APPENDIX 9

Baseline Contamination Assessment

Douglas Partners
Geotechnics • Environment • Groundwater

Integrated Practical Solutions

REPORT
on
BASELINE CONTAMINATION ASSESSMENT

FORMER NAPHTHA STORAGE AREA
GREENLEAF ROAD, KOORAGANG ISLAND

Prepared for
MANILDRA PARK PTY LTD &
REGIONAL LAND MANAGEMENT CORPORATION
on behalf of
NSW STATE PROPERTY AUTHORITY

Project 39654
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TABLE OF CONTENTS

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APPENDIX A

Notes Relating to this Report
Test Pit Logs – Pits 101 to 111
Borehole Logs – Bores 201 to 203

APPENDIX B

Laboratory Report Sheets

APPENDIX C

Quality Control/Quality Assurance
Chain of Custody Sheets (Field and Dispatch)

APPENDIX D

Drawing 1 – Test Location Plan

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REPORT ON
BASELINE CONTAMINATION ASSESSMENT
FORMER NAPHTHA STORAGE AREA
GREENLEAF ROAD, KOORAGANG ISLAND

1. INTRODUCTION

This report presents the findings of a baseline contamination assessment for Lots 10 to 13, DP 234887, Greenleaf Road, Kooragang Island, NSW. The assessment was carried out at the request of Mr Nick Fletcher of Manildra Park Pty Limited, and the Regional Land Management Corporation on behalf of the NSW State Property Authority.

It is understood that the site is currently zoned 4(b) - Port and Industry Zone by Newcastle City Council (NCC) and that this zoning will be retained.

It is understood that the proposed site use includes storage of marine fuels in existing storage tanks on the site.

The assessment was undertaken to identify past and present contaminating activities, report on site condition, and provide an assessment of site contamination.

The assessment was undertaken with reference to NSW EPA "Guidelines for Consultants Reporting on Contaminated Sites" (Ref 1).

The Baseline Contamination Assessment comprised the following tasks:

- review of previous assessments undertaken on the site;
- brief site history review comprising review of historic aerial photos, search of council records and land titles;
- site inspection;
- subsurface investigation including soil sampling at 14 locations across the site;
- installation of groundwater monitoring wells for collection of groundwater samples;
- groundwater monitoring and sampling from the installed wells and the previously established groundwater monitoring wells;
- interpretation of the results of laboratory testing in the context of field observations, local geology and hydrogeology, and history of the site; and
- preparation of this report which discusses the findings of the assessment.

At the time of the investigation, no site plan was available. The site plan from a previous assessment at the site was used for the current assessment (Ref 2).

2. SITE IDENTIFICATION

The site is identified as Lots 10 to 13, DP 234887, Greenleaf Road, Kooragang Island, NSW, and is shown on Drawing 1, Appendix D.

The site comprises an approximate rectangular area of about 2.75 ha. It has a western frontage of about 250 m to Greenleaf Road, and an eastern frontage to the Hunter River. The site is bounded to the north by commercial/industrial development and to the south by vacant land.

3. BACKGROUND

A "Site Contamination Assessment" was conducted by AGC Woodward-Clyde during September 1991 for Ampol Limited in response to a proposed redevelopment of the site. The assessment was undertaken to assess whether soil and groundwater contamination due to past activities was present at the site. The assessment included a historical review, excavation of test pits, installation of four groundwater monitoring bores, analysis of soil and groundwater samples and preparation of a report.

As part of the AGC Woodward-Clyde investigation, the following historical information was presented. The information was supplied by an employee of Incitec, the former land holders:

- the location of the subject site was formed by the reclamation of low lying islands within the Hunter River in the early 1960s. It is understood that the site was reclaimed using dredged river sediments;
- two large cylindrical tanks (approximately 24 ML each) were established on the site in 1969 (along with associated bunding and car park area) when the Incitec fertiliser plant was established to the west of the subject site. There had been no previous landuse on the subject site prior to the construction of the tanks;
- the tanks were used for the storage of naphtha (hydrocarbon fuel product) between 1969 and 1982;
- naphtha was used in the production of hydrogen. The Incitec plant produced ammonia and ammonium nitrate product;
- no phosphate fertiliser product or sulphuric acid had been produced at the Incitec site;
- the use of the tanks was terminated in 1982, and the tanks were desludged in 1983.

The field investigation for the AGC Woodward-Clyde investigation comprised the following:

- drilling of four boreholes for soil sampling and installation of four groundwater monitoring wells;
- excavation of 19 backhoe pits over a 50 m grid across the site;

- soil vapour measurements for hydrocarbons using a photoionisation detector (PID) at each soil sampling point.

Subsurface conditions across the site generally comprised sand (dredged material) underlain by clay. Groundwater was encountered at depths between 1.5 m and 3.0 m below the ground surface.

Soil and groundwater samples from the boreholes and test pits were analysed for the following potential contaminants:

- TRH – Total Recoverable Hydrocarbons;
- BTEX – Benzene, Toluene, Ethylbenzene and Xylene;
- Trace metals – Total Lead, Cadmium, Copper and Zinc.

In addition, groundwater samples from each groundwater bore were also analysed for phosphate, nitrate, sulphate, fluoride, pH and conductivity.

It is noted that composite soil samples were collected from the excavated/drilled soils (ie. one sample from each location).

The results of soil analysis indicate no exceedences of the adopted criteria, with no detected TRH, BTEX or cadmium.

The results of groundwater analysis indicated levels of TRH from the groundwater sample in Bore 1 in the north-western corner of the site in exceedence of the adopted guideline. Subsequent re-sampling of this groundwater well indicated TRH results below detection limits. Levels of nitrate and phosphorus also indicated a nutrient rich groundwater. It was reported that the results may be indicative of elevated levels in the region or be due to a local influence.

At the time of the previous report, there were no uniformly accepted guidelines for the assessment of contaminants in soil or groundwater. As such, the report is not in strict accordance with current NSW EPA guidelines. We cannot confirm the accuracy or completeness of the report, and accordingly we have taken the results at face value.

4. GEOLOGY AND HYDROGEOLOGY

The 1:100,000 scale Geological map for Newcastle indicates the site is underlain by an alluvium aged quaternary deposit comprising of gravel, sand, silt and clay.

Reference to the Newcastle Acid Sulphate Soil Risk Map prepared by the former Department of Land & Water Conservation indicates that the site is within an area of disturbed terrain, indicative of filled areas that have been reclaimed as part of urban development. It is noted that acid sulphate soils are present in areas surrounding Kooragang (including river sediments adjacent to the site). It is likely that underlying natural soils at the site (i.e. beneath dredged fill materials) may be potential acid sulphate soils.

The regional groundwater flow regime is generally expected to be to the east of the site towards the Hunter River, which forms the eastern site boundary and is considered to be the nearest sensitive receptor. The depth to the water table is expected to be between 1 m and 3 m, based on previous site assessments. It should be noted that groundwater levels are affected by climatic conditions, soil permeability, and tidal fluctuations at this site, and will therefore vary with time.

An on-line records search of registered groundwater wells with the Department of Natural Resources (DNR) indicated that the nearest registered groundwater well (GW053226) is located approximately 2.4 km to the north-west of the site.

Groundwater monitoring wells were installed at four locations as part of the previous assessment undertaken at the site (Ref 2). Monitoring well construction generally comprised 50 mm diameter slotted PVC, covered with filter sock. The monitoring wells were installed to a depth of 2.8 m, with the borehole annulus backfilled with 1 mm to 2 mm graded sand. Groundwater depths between 1.5 m and 2.0 m below the ground surface were measured in groundwater bores, as noted in the borehole logs.

Reference to the Newcastle 1:25,000 topographical map indicates that the site is generally flat, and that the elevation of the site is not likely to be greater than 5 m AHD.

5. SITE HISTORY

5.1 Site History Review

The brief review of site history comprised the following:

- Newcastle City Council (NCC) records search;
- Discussions with an employee of Orica (current occupiers of the plant adjacent to the subject site);
- Review of historical aerial photos;
- Review of previous investigations undertaken within the site (Section 3);
- Historical Title Search;
- Searches with NSW Department of Environment and Conservation (DEC).

Details are presented in the following sections.

5.2 Council Records Search

Correspondence with NCC indicated the following Building Application (BA) and Development Applications (DA) for the site:

- 1969 – BA for Eastern Nitrogen for a site office, foam station and test station;
- 1993 – DA approved for a proposed petroleum terminal with connecting parallel underground pipelines and wharf upgrade.

The following was also noted by Council:

- the site may be subject to flooding;
- the site is not in an area of mine subsidence;
- there is potential for contamination at the site.

5.3 Discussions with Orica Employee

The historical information presented below was a result of discussions on 3 and 8 January 2007 with Greg Strutt, an employee of Orica. Mr Strutt had been an employee at the site for several years and was familiar with the former and current land use of the subject site, and the adjacent plant. The current Orica plant is located immediately west of the subject site, and Mr Strutt noted that the site was formerly Eastern Nitrogen, followed by Consolidated Fertilisers and Incitec. Eastern Nitrogen had previously used the tanks on the subject site for storage of naphtha, used in the production of hydrogen.

Chronological site history is summarised below:

- the construction of two large tanks on the subject site was completed in about 1969;
- it is understood that the construction for the tanks was the first activity on the site following the reclamation of the area (ie. following site filling);
- the tanks were built as part of Eastern Nitrogen Ltd, located on the western side of Greenleaf Road, adjacent to the subject site;
- Eastern Nitrogen manufactured ammonia and nitric acid;
- the tanks on the subject site were used for the storage of naphtha (a petroleum product), used by Eastern nitrogen to produce hydrogen, and also used as a fuel;
- naphtha was transported to the site by ship (to the K2 wharf on Kooragang);
- the Eastern Nitrogen site converted it's fuel supply to natural gas in the late 1970s, so the use of naphtha for fuel was no longer required;
- the use of the tanks was terminated in the late 1970s or early 1980s. The tanks were decommissioned and have not been used since;
- the lease was transferred to Ampol (possibly in the early 1990s). Heavy oil storage for ships was proposed for the site, however, the site was never used by Ampol;
- the lease reverted back to the Department of Public Works, with control of the site subsequently given to the Regional Land Management Corporation (RLMC);
- current site use by Orica is limited to an EPA licensed effluent outfall from the Orica plant to the Hunter River (through Lot 9 to the south of the subject site), with an associated sample station which automatically monitors the effluent quality;

- it is understood that the fire fighting system at the site (ie. underground pipes) has been decommissioned, along with the electricity to the site (ie. for pumps, lighting etc).

5.4 Review of Historical Aerial Photos

The following historical aerial photos were reviewed for the assessment:

Table 1 – Aerial Photo Review

Year	Approximate Scale	Black and White/Colour
1954	1:30,000	B & W
1966	1:40,000	B & W
1975	1:40,000	B & W
1984	1:40,000	B & W
1987	1:16,000	Colour
1993	1:25,000	Colour
2001	1:25,000	Colour

1954 Aerial photo

- land has not yet been reclaimed and Kooragang Island consists of many smaller unlinked islands;
- site is possibly situated in low-lying swamp area adjacent to the Hunter River.

1966 Aerial Photograph

- current area of Kooragang Island is formed. The site is not vegetated and appears largely covered in fill material (ie. reclaimed);
- the western site boundary, Greenleaf road is visible as well as much of the island's road network;
- some development is visible to the west and south of the site.

1975 Aerial Photograph

- most site boundaries are distinguishable;
- two large circular storage tanks located in the central portion of the site;
- soil bunds are observed around the tank area;
- lightly vegetated;
- adjacent site to the north holds two long rectangular buildings;
- south of site consists of medium-dense vegetation;
- area to the west of the subject site is largely developed with buildings including the sites east of Greenleaf Road. Much of the former vegetation has been cleared;
- Stockton Bridge linking Kooragang Island and Stockton is visible.

1984 Aerial Photograph

- similar to previous photo;
- further buildings exist on the northern adjacent site;
- thin rectangular shape present in the northern portion of the site (possibly pavement?);
- southern site along boundary appears to have been cleared of vegetation (possibly south of site).

1987 Aerial Photograph

- similar to previous photo;
- thin rectangular shape no longer present in the northern portion of the site;
- above ground pipes are visible in western and southern portions of the site;
- area to south of site appears to be used as a car park.

1993 Aerial Photograph

- similar to previous photo;
- two small buildings apparent in the north-western corner of the site;
- water bodies to the north of Stockton Bridge appear to be filled will soil materials.

2001 Aerial Photograph

- similar to previous photo;
- two small buildings located in the north-west of the site are no longer visible;
- site along northern boundary is mostly cleared, with one large rectangular building remaining and several smaller buildings to the north of the site. Cleared areas appeared to be not vegetated in this area;
- former surface water area to the north of the Stockton Bridge remains unused but appears vegetated.

It is noted that data obtained from aerial photos was limited due to the relatively small scale and poor resolutions.

5.5 NSW DEC (formerly EPA)

A review of the NSW DEC public register indicated the site has no statutory notices issued under the provision of the Contaminated Land and Management Act.

It is noted, however, that the Orica site immediately west of the subject site has the following notices issued:

- Note of Existence of Voluntary Remediation Proposal (current);
- Declaration of Remediation Site (current);
- Note of Existence of Voluntary Remediation Proposal (former).

The declaration of remediation site notes that arsenic and ammonia contaminated groundwater from the adjacent site has migrated off the site and may continue to migrate.

5.6 Land Titles

Review of the land titles for the site indicates the following with respect to land holdings:

- Eastern Nitrogen were granted a lease of 20 years for the site from 26 July 1967;
- the lease for Eastern Nitrogen was extended for a further 10 years (ie. to July 1997);
- the lease for the site was transferred to Ampol Limited on 3 February 1992.

It is understood that the Department of Public Works resumed control of the site following Ampol. The site is currently controlled by the Regional Land Management Corporation (RLMC).

6. SITE CONDITION (8 January 2007)

The subject site is located on the eastern side of Greenleaf Road, Kooragang, as shown on Drawing 1, Appendix D.

General site features include the following:

- two metal storage tanks with floating roofs located in the central and northern portions of the site (Photo 1);
- an open brick and concrete base foam station located in the southern portion of the site (Photos 2 and 3);
- A small storage building with metal roof located adjacent to the foam station (Photo 3);
- soil bunding around the storage tanks which continues to the southern portion of the site (Photo 4).

Photo 1 – metal storage tanks (looking south-west)

Photo 2 – foam station and associated pipelines (looking north)

Photo 3 – storage building (left of photo) and adjacent foam station (right of photo)

Photo 4 – soil bunding surrounding the storage tanks (looking south)

Several other disused structures were noted within the site including:

- a pumping station located in the western portion of the site between the storage tanks (Photo 5);

- pipe network linking storage tanks to the pump station located between the tanks in the northern region of the site (Photo 6);
- an oil-water separator located in the eastern portion of the site adjacent to the storage tanks (Photo 7);
- several ladder structures used to access areas within the bunded areas (Photo 8); and
- several fire hydrants located mostly on the soil bunding as well as within the storage tank area (Photo 9).

Photo 5 – pumping station linked to storage tanks located close to the western boundary of the site (looking east)

Photo 6 – pipe network linking storage tanks and pumping station situated between the storage tanks (looking east)

Photo 7 – oil-water separating device located in the eastern portion of the site

Photo 8 – step and platform structure (centre of photo for entry into the storage tank area (looking south)

Photo 9 – hydrants and fire-fighting equipment in the central-northern portion of the site (ie. between the northern and southern tanks)

Dark grey/black sand sized granular filling (possible sandblasting material) was observed on the ground surface at the perimeter of the fuel storage tanks, as shown in Photo 10.

Photo 10 – dark grey/black granular material in the vicinity of the fuel storage tanks

The site is generally flat. The majority of the site comprises of unsealed grassed areas. The northern region of the site includes the entry point with vegetation consisting of mostly grasses (Photo 11).

Photo 11 – northern region of the site which remains mostly cleared (looking west)

Similarly the eastern portion of the sight, adjacent to the Hunter River, remains covered in short grasses as shown in Photo 12. A single-lane gravel access track was observed to the east of the site.

Photo 12 – eastern region of the site which remains mostly cleared (looking south)

The central-southern section of the site is bounded by the soil bunds and consists of an area covered in longer grasses (Photo 13). The area was not observed to contain any surface structures.

Photo 13 – central-southern region of the site covered in longer grasses (looking north-west)

Adjacent sites comprised the following:

- north – commercial development;
- east – Hunter River (North Arm);
- south – Car parking area, effluent outflow pipe and monitoring station (Orica) and vacant/unoccupied cleared land;
- west – Greenleaf Road, Orica plant.

7. POTENTIAL CONTAMINANTS

Based on the available site history information and observations made during the site inspection the principal sources of potential contamination are considered to be:

- the previous use of the storage tanks for holding of naphtha, which may be a source of hydrocarbons and heavy metals;

- sand blasting materials, paints and particulate metals from the metal storage tanks, observed in near surface soils in the vicinity of the tanks, which may be a source of heavy metals;
- possible fill materials (source unknown) which may contain a range of contaminants including hydrocarbons, heavy metals, pesticides, PCB's etc;
- potential migration of ammonia and heavy metals from the adjacent Orica plant onto the site.

8. FIELD WORK

8.1 Sampling Rationale

A systematic and judgemental sampling procedure was conducted for the preliminary site assessment to address the potential sources of contamination described above.
A total of 11 test pit and three borehole locations were sampled and analysed. Although this number is less than the minimum number of sampling points suggested by the NSW EPA Sampling Design Guidelines (Ref 3) for site characterisation, the sampling undertaken is considered adequate for the preliminary assessment of site conditions. The results of the previous assessment (Ref 2) and site history review were also considered in the current assessment.

Samples were selected for analysis on the basis of the likely presence of contamination, based on material type, visual or olfactory evidence of possible contamination (ie. odour or staining), proximity to a known source of contamination, and whether generally representative of soil/fill conditions.

Groundwater from wells installed in the three bore holes plus an existing well on the site was also sampled and analysed.

8.2 Methods

The field work was undertaken on 8-9 January 2007, and 5-6 March 2007 comprising the following:

- site walkover survey;
- excavation of 11 test pits to depths of 1.2 m to 2.6 m by backhoe (Pits 101 to 111);
- collection of soil samples for environmental testing;
- drilling of three bore holes to depths of 4 m to 4.5 m with a truck mounted drilling rig (Bores 201 to 203);
- installation of three groundwater wells in the above borehole locations;
- groundwater sampling for environmental testing from the installed groundwater wells, plus sampling of one existing well on the site (Well B).

The pits and bore holes were set out by an experienced Environmental Engineer from Douglas Partners Pty Ltd (DP). The subsurface profile in each pit and bore, and the collected soil samples were logged for identification and testing purposes. The approximate test locations are shown on Drawing 1, Appendix D.

Test pit and borehole/groundwater well locations were selected to assess identified areas of potential contamination, as summarised in Table 2, below:

Table 2 – Targeted Potential Contaminant Sources

Location	Potential Contaminant Source
All pits/bores	Imported fill materials
Pit 106	Near surface dark grey/black filling
Bore 201	Previously identified hydrocarbon contamination in groundwater
Bore 201, Well B	Adjacent site use (identified arsenic and ammonia contamination
Bore 202, 203	On-site storage of naphtha

Samples for environmental purposes were generally collected from the near surface, and at regular depth intervals or changes in strata within each pit. Soil samples were collected directly from the side walls of the test pits or from the backhoe bucket. Care was taken to remove any extraneous material deposited on the sample.

All sampling data was recorded on DP chain of custody sheets, and the general sampling procedure comprised:

- the use of disposable gloves for each sampling event;
- transfer of samples into laboratory-prepared glass jars, and capping immediately;
- collection of 10% replicate samples for QA/QC purposes;
- collection of replicate soil samples in zip-lock plastic bags at each depth for PID screening;
- labelling of sample containers with individual and unique identification, including project number, sample location and sample depth;
- placement of the sample jars into a cooled, insulated and sealed container for transport to the laboratory; and
- use of chain of custody (C-O-C) documentation ensuring that sample tracking and custody could be cross-checked at any point in the transfer of samples from the field to the laboratory. Copies of completed forms are contained in Appendix C.

Replicate samples for each sample were screened for the presence of volatile organic compounds (VOCs), using a Photovac 2020 Pro Plus photo-ionisation detector (PID) with a 10.6 eV lamp, calibrated to 100 ppm Isobutylene. The PID is capable of detecting over 500 VOCs.

The work was undertaken in accordance with the DP quality system and procedures for preliminary contamination assessments. A list of the procedures used and other information on quality assurance and quality control, including analysis of replicate samples, is found in Appendix C.

8.3 Well Design and Installation

Three groundwater wells constructed of 50 mm diameter flush threaded Class 18 PVC were installed in Bores 201, 202, and 203 in accordance with current industry standards, using solid flight augers from the truck mounted drilling rig.

A 3 m machine slotted PVC screen with an end cap was installed from a depth of about 1 m above the observed water table, to up to 2 m below the water table (ie. to intercept possible floating product). A filter pack was installed in the bore annulus consisting of 5/2 graded and washed gravel to at least 200 mm above the slotted PVC screen. A bentonite seal (300 mm thick) was placed above the filter pack within the annulus. The annulus above the bentonite was filled with concrete.

An end cap was installed at the top of the well which was just below ground level. The wells were completed at the surface with a flush mounted well cover set in concrete. Details of well design and construction are shown on Borehole Logs 201, 202, and 203, Appendix A.
Drilling and well installation was undertaken under QA/QC protocol to minimise the risk of cross contamination.

The groundwater wells were surveyed for elevation (top of casing) by DP.

8.4 Well Development/Purging and Sampling

Following installation, the wells were developed by removing a minimum of three bore volumes of groundwater using a disposable plastic bailer for each location to ensure an efficient hydraulic connection between the well and the formation. Regular pH and electrical conductivity (EC) measurements were undertaken on groundwater during development using calibrated portable meters until steady readings were achieved.

Groundwater samples from the wells were collected using a disposable plastic bailer for each location, and were preserved in laboratory prepared containers for analysis. The samples were delivered to the laboratory within the recommended holding times for analysis. The groundwater level was allowed to recover from the effects of purging prior to sampling. Samples were collected under strict QA/QC protocols.

The headspace of each well was also screened for the presence of volatile organic compounds (VOCs) using a calibrated PID prior to purging. Following development, an oil-water interface meter was used to assess the possible presence of a floating product within each well.

The process of obtaining samples and their transportation, storage and delivery to laboratories for analysis was documented on a DP standard chain-of-custody form. Copies of completed forms are contained in Appendix C.

The depth to groundwater was measured prior to sampling in each well to assist in determining groundwater flow direction.

8.5 Data Quality Objectives (DQOs)

Table 3 summarises data quality objectives (DQOs) and the procedures designed to enable achievement of the DQOs.

Table 3 – Data Quality Objectives

DQO	Achievement Evaluation Procedure
Documentation completeness	Completion of field and laboratory chain of custody documentation, completion of borehole logs
Data completeness	Analysis of appropriate determinants based on site history and on-site observation
Data comparability	Use of NATA certified laboratory, use of consistent sampling technique
Precision and accuracy for sampling and analysis	Achievement of 50% RPD for replicate analysis, acceptable levels for laboratory QC criteria

8.6 Results

The subsurface conditions are presented in detail in the test pit and borehole logs, Appendix A. These should be read in conjunction with the general notes preceding them, which explain definitions of the classification methods and descriptive terms.

The following is a summary of the subsurface conditions encountered:

FILLING – encountered to 1.1 m depth to greater than 2.6 m depth in all pits and bores, generally comprising light grey brown fine to medium grained sand filling containing shells and shell fragments (generally uniform sand fill conditions at the test locations);

SAND – encountered in Pits 101 to 105, 110 and 111 from 1.2/1.9 m depth to 1.8/2.3 m depth and in Bores 201 to 203 from 1.1/1.6 m depth to 1.7/2.1 m depth generally comprising grey fine to medium grained sand;

SILTY CLAY – encountered in Pit 105 from 1.8 m depth to 2.2 m depth comprising grey silty clay, and in Bore 201 from 2.1 m to 3.7 m depth comprising dark grey silty clay with some shells and shell fragments (generally soft);

GRAVELLY CLAY – encountered in Bore 202 from 1.7 m to 3.4 m depth comprising grey brown gravelly clay with some shells and shell fragments;

SANDY CLAY – encountered in Pit 104 and Bore 203 from 2.1 m depth , and below the silty clay and gravelly clay layers in Bores 201 and 202 respectively, generally comprising grey fine to medium grained sandy clay with some shells and shell fragments (generally soft).

Groundwater was encountered in Bore 201 at 1.5 m depth, Bore 202 at 1.7 m depth, and Bore 203 at 1.9 m depth during drilling. It should be noted that groundwater levels are affected by factors such as climatic conditions, soil permeability and tides and will therefore vary with time.

8.7 Groundwater Conditions

Wet to saturated conditions were encountered in all bores from depths of 1.5 m to 1.9 m. Groundwater wells were installed in the bores following drilling to measure and sample groundwater. Groundwater was also levelled and sampled from Well B which was installed

during a previous investigation (well construction details not known). Groundwater levels were measured on 5 March 2007 prior to development. The results are shown below in Table 4.

Table 4 – Groundwater Observations and Measurements

Bore/Well	RL Ground Surface	RL Top of Casing	Groundwater Observations	Depth to Groundwater*	RL Groundwater
201	10.09	10.05	Wet to saturated from 1.5 m during drilling	1.31	8.74
202	9.78	9.68	Wet to saturated from 1.7 m during drilling	1.77	7.91
203	10.02	9.98	Wet to saturated from 1.9 m during drilling	1.97	8.01
Well B	10.17	10.8	-	2.18	8.62

Notes to Table 4:

* Depth below Top of PVC Casing

The general groundwater flow direction based on measured water levels and site topography is to the east (ie. towards the Hunter River North Arm).

Groundwater parameters measured in the field during development and sampling are presented in Table 5, below. The measured results suggest that the groundwater is approximately neutral to slightly basic and the electrical conductivity is relatively low, indicating levels at the upper bound of fresh water.

Table 5 – Measured Groundwater Parameters

Bore	PID (ppm)	pH	Electrical Conductivity (mS/m)
201	< 1	7.2	1.33
202	< 1	7.8	1.15
203	< 1	7.6	1.07
Well B	< 1	7.5	0.87

Notes to Table 5:

PID – Photoionisation Detector

8.8 Contaminant Observations

There was no visual or olfactory evidence (ie. staining or odours) within the test pits or bores to suggest the presence of gross contamination in the soils investigated. Results of PID screening on soil samples also suggest the absence of gross volatile hydrocarbon impact, as shown on the test pit and borehole logs in Appendix A.

Groundwater and groundwater seepage was observed in some of the pits, with groundwater observed in all boreholes. There was no visual or olfactory evidence (ie. staining or odours) to suggest the presence of gross contamination within groundwater.

9. LABORATORY TESTING

9.1 Analytical Programme

9.1.1 Soil

Laboratory testing for soil was undertaken by SGS Australia, a laboratory registered with the National Association of Testing Authorities, Australia (NATA).

A total of 14 soil samples from test pits (including one QA/QC sample) and one soil sample from each of the boreholes were selected to provide a preliminary assessment of soil/fill conditions. The samples were selected to target the identified potential sources of contamination (see Section 6),

The selected samples were analysed for some or all of the following potential contaminants:

- Total Recoverable Hydrocarbons (TRH);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Organochlorine Pesticides (OCP);
- Organophosphorus Pesticides (OPP);

- Polychlorinated Biphenyls (PCB);
- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Phenols;
- Metals: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Zinc (Zn).

Quality Control/Quality Assurance (QA/QC) testing comprised one soil replicate (sample D3), the results of which are detailed in Appendix C.

In addition, four fill samples were analysed for asbestos in soil.

9.1.2 Groundwater

Laboratory testing for groundwater was undertaken by SGS Australia, a laboratory registered with the National Association of Testing Authorities, Australia (NATA).

A total of five groundwater samples from the three installed groundwater wells and one existing groundwater well (including one QA/QC sample) were selected to provide a preliminary assessment of groundwater conditions. The samples were selected to target the identified potential sources of contamination (See Section 7).

The selected samples were analysed for some or all of the following potential contaminants:

- Total Recoverable Hydrocarbons (TRH);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Benzene, Toluene, Ethyl Benzene, Xylene (BTEX);
- Metals: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb); Mercury (Hg), Nickel (Ni), Zinc (Zn);
- Ammonia.

QA/QC testing comprised one groundwater replicate (samples DW1), the results of which are detailed in Appendix C.

9.2 Analytical Results

9.2.1 Soil

The results of chemical analysis of soil samples are presented in the laboratory report sheets (Appendix B), and are summarised in Tables 6, 7, 8 and 9 below.

Table 6 – Laboratory Results for Metals in Soil

Sample Identification (m)	PID (ppm)	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
Pit 101/0.05	<1	<PQL	0.1	2.8	4.1	4	<PQL	2.6	27
Pit 102/0.05	<1	<PQL	0.6	5.9	11	18	<PQL	3.7	130
Pit 103/0.05	<1	3	1.1	8.8	10	26	0.08	5	120
Pit 104/0.05	<1	4	1.2	11	27	59	<PQL	6.1	400
Pit 104/2.0	<1	<PQL	<PQL	2.1	0.8	2	<PQL	2.3	9.9
Pit 105/0.05	<1	6	0.2	16	23	16	<PQL	11	120
Pit 105/1.5	<1	4	<PQL	1.9	0.5	<PQL	<PQL	2	4.5
Pit 106/0.01	<1	12	11	290	2800	3300	0.1	64	<PQL
D3	<1	35	12	250	3000	3700	<PQL	68	<PQL
Pit 107/0.05	<1	5	1.5	14	16	36	<PQL	7.4	180
Pit 108/0.15	<1	5	1.5	14	16	36	<PQL	7.4	180
Pit 109/0.01	<1	5	1.5	14	16	36	<PQL	7.4	180
Pit 110/0.05	<1	5	1.5	14	16	36	<PQL	7.4	180
Pit 111/0.05	<1	11	3.8	41	140	200	0.06	11	1300
Bore 201/1.0	<1	<PQL	<PQL	2.7	0.94	1	<PQL	3.1	7.5
Bore 202/1.0	<1	3	<PQL	4.1	2.3	2	<PQL	4.2	10
Bore 203/1.5	<1	<PQL	<PQL	2	1.2	1	<PQL	1.9	7.1
PQL		3	0.1	0.3	0.5	1	0.05	0.5	0.3
NEHF F (Ref 4)		500	100	500	5000	1500	75	3000	35000
Solid Waste (Ref 5)		100	20	100	NC	100	4	40	NC
Industrial Waste (Ref 5)		400	80	400	NC	400	16	160	NC

Notes to Table 6

All results expressed in mg/kg on a dry weight basis
NC – no criteria
PQL – Laboratory Practical Quantification Limit
D3 – Replicate sample of Test Pit 106/0.01
Shaded results indicate exceedence of NEHF F criteria (Ref 4)

Table 7 – Laboratory Results for TRH and BTEX in Soil

Sample Identification (m)	PID (ppm)	TRH				Benzene	Toluene	Ethyl Benzene	Total Xylene
		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}				
Pit 101/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 102/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 103/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 104/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 104/2.0	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 105/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 105/1.5	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 106/0.01	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
D3	<1	<PQL	<PQL	57	160	<PQL	<PQL	<PQL	<PQL
Pit 107/0.05	<1	<PQL	<PQL	<PQL	60	<PQL	<PQL	<PQL	<PQL
Pit 108/0.15	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 109/0.01	<1	<PQL	<PQL	<PQL	98	<PQL	<PQL	<PQL	<PQL
Pit 110/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 111/0.05	<1	<PQL	<PQL	<PQL	89	<PQL	<PQL	<PQL	<PQL
Bore 201/1.0	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Bore 202/1.0	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Bore 203/1.5	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
PQL		20	50	50	50	0.5	0.5	0.5	1.5
Service Station (Ref 6)		65	1000 total			1	1.4	3.1	14
Solid Waste (Ref 5)		650	10000 total			10	288	600	1000

Notes to Table 7:

All results expressed in mg/kg on a dry weight basis
PQL – Laboratory Practical Quantification Limit
D3 – Replicate sample of Pit 106/0.01

Table 8 – Laboratory Results for OCP, OPP, PCB and PAH in Soil

Sample Identification (m)	PID (ppm)	Phenols	PCB	OPP	OCP				Total +ve PAH	Benzo (a) pyrene
					Aldrin/Dieldrin	Chlordane	DDT	Heptachlor		
Pit 101/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 102/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.27	0.07
Pit 103/0.05	<1	NT	<PQL	NT	NT	NT	NT	NT	1.15	0.15
Pit 104/0.05	<1	2	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.52	0.12
Pit 104/2.0	<1	NT	NT	NT	NT	NT	NT	NT	<PQL	<PQL
Pit 105/0.05	<1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL
Pit 105/1.5	<1	NT	NT	NT	NT	NT	NT	NT	<PQL	<PQL
Pit 106/0.01	<1	0.6	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	2.01	0.21
D3	<1	2	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	1.25	0.15
Pit 107/0.05	<1	1.8	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	2.16	0.26
Pit 108/0.15	<1	NT	NT	NT	NT	NT	NT	NT	0.28	0.08
Pit 109/0.01	<1	NT	NT	NT	NT	NT	NT	NT	5.63	0.63
Pit 110/0.05	<1	2.3	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	1.26	0.16
Pit 111/0.05	<1	NT	NT	NT	NT	NT	NT	NT	3.27	0.37
Bore 201/1.0	<1	NT	NT	NT	NT	NT	NT	NT	<PQL	<PQL
Bore 202/1.0	<1	NT	NT	NT	NT	NT	NT	NT	<PQL	<PQL
Bore 203/1.5	<1	NT	NT	NT	NT	NT	NT	NT	<PQL	<PQL
PQL		0.5	0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.05
NEHF F (Ref 4)		42500	50	NC	50	250	1000	50	100	5
Solid Waste (Ref 5)		288	50	NC	NC	NC	NC	NC	200	0.8
Industrial Waste (Ref 5)		1152	50	NC	NC	NC	NC	NC	800	3.2

Notes to Table 8:

All results expressed in mg/kg on a dry weight basis
PQL – Laboratory Practical Quantification Limit
D3 – Replicate sample of Pit 106/0.01
NT – Not Tested

Table 9 – Laboratory Results for Asbestos in Soil and Fibro Fragments

Sample Identification	Sample Type	Asbestos Detected
Pit 101/0.05	Filling	No asbestos detected
Pit 104/0.05	Filling	No asbestos detected
Pit 105/0.05	Filling	No asbestos detected
Pit 110/0.05	Filling	No asbestos detected

Due to the presence of elevated lead levels in the fill sample Pit 106/0.01, additional leachability testing was conducted as follows:

- Standard leachability testing (TCLP) using acidic leachant to confirm waste classification for off-site disposal to a licensed landfill (in accordance with Ref 5);
- Water Leach – leachability testing using a distilled water leachant to assess the propensity for the material to leach in water (i.e. to assess leachability potential for materials remaining on-site).

The results of leachability testing are shown in Table 10, below.

Table 10 – Leachability Testing (acid and water leachate) for Pit 106/0.01

Sample	Depth (m)	PID	Lead (Pb)		
			Total (mg/kg)	TCLP (mg/L)	Water Leach (mg/L)
Pit 106	0.01	<1	3300	0.05	0.032
Laboratory PQL			2	0.02	0.001
NEHF F (Ref 4)			1500	NC	NC
ANZECC (2000) – Trigger Values for Slightly to Moderately Disturbed Systems (Ref 7)		Fresh	NC	NC	0.0034
		Marine	NC	NC	0.0044
NSW EPA Environmental Guidelines – Assessment, Classification & Management of Non-Liquid Wastes (Ref 5)		Inert	1500 *	0.5	NC
		Solid	1500 *	5	NC
		Industrial	6000 *	20	NC

Notes to Table 10:

Total results expressed in mg/kg on a dry weight basis
TCLP and ASTM concentrations in mg/L
PQL – Laboratory Practical Quantification Limit
* Waste classification criteria for total concentrations when used with TCLP results
NC – No Criteria
TCLP – standard NSW EPA TCLP test
Water Leach – leachability testing using distilled water as extracting fluid
Shaded results exceed NEHF F criteria (Ref 4)
Bold results exceed Solid Waste criteria
Highlighted results exceed ANZECC criteria (Ref 7)

9.2.2 Groundwater

The results of chemical analysis of groundwater samples are presented in the laboratory report sheets (Appendix B), and are summarised in Table 11, below:

Table 11 – Laboratory Results – Groundwater Analysis

Analyte	Sample					PQL	ANZECC 2000
	Bore 201	Bore 202	Bore 203	DW1	Well B		
Metal							
As [1]	1.7	5.5	2.3	2.2	<PQL	1	13
Cd	<PQL	<PQL	<PQL	<PQL	<PQL	0.1	0.2
Cr [3]	<PQL	<PQL	<PQL	<PQL	<PQL	1	1
Cu	<PQL	<PQL	<PQL	<PQL	1.3	1	1.4
Pb	<PQL	<PQL	<PQL	<PQL	<PQL	1	3.4
Hg [2]	<PQL	<PQL	<PQL	<PQL	<PQL	0.5	0.06
Ni	<PQL	1.3	<PQL	<PQL	<PQL	1	11
Zn	13	4.9	8.3	4.3	12	1	8
TRH							
C_6 - C_9	<PQL	<PQL	<PQL	<PQL	<PQL	40	NC
C_{10} - C_{14}	<PQL	<PQL	<PQL	<PQL	<PQL	40	NC
C_{15} - C_{28}	<PQL	<PQL	<PQL	<PQL	<PQL	200	NC
C_{29} - C_{36}	<PQL	<PQL	<PQL	<PQL	<PQL	200	NC
BTEX							
Benzene	<PQL	<PQL	<PQL	<PQL	<PQL	1	950
Toluene	<PQL	<PQL	<PQL	<PQL	<PQL	1	NC
Ethyl Benzene	<PQL	<PQL	<PQL	<PQL	<PQL	1	NC
Xylene	<PQL	<PQL	<PQL	<PQL	<PQL	3	200[4]
PAHs							
Total PAHs	<PQL	<PQL	<PQL	<PQL	<PQL	0.5	NC
Benzo(a)pyrene	<PQL	<PQL	<PQL	<PQL	<PQL	0.5	NC
Ammonia							
Ammonia as N	1300	1000	470	460	2300	30	900

Notes to Table 11:

ANZECC 2000 – Trigger Values for slightly to moderately disturbed systems (fresh water) (Ref 7)
Results expressed in ug/L
PQL – Practical Quantification Limits
(1) – Arsenic(V) (conservative)
(2) – Mercury (inorganic)
(3) – Chromium (VI)
(4) p-xylene (the lesser criteria of individual xylene species in ANZECC 2000 trigger values, ie. conservative)
NC – No criteria
Shaded results exceed ANZECC 2000 criteria (Ref 7)

10. ASSESSMENT OF CONTAMINATION

10.1 Assessment Criteria

Results of the chemical analyses were compared to the following NSW EPA recommended guidelines:

- NSW EPA (1998). Contaminated Sites – Guidelines for the Site Auditor Scheme, 2nd Edition, April 2006 (Ref 4);
- NSW EPA (1994). Contaminated Sites – Guidelines for Assessing Service Station Sites, December 1994, (Ref 6);
- NSW EPA (1999). Environmental Guidelines: Assessment, Classification & Management of Liquid and Non-Liquid Wastes (Ref 5);
- ANZECC (2000) Fresh and Marine Water Quality Guidelines (Ref 7);
- Ministry of Housing, Spatial Planning and the Environment (1994) Environmental Quality Objectives in the Netherlands, (Ref 8).

The NSW EPA Guidelines for the NSW Site Auditor Scheme (Ref 4) contain National Environmental Health Forum (NEHF) levels for various beneficial use scenarios including: low density residential (A), high density residential (D), recreational (E) and commercial/industrial (F). These criteria are applicable where aesthetic and ecological concerns are not an issue.

Health based criteria for commercial/industrial (NEHF F), are considered to be appropriate for the proposed development.

The NSW EPA Guidelines for Assessing Service Station Sites (Ref 6) were used to assess total TRH and BTEX contamination across the site. The criteria used are threshold concentrations for sensitive land use.

The NSW EPA Environmental Guidelines for the Assessment, Classification & Management of Liquid & Non-Liquid Wastes (Ref 5) was used to assess soil conditions for possible off-site disposal to a licensed landfill.

The ANZECC (2000) Guidelines for Fresh and Marine Water Quality (Ref 7) were used to assess groundwater quality. The protection of aquatic ecosystem guidelines are considered to be relevant due to the proximity of the site to Throsby Basin and Newcastle Harbour. The receiving waters are considered to be a "slightly to moderately disturbed system". In addition, the Netherlands Environmental Quality Objectives (1994) were used to assess hydrocarbon contamination within groundwater.

The ANZECC (2000) guidelines were also considered to assess the potential for adverse impact on receiving waters from leachate generated from soils containing elevated total lead contaminant concentrations, based on the results of the water leach test. It is noted, however, that the leachability test method involves vigorous tumbling / agitation, which is not consistent with the likely process associated with rainfall and infiltration through on-site soils. The propensity of the materials to leach may therefore be overestimated in the water leach test.

10.2 Assessment of Contamination

10.2.1 Soil

Soil chemical analysis results were generally within the health based criteria for commercial/industrial land use (ie. NEHF F), and NSW EPA sensitive land use criteria for TRH, and BTEX, with the exceptions of Pit 106/0.01 (and the replicate sample D3) which contained lead levels in exceedence of NEHF F criteria.

Leachability testing using a distilled water leachant suggests that near surface materials from Pit 106 (which contained an elevated lead level) has a propensity to leach in water, as evidenced by an exceedance of the ANZECC criteria for lead. It is noted, however, that the water leach test is likely to overestimate the leachability potential for materials left on-site, considering natural processes such as rainfall and infiltration.

Slightly elevated chromium and copper levels were also found in Pit 106/0.01 and the replicate sample D3, with levels within the NEHF F criteria.

10.2.2 Groundwater

Groundwater chemical analysis results were generally within the ANZECC (2000) Guidelines for Fresh and Marine Water Quality (slightly to moderately disturbed system), with the following exceptions:

- slightly elevated zinc in groundwater in Bores 201, 203 and Well B;
- slightly elevated ammonia in groundwater in Bores 201, 202 Well B.

11. CONCLUSIONS

The results of the above investigation indicated the following with respect to potential contamination associated with external areas (outside the existing building envelope):

- the presence of elevated lead levels in near surface soils around the perimeter of the former naphtha tanks above the adopted landuse criteria (likely to be due to sandblasting materials/activities, possible lead based paints and/or metal fragments);
- the presence of slightly elevated zinc and ammonia levels in groundwater sampled within the site (from installed and existing groundwater wells).

The areas assessed in the above investigation are likely to be suitable for the proposed commercial/industrial development, provided the following is undertaken:

- additional investigation is undertaken to delineate lead impacted soils around the perimeter of the on-site tanks;
- localised remedial works are conducted to remove lead impacted soils around the perimeter of the on-site tanks.

On-site management or off-site disposal of the lead contaminated material could be considered as possible remedial options.

On-site management would require appropriate containment /capping. The propensity of the material to leach in distilled water should be considered in the design for on-site management (i.e. minimise infiltration and the potential for migration of leachate). In addition, a proposal for on-site management of lead contaminated material is likely to attract requirements for a NSW DECC accredited auditor as part of the development application process. Leaving the material on site would also attract a notice on the Section 149 Certificate for the site and a requirement for a long term Environmental Management Plan for construction, excavation and future site use.

Off-site disposal of contaminated soils would require appropriate excavation/stripping of the near-surface lead impacted soils, and disposal to a licensed landfill. Under the current waste classification (i.e. without additional treatment), off-site disposal at an industrial waste landfill will be required.

Remediation should be conducted in accordance with a site specific remedial action plan, which details the remedial methodology and validation requirements in accordance with NSW EPA guidelines (Ref 1).

The results of chemical analysis suggest that fill materials on the site are classified between 'Solid' and 'Industrial Waste', with lead impacted soils in the vicinity of the tanks classified as 'Industrial Waste' in accordance with Ref 5. If off-site disposal of site soils is required then additional analysis is recommended to confirm disposal options.

If materials other than those observed during this investigation are encountered during development then additional advice should be sought from this office in regard to their suitability or otherwise to remain on-site.

It is noted that a potential for ammonia contamination in groundwater was present due to the identified ammonia and arsenic contamination in groundwater on the adjacent site (ie. Orica Plant). Slightly elevated ammonia levels were found in groundwater on the subject site. The migration of contaminants from the adjacent site therefore cannot be discounted.

Slightly elevated zinc levels encountered in groundwater are likely to be consistent with regional groundwater quality in the area.

With respect to acid sulphate soils at the site, the acid sulphate soil map for Newcastle indicates acid sulphate soils are present in areas surrounding Kooragang (including river sediments adjacent to the site). Without undertaking specific assessment of the subject site, it is likely that underlying natural soils at the site (i.e. beneath dredged fill materials) may be potential acid sulphate soils also. It is considered unlikely that existing dredged fill materials at the site (comprising sands and shell fragments) will pose any acid sulphate soil issues (i.e. material was dredged and placed approximately 40 years ago).

Discussions with the client indicate that excavation associated with construction activities at the site are unlikely to extend beyond the dredged sand filling. The potential for disturbance of acid sulphate soils is therefore considered low.

If the proposed development will disturb underlying natural soils, it is likely that some form of acid sulphate soil management will be required, including the following:

- appropriate stockpiling of potential acid sulphate materials (i.e. bunded and lined areas);
- lime treatment of acid sulphate materials;
- screening tests on treated materials to monitor the treatment process;
- minimising exposure time for acid sulphate soils if possible;
- monitoring of dewatering activities (if required).

If excavations are to be undertaken in natural soils beneath dredged sand filling (i.e. depths greater than approximately 1.5 m to 2.5 m below the ground surface), then an acid sulphate soil management plan should be prepared outlining the details of the proposed approach including objectives, methods and procedures by which construction works will be managed, with regard to potential and actual acid sulphate soils on the site.

12. LIMITATIONS OF THIS REPORT

DP have performed investigation and consulting services for this project in general accordance with current professional and industry standards for land contamination investigation.

Whilst every effort has been made to ensure a representative programme of field and laboratory sampling and testing, conditions different to those identified during these tasks may exist. Therefore DP cannot provide unqualified warranties nor does DP assume any liability for site conditions not observed or accessible during the time of the investigations.

Despite all reasonable care and diligence, the ground conditions encountered and concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. In addition, site characteristics may change over time in response to variations in natural conditions, chemical reactions and other events, eg. groundwater movement and/or spillages of contaminating substances. These changes may occur subsequent to DP's investigations and assessment.

This report and associated documentation and the information herein have been prepared solely for the use of Manildra Park Pty Ltd and the Regional Land Management Corporation on behalf of the NSW State Property Authority. Any reliance assumed by other parties on this report shall be at such party's own risk. Any ensuing liability resulting from use of the report by other parties cannot be transferred to DP.

DOUGLAS PARTNERS PTY LTD

Reviewed by:

Patrick Heads
Environmental Engineer

Stephen Jones
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REFERENCES

1. NSW EPA Contaminated Sites "Guidelines for Consultants Reporting on Contaminated Sites", November 1997.

2. AGC Woodward Clyde "Site Contamination Assessment, Kooragang Island, Newcastle, prepared for Ampol Limited", project 3214, October 1991.

3. NSW EPA Contaminated Sites "Sampling Design Guidelines", September 1995.

4. NSW EPA Contaminated Sites "Guidelines for NSW Site Auditor Scheme, 2nd Edition", April 2006.

5. NSW EPA Environmental Guidelines "Assessment, Classification and Management of Liquid and Non-Liquid Wastes", July 1999

6. NSW EPA Contaminated Sites "Guidelines for Assessing Service Station Sites", December 1994.

7. ANZECC (2000) "Australian and New Zealand Guidelines for Fresh and Marine Water Quality", October 2000.

8. Ministry of Housing, Spatial Planning and the Environment "Environmental Quality Objectives in the Netherlands", 1994.

APPENDIX A

Notes Relating to this Report
Test Pit Logs – Pits 101 to 111
Borehole Logs – Bores 201 to 203

Douglas Partners
Geotechnics - Environment - Groundwater

NOTES RELATING TO THIS REPORT

Introduction

These notes have been provided to amplify the geotechnical report in regard to classification methods, specialist field procedures and certain matters relating to the Discussion and Comments section. Not all, of course, are necessarily relevant to all reports.

Geotechnical reports are based on information gained from limited subsurface test boring and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, Geotechnical Site Investigations Code. In general, descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (eg. sandy clay) on the following bases:

Soil Classification	Particle Size
Clay	less than 0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.06 to 2.00 mm
Gravel	2.00 to 60.00 mm

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Undrained Shear Strength kPa
Very soft	less than 12
Soft	12—25
Firm	25—50
Stiff	50—100
Very stiff	100—200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT) as below:

Relative Density	SPT "N" Value (blows/300 mm)	CPT Cone Value (q_c — MPa)
Very loose	less than 5	less than 2
Loose	5—10	2—5
Medium dense	10—30	5—15
Dense	30—50	15—25
Very dense	greater than 50	greater than 25

Rock types are classified by their geological names. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing with a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

Drilling Methods.

The following is a brief summary of drilling methods currently adopted by the Company and some comments on their use and application.

Test Pits — these are excavated with a backhoe or a tracked excavator, allowing close examination of the in-situ soils if it is safe to descent into the pit. The depth of penetration is limited to about 3 m for a backhoe and up to 6 m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Large Diameter Auger (eg. Pengo) — the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube sampling.

Continuous Sample Drilling — the hole is advanced by pushing a 100 mm diameter socket into the ground and withdrawing it at intervals to extrude the sample. This is the most reliable method of drilling in soils, since moisture content is unchanged and soil structure, strength, etc. is only marginally affected.

Continuous Spiral Flight Augers — the hole is advanced using 90—115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and in sands above the water

table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling — the hole is advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from 'feel' and rate of penetration.

Rotary Mud Drilling — similar to rotary drilling, but using drilling mud as a circulating fluid. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg. from SPT).

Continuous Core Drilling — a continuous core sample is obtained using a diamond-tipped core barrel, usually 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation.

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" — Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of say 4, 6 and 7

  as 4, 6, 7
  N = 13

- In the case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm

  as 15, 30/40 mm.

The results of the tests can be related empirically to the engineering properties of the soil.

Occasionally, the test method is used to obtain samples in 50 mm diameter thin walled sample tubes in clays. In such circumstances, the test results are shown on the borelogs in brackets.

Cone Penetrometer Testing and Interpretation

Cone penetrometer testing (sometimes referred to as Dutch cone — abbreviated as CPT) described in this report has been carried out using an electrical friction cone penetrometer. The test is described in Australian Standard 1289, Test 6.4.1.

In the tests, a 35 mm diameter rod with a cone-tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20 mm per second) the information is plotted on a computer screen and at the end of the test is stored on the computer for later plotting of the results.

The information provided on the plotted results comprises: —

- Cone resistance — the actual end bearing force divided by the cross sectional area of the cone — expressed in MPa.
- Sleeve friction — the frictional force on the sleeve divided by the surface area — expressed in kPa.
- Friction ratio — the ratio of sleeve friction to cone resistance, expressed in percent.

There are two scales available for measurement of cone resistance. The lower scale (0—5 MPa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main scale (0—50 MPa) is less sensitive and is shown as a full line.

The ratios of the sleeve friction to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1%—2% are commonly encountered in sands and very soft clays rising to 4%—10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:—

q_c (MPa) = (0.4 to 0.6) N (blows per 300 mm)

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:—

q_c = (12 to 18) c_u

Interpretation of CPT values can also be made to allow estimation of modulus or compressibility values to allow calculation of foundation settlements.

Inferred stratification as shown on the attached reports is assessed from the cone and friction traces and from experience and information from nearby boreholes, etc. This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties, and where precise information on soil classification is required, direct drilling and sampling may be preferable.

Hand Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150 mm increments of penetration. Normally, there is a depth limitation of 1.2 m but this may be extended in certain conditions by the use of extension rods.

Two relatively similar tests are used.

- Perth sand penetrometer — a 16 mm diameter flat-ended rod is driven with a 9 kg hammer, dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.
- Cone penetrometer (sometimes known as the Scala Penetrometer) — a 16 mm rod with a 20 mm diameter cone end is driven with a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). The test was developed initially for pavement subgrade investigations, and published correlations of the test results with California bearing ratio have been published by various Road Authorities.

Laboratory Testing

Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms.

Bore Logs

The bore logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable, or possible to justify on economic grounds. In any case, the boreholes represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes, the frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Ground Water

Where ground water levels are measured in boreholes, there are several potential problems;

- In low permeability soils, ground water although present, may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Engineering Reports

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface condition, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- unexpected variations in ground conditions — the potential for this will depend partly on bore spacing and sampling frequency
- changes in policy or interpretation of policy by statutory authorities
- the actions of contractors responding to commercial pressures.

If these occur, the Company will be pleased to assist with investigation or advice to resolve the matter.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section

is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

AN ENGINEERING CLASSIFICATION OF SEDIMENTARY ROCKS IN THE SYDNEY AREA

This classification system provides a standardized terminology for the engineering description of the sandstone and shales in the Sydney area, but the terms and definitions may be used elsewhere when applicable.

Under this system rocks are classified by Rock Type, Degree of Weathering, Strength, Stratification Spacing, and Degree of Fracturing. These terms do not cover the full range of engineering properties. Descriptions of rock may also need to refer to other properties (e.g. durability, abrasiveness, etc.) where these are relevant.

ROCK TYPE DEFINITIONS

Rock Type	Definition
Conglomerate:	More than 50% of the rock consists of gravel sized (greater than 2mm) fragments
Sandstone:	More than 50% of the rock consists of sand sized (.06 to 2mm) fragments
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06mm) granular particles and the rock is not laminated
Claystone:	More than 50% of the rock consists of clay or sericitic material and the rock is not laminated
Shale:	More than 50% of the rock consists of silt or clay sized particles and the rock is laminated

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. clayey sandstone, sandy shale.

DEGREE OF WEATHERING

Term	Symbol	Definition
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is no longer recognisable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh	Fs	Rock substance unaffected by weathering, limonite staining along joints.
Fresh	Fr	Rock substance unaffected by weathering.

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly laminated	<6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	>2 m

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Society of Rock Mechanics (Reference).

Strength Term	Is(50) MPa	Field Guide	Approx. qu MPa*
Extremely Low:	0.03	Easily remoulded by hand to a material with soil properties	0.7
Very Low:	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.	2.4
Low:	0.3	A piece of core 150 mm long x 50 mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	7
Medium:	1	A piece of core 150 mm long x 50 mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.	24
High:	3	A piece of core 150 mm long x 50 mm dia. cannot be broken by unaided hands, can be slightly scratched or scored with knife.	70
Very High:	10	A piece of core 150 mm long x 50 mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	240
Extremely High:		A piece of core 150 mm long x 50 mm dia. is difficult to break with hand held hammer. Rings when struck with a hammer.	

* The approximate unconfined compressive strength (qu) shownin the table is based on an assumed ratio to the point load index of 24:1. This ratio may vary widely.

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks

Term	Description
Fragmented:	The core is comprised primarily of fragments of length less than 20 mm, and mostly of width less than the core diameter.
Highly Fractured:	Core lengths are generally less than 20 mm - 40 mm with occasional fragments.
Fractured:	Core lengths are mainly 30 mm - 100 mm with occasional shorter and longer sections.
Slightly Fractured:	Core lengths are generally 300 mm - 1000 mm with occasional longer sections and occasional sections of 100 mm - 300 mm.
Unbroken:	The core does not contain any fracture.

REFERENCE

International Society of Rock Mechanics, Commission on Standardisation of Laboratory and Field Tests, Suggested Methods for Determining the Uniaxial Compressive Strength of Rock Materials and the Point Load Strength Index, Committee on Laboratory Tests Document No. 1 Final Draft October 1972

GRAPHIC SYMBOLS FOR SOIL & ROCK

SOIL

BITUMINOUS CONCRETE

CONCRETE

TOPSOIL

FILLING

PEAT

CLAY

SILTY CLAY

SANDY CLAY

GRAVELLY CLAY

SHALY CLAY

SILT

CLAYEY SILT

SANDY SILT

SAND

CLAYEY SAND

SILTY SAND

GRAVEL

SANDY GRAVEL

CLAYEY GRAVEL

COBBLES/BOULDERS

TALUS

SEDIMENTARY ROCK

BOULDER CONGLOMERATE

CONGLOMERATE

CONGLOMERATIC SANDSTONE

SANDSTONE FINE GRAINED

SANDSTONE COARSE GRAINED

SILTSTONE

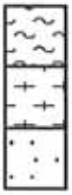
LAMINITE

MUDSTONE, CLAYSTONE, SHALE

COAL

LIMESTONE

METAMORPHIC ROCK



SLATE, PHYLITTE, SCHIST

GNEISS

QUARTZITE

IGNEOUS ROCK

GRANITE

DOLERITE, BASALT

TUFF

PORPHYRY

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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 101
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0	FILLING - Light grey brown fine to medium grained sand filling with shells and shell fragments, rootlets to 0.15m, dry		D, PID	0.05		<1 ppm		
		From 0.5m - damp		D, PID	0.5		<1 ppm		
		From 0.9 to 1.1m - Some clay and rootlets and orange staining		D, PID	1.0		<1 ppm		
	1.2	SAND - Grey fine to medium grained sand, wet							
		From 1.5m - Saturated		D, PID	1.5		<1 ppm	▼	
				D, PID	2.0		<1 ppm		
	2.3	Pit discontinued at 2.3m, due to collapse							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20; 1; 2

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Free groundwater observed at 1.5m

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 102
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.0	FILLING - Light grey brown fine to medium grained sand filling with shells and shell fragments, rootlets to 0.15m, dry		D, PID	0.05		<1 ppm		
		From 0.4m - damp		D, PID	0.5		<1 ppm		
		From 0.9 to 1.1m - Some clay and rootlets		D, PID	1.0		<1 ppm		
	1.2	SAND - Grey fine to medium grained sand, wet							
		From 1.5m - Saturated		D, PID	1.5		<1 ppm	▼	
				D, PID	2.0		<1 ppm		
	2.3	Pit discontinued at 2.3m							

RIG: Case 580 super LE backhoe, 600mm bucket with teeth
LOGGED: Heads

WATER OBSERVATIONS: Free groundwater observed at 1.5m

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 103
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.0	FILLING - Light grey brown fine to medium grained sand filling with shells and shell fragments, rootlets to 0.15m, dry		D, PID	0.05		<1 ppm		
	0.15	FILLING - Light grey brown fine to medium grained sand and fine to medium grained gravel filling, dry		D, PID	0.2		<1 ppm		
	0.3	FILLING - Light grey brown fine to medium grained sand filling, some shell fragments, some gravel, damp		D, PID	0.5		<1 ppm		
		From 0.8m - moist							
	1			D, PID	1.0		<1 ppm		1
				D, PID	1.5		<1 ppm		
	1.6	SAND - Grey fine to medium grained sand with some shells and shell fragments, wet						▽	
	2			D, PID	2.0		<1 ppm		2
	2.1	Pit discontinued at 2.1m, due to collapse							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Seepage from 1.6m depth

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

Douglas Partners
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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 104
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
		FILLING - Grey brown fine to medium sand filling with shell and shell fragments, rootlets to 0.15m		D, PID	0.05		<1 ppm		
		From 0.5m - Trace shells, damp		D, PID	0.5		<1 ppm		
	1			D, PID	1.0		<1 ppm		1
		Wire rope at 1.1m, approx 20mm diameter							
		From 1.5m - Moist		D, PID	1.5		<1 ppm		
	1.8	SAND - Grey fine to medium grained sand, some shells and shell fragments, wet						▽	
	2			D, PID	2.0		<1 ppm		2
	2.1	SANDY CLAY - Grey to dark grey sandy clay, M>Wp							
				D	2.3				
	2.4	Pit discontinued at 2.4m, due to collapse							

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Heavy seepage at 1.8m prior to collapse

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▽ Water level

CHECKED	
Initials:	
Date:	

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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 105
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.0	FILLING - Light brown fine to medium grained sand and fine to medium grained subrounded gravel filling, some clay (roadbase), dry		D, PID	0.05		<1 ppm		
	0.4	FILLING - Brown fine to medium grained sand filling, shell and shell fragment filling, damp to moist		D, PID	0.5		<1 ppm		
1	1.0	FILLING - Light grey brown fine to medium grained sand filling, some shell fragment, moist		D, PID	1.1		<1 ppm		1
	1.3	SAND - Grey fine to medium grained sand, some shell fragments, wet		D, PID	1.5		<1 ppm		
		From 1.7m - Saturated						▼	
	1.8	CLAY/SILTY CLAY - Grey clay/silty clay, M>Wp							
2				D, PID	2.0		<1 ppm		2
	2.2	Pit discontinued at 2.2m, due to collapse							

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Free groundwater observed at 1.7m

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 106
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
		FILLING - Intermixed grey brown silty sand and black fine to coarse sand (sandblasting sand)		D, PID	0.01		<1 ppm		
				D, PID	0.05		<1 ppm		
	0.3	FILLING - Light grey brown fine to medium grained sand, shell and shell fragments, gravel, some cobbles, damp							
		From 0.5m - Grey brown		D, PID	0.5		<1 ppm		
	1			D, PID	1.0		<1 ppm		1
	1.2	Pit discontinued at 1.2m, extent of investigation							
	2								2

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Terminated due to proximity of above ground tank

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 107
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.0	FILLING - Grey brwn silty sand filling with rootlets, dry		D, PID	0.05		<1 ppm		
	0.1	FILLING - Light grey brown fine to coarse grained sand and fine to medium grained subrounded gravel filling, dry							
	0.3	FILLING - Grey brown fine to medium grained sand filling, trace shell fragments, damp		D, PID	0.5		<1 ppm		
		From 0.9m - Moist							
	1			D, PID	1.0		<1 ppm		1
				D, PID	1.5		<1 ppm	▽	
	2			D, PID	2.0		<1 ppm		2
				D, PID	2.5		<1 ppm		
	2.6	Pit discontinued at 2.6m, due to collapse							

Dynamic Penetrometer Test (blows per mm): 5 10 15 20

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Heavy seepage from 1.8m prior to collapse

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

Douglas Partners
Geotechnics • Environment • Groundwater

TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 108
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.1	FILLING - Grey brwn silty sand filling with rootlets, dry							
		FILLING - Light grey brown fine to coarse grained sand and fine to medium grained subrounded gravel filling, dry		D, PID	0.15		<1 ppm		
	0.3	FILLING - Light grey brown fine to medium grained sand with shells and shell fragments, damp		D, PID	0.5		<1 ppm		
		From 0.8m - Some shell fragments, moist							
	1	Silty lens at approx. 1.0m		D, PID	1.0		<1 ppm		1
				D, PID	1.5		<1 ppm		
		From 1.8m - Fine to coarse grained, wet						▽	
	2			D, PID	2.0		<1 ppm		2
	2.3	Pit discontinued at 2.3m, due to collapse							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Seepage from approx. 1.8m

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

Douglas Partners
Geotechnics • Environment • Groundwater

TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 109
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.05	FILLING - Grey brown silty sand and rootlets filling, dry		D, PID	0.01		<1 ppm		
		FILLING - Light brown fine to coarse grained sand and fine to medium subrounded gravel filling, dry		D, PID	0.1		<1 ppm		
	0.3	FILLING - Light brown/light grey brown fine to medium grained sand filling with some shell fragments, damp		D, PID	0.5		<1 ppm		
	1	From 1.2m - moist		D, PID	1.0		<1 ppm		1
				D, PID	1.5		<1 ppm		
	2			D, PID	2.0		<1 ppm		2
	2.1	Pit discontinued at 2.1m, due to collapse							

Dynamic Penetrometer Test (blows per mm): 5 10 15 20

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 110
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
	0.1	FILLING - Grey brown silty sand and rootlets filling, dry		D, PID	0.05		<1 ppm		
		FILLING - Light grey brown fine to medium grained sand filling with some gravel and shell fragments		D, PID	0.5		<1 ppm		
		Plastic covered pipe at 0.7m (service - not damaged) (moved east 1.5m)							
	1			D, PID	1.0		<1 ppm		1
				D, PID	1.5		<1 ppm		
	1.9	SAND - Grey fine to medium grained sand with shell fragments, wet						▽	
	2			D, PID	2.0		<1 ppm		2
	2.3	Pit discontinued at 2.3m, due to collapse							

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Seepage from 1.9m depth

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▽ Water level

CHECKED	
Initials:	
Date:	

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TEST PIT LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Baseline Contamination Assessment
LOCATION: 20 Greenleaf Road, Kooragang Island

SURFACE LEVEL: –
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

PIT No: 111
PROJECT No: 39654
DATE: 09 Jan 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.0	FILLING - Grey brown silty sand and rootlets filling, dry		D, PID	0.05		<1 ppm		
	0.1	FILLING - Light grey brown fine to medium grained sand filling with some shells and shell fragments		D, PID	0.5		<1 ppm		
	1			D, PID	1.0		<1 ppm		1
	1.7	SAND - Grey fine to medium grained sand with shells and shell fragments, saturated		D, PID	1.8		<1 ppm	▽	
	2			D	2.2				2
	2.3	Pit discontinued at 2.3m, due to collapse							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Case 580 super LE backhoe, 600mm bucket with teeth

LOGGED: Heads

WATER OBSERVATIONS: Heavy seepage from 1.7m

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		▼	Water level

CHECKED	
Initials:	
Date:	

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BOREHOLE LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Preliminary Contamination Assessment
LOCATION: Kooragang Island

SURFACE LEVEL: 10.09 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

BORE No: 201
PROJECT No: 39654
DATE: 05 Mar 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.1	FILLING: Grey brown gravelly, fine to medium grained sand filling with some clay, rootlets		D,PID	0.05		<1ppm		Gatic Concrete from surface to 0.2m
		FILLING: Light grey brown, fine to medium grained sand filling, dry, some shell fragments							Bentonite plug from 0.2m to 0.5m
1				D,PID	1.0		<1ppm		1
	1.1	SAND: Grey, fine to medium grained sand, damp, some shells							
		Saturated at 1.5m depth		D,PID	1.5		<1ppm	▼	
2				D,PID	2.0		<1ppm		2
	2.1	SILTY CLAY: Dark grey, very soft silty clay, M>Wp, shell/shell fragments							
				D,PID	2.5		<1ppm		50mm diameter Class 18 PVC screen from 1.0m to 4m 5/2 gravel filter from 0.5m to 4m
3				D,PID	3.0		<1ppm		3
				D,PID	3.5		<1ppm		
		Becoming sandy from 3.7m depth							
4	4.0	Bore discontinued at 4.0m, limit of investigation		D,PID	4.0		<1ppm		4 End cap

RIG: Truck Mounted **DRILLER:** Albert **LOGGED:** Collins **CASING:**

TYPE OF BORING: 100mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 1.5m depth during drilling. Groundwater observed at 1.31m below top of casing on 5.3.07

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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BOREHOLE LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Preliminary Contamination Assessment
LOCATION: Kooragang Island

SURFACE LEVEL: 9.78 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

BORE No: 202
PROJECT No: 39654
DATE: 05 Mar 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING: Light grey brown, fine to medium grained sand filling, dry, shell/shell fragments		D,PID	0.1		<1ppm		Gatic Concrete from surface to 0.2m Bentonite plug from 0.2m to 0.5m
	1			D,PID	1.0		<1ppm		1
	1.5	SAND: Grey, fine to medium grained sand, damp, shells/fragments		D,PID	1.5		<1ppm		
	1.7	Saturated at 1.7m depth GRAVELLY CLAY: Grey brown gravelly clay, shells M>Wp						▼	
	2			D,PID	2.0		<1ppm		2
				D,PID	2.5		<1ppm		50mm diameter Class 18 PVC screen from 1.0m to 4m 5/2 gravel filter from 0.5m to 4m
	3	Gravel content decreasing from 3m depth		D,PID	3.0		<1ppm		3
		Becoming sandy clay at 3.4m depth		D,PID	3.5		<1ppm		
	4 4.0	Bore discontinued at 4.0m, limit of investigation		D,PID	4.0		<1ppm		4 End cap

RIG: Truck Mounted **DRILLER:** Albert **LOGGED:** Collins **CASING:**

TYPE OF BORING: 100mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 1.7m depth during drilling. Groundwater observed at 1.77m below top of casing on 5.3.07

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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BOREHOLE LOG

CLIENT: Manildra Park Pty Ltd
PROJECT: Preliminary Contamination Assessment
LOCATION: Kooragang Island

SURFACE LEVEL: 10.02 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/–

BORE No: 203
PROJECT No: 39654
DATE: 05 Mar 07
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING: Light grey brown, fine to medium grained sand filling with some gravel, dry, some shell fragments, rootlets to 0.5m depth		D	0.05		<1ppm		Gatic Concrete from surface to 0.2m
		Gravel content decreasing							Bentonite plug from 0.2m to 0.5m
	1			D,PID	1.0		<1ppm		1
				D,PID	1.5		<1ppm		
	1.6	SAND: Grey, fine to medium grained sand, damp, shell fragments							
		Saturated from 1.9m depth						▼	
	2			D,PID	2.0		<1ppm		2
	2.1	SANDY CLAY: (Soft) grey sandy clay, M>Wp, some shell fragments							
				D,PID	2.5		<1ppm		5/2 gravel filter from 0.5m to 4.5m
		Sand and shell content increasing from 2.8m depth							
	3			D,PID	3.0		<1ppm		3 50mm diameter Class 18 PVC screen from 1.0m to 4.5m
				D,PID	3.5		<1ppm		
	4			D,PID	4.0		<1ppm		4
	4.5	Bore discontinued at 4.5m, limit of investigation		D,PID	4.5		<1ppm		End cap

RIG: Truck Mounted **DRILLER:** Albert **LOGGED:** Collins **CASING:**

TYPE OF BORING: 100mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 1.9m depth during drilling. Groundwater observed at 1.97m below top of casing on 5.3.07

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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APPENDIX B

Laboratory Test Results

SGS

12 July 2007

TEST REPORT

Douglas Partners Pty Ltd
Box 324
Hunter Region Mail Centre
NSW 2310

Your Reference: 39654, Kooragang Island
Report Number: 50029-R

Attention: Patrick Heads

Dear Patrick
The following samples were received from you on the date indicated.

Samples: Qty.	25 Soils
Date of Receipt of Samples:	11/01/07
Date of Receipt of Instructions:	11/01/07
Date Preliminary Report Faxed:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report.
Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

This report cancels and supersedes report No. 50029 issued by SGS Environmental Services due to changes to samples reported at the client's request.

Yours faithfully
SGS ENVIRONMENTAL SERVICES

Ly Kim Ha
Senior Organic Chemist

Edward Ibrahim
Laboratory Services Manager

Alexandra Stenta
Key Account Representative

SGS Ref	Sample ID	TRH C6 - C9 P&T	TRH C10 - C14	TRH C15 - C28	TRH C29 - C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	BTEX Surrogate (%)
---	---	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%
50029-R-1	101/0.05	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	119
50029-R-2	102/0.05	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	72
50029-R-3	103/0.05	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	71
50029-R-4	104/0.05	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	128
50029-R-5	105/0.05	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	124
50029-R-6	106/0.01	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	116
50029-R-7	107/0.05	<20	<20	<50	60	<0.5	<0.5	<0.5	<1.5	117
50029-R-8	108/0.15	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	117
50029-R-9	109/0.01	<20	<20	<50	98	<0.5	<0.5	<0.5	<1.5	114
50029-R-10	110/0.05	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	93
50029-R-11	111/0.05	<20	<20	<50	89	<0.5	<0.5	<0.5	<1.5	90
50029-R-16	104/2.0	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	74
50029-R-17	105/1.5	<20	<20	<50	<50	<0.5	<0.5	<0.5	<1.5	78
50029-R-19	D3	<20	<20	57	160	<0.5	<0.5	<0.5	<1.5	79

SGS Ref	Sample ID	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]anthracene	Chrysene	Benzo[b,k]fluoranthene	Benzo[a]pyrene	Indeno[123-cd]pyrene	Dibenzo[ah]anthracene	Benzo[ghi]perylene
---	---	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/k
50029-R-1	101/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
50029-R-2	102/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.2	0.07	<0.1	<0.1	<0.1
50029-R-3	103/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.1	0.2	0.15	0.1	<0.1	0.1
50029-R-4	104/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	<0.1	<0.1	<0.2	0.12	<0.1	<0.1	<0.1
50029-R-5	105/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
50029-R-6	106/0.01	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.3	0.3	0.2	0.2	0.4	0.21	0.1	<0.1	0.2
50029-R-7	107/0.05	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.3	0.3	0.2	0.2	0.4	0.26	0.2	<0.1	0.2
50029-R-8	108/0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.2	0.08	<0.1	<0.1	<0.1
50029-R-9	109/0.01	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.8	0.8	0.5	0.5	1.1	0.63	0.4	0.1	0.5
50029-R-10	110/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.1	0.3	0.16	0.1	<0.1	0.1
50029-R-11	111/0.05	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.5	0.5	0.3	0.3	0.6	0.37	0.2	<0.1	0.3
50029-R-16	104/2.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
50029-R-17	105/1.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
50029-R-19	D3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.1	0.3	0.15	0.1	<0.1	0.1

SGS Ref	Sample ID	Total PAH's	Nitrobenzene-d5	2-Fluorobiphenyl	p-Terphenyl-d14
---	---	mg/kg	%	%	%
50029-R-1	101/0.05	<1.55	113	110	122
50029-R-2	102/0.05	<1.57	104	102	110
50029-R-3	103/0.05	<1.85	96	97	100
50029-R-4	104/0.05	<1.82	102	98	109
50029-R-5	105/0.05	<1.55	99	98	106
50029-R-6	106/0.01	<2.61	112	100	111
50029-R-7	107/0.05	<2.76	102	103	106
50029-R-8	108/0.15	<1.58	104	103	105
50029-R-9	109/0.01	<6.13	107	104	109
50029-R-10	110/0.05	<1.96	104	104	108
50029-R-11	111/0.05	<3.87	103	102	110
50029-R-16	104/2.0	<1.55	97	99	104
50029-R-17	105/1.5	<1.55	94	96	105
50029-R-19	D3	<1.95	104	105	113

SGS Ref	Sample ID	HCB	alpha-BHC	gamma-BHC (Lindane)	Heptachlor	Aldrin	beta-BHC	delta-BHC	Heptachlor Epoxide	o,p'-DDE	alpha-Endosulfan	trans-Chlordane	cis-Chlordane	trans-Nonachlor	p,p'-DDE	Dieldrin
---	---	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/k
50029-R-1	101/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
50029-R-2	102/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
50029-R-4	104/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
50029-R-5	105/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
50029-R-6	106/0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
50029-R-7	107/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
50029-R-10	110/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
50029-R-19	D3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

SGS Ref	Sample ID	Endrin	o,p'-DDD	o,p'-DDT	beta-Endosulfan	p,p'-DDD	p,p'-DDT	Endosulfan Sulphate	Endrin Aldehyde	Methoxychlor	Endrin Ketone	2,4,5,6-Tetrachloro-m-xylene (Surrogate
---	---	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%
50029-R-1	101/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	113
50029-R-2	102/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	113
50029-R-4	104/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	114
50029-R-5	105/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	111
50029-R-6	106/0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	115
50029-R-7	107/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	109
50029-R-10	110/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	115
50029-R-19	D3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	116

SGS Ref	Sample ID	Chlorpyrifos	Fenitrothion	Bromofos Ethyl	Ethion	OP_Surrogate 1
---	---	mg/kg	mg/kg	mg/kg	mg/kg	%
50029-R-1	101/0.05	<0.1	<0.1	<0.1	<0.1	113
50029-R-2	102/0.05	<0.1	<0.1	<0.1	<0.1	113
50029-R-4	104/0.05	<0.1	<0.1	<0.1	<0.1	114
50029-R-5	105/0.05	<0.1	<0.1	<0.1	<0.1	111
50029-R-6	106/0.01	<0.1	<0.1	<0.1	<0.1	115
50029-R-7	107/0.05	<0.1	<0.1	<0.1	<0.1	109
50029-R-10	110/0.05	<0.1	<0.1	<0.1	<0.1	115
50029-R-19	D3	<0.1	<0.1	<0.1	<0.1	116

SGS Ref	Sample ID	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	Arochlor 1262	Arochlor 1268	Total Positive PCB	PCB_Surrogate 1
---	---	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%
50029-R-1	101/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.90	113
50029-R-2	102/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.90	113
50029-R-4	104/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.90	114
50029-R-5	105/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.90	111
50029-R-6	106/0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.90	115
50029-R-7	107/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.90	109
50029-R-10	110/0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.90	115
50029-R-19	D3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.90	116

SGS Ref	Sample ID	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
---	---	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
50029-R-1	101/0.05	<3	0.1	2.8	4.1	4	<0.05	2.6	27
50029-R-2	102/0.05	<3	0.6	5.9	11	18	<0.05	3.7	130
50029-R-3	103/0.05	3	1.1	8.8	10	26	0.08	5.0	120
50029-R-4	104/0.05	4	1.2	11	27	59	<0.05	6.1	400
50029-R-5	105/0.05	6	0.2	16	23	16	<0.05	11	120
50029-R-6	106/0.01	12	11	290	2,800	3,300	0.10	64	<0.3
50029-R-7	107/0.05	5	1.5	14	16	36	<0.05	7.4	180
50029-R-8	108/0.15	9	0.7	17	19	20	<0.05	12	130
50029-R-9	109/0.01	12	3.0	28	31	76	0.05	14	330
50029-R-10	110/0.05	7	1.8	18	46	58	<0.05	10	460
50029-R-11	111/0.05	11	3.8	41	140	200	0.06	11	1,300
50029-R-16	104/2.0	<3	<0.1	2.1	0.8	2	<0.05	2.3	9.9
50029-R-17	105/1.5	4	<0.1	1.9	0.5	<1	<0.05	2.0	4.5
50029-R-19	D3	35	12	250	3,000	3,700	<0.05	68	<0.3

SGS Ref	Sample ID	Total Phenolics (as Pl
---	---	mg/kg
50029-R-1	101/0.05	<0.5
50029-R-2	102/0.05	<0.5
50029-R-4	104/0.05	2.0
50029-R-5	105/0.05	<0.5
50029-R-6	106/0.01	0.6
50029-R-7	107/0.05	1.8
50029-R-10	110/0.05	2.3
50029-R-19	D3	2.0

SGS Ref	Sample ID		Sample Description	Asbestos ID in soil
---	---			
50029-R-21	101/0.05		33g sand, soil, plant matter	No asbestos detected
50029-R-22	104/0.05		37g sand, clay, rocks	No asbestos detected
50029-R-23	105/0.05		34g sand, soil, plant matter	No asbestos detected
50029-R-24	110/0.05		35g sand, plant matter	No asbestos detected

Method ID	Methodology Summary
SEO-017	BTEX/TRH C6-C9 - Determination by Purge and Trap Gas Chromatography with Flame Ionisation Detection (FID) and Photo Ionisation Detection (PID). The surrogate spike used is aaa-trifluorotoluene.
SEO-020	TRH - Determination of Total Recoverable Hydrocarbons by gas chromatography following extraction with DCM/Acetone for solids and DCM for liquids.
SEO-018	BTEX - Determination by purge and trap/ Gas Chromatography with MS Detection.
SEO-030	PAHs by GC/MS - Determination of Polynuclear Aromatic Hydrocarbons (PAH's) by Gas Chromatography / Mass Spectrometry following extraction with dichloromethane or dichloromethane/acetone. The surrogate spike used is p-Terphenyl-d14.
SEO-005	OC/OP/PCB - Determination of a suite of Organchlorine Pesticides, Chlorinated Organo-phosphorus Pesticides and Polychlorinated Biphenyls (PCB's) by sonication extraction using dichloromethane for waters or acetone / hexane for soils followed by Gas Chromatographic separation with Electron Capture Detection (GC/ECD). The surrogate spike used is 2,4,5,6-Tetrachloro-m-xylene.
SEM-010	Metals - Determination of various metals by ICP-AES following aqua regia digest.
SEM-005	Mercury - Determination of Mercury by Cold Vapour Generation Atomic Absorption Spectroscopy.
SEI-066	Phenols - Determined by colourimetric method using Discrete Analyser, following steam distillation of the sample.
AN602	Qualitative identification of asbestos type fibres in bulk using Polarised Light Microscopy and Dispersion Staining Techniques. Accreditation does not cover the identification of Synthetic Mineral Fibre.
AN002	Preparation of soils, sediments and sludges undergo analysis by either air drying, compositing, subsampling and 1:5 soil water extraction where required. Moisture content is determined by drying the sample at 105 ± 5°C.

Method ID	Methodology Summary

QUALITY CONTROL TRH/BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
TRH C_6 - C_9 P&T	mg/kg	20	SEO-017	<20	50029-3	<20 || <20	50029-3	79 || [N/T]
TRH C_{10} - C_{14}	mg/kg	20	SEO-020	<20	50029-3	<20 || <20	50029-3	86 || [N/T]
TRH C_{15} - C_{28}	mg/kg	50	SEO-020	<50	50029-3	<50 || <50	50029-3	90 || [N/T]
TRH C_{29} - C_{36}	mg/kg	50	SEO-020	<50	50029-3	<50 || <50	50029-3	91 || [N/T]
Benzene	mg/kg	0.5	SEO-017	<0.5	50029-3	<0.5 || <0.5	50029-3	64 || [N/T]
Toluene	mg/kg	0.5	SEO-017	<0.5	50029-3	<0.5 || <0.5	50029-3	65 || [N/T]
Ethylbenzene	mg/kg	0.5	SEO-017	<0.5	50029-3	<0.5 || <0.5	50029-3	68 || [N/T]
Total Xylenes	mg/kg	1.5	SEO-017	<1.5	50029-3	<1.5 || <1.5	50029-3	71 || [N/T]
BTEX Surrogate (%)	%	0	SEO-018	102	50029-3	71 || 71 || RPD: 0	50029-3	75 || [N/T]
QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
Naphthalene	mg/kg	0.1	SEO-030	<0.1	50029-3	<0.1 || <0.1	Batch	93 || [N/T]
Acenaphthylene	mg/kg	0.1	SEO-030	<0.1	50029-3	<0.1 || <0.1	Batch	83 || [N/T]
Acenaphthene	mg/kg	0.1	SEO-030	<0.1	50029-3	<0.1 || <0.1	Batch	110 || [N/T]
Fluorene	mg/kg	0.1	SEO-030	<0.1	50029-3	<0.1 || <0.1	[NR]	[NR]
Phenanthrene	mg/kg	0.1	SEO-030	<0.1	50029-3	<0.1 || <0.1	Batch	95 || [N/T]
Anthracene	mg/kg	0.1	SEO-030	<0.1	50029-3	<0.1 || <0.1	Batch	101 || [N/T]
Fluoranthene	mg/kg	0.1	SEO-030	<0.1	50029-3	0.2 || 0.2 || RPD: 0	Batch	93 || [N/T]
Pyrene	mg/kg	0.1	SEO-030	<0.1	50029-3	0.2 || 0.2 || RPD: 0	Batch	94 || [N/T]
Benzo[*a*]anthracene	mg/kg	0.1	SEO-030	<0.1	50029-3	0.1 || 0.1 || RPD: 0	[NR]	[NR]
Chrysene	mg/kg	0.1	SEO-030	<0.1	50029-3	0.1 || 0.1 || RPD: 0	[NR]	[NR]
Benzo[*b,k*]fluoranthene	mg/kg	0.2	SEO-030	<0.2	50029-3	0.2 || 0.2 || RPD: 0	[NR]	[NR]
Benzo[*a*]pyrene	mg/kg	0.05	SEO-030	<0.05	50029-3	0.15 || 0.15 || RPD: 0	Batch	99 || [N/T]
Indeno[*123-cd*]pyrene	mg/kg	0.1	SEO-030	<0.1	50029-3	0.1 || 0.1 || RPD: 0	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
Dibenzo[*ah*]anthracene	mg/kg	0.1	SEO-030	<0.1	50029-3	<0.1 || <0.1	[NR]	[NR]
Benzo[*ghi*]perylene	mg/kg	0.1	SEO-030	<0.1	50029-3	0.1 || 0.1 || RPD: 0	[NR]	[NR]
Total PAH's	mg/kg	1.55	SEO-030	<1.55	50029-3	<1.85 || <1.85	[NR]	[NR]
Nitrobenzene-d5	%	0	SEO-030	101	50029-3	96 || 102 || RPD: 6	Batch	100 || [N/T]
2-Fluorobiphenyl	%	0	SEO-030	93	50029-3	97 || 103 || RPD: 6	Batch	101 || [N/T]
p -Terphenyl-*d14*	%	0	SEO-030	106	50029-3	100 || 107 || RPD: 7	Batch	102 || [N/T]
QUALITY CONTROL OC Pesticides in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
HCB	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
gamma-BHC (Lindane)	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Heptachlor	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	50029-6	114 || [N/T]
Aldrin	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	50029-6	98 || [N/T]
beta-BHC	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
delta-BHC	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	50029-6	112 || [N/T]
Heptachlor Epoxide	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
o,p'-DDE	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
alpha-Endosulfan	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
trans-Chlordane	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
cis-Chlordane	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
trans-Nonachlor	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
p,p'-DDE	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Dieldrin	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	50029-6	115 || [N/T]
Endrin	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	50029-6	121 || [N/T]

QUALITY CONTROL OC Pesticides in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
o,p'-DDD	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
o,p'-DDT	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
beta-Endosulfan	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
p,p'-DDD	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
p,p'-DDT	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	50029-6	120 || [N/T]
Endosulfan Sulphate	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Methoxychlor	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Endrin Ketone	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
2,4,5,6-Tetrachloro-m-xylene *(Surrogate*	%	0	SEO-005	121	50029-19	116 || 112 || RPD: 4	50029-6	110 || [N/T]
QUALITY CONTROL OP Pesticides in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
Chlorpyrifos	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	50029-6	116 || [N/T]
Fenitrothion	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Bromofos Ethyl	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
OP_Surrogate 1	%	0	SEO-005	121	50029-19	116 || 112 || RPD: 4	50029-6	110 || [N/T]

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
Arochlor 1016	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Arochlor 1260	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	Batch	100 || [NT]
Arochlor 1262	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Arochlor 1268	mg/kg	0.1	SEO-005	<0.1	50029-19	<0.1 || <0.1	[NR]	[NR]
Total Positive PCB	mg/kg	0.9	SEO-005	<0.90	50029-19	<0.90 || <0.90	[NR]	[NR]
PCB_Surrogate 1	%	0	SEO-005	121	50029-19	116 || 112 || RPD: 4	Batch	108 || [NT]

QUALITY CONTROL Acid Extractable Metals in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
Arsenic	mg/kg	3	SEM-010	<3	50029-1	<3 || <3	50029-2	106 || [N/T]
Cadmium	mg/kg	0.1	SEM-010	<0.1	50029-1	0.1 || 0.1 || RPD: 0	50029-2	93 || [N/T]
Chromium	mg/kg	0.3	SEM-010	<0.3	50029-1	2.8 || 2.7 || RPD: 4	50029-2	93 || [N/T]
Copper	mg/kg	0.5	SEM-010	<0.5	50029-1	4.1 || 3.7 || RPD: 10	50029-2	96 || [N/T]
Lead	mg/kg	1	SEM-010	<1	50029-1	4 || 4 || RPD: 0	50029-2	83 || [N/T]
Mercury	mg/kg	0.05	SEM-005	<0.05	50029-1	<0.05 || <0.05	50029-2	93 || [N/T]
Nickel	mg/kg	0.5	SEM-010	<0.5	50029-1	2.6 || 2.2 || RPD: 17	50029-2	92 || [N/T]
Zinc	mg/kg	0.3	SEM-010	<0.3	50029-1	27 || 26 || RPD: 4	50029-2	93 || [N/T]
QUALITY CONTROL Total Phenolics in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base+Duplicate+%RPD	Spike Sm#	Matrix Spike % Recovery Duplicate+% RPD
Total Phenolics (as Phenol)	mg/kg	0.5	SEI-066	<0.5	50029-1	<0.5 || <0.5	50029-2	91 || [N/T]

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Moisture	%	1	AN002	<1

QUALITY CONTROL TRH/BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base:Duplicate:%RPD
TRH C_6 - C_9 P&T	mg/kg	[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	[NT]	[NT]
Benzene	mg/kg	[NT]	[NT]
Toluene	mg/kg	[NT]	[NT]
Ethylbenzene	mg/kg	[NT]	[NT]

QUALITY CONTROL TRH/BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base:Duplicate:%RPD
Total Xylenes	mg/kg	[NT]	[NT]
BTEX Surrogate (%)	%	[NT]	[NT]
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base:Duplicate:%RPD
Naphthalene	mg/kg	[NT]	[NT]
Acenaphthylene	mg/kg	[NT]	[NT]
Acenaphthene	mg/kg	[NT]	[NT]
Fluorene	mg/kg	[NT]	[NT]
Phenanthrene	mg/kg	[NT]	[NT]
Anthracene	mg/kg	[NT]	[NT]
Fluoranthene	mg/kg	[NT]	[NT]
Pyrene	mg/kg	[NT]	[NT]
Benzo[*a*]anthracene	mg/kg	[NT]	[NT]
Chrysene	mg/kg	[NT]	[NT]
Benzo[*b,k*]fluoranthene	mg/kg	[NT]	[NT]
Benzo[*a*]pyrene	mg/kg	[NT]	[NT]
Indeno[*123-cd*]pyrene	mg/kg	[NT]	[NT]
Dibenzo[*ah*]anthracene	mg/kg	[NT]	[NT]
Benzo[*ghi*]perylene	mg/kg	[NT]	[NT]
Total PAH's	mg/kg	[NT]	[NT]
Nitrobenzene-d5	%	[NT]	[NT]

QUALITY CONTROL PAHs in Soil	**UNITS**	**Dup. Sm#**	**Duplicate Base:Duplicate:%RPD**
2-Fluorobiphenyl	%	[NT]	[NT]
p -Terphenyl-*d14*	%	[NT]	[NT]
QUALITY CONTROL Acid Extractable Metals in Soil	UNITS	Dup. Sm#	Duplicate Base:Duplicate:%RPD
Arsenic	mg/kg	50029-11	11 || 10 || RPD: 10
Cadmium	mg/kg	50029-11	3.8 || 3.1 || RPD: 20
Chromium	mg/kg	50029-11	41 || 31 || RPD: 28
Copper	mg/kg	50029-11	140 || 110 || RPD: 24
Lead	mg/kg	50029-11	200 || 170 || RPD: 16
Mercury	mg/kg	50029-11	0.06 || 0.07 || RPD: 15
Nickel	mg/kg	50029-11	11 || 12 || RPD: 9
Zinc	mg/kg	50029-11	1300 || 1200 || RPD: 8

QUALITY CONTROL Total Phenolics in Soil	UNITS	Dup. Sm#	Duplicate Base:Duplicate:%RPD
Total Phenolics (as Phenol)	mg/kg	[NT]	[NT]

Result Codes

[NS]	:	Insufficient Sample for this test	[HBG]	:	Results not Reported due to High Background Interference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Result Comments

ASBESTOS NB. Even after disintegration of certain bulk samples (vinyl tiles and bituminous type materials), the detection, of fibres may be difficult when using Polarised Light Microscopy and Dispersion Staining Techniques. This may be due to the matrix of the sample (uneven distribution), or fine fibres that are difficult to detect and positively identify.
Asbestos sample #25: <1mm length fibre bundles x3 found loose in sample

Date Organics extraction commenced: 16/01/07
NATA Accreditation No. 2562, Site No. 4354

Quality Control Protocol

Reagent Blank: Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.
Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 10 samples.
Matrix Spike Duplicates: Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.
Surrogate Spike: Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.
Control Standards: Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.
Additional QC Samples: A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

16 March 2007 **TEST REPORT**

Douglas Partners Pty Ltd
Box 324
Hunter Region Mail Centre
NSW 2310

Your Reference: 39654, Kooragang Island
Report Number: 50029A

Attention: Patrick Heads

Dear Patrick
The following samples were received from you on the date indicated.

Samples: Qty.	1 Soil
Date of Receipt of Samples:	11/01/07
Date of Receipt of Instructions:	09/03/07@2.32pm
Date Preliminary Report Emailed:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report. Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

Yours faithfully
SGS ENVIRONMENTAL SERVICES

James McMahon
Business Manager Sydney
Approved Signatory

Alexandra Stenta
Key Account Representative

SGS Australia Pty Ltd ABN 44 000 964 278 | Environmental Services Unit 16, 33 Maddox Street, Alexandria Australia t (02) 8594 0400 f (02) 8594 0499 www.au.sgs.com
Member of the SGS Group

TCLP for Pb Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	50029A-6 Pit 106/0.01 soil 9/01/2007
pH of soil for fluid# determ.	pH units	6.71
pH of soil for fluid # determ. (acid)	pH units	1.60
Extraction fluid used		1
pH of final Leachate	pH units	4.99
Lead	mg/L	0.05

Metals in TCLP (AS4439) Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ---------- 	50029A-6 Pit 106/0.01 soil 9/01/2007
pH of final Leachate	pH units	5.73
Lead	µg/L	32

Method ID	Methodology Summary
SEP-003	Toxicity Characteristic Leaching Procedure (TCLP) and AS Bottle leach procedure.
SEM-010	Metals - Determination of various metals by ICP-AES following aqua regia digest.
AN320	Metals - Determination of various metals by ICP-MS at trace levels following aqua regia digest. Method based on USEPA 6020A.

QUALITY CONTROL TCLP for Pb	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
pH of soil for fluid# determ.	pH units		SEP-003	[NT]	[NT]	[NT]	[NR]	[NR]
pH of soil for fluid # determ. (acid)	pH units		SEP-003	[NT]	[NT]	[NT]	[NR]	[NR]
Extraction fluid used			SEP-003	[NT]	[NT]	[NT]	[NR]	[NR]
pH of final Leachate	pH units		SEP-003	[NT]	[NT]	[NT]	[NR]	[NR]
Lead	mg/L	0.02	SEM-010	<0.02	[NT]	[NT]	LCS	101 || [N/T]
QUALITY CONTROL Metals in TCLP (AS4439)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
pH of final Leachate	pH units		SEP-003	[NT]	[NT]	[NT]	[NR]	[NR]
Lead	µg/L	1	AN320	<1.0	[NT]	[NT]	LCS	101 || [N/T]

Result Codes

[INS]	:	Insufficient Sample for this test	[HBG]	:	Results not Reported due to High Background Interference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Result Comments

Date Organics extraction commenced: N/A
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Dioxins/Furans* and PAH in XAD and PUF).

Quality Control Protocol

Reagent Blank: Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.
Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 10 samples.
Matrix Spike Duplicates: Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.
Surrogate Spike: Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.
Control Standards: Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.
Additional QC Samples: A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

SGS

19 March 2007 **TEST REPORT**

Douglas Partners Pty Ltd
Box 324
Hunter Region Mail Centre
NSW 2310

Your Reference: 39654, Kooragang
Report Number: 51136

Attention: Patrick Heads

Dear Patrick
The following samples were received from you on the date indicated.

Samples: Qty.	3 Soils, 5 Waters
Date of Receipt of Samples:	07/03/07
Date of Receipt of Instructions:	07/03/07
Date Preliminary Report Emailed:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report.
Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

Yours faithfully
SGS ENVIRONMENTAL SERVICES

James McMahon
Business Manager Sydney
Approved Signatory

Edward Ibrahim
Laboratory Services Manager

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Member of the SGS Group

BTEX in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	51136-1 Bore 201/1.0 Soil 5/03/2007	51136-2 Bore 202/1.0 Soil 5/03/2007	51136-3 Bore 203/1.5 Soil 5/03/2007
Benzene	mg/kg	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<0.5	<0.5	<0.5
Total Xylenes	mg/kg	<1.5	<1.5	<1.5
BTEX Surrogate (%)	%	71	75	117

TRH in soil with..C6-C9 by P/T Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	51136-1 Bore 201/1.0 Soil 5/03/2007	51136-2 Bore 202/1.0 Soil 5/03/2007	51136-3 Bore 203/1.5 Soil 5/03/2007
TRH C6 - C9 P&T	mg/kg	<20	<20	<20
TRH C10 - C14	mg/kg	<20	<20	<20
TRH C15 - C28	mg/kg	<50	<50	<50
TRH C29 - C36	mg/kg	<50	<50	<50

PAHs in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	51136-1 Bore 201/1.0 Soil 5/03/2007	51136-2 Bore 202/1.0 Soil 5/03/2007	51136-3 Bore 203/1.5 Soil 5/03/2007
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1
Benzo[*a*]anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo[*b,k*]fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo[*a*]pyrene	mg/kg	<0.05	<0.05	<0.05
Indeno[*123-cd*]pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo[*ah*]anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo[*ghi*]perylene	mg/kg	<0.1	<0.1	<0.1
Total PAH's	mg/kg	<1.55	<1.55	<1.55
Nitrobenzene-d5	%	101	101	99
2-Fluorobiphenyl	%	95	98	95
p -Terphenyl-*d14*	%	98	99	98

Acid Extractable Metals in Soil Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	51136-1 Bore 201/1.0 Soil 5/03/2007	51136-2 Bore 202/1.0 Soil 5/03/2007	51136-3 Bore 203/1.5 Soil 5/03/2007
Arsenic	mg/kg	<3	3	<3
Cadmium	mg/kg	<0.1	<0.1	<0.1
Chromium	mg/kg	2.7	4.1	2.0
Copper	mg/kg	0.94	2.3	1.2
Lead	mg/kg	1	2	1
Mercury	mg/kg	<0.05	<0.05	<0.05
Nickel	mg/kg	3.1	4.2	1.9
Zinc	mg/kg	7.5	10	7.1

BTEX in Water Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	51136-4 Bore 201 Water 6/03/2007	51136-5 Bore 202 Water 6/03/2007	51136-6 Bore 203 Water 6/03/2007	51136-7 WELL B Water 6/03/2007	51136-8 DW1 Water 6/03/2007
Benzene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Xylenes	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003

TRH in water with C6-C9 by P/T Our Reference: Your Reference Sample Type Date Sampled	UNITS --- ---	51136-4 Bore 201 Water 6/03/2007	51136-5 Bore 202 Water 6/03/2007	51136-6 Bore 203 Water 6/03/2007	51136-7 WELL B Water 6/03/2007	51136-8 DW1 Water 6/03/2007
TRH C_6 - C_9 P&T	mg/L	<0.040	<0.040	<0.040	<0.040	<0.040
TRH C_{10} - C_{14}	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C_{15} - C_{28}	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
TRH C_{29} - C_{36}	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2

PAHs in Water Our Reference: Your Reference Sample Type Date Sampled	UNITS --- ---	51136-4 Bore 201 Water 6/03/2007	51136-5 Bore 202 Water 6/03/2007	51136-6 Bore 203 Water 6/03/2007	51136-7 WELL B Water 6/03/2007	51136-8 DW1 Water 6/03/2007
Naphthalene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo[*a*]anthracene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo[*b,k*]fluoranthene	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo[*a*]pyrene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno[*123-cd*]pyrene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo[*ah*]anthracene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo[*ghi*]perylene	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total PAH's	µg/L	<8.0	<8.0	<8.0	<8.0	<8.0
Nitrobenzene-d5	%	125	125	127	118	113
2-Fluorobiphenyl	%	103	106	100	95	91
p -Terphenyl-*d14*	%	122	114	114	103	104

Dissolved heavy metals Our Reference: Your Reference Sample Type Date Sampled	UNITS --- ---	51136-4 Bore 201 Water 6/03/2007	51136-5 Bore 202 Water 6/03/2007	51136-6 Bore 203 Water 6/03/2007	51136-7 WELL B Water 6/03/2007	51136-8 DW1 Water 6/03/2007
Arsenic	µg/L	1.7	5.5	2.3	<1.0	2.2
Cadmium	µg/L	<0.10	<0.10	<1	<1	<1
Chromium	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Copper	µg/L	<1.0	<1.0	<1.0	1.3	<1.0
Lead	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Mercury	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Nickel	µg/L	<1.0	1.3	<1.0	<1.0	<1.0
Zinc	µg/L	13	4.9	8.3	12	4.3

Ammonia and Cyanide Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	51136-4 Bore 201 Water 6/03/2007	51136-5 Bore 202 Water 6/03/2007	51136-6 Bore 203 Water 6/03/2007	51136-7 WELL B Water 6/03/2007	51136-8 DW1 Water 6/03/2007
Ammonia as N	mg/L	1.3	1.0	0.47	2.3	0.46

Moisture Our Reference: Your Reference Sample Type Date Sampled	UNITS ---------- ----------	51136-1 Bore 201/1.0 Soil 5/03/2007	51136-2 Bore 202/1.0 Soil 5/03/2007	51136-3 Bore 203/1.5 Soil 5/03/2007
Moisture	%	8	7	3

Method ID	Methodology Summary
SEO-017	BTEX/TRH C6-C9 - Determination by Purge and Trap Gas Chromatography with Flame Ionisation Detection (FID) and Photo Ionisation Detection (PID). The surrogate spike used is aaa-trifluorotoluene.
SEO-018	BTEX - Determination by purge and trap/ Gas Chromatography with MS Detection.
SEO-020	TRH - Determination of Total Recoverable Hydrocarbons by gas chromatography following extraction with DCM/Acetone for solids and DCM for liquids.
SEO-030	PAHs by GC/MS - Determination of Polynuclear Aromatic Hydrocarbons (PAH's) by Gas Chromatography / Mass Spectrometry following extraction with dichloromethane or dichloromethane/acetone. The surrogate spike used is p-Terphenyl-d14.
SEM-010	Metals - Determination of various metals by ICP-AES following aqua regia digest.
SEM-005	Mercury - Determination of Mercury by Cold Vapour Generation Atomic Absorption Spectroscopy.
USEPA 6020A	DEFAULT
SEI-037	Ammonia - Determined by colourimetric method using Discrete Analyser
SEP-001	Moisture content at 103-105C, compositing and preparation on a 1:5 soil suspension.

QUALITY CONTROL BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Benzene	mg/kg	0.5	SEO-017	<0.5	[NT]	[NT]	LCS	78 || [N/T]
Toluene	mg/kg	0.5	SEO-017	<0.5	[NT]	[NT]	LCS	83 || [N/T]
Ethylbenzene	mg/kg	0.5	SEO-017	<0.5	[NT]	[NT]	LCS	84 || [N/T]
Total Xylenes	mg/kg	1.5	SEO-017	<1.5	[NT]	[NT]	LCS	86 || [N/T]
BTEX Surrogate (%)	%	0	SEO-018	98	[NT]	[NT]	LCS	85 || [N/T]
QUALITY CONTROL TRH in soil with..C6-C9 by P/T	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
TRH C_6 - C_9 P&T	mg/kg	20	SEO-017	<20	[NT]	[NT]	LCS	101 || [N/T]
TRH C_{10} - C_{14}	mg/kg	20	SEO-020	<20	[NT]	[NT]	LCS	107 || [N/T]
TRH C_{15} - C_{28}	mg/kg	50	SEO-020	<50	[NT]	[NT]	LCS	115 || [N/T]
TRH C_{29} - C_{36}	mg/kg	50	SEO-020	<50	[NT]	[NT]	LCS	107 || [N/T]
QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Naphthalene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	LCS	89 || [N/T]
Acenaphthylene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	LCS	82 || [N/T]
Acenaphthene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	LCS	109 || [N/T]
Fluorene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	[NR]	[NR]
Phenanthrene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	LCS	89 || [N/T]
Anthracene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	LCS	98 || [N/T]
Fluoranthene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	LCS	90 || [N/T]
Pyrene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	LCS	91 || [N/T]
Benzo[*a*]anthracene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo[*b,k*]fluoranthene	mg/kg	0.2	SEO-030	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo[*a*]pyrene	mg/kg	0.05	SEO-030	<0.05	[NT]	[NT]	LCS	95 || [N/T]
Indeno[*123-cd*]pyrene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo[*ah*]anthracene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo[*ghi*]perylene	mg/kg	0.1	SEO-030	<0.1	[NT]	[NT]	[NR]	[NR]
Total PAH's	mg/kg	1.55	SEO-030	<1.55	[NT]	[NT]	[NR]	[NR]
Nitrobenzene-d5	%	0	SEO-030	101	[NT]	[NT]	LCS	97 || [N/T]
2-Fluorobiphenyl	%	0	SEO-030	100	[NT]	[NT]	LCS	95 || [N/T]
p -Terphenyl-*d* 14	%	0	SEO-030	102	[NT]	[NT]	LCS	96 || [N/T]

QUALITY CONTROL Acid Extractable Metals in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Arsenic	mg/kg	3	SEM-010	<3	[NT]	[NT]	LCS	99 || [N/T]
Cadmium	mg/kg	0.1	SEM-010	<0.1	[NT]	[NT]	LCS	102 || [N/T]
Chromium	mg/kg	0.3	SEM-010	<0.3	[NT]	[NT]	LCS	98 || [N/T]
Copper	mg/kg	0.5	SEM-010	<0.5	[NT]	[NT]	LCS	103 || [N/T]
Lead	mg/kg	1	SEM-010	<1	[NT]	[NT]	LCS	100 || [N/T]
Mercury	mg/kg	0.05	SEM-005	<0.05	[NT]	[NT]	LCS	99 || [N/T]
Nickel	mg/kg	0.5	SEM-010	<0.5	[NT]	[NT]	LCS	101 || [N/T]
Zinc	mg/kg	0.3	SEM-010	<0.3	[NT]	[NT]	LCS	99 || [N/T]
QUALITY CONTROL BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Benzene	mg/L	0.001	SEO-017	<0.001	[NT]	[NT]	LCS	100 || [N/T]
Toluene	mg/L	0.001	SEO-017	<0.001	[NT]	[NT]	LCS	100 || [N/T]
Ethylbenzene	mg/L	0.001	SEO-017	<0.001	[NT]	[NT]	LCS	100 || [N/T]
Total Xylenes	mg/L	0.003	SEO-017	<0.003	[NT]	[NT]	LCS	99 || [N/T]
QUALITY CONTROL TRH in water with C6-C9 by P/T	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
TRH C_6 - C_9 P&T	mg/L	0.04	SEO-017	<0.040	[NT]	[NT]	LCS	99 || [N/T]
TRH C_{10} - C_{14}	mg/L	0.1	SEO-020	<0.1	[NT]	[NT]	LCS	78 || [N/T]
TRH C_{15} - C_{28}	mg/L	0.2	SEO-020	<0.2	[NT]	[NT]	LCS	85 || [N/T]
TRH C_{29} - C_{36}	mg/L	0.2	SEO-020	<0.2	[NT]	[NT]	LCS	86 || [N/T]
QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Naphthalene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	LCS	88 || [N/T]
Acenaphthylene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	LCS	82 || [N/T]
Acenaphthene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	LCS	105 || [N/T]
Fluorene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	[NR]	[NR]
Phenanthrene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	LCS	90 || [N/T]
Anthracene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	LCS	96 || [N/T]
Fluoranthene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	LCS	94 || [N/T]
Pyrene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	LCS	94 || [N/T]
Benzo[*a*]anthracene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	[NR]	[NR]
Chrysene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	[NR]	[NR]
Benzo[*b,k*]fluoranthene	µg/L	1.0	SEO-030	<1.0	[NT]	[NT]	[NR]	[NR]
Benzo[*a*]pyrene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	LCS	108 || [N/T]
Indeno[*123-cd*]pyrene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	[NR]	[NR]

PROJECT: 39654, Kooragang **REPORT NO: 51136**

QUALITY CONTROL PAHs in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Dibenzo[*ah*]anthracene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	[NR]	[NR]
Benzo[*ghi*]perylene	µg/L	0.5	SEO-030	<0.5	[NT]	[NT]	[NR]	[NR]
Total PAH's	µg/L	8.0		<8.0	[NT]	[NT]	[NR]	[NR]
Nitrobenzene-d5	%	0	SEO-030	98	[NT]	[NT]	LCS	102 || [N/T]
2-Fluorobiphenyl	%	0	SEO-030	94	[NT]	[NT]	LCS	96 || [N/T]
p -Terphenyl-*d* 14	%	0	SEO-030	96	[NT]	[NT]	LCS	101 || [N/T]
QUALITY CONTROL Dissolved heavy metals	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Arsenic	µg/L	1	USEPA 6020A	<1.0	51136-5	5.5 || 5.5 || RPD: 0	LCS	97 || [N/T]
Cadmium	µg/L	0.1	USEPA 6020A	<0.10	51136-5	<0.10 || <0.10	LCS	101 || [N/T]
Chromium	µg/L	1	USEPA 6020A	<1.0	51136-5	<1.0 || <1.0	LCS	101 || [N/T]
Copper	µg/L	1	USEPA 6020A	<1.0	51136-5	<1.0 || <1.0	LCS	1074 || [N/T]
Lead	µg/L	1	USEPA 6020A	<1.0	51136-5	<1.0 || <1.0	LCS	105 || [N/T]
Mercury	mg/L	0.0005	SEM-005	<0.0005	51136-5	<0.0005 || [N/T]	LCS	102 || [N/T]
Nickel	µg/L	1	USEPA 6020A	<1.0	51136-5	1.3 || 1.5 || RPD: 14	LCS	100 || [N/T]
Zinc	µg/L	1	USEPA 6020A	<1.0	51136-5	4.9 || 5.4 || RPD: 10	LCS	101 || [N/T]

PROJECT: 39654, Kooragang **REPORT NO: 51136**

QUALITY CONTROL Ammonia and Cyanide	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N	mg/L	0.03	SEI-037	<0.03	51136-4	1.3 || 1.4 || RPD: 7	51136-5	90 || [N/T]

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Moisture	%	1	SEP-001	<1

QUALITY CONTROL Ammonia and Cyanide	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Ammonia as N	mg/L	[NT]	[NT]	LCS	96 || [N/T]

Result Codes

[INS]	:	Insufficient Sample for this test	[HBG]	:	Results not Reported due to High Background Interference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Result Comments

Date Organics extraction commenced: 13/03/07
NATA Corporate Accreditation No. 2562, Site No 4354
Note: Test results are not corrected for recovery (excluding Dioxins/Furans* and PAH in XAD and PUF).
This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

Quality Control Protocol

Reagent Blank: Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.
Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 10 samples.
Matrix Spike Duplicates: Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.
Surrogate Spike: Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.
Control Standards: Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.
Additional QC Samples: A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

APPENDIX C

Quality Control/Quality Assurance
Chain of Custody Sheets (Field and Dispatch)

QUALITY ASSURANCE/QUALITY CONTROL

BASELINE CONTAMINATION ASSESSMENT
FORMER NAPHTHA STORAGE AREA
GREENLEAF ROAD, KOORAGANG ISLAND

Quality Assurance (QA) was maintained by:

- compliance with a Project Quality Plan written for the objectives of the study;
- using qualified engineers to undertake the field supervision and sampling;
- following the Douglas Partners Pty Ltd (DP) operating procedures for sampling, field testing and decontamination as presented in Table 1;
- using NATA registered laboratories for sample testing that generally utilise standard laboratory methods of the US EPA, the APHA and NSW EPA.

Table 1 – Field Procedures

Abbreviation	Procedure Name
FPM LOG	Logging
FPM DECONT	Decontamination of Personnel and Equipment
FPM ENVID	Sample Identification, Handling, Transport and Storage of Contaminated Samples
FPM PIDETC	Operation of Field Analysers
FPM ENVSAMP	Sampling of Contaminated Soils

(from DP Field Procedures Manual)

Quality Control (QC) of the laboratory programme was achieved by the following means:

- check replicate – a specific sample was split in the field, placed in separate containers and labelled with different sample numbers, and sent to the laboratory for analysis;
- method blanks – the laboratory ran reagent blanks to confirm the equipment and standards used were uncontaminated;
- laboratory duplicates – the laboratory split samples internally and conducted tests on separate extracts;
- laboratory spikes – samples were spiked by the laboratory with a known concentration of contaminants and subsequently tested for percent recovery.

DISCUSSION

A. Check Replicate

The Relative Percent Difference (RPD) between replicate results is used as a measure of laboratory reproducibility and is given by the following:

$$RPD = \frac{ABS(\text{Replicate result 1} - \text{Replicate result 2})}{(\text{Replicate result 1} + \text{Replicate result 2})/2} \times 100$$

The RPD can have a value between 0% and 200%. An RPD data quality objective of up to 50% is generally considered to be acceptable for organic analysis, and 35% for inorganics (ie. Metals).

A summary of the results of the soil replicate QA/QC testing is provided in Table 2.

Table 2 – Results of Quality Control Analysis

Analyte		Pit 106/0.01	D3	RPD (%)	Bore 203	DW1	RPD (%)
Metals	As	12	35	98	2.3	2.2	4
	Cd	11	12	9	<PQL	<PQL	N/A
	Cr	290	250	15	<PQL	<PQL	N/A
	Cu	2800	3000	7	<PQL	<PQL	N/A
	Pb	3300	3700	11	<PQL	<PQL	N/A
	Hg	0.1	<PQL	N/A	<PQL	<PQL	N/A
	Ni	64	68	6	<PQL	<PQL	N/A
	Zn	<PQL	<PQL	N/A	8.3	4.3	63
TRH	C_6 - C_9	<PQL	<PQL	N/A	<PQL	<PQL	N/A
	C_{10} - C_{14}	<PQL	<PQL	N/A	<PQL	<PQL	N/A
	C_{15} - C_{28}	<PQL	57	N/A	<PQL	<PQL	N/A
	C_{29} - C_{36}	<PQL	160	N/A	<PQL	<PQL	N/A
BTEX	Benzene	<PQL	<PQL	N/A	<PQL	<PQL	N/A
	Toluene	<PQL	<PQL	N/A	<PQL	<PQL	N/A
	Ethyl Benzene	<PQL	<PQL	N/A	<PQL	<PQL	N/A
	Xylene	<PQL	<PQL	N/A	<PQL	<PQL	N/A
PAH	Total PAHs	2.01	1.25	47	<PQL	<PQL	N/A
	Benzo(a)pyrene	0.21	0.15	33	<PQL	<PQL	N/A
OCPs	Total OCPs	<PQL	<PQL	N/A	NT	NT	N/A
	Aldrin + Dieldrin	<PQL	<PQL	N/A	NT	NT	N/A
	Chlordane	<PQL	<PQL	N/A	NT	NT	N/A
	DDT	<PQL	<PQL	N/A	NT	NT	N/A
	Heptachlor	<PQL	<PQL	N/A	NT	NT	N/A
OPPs		<PQL	<PQL	N/A	NT	NT	N/A
PCBs		<PQL	<PQL	N/A	NT	NT	N/A
Phenols		0.6	2	108	NT	NT	N/A
Ammonia		NT	NT	N/A	470	460	2

Notes to Table 2:

Soil results expressed in mg/kg on dry weight basis
Groundwater results expressed in µg/L
PQL – Practical Quantification Limit
N/A – Not Applicable

RPDs for soils ranged from 6% to 109%, and for groundwater ranged from 2% to 63%, with the majority of results within the acceptable limits. Slightly elevated RPDs were found for some heavy metals, PAHs and phenols. Elevated RPDs may be attributed to heterogeneity of the fill materials analysed, together with relatively low contaminant concentrations in soil and groundwater for some analytes (ie. small differences in concentrations) resulting in high RPDs.

B. Method Blanks

All method blanks returned results lower than the laboratory detection limit, therefore are acceptable.

C. Laboratory Duplicates

The average RPD for individual contaminants ranged from 0% to 28%, which is considered to be within acceptable limits.

D. Laboratory Spikes

Recoveries in the order of 70% to 130% are generally considered to be acceptable. The average percent recovery for individual organic contaminants ranged from 64% to 121% which is generally within the quality control objectives. The lower bound was recorded for benzene. The results should however be qualified and may slightly under-estimate or over-estimate contaminant concentrations in certain samples (ie. biased low or high respectively).

CONCLUSIONS

In summary, it is noted that the magnitude of RPDs for field replicates (ie. blind replicates) are generally higher than those for laboratory replicates. Field replicate results generally show greater variability than laboratory replicates, because they measure both field and laboratory reproducibility.

The accuracy and precision of the soil testing procedures, as inferred by the QA/QC data is generally considered to be of sufficient standard to allow the data reported to be used to interpret site contamination conditions.

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CHAIN OF CUSTODY FIELD SHEET

Client: MALINDRA PARK PTY LTD
Project: BASELINE CONTAMINATION ASSESSMENT Project No: 39654
Location: 20 GREENLEAF ROAD, KOORAGANG

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling By	Sampling Date	Sampling Time	Received by: PH Date: 9/11/07 Storage Location*	☑ SAS Date: 19.11.07	
PIT 101	0.05		S	G/P	PH	9/11/07	am	fridge	✓	
	0.5									
	1.0									
	1.5									
	2.0									
PIT 102	0.05								✓	
	0.5	D1								
	1.0									
	1.5									
	2.0									
PIT 103	0.05								✓	
	0.2									
	0.5									
	1.0									
	1.5									
	2.0								✓	
PIT 104	0.05	D2							✓	
	0.5									
	1.0									
	1.5		↓	↓	↓	↓	↓	↓		

Default containers for soil: glass = clear 125/250 mL with teflon liner, plastic =press seal bag
*Default storage: Glass containers in fridge, plastic containers shelved, all water samples in fridge

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CHAIN OF CUSTODY FIELD SHEET

Client: MALINDRA PARK PTY LTD
Project: BASELINE CONTAMINATION ASSESSMENT Project No: 39654
Location: 20 GREENLEAF ROAD, KOORAGANG

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling By	Sampling Date	Sampling Time	Received by: PH Date: 9/1/07 Storage Location*	☑ SGS Date: 10/1/07	
PIT 104	2.0		S	G/P	PH	9/1/07	am		✓	
PIT 105	0.05								✓	
	0.5									
	1.1									
	1.5								✓	
	2.0									
PIT 106	0.01	D3							✓ +D3	
	0.05									
	0.5									
	1.0									
PIT 107	0.05								✓	
	0.5									
	1.0									
	1.5									
	2.0									
	2.5									
PIT 108	0.15								✓	
	0.5									
	1.0									
	1.5									

Default containers for soil: glass = clear 125/250 mL with teflon liner, plastic =press seal bag
*Default storage: Glass containers in fridge, plastic containers shelved, all water samples in fridge

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CHAIN OF CUSTODY FIELD SHEET

Client: MANILORA PARK PTY LTD

Project: BASELINE CONTAMINATION ASSESSMENT Project No: 39654

Location: 20 GREENLEAF ROAD, KOORAGANG

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling By	Sampling Date	Sampling Time	Received by: AH Date: 9/1/07 Storage Location*	☑ SAS Date: 10/1/07	
PIT 108	2.0		S	G/P	AH	9/1/07	am	fridge		
PIT 109	0.01						pm		✓	
	0.1									
	0.5	04								
	1.0									
	1.5									
	2.0									
PIT 110	0.05								✓	
	0.5									
	1.0									
	1.5									
	2.0									
PIT 111	0.05								✓	
	0.5									
	1.0	05								
	1.8		↓	↓	↓	↓	↓	↓		

Default containers for soil: glass = clear 125/250 mL with teflon liner, plastic =press seal bag
*Default storage: Glass containers in fridge, plastic containers shelved, all water samples in fridge

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CHAIN OF CUSTODY FIELD SHEET

Client: Maildra Park Pty Ltd
Project: Prelim. G/W Assessment Project No: 39654
Location: Kooragang Island

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling By	Sampling Date	Sampling Time	Received by: LMC Date: 5/3/07 Storage Location*	☑ SGS Date: 6/3/07	
Bore 201	0.05		S	G	LMC	5/3/07	AM	Fridge		
	1								✓	
	1.5									
	2									
	2.5									
	3									
	3.5									
	4									
Bore 202	0.1									
	1								✓	
	1.5									
	2									
	2.5									
	3	[redacted]								
	3.5	R1								
	4									
Bore 203	0.05									
	1									
	1.5								✓	
	2									

Default containers for soil: glass = clear 125/250 mL with teflon liner, plastic =press seal bag
*Default storage: Glass containers in fridge, plastic containers shelved, all water samples in fridge

3.5
4 x Dodge
.1 C

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CHAIN OF CUSTODY FIELD SHEET

Client: Manildra Park Pty Ltd

Project: Preliminary G/W Assessment Project No:39654

Location: Kooragang Island

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling By	Sampling Date	Sampling Time	Received by: LMC Date: 5/3/07 Storage Location*	☐ Date:	
Bore 203	2.5		S	G	LMC	5/3/07	AM	Fridge		
	3		↓	↓	↓	↓	↓	↓		
	3.5									
	4									
	4.5		↓	↓	↓	↓	↓	↓		

Default containers for soil: glass = clear 125/250 mL with teflon liner, plastic =press seal bag
*Default storage: Glass containers in fridge, plastic containers shelved, all water samples in fridge

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CHAIN OF CUSTODY FIELD SHEET

Client: Manildra Park Pty Ltd
Project: Preliminary G/W Assessment ..... Project No:39654
Location: Kooragang Island

Field								DP Office	Despatch	Notes
Sample ID	Depth (m)	Duplicate/ Replicate Sample	Sample Type S-soil W-water	Container Type G-glass P-plastic	Sampling			Received by: LMC Date: 6/3/07	☑ SGS	
					By	Date	Time	Storage Location*	Date: 6/3/07	
Well B	—	—	W	G/P	LMC	6/3/07	PM	esky	✓	
Bore 201	—	—	↓	↓	↓	↓	↓	↓	✓	
Bore 202	—	—	↓	↓	↓	↓	↓	↓	✓	
Bore 203	—	DW1	↓	↓	↓	↓	↓	↓	✓ + DW1	

Default containers for soil: glass = clear 125/250 mL with teflon liner, plastic =press seal bag
*Default storage: Glass containers in fridge, plastic containers shelved, all water samples in fridge

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CHAIN OF CUSTODY DESPATCH SHEET

Project Name: Kooragang Island
Project No: 39654 DP Order No:
DP Contact Person: Patrick Heads
Prior Storage: esky / fridge / shelved (circle)

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Matt Hill

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: TRH	BTEX	#Metals	PCB's	PAH's	OCP's	OPP's	Phenols				TCLP	Notes
101/0.05	9/1/07	S	1	✓	✓	✓	✓	✓	✓	✓	✓					
102/0.05			2	✓	✓	✓	✓	✓	✓	✓	✓					
103/0.05			3	✓	✓	✓		✓								
104/0.05			4	✓	✓	✓	✓	✓	✓	✓	✓					
105/0.05			5	✓	✓	✓	✓	✓	✓	✓	✓					
106/0.01			6	✓	✓	✓	✓	✓	✓	✓	✓					
107/0.05			7	✓	✓	✓	✓	✓	✓	✓	✓					
108/0.15			8	✓	✓	✓		✓								
109/0.01			9	✓	✓	✓		✓								
110/0.05			10	✓	✓	✓	✓	✓	✓	✓	✓					
111/0.05			11	✓	✓	✓		✓								
112/0.5			12	✓	✓	✓		✓								
PQL (S)		mg/kg														
PQL (W)		mg/L														

SGS
Received 9/1/07
By
Time 3:15 am/pm
Samples Intact yes/no
Ice/Cooler Pack yes/no
Comments: SE0029

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 10/1/07
Total number of samples in container: 25
Results required by:
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature:
Date: 9/1/07 Lab Ref: SE0029

Send results to:
Douglas Partners Pty Ltd
Address:
BOX 324 Hunter Region Mail Centre
NSW 2310
Fax: (02) 4960 9601

* NOT INCLUDED IN FINAL REPORT

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CHAIN OF CUSTODY DESPATCH SHEET

Project Name: Koorangang Island
Project No: 39654 DP Order No:
DP Contact Person: Patrick Heads
Prior Storage: esky / fridge / shelved (circle)

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Matt Hill

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: TRH	BTEX	Metals	PCB's	PAH's	OCP's	OPP's	Phenols	Asbestos			TCLP	Notes
* 113/0.05	9/1/07	S	13	✓	✓	✓	✓	✓	✓	✓	✓					
* 114/0.1			14	✓	✓	✓		✓								
* 115/0.05			15	✓	✓	✓		✓								
104/2.0			16	✓	✓	✓		✓								
105/1.5			17	✓	✓	✓		✓								
* 112/1.5			18	✓	✓	✓	✓	✓	✓	✓	✓					
D3			19	✓	✓	✓	✓	✓	✓	✓	✓					
* D6			20	✓	✓	✓	✓	✓	✓	✓	✓					
19/0.05			21									✓				
104/0.05			22									✓				
105/0.05			23									✓				
110/0.05			24									✓				
		mg/kg														
		mg/L														

* practical quantitation limit *As per Laboratory Method (Detection Limit)
Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 10/1/07
Total number of samples in container: 25
Results required by:
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature:
Date: Lab Ref:

Send results to:
Douglas Partners Pty Ltd
Address:
BOX 324 Hunter Region Mail Centre
NSW 2310
Fax: (02) 4960 9601

* NOT INCLUDED IN FINAL REPORT

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: Kooragang Island
Project No: 39654 DP Order No:
DP Contact Person: Patrick Heads
Prior Storage: (esky) / (fridge) / shelved (circle)

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Matt Hill

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	TRH	BTEX	*Metals	PCB's	PAH's	OCP's	OPP's	Phenols	Asbestos			TCLP	Notes
* 114/0.1	9/1/07	S	25									✓				
PQL (S)		mg/kg														
PQL (W)		mg/L														

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
* Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished:
Total number of samples in container: 25
Results required by:
TAT (Circle) (Standard) 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature:
Date: Lab Ref:

Send results to:
Douglas Partners Pty Ltd
Address.
BOX 324 Hunter Region Mail Centre
NSW 2310
Fax: (02) 4960 9601

* NOT INCLUDED IN FINAL REPORT

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: KOORALANG
Project No: 29654 (SGS 50029) DP Order No: 64623 (as previous)
DP Contact Person: PATRICK HEADS
Prior Storage: esky / fridge / shelved (circle) SGS LAB

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Angela

Sample ID	Date Sampled	Sample Type C-soil W-water	Lab ID	Analytes: TCLP Lead	Analytes: ASTM water leach lead	Analytes	TCLP	Notes
PIT106 0.01	9/1/07	S		✓	✓			
						SGS REF: 50029A		
						Dx Date: 16/3/07		
						TAT: Standard		
PQL (S)		mg/kg						
PQL (W)		mg/L						

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 10/1/07 (SGS Lab)
Total number of samples in container: all Lab
Results required by: 16/3/07
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature: Angela
Date: 9/3/07 Lab Ref: 50029A

Send results to: PATRICK HEADS
Douglas Partners Pty Ltd
Address:
BOX 324 Hunter Region Mail Centre
NSW 2310
Fax: (02) 4960 9601

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project Name: ...LOCKLEYS...
Project No: ...39654... DP Order No:
DP Contact Person: ...PATRICK HEALY...
Prior Storage: esky / fridge / shelved (circle)

To: SGS Australia PTY LTD
Unit 16/33 Maddox Street
ALEXANDRIA NSW 2015
Ph: (02) 8594 0400
Attn: Angela

Sample ID	Date Sampled	Sample Type S-soil W-water	Lab ID	Analytes: TRH	BTEX	PAH	Metals #	Ammonia	TCLP	Notes
BORE201 1.0	5/3/07	S	1	✓	✓	✓	✓			
BORE202 1.0			2	✓	✓	✓	✓			
BORE203 1.5			3	✓	✓	✓	✓			
BORE201	6/3/07	W	4	✓	✓	✓	✓	✓		
BORE202			5	✓	✓	✓	✓	✓		
BORE203			6	✓	✓	✓	✓	✓		
WELL B			7	✓	✓	✓	✓	✓		
DW1			8	✓	✓	✓	✓	✓		
PQL (S)		mg/kg								
PQL (W)		mg/L								

SGS
Received 7/3/07
By
Time
Samples intact (yes/no)
Ice/Cooler Pack (yes/no)
Comments: 5113L

PQL = practical quantitation limit *As per Laboratory Method (Detection Limit)
# - Metals to Analyse (Please circle): As Cd Cr Cu Pb Zn Hg Ni Other
Date relinquished: 6/3/07
Total number of samples in container: 8
Results required by: 14/3/07
TAT (Circle): Standard 72 hr 48hr 24hr

SAMPLES RECEIVED
Please sign and date to acknowledge receipt of samples and return by fax
Signature:
Date: 7/3/07 Lab Ref.: 5113

Send results to:
Douglas Partners Pty Ltd
Address:
BOX 324 Hunter Region Mail Centre
NSW 2310
Fax (02) 4960 9601

SGS Environmental Services
Unit 16, 33 Maddox St. Alexandria NSW 2015
Telephone Number : (+61 2) 8594 0400
Fax Number : (+61 2) 8594 0499

SAMPLE RECEIPT CONFIRMATION

COMPANY	:	Douglas Partners Pty Ltd	FAX NO.	:	02 4960 9601
ATTENTION	:	Patrick Heads	PAGES	:	1
FROM	:	Sample Receipt	DATE	:	11/01/07

This is to confirm that samples for Project **39654, Kooragang Island** were received on **11/01/07** the results are expected to be ready on **18/01/07** . Please quote SGS Reference: **50029** when making enquiries regarding this project. Please refer to below which details information about the integrity of the samples and other useful information.

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples, unless otherwise instructed.

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

Comments:

Terms and conditions are available from www.au.sgs.com

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

SGS Environmental Services
Unit 16, 33 Maddox St. Alexandria NSW 2015
Telephone Number : (+61 2) 8594 0400
Fax Number : (+61 2) 8594 0499

SAMPLE RECEIPT CONFIRMATION

COMPANY	:	Douglas Partners Pty Ltd	FAX NO.	:	02 4960 9601
ATTENTION	:	Patrick Heads	PAGES	:	1
FROM	:	Sample Receipt	DATE	:	8/03/07

This is to confirm that samples for Project **39654, Kooragang** were received on **07/03/07** the results are expected to be ready on **14/03/07** . Please quote SGS Reference: **51136** when making enquiries regarding this project. Please refer to below which details information about the integrity of the samples and other useful information.

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples, unless otherwise instructed.

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

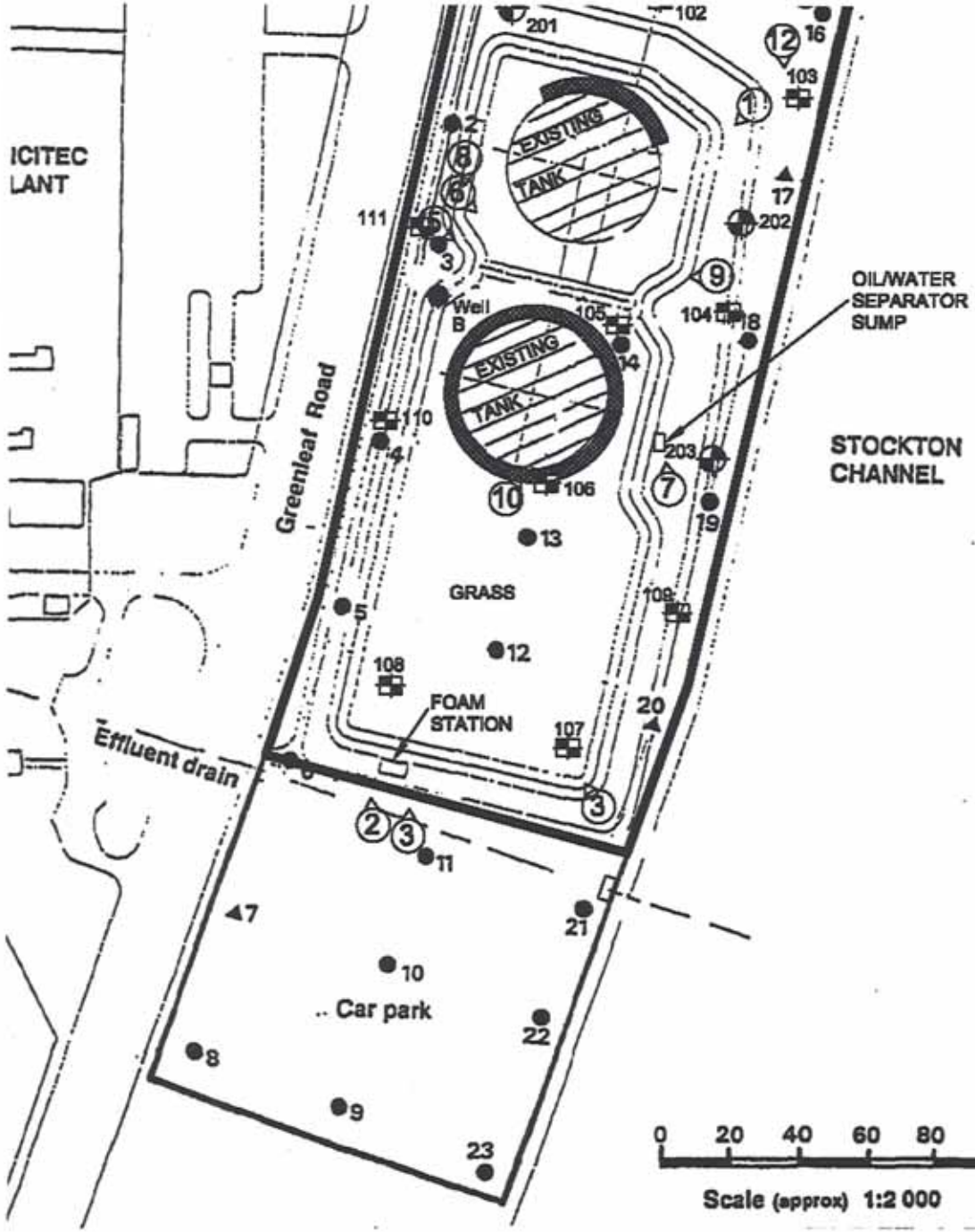
Comments:

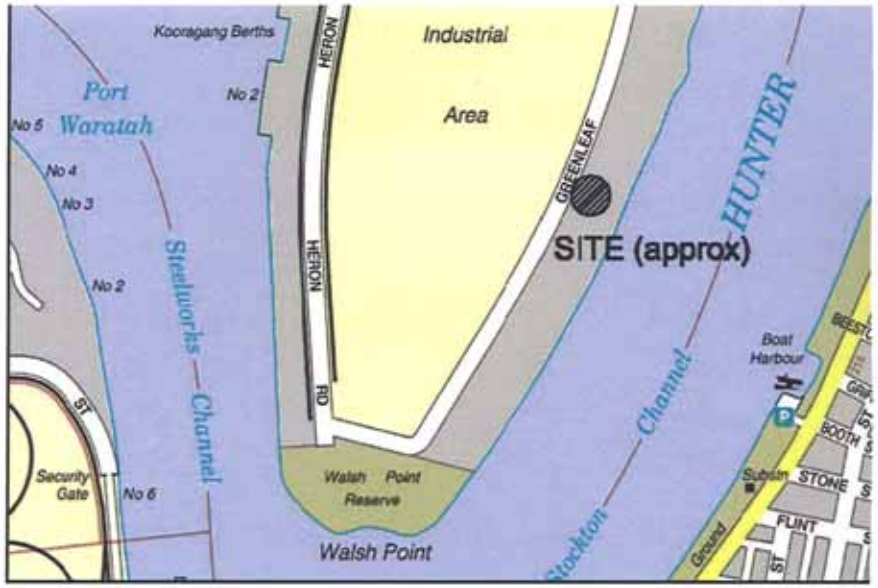
Terms and conditions are available from www.au.sgs.com

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

APPENDIX D

Drawing 1 – Test Location Plan





LOCALITY PLAN

LEGEND

- SITE AREA
- TEST BORE LOCATION (FORMER INVESTIGATION AGC WOODWARD CLYDE)
- GROUNDWATER MONITORING WELL LOCATION (FORMER INVESTIGATION AGC WOODWAI
- APPROXIMATE TEST PIT LOCATION
- APPROXIMATE TEST BORE AND GROUNDWATER MONITORING WELL LOCATION
- EXISTING GROUNDWATER MONITORING WELL LOCATION
- APPROXIMATE OBSERVED EXTENT OF BLACK SURFACE SAND (SAND BLASTING SAND)