



geotechnical • geo-environmental • groundwater

**BUTLER
PARTNERS**

Project No. 010-195B

13 October 2010

Mirvac Constructions (QLD) Pty Ltd
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**PLANS AND DOCUMENTS
referred to in the ULDA
APPROVAL dated 6 / 5 /11**

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Attention: Grant Richardson

Dear Grant

**RE: CONTAMINATED SOIL INVESTIGATION, REMEDIATION AND VALIDATION
HIGH RISE DEVELOPMENT
19 HERCULES STREET, HAMILTON**

1.0 INTRODUCTION

It is understood that it is proposed to construct a multi level, mixed use building, suspended over basement car parking at the 19 Hercules Street site. It is also understood that the footprint of the proposed basement will encompass the entire site area and that all existing site fill material will require excavation and removal.

Butler Partners have been commissioned to undertake an additional investigation at the site in order to further delineate identified contamination and characterise soils for off-site disposal. The site is listed on the Department of Environment and Resource Managements (DERM's) Environmental Management Register (EMR) for the notifiable activity of 'hazardous contaminant'.

2.0 BACKGROUND

Previous investigation at the site by Butler Partners identified concentrations of heavy metals (zinc) and polycyclic aromatic hydrocarbons (PAHs) in site fill material above DERM's sensitive land use criterion and are reported in the following Butler Partners report:

*Stage 1 and 2 Environmental Site Assessment
Proposed Extension of Portside Wharf
19 Hercules Street, Hamilton
October 2006
Prepared for: Multiplex Developments Australia Pty Ltd*

Two phases of intrusive investigation were completed on 27 May 2006 and 5 September 2006. The general stratigraphy encountered across the site consisted of a surface layer of fill material (up to 1.0m in depth) overlying a layer of sand fill material (between approximately 1.0m and 3.0m) which is underlain by natural alluvial sands and clays. The thickness of fill material varied across the site, but was found to be deepest in the southwest portion of the site. Fill material consisted of a range of materials including sandy gravels, clay sands, silty clays, sands, concrete and ash

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3.0 ACID SULFATE SOILS

Based on the results of the previous Acid Sulfate Soils (ASS) investigations undertaken by Butler Partners soils containing natural clay materials require treatment and management for ASS. Test locations carried out across the site encountered interbedded layers of silt and clay in the sandy strata as well as clay strata in some areas. Management for ASS will be required where excavations are undertaken in materials containing silt and clay materials. It is understood that ASS material encountered during bulk excavations will be transported to an off-site treatment facility prior to disposal or re-use. Removal of ASS material will be managed under an Acid Sulfate Soils Management Plan (ASSMP).

4.0 ADDITIONAL ENVIRONMENTAL INVESTIGATION

It is proposed to undertake additional investigation at the site in order to further delineate identified contamination and characterise soils for off-site disposal. Further investigations will be undertaken following demolition of existing site infrastructure to enable access to previously inaccessible areas.

A 15m x 15m grid will be established across the footprint of the site, with one sampling location placed in the centre of each grid square. It is proposed that an additional twenty-five test locations will be required to be investigated as follows:

- Sampling and laboratory analysis of surface fill material (approximately 0m to 1.0m below existing surface levels) at approximate 0.5m depth intervals or at major stratigraphic change will be undertaken, to provide testing at a minimum rate of one sample per 50m³, in accordance with DERM Guidelines for off-site disposal of contaminated soil;
- Sampling and laboratory analysis of sand fill material (approximately 1.0m to 3.0m below existing surface levels) at approximately 1.0m depth intervals on a 30m x 30m grid, to provide testing at a minimum rate of one sample per 1,000m³;
- Natural alluvial material will be sampled and analysed (below approximately 3.0m from existing surface levels) on a 30m x 30m grid to confirm that the natural material is 'clean'; and
- Total Characteristic Leaching Potential (TCLP) testing on selected samples to allow characterisation for landfill disposal of soils to be excavated for the basement.

Three groundwater monitoring wells will also be installed during investigation works and will be sampled to assess the contamination status of groundwater underlying the site.

Upon completion of additional investigation works (early 2011), a Remediation Plan will be prepared (if required) to provide a framework for remediation activities to be undertaken on the site.

5.0 GENERAL REMEDIATION AND VALIDATION STRATEGY

In general, the remediation strategy for the site, based on existing contamination identified on the site, is the excavation and off-site disposal of identified contaminated soils from site area. Soil will be loaded onto trucks and disposed to a licensed landfill facility (yet to be determined). All loads of soil will be documented and will be accompanied by documentation describing the nature of the contaminants contained in the load and its destination. No stockpiling of contaminated soils for periods of longer than twenty-four hours will occur. Any temporary stockpiles of odourous materials will be covered as long as it remains on site. All trucks will be covered prior to leaving the site.

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Off-site disposal of contaminated soil will be carried out in accordance with the conditions of Soil Disposal Permit, granted under s424 the *Environmental Protection Act 1994*. Disposal locations for contaminated soil will be assessed based on total concentrations of contaminants and the results of TCLP concentrations compared with the receiving landfill's environmental licence.

All off-site movement of material will be supervised and will be tracked from 'cradle to grave' by Butler Partners as follows:

- a manifest will be maintained for every truckload of contaminated soil removed from site;
- the landfill will provide a weighbridge print-out for the received contaminated soil; and
- weighbridge print outs will be compared with the manifest of contaminated soil removed from site.

Samples collected in natural soils during the further assessment will be used as 'pre-validation' samples, with additional excavation base validation sample collected and analysed on a 1 per 100m² basis and excavation walls sampled and analysed on a 1 per 10 lineal metre basis, at vertical intervals no greater than 0.5m. The collected samples will be analysed for the contaminants for which the overlying material was remediated.

6.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

QA/QC procedures will be based on the current industry accepted standards comprising the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM) National Environment Protection Council and Australian Standard AS4482-1 *Guide to the Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and semi-volatile compounds*.

7.0 SUITABLY QUALIFIED PERSONS TO CONDUCT/SUPERVISE WORKS

A person qualified in accordance with s381 and s395 of the *Environmental Protection Act 1994* will conduct/supervise all investigations, remediation works and compile report/s required to remediate the site.

Yours faithfully

BUTLER PARTNERS PTY LTD

LUKE AMIES

Associate



**STAGE 1 & 2 ENVIRONMENTAL SITE
ASSESSMENT
PROPOSED EXTENSION OF PORTSIDE WHARF
19 HERCULES STREET
HAMILTON**

Prepared for
Multiplex Developments Australia Pty Ltd

Project No. 03900F
October 2006

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ATTACHMENTS:

Drawing No. 1	Locality Plan & Test Locations
Appendix A	Current and Historical Land Titles, and Queensland EPA Registers Search Results
Appendix B	Bore Report Sheets with Explanatory Notes
Appendix C	Laboratory Report Sheets

SECTION 1 - INTRODUCTION

1.1 Project

It is understood it is proposed to extend the Portside Wharf development to include 19 Hercules Street, Hamilton, which is covered by property description Lot 596 on SL6381. It is also understood the proposed use of the land is mixed use (i.e. residential/commercial) and as such, an Environmental Site Assessment (ESA) is required to assess the site's suitability for the proposed land use in relation to contaminated land matters.

1.2 Scope of Work Undertaken

In order to assess the site's suitability for the proposed land use the following scope of work was undertaken:

- review of EPA Registers;
- review of historical information relating to the site including land titles and aerial photographs and Brisbane City Council Flammable and Combustible Goods information;
- site inspection by an experienced geo-environmental engineer/scientist;
- identification of surrounding land uses;
- interviews with personnel familiar with the history of the site;
- a limited program of soil sampling and laboratory analysis; and
- preparation of a report suitable for submission to the EPA.

Two phases of intrusive investigation were completed on 27 May 2006 and 5 September 2006 based on the size of the site and the area accessible to drilling. The May event proposed to collect samples from eight (8) test locations while the September event proposed to assess soils at 13 locations and submit the collected samples for a selection of the following laboratory analyses:

- heavy metals;
- total petroleum hydrocarbons (TPH);
- monocyclic aromatic hydrocarbons as benzene, toluene, ethyl benzene and xylenes (BTEX);
- polycyclic aromatic hydrocarbons (PAH);
- Organophosphates/Organochlorines (OC/OP) pesticides; and
- polychlorinated biphenyls (PCBs).

1.3 Commission

Based on the proposed nature of the development, the anticipated subsurface conditions and the scope of works, fees to undertake the investigation were presented in proposals of 23 January 2006 and 17 August 2006. Butler Partners Pty Ltd (Butler Partners) was subsequently commissioned by Multiplex Developments Australia Pty Ltd to undertake the scope of works as proposed.

1.4 Technical Framework

In general, this Stage 1 & 2 Environmental Site Assessment (ESA) has been carried out in accordance with:

- *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland*, May 1998;
- *Draft Investigation Thresholds for Underground Storage Tanks*, January 1999;
- The Australian and New Zealand Environment and Conservation Council/National Health and Medical Research Council *Guidelines for the Assessment and Management of Contaminated Sites (the ANZECC/NHMRC Guidelines)* January 1992;
- Australian Standard AS 4482.1-2005 *Guide to the Sampling and Investigation of Potentially Contaminated Soil – Part 1: Non-volatile and Semi-volatile compounds*; and
- *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (National Environment Protection Council).

SECTION 2 - THE SITE

2.1 Site Identification

Details of the site are given in Table 1. Copies of the Current Land Title and Registered Plan information are presented in Appendix A.

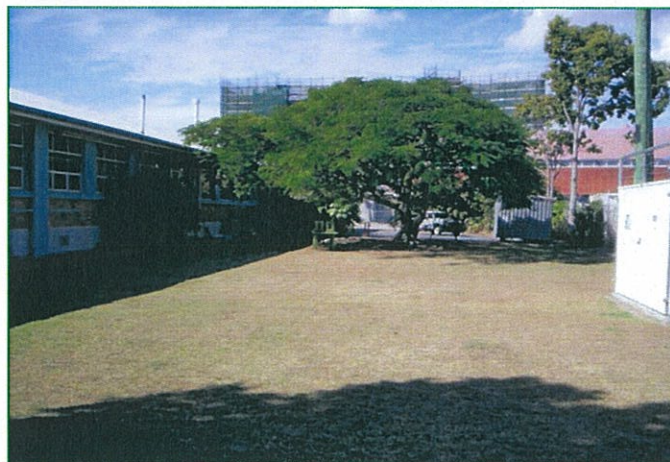
Table 1: Summary of Registered Plan and Current Title Search Information

Lot 596 on SL6381	
Site Address	19 Hercules Street, Hamilton
Registered Owner	State of Queensland (Department of Primary Industries)
Local Government	Brisbane City Council
Current Land Use	Commercial

2.2 Site Description

The site is roughly rectangular in shape covering an area of 8845m² with the northern site boundary fronting Hercules Street. The site is bounded to the east and south by the Portside Wharf development and to the west by a seafood outlet and buildings used as the site offices for the Portside Wharf development. A site layout and locality plan is located on the attached Drawing No. 1 and general photographs of the site are presented as Photographs 1 to 3.

At the time of investigation, the site was occupied by a number of buildings comprising a two-story concrete block office building fronting Hercules Street; a two-story brick building and a single-story demountable office block occupying the central portion of the site; and a single story brick office block and concrete block chemical store occupied the southern portion of the site. A grassed area existed in the southwest corner of the site and gardens were located adjacent to the eastern wall of the buildings that occupied the site. The balance of the site not occupied by buildings, the grassed area, or gardens, were covered by either asphalt or concrete pavements in moderate to poor condition.



Photograph 1: View looking east across the grasses area located in the southwest corner of the site



Photograph 2: View looking southeast from the centre of the site



Photograph 3: View looking south from the northeast corner of the site

2.3 Government Records

A search of the EPA's Environmental Management Register (EMR) and Contaminated Land Register (CLR) indicates that Lot 596 on SL6381 is NOT listed on the EMR or the CLR.

A copy of the search response is presented in Appendix A.

2.4 Geology

Reference to the Geological Survey of Queensland's 1:31,680 Brisbane Series Maps indicates that the site is underlain by Quaternary alluvial sands, clay, mud, silt, sand and gravel.

2.5 Hydrogeology/Hydrology

A study of the hydrogeology of the site was not conducted as part of this investigation. However, it is reasonable to assume the hydrogeology of the area is dominated by the Brisbane River, located approximately 150m south of the site.

SECTION 3 - SITE HISTORY

A site history review was conducted and comprised the following:

- review of historical aerial photographs; and
- current and historical title searches.

3.1 Aerial Photograph Review

1951 – The site is occupied by two adjacent buildings located centrally within the site and a number of small buildings within the southern portion of the site; an unsealed road traverses the eastern boundary; and the northern portion of the site is vacant land. Two large warehouses are located east of the site. A building is also located near the southeast corner of the site on the adjacent lot and the Hamilton Wharf Cold Stores are located to the south fronting the Brisbane River. An extract of the 1951 aerial photograph is provided in Photograph 4.



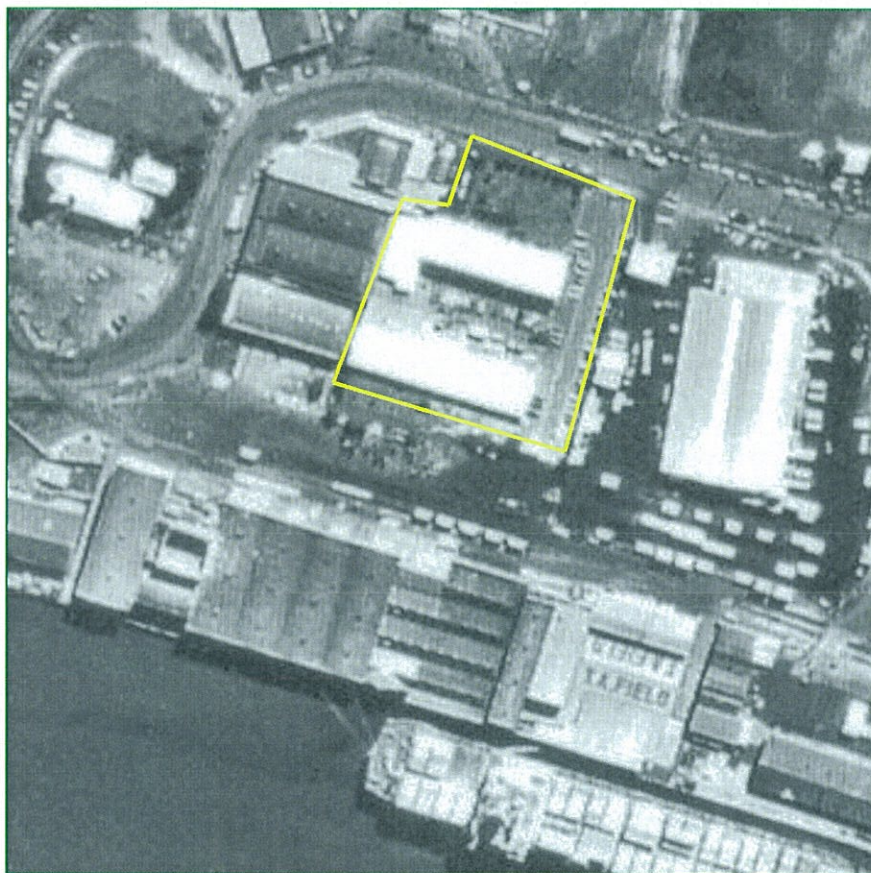
Photograph 4: Extract from 1951 Aerial Photograph

1960 – The buildings that occupied the site in 1951 have been replaced by a single rectangular building located along the southern boundary with the remainder of the site being vacant. The majority of the site is vacant. A number of buildings have been constructed on the lot west of the site and a sealed road (Hercules Street) fronts the northern site boundary. An extract of the 1960 aerial photograph is provided in Photograph 5.



Photograph 5: Extract from 1960 Aerial Photograph

1981 – A second building has been constructed within the central portion of the site with a car park located between the two buildings. The northern portion of the site is occupied by vacant land, which is grassed and lined with trees. The unsealed road located along the eastern site boundary has been sealed and the warehouses to the east of the site has been replaced by a large building and a smaller building, possibly a gatehouse, fronting Hercules Street. An extract of the 1981 aerial photograph is provided in Photograph 6.



Photograph 6: Extract from 1981 Aerial Photograph

1991 – Similar to the photograph taken in 1981, although additional small buildings have been constructed in the former car park between the two existing buildings. An extract of the 1991 aerial photograph is provided in Photograph 7.



Photograph 7: Extract from 1991 Aerial Photograph

2004 – Similar to the photograph taken in 1991, except a third building now occupies the vacant land in the northern portion of the site fronting Hercules Street. An extract of the 2004 aerial photograph is provided in Photograph 8.



Photograph 8: Extract from 2004 Aerial Photograph

3.2 Historical Title Search

The Department of Natural Resources and Mines (DNR&M) carried out a historical title search for Lot 596 on SL6381. Historical titles were traced back to 2005, when the State of Queensland represented by the Department of Primary Industries (DPI) obtained the land by Deed of Grant.

The State of Queensland (Department of Primary Industries) was the owner of Lot 596 on SL6381 at the time of the current title searches (21 March 2006). A copy of the title search is provided in Appendix A.

SECTION 4 - FIELDWORK

4.1 Drilling and Sampling Methods

Fieldwork undertaken on 27 May 2006 comprised the drilling of eight (8) bores across the site (locations 1 to 8). Bores were drilled using a power auger trailer mounted rig operating solid flight augers, and strata identification was from auger cuttings brought to the surface. Fieldwork undertaken on 5 September 2006 comprised drilling of 11 bores across the site (location to 17 to 27). A further two locations could not be completed due to reinforced concrete and rock boulders. Drilling was undertaken by a Geoprobe 6610 DT pushtube drill rig.

To minimise the potential for cross contamination of samples, each sample was collected using disposable gloves, which were replaced between the collection of each sample.

Samples were placed immediately into laboratory prepared jars that were sealed, labelled with a unique identifier and placed into a chilled ice chest. Each sample was immediately recorded on a chain of custody register, which was used to track the movement of the samples. The samples remained in the chilled ice chest and were transported to the analytical laboratory for analysis.

4.2 Test Locations and Supervision

Bore locations were set-out by direct measurement from existing site boundaries with each bore location being dependent on access and service locations. An experienced environmental scientist set out the test locations, logged the stratigraphy encountered in the bores, and undertook the in-situ sampling and testing program. Drawing No. 1 shows the test locations.

SECTION 5 - INVESTIGATION RESULTS

5.1 Results

The subsurface conditions encountered at the bore locations are given in detail on Bore Reports presented in Appendix B, using classification and descriptive terms defined in attached notes.

5.2 Subsurface Conditions

The general stratigraphy encountered across the site consisted of a layer of fill material (up to 2.4m in depth) overlying natural sands. The thickness of fill material varied across the site, but was found to be deepest in the southwest portion of the site. Fill material consisted of a range of materials including sandy gravels, clay sands, silty clays, sands, concrete and ash.

Auger refusal was encountered in Bores 1 and 2 at approximately 1m, and at 0.06m in Bores 7 and 8 on concrete. During September 2006 drilling shallow refusal was encountered on four occasions resulting in two proposed locations that movement of bores within the vicinity of the location could not obviate. Refusal occurred on large rock rubble fragments north and east of Bore 3, and between Bores 4 and 5, on steel reinforced concrete near Bore 7.

5.3 Groundwater

Free groundwater was not encountered during drilling in May 2006, however, groundwater was present in bore B25 drilled in September 2006. A moisture line was present in sand cores at 2m to 3 m depth in B24.

5.4 Laboratory Testing

In general, soil samples from each 0.5m depth interval and/or from each strata unit down the soil profile until natural soil was encountered, were submitted to Australian Laboratory Services Australia (ALS), a laboratory registered by NATA for the analyses required. Based on site history and fieldwork observations, soil samples were submitted for a combination of the following analyses:

- heavy metals – representative samples from each location and strata unit;
- polycyclic aromatic hydrocarbons (PAH) – in areas where ash or dark discolouration was observed; and
- pesticides (OC/OP) – representative samples.

A summary of the laboratory results for this Stage 1 & 2 ESA is provided in Table 2. A copy of the laboratory reports is provided in Appendix C.

Table 2 - Analytical Results for Soils (Total Concentrations)

Test Location	Sample Number	Sample Depth (m)	Material Type	PAH			Organics (mg/kg)				Inorganics (mg/kg)								
				Total	Benzo (a) pyrene	Total OPs	Aldrin & Dieldrin	Chlordane	DDT	Heptachlor	As	Cd	Total Cr	Cu	Pb	Hg	Ni	Zn	
Background Levels	EPA HIL-A (mg/kg)			0.95-5	-	-	-	-	-	-	-	0.2-30	0.04-2	0.5-110	1-190	<2-200	0.001-0.1	2-400	2-180
	EPA HIL-A (mg/kg)			20	1	-	10	50	200	10	100	20	12%	1,000	300	15	600	7000	
	Phytotoxicity Levels			-	-	-	-	-	-	-	-	-	-	200	-	-	-	400	
Landfill Criteria - Day Cover (mg/kg)	EPA HIL-F (mg/kg)			100	5	-	50	250	1,000	50	500	100	60%	5,000	1,500	75	3000	35 000	
	Landfill Criteria - Day Cover (mg/kg)			500	-	10	5	5	5	5	200	40	240,000	2,000	600	30	600	14000	
	Landfill Criteria - Maximum (mg/kg)			1,000	-	50	50	50	50	50	-	-	-	-	-	-	-	-	
Laboratory Level of Reporting (mg/kg)				20	1	1.4	0.1	0.1	0.2	0.1	5	1	2	5	5	0.1	2	5	
Bore 1	1-1	0.04-0.25	Fill	-	-	-	-	-	-	-	14	<1	33	34	9	<0.1	24	64	
	1-2	0.25-0.5	Fill	-	-	<LOR	>LOR	>LOR	>LOR	>LOR	18	<1	25	46	72	0.1	16	259	
	1-3	0.5-0.95	Fill	-	-	-	-	-	-	-	12	<1	23	17	59	<0.1	8	161	
	2-1	0.04-0.25	Fill	-	-	-	-	-	-	-	21	<1	12	14	38	<0.1	6	106	
	2-2	0.25-0.5	Fill	-	-	-	-	-	-	-	10	<1	11	9	28	<0.1	4	82	
	2-3	0.5-1.0	Fill	-	-	-	-	-	-	-	8	<1	14	10	31	0.1	5	95	
	3-1	0.25-0.25	Fill	-	-	-	-	-	-	-	15	<1	12	10	30	<0.1	<3.5	76	
	3-2	0.25-0.5	Fill	-	-	-	-	-	-	-	12	<1	22	8	27	<0.1	2	76	
	3-3	0.5-1.0	Fill	-	-	-	-	-	-	-	14	<1	14	9	27	<0.1	3	80	
	3-4	1.0-1.3	Silty Clay	-	-	-	-	-	-	-	8	<1	26	21	26	0.3	20	416	
	3-5	1.5-2.0	Sand	-	-	-	-	-	-	-	<5	<1	8	<5	5	<0.1	11	34	
	3-6	2.7-3.0	Sand	-	-	-	-	-	-	-	<5	<1	10	<5	9	<0.1	15	26	
	4-1	0.04-0.25	Fill	-	-	-	-	-	-	-	22	<1	18	23	24	<0.1	8	57	
	4-2	0.4-0.5	Fill	-	-	-	-	-	-	-	<5	<1	9	5	10	<0.1	8	34	
	4-3	0.5-1.0	Fill	-	-	-	-	-	-	-	<5	<1	12	6	10	<0.1	9	23	
	4-4	1.3-1.5	Sand	-	-	-	-	-	-	-	<5	<1	10	<5	10	<0.1	8	27	
	4-5	2.0-2.5	Sand	-	-	-	-	-	-	-	<5	<1	9	<5	11	<0.1	8	20	
	5-1	0.04-0.25	Fill	-	-	-	-	-	-	-	11	<1	9	10	6	<0.1	8	112	
	5-2	0.25-0.5	Fill	-	-	-	-	-	-	-	<5	<1	33	30	45	<0.2	20	124	
	5-3	0.5-1.0	Fill	-	-	-	-	-	-	-	<5	<1	10	5	8	<0.1	9	28	
	5-4	1.2-1.5	Sand	-	-	-	-	-	-	-	<5	<1	9	5	11	<0.1	9	47	
	5-5	2.0-2.5	Sand	-	-	-	-	-	-	-	<5	<1	10	<5	<5	<0.1	9	22	
	6-1	0-0.25	Fill	154.7	6.7	-	-	-	-	-	<5	<1	4	13	34	<0.1	2	42	
	6-2	0.25-0.5	Fill	>LOR	>LOR	<LOR	>LOR	>LOR	>LOR	>LOR	<5	<1	8	6	<5	<0.1	9	20	
	6-3	0.5-1.0	Fill	>LOR	>LOR	-	-	-	-	-	<5	<1	7	<5	<5	<0.1	11	23	
	6-4	1.0-1.5	Fill	-	-	-	-	-	-	-	<5	<1	10	5	6	<0.1	9	23	
	6-5	2.4-2.5	Sand	-	-	-	-	-	-	-	<5	<1	10	6	60	<0.1	9	29	
Dup01-Blind	0.5-1.0	Fill	-	-	-	-	-	-	-	10	<1	23	14	27	0.2	10	88		
Dup01-Split	0.5-1.0	Fill	-	-	-	-	-	-	-	16	<0.5	22	14	45	<0.2	7	160		

NOTES:

1 Analyte exceeds the HIL-A Guideline Criteria

<LOR Below the limit of reporting

100 % QLD EPA Draft Investigation Thresholds for Underground Storage Tanks - January 1999

- Not analyzed

5.5 Quality Assurance/Quality Control (QA/QC) Methods

The samples were dispatched under Chain of Custody documentation provided in Appendix C in order to identify sample movements. The laboratory's internal QA/QC measures included spike analyses, method blanks and duplicates. The laboratory's internal QA/QC results for each batch are included in the laboratory reports.

Field QC comprised blind and split duplicate sampling of two samples; one from the May drill program and one from the September drill program as provided in Table 3. The blind duplicate samples were collected to ensure the reproducibility of the laboratory analysis while the split duplicate samples were collected to check the analytical proficiency of the laboratories.

Table 3: QC Samples and Analysis

Duplicate Sample No	Primary sample No.	Analysis
Dup01	3-3	Metals
D1	B26C	Metals, PAH
D2	B26C	Metals, PAH

A summary of the QC results is provided in Table 4 and a discussion of these results is provided Section 6.1.4.

To ensure the integrity of data transfer the electronic data supplied by the laboratory has been used to develop the results summary tables.

Table 4: Summary of Quality Control Results

Sample No.	Metal Species (mg/kg)								Total PAH	B(a)P
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn		
3-3	14	<1	14	9	27	<0.1	3	80	NA	NA
DUP01 (Blind)	10	<1	23	14	27	<0.2	10	88	NA	NA
DUP01 (Split)	16	<0.5	22	14	45	<0.2	7	160	NA	NA
RPD (Blind)	33	ND	49	43	0	ND	108	10	NA	NA
RPD (Split)	13	ND	43	43	50	ND	80	67	NA	NA
B26C	2.2	<0.5	8	3.8	4.7	<0.2	7.1	17	<LOR	<1
D1 (Blind)	3.4	<0.5	14	5	6.2	<0.2	13	26	<LOR	<1
D2 (Split)	<5	<1	8	<5	<5	<0.1	9	16	<LOR	<1
RPD (Blind)	30	ND	40	19	19	ND	43	30	ND	ND
RPD (Split)	ND	ND	0	ND	ND	ND	16	4	ND	ND

Bold – RPD values exceed 50%

ND – not determined

NA – not analysed

SECTION 6 - ENVIRONMENTAL DISCUSSION

6.1 Contaminated Land

6.1.1 Potential Contamination Sources

Potentially contaminating activities identified in the site history review and observations made on site include:

- filling at the site with material from unknown sources; and
- storage of chemicals (i.e. chemical store).

Potential contaminants of concern associated with fill material:

- heavy metals;
- polycyclic aromatic hydrocarbons (PAH); and
- organochlorine/organophosphorus pesticides (OC/OP).

6.1.2 Results and Assessment Criteria

To assess the suitability of the site for its proposed use, assessment criteria are required for heavy metals, PAHs and OC/OPs.

Heavy Metals, PAHs and OC/OPs

Assessment of heavy metal, PAH and OC/OP soil contamination is based on the Queensland EPA's *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland, May 1998* ('the Guidelines').

Investigation levels for contaminants are presented in the Guidelines for a range of categories:

- *Background levels* provide levels of contaminants which would be expected to occur naturally in soils in Queensland;
- *Environmental Investigation Levels (EILs)* are levels below which contaminants in soils are not considered to adversely impact the environment;
- *Phytotoxicity Investigation Levels (PILs)* are levels below which contaminants in soil are not considered toxic to plant life; and
- *Health-based Investigation Levels (HILs)* are levels below which contaminants in soils are not considered to adversely impact human health. HILs are divided into six exposure settings depending upon proposed land-use type. Exposure settings range from standard residential settings with garden accessible soil (HIL-A), to commercial/industrial type exposure that includes offices/shops, factories and industrial sites (HIL-F).

It is considered that HIL Exposure Setting 'A' (HIL-A) criteria for contaminants of concern excluding copper and zinc, and PILs for copper and zinc, are appropriate for assessing 'clean' fill in on-site soils based on the proposed land use and unrestricted removal of soil from the site. PILs for copper and zinc and HIL-A criteria available for other contaminants of concern are presented in Table 2.

6.1.3 Comparison of Results to Assessment Criteria

The results of the laboratory analyses have been compared with the assessment criteria and the results are summarised below.

6.1.3.1 *Metals*

- Arsenic, Cadmium Chromium, Lead, Mercury and Nickel (As, Cd, Cr, Pb, Hg and Ni) – all 42 primary samples analysed returned concentrations below the respective HIL-A criteria;
- Copper (Cu) – all 42 primary samples analysed returned concentrations below the respective PIL criteria; and
- Zinc (Zn) – one (1) of the 42 primary samples analysed returned concentrations above the respective PIL criteria.

6.1.3.2 *Polycyclic Aromatic Hydrocarbons (PAH)*

- Benzo(a)pyrene – one of the 10 samples analysed returned a concentration above the HIL-A criterion; and
- Total - one of the 10 samples analysed returned a concentration above the HIL-A criterion.

6.1.3.3 *OC/OPs*

All of the samples tested for OC/OPs returned concentrations below the laboratory's Limit of Reporting (LOR).

6.1.4 Quality Control (QC)

Blind and spilt duplicate samples were collected and the samples submitted to ALS and the National Measurement Institute (NMI) for the analyses required. The spilt and blind duplicate analytical results are compared to the primary sample result using Relative Percentage Difference (RPD). The RPD is defined as the absolute difference between two values, divided by their mean values and expressed as a percentage. Where either primary or duplicate samples (or both) have concentrations below the laboratory level of reporting, the RPD is not calculated. An RPD value below 50% is considered acceptable. The calculated RPD for both duplicates is shown in Table 4.

The calculated RPD for Nickel species analysed in sample B3-3 and Dup01-blind (primary and duplicate sample respectively) was 108%, which exceeds the acceptable 50% RPD. The calculated RPD for Nickel and Zinc species analysed in sample B3-3 and Dup01-split (primary and duplicate sample) was 80% and 67%, respectively, also exceeding the acceptable RPD of 50%.

Samples analysed as part of this investigation returned heavy metal concentrations close to the laboratory's LOR. In these cases, when analyte concentrations are extremely low, small discrepancies in data can generate high RPDs, which do not reflect an accurate representation of the data's reproducibility. Furthermore, primary and duplicate samples taken from fill materials yielded similar heavy metal concentrations, in the same order of magnitude, as other samples analysed from similar stratigraphic horizons (fill materials) across the site.

It is considered that the variation in heavy metal concentrations observed between primary and duplicate samples is a reflection of the inhomogeneity of the materials analysed and the close proximity of the results to the laboratory's LOR. The RPDs reported in this investigation are therefore considered to be acceptable.

6.2 Discussion

Sample B3-4 (taken from 1.0m to 1.3m depth) reported zinc concentration of 416 mg/kg, which exceeds the PIL criteria of 400 mg/kg. Samples B3-3 and B3-5, taken immediately above and below sample B3-4, respectively, returned concentrations of zinc below the PIL criteria, indicating the identified contamination is of limited vertical extent between 1.0m to 1.3m depth. No samples from bores surrounding B3 reported zinc in excess of PILs. The impact is therefore considered to be of limited extent. Allowing for a 0.5m thickness of impacted material to extend the full distance to the nearest sample point as shown on Drawing No. 1, it is conservatively estimated that up to 192m³ (in-situ volume) could be impacted by zinc. It is expected that upon excavation the volume of soil containing concentrations of zinc exceeding the PIL would be less than this estimate.

Ash within sample B6-1 (taken from 0.0m to 0.25m depth) returned concentrations of benzo(a)pyrene and total PAHs at 6.7 and 154.7 mg/kg, respectively, exceeding the HIL-A criteria of 1 and 20 mg/kg, respectively. Samples of fill material taken from the strata immediately below sample B6-1 (represented by samples B6-2 and B6-3 taken from 0.25m to 0.5m and 0.5m to 1.0m depth, respectively) returned concentrations of benzo(a)pyrene and total PAH below the HIL-A criteria. These results indicate that the benzo(a)pyrene impact does not extend vertically downwards. The PAHs were not detected in surrounding bores. Allowing for a 0.25m thickness of impacted material to extend the full distance to the nearest sample point as shown on Drawing No. 1, it is conservatively estimated that up to 77m³ (in-situ volume) could be impacted by PAHs. It is expected that upon excavation the volume of soil containing concentrations of PAHs exceeding the HIL-A criteria would be less than this estimate.

All other contaminants of concern, including heavy metals (excluding zinc) and OC/OPs, returned concentrations below the HIL-A criteria and are considered to pose no significant environmental and/or human health risk.

No analytes exceeding the site assessment criteria were detected around the hazardous goods store or in the vicinity of B7, B8, B20, B21. The lack of impacts is attributed to a combination of the generally small unit quantities of hazardous goods used by the research and testing facility, the precautions in materials handling necessitated by a quarantine handling facility and the presence of extensive sealed surfaces at the site.

6.3 Conclusions

Based on the results of this Stage 1 & 2 ESA undertaken by Butler Partners, it is concluded that:

- Lot 596 on SL6381 is not listed on the EPA's EMR;
- the site is owned by the State of Queensland represented by the Department of Primary Industries and Fisheries;
- potentially contaminating activities performed on site include:
 - filling at the site with material from unknown sources; and
 - storage of chemicals (chemical store);
- laboratory testing of site soils indicate elevated levels of zinc exceeding the PIL criteria in one (1) soil sample taken from Bore 3;
- the identified zinc contamination present at Bore 3 is of limited vertical extent between 1.0m to 1.3m depth; the impact does not extend south beyond B18, west beyond B19, north beyond B2. If impacts of 0.5m thickness extend all the way to the next sample point as shown in Drawing No.1, the estimated impacted in-situ volume is 192m³;
- ash observed in Bore 6 returned concentrations of benzo(a)pyrene and total PAH above the HIL-A criteria; and
- the identified benzo(a)pyrene and total PAH contamination in bore 6 has been vertically defined, the impact does not extend south beyond B24, west beyond B25, north beyond B26 or east beyond B27. If impacts of 0.25m thickness extend all the way to the next sample point as shown in Drawing No.1, the estimated impacted in-situ volume is 77m³; all other samples analysed returned concentrations of heavy metals, PAH and OC/OPs below the respective HIL-A/PIL assessment criteria.

6.4 Recommendations

The soil impacts identified at this site are contained within near surface materials and are of limited areal extent. Zinc was present at 416 mg/kg at one location; this result is below the HIL 'A' criterion and as such, is not considered to pose a human health risk within a sensitive land use scenario. This concentration does exceed the PIL, however, the area of impact is sealed with bitumen/concrete and therefore does not pose a phytotoxic risk. As the site will remain sealed until redevelopment, it is recommended that the impact is left in place until development, excavated and tested for possible disposal requirements at the time of development.

PAHs present in the surface at one location exceeded the HIL 'A', however, it was limited to less than 0.5m depth and did not persist to the delineation sample points within 10m of the impact. As the impact is of limited extent, it is recommended that the impact be excavated and stockpiled during re-development and be removed to landfill if required following characterisation of the stockpile.

BUTLER PARTNERS PTY LTD

MARK BAKER
Environmental Scientist

St.JOHN HERBERT
Principal Scientist

CLIENT:
MULTIPLY DEVELOPMENTS
AUSTRALIA PTY LTD

BUTTLER
PARTNERS

79 Doggett Street, Newstead
Queensland 4006 Australia
Telephone 61 7 3852 3800
Facsimile 61 7 3852 3808

PROPOSED EXTENSION OF PORTSIDE WHARF 19 HERCULES STREET, HAMILTON LOCALITY PLAN, SITE LAYOUT, SAMPLE LOCATIONS & INFERRED IMPACTED AREAS



SCALE: 1:750 (A3)

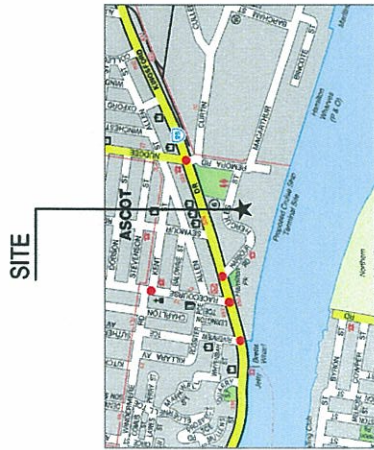
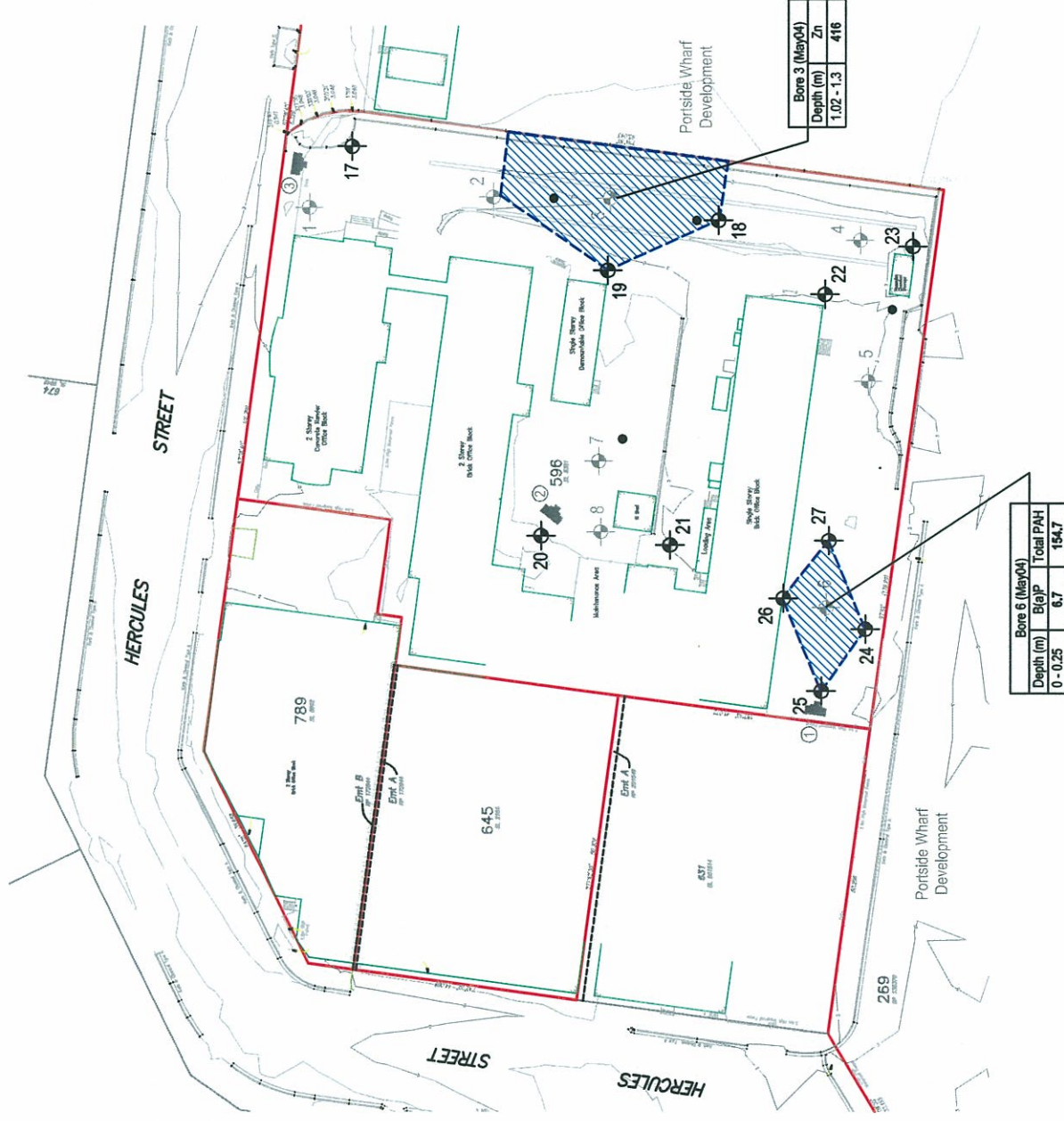
DATE: OCTOBER 2006

DRAWN BY: FD

APPROVED:

PROJECT No: 03900F

DRAWING No: 1 REV: A



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UBD Reference: Map 140 Ref Q18 (50th Edition) N.T.S.

LEGEND

- 17 Bore (September 2006)
- 1 Bore (May 2006)
- Bore Refusal At/Near Surface
- Existing Lot Boundary
- Inferred Extent of Impact
- Photograph Number, Location and Direction

Contamination Results:

Test Number	Test Number
Bore 6 (May04)	Bore 6 (May04)
Depth (m)	Depth (m)
0 - 0.25	0 - 0.25
B(a)p	B(a)p
6.7	6.7
Analyte	Analyte
Analyte Result	Analyte Result
(mg/kg)	(mg/kg)

Depth (m)	B(a)p	Total PAH
0 - 0.25	6.7	154.7

Depth (m)	Zn
1.02 - 1.3	416

APPENDIX A

CURRENT AND HISTORICAL LAND TITLES, AND QUEENSLAND EPA REGISTERS SEARCH RESULTS



HISTORICAL TITLE SEARCH

NATURAL RESOURCES & MINES, QUEENSLAND

Request No: 1135984

Search Date: 27/03/2006 3:07 pm

Title Reference: 40046479

Date Created: 25/02/2005

Government House, Brisbane, in Queensland aforesaid, this 24th day of February, in the 54th Year of Our Reign and in the year of Our Lord 2005.

REGISTERED OWNER

THE STATE OF QUEENSLAND (REPRESENTED BY THE DEPARTMENT
OF PRIMARY INDUSTRIES AND FISHERIES)

ESTATE AND LAND

Estate in Fee Simple

LOT 596 CROWN PLAN SL6381
County of STANLEY Parish of TOOMBUL
Local Government: BRISBANE CITY

EASEMENTS, ENCUMBRANCES AND INTERESTS

1. REQUEST FOR INDEFEASIBLE TITLE No 708463210
An Indefeasible Title is requested for the land
Produced at 08:53 on 25/02/2005
2. Rights and interests reserved to the Crown by
Deed of Grant No. 40046479 (Lot 596 on CP SL6381)

ADMINISTRATIVE ADVICES - NIL
UNREGISTERED DEALINGS - NIL

CERTIFICATE OF TITLE ISSUED - No

Caution - Charges do not necessarily appear in order of priority

** End of Historical Title Search **

COPYRIGHT THE STATE OF QUEENSLAND (NATURAL RESOURCES & MINES) [2006]
Requested By: External Supervisor



CURRENT TITLE SEARCH

NATURAL RESOURCES & MINES, QUEENSLAND

Request No: 1135064

Search Date: 21/03/2006 1:07 pm

Title Reference: 50542845

Date Created: 28/02/2005

Previous Title: 40046479

REGISTERED OWNER

Dealing No: 708463210 25/02/2005

THE STATE OF QUEENSLAND

(REPRESENTED BY THE DEPARTMENT OF PRIMARY INDUSTRIES AND
FISHERIES)

ESTATE AND LAND

Estate in Fee Simple

LOT 596 CROWN PLAN SL6381

County of STANLEY

Parish of TOOMBUL

Local Government: BRISBANE CITY

EASEMENTS, ENCUMBRANCES AND INTERESTS

1. Rights and interests reserved to the Crown by
Deed of Grant No. 40046479 (Lot 596 on CP SL6381)

ADMINISTRATIVE ADVICES - NIL

UNREGISTERED DEALINGS - NIL

CERTIFICATE OF TITLE ISSUED - No

** End of Current Title Search **

COPYRIGHT THE STATE OF QUEENSLAND (NATURAL RESOURCES & MINES) [2006]
Requested By: External Supervisor



HISTORICAL TITLE SEARCH

NATURAL RESOURCES & MINES, QUEENSLAND

Request No: 1135984

Search Date: 27/03/2006 3:07 pm

Title Reference: 40046479

Date Created: 25/02/2005

This Title Has Been Fully Cancelled

[Form 1.1] Title Reference: 40046479

QUEENSLAND

DEED OF GRANT OF LAND

Land Act 1994

Elizabeth the Second, by the Grace of God, Queen of Australia,
and Her other Realms and Territories, Head of the Commonwealth:-

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETING:

WE, with the advice of the Executive Council, under the Land Act 1994,
grant in fee simple all that parcel of land described in Schedule 1 to the
person described in Schedule 2,

SUBJECT TO the reservations and conditions specified, and such other
reservations and conditions as may be contained in and declared by the
laws of the State.

Specified Reservations -

- (a) All minerals (as defined by the Mineral Resources Act 1989) on and below the surface of the land
- (b) The right of access for the purpose of searching for and working any mines (as defined by the Mineral Resources Act 1989) in any part of the land
- (c) All petroleum (as defined by the Petroleum Act 1923) on and below the surface of the land
- (d) All rights of access for the purpose of searching for and for the operations of obtaining petroleum in any part of the land, and all rights of way for access and for pipelines and other purposes requisite for obtaining and conveying petroleum in the event of petroleum being obtained in any part of the said land
- (e) All quarry material (as defined by the Forestry Act 1959) on and below the surface of the land

Specified Conditions - Nil

IN TESTIMONY WHEREOF, WE have caused this OUR grant to be sealed with the
Seal of the State of Queensland.

WITNESS our Trusty and Well-beloved Her Excellency Quentin Bryce,
Companion of the Order of Australia, Governor in and over the State of
Queensland and its Dependencies, in the Commonwealth of Australia, at

QLD ENVIRONMENTAL PROTECTION AGENCY
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

Transaction ID: 815096 EMR Site Id: 21 March
2006

This response relates to a search request received for the site:

Lot: 596 Plan: SL6381

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

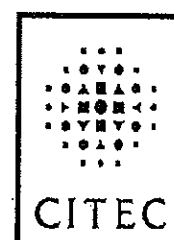
The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

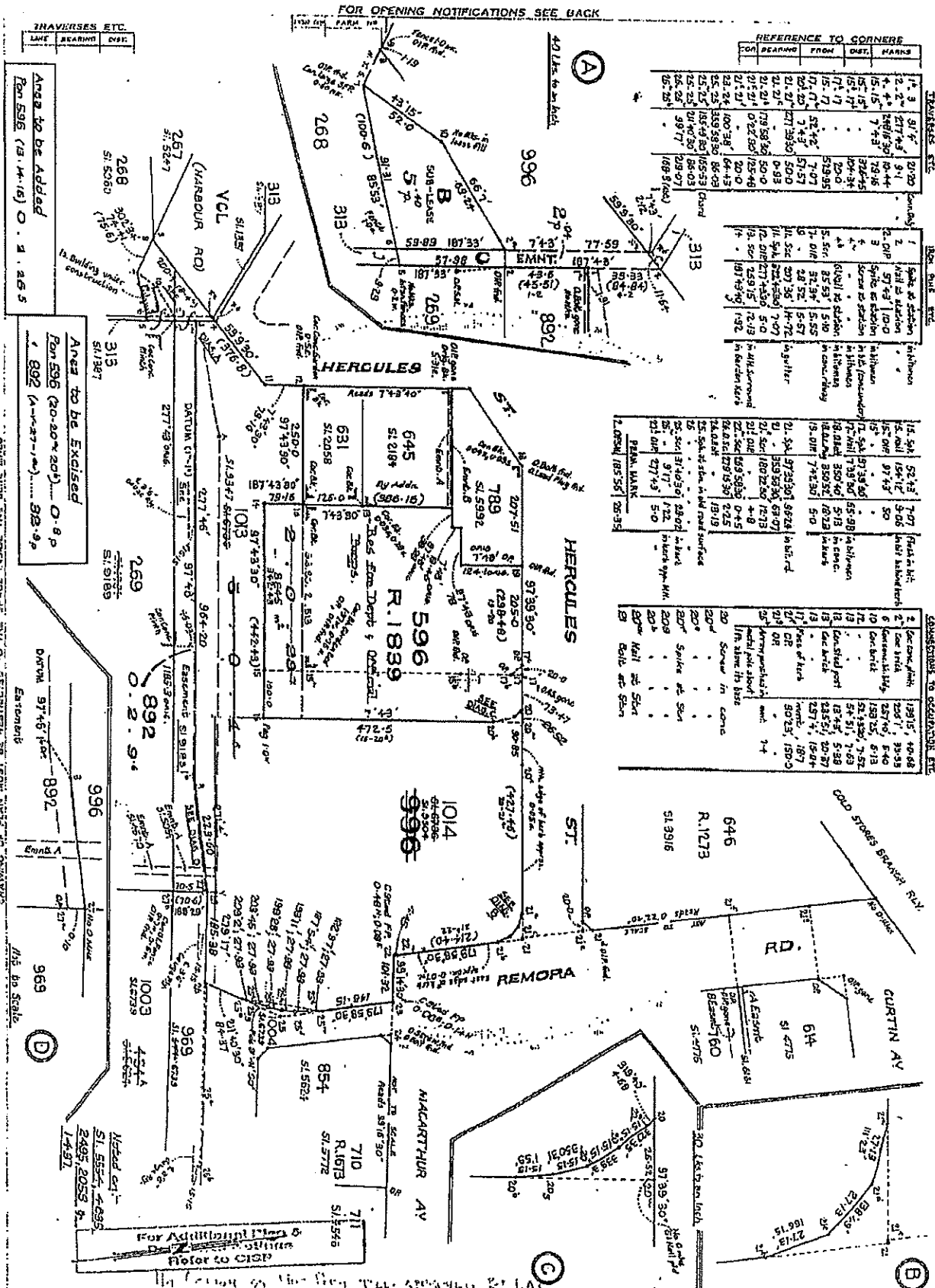
Note: The Statutory fee for a search extract is \$34.00 per lot for Internet Searches & \$40.00 per lot otherwise. Extra service fees apply for CITEC CONFIRM'S Internet and Express services. Searches may also be conducted through the State Government website at www.qld.gov.au or through www.smartservice.qld.gov.au.

If you have any queries in relation to this search please phone (07) 3227 7370.

Lindi Bowen
Registrar, Contaminated Land Unit



FOR OPENING NOTIFICATIONS SEE BACK



REFERENCE TO CORNERS

TO	BEARING	FROM	DIST.	MARK
1	91° 57'	2	20.00	Iron nail
2	271° 43'	3	9.41	Iron nail
3	201° 15'	4	19.96	Iron nail
4	171° 17'	5	20.47	Iron nail
5	151° 17'	6	20.47	Iron nail
6	121° 17'	7	20.47	Iron nail
7	91° 57'	8	20.47	Iron nail
8	61° 57'	9	20.47	Iron nail
9	31° 57'	10	20.47	Iron nail
10	0° 57'	11	20.47	Iron nail
11	311° 57'	12	20.47	Iron nail
12	341° 57'	13	20.47	Iron nail
13	371° 57'	14	20.47	Iron nail
14	401° 57'	15	20.47	Iron nail
15	431° 57'	16	20.47	Iron nail
16	461° 57'	17	20.47	Iron nail
17	491° 57'	18	20.47	Iron nail
18	521° 57'	19	20.47	Iron nail
19	551° 57'	20	20.47	Iron nail
20	581° 57'	21	20.47	Iron nail
21	611° 57'	22	20.47	Iron nail
22	641° 57'	23	20.47	Iron nail
23	671° 57'	24	20.47	Iron nail
24	701° 57'	25	20.47	Iron nail
25	731° 57'	26	20.47	Iron nail
26	761° 57'	27	20.47	Iron nail
27	791° 57'	28	20.47	Iron nail
28	821° 57'	29	20.47	Iron nail
29	851° 57'	30	20.47	Iron nail
30	881° 57'	31	20.47	Iron nail
31	91° 57'	32	20.47	Iron nail

CONSTRUCTIONS TO OBSERVATION ETC.

NO.	DESCRIPTION	DATE	BY
1	Loc. 1000	1991/5	1000
2	Loc. 1001	1991/5	1001
3	Loc. 1002	1991/5	1002
4	Loc. 1003	1991/5	1003
5	Loc. 1004	1991/5	1004
6	Loc. 1005	1991/5	1005
7	Loc. 1006	1991/5	1006
8	Loc. 1007	1991/5	1007
9	Loc. 1008	1991/5	1008
10	Loc. 1009	1991/5	1009
11	Loc. 1010	1991/5	1010
12	Loc. 1011	1991/5	1011
13	Loc. 1012	1991/5	1012
14	Loc. 1013	1991/5	1013
15	Loc. 1014	1991/5	1014
16	Loc. 1015	1991/5	1015
17	Loc. 1016	1991/5	1016
18	Loc. 1017	1991/5	1017
19	Loc. 1018	1991/5	1018
20	Loc. 1019	1991/5	1019
21	Loc. 1020	1991/5	1020
22	Loc. 1021	1991/5	1021
23	Loc. 1022	1991/5	1022
24	Loc. 1023	1991/5	1023
25	Loc. 1024	1991/5	1024
26	Loc. 1025	1991/5	1025
27	Loc. 1026	1991/5	1026
28	Loc. 1027	1991/5	1027
29	Loc. 1028	1991/5	1028
30	Loc. 1029	1991/5	1029
31	Loc. 1030	1991/5	1030

AUTHORITY		INSTRUCTIONS		MAPS		CHECKED		PASSED		QUANTITIES		MERIDIAN OBSERVATIONS		SCALE		SURVEY PLAN		POSS 996, 992, 596, Eastmt C	
Her DSR		PRIVATE		A1		HFO		2.0.72				STC		1:1000		1:1000		3rd SUB LEASE 11 IN FOR 996	
ADJUSTMENTS		FOR		PREV. AREA		DRAWN		CHECKED		PASSED		CHARTED		SUBD 46 FOR CAM		VIA 51.5524		PARISH OF TOOMBUL	
CROWN COPYRIGHT RESERVED																		County of - Stanley	
																		L.A. District of - Brisbane	
																		SI.6381	

APPENDIX B

BORE REPORT SHEETS WITH EXPLANATORY NOTES

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Development Australia Pty Ltd

Project: Proposed Extension of Portside Wharf

Location: 19 Hercules Street, Hamilton

Project No: 03900F

BORE 1

Page No: 1 of 1

Date: 27 May 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	ASPHALT			0.04		
	FILL					
	- brown, sandy gravel (roadbase)		E	0.25	1-1	
	- brown, grey, silty clay with gravel		E		1-2	
	- brown, sandy gravel		E	0.5	1-3	
1	End of Bore at 0.95 m (Due to auger refusal)			0.95		
2						
3						

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Power Auger

Drilling Method: 90mm diameter flight augers

Groundwater: No free groundwater observed during augering

Remarks:

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Development Australia Pty Ltd

Project: Proposed Extension of Portside Wharf

Location: 19 Hercules Street, Hamilton

Project No: 03900F

BORE 2

Page No: 1 of 1

Date: 27 May 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	ASPHALT			0.04	2-1	
	FILL - brown, sandy gravel (roadbase)		E	0.25		
	- brown, sandy gravel		E	0.5	2-2	
	- brown, clayey sands - gravel		E	1.0	2-3	
1	End of Bore at 1.3 m (Due to auger refusal)					
2						
3						

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Power Auger

Drilling Method: 90mm diameter flight augers

Groundwater: No free groundwater observed during augering

Remarks:

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Development Australia Pty Ltd

Project: Proposed Extension of Portside Wharf

Location: 19 Hercules Street, Hamilton

Project No: 03900F

BORE 3

Page No: 1 of 1

Date: 27 May 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	ASPHALT			0.025		
	FILL - grey brown sandy gravel		E	0.25	3-1	
			E	0.5	3-2	
	- grey brown, sandy gravel with silty clay		E	1.0	3-3 DUP01	
1	SILTY CLAY - dark grey		E	1.3	3-4	
	SAND - brown, medium to coarse grained, moist		E	1.5	3-5	
2				2.0		
	- grey, medium to coarse grained, moist		E	2.7	3-6	
3	End of Bore at 3 m (Due to auger refusal)			3.0		

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Power Auger

Drilling Method: 90mm diameter flight augers

Groundwater: No free groundwater observed during augering

Remarks:

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Development Australia Pty Ltd

Project: Proposed Extension of Portside Wharf

Location: 19 Hercules Street, Hamilton

Project No: 03900F

BORE 4

Page No: 1 of 1

Date: 27 May 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	ASPHALT			0.04	4-1	
	FILL - brown, sandy gravel (roadbase)		E	0.25		
	- brown, medium to coarse grained sand		E	0.4	4-2	
				0.5		
			E		4-3	
1				1.0		
	SAND - brown, fine to medium grained		E	1.3	4-4	
				1.5		
2				2.0	4-5	
			E			
				2.5		
	End of Bore at 2.5 m (Due to auger refusal)					
3						

D Disturbed Sample
B Bulk Sample
U Undisturbed Tube (50mm diameter)
pp Pocket Penetrometer Test (kPa)

E Environmental Sample
S Standard Penetrometer Test (SPT)
HB SPT Hammer Bouncing
() No Sample Recovery

C NMLC Coring
Is(50) Point Load Test Result (MPa)
(d) Diametral Point Load Strength Test
(a) Axial Point Load Strength Test

Rig: Power Auger

Drilling Method: 90mm diameter flight augers

Groundwater: No free groundwater observed during augering

Remarks:

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Development Australia Pty Ltd

Project: Proposed Extension of Portside Wharf

Location: 19 Hercules Street, Hamilton

Project No: 03900F

BORE 5

Page No: 1 of 1

Date: 27 May 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	ASPHALT			0.04		
	FILL		E		5-1	
	- brown, sandy gravel (roadbase)			0.25		
	- grey brown, silty clay and gravel		E		5-2	
	- brown, medium to coarse grained sand		E	0.5		
				1.0		
				1.2		
	SAND		E		5-4	
	- brown, fine to medium grained			1.5		
				2.0		
			E		5-5	
				2.5		
	End of Bore at 2.5 m					
3						

D Disturbed Sample
B Bulk Sample
U Undisturbed Tube (50mm diameter)
pp Pocket Penetrometer Test (kPa)

E Environmental Sample
S Standard Penetrometer Test (SPT)
HB SPT Hammer Bouncing
() No Sample Recovery

C NMLC Coring
Is(50) Point Load Test Result (MPa)
(d) Diametral Point Load Strength Test
(a) Axial Point Load Strength Test

Rig: Power Auger

Drilling Method: 90mm diameter flight augers

Groundwater: No free groundwater observed during augering

Remarks:

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Development Australia Pty Ltd

Project: Proposed Extension of Portside Wharf

Location: 19 Hercules Street, Hamilton

Project No: 03900F

BORE 6

Page No: 1 of 1

Date: 27 May 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	FILL - grey, sandy silt with black ash (charcoal)		E	0.0	6-1	
	- brown, medium to coarse grained sand		E	0.25	6-2	
			E	0.5	6-3	
1			E	1.0	6-4	
			E	1.5		
2						
	SAND - brown, fine to medium grained		E	2.4 2.5	6-5	
	End of Bore at 2.5 m					
3						

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Power Auger

Drilling Method: 90mm diameter flight augers

Groundwater: No free groundwater observed during augering

Remarks:

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Development Australia Pty Ltd

Project: Proposed Extension of Portside Wharf

Location: 19 Hercules Street, Hamilton

Project No: 03900F

BORE 7

Page No: 1 of 1

Date: 27 May 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	ASPHALT End of Bore at 0.06 m (Due to Refusal on concrete)					
1						
2						
3						

D Disturbed Sample
B Bulk Sample
U Undisturbed Tube (50mm diameter)
pp Pocket Penetrometer Test (kPa)

E Environmental Sample
S Standard Penetrometer Test (SPT)
HB SPT Hammer Bouncing
() No Sample Recovery

C NMLC Coring
Is(50) Point Load Test Result (MPa)
(d) Diametral Point Load Strength Test
(a) Axial Point Load Strength Test

Rig: Power Auger

Drilling Method: 90mm diameter flight augers

Groundwater: No free groundwater observed during augering

Remarks:

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Development Australia Pty Ltd

Project: Proposed Extension of Portside Wharf

Location: 19 Hercules Street, Hamilton

Project No: 03900F

BORE 8

Page No: 1 of 1

Date: 27 May 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	ASPHALT					
	End of Bore at 0.06 m (Due to Refusal on concrete)					
1						
2						
3						

D Disturbed Sample
B Bulk Sample
U Undisturbed Tube (50mm diameter)
pp Pocket Penetrometer Test (kPa)

E Environmental Sample
S Standard Penetrometer Test (SPT)
HB SPT Hammer Bouncing
() No Sample Recovery

C NMLC Coring
Is(50) Point Load Test Result (MPa)
(d) Diametral Point Load Strength Test
(a) Axial Point Load Strength Test

Rig: Power Auger

Drilling Method: 90mm diameter flight augers

Groundwater: No free groundwater observed during augering

Remarks:

BORE REPORT

**BUTLER
PARTNERS**

Client: Multiplex Developments Australia Pty Ltd

Project: DPI & F Portside

Location: 19 Hercules Street, Hamilton

Project No: 03900G

BORE B17

Page No: 1 of 1

Date: 23 September 2006

Depth (m)	Description	Lithology	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	BITUMEN - 50mm thick pavement		E	0.1	B17A	
	FILL - orange-brown, gravel and sand			0.25		
1	- pale grey, gravel fill with rock and concrete fragments			1.2	B17B	
	CLAY - firm, brown		E	1.5		
	SAND - loose, brown, medium grained, with shell fragments			2.1	B17C	
2			E	2.25		
	CLAYEY SILT - grey, moderate plasticity, moist		E	2.5	B17D	
				2.6		
3	End of Bore at 2.6 m					
4						
5						
6						

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: 6610 D7 Geoprobe

Drilling Method: Pushtube

Groundwater: No free groundwater encountered during drilling

Remarks: