

Melbourne Water Corporation

**Area 2, Melbourne Water's
Werribee Fields, Werribee**

Environmental Audit Report

Report

October 2004

ENVIRONMENT PROTECTION ACT 1970

Certificate of Environmental Audit

I, Fouad Abo of GHD Pty Ltd, 180 Lonsdale Street Melbourne, a person appointed by the Environment Protection Authority ("the Authority") under the Environment Protection Act 1970 ("the Act") as an Environmental Auditor for the purposes of the Act, having:

1. been requested by Mr Timm Kurth of Melbourne Water to issue a certificate of environmental audit in relation to the site bounded by New Farm and Farm Roads, Princes Highway (Old Geelong Road), the Maltby Bypass, and the Powercor Depot to the north, at Melbourne Water's Werribee Fields, Werribee (known as Area 2 - Werribee Fields), located in the City of Wyndham, comprising the land shown as lot P on plan of subdivision PS 401725T defined by the Certificate of Title Volume 10446 Folio 721 and Volume 10513 Folio 533 (see attached titles), owned by Melbourne Water Corporation.
2. had regard to, amongst other things, -
 - a. guidelines issued by the Authority for the purposes of Section IXD of the Act;
 - b. the beneficial uses that may be made of the site; and
 - c. relevant State environment protection policies/industrial waste management policies, namely: State Environment Protection Policy (Prevention and Management of Contamination of Land) 2002, State Environment Protection Policy (Groundwaters of Victoria) 1997, State Environment Protection Policy (Waters of Victoria) 2003, Industrial Waste Management Policy (Prescribed Industrial Waste) 2000, Industrial Waste Management Policy (Waste Acid Sulphate Soils) 1999, State Environment Protection Policy (Air Quality Management) 2001, and State Environment Protection Policy (Ambient Air Quality) 1999.
3. in making a total assessment of the nature and extent of any harm or detriment caused to, or the risk of any possible harm or detriment that may be caused to, any beneficial use made of the site by any industrial processes or activity, waste or substance (including any chemical substance); and
4. completed an environmental audit report in accordance with section 53X of the Act, a copy of which has been sent to the Authority and the relevant planning and responsible authority.

HEREBY CERTIFY that I am of the opinion that the condition of site is neither detrimental nor potentially detrimental to any beneficial use of the site.

Other related information

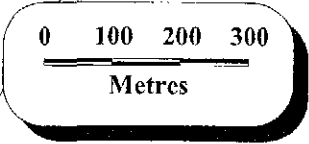
- ▶ There were elevated concentrations of selenium in groundwater which exceeded the threshold criterion that would be commonly adopted for stock watering. However, as these levels were considered to be naturally occurring, the auditor considered that the beneficial uses of the land were not affected.
- ▶ The site is located within a RAMSAR protected area and Melbourne Water is following the appropriate requirements under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.



This Certificate forms part of environmental audit report: titled "GHD Pty Ltd, Melbourne Water Corporation, Area 2, Melbourne Water's Werribee Fields, Werribee, Environmental Audit Report, October 2004". Further details regarding the condition of the site may be found in the environmental audit report.

DATED: 29 October 2004

SIGNED: _____


FOUAD ABO
ENVIRONMENTAL AUDITOR
(Appointed Pursuant to the Environment Protection Act 1970)



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	Audit Area 2

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Project:	Environmental Site Assessment Melbourne Water Werribee		
Title:	Audit Areas		
Project No:	3111575	Date	29.10.04
Scale:	1:11,000		

Executive Summary

This report sets out the results of an Environmental Audit of the site bounded by New Farm and Farm Roads, Princes Highway (Old Geelong Road), the Maltby Bypass, and the Powercor Depot to the north at Werribee Fields, Werribee (known as Area 2 – Melbourne Water's Werribee Fields) in accordance with Part IXD of the Environment Protection Act.

Name of Auditor	Fouad Abo
Term of appointment of Auditor	7 January 1997 to 6 January 2006
Date Certificate requested	15 March 2000
Owners of the site	Melbourne Water Corporation
Person requesting a Certificate	Mr Timm Kurth of Melbourne Water.
Municipality	Wyndham City Council
Title Information	Lot 1 on Plan of Subdivision 412756U, Certificate of Title Volume 10446, Folio 721; and Lot P on Plan of Subdivision 401725T, Certificate of Title Volume 10513, Folio 533.
Zoning	Public Use Zone Service and Utility under the Wyndham Planning Scheme
Completion date of the audit	29 October 2004

Based on all data available at the date of issuance of this audit report, the audit findings were:

- There was no evidence of soil contamination resulting from activities at the site or from imported fill material. However, slightly elevated concentrations of arsenic and chromium were found to be present at some locations. These were considered to be naturally occurring and were found to have low leachability and bioavailability, and therefore did not impact on the beneficial uses of the site.
- There are concentrations of boron, chromium, copper, selenium, and zinc in groundwater in excess of the criteria for ecosystem protection, and selenium in excess of the criteria for raw drinking water (relevant to the recreation beneficial use), and stock watering. However, these concentrations are considered to be naturally elevated and do not preclude the beneficial uses of ecosystem protection or primary contact recreation. Based on the available criteria, selenium levels exceeded the criterion for the beneficial use of stock watering, however, these levels are considered to be naturally occurring and they were not affecting the land beneficial uses.
- There were no visible or buried wastes or offensive odours that would adversely impact the aesthetics or the air quality at the site.
- There was no evidence of any contaminants present on the site having moved off-site.
- The extent of sampling and analysis and the QA/QC activities undertaken by the Assessor were in accordance with applicable standards and guidelines and provided confidence that the testing results of the soils and groundwater were representative of the conditions at the site at the time of conducting this audit.

The result of this audit was the issue of a Certificate of Environmental Audit. The auditor has signed this Certificate having satisfied himself that investigations carried out were of a standard consistent with guidelines and practices current at the time of the audit, and have indicated to a high degree of

confidence that the site is suitable for all beneficial uses.

This executive summary should be read in conjunction with the full audit report "*Melbourne Water Corporation, Area 2, Melbourne Water's Werribee Fields, Werribee, Environmental Audit Report, October 2004*".



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1. Introduction

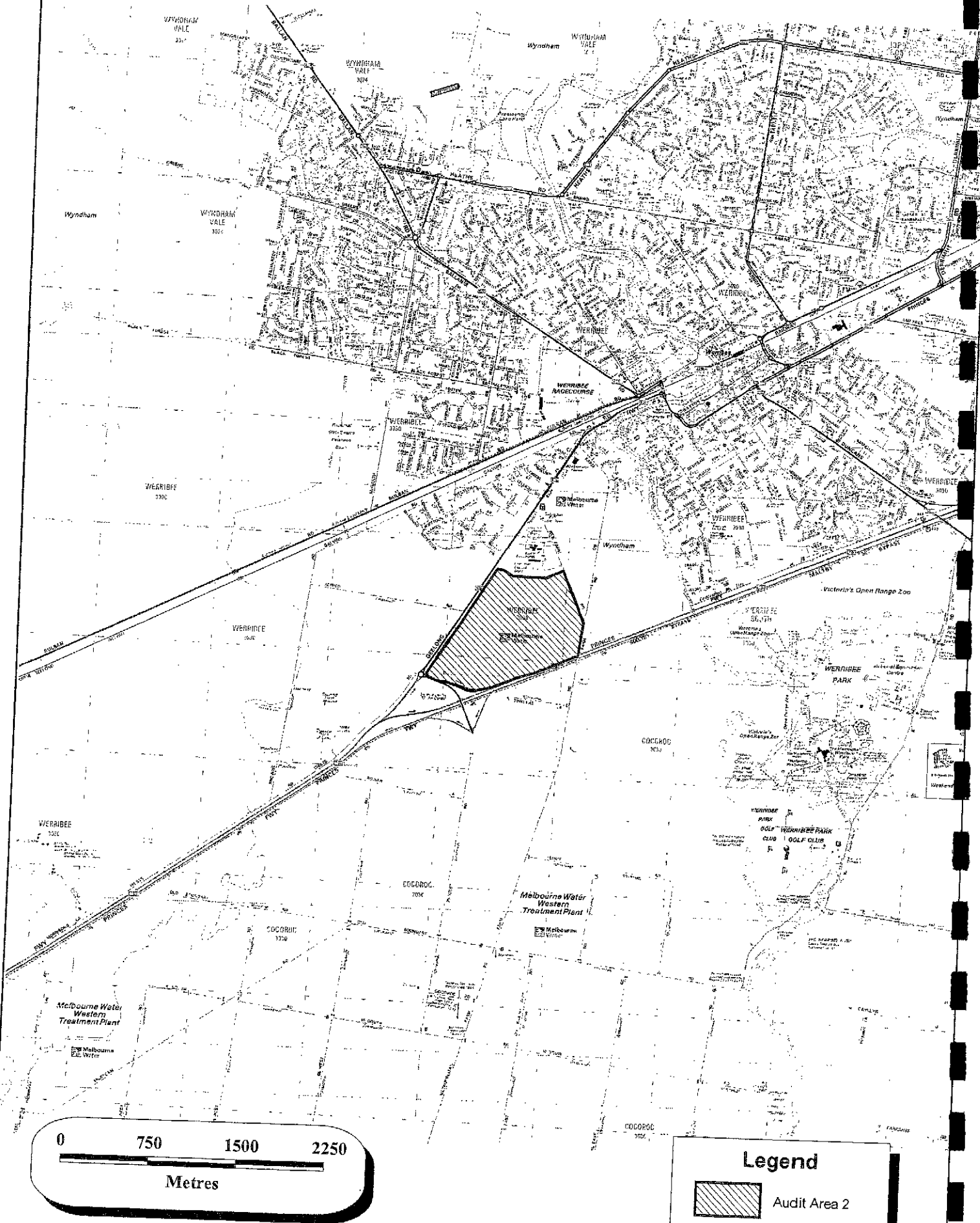
1.1 Background

This Environmental Audit Report sets out the results of a Statutory Environmental Audit in accordance with Part IXD of the Environment Protection Act, 1970. The report was completed in accordance with the guidelines issued by the EPA for environmental audit of contaminated sites.

The purpose of initiating the audit was to facilitate the change of zoning for the site to a more sensitive land use. Table 1 below presents the details of the request for the environmental audit at the site, and provides a description of the site. The location of the site is shown in Figure 1.

Table 1: Background Details About the Site

Name of Auditor	Dr Fouad Abo
Term of appointment of Auditor	7 January 2004 to 6 January 2006
Date Certificate requested	15 March 2000
Owners of the site	Melbourne Water Corporation
Person requesting a Certificate	Mr Timm Kurth of Melbourne Water
Municipality	Wyndham City Council
Title Information	<ul style="list-style-type: none">▶ All of the land shown on Lot P on Plan of Subdivision 401725T, Certificate of Title Volume 10513, Folio 533; and▶ Part of the land shown on Lot 1 on Plan of Subdivision 412756U, Certificate of Title Volume 10446, Folio 721.
Zoning	Public Use Zone Service and Utility under the Wyndham Planning Scheme
Address of the Site	The site bounded by New Farm and Farm Roads, Princes Highway (Old Geelong Road), the Maltby Bypass, and the Powercor Depot to the north, at Werribee Fields, Werribee (Defined as Area 2 – Werribee Fields)
Current Occupier	Melbourne Water Corporation
Site Area	Approximately 90 ha
Australian Map Grid Reference	292 500 mE, 5 800 100 mN, Zone 55
Melway Map Reference	Map 408, grid ref C-F, 1-3
Site Assessors	OTEK Australia Pty Ltd, Milsearch Pty Ltd, Enterra Pty Ltd
Audit Completion Date	29 October 2004



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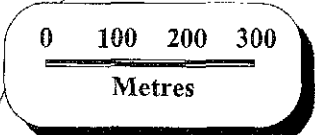
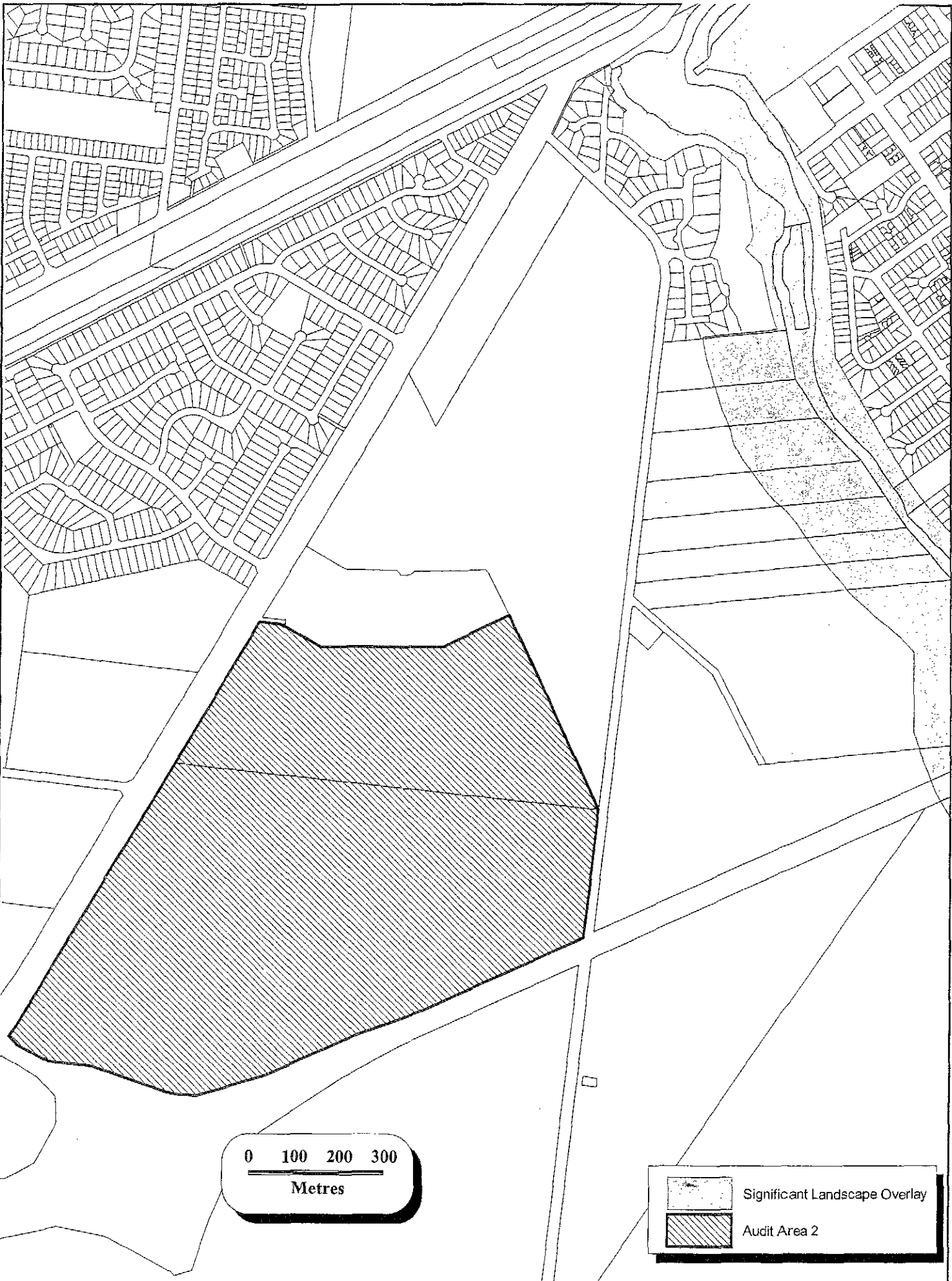



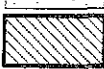
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Project: Environmental Site Assessment
 Melbourne Water Werribee

Title: Figure 1: Site Location

Project No: 3111575 Date: 01.11.04 Scale: 1:42,000



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Project:	Environmental Site Assessment Melbourne Water Werribee		
Title:	Figure 2: Audit Areas		
Project No:	3111675	Date:	29.10.04
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1.2 Input to this Report by Auditor's Support Team

The following members of the Auditor's support team assisted with this audit:

Table 2: Auditor's Support Team

Name	Qualification/Role	Contribution to audit
Anissa Groves *	Auditor's assistant/ Senior Environmental Scientist	Site inspections, review of correspondence, and comments on scoping of environmental assessment.
Patrick O'Neal *	Associate Hydrogeologist	Site inspections, review of correspondence, and comments on scoping of environmental assessment. Provided hydrogeological advice on groundwater pollution issues during the early stages of the audit.
Lee Gedge	Auditor's Assistant/ Senior Hydrogeologist	Review of assessment report, wrote the draft version of the environmental audit report, site inspections, review of correspondence. Provided hydrogeological advice on groundwater pollution issues during the later stages of the audit.
Geoff Pettifer	Principal Geophysist	Review the ENTERRA Geophysical assessment and provide assistance to the auditor in this area.

* Former employee of GHD while the audit was being conducted

1.3 Issue of Certificates and Statements of Environmental Audit

The Environmental Audit system provides a rigorous mechanism of providing confidence to planning and responsible authorities, prospective purchasers and others that potentially contaminated land is suitable for a use. If the contamination status of the site does not preclude any beneficial uses, then a Certificate of Environmental Audit can be issued. If the auditor is of the opinion that contamination may render a site unsuitable for some beneficial uses, the auditor must issue a Statement of Environmental Audit to that effect. The statement will outline the specific uses that would not be compromised by the level and type of site contamination. It will also apply conditions to the use of the site for those beneficial uses.



2. Site Investigation Review

2.1 Documents Reviewed

The following documents have been critically reviewed for the purposes of this audit:

Table 3: Documents Reviewed

Author	Date	Document Title
Sinclair Knight Merz Pty Ltd	February 1993	Sinclair Knight Merz (SKM) Environmental Assessment Report (Note: full copy of report was not available for review).
O TEK Australia Pty Ltd	October 2002	O TEK Australia Pty Ltd, Phase 1 Report, Werribee Fields, Werribee, Victoria, Prepared for Melbourne Water. <i>The following reports were included as Appendices to the Phase 1 Report, and were reviewed by O TEK and the Auditor and his team:</i> <ul style="list-style-type: none">▶ Biosis Pty Ltd (March 2000) - Biosis Archaeological and Cultural Heritage Survey report (project reference number 1471).▶ Milsearch Pty Ltd (April 2000) - A Review of World War II-Era Military Activity at Werribee Fields for Melbourne Water.▶ Enterra Pty Ltd (31 May 2001) - Melbourne Water, Werribee Fields Development – Sub Surface Investigation, Prepared for Melbourne Water.
O TEK Australia Pty Ltd	November 2003	Melbourne Water, Werribee Fields - Area 2, Environmental Site Assessment Report.

2.2 Site Status at Audit Completion

The topography in the vicinity of the site is generally flat. At the time of completion of the Audit, the site was used for cropping.

There was a weather station located on the northern portion of the site, and a fence aligned north-east to south-west dividing the site into two similar sized paddocks. There was an open spoon drain near the north-west corner of the site and a small perennial dam located at the midpoint of the site's western boundary. There were no buildings or other structures located on the site.

The site is not subject to any overlays related to contaminated land. It is not on the EPA contaminated sites register and is not subject to an EPA clean-up or pollution abatement notice.



2.3 Site Status at Audit Commencement

The site was formerly part of the Melbourne Water Werribee Complex, and has been owned by Melbourne Water since the 1920's. It has been used for agricultural purposes, including cropping and grazing since at least this time. Apart from mobile agricultural machinery, no evidence was found that any other infrastructure had ever existed at the site. However, the following potential sources of contamination were identified:

- ▶ Effluent irrigation at the south-west of the site;
- ▶ Rumours of a UST at the north-west of the site;
- ▶ Rumours of illegal dumping in the perennial dam adjacent to the western boundary of the site; and
- ▶ Rumours of CCA drum burial in the centre of the site.

Apart from effluent irrigation to the southwest of the site, subsequent detailed and repeated investigations (intrusive and research based) failed to provide any evidence of the existence of these potential sources of contamination. The sources of the rumours (from former site employees) were later found to be unreliable. Also, the assessor provided evidence that demonstrated that the area irrigated by effluent is now part of a newly developed Caltex service station and the Princess Freeway access ramp, and is not part of the audit site.

2.4 Proposed Site Development

It is proposed that the site be subdivided and developed for a residential use. This will be a standard low-density residential use with gardens and accessible soil.

2.5 Chronology of Site Investigation Activities

Table 4: Sequence of Site Activities

Date	Site Activity
15 March 2000	Audit requested by Mr Timm Kurth of Melbourne Water.
March 2000	Biosis completed an archaeological and cultural heritage survey of the site.
April 2000	Milsearch completed a site history review of the World War II military activity at the site.
November 2000 to February 2001	Enterra undertook a series of sub surface surveys and anomaly investigations. The auditor and/or the auditor's representative were present during some of these works.
14 November to 4 December 2001	O TEK Initial Soil Sampling Program including site inspections by the Auditor and/or his representative.
October 2002	O TEK completed a Phase 1 Environmental Assessment that included a review of the Milsearch, Enterra and Biosis reports.
9 to 17 October 2003	O TEK Trenching Program requested by the auditor including site inspections by the Auditor.
9 to 16 October 2003	O TEK Further targeted soil sampling including site inspections by the Auditor.
9 October 2003	O TEK Groundwater monitoring well installation including site inspections by the Auditor and/or his representative.
16 and 17 October 2003	O TEK Groundwater Sampling including site inspections by the Auditor's representative.

2.6 Site Definition and Description

The Assessor's description and definition of the site are as follows:



Table 5: Site Definition and Description

Aspect	Comments
Site Locality	The Assessor provided site locality plans as Figure 1 and Figure 2 in their final report. The Auditor has also provided a locality plan in Figure 1 of this report.
Area	The site encompasses an area of 90 ha and is semi-triangular in shape.
Surrounding Land Use	North: Industrial site occupied by Powercor East: Agricultural (Defined as Area 3 – Werribee Fields) South: Recently constructed Caltex Service Centre to the southwest and grazing area/ Western Treatment Plant to the southeast. West: Agricultural
Topography	The topography of the site and local area is generally flat.
Sampling Locations	The Assessor's soil and groundwater sampling locations are shown in the figures 4 & 5 contained in the OTEK November 2003 assessment report attached as Appendix C.

This information contained in Table 5 satisfactorily defines the site for the purposes of the audit.

2.7 History of Site Use

The site history review undertaken by OTEK included personal interviews with current and former Melbourne Water employees, review of historical publications, review of detailed site history information obtained by Biosis and especially Milsearch, and an aerial photograph search. No aerial photographs prior to 1945 were available. The site history review undertaken by OTEK provided the following general information:

- The site was previously part of the Melbourne Water Werribee Complex, and has been owned by Melbourne Water since the 1920's. Based on the historical information reviewed as part of this ESA, the site has been used for agricultural purposes, including cropping and grazing since at least this time.
- There is no evidence to suggest that any portion of Area 2 was used by the Royal Australian Air Force during World War II, except for rumours of a possible runway, and also a potential presence of an underground storage tank (UST). However, despite exhaustive investigations (physical, geophysical and historical) no evidence of the current or former existence of a runway or an UST at the site was encountered.
- As mentioned above, wastewater irrigation has occurred on a small portion of adjacent land to the southwest of the site (now occupied by the Caltex Service Station and the Freeway Access Ramp), however, the site itself has not been irrigated using wastewater.



The following additional reports were commissioned during the audit to provide supporting information for the OTEK Phase 1 Assessment. Copies of the reports are included as appendices to the OTEK Phase 1 Report located in Appendix B of this audit report.

2.7.1 Biosis Pty Ltd (March 2000)

Biosis, Archaeological and Cultural Heritage Survey report (project reference number 1471), 2000.

Biosis Pty Ltd (Biosis) was commissioned to conduct an archaeological and cultural heritage survey of the site to identify any areas of archaeological or cultural heritage that may be impacted by the proposed development of the site. The survey included research of background information relating to the site followed by site inspections and a systematic ground survey. Liaison was also made with the Wathaurong Aboriginal Cooperative Ltd and the South-West Region Cultural Heritage Group.

The report found that there were no areas of aboriginal or non-aboriginal archaeological or cultural significance present on the site. An area of aboriginal archaeological significance was identified on adjacent land to the east of the site along an alluvial terrace adjoining the bank of the Werribee River. However, as this area is not part of the subject site, it is not considered to be of significance for this audit.

2.7.2 Milsearch Pty Ltd (April 2000)

A Review of World War II-Era Military Activity at Werribee Fields for Melbourne Water

Milsearch Pty Ltd (Milsearch) undertook an investigation of the site history to establish whether there was any potential for residual munitions and other buried wastes to be present from the former military use of the Werribee Fields area. This included a review of the historical information and military archives as well as site inspections.

The report found that there was no evidence to suggest that any portion of the site subject to this audit was used by the Royal Australian Air Force. However, there were rumours of a possible runway and an underground fuel tank at the site. No evidence of the previous existence of a runway or underground fuel tank at the site was encountered during subsequent exhaustive investigations including geophysical surveys and extensive investigative trenching requested by the auditor.

2.7.3 Enterra Pty Ltd (31 May 2001)

Melbourne Water, Werribee Fields Development – Sub Surface Investigation, Prepared for Melbourne Water, 2001.

In response to the findings of the Milsearch report, a subsurface geophysical investigation was conducted by Enterra to locate any unexploded ordnance, buried wastes or other underground facilities. The survey was conducted using a digital magnetometer and electromagnetic detection equipment.

The survey found no evidence of unexploded ordnance or live ammunition at the site. While burial sites containing mostly rubble were confirmed on adjacent land belonging to other parts of the Werribee Complex, no such sites or other underground structures were identified on the land subject to this audit.

The potential contaminants of concern identified from the site history survey are summarised in Table 6 below:



Table 6: Potential contaminants of concern

Site activity/Source	Potential Contaminants of Concern	Location
<i>On site</i>		
Possible UST	TPHs, BTEX, lead	Was rumoured to have existed at the north-west of the site
Effluent irrigation	Inorganics, fluoride, lime, nutrients	At the south-west of the site
Rumours of illicit dumping	Inorganics, PAHs, TPHs	Was rumoured to have occurred in the perennial dam adjacent to the western boundary of the site.
Rumours of CCA drum burial	Chromium, Copper, Arsenic	Was rumoured to have occurred in the centre of the site.
<i>Off site</i>		
Industrial site occupied by Powercor	TPHs, PCBs, Inorganics	Located on adjacent land to the north.

2.8 Site Soils and Hydrogeology

The soil and groundwater borelogs recorded at the site are contained within Appendix C and D of the Assessor's report, which is contained within Appendix C of this report.

2.8.1 Soils

Fill material was not observed on any area of the site. The Assessor indicated that the natural soils on site generally consisted of:

- ▶ 0 – 0.2 m: (CH) Silty clay, very stiff, moderate to high plasticity, brown; underlain by;
- ▶ 0.2 – 8m (MH) Silty clay, stiff, slightly moist, moderate to high plasticity, brown;
- ▶ ~ 8 – 9 m (CL) Silty Clay, stiff, moist to very moist, low plasticity, mottled brown/grey;
- ▶ ~ > 9 m Weathered basalt, hard, moist, dark brown.

2.8.2 Geology and Aquifers

The 1:63 360 Melbourne Geological Map (Geological Survey of Victoria) indicates that the site is located on the Quaternary Age 'Deutgam Silt'. The Deutgam Silt comprises grey to grey-brown silt with abundant carbonate nodules, and some gravel, sand and silty sand in the lower part of the sequence. The Deutgam Silt overlies the Quaternary Age Newer Volcanics Formation, which predominantly comprises dark to light grey olivine basalt. The borelogs provided by the Assessor were consistent with this description.

The Deutgam Silt is not expected to constitute a significant aquifer system in the vicinity of the site. Groundwater is likely to be present within the underlying Newer Volcanics.



2.8.3 Groundwater Flow System

The groundwater is expected to be moving to the east towards the Werribee River, which is located approximately 1 km from the site. The Werribee River is likely to represent the nearest receiving surface water body in the vicinity of the site. Groundwater originating from the Older Volcanics Aquifer may discharge to this tributary. Regionally, the groundwater flow direction is expected to be towards the southeast in the direction of Port Phillip Bay.

The hydraulic conductivity of the Newer Volcanics Aquifer was estimated by OTEK to be 1.9×10^{-4} m/sec. Groundwater in this aquifer is likely to occur in fractures (secondary porosity). The depth to groundwater at the site was found to be between 6.8m and 9.3m below ground level.

2.8.4 Groundwater Database and Groundwater Quality

A search of the State Groundwater Database performed by OTEK identified eight wells within a one-kilometre radius of the site.

Three of the wells were registered for a domestic use, while the uses of the remaining five wells were listed as not known. The total depths of the wells ranged between 16.15m and 33.52m below ground level. Standing water levels were between 7m and 9.1m below ground level. The database listed four of the wells as having been installed in basalt and one as having been installed in gravel. No lithological details were available for the remaining wells.



3. Soil Quality Assessment

3.1 Beneficial Uses of the Land to be Protected

The land use categories of possible relevance to any site according to the State Environment Protection Policy (Prevention and Management of Contamination of Land, 2002) are as follows:

- ▶ Parks and Reserves;
- ▶ Agricultural;
- ▶ Sensitive use including child care centre, pre-school, primary school and residential, any of which may take place in a high density (where there is minimal access to soil) area or other lower density areas (where there is generally substantial access to soil);
- ▶ Recreation/Open Space;
- ▶ Commercial; and
- ▶ Industrial.

The Policy defines beneficial uses protected by the Policy for land as being:

- ▶ Maintenance of natural ecosystems, modified ecosystems, and highly modified ecosystems;
- ▶ Human health;
- ▶ Buildings and structures;
- ▶ Aesthetics; and
- ▶ Production of food, flora, and fibre.

In Section 5 of the policy the land is assessed for its suitability for all beneficial uses.

The protected beneficial uses for each of the respective land uses are shown in Table 1 of the *SEPP 2002 Prevention and Management of Contamination of Land*. This table is reproduced in Table 7 below:



Table 7: Protected Beneficial Uses of Land

Beneficial Use	Land Use						
	Parks & Reserves	Agricultural	Sensitive Use (High Density Residential)	Sensitive Use (Other)	Recreation/Open space	Commercial	Industrial
Maintenance of Ecosystems							
Natural Ecosystems	✓						
Modified Ecosystems	✓	✓		✓	✓		
Highly Modified Ecosystems		✓	✓	✓	✓	✓	✓
Human Health	✓	✓	✓	✓	✓	✓	✓
Buildings & Structures	✓	✓	✓	✓	✓	✓	✓
Aesthetics	✓		✓	✓	✓	✓	
Production of Food, Flora & Fibre	✓	✓		✓			

3.2 Screening Criteria Adopted

In December 1999, the National Environment Protection Council (NEPC) published a guideline for the investigation levels for soil and groundwater in the assessment of site contamination and is referred to as the National Environment Protection (*Assessment of Site Contamination*) Measure (NEPM). The NEPM lists Ecological Investigation Levels (EILs) and Health Investigation Levels (HILs) in Schedule B(1). EILs were set for urban land use (comprising city, suburban and industrial areas). Where no EIL level exists for an analyte the following criteria will be used.

- The Environmental Investigation “B” levels presented in the Australian and New Zealand Environment and Conservation Council & National Health and Medical Research Council (ANZECC & NHMRC) “Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites”, 1992;
- Where there are no NEPM or ANZECC guidelines, reference has been made to the 2000 Dutch Target and Intervention Values. The Dutch values have been used for a range of components as default ecological investigation levels.
- Threshold concentrations for sensitive land use- soils (Table 3) from the EPA of New South Wales “Guidelines for Assessment of Service Station Sites”, 1994.

If the site was to be developed into **residential land**, the NEPM HIL “A” or “D” criteria would be appropriate depending on the density of the proposed development, i.e.: “NEPM HIL A - Standard residential with garden/ accessible soil (home grown produce contributing less than 10% fruit and vegetable intake; no poultry); this category includes children’s day care centres, preschools and primary schools”; or “NEPM HIL D - Residential with minimal opportunities for soil access: includes dwellings with fully and permanently paved yard space such as high rise apartments and flats”.



If the site was to be used as "a park, recreational **open space** and playing fields or a secondary school", then the NEPM HIL E criteria would then apply.

If the site was to be used for **commercial or industrial** purposes the NEPM HIL F criteria applies in this case, i.e. "NEPM HIL F - Commercial/Industrial: includes premises such as shops and offices as well as factories and industrial sites".

Other criteria referenced in this Audit include:

- ▶ The EPA Publication 448 "Classification of Waste" for the setting of conditions on future management of soil on the site.
- ▶ The *SEPP 2002 Prevention and Management of Contamination of Land* also specifies that "contamination must not cause the land to be offensive to the senses of human beings".

3.3 Field Investigation Summary - Soils

3.3.1 On-Site Investigation

Field soil investigations were generally carried out in three phases of work. These are described below:

Previous Soil Investigation – Reported February 1993 (Full Copy of Report Not Available)

A limited soil-sampling program of the entire Melbourne Water Werribee Treatment Complex was conducted by Sinclair Knight Merz Pty Ltd in 1993. Samples were retrieved from seven boreholes drilled within the area (i.e. Area 2 site).

Phase One Soil Investigation – Reported December 2002 (Included in the OTEK Phase 2 Report – Appendix C)

A phase one soil-sampling program was conducted by OTEK between November 2001 and December 2002. The purpose of the assessment was to determine if there was any impact resulting in soil contamination from the previous uses of the land, or from the presence of any imported fill. In addition, the soil sampling was designed to investigate potential sources of contamination that were identified in desktop reviews and were listed in Table 6 above.

Considering the AS 4482-1 (1997), the NEPM (1999), and the large area of the site, sampling was undertaken at 1,247 locations, with testing generally conducted at two depth intervals of 0.2m and 0.5m below ground level. Some boreholes were also advanced to five metres below ground level.

In addition to the soil-sampling program, targeted excavations of areas where geophysical anomalies were identified were conducted to follow up rumours and determine the presence of potentially contaminating facilities or wastes such as those listed in Table 6.

Further Soil Investigation – Reported November 2003 (Included in the OTEK Phase 2 Report – Appendix C)

A further targeted soil-sampling program was conducted by OTEK during October and November 2003. The further soil sampling was carried out at the request of the auditor to check the results of the phase one sampling. In particular, this was to confirm or otherwise the elevated levels of arsenic and microbiological contamination that were detected during the phase one soil investigation.

For arsenic, sampling was undertaken at 13 test pit locations to a depth of 1.5m, with samples retrieved from the near surface, 0.5m, 1.0m and 1.5m. An additional three test pits were excavated to a depth of 1m to obtain samples for testing for microbiological contamination. Also three surface samples were collected from



within the spoon drain at the north-west of the site to assess the potential for stormwater or sediment to have migrated on to the site from Area 1 to the north.

Further to the Enterra geophysical, investigation to verify the results of the geophysical survey and confirm that a UST had not been previously located in the north-west of the site and burial of CCA drums did not occur in the central portion of the site, a series of trenches were requested by the auditor and were excavated in these two areas of the site. Approximately 1km of trenches, extending to a depth of between 1.0 and 1.5m, were excavated across the central 12 hectares of the site where CCA drums were rumoured to have been buried. The investigated area was expanded significantly from the suspect area to allow for a wider investigation of the potential for these wastes to be present. Also, approximately 200 metres of trenches to a depth of between 1.0 and 1.5m were excavated across the north-western corner of the site where a UST was rumoured to have previously been located. Furthermore, during the auditor's inspection of the trenches, a number of other targeted trenches were dug in areas on the site that were topographically different including depressions, mounds and areas with less vegetation. The trenching did not identify anything that was of concern or warranted further investigation.



3.4 Laboratory Analysis Program

The laboratory analysis program for the initial and further soil investigations was designed to assess the contamination status of the natural soils and any fill material on the site. The following laboratories undertook the analysis:

- ▶ Amdel (as the Primary Laboratory); and
- ▶ Labmark and AGAL (as the secondary laboratory for the analysis of split sample for QA purposes).

These laboratories were NATA accredited for the analyses undertaken.

The analytical program undertaken by the assessor has been summarised in Table 8 below.

Table 8: Analytical Program

Number of Sampling Locations	Number of Samples	Individual or Composite	Sample Depths	Analyses
General Site – 1089 Grid Locations				
1,089	2,178	Individuals	0.2m and 0.5m	▶ PH.
599	1,198	Individuals	0.2m and 0.5m	▶ Inorganics Screen; and ▶ Approximately two thirds analysed for E.coli and a broad screen of potential contaminants referred to as an 'EPAV Screen' comprising benzene, toluene, ethylbenzene and total xylene's (BTEX); total petroleum hydrocarbons (TPHs); polycyclic aromatic hydrocarbons (PAHs); speciated phenols; chlorinated hydrocarbons; organochlorine (OCPs) and organophosphate (OPP) pesticides; polychlorinated biphenyls (PCBs), inorganics (antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, tin, and zinc).
488	976	2 and 3 Part Composites	0.2m and 0.5m	▶ Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.
Suspected CCA Drum Area – 86 Targeted Locations				
86	147	Individuals	0.2m and 0.5m	▶ PH.
86	141	Individuals	0.2m and 0.5m	▶ E.coli and an 'EPAV Screen (as defined above).
86	12	Individuals	0.2m and 0.5m	▶ Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.
65	130	2 and 3 Part Composites	0.2m and 0.5m	▶ Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.
Suspected UST Area – 22 Targeted Locations				
22	44	Individuals	0.2m and 0.5m	▶ PH.



Number of Sampling Locations	Number of Samples	Individual or Composite	Sample Depths	Analyses
7	14	Individuals	0.2m and 0.5m	▶ Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.
15	30	2 and 3 Part Composites	0.2m and 0.5m	▶ Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.
Stored Treated Timber Area – 50 Targeted Locations				
50	100	Individuals	0.2m and 0.5m	▶ PH.
16	32	Individuals	0.2m and 0.5m	▶ Approximately two thirds analysed for E.coli and an 'EPAV Screen (as defined above).
34	68	2 and 3 Part Composites	0.2m and 0.5m	▶ Arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.
Further Sampling Program– 17 Further Targeted Locations at the request of the Auditor				
11	44	Individuals	0.2m, 0.5m, 1.0m and 1.5m	▶ PH.
11	22	Individuals	0.2m, 0.5m, 1.0m and 1.5m	▶ Available arsenic using the Toxicity Characteristic Leaching Procedure (TCLP), and Australian Standard Leaching Procedure (ASLP).
4	12	Individuals	0.2m, 0.5m, 1.0m and 1.5m	▶ Total chromium, copper and nickel. 8 of these samples were also analysed for available chromium, copper, and nickel using the TCLP and ASLP methods.
3	6	Individuals	0.2m, 0.5m and 1.0m	▶ E.coli.
3	3	Individuals	0.2m	▶ Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, manganese, molybdenum, nickel, selenium, tin, vanadium, and zinc.



3.5 Adequacy of the Assessor's Investigation Program

The site covers an area of approximately 90 ha. For this area, the Australian Standard (AS 4482.1) indicates that to detect hot spots of contamination of 35.6m diameter (refer Table 1 AS 4482.1) with a confidence of 95%, 990 sampling points arranged in a grid over the site are required (given that 5 hectares is the largest site area provided in Table 1 of AS 4482.1, the former is based on 18 x 5 hectare sites).

3.5.1 Initial Sampling Program

During the initial sampling, testing was conducted at a total of 1,247 locations across the site including targeted sampling - which was based on the results of the initial sampling and historical information. This sampling density is considered appropriate for this site. The Assessor's initial sampling program can be summarised as follows:

- ▶ A total of 1,089 grid and 158-targeted boreholes were drilled. The targeted locations consisted of the following:
 - 50 boreholes at the south of the site where treated timber was rumoured to have previously been stored;
 - 86 boreholes at the centre of the site where CCA drums were rumoured to have been buried; and
 - 22 boreholes targeted at the suspected former location of a UST at the north-west of the site.
- ▶ During the initial sampling, samples were generally retrieved from the near surface and at a depth of 0.5m below ground level. For the further sampling, samples were retrieved to a maximum depth of 1.5m below ground level.

The results of the initial sampling program showed elevated concentrations of arsenic in many samples. The maximum arsenic concentrations were reported to be 79 mg/kg and 72 mg/kg in 0.2m and 0.5m depth samples respectively. The mean arsenic concentrations for these depth intervals were 20.5 mg/kg and 22.1 mg/kg respectively. The auditor subsequently requested that further investigation be undertaken in order to *determine a source for the arsenic*.

The further investigation included:

- ▶ Statistical contouring of the concentrations of arsenic, chromium, and copper to determine if there was any link that may indicate a potential CCA source;
- ▶ Review of QA/QC results to determine if the elevated arsenic concentrations may be the result of laboratory error;
- ▶ Further sampling at 11 locations where elevated arsenic concentrations were previously identified; and
- ▶ Elutriation testing using both TCLP and ASLP methods to determine the proportion of available arsenic in the soil.

Statistical contouring of the arsenic, chromium, and copper concentrations did not show any correlation between these potential contaminants. Therefore, it was considered unlikely that CCA was the source of the elevated arsenic concentrations observed at the site.

However, a review of the analytical results indicated that generally poor agreement was obtained between Amdel (primary laboratory) and Labmark (secondary laboratory) for some inorganics in duplicate samples, particularly arsenic. Specifically, all split duplicate samples analysed by Labmark showed consistently low arsenic concentrations (well below the EIL) across the entire site. Therefore, both laboratories were



requested to review their analytical data with respect to the accuracy of the arsenic concentrations.

Amdel has indicated that errors were identified in their analyses (refer correspondence in Appendix F of the Otek November 2003 Report), whereas Labmark confirmed their original results as being accurate. (refer correspondence in Appendix F of the Otek November 2003 Report). According to Amdel, the errors would have resulted in arsenic concentrations being reported approximately two times higher than actual values. The factor of 2 was calculated based on the results of the analysis of Certified Reference Material (CRM) that was analysed with the samples for quality control purposes. However, based on the results of 75 split duplicate samples analysed by the secondary laboratory during the initial sampling program, and results of the further sampling undertaken, with duplicate samples analysed by three laboratories, it was considered that some of the original results for arsenic may have been inaccurate by significantly more than a factor of 2, and up to a factor of 10 times too high. This is based on the secondary laboratory reporting concentrations generally in the range of 4 to 8mg/kg, consistent with the results of the further sampling program undertaken in October 2003 and outlined below.

3.5.2 Further Sampling Program

During the further sampling, analysis was conducted at a total of 17 locations across this site. The Assessor's further sampling program is summarised as follows:

- ▶ 11 test pits excavated to 1.5m to retest areas where arsenic results were found to be affected by laboratory error;
- ▶ 3 test pits to 1.0m depth in areas where microbiological contamination was found to be present to confirm these results; and
- ▶ 3 surface samples within the spoon drain.

The results of the further soil sampling undertaken for arsenic did not confirm the elevated arsenic concentrations originally reported by Amdel in 2001. In the 44 samples analysed the maximum arsenic concentration was 10mg/kg, which is well below the NEPM EIL of 20mg/kg. Also, relative percent differences (RPDs) for the 11 primary and 22 duplicate samples analysed were generally 30% indicating good agreement.

Therefore, it was considered that the further sampling confirmed that laboratory error by Amdel was the source of the elevated arsenic concentrations observed during the initial sampling program in 2001.

Based on all the above discussed search undertaken, the outcome of the Audit is not considered to be affected by the erroneous 'elevated arsenic' concentrations. Furthermore, even the erroneous results were not at levels that could have presented an adverse risk to human health, and elutriation testing has shown that the available proportion of the inorganics in the soil is very low. Also, with the exception of a few copper results, the remaining analytical data does not appear to have been affected by the laboratory error.

3.6 Contamination Status of the Site

The contamination status of the site has been determined by excluding all erroneous arsenic results (i.e. from sample 2A/867/0.2 onwards). The results of the further sampling program have instead been included.

Apart from arsenic that was erroneously found to be in excess of the NEPM EIL criterion of 20mg/kg in 70 out of 450 samples (16%), the concentrations of all other contaminants were found to be below both the NEPM EIL and HIL A criteria. The maximum concentration of arsenic was 49mg/kg and was detected in sample 2A/791/0.5 retrieved from a depth of 0.5m. A statistical analysis of the results shows that the 95% Upper Confidence Limit (UCL) for arsenic at the site is 12.0mg/kg, which is well below the NEPM EIL criterion.



3.7 Aesthetics of the Site

No odours were detected at the site during our site inspections and during sampling. Also, no rubble/scrap/waste or other aesthetically unacceptable materials were observed on the site to any extent of aesthetical concern.

3.8 Asbestos

No asbestos containing materials were observed on the surface of the site or at depth during sampling. Also, there were evidence of buildings or other structures constructed of any asbestos containing materials identified at the site.

3.9 Summary of Final Condition of the Site

The results of contaminant concentrations that were found to be slightly elevated during the assessment were statistically analysed in order to determine the final contamination condition of the site. The statistical analysis did not include results found by the laboratories to be erroneous. The results of the statistical analysis are presented in Table 9 below.

Table 9: Results of Statistical Analysis

Analyte	Arsenic	Chromium	Copper	Nickel	Zinc	Mercury
NEPM Criteria						
EIL	20*	50 *	100	60	200	1
HIL 'A'	100	100/12%**	1000	600	7000	15
Statistical Results						
Number of Samples	450	646	646	646	638	640
Maximum (mg/kg)	49	78	40	58	86	0.17
Mean (mg/kg)	11	42	24	36	44	0.03
95% UCL (%)	12	43	24	36	44	0.04

NOTES: UCL = Upper Confidence Limit
 EIL = Ecological Investigation Level
 HIL 'A' = Health Investigation Level for a Standard Residential (Sensitive) Land Use
 * ANZECC B Criterion, the interim urban EIL is 400
 ** 100 is for Cr VI which usually represent a small % of total Cr, and 12% is for Cr III

The above results show that maximum concentrations of arsenic exceeded the ANZECC B investigation criteria. However, the mean concentrations and 95% UCLs of all contaminants were below the NEPM EIL criteria and the NEPM HIL A criteria for a standard (low density) residential land use. Also, the maximum concentrations are well below the Dutch intervention value and well below the NEPM interim urban EIL criterion for Cu.

For arsenic, 70 out of a total 450 samples analysed were found to be in excess of the ANZECC B criterion of 20mg/kg. For total chromium, 102 out of a total of 646 analysed were found to be in excess of the ANZECC B criterion (used where no NEPM EIL available) of 50mg/kg. These concentrations were found to be generally



evenly distributed between the upper soil profile and 0.5m depth and are believed to be naturally occurring within the sedimentary profile. Also, there was no visible field evidence of contamination through the soil profile.

In order to estimate the bioavailable proportion of arsenic, chromium, copper and nickel in the soil, the samples from 0.2m and 0.5m depth retrieved from 11 locations during the further sampling program were submitted for elutriation testing using both the TCLP and ASLP methods. In total, 22 samples from 11 locations were analysed for available arsenic, and 8 samples from 4 locations were analysed for available chromium, copper, and nickel.

The results of the elutriation testing are presented in the OTEK November 2003 report and show that the availability of these trace elements in the soil at the site is very low. The available proportion of the total concentrations in all samples analysed was well below the NEPM EIL for each element. Therefore, the potential for phytotoxicity to occur from these concentrations present in the soil at the site is considered most unlikely.

A full summary of the results of sampling and analysis of soils from the site is contained within the Tables presented in the Assessor's report located in Appendix C of this report.

3.10 Off Site Soil Contamination

Based on information available for this audit, there was no evidence to indicate that the activities undertaken on the site have resulted in contamination of the surrounding sites.



4. Groundwater Quality Assessment

4.1 Beneficial Uses of Groundwater to be Protected

As per the *State Environment Protection Policy (SEPP) Groundwaters of Victoria, 1997*, table 10 below shows the beneficial uses of each segment of the groundwater that shall be protected.

Table 10: Protected Beneficial Uses of groundwater Segments

Beneficial Uses	Segments (mg/L TDS)				
	A1 (0-500)	A2 (501-1,000)	B (1,001-3,500)	C (3,501-13,000)	D (greater than 13,000)
Maintenance of ecosystems	✓	✓	✓	✓	✓
Potable water supply					
Desirable	✓				
Acceptable		✓			
Potable mineral water supply	✓	✓	✓		
Agriculture, parks & gardens	✓	✓	✓		
Stock watering	✓	✓	✓	✓	
Industrial water use	✓	✓	✓	✓	✓
Primary contact recreation (eg. Bathing, swimming)	✓	✓	✓	✓	
Buildings and structures	✓	✓	✓	✓	✓

The Authority (EPA) may determine that these beneficial uses do not apply to groundwater where:

- ▶ there is insufficient yield,
- ▶ the background level of a water quality indicator other than TDS precludes a beneficial use,
- ▶ the soil characteristics preclude a beneficial use, or
- ▶ a groundwater quality restricted use zone has been declared.

4.2 Groundwater Investigation Thresholds

Table 3 of the *SEPP Groundwaters of Victoria (1997)* specifies the water quality criteria required to protect beneficial uses. These criteria are specified in Table 11 below:



Table 11: Groundwater Quality Indicators

Beneficial Use Category	Water Quality Indicators
Maintenance of Ecosystem	<p>Those specified in the relevant SEPP for surface waters. This site is located in an area covered by the <i>SEPP Waters of Victoria</i> (June 2003).</p> <p>The SEPP lists the beneficial uses to be protected for each segment of the water environment. In accordance with Figure 1 and Part VII, Annex A, the rivers and streams adjacent to the site are included in the "Cleared Hills and Coastal Plains" Segment. The environmental quality objectives are those values in the ANZECC 2000 guidelines, and the level of ecosystem protection for this Segment is generally 95% for slightly to moderately modified aquatic ecosystems.</p>
Potable Water Supply (Desirable and acceptable)	<p>ANZECC (1992) <i>Australian Water Quality Guidelines for Fresh and Marine Waters</i>, criteria for raw water for drinking supply, and</p> <p>The NHMRC National Health and Medical Research Council (1996) <i>Australian drinking Water Guidelines</i>.</p>
Potable Mineral Water	<p>Australian Food Standards Code (1987) – <i>Standard 08 Mineral Water</i>, criteria for potable mineral water supply.</p>
Agriculture, Parks & Gardens	<p>ANZECC (1992) <i>Australian Water Quality Guidelines for Fresh and Marine Waters</i>, criteria for irrigation.</p>
Stock Watering	<p>ANZECC (1992) <i>Australian Water Quality Guidelines for Fresh and Marine Waters</i>, livestock criteria.</p>
Industrial Water use	<p>ANZECC (1992) <i>Australian Water Quality Guidelines for Fresh and Marine Waters</i>, criteria for industrial use.</p>
Primary Contact Recreation	<p>ANZECC (1992) <i>Australian Water Quality Guidelines for Fresh and Marine Waters</i>, criteria for primary contact recreation.</p>
Buildings & Structures	<p>The groundwater shall not be corrosive to structures or building materials (pH, sulphate, redox potential).</p>

4.3 Field Investigation Summary

4.3.1 On Site Groundwater Investigations

During the Phase 2 assessment conducted for the audit, OTEK installed and sampled three groundwater wells (B-1/MW1, B-2/MW-2, and B-3/MW3). Figure 2 shows the locations of the wells, which were positioned to provide maximum coverage of the site and to provide an adequate triangulation in order to determine the groundwater flow direction.

Groundwater was encountered at depths ranging from approximately 8.1m to 9.5m in basalt rock, and stabilised at depths of between 6.8m and 9.4m. Further details of the installation, construction, development, and sampling associated with the groundwater well program are provided in Appendix D of the OTEK November 2003 report.

OTEK undertook the Groundwater sampling using a low-flow QED Sample Pro MicroPurge bladder pump and was in accordance with EPA's (2000) *Groundwater Sampling Guidelines*.

In order to provide an indication of the hydraulic conductivity of the aquifer, OTEK performed hydraulic



conductivity testing on groundwater well MW-3 using a saturated zone slug (rising head) test. During the test, water level measurements were taken using an In-Situ 'Minitroll' (pressure transducer). Based on an average of two tests, the hydraulic conductivity of the basalt aquifer beneath the site was estimated to be 1.9×10^{-4} m/sec. This was calculated by OTEK using a modification of the commonly used Bouwer-Rice method (Kruseman & de Ridder, 1994).

4.4 Laboratory Analysis Program

Groundwater samples from each groundwater well were analysed for inorganics (antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, selenium, tin, vanadium and zinc), TPHs, BTEX, PAHs, total dissolved solids (TDS), sodium, potassium, calcium, iron, magnesium, sulphate, bromide, chloride, fluoride, nitrate, nitrite, alkalinity, hardness, pH, and EC.

4.5 Relevant Beneficial Uses

The results of the Assessor's groundwater field investigations indicated that the TDS of the groundwater tested at the site was between 5,600 mg/L in MW-3 to 5,900 mg/L in MW-2. Therefore, the groundwater at this site falls into *Segment C of the protected beneficial categories of the groundwater environment (Groundwater SEPP, 1997)*.

On this basis the beneficial uses relevant for the site are:

- ▶ Maintenance of Ecosystems;
- ▶ Stock Watering;
- ▶ Industrial Water Use;
- ▶ Primary Contact Recreation; and
- ▶ Buildings and Structures.

The site is not located in a recognised mineral water production area, therefore this beneficial use is not considered relevant.

4.6 Groundwater Contamination and Pollution Assessment of Risks

Is the groundwater likely to be polluted?

The former use of the site for agriculture indicated that the groundwater might have a potential to have been contaminated from the potential former use of chemicals at the site or from the potential sources of contamination that were identified during the site history including: possible illicit dumping on the site, rumours of a copper chromium arsenic (CCA) drum burial site and a UST, and the potential use of effluent to irrigate the site.

However, groundwater contamination was considered to be unlikely given the depth to groundwater, the nature of the soil, and the results of the soil assessment, which did not indicate the presence of soil contamination. Also, the potential sources of contamination mentioned above were found to be non-existent through exhaustive investigations that included site history search, investigative trenching across the site, comprehensive soil sampling and analysis program, investigation with Melbourne Water's relevant staff about the type of fertilisers and pesticides that were used, and geophysical surveys and subsequent intrusive assessment.



Is the groundwater polluted?

The groundwater testing results from the three wells were as follows:

4.6.1 Organic Contaminants

All organic contaminants tested for were found to be below the site acceptance criteria (relevant segment of the groundwater criteria) or below the laboratory reported detection limits for all three monitoring wells.

4.6.2 Inorganic Contaminants

Boron, chromium, copper, selenium, and zinc were found to be slightly in excess of the ANZECC 2000 criteria for freshwater (not a site relevant beneficial use) for moderately disturbed systems in wells sampled at the site. In addition, selenium was found to be in excess of the ANZECC 1992 criteria for livestock and raw drinking water (the later is not a site relevant beneficial use). All other inorganic contaminants were found to be below the criteria for the audit or below laboratory reported detection limits.

Table 12 below provides a summary of the concentrations that exceeded the adopted criteria.

Table 12: Results of Groundwater Samples that Exceed the Criteria for the Audit (µg/L)

Contaminant	Criteria			MW1	MW2	MW3	MW2 (Split Sample from MW2)
	ANZECC 2000 Aquatic Ecosystems – Freshwater *	ANZECC 1992 – Raw Drinking Water	ANZECC 1992 – Criteria for Livestock				
Boron	370	<u>1000</u>	5000	-	-	-	420
Chromium	1	<u>50</u>	1000	7	6	7	-
Copper	1.4	<u>1000</u>	500	5	8	5	-
Selenium	11	<u>10</u>	20	<u>31</u>	<u>43</u>	<u>28</u>	<u>51</u>
Zinc	8	<u>5000</u>	20000	18	16	15	-

Notes: - Denotes that result was below the adopted criteria or below laboratory reported detection limits

* Trigger values for Slightly – Moderately Disturbed Systems

All results listed in the table exceed the ANZECC 2000 criteria for ecosystem protection

Results underlined exceed the ANZECC 1992 AWQG Criteria for Raw Drinking Water (used here for 'Recreational Water')

Results **bolded** exceed the ANZECC 1992 AWQG Criteria for Livestock



4.7 Summary of Contamination Status

Contamination detected in the groundwater can be summarised as follows:

- ▶ Concentrations of boron, chromium, copper, selenium and zinc were slightly in excess of the ANZECC 2000 criteria for *Ecosystem Protection* (freshwater) for slightly-moderately disturbed systems.
- ▶ Concentrations of selenium were in excess of the ANZECC 1992 criterion for *Livestock*.

Each of the relevant beneficial uses is discussed below in terms of the contamination status of the site.

A full discussion of the results of sampling and analysis of groundwater from the site is contained in the groundwater results tables in the Assessor's report located in Appendix C of this report.

4.7.1 Maintenance of Ecosystems

Slightly elevated concentrations of boron (maximum of 420 µg/L in MW2 split duplicate sample while the pair sample FROM MW2 was below the criterion), chromium (maximum of 7 µg/L in MW1 and MW3), copper (maximum of 8 µg/L in MW2), selenium (maximum of 51 µg/L in MW2 split duplicate sample) and zinc (maximum of 18 µg/L in MW1) were found to be in excess of the adopted criteria for maintenance of ecosystems. The Werribee River is located approximately 1km to the east of the site and is likely to receive groundwater from the site. Therefore, maintenance of ecosystems is considered a relevant beneficial use.

However, given the depth to groundwater and the generally low concentrations (and low leachability) of these potential contaminants in soils sampled at the site, the elevated concentrations in groundwater are not considered to have resulted from on-site activities including fertilizers and insecticides. Instead the concentrations are considered to be naturally elevated and are within background levels for this type of soils. Also, similar concentrations were measured in all three wells, which are at considerable distance (from a hydrogeology perspective) from each other, and are consistent with concentrations measured in the basalt aquifer on adjacent land to the north during previous works. All this indicates a generalised and naturally occurring regime rather than a point source of contamination.

4.7.2 Stock Watering

Concentrations of selenium in excess of the ANZECC 1992 Australian Water Quality Guideline criterion for Selenium (20 µg/L) were detected in all three groundwater wells. The maximum concentration was 50 µg/L detected in the split duplicate sample retrieved from well MW2.

A search of environmental Audits that have previously been conducted in the vicinity of the site was undertaken to ascertain if selenium has been reported at similar concentrations regionally. The search showed that five Audits have been completed within a 10km radius of the site. Concentrations of selenium in groundwater were analysed in one Audit conducted for a site at 200-208 Derrimut Road, Hoppers Crossing, located in the same geology approximately 5km northeast of the subject site. For the three wells sampled for the Derrimut Road Audit, concentrations of selenium of 500 µg/L, 52 µg/L and 54 µg/L were detected. As for this audit subject site, no source of selenium was identified at the Derrimut Road site, and therefore these concentrations were considered likely to be naturally occurring. It is the Auditor's and his Hydrogeologist's opinion that the concentrations of selenium detected in groundwater at the subject site are also representative of background concentrations, and are consistent with off-site concentrations recorded in land in the vicinity of the site.

For the reasons discussed above, the elevated concentrations of selenium in groundwater are not considered to have resulted from all the known on-site activities, but are instead considered to be naturally elevated, and



therefore the site is considered to be "cleaned up to the extent practicable". The auditor has discussed this issue with EPA and the client during a site visit on 15 July 2004, and had had follow up discussions and emails with EPA including providing a relevant part from the draft audit, and hence the conclusion of the audit outcome. This is also in accordance with the SEPP, Groundwaters of Victoria, 1997 (part IV, 10.2.c). Clean up is not considered reasonable from a holistic environmental perspective (i.e. not reasonable or realistic to attempt remediation of groundwater that has naturally occurring elevated levels of selenium that are likely to be naturally occurring and a regional issue, which would make any clean up temporary only) and is, hence not realistic as discussed and agreed to with EPA and in accordance with the above mentioned SEPP clause.

4.7.3 Industrial Water Use

Industrial water use in the vicinity of the site is unlikely as the background water quality indicators such as TDS, generally make the water unsuitable for most industrial water use applications. Where industrial water criteria are exceeded, the background water quality indicators (i.e. TDS) become the objective (as per the Groundwater SEPP) and make the water unsuitable for that particular use.

Also, considering the proposed urban redevelopment of the site, the Auditor considers that this beneficial use is unlikely to be realised. Therefore, it is considered that the groundwater is not polluted with respect to this beneficial use.

4.7.4 Primary Contact Recreation

The groundwater may be used to fill swimming pools in the vicinity of the site or for future residential backyards pools, therefore primary contact recreation is considered to be a relevant beneficial use. In this case the ANZECC 1992 guidelines for raw drinking water have been used for consideration of this beneficial use. However, it is commonly considered that a person may drink up to 2L of water per day, and may swallow up to 100mL of water while swimming. Therefore, primary contact recreation criteria can be taken as 20 times the drinking water criteria where contaminants are not volatile, and hence do not represent an inhalation risk, and the dermal contact risk is assumed to be minimal.

As all detected contaminants are below the drinking water criteria with a 20 times factor applied, the groundwater is not considered to be polluted with respect to this beneficial use.

4.7.5 Buildings and Structures

The *SEPP Groundwaters of Victoria* states that introduced contaminants shall not cause groundwater to become corrosive to structures or building materials. The standing water level of the groundwater was found to be between 8.1 to 9.5m below surface level, and therefore is unlikely to come into contact with building foundations. It is also considered that the assessed groundwater quality has not adversely impacted this beneficial use anyway.

Therefore the groundwater is not considered to be polluted with respect to this beneficial use.



4.8 Summary of Pollution and Relevance of Beneficial Uses

Table 13 below summarises the relevance of protected beneficial uses at the site.

Table 13: Likelihood of Beneficial Uses Being Realised

Protected A2 Beneficial Uses	Existing	Likelihood/ relevance of beneficial use	Is Beneficial Use precluded by pollution?	Pollutants
Maintenance of ecosystems	Yes	The groundwater is likely to discharge to the Werribee River located 1km to the east of the site.	No	Not applicable (NA)
Stock watering	Yes	Not likely in an urban environment (consistent with the designated zoning by the planning authority).	Yes	Se
Industrial use	No	Criteria for specific industrial applications generally preclude the use of the groundwater for this purpose.	Not applicable	NA
Primary contact recreation	Yes	Groundwater wells may be used to fill or top up swimming pools.	Yes	NA
Buildings and structures	Yes	The depth of the water table makes it unlikely that buildings and structures will be affected by any groundwater pollution.	No	NA

4.9 Conclusions on Groundwater Quality

The results of the groundwater assessment performed for the audit by OTEK showed that there were concentrations of boron, chromium, copper, selenium and zinc in one or more wells that are in excess of the criteria for ecosystem protection. In addition, selenium exceeded the criteria for raw drinking water and stock watering in all three wells. As discussed in details above, however, and given the depth to groundwater, the absence of soil contamination, the low leachability of these elements in soil, the consistency of the results over wide areas of the site and on adjacent sites, and the site history, the elevated concentrations of these analytes in the groundwater are not considered to have resulted from all known on-site activities. Rather, they are considered most likely to be naturally occurring.

The beneficial use 'Ecosystem Protection', which applies at the point of discharge, is not considered to be precluded by the concentrations of the inorganics measured in the groundwater, as a result of the distance to the Werribee River from the site, i.e. Approximately 1km away.

The beneficial use 'Primary Contact Recreation' is not precluded as it is reasonably assumed that swimmers will ingest less than 2 litres of water (average daily intake/person) during a normal swimming session, as presented in the ANZECC 1992 Australian Water Quality Guidelines.

The elevated concentrations of selenium measured in all three wells are in excess of the guidelines for the beneficial use 'Stock Watering'. However, as the concentrations of selenium are considered to be naturally occurring, in accordance with Clause 10, 2 (c) of the SEPP - Groundwaters of Victoria and discussion with EPA, this guideline does not apply as in such instances the background level becomes the groundwater quality objective.



5. Quality Review of the Site Assessment and Auditor Verification

5.1 QA/QC Review

The Auditor and member of his team, as part of the audit process has undertaken a critical review of the Quality Assurance and Quality Control documentation and procedures presented by the Assessor to verify the integrity of the data presented. A summary of this review is provided in Table 14 below:

Table 14: Review of QA/QC of the Assessment

QA/QC check	Information provided	Auditor's comment
Work Plans	The assessor prior to each stage of work provided successive work plans during the audit.	After amendments at the request of the auditor, the work plans were found to become adequate for the purposes of the audit.
Field Procedures	The Assessor's standard field procedures were provided.	The Assessor's sampling procedures were reviewed and observed in the field, and were found to be consistent with current industry practice.
NATA accreditation	Laboratory Reports are provided in the appendices of the Assessor's reports.	All reports contain the NATA certification stamp and were signed by a NATA accredited signatory.
QC testing –Blind duplicate soil samples	A total of 80 blind duplicate soil samples were analysed during the assessment for the audit. RPDs were calculated for each blind duplicate pair and are provided in Tables 10D, 10F of the Assessor's November 2003 report.	Soil blind duplicate analysis was undertaken for As, Cd, Cu, Pb, Ni, Zn and Hg. Of the 422 blind duplicate soil analytes for which RPDs could be calculated, 383 were below the acceptable result of 50%. That is, 91% were acceptable.
QC testing –Field Split soil samples	A total of 97 split duplicate soil samples were analysed during the assessment for the audit. RPDs were calculated for each split duplicate pair and are provided in Tables 10D, 10F, 19 and 20 of the Assessor's November 2003 report.	Soil blind duplicate analysis was undertaken for As, Cd, Cu, Pb, Ni, Zn and Hg. Of the 506 split duplicate soil analytes for which RPDs could be calculated, 382 were below the acceptable result of 50%. That is, 75% were acceptable.
QC testing –Blind duplicate groundwater samples	One blind duplicate groundwater sample was retrieved during the groundwater assessment. RPDs were calculated for each analyte pair and are provided in Tables 19 and 20 of the Assessor's November 2003 report.	Groundwater blind duplicate analysis was undertaken for Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Se, Sn, V, Zn, Hg, BTEX and TPHs. All of the blind duplicate groundwater analytes for which RPDs could be calculated, were below the acceptable result of 50%.



QA/QC check	Information provided	Auditor's comment
QC testing –Field Split groundwater samples	One split duplicate groundwater sample was retrieved during the groundwater assessment. RPD's were calculated for each analyte pair and are provided in Tables 19 and 20 of the Assessor's November 2003 report.	Groundwater split duplicate analysis was undertaken for Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Se, Sn, V, Zn, Hg, BTEX and TPH All of the split duplicate groundwater analytes for which RPDs could be calculated were below the acceptable result of 50%.
Soil QC-Testing	See above	80 of the total 1,296 soil samples analysed, i.e. 6.2 %, were blind duplicates. 97 of the total 1,296 soil samples analysed, i.e. 7.5 %, were split duplicates. This frequency of field duplicate soil samples are in accordance with the Australian Standard (AS4482.1) requirement of minimum 5% blind duplicates and 5% split duplicates.
Groundwater QC-Testing	See above	1 of the total 3 groundwater samples analysed, i.e. 33%, were blind duplicates. 1 of the total 3 groundwater samples analysed, i.e. 33%, were split duplicates. This frequency of field duplicate groundwater samples are in accordance with the Australian Standard (AS4482.1) of minimum 5% blind duplicates and 5% split duplicates.
Laboratory Internal QC	Laboratory Reports were provided in the appendices of the Assessor's reports.	Amdel, Labmark and AGL performed internal QC with adequate testing and satisfactory results for method blanks, laboratory duplicates and matrix spikes
Rinsate Blanks	Two rinsate blanks and two trip blanks were analysed during the assessment for the audit. The results of the analysis are provided in Tables 10F, 19 and 20 of the Assessor's December 2003 report.	All results were less than the detection limit of the test.
Holding times	Laboratory Reports are provided in the appendices of the Assessor's reports. (provided electronically in the attached CD).	All samples were tested within the recommended holding times.
Sample tracking	Chains of Custody were provided in the appendices of the Assessor's reports.	All chains of custody were present and correctly completed.
Sample preservation and storage	The Assessor's standard field procedures were provided.	The standard field procedures specified appropriate sample preservation and storage methods.
Composite sampling method	During the initial soil sampling, 1,204 soil samples were composited into two and three part composites for analysis.	Compositing was performed in the laboratory in accordance with AS4482.1. Composite samples were not analysed for volatiles.



QA/QC check	Information provided	Auditor's comment
Volatile losses	Observations were made of the assessors sampling procedures during site inspections. Specific field procedures for soil sampling are provided in Section 5 of the OTEK 2003 December report.	The Assessor's field procedures specify sampling methodologies to minimise the loss of volatiles. These were observed to be implemented during sampling.

5.2 Auditor Site Verification Activities

The Auditor and/or his representative inspected the site on approximately 20 occasions (including Areas 3 and 4 - subject to separate audits) during the duration of the audit including site meetings with the assessors, the client, and EPA. Other site verification activities included the following:

- ▶ Site photographs;
- ▶ Inspections of borings/sampling/test pits/groundwater wells/trenching/geophysical surveying; and
- ▶ Interviews with the assessor and site management.

5.3 Conclusions on QA/QC

The results of the QA/QC program implemented during the different sampling events of the site assessment are considered to be acceptable, with the exception of the split duplicate soil samples. This refers to the poor correlation of split duplicate soil samples with the primary samples collected during the initial sampling, which indicated laboratory error - in particular arsenic was found to be consistently elevated in primary samples. As discussed before, an investigation by the laboratories subsequently resulted in confirmation by the primary laboratory (Amdel) that an error had occurred causing arsenic to be reported over two times its actual value (confirmed in writing by Amdel in their letter of 11 November 2003 – Appendix D). As the samples had by that time been discarded, re-testing was not possible. Hence, subsequent further soil sampling and analysis were carried out, which confirmed the results of the secondary laboratory as the analysis of the Amdel of this patch of samples showed that arsenic concentrations were not elevated.

After consideration of the QA/QC procedures implemented and the actions taken above, the Auditor was satisfied that the quality of the final test results were adequate and therefore the results reported were representative of the contamination status of the soil and groundwater at the site.



6. Auditor's Assessment of Risks at the Site

6.1 Evaluation of Risks - Human Health

There was no evidence of soil contamination in excess of the NEPM HIL 'A' criteria (or other equivalent criteria) for a standard residential use. These criteria are the most stringent of the NEPM criteria (ie other HIL criteria) and are protective of all beneficial uses from human health perspective.

Therefore, no human health risks associated with the proposed use of the site exist.

6.2 Evaluation of Risks - Ecological

The results of soil sampling showed that maximum concentrations of arsenic and copper exceeded the ANZECC B/NEPM EIL criteria in some samples. However, the results of subsequent elutriation testing indicated that the bioavailability/bioaccessibility of these analytes in the soil at the site was very low, and the bioaccessible proportion of the total concentrations in all samples analysed were well below the NEPM EIL for each element. Therefore, the potential for phytotoxicity to occur from the concentrations present in the soil at the site was considered to be negligible and most unlikely.

The results of the groundwater assessment showed that concentrations of boron, chromium, copper, selenium and zinc were in excess of the criteria for ecosystem protection. However, as discussed in details above and given the depth to groundwater, the absence of soil contamination, the low leachability of these analytes in soil, the consistency of the results over wide areas of the site and on adjacent sites and the site history, the elevated concentrations of these analytes in the groundwater were not considered to have resulted from on-site activities. Rather, they were considered to be naturally occurring. The beneficial use 'Ecosystem Protection', which applies at the point of discharge, was not considered to be precluded by the concentrations of the inorganics measured in the groundwater, this is also due to the nature of the soil type and the distance to the Werribee River from the site, i.e. Approximately 1km away.

Therefore, it is considered that no ecological risks associated with the land beneficial uses exist.

6.3 Beneficial Uses Impacted by the Condition of the Site

Concentrations of selenium in excess of the relevant ANZECC 1992 AWQG criteria that are considered to be protective of the beneficial use of Stock Watering were detected in groundwater at the site. The current, likely to be natural, condition of the site, therefore adversely impacts this beneficial use. However, as discussed above and as the concentrations of selenium are considered to be naturally occurring, and therefore in accordance with the SEPP – Groundwaters of Victoria, the selenium criterion for Stock Watering is not applicable as the selenium background levels become the groundwater quality objective.

6.4 Consistency of the Proposed Development with the Condition of the Site

The site is proposed to be developed for a standard low-density residential use (defined in the SEPP Prevention and Management of Contamination of Land as 'Sensitive Use – Other'), and includes garden/accessible soil.

Based on the outcomes presented in Sections 6.1 and 6.2 above, the auditor considers that the current condition of the site is consistent with the proposed development.



7. Audit Conclusions

Following completion of the environmental audit at Area 2, Melbourne Water's Werribee Fields, Werribee (as defined in section 1.1 of this report and the attached site plan), the following conclusions were made. These conclusions should be read in conjunction with the other sections of the audit report:

- ▶ There was no evidence of soil contamination resulting from all known activities at the site or from imported fill material. However, slightly elevated concentrations of arsenic and chromium were found to be present at some locations. These were considered to be naturally occurring and were found to have low leachability and bioaccessibility, and therefore did not impact on the beneficial uses of the land.
- ▶ There were concentrations of boron, chromium, copper, selenium and zinc in groundwater in excess of the criteria for ecosystem protection, and selenium in excess of the criteria for raw drinking water (relevant to the recreation beneficial use), and stock watering. These concentrations were considered to be naturally elevated and do not preclude the beneficial uses of ecosystem protection or primary contact recreation. Selenium levels exceeded the criterion for the beneficial use of stock watering, however, as these levels were considered to be naturally occurring, the auditor considers that the site has been "cleaned up to the extent practicable", this issue was discussed with EPA as detailed in different sections of this report.
- ▶ There were no visible or buried wastes or offensive odours that would adversely impact the aesthetic, and/or the air quality at the site.
- ▶ There was no evidence of any contaminants present on the site that may have migrated off-site.
- ▶ The QA/QC activities undertaken by the Assessors provided confidence that the testing results of the soils and groundwater were representative of the conditions at the site at the time of the conducting this audit.

Based on all information obtained during the site assessment for the audit, the Auditor was of the opinion that the site was suitable for all beneficial uses, and therefore in accordance with the Environment Protection Act 1970, and the appropriate policies and guidelines issued by the EPA, a Certificate of Environmental Audit has been issued.

Other related information contained in the Certificate of Environmental Audit is as follows:

- ▶ There are elevated concentrations of selenium in groundwater which exceed the threshold criterion that would be commonly adopted for stock watering. However, as these levels were considered to be naturally occurring, the auditor considered that the beneficial uses of the land were not affected.



- ▶ The site is located within a RAMSAR protected area and Melbourne Water is following the appropriate requirements under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999

DATED: 29 October 2004

SIGNED: *Fouad Abo*

DR FOUAD ABO

ENVIRONMENTAL AUDITOR

(Appointed pursuant to the Environment Protection Act 1970)



8. Limitations Of This Report

This report presents the outcome of an environmental audit conducted for the purposes of determining whether to issue a Certificate of Environmental Audit for the site or where a Certificate is not issued to determine what beneficial uses the site is suitable for and what conditions (if any) should be placed on a Statement of Environmental Audit. The advice provided herein relates only to these purposes and must be reviewed by a competent Environmental Scientist or Environmental Engineer, experienced in contaminated site investigations, before being used for any other purpose. GHD Pty Ltd (GHD) and the Auditor accept no responsibility for other use of the advice.

Where drill hole or test pit logs, laboratory tests, geophysical tests and similar work have been performed and recorded by others, the data is included and used in the form provided by others. GHD accepts responsibility for satisfying itself that the data is representative of conditions on the site but does not warrant the complete accuracy of the information.

The advice tendered in this report is based on information obtained from the investigation locations, test points and sampling points and is not warranted in respect to the conditions that may be encountered across the site at other than these locations. *It is emphasised that the actual characteristics of the subsurface and surface materials may vary significantly between adjacent test points and sample intervals and at locations other than where observations, explorations and investigations have been made.* Sub-surface conditions, including groundwater levels and contaminant concentrations can change over time. This should be borne in mind when assessing the data.

Despite the above limitations of any subsurface investigation, it is the Auditor's opinion that the test points chosen are representative of conditions on the site and that the laboratory results on soil and groundwater samples are representative of soils and, where relevant, groundwater on the site.

It should be noted that because of the inherent uncertainties in sub-surface evaluations, changed or unanticipated sub-surface conditions might occur that could affect total project cost and/or execution. Neither GHD nor the Auditor accepts responsibility for the consequences of significant variances in the conditions between test points or with time.

An understanding of the site conditions depends on the integration of many pieces of information, some regional, some site-specific, some structure-specific, and some experienced-based. Hence, this report should not be altered, amended or abbreviated, issued or read in part and issued incomplete in any way without prior checking and approval by GHD and the auditor. GHD and the auditor accept no responsibility for any circumstances that arise from the issue of the report that has been modified in any way as outlined above.

This Audit was carried out for the purposes of assessing whether soil and groundwater on the site is contaminated with chemicals of man-origin or contains chemicals or elements at unusual concentrations that may impact on beneficial use. It was not carried out for the purposes of assessing the load-carrying suitability of soil and fill on the site for foundations nor establishment of gardens and lawn, which would require additional inspection and testing.

Conclusions and executive summary must not be read in isolation of other sections of the report.



9. References

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- ▶ Australian & New Zealand Environment & Conservation Council (1992) *Australian Water Quality Guidelines for Fresh and Marine Waters*. National Water Quality Management Strategy.
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- ▶ EPAV, (1995). *Classification of Wastes*, Publication 448, September 1995
- ▶ EPAV, (2000). *A Guide to the Sampling and Analysis of Waters, Wastewater, Soils and Wastes*. Publication 441 7th Edition, March 2000
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- ▶ Victorian Government, (1997). *State Environment Protection Policy (Groundwaters of Victoria)*. Victorian Government Gazette No. S160 17 December 1997.
- ▶ Victorian Government, (2002). *State Environmental Protection Policy (Prevention and Management of Contamination of Land)*. Victorian Government Gazette No. S95 4 June 2002.
- ▶ Victorian Government, (2003). *State Environment Protection Policy (Waters of Victoria)*. Victorian Government Gazette No. S107 Wednesday 4th June 2003.



Appendix A

Site Plan and Certificate of Title Information

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REGISTER SEARCH STATEMENT Land Victoria

Security no : 124007184217W

Volume 10446 Folio 721

Produced 27/08/2003 01:08 pm

LAND DESCRIPTION

Lot 1 on Plan of Subdivision 412756U.
PARENT TITLE Volume 10309 Folio 293
Created by instrument PS412756U 28/05/1999

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
MELBOURNE WATER CORPORATION of LEVEL 5/607 BOURKE STREET MELBOURNE 3000
PS412756U 28/05/1999

ENCUMBRANCES, CAVEATS AND NOTICES

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

NOTICE Section 47(2) Heritage Act 1995
REGISTER NO. 1884
X234908X 29/12/2000

DIAGRAM LOCATION

SEE PS412756U FOR FURTHER DETAILS AND BOUNDARIES

DEALING ACTIVITY IN THE LAST 105 DAYS

NIL

STATEMENT END

instruments number	text reference	
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PS412756U	PS412756U	order



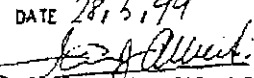

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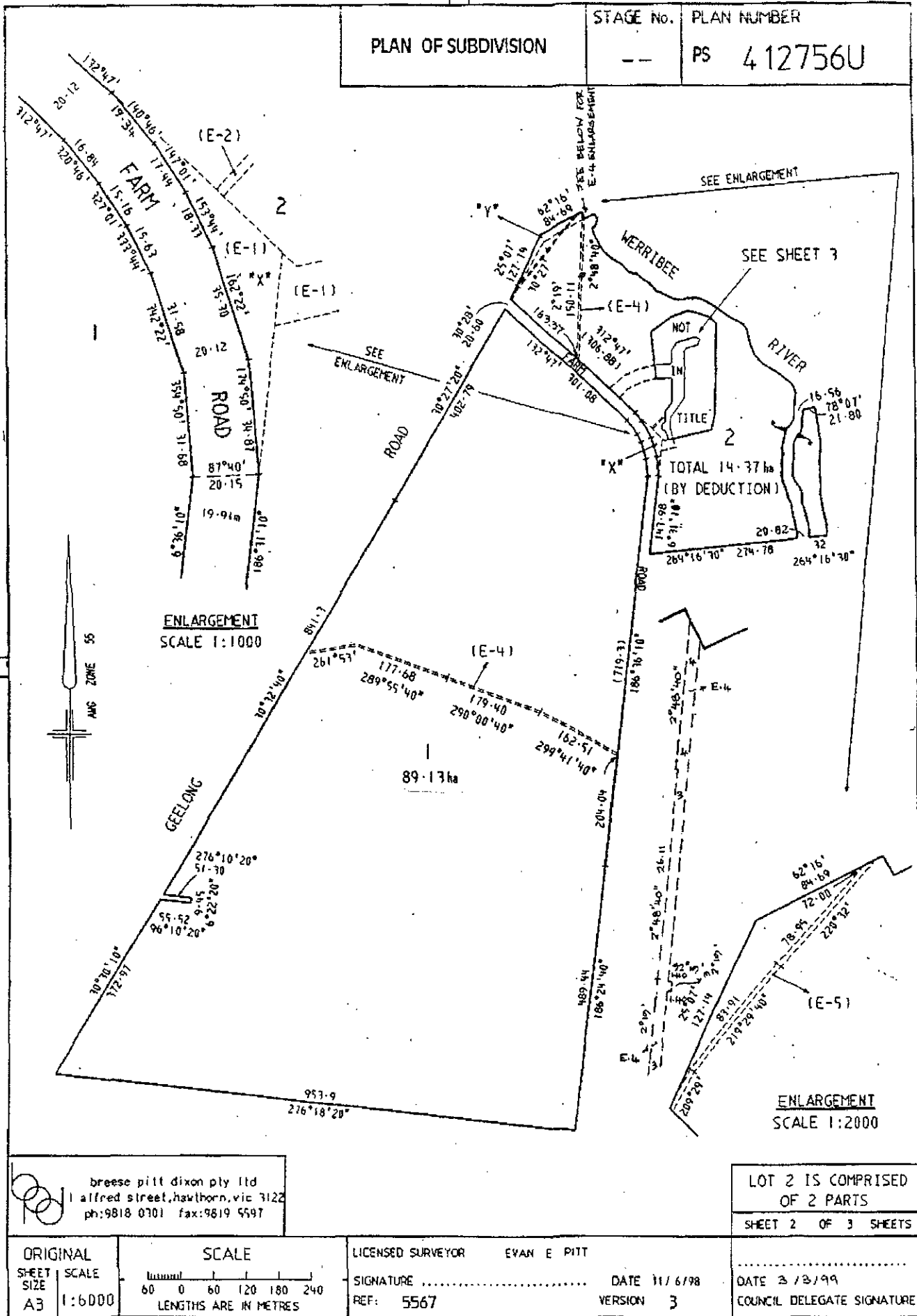
Level 3 121 William St
Melbourne, VIC 3000
Phone (03) 9649 7070
Fax (03) 9649 7125

The following charges were applied:

Date	Charge	GST	Total
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	PLAN OF SUBDIVISION	STAGE No. ---	LTO USE ONLY EDITION 2	PLAN NUMBER PS 412756U
LOCATION OF LAND PARISH: MAMBOURIN CROWN ALLOTMENT: 22A, 23A, 24A, 24B AND PART 10A AND PART OF A FORMER GOVERNMENT ROAD TOWNSHIP: WERRIBEE CROWN ALLOTMENT: 4A, 5A, 6A, 7A, 8A, 9A, PART H SECTION 7 AND PART B SECTION 8 CROWN PORTION: PART 3 SECTION 7 LTO BASE RECORD: CHART 8 MAMBOURIN TITLE REFERENCES: VOL.10509 FOL.293 LAST PLAN REFERENCE: LOT K PS:401042Y POSTAL ADDRESS: FARM ROAD, (AT TIME OF SUBDIVISION) WERRIBEE, 3030 AMG CO-ORDINATES: E 293 000 (OF APPROX. CENTRE OF PLAN) N S 801 000 ZONE: 55		COUNCIL CERTIFICATION AND ENDORSEMENT COUNCIL NAME : WYNDHAM CITY COUNCIL REF : 75/110/5767 1. THIS PLAN IS CERTIFIED UNDER SECTION 6 OF THE SUBDIVISION ACT 1988. 2. THIS PLAN IS CERTIFIED UNDER SECTION 11(7) OF THE SUBDIVISION ACT 1988: DATE OF THE ORIGINAL CERTIFICATION UNDER SECTION 6 3. THIS IS A STATEMENT OF COMPLIANCE ISSUED UNDER SECTION 21 OF THE SUBDIVISION ACT 1988. OPEN SPACE (i) A REQUIREMENT FOR PUBLIC OPEN SPACE UNDER SECTION 18 OF THE SUBDIVISION ACT 1988 IS / HAS NOT BEEN MADE. (ii) THE REQUIREMENT HAS BEEN SATISFIED. (iii) THE REQUIREMENT IS TO BE SATISFIED IN STAGE COUNCIL DELEGATE COUNCIL SEAL DATE 3 / 3 / 99 RE-CERTIFIED UNDER SECTION 11(7) OF THE SUBDIVISION ACT 1988 COUNCIL DELEGATE COUNCIL SEAL DATE / /		
VESTING OF ROADS OR RESERVES				
IDENTIFIER	COUNCIL/BODY/PERSON			
NIL	NIL			
NOTATIONS				
DEPTH LIMITATION DOES NOT APPLY EXCEPT FOR: THE LAND MARKED "X" - LIMITED TO A DEPTH OF 15m BELOW THE SURFACE THE LAND MARKED "Y" - LIMITED TO A DEPTH OF 15.24m BELOW THE SURFACE SURVEY: THIS PLAN IS NOT BASED ON SURVEY		STAGING THIS IS NOT A STAGED SUBDIVISION PLANNING PERMIT No. DATE OF ORIGINAL CERTIFICATION: / / THIS SURVEY HAS BEEN CONNECTED TO PERMANENT MARKS No(s) IN CLAIMED SURVEY AREA No.		
EASEMENT INFORMATION				NOTATIONS
LEGEND: A - APPURTENANT E - ENCUMBERING EASEMENT R - ENCUMBERING EASEMENT (ROAD)				ESTATE
EASEMENT REFERENCE	PURPOSE	WIDTH (METRES)	ORIGIN	LAND BENEFITED OR IN FAVOUR OF
(E-1)	WAY, DRAINAGE, SEWERAGE AND SUPPLY OF GAS, WATER, TELECOMMUNICATIONS AND ELECTRICITY	SEE PLAN	PS:401042Y	LAND IN PS:401042Y, POWERCOR LIMITED, CITY WEST WATER LIMITED AND WYNDHAM CITY COUNCIL
(E-2)	DRAINAGE AND SEWERAGE	3	PS:401042Y	LAND IN PS:401042Y, WYNDHAM CITY COUNCIL, CITY WEST WATER LIMITED
(E-3)	CARRIAGEWAY	SEE PLAN	PS:401042Y	LAND IN PS:401042Y
(E-4)	SEWERAGE	SEE PLAN	THIS PLAN	CITY WEST WATER LIMITED
(E-5)	TELECOMMUNICATIONS	2	THIS PLAN	LAND IN THIS PLAN
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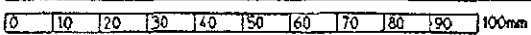
breese pitt dixon ply ltd
 1 alfred street, hawthorn, vic 3122
 ph: 9818 0701 fax: 9819 5597

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 SHEET 2 OF 3 SHEETS

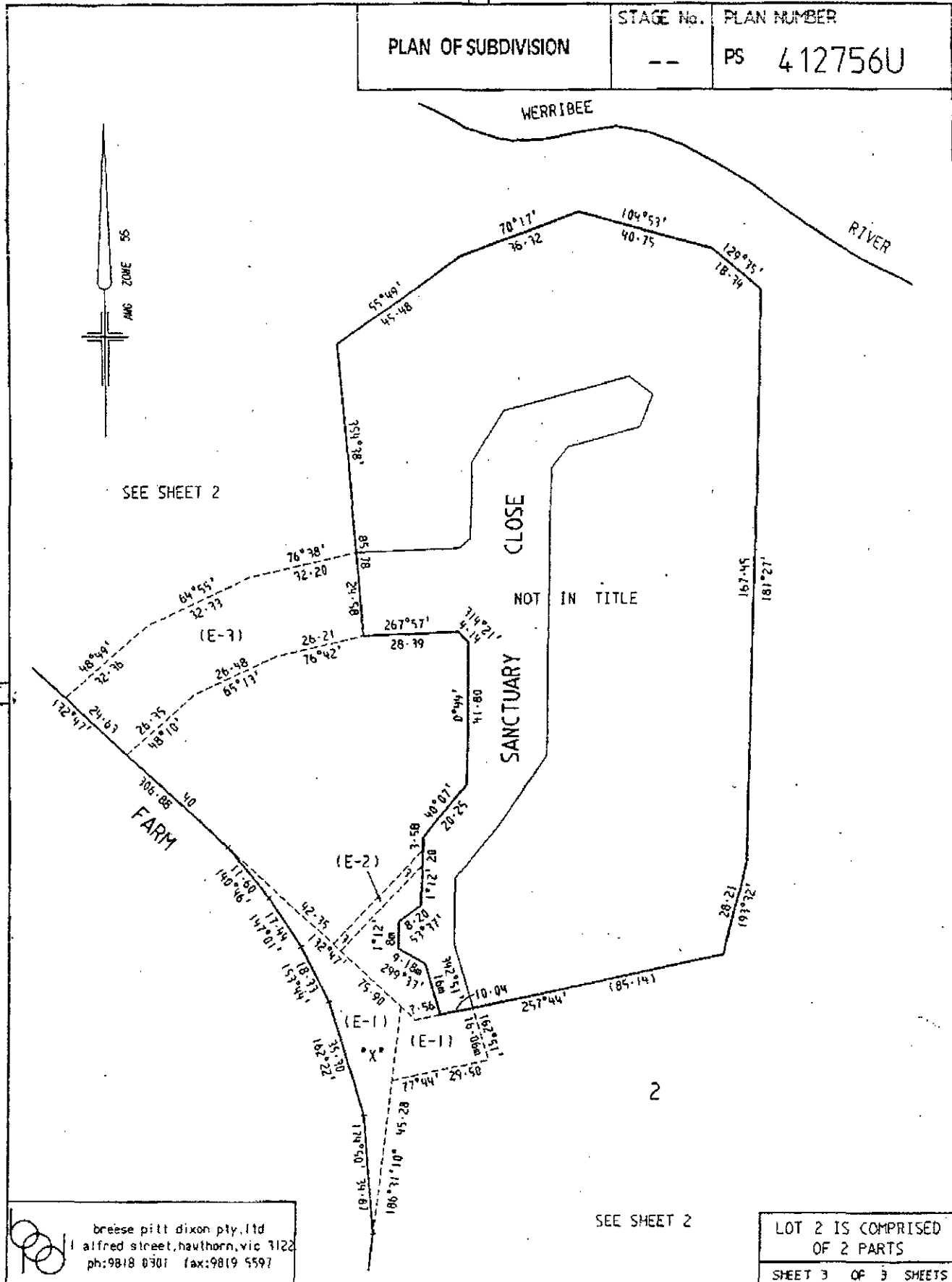
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DATE 3/3/99
 COUNCIL DELEGATE SIGNATURE



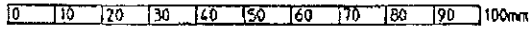
PLAN OF SUBDIVISION	STAGE No.	PLAN NUMBER
	--	PS 412756U



breese pitt dixon pty. ltd
 1 alfred street, hawthorn, vic 3122
 ph:9818 0301 fax:9819 5597

LOT 2 IS COMPRISED
 OF 2 PARTS
 SHEET 3 OF 3 SHEETS

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SCALE LENGTHS ARE IN METRES		REF: 5567	VERSION 3	COUNCIL DELEGATE SIGNATURE	



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REGISTER SEARCH STATEMENT Land Victoria

Security no : 124007184219U Volume 10513 Folio 533
Produced 27/08/2003 01:08 pm

LAND DESCRIPTION

Lot P on Plan of Subdivision 401725T.
PARENT TITLES :
Volume 03012 Folio 241 Volume 10512 Folio 139
Created by instrument PS401725T 02/05/2000

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
MELBOURNE WATER CORPORATION
PS401725T 02/05/2000

ENCUMBRANCES, CAVEATS AND NOTICES

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE PS401725T FOR FURTHER DETAILS AND BOUNDARIES

DEALING ACTIVITY IN THE LAST 105 DAYS

NIL

STATEMENT END

instruments number	text reference	order
PS401725T	PS401725T	

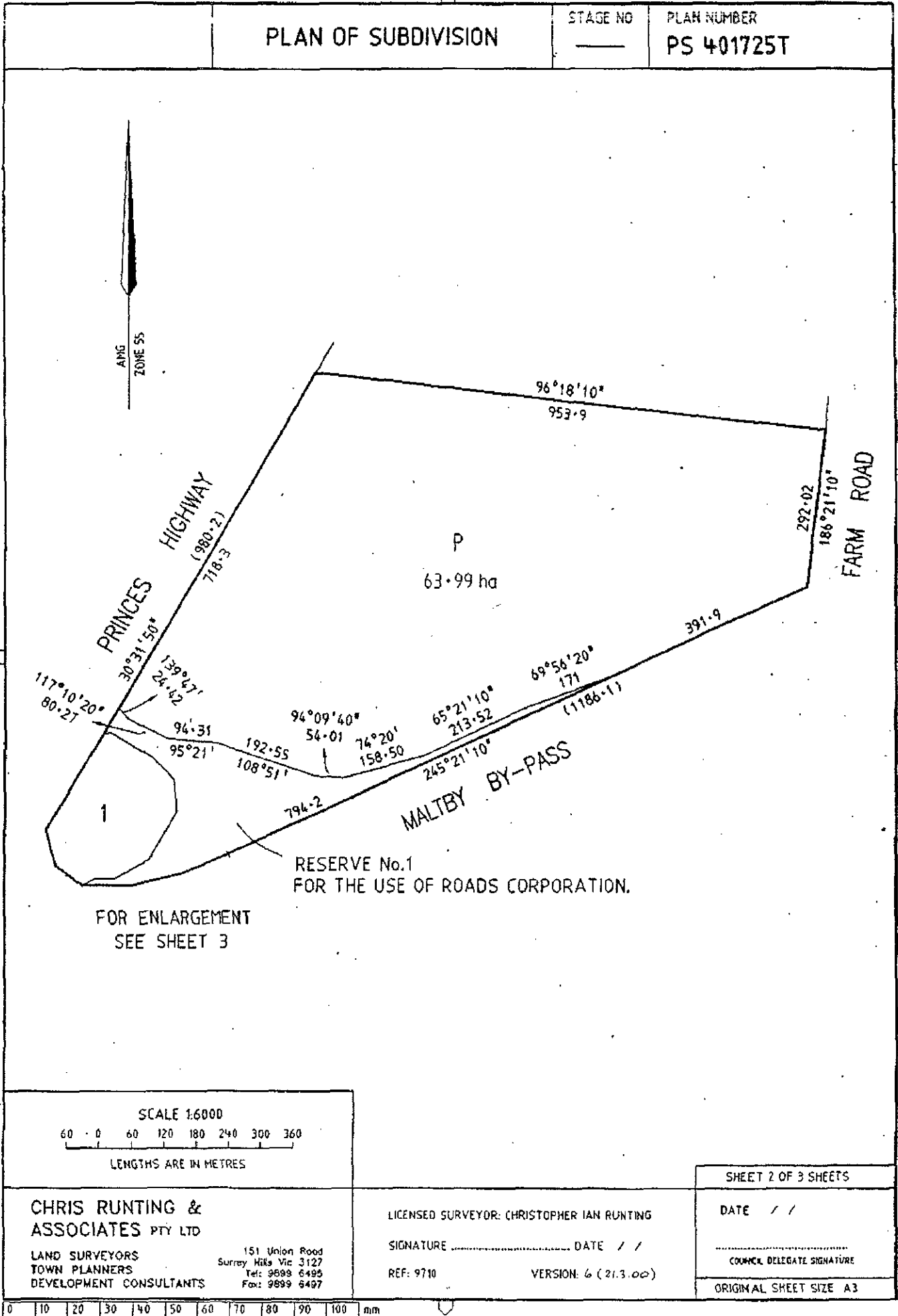


www.discoverie.com.au

Level 3 121 William St
Melbourne, VIC 3000
Phone (03) 9649 7070
Fax (03) 9649 7125

The following charges were applied:

Date	Charge	GST	Total
27/08/2003 01:08PM	\$15.00	\$1.50	\$16.50



PLAN OF SUBDIVISION

Stage No. /

LR use only

Plan Number

EDITION

PS 511425S

Location of Land

Parish: MAMBOURIN
 Township: WERRIBEE
 Crown Allotment: 22A
 Section: 7
 Crown Allotment: 4A, 5A, 6A, 7A, 8A, 9A, & H PART
 Section: 8
 Crown Allotment: 8 (PART)

Title Reference: VOL 10446 FOL 721

Last Plan Reference: PS 412756U LOT 1

Postal Address: PRINCES HIGHWAY
 (at time of subdivision) WERRIBEE 3030

AMG Co-ordinates E 292800 Zone: 55
 (of approx. centre of land in plan) N 5800800

Council Certification and Endorsement

Council Name: WYNDHAM CITY COUNCIL Ref: WYPA2241 WYR 0797
 1. This plan is certified under section 6 of the Subdivision Act 1988.
~~2. This plan is certified under section 11(7) of the Subdivision Act 1988.~~
~~Date of original certification under section 6~~
 3. ~~This is a statement of compliance issued under section 21 of the Subdivision Act 1988.~~

OPEN SPACE

- (i) A requirement for public open space under section 18 of the Subdivision Act 1988 has/has not been made.
- (ii) ~~The requirement has been satisfied.~~
- (iii) ~~The requirement is to be satisfied in Stage~~ _____

Council Delegate
~~Council Seal~~
 Date 19 / 05 / 2003

~~Re-certified under section 11(7) of the Subdivision Act 1988~~

~~Council Delegate~~
~~Council Seal~~
 Date / /

Vesting of Roads and/or Reserves

Notations

Staging This is/is not a staged subdivision Planning Permit No.

Depth Limitation DOES NOT APPLY

Survey This plan is/~~is not~~ based on survey
 This survey has been connected to permanent marks no(s)
 in Proclaimed Survey Area No.

Easement Information

Legend: E - Encumbering Easement, Condition in Crown Grant in the Nature of an Easement or Other Encumbrance
 A - Appurtenant Easement
 R - Encumbering Easement (Road)

Subject Land	Purpose	Width (metres)	Origin	Land Benefited/In Favour Of
E-1	SEWERAGE	SEE DIAG	PS 412756U	CITY WEST WATER LIMITED
E-2	SEWERAGE	SEE DIAG	THIS PLAN	LOT 1 ON THIS PLAN
E-3	CARRIAGEWAY	SEE DIAG	THIS PLAN	LOT 1 ON THIS PLAN.

LR use only

Statement of Compliance
 Exemption Statement

Received
 Date / /

LR use only

PLAN REGISTERED
 TIME
 DATE / /

Assistant Registrar of Titles

Sheet 1 of 3 sheet

WERRIBEE FIELD 2 LOTS

Bosco Jonson Pty Ltd
 A.B.N 95 282 532 642
 P.O. Box 243, South Melbourne, Vic 3205
 71 Palmerston Crescent South Melbourne
 Vic 3205 Australia DX 20524 Emerald Hill
 Tel (03) 9599 1400 Fax (03) 9599 5997



LICENSED SURVEYOR (PRINT) ROSS NICHOLSON

SIGNATURE _____ DATE / /

REF 2110003 07/05/03 VERSION C
 DWG 211000WC

DATE / /

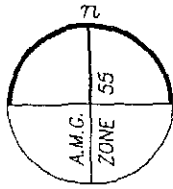
COUNCIL DELEGATE SIGNATURE _____

PLAN OF SUBDIVISION

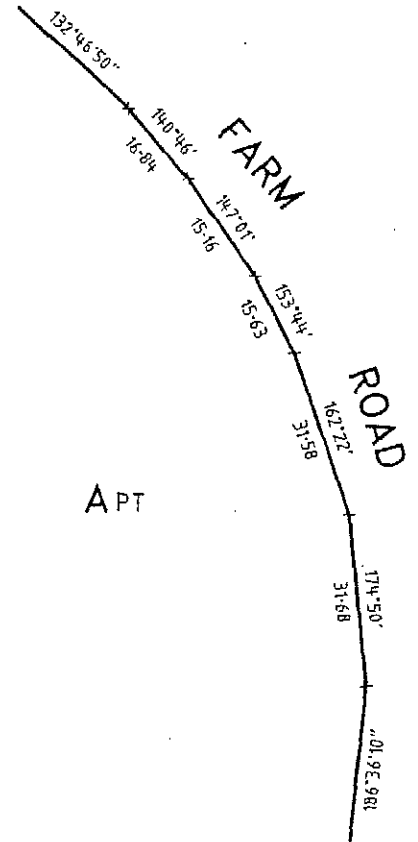
Stage No.

Plan Number

PS 511425S



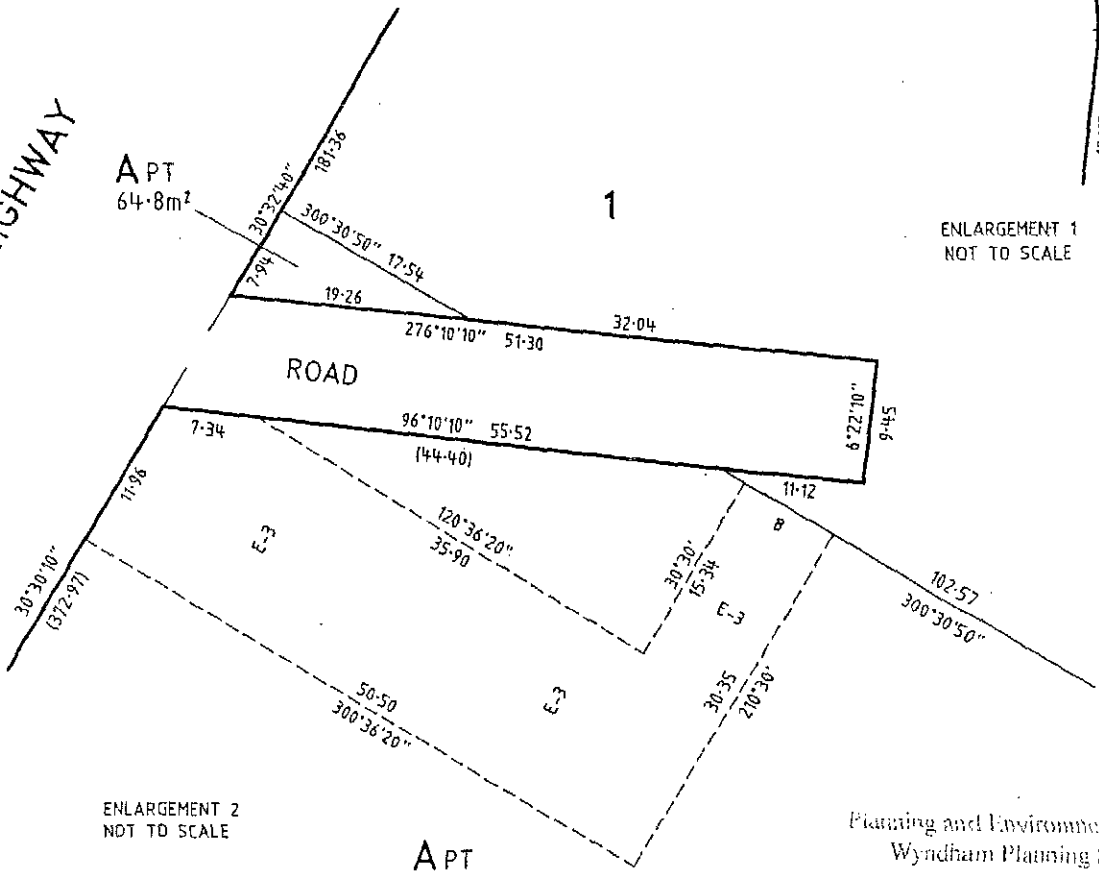
PRINCES HIGHWAY



APT
64.8m²

1

ENLARGEMENT 1
NOT TO SCALE



ENLARGEMENT 2
NOT TO SCALE

APT

Planning and Environment Act 1987
Wyndham Planning Scheme
Plan ...3... of ...3...
Referred to in Permit WYP ...224...
Signature of the Responsible Authority
[Signature] Date 14/05/2003

WERRIBEE FIELD

2 LOTS

Bosco Jonson Pty Ltd

A.B.N 95 282 532 642
P.O. Box 243, South Melbourne, Vic 3205
71 Palmerston Crescent South Melbourne
Vic 3205 Australia DX 20524 Emerald Hill
Tel 03) 9699 1400 Fax 03) 9699 5992

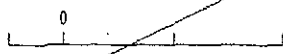


ORIGINAL

SCALE

SCALE

SHEET
SIZE
A3



LENGTHS ARE IN METRES

LICENSED SURVEYOR (PRINT) ROSS NICHOLSON

SIGNATURE DATE / /

REF 2110003: 07/05/03 VERSION C
DWG 211000WC

Sheet 3 of 3 sheets

DATE / /

COUNCIL DELEGATE SIGNATURE

Original sheet size A3

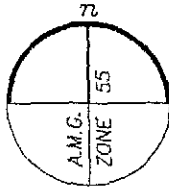
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PLAN OF SUBDIVISION

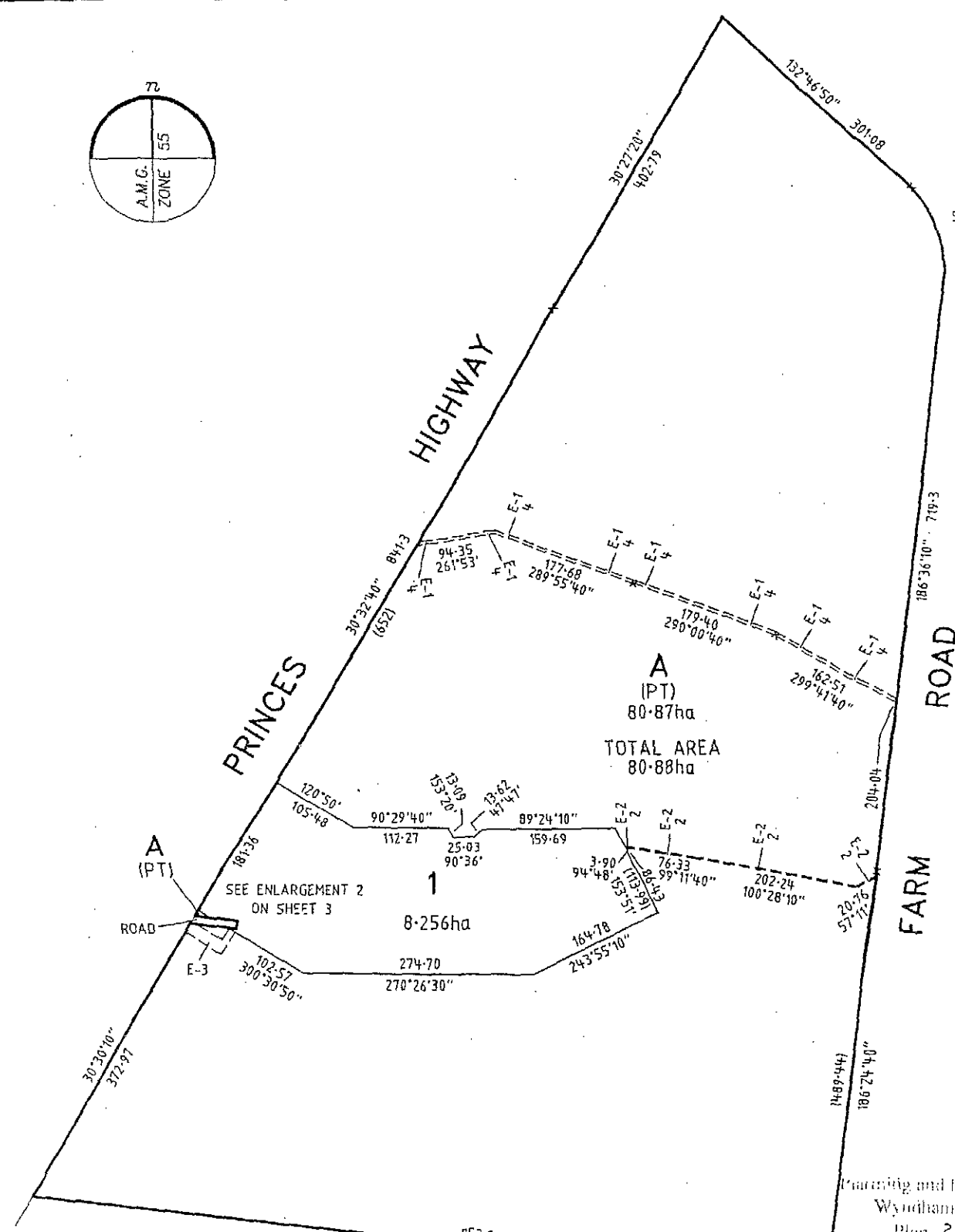
Stage No.

Plan Number

PS 511425S



SEE ENLARGEMENT ON SHEET 2



WERRIBEE FIELD 2 LOTS

Bosco Jonson Pty Ltd
 A.B.N 95 282 532 642
 P.O. Box 243, South Melbourne, Vic 3205
 71 Palmerston Crescent South Melbourne
 Vic 3205 Australia DX 20524 Emerald Hill
 Tel 03) 9699 1400 Fax 03) 9699 5992



Planning and Environment
 Wyndham Planning Scheme
 Plan 2 of 3
 Referred to in Permit WYP
 Signature of the Responsible Authority
 Date

ORIGINAL	SCALE
SCALE	SHEET SIZE
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<p>LENGTHS ARE IN METRES</p>	

LICENSED SURVEYOR (PRINT) ROSS NICHOLSON
 SIGNATURE DATE / /
 REF 2110003 07/05/03 VERSION C
 DWG 211000WC

Sheet 2 of 3 sheets
 DATE / /
 COUNCIL DELEGATE SIGN
 Original sheet size A3



Appendix B
Assessor's Phase 1 Report (October 2002)



Appendix C
Assessor's Phase 2 Report
(November 2003)



Appendix D

Letters re: Laboratories Checks of Results

11 November 2003

O TEK Australia
Level 1, 222 St Kilda Road,
Hawthorn VIC 3182

Attention: Mr Andrew Kite

Dear Andrew

Re - False Positives for Arsenic in Soil samples from Werribee, 2001.

Thank you for your query of October 13th with regards to the higher than expected Arsenic results from your site in Werribee, Vic (ref. M0003). In accordance with our quality system, a client query was raised and due to the nature of the complaint, a Corrective Action Investigation (CAI) was initiated to identify the source of the higher than normal results being reported from the original data.

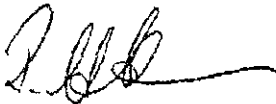
Due to the time between the samples being tested and this complaint, we no longer have the original sample available to re-analysis. Upon investigation, we identified an oversight by the senior chemist as the root cause of the error. Soil samples have a complex matrix for analysis by ICP-AES due to high Iron content. Iron will cause spectral interferences with other elements and the instrument software compensates for this interference. To ensure the software is correctly compensating for the Iron and other elemental interferences, this laboratory analyses a Certified Reference Material Standard or CRM. The Certified Reference Material is a soil sample, which is certified with a known concentration of target elements. The CRM analysed with your samples gave an elevated result for Arsenic, which indicates there could have been incorrect software compensation. Unfortunately the analyst did not notice this error and the samples were reported. The net effect was that the Arsenic results were reported approximately twice as high as they should have been (based on the elevated CRM)

This interference was also found to have affected the element Copper from sample run on the 30/11/01, again with an elevated CRM result. This could affect OTEK samples 2A/346/0.5, 2A/358/0.5, 2A/370/0.5, 2A/410/0.5 & 2A/434/0.5. All other elements in the requested data was found to be within acceptable limits and reported correctly.

Experienced analysts all know that this needs to be checked and accounted for the CRM, however the analyst on the days the samples were run, failed to notice the Arsenic (and Copper) were elevated and reported the results. Further investigation into the issue was inhibited as the Laboratory Manager and Senior Chemist who approved the results at the time, no longer work for Amdel.

I trust that this investigation explains the cause of the error satisfactorily and will leave you assured that a repeat episode will not re-occur. I would like to apologize for the inconvenience this caused you and again would like to thank you for bringing this to our attention. Please feel free to call myself or James McMahon (the NSW Lab Manager) should you require any further information or clarification.

Yours sincerely



Ryan Hamilton

Client Services Coordinator
Amdel Ltd. Phone: 61 2 9482 1922
Fax: 61 2 4902 4899
Mobile: 0408 813 065
Web: www.amdel.com



22nd October 2003

Dear Andrew

This letter is to confirm that LabMark has checked the transcription of data for the reports indicated in your fax dated 13th October 2003 ref:M3134C0803.doc. As part of this process SAL laboratory manager Lance Smith reviewed raw data pertaining to these reports and found the data quality to be satisfactory (note the analysis was sub-contracted to SAL, NATA accreditation no. 1884).

If you have any further queries do not hesitate in contacting me on 02 9476 6533 or mobile no. 0419 601 496.

Regards

A handwritten signature in black ink, appearing to read "Simon Mills", written in a cursive style.

Simon Mills
Instrument Manager
Labmark Pty Limited



Appendix E
Glossary of Terms



"Act"	the Environment Protection Act 1970 as amended
ANZECC	Australian and New Zealand Environment and Conservation Council, a council of ministers responsible for environment in state and federal government including the NZ national government.
ANZECC B	concentration guidelines for contaminants issued by ANZECC in 1992 which, when exceeded, indicate that investigation of the impact of the contaminant on beneficial use (on the environment) is necessary
Assessment of site contamination	a set of formal methods for determining the nature, extent and levels of existing contamination and the actual or potential risk to human health or the environment on or off-site from that contamination.
Environmental auditor	means a person appointed under section 53S of the Environment Protection Act as an environmental auditor for the purposes of that Act.
Background level	the level of an indicator (measured in a manner and at a location specified by the Authority) in the surface waters of the segment outside the influence of any waste discharge containing a measurable level of that indicator.
Beneficial use	beneficial use in relation to assessment of contaminated land means a use of the environment or any element or segment of the environment which: (a) is conducive to public benefit, welfare, safety, health or aesthetic enjoyment, and which requires protection from the effects of waste discharges, emissions or deposits, or (b) is declared in State environment protection policy to be a beneficial use.
Contaminant	a chemical of man-made origin that has been added to soil or groundwater
Contamination	the condition of land or water where any chemical substance or waste has been added at above background level and represents, or potentially represents, an adverse health or environmental impact.
Dutch Intervention Levels	concentration guidelines issued by the Dutch government in 2000 which, if exceeded, indicate that remediation may be necessary
Dutch Target Level	concentration guidelines issued by the Dutch government in 2000, which, if exceeded, indicate that there may be some contamination.
EAO, environmental audit overlay	environmental audit overlay, an overlay in a planning scheme that is meant to indicate that the land is potentially contaminated. An EAO can only be removed by completion of an environmental audit.
Ecological risk assessment	a set of formal, scientific methods for defining and estimating the probabilities and magnitudes of adverse impacts on plants, animals and/or the ecology of a specified area posed by a particular stressor(s) and frequency of exposure to the stressor(s). (Stressors include release of chemicals, other human actions and natural catastrophes).
Element of the environment	in relation to the assessment of contaminated land element means any of the principal constituent parts of the environment including waters, atmosphere, land, vegetation, climate, odour, aesthetics, fish and wildlife.
EPA	Environment Protection Authority of Victoria ("Authority")
Exceedance	an instance where the concentration of a substance in soil or groundwater exceeds a nominated guideline



Fill material	soil (sand, clay and silt), gravel or rock with contaminant concentrations less than those specified in Table 1 of Publication 448 entitled "Classification of Wastes".
Groundwater	any water contained in or occurring in a geological structure or formation
Health risk assessment	the process of estimating the potential impact of a chemical, biological or physical agent on a specified human population system under a specific set of conditions.
Investigation level	the concentration of a contaminant above which further appropriate investigation and evaluation will be required.
MAH	monocyclic aromatic compounds, namely benzene, chlorinated benzenes, chlorinated phenols, phenol, toluene and xylene
mg/kg	milligram per kilogram, the measure of concentration of a contaminant or naturally occurring chemical in soil, normally expressed as mg per kg of oven dry soil
mg/L	milligram per litre, the measure of concentration of a contaminant or naturally occurring chemical in water
Ministers Direction No 1	the Direction issued by the Minister responsible for planning in 1992 which states that if potentially contaminated land is to be rezoned by a Council to a sensitive use, then Council should satisfy itself that the land is suitable for that use and should this by ordering an Environmental Audit.
Potentially contaminated land	means land used or known to have been used for:(a) industry, (b) mining, (c) storage of chemicals, gas, wastes or liquid fuel (if not ancillary to another use of the land).
Prescribed wastes	wastes listed in the Environment Protection (Prescribed Waste) Regulations
Regulations	a regulation made under the "Act".
Segment of the environment	segment in relation to the environment means any portion or portions of the environment expressed in terms of volume, space, area, quantity, quality or time or any combination thereof.
Sensitive use	in relation to Ministers Direction No 1, sensitive use means residential use, a child-care centre, a preschool centre or a primary school
SEPP	State Environment Protection Policy



GHD Pty Ltd ABN 39 008 488 373

180 Lonsdale Street

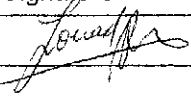
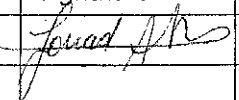
Melbourne, Victoria 3000

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	L. Gedge	F. Abo		F. Abo		29/09/04

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