Handling was:

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2151



II PRECISION/ACCURACY ASSESSMENT

1. Was a NATA registered laboratory used?
2. Did the laboratory perform the requested tests?
3. Were the laboratory methods adopted NATA endorsed?
4. Were the appropriate test procedures followed?
5. Were the reporting limits satisfactory?
6. Was the NATA Seal on the reports?
7. Were the reports signed by an authorised person?

Yes	No (Comment below)
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐

COMMENTS:

Precision/Accuracy of the Laboratory Report

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2151

III. FIELD QA/QC

- | | | | |
|----|-----------------------------|--------|-----|
| 1. | Number of Samples Analysed | Soil: | 0 |
| | | Water: | 2 |
| 2. | Number of Days of Sampling: | Soil: | N/A |
| | | Water: | 1 |

3. Number and Type of QA/QC Samples Collected:

	SOIL	WATER
Field Duplicates	N/A	☒
Trip Blanks	N/A	☒
Wash Blanks	N/A	☒
Other (Field Blanks, Spiked Trip Blanks, etc.)	N/A	☒

4. FIELD DUPLICATES

- A. Were an Adequate Number of field duplicates collected?
- B. Were RPDs within Control Limits?
- a. Organics (< 50 %)
- b. Metals/Inorganics (< 50 %)

Yes	No (Comment below)
☒	☐
☒ ☒	☐ ☐

COMMENTS:

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2151



5. TRIP BLANKS

A. Were an Adequate Number of trip blanks collected?

B. Were the Trip Blanks free of contaminants?

(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
☒	☐
☒	☐

6. WASH BLANKS

A. Were an adequate number of Wash Blanks collected?

B. Were the Wash Blanks free of contaminants?

(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
☒	☐
N/A	N/A

COMMENTS:

- A trip spike & blank was carried into the field and transported with soil samples (batch 5E2047) where recoveries were within the control limits of 60% to 110%.
- A wash blank sample was not considered necessary as groundwater samples were collected with designated sampling equipment using a clean pair of disposable gloves for each sample.

Field QA/QC was:

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2151



IV LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Types and Number of QA/QC Samples

	SOIL	WATER
Laboratory Blanks/Reagent Blanks	N/A	☒
Matrix Spikes/Matrix Spike Duplicates	N/A	☐
Laboratory Duplicates	N/A	☐
Surrogates	N/A	☒

2. Were the laboratory blanks/reagents blanks free of contamination?

3. Were the spike recoveries within control limits?

a. Organics (60% to 110%)

b. Metals/Inorganic (70% to 130%)

4. Were the RPDs of the laboratory duplicates within control limits?

5. Were the surrogate recoveries within control limits?

Yes	No (Comment below)
☒	☐
☐ ☒	☒ ☐
N/A	N/A
☐	☒

COMMENTS:

- The laboratory did not perform duplicates for water samples, due to the batch containing less than 10 water samples. The laboratory also did not perform matrix spikes due to the batch containing less than 20 water samples.
- The laboratory indicated that the practical quantitation limits (PQL's) for BTEX were raised due to matrix interference in groundwater sample MW3.
- A volatile TPH/BTEX compound surrogate recorded a recovery of 119% for groundwater sample MW3, which is outside the upper control limit of 110%. This may indicate that slightly higher concentrations of benzene, toluene and volatile TPH may have been recorded in MW3 than what was actually present.
- In the batch QA/QC, a laboratory control recorded a recovery of 115% for toluene, which is outside the upper control limit of 110%. This result may indicate slightly higher concentrations of toluene may have been recorded than what was actually present in soil samples. This is not considered significant as the concentrations of toluene in groundwater samples were well below the adopted soil investigation levels (SILs).
- In the batch QA/QC, a laboratory control recorded recoveries ranging between 115% and 121% for o, m & p xylene, which is outside the upper control limit of 110%. This result can be disregarded as the concentrations of o,m & p xylenes in groundwater samples were below the PQL.

5. The laboratory internal QA/QC was:

☐ Satisfactory

☐ Unsatisfactory

☒ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2151



V. DATA USABILITY

1. Data Directly Usable ☐
2. Data Usable with the following corrections/modifications (see comment below) ☒
3. Data Not Usable. ☐

COMMENTS:

Some higher control spike and surrogate recoveries were recorded in some groundwater samples for toluene, benzene and volatile TPH, indicating slightly higher concentrations of these analytes may have been recorded than what was actually present.

QA/QC Report Prepared by

James Boyle

QA/QC Report Reviewed by:

A handwritten signature in black ink, appearing to read "L.P. Foy", written over a horizontal line.

(Project Manager)

	Primary Sample Conc. (mg/kg)	Duplicate Sample Conc. (mg/Kg)	RPD (%)
Sample No.	CGBH2	QA1	
Depth (m)	0.2-0.5	0.2-0.5	
Analyte			
TOTAL PETROLEUM HYDROCARBONS			
C6 - C9 Fraction	<5	<5	ND
C10 - C14 Fraction	<20	<20	ND
C15 - C28 Fraction	120	90	28.57
C29 - C36 Fraction	<100	<100	ND
BTEX			
Benzene	<0.2	<0.2	ND
Toluene	<1	<1	ND
Ethylbenzene	<1	<1	ND
meta- & para-Xylene	<2	<2	ND
ortho-Xylene	<1	<1	ND
POLYCYCLIC AROMATIC HYDROCARBONS			
Naphthalene	<0.5	<0.5	ND
Acenaphthylene	<0.5	<0.5	ND
Acenaphthene	<0.5	<0.5	ND
Fluorene	<0.5	<0.5	ND
Phenanthrene	2.0	1.6	22.22
Anthracene	1.8	1.4	25.00
Fluoranthene	3.2	2.4	28.57
Pyrene	3.4	2.4	34.48
Benzo(a)anthracene	1.8	1.4	25.00
Chrysene	1.2	1	18.18
Benzo(b)&(k)fluorant	2.0	2	0.00
Benzo(a)pyrene	1.6	1.2	28.57
Indeno(123-cd)pyrene	0.9	0.6	40.00
Dibenz(ah)anthracene	<0.5	<0.5	ND
Benzo(ghi)perylene	0.9	0.7	25.00
Total PAHs	18.8	14	29.27
ORGANOCHLORINE PESTICIDES			
Dieldrin	<1	<1	ND
Heptachlor epoxide	<1	<1	ND
DDT	<1	<1	ND
DDE	<1	<1	ND
Other OCP	<1	<1	ND
TOTAL PCB			
	<1	<1	ND
HEAVY METALS			
Arsenic	<5	<5	ND
Cadmium	<0.5	<0.5	ND
Chromium	9	17	61.54
Copper	38	33	14.08
Nickel	11	11	0.00
Lead	560	210	90.91
Zinc	350	170	69.23
Mercury	0.21	<0.05	Inconsistent

Notes:

Bold

RPD exceeds control limit of 50%

ND Not Detected

Coffey

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2205



I. SAMPLE HANDLING

1. Were the sample **holding times** met?
2. Were the samples in **proper custody** between the field and reaching the laboratory?
3. Were the samples **properly and adequately** preserved?
This includes keeping the samples chilled, where applicable.
4. Were the samples received by the laboratory in good condition?

Yes	No (Comment below)
☒	☐
☒	☐
☒	☐
☒	☐

COMMENTS:

Sample Handling was:

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2205



II PRECISION/ACCURACY ASSESSMENT

1. Was a NATA registered laboratory used?
2. Did the laboratory perform the requested tests?
3. Were the laboratory methods adopted NATA endorsed?
4. Were the appropriate test procedures followed?
5. Were the reporting limits satisfactory?
6. Was the NATA Seal on the reports?
7. Were the reports signed by an authorised person?

Yes	No (Comment below)
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐
☒	☐

COMMENTS:

Precision/Accuracy of the Laboratory Report



Satisfactory



Unsatisfactory



Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2205



5. TRIP BLANKS

A. Were an Adequate Number of trip blanks collected?

B. Were the Trip Blanks free of contaminants?

(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
☐	☒
N/A	N/A

6. WASH BLANKS

A. Were an adequate number of Wash Blanks collected?

B. Were the Wash Blanks free of contaminants?

(If no, comment whether the contaminants present are also detected in the samples and whether they are common laboratory chemicals.)

Yes	No (Comment below)
☐	☐
N/A	N/A

COMMENTS:

- A trip spike & blank was carried into the field and transported with soil samples (batch 5E2047) where recoveries were within the control limits of 60% to 110%.
- A wash blank was analysed in batch 5E2047, and was contaminant free.

Field QA/QC was:	☐ Satisfactory	☐ Unsatisfactory
	☒ Partially Satisfactory	

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2205



IV LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Types and Number of QA/QC Samples

	SOIL	WATER
Laboratory Blanks/Reagent Blanks	☒	NA
Matrix Spikes/Matrix Spike Duplicates	☐	NA
Laboratory Duplicates	☒	NA
Surrogates	☒	NA

2. Were the laboratory blanks/reagents blanks free of contamination?

3. Were the spike recoveries within control limits?

a. Organics (60% to 110%)

b. Metals/Inorganic (70% to 130%)

4. Were the RPDs of the laboratory duplicates within control limits?

5. Were the surrogate recoveries within control limits?

Yes	No (Comment below)
☒	☐
☒ ☒	☐ ☐
☒	☐
☒	☐

COMMENTS:

- The laboratory did not perform matrix spikes due to the batch containing less than 20 water samples.

5. The laboratory internal QA/QC was:

☒ Satisfactory

☐ Unsatisfactory

☐ Partially Satisfactory

Coffey Geosciences Pty Ltd

A.C.N. 056 335 516

Environmental Division

QA/QC DATA VALIDATION REPORT

Job No:E14497/3 Batch: 5E2205



V. DATA USABILITY

1. Data Directly Usable
2. Data Usable with the following corrections/modifications (see comment below)
3. Data Not Usable.

☒
☐
☐

COMMENTS:

QA/QC Report Prepared by

QA/QC Report Reviewed by:

James Boyle

A handwritten signature in black ink, appearing to read "J. Boyle", written over a horizontal line.

(Project Manager)

	Primary Sample Conc. (ug/L)	Duplicate Sample Conc. (ug/L)	RPD (%)
Sample No.	MW2	X1	
Depth (m)	-	-	
Analyte			
TPH			
C6-C9	<20	<20	ND
C10-C14	<20	<20	ND
C15-C28	<100	<100	ND
C29-C36	<100	<100	ND
BTEX			
Benzene	<0.5	<0.5	ND
Toluene	<2	<2	ND
Chlorobenzene	<2	<2	ND
Ethylbenzene	<2	<2	ND
meta- & para-Xylene	<2	<2	ND
ortho-Xylene	<2	<2	ND
POLYNUCLEAR AROMATICS			
Naphthalene	<1	<1	ND
Acenaphthylene	<1	<1	ND
Acenaphthene	<1	<1	ND
Fluorene	<1	<1	ND
Phenanthrene	<1	<1	ND
Anthracene	<1	<1	ND
Fluoranthene	<1	<1	ND
Pyrene	<1	<1	ND
Benzo(a)anthracene	<1	<1	ND
Chrysene	<1	<1	ND
Benzo(b)&(k)fluorant	<2	<2	ND
Benzo(a)pyrene	<1	<1	ND
Indeno(123-cd)pyrene	<1	<1	ND
Dibenz(ah)anthracene	<1	<1	ND
Benzo(ghi)perylene	<1	<1	ND
Total PAHs	<1	<1	ND
Heavy Metals			
Pb	<1	<1	ND

Notes:

Bold

RPD exceeds control limit of 30%

ND Not Detected

Coffey