Appendix J
Site Audit Report

Site Audit Report

Lots 1-2 DP1107753
59 Lakeview Road
Morisset Park NSW 2264

September 2007
JBS 40108-11796
JBS Environmental Pty Ltd

NSW Site Auditor Scheme
SITE AUDIT STATEMENT

Department of
Environment and Conservation (NSW)

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the* Contaminated Land Management Act 1997 *on 21 February 2005. For more information about completing this form, go to Part IV.

PART I: Site audit identification

Site audit statement no. **0503-0615**

This site audit is a **statutory audit**/~~non-statutory audit~~* within the meaning of the *Contaminated Land Management Act 1997*.

Site auditor details (as accredited under the *Contaminated Land Management Act 1997*)

Name	**Andrew Lau**	Company	**JBS Environmental Pty Ltd**		
Address	**PO Box 940**				
	MASCOT	**NSW**		Postcode	**1460**
Phone	**02 8338 1011**	Fax	**02 8338 1700**		

Site Details

Address	**59 Lakeview Road**				
	MORISSET PARK	**NSW**		Postcode	**2264**

Property description *(attach a list if several properties are included in the site audit)*

Lots 1-2 DP1107753 (formerly Lot 38 DP1076099)

……

……

Local Government Area **Lake Macquarie**

Area of Site (eg. hectares) **17.3 Ha** Current zoning **2(1) Residential**
6(1) Open Space
6(2) Tourism and Recreation

To the best of my knowledge, the site ~~is~~/**is not*** the subject of a declaration, order, agreement or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*.

Declaration/Order/Agreement/Notice* no(s) N/A……

……

Site audit commissioned by

Name **Craig Shepherd** Company **Johnson Property Group Pty Ltd**

Address **268 Old Northern Road**

CASTLE HILL NSW Postcode **2154**

Phone **02 9899 1888** Fax **02 9899 8100**

Name and phone number of contact person (if different from above)

……

Purpose of site audit

☑ A. To determine land use suitability (please specify intended use[s])

Residential with Gardens and Accessible Soil

OR

☐ ~~B(i) To determine the nature and extent of contamination, and/or~~

☐ ~~B(ii) To determine the appropriateness of an investigation/remedial action/management plan*, and/or~~

☐ ~~B(iii) To determine if the land can be made suitable for a particular use or uses by implementation of a specified remedial action plan/management plan* (*please specify intended use[s]*)~~

Information sources for site audit

Consultancy(ies) which conducted the site investigation(s) and/or remediation

PPK Environment and Infrastructure Pty Ltd
Parsons Brinkerhoff Pty Ltd
David Lane Associates Pty Ltd

Title(s) of report(s) reviewed ……

- Phase 1 Environmental Site Assessment – St John of God, Henry Street, Morisset Park, NSW, PPK Environment and Infrastructure, August 2001 (PPK 2001);
- Phase 2 Environmental Site Assessment – St John of God, Henry Street, Morisset Park, NSW, Parsons Brinkerhoff Pty Ltd, February 2005 (PB 2005); and
- Validation Report – 59 Lakeview Road, Morisset Park, NSW, David Lane Associates, August 2007 (DLA 2007).

Other information reviewed (including previous site audit reports and statements relating to the site)

N/A

Site audit report

Title **Site Audit Report, 59 Lakeview Road, Morisset Park, NSW, 2264**

Report no. **JBS40108-11796** Date **3rd September 2007**

PART II: Auditor's findings

Please complete either Section A or Section B, **not** both. *(Strike out the irrelevant section.)*

Use Section A where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land use(s).

Use Section B where the audit is to determine the nature and extent of contamination and/or the appropriateness of an investigation or remedial action or management plan and/or whether the site can be made suitable for a specified land use or uses subject to the successful implementation of a remedial action or management plan.

Section A

☑ **I certify that, in my opinion, the site is SUITABLE for the following use(s)** *(tick all appropriate uses and strike out those not applicable)*:

- ☐ ~~Residential, including substantial vegetable garden and poultry~~
- ☐ ~~Residential, including substantial vegetable garden, excluding poultry~~
- ☑ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☑ Day care centre, preschool, primary school
- ☑ Residential with minimal opportunity for soil access, including units
- ☑ Secondary school
- ☑ Park, recreational open space, playing field
- ☑ Commercial/industrial
- ☐ ~~Other (please specify)~~

subject to compliance with the following environmental management plan *(insert title, date and author of plan)* **in light of contamination remaining on the site:**

N/A…….

……...

……...

OR

☐ ~~I certify that, in my opinion, the site is NOT SUITABLE for any use due to the risk of harm from contamination.~~

Overall comments

NIL

Section B

Purpose of the plan[1] which is the subject of the audit

……

……

I certify that, in my opinion:

☐ the nature and extent of the contamination HAS/HAS NOT* been appropriately determined

AND/OR

☐ the investigation/remedial action plan/management plan* IS/IS NOT* appropriate for the purpose stated above

AND/OR

☐ **t**he site CAN BE MADE SUITABLE for the following uses *(tick all appropriate uses and strike out those not applicable)***:**

- ☐ Residential, including substantial vegetable garden and poultry
- ☐ Residential, including substantial vegetable garden, excluding poultry
- ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☐ Day care centre, preschool, primary school
- ☐ Residential with minimal opportunity for soil access, including units
- ☐ Secondary school
- ☐ Park, recreational open space, playing field
- ☐ Commercial/industrial
- ☐ Other (please specify) ……

if the site is remediated/managed* in accordance with the following remedial action plan/management plan* *(insert title, date and author of plan)*

……

……

subject to compliance with the following condition(s):

……

……

Overall comments

NIL……

……

……

……

[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. **0503**).

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997,* and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed:  **3rd September 2007**

PART IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remedial action or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use(s) of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A or Section B of Part II, **not** both.

In **Section A** the auditor may conclude that the land is *suitable* for a specified use(s) OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further remediation or investigation of the site was needed to render the site fit for the specified use(s). Any **condition** imposed should be limited to implementation of an environmental management plan to help ensure the site remains safe for the specified use(s). The plan should be legally enforceable: for example a requirement of a notice under the *Contaminated Land Management Act 1997* (CLM Act) or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the *Environmental Planning and Assessment Act 1979*.

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

In **Section B** the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or whether land can be made suitable for a particular land use or uses upon implementation of a remedial action or management plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

In **Part III** the auditor certifies his/her standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to:

Department of Environment and Conservation (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
Fax: (02) 9995 5930

AND

the **local council** for the land which is the subject of the audit.

Table of Contents

List of Appendices

List of Abbreviations

A list of the common abbreviations used throughout this report is provided below.

- As Arsenic
- Cd Cadmium
- Cr Chromium
- Cu Copper
- BTEX Benzene, Toluene, Ethylbenzene and Xylenes
- B(a)P Benzo (a) pyrene
- DECC NSW Department of Environment and Climate Change
- DoP NSW Department of Planning
- DQO Data Quality Objectives
- DWE NSW Department of Water and Energy
- DP Deposited Plan
- EPA New South Wales Environment Protection Authority
- Hg Mercury
- HIL Health Based Investigation Level
- LOR Limit of Reporting
- MAH Monocyclic Aromatic Hydrocarbon
- Ni Nickel
- OCP Organochlorine Pesticide
- SAR Site Audit Report
- SAS Site Audit Statement
- PAH Polycyclic Aromatic Hydrocarbons
- Pb Lead
- PBIL (Provisional) Phytotoxicity Based Investigation Level
- PCB Polychlorinated Biphyenyls
- PQL Practical Quantitation Limit
- QA/QC Quality Assurance/Quality Control
- RPD Relative Percentage Difference
- TPH Total Petroleum Hydrocarbons (C_6-C_9 and C_{10}-C_{36})
- UST Underground Storage Tank
- Zn Zinc

1 Introduction

1.1 Site Auditor

Andrew Lau, of JBS Environmental Pty Ltd, was engaged by Johnson Property Group Pty Ltd on 15th September 2006 to conduct a site audit at the property identified as Lots 1-2 DP1107753 (formerly Lot 38 DP1076099) located at 59 Lakeview Road, Morisset Park, NSW, 2264. Andrew Lau is a Site Auditor accredited by the NSW EPA under the *Contaminated Land Management Act 1997* (CLMA 1997) (Accreditation Number 0503).

1.2 Objectives of Audit

The objectives of this site audit were to:

- Independently review the suitability and appropriateness of the contamination assessment, remediation and validation activities undertaken at the site;
- Determine land use suitability; and
- Prepare a Site Audit Report and issue a Site Audit Statement.

In accordance with the requirements of s.51 (CLMA 1997), the site audit was undertaken with consideration to:

- The provisions of the Act, Regulations and subsequent amendments;
- The provisions of any relevant environmental planning instruments; and
- The guidelines made or approved by the DECC (**Appendix A**).

1.3 Type of Audit

The site audit has been conducted as a statutory audit, since the requirement arose from a requirement of development consent issued by Lake Macquarie Council (DA/3010/2004) under the *Environmental Planning and Assessment Act 1979.*

1.4 Documents Reviewed

The following documents were reviewed as part of this site audit:

- *Phase 1 Environmental Site Assessment – St John of God, Henry Street, Morisset Park, NSW,* PPK Environment and Infrastructure, August 2001 (PPK 2001);
- *Phase 2 Environmental Site Assessment – St John of God, Henry Street, Morisset Park, NSW,* Parsons Brinkerhoff Pty Ltd, February 2005 (PB 2005); and
- *Validation Report – 59 Lakeview Road, Morisset Park, NSW,* David Lane Associates, August 2007 (DLA 2007).

1.5 Site Inspections

The site was inspected on the date(s) shown in **Table 1.1**.

Table 1.1 Summary of Audit Inspections

Date	Attendance	Purpose
1st September 2006	Craig Shepherd – Johnson Property Group David Lane – DLA Associates Andrew Lau – JBS Environmental	Detailed site inspection / inspection of UST and asbestos impact

1.6 Chronology of Site Assessment, Remediation, Validation and Audit Works

The process of site assessment, Auditor review and preparation of final audit undertaken at the site has been summarised in **Table 1.2**.

Table 1.2 Summary of Environmental and Audits Works Undertaken at the Site

Date	Action
August 2001	Completion of a Phase 1 Environmental Assessment Report (PPK 2001) for the site. The Phase 1 assessment included: review of published site history; review of regional geology and hydrogeology; and an assessment of potential for contamination.
February 2005	Preparation of a Phase 2 Environmental Assessment Report (PB 2005) for the site. The Phase 2 assessment included: review of the findings from the Phase 1 assessment; installation of 18 soil borings; soil sampling; and Review of results of analysis for site characterisation.
Pre August 2006	Building demolition including asbestos removal and removal of aboveground storage tank.
September 2006	Removal of underground storage tanks, followed by inspection and validation.
October 2006	Validation of asbestos impacted surface soils and decommissioning and validation of the on-site waste water treatment plant.
January 2007	Validation sampling across entire site area.
April 2007	Additional asbestos validation.
May 2007	Preparation of draft validation report, review and comment by site auditor
August 2007	Preparation of final validation report (DLA 2007).
September 2007	Preparation of Site Audit Report and Site Audit Statement (JBS 2007).

2 Site Description

2.1 Site Identification

The site details are summarised in **Table 2.1** described in further detail in the following sections. A plan identifying the subject site is presented in **Appendix C**. The site location is shown in **Appendix D**.

Table 2.1 Summary Site Details

Street Address:	59 Lakeview Road Morisset Park NSW 2264
Property Description:	Lots 1-2 DP1107753 (formerly Lot 38 DP1076099)
Parish:	Morisset
County:	Northumberland
Local Government Area:	Lake Macquarie
Property Size:	17.3 Ha
Zoning:	2(1) Residential, 6(1) Open Space and 6(2) Tourism and Recreation
Existing Use	Vacant
Proposed Use	Residential

2.2 Site Condition

The consultant (DLA 2007) reported that the site formerly comprised the St John of God Monastery, which was partially demolished in the late 1990s and used as a disabled and wayward children's home on the weekends.

The site is reported to have been largely cleared of original vegetation and is largely comprised of open grassed paddocks with a sparse scattering of large eucalyptus trees which become more concentrated around the property boundary. The area which formerly comprised buildings has been covered with gravel roadbase material.

The site also comprised two small farm dams, an effluent irrigation area and final settling pond, and a former cemetery.

There was no visual or olfactory evidence of contamination and there were no indications of any phytotoxic effects on any of the vegetation.

2.3 Topography

The consultant (DLA 2007) reported that the site represents a small peninsular protruding into the western shoreline of Lake Macquarie and has a maximum elevation of 12.4 metres above sea level in the south western quadrant.

The site is reported as sloping towards Lake Macquarie, which over a large portion of the site is in a north easterly direction.

Evidence of changes in the site topography were reported by the consultant (DLA 2007), including the two farm dams, the effluent irrigation area and the final settling pond.

2.4 Geology

The consultant (DLA 2007) reported that the underlying geology of Morisset Park consists of Triassic and Permian sediments of the Narrabeen Group – Clifton subgroup – Munmorah Conglomerate Formation occurring within the Sydney Basin geological unit.

The regional soils map (Department of Conservation and Land Management NSW, 1993, Soil Landscape Series Sheet 9131-9231, Gosford – Lake Macquarie, Scale 1:100 000) indicates that the site contains two distinct soil landscapes of the central coast lowlands, being Doyalson and Wyong.

The Doyalson soil landscape is located within the southern and western portions of the site and is reported as being characterised by pebbly sandstone, grey-green and grey siltstone and claystone. It is reported as being limited by its lack of fertility, erosion hazard and hard setting tendency.

The Wyong soil landscape is located in the northern parts of the site and comprises poorly drained deltaic floodplain areas and alluvial flats with quaternary sediments made of sand, silt, gravel and clay. Limitations of this soil landscape are reported as including waterlogging, flooding and high acid sulfate potential.

The consultant (DLA 2007) has noted that a review of the Department of Natural Resources (DNR) database (iPlan) confirmed the presence of Class 1 Acid Sulfate Soils along the northern shoreline areas of the site and in association with the Wyong soil landscape.

2.5 Hydrology

The consultant (DLA 2007) indicated that rainfall would be expected to infiltrate into the subsurface, with any surface water runoff flowing in a generally north easterly direction, consistent with the site topography. The nearest downgradient surface water body is Lake Macquarie which surrounds the site in the northerly, easterly and southerly directions.

2.6 Hydrogeology

The consultant (DLA 2007) has reported that the sand and gravel layers within the alluvial deposits are expected to act as shallow and semi-confined aquifers. Groundwater recharge into these aquifers was reported to predominantly occur through direct infiltration of surface water and rainfall. Groundwater flow was stated by the consultant (DLA 2007) as being expected to be towards the northeast, towards Lake Macquarie.

A review of registered groundwater bores undertaken by the consultant (DLA 2007) identified the presence of eight bores within a 5 km proximity of the site. No bores were located within 1 km of the site and, combined with the fact that the site lies on a peninsula, mean that the registered groundwater bore data offers little in the way of useful information pertaining to the site groundwater conditions.

The consultant (DLA 2007) indicated that groundwater would be expected to be between 3.5 – 12.4 m from the ground surface, based on the elevation of the site and observations made during the tank pit excavation which did not encounter groundwater at depths of 3.5 m below the surface.

2.7 Meteorology

The consultant (DLA 2007) provided local meteorology data which was supplied from the Department of Meteorology NSW for the Morisset Park area. The consultant reported that the annual average temperature was 21.7°C , with an annual rainfall of aprox. 1229 mm.

2.8 Surrounding Environment

The consultant (DLA 2007) identified the following surrounding features:

- Residential properties to the east of the site; and
- Lake Macquarie lies to the north, east and south of the site.

The consultant (DLA 2007) reported that no potential off-site sources of contamination were identified in the immediate vicinity of the site.

2.9 Audit Findings

The information provided by the consultant (DLA 2007) in regards to the site condition and surrounding environment has been checked against, and meets the requirements of, EPA 1997. The information provided was also consistent with the observations made by the Site Auditor during the site inspection.

The zoning provided by the consultant (DLA 2007) was checked against Lake Macquarie Council's zoning maps and found to be incorrect, due to the inclusion of an out-of-date s.149 certificate which was issued prior to the current Local Environmental Plan (2004). As such, the zoning information included in the summary table of this audit report (Table 2.1) was obtained from the Council's zoning map by the Site Auditor. However, the consultant's error did not materially affect the assessment of site suitability, since the most sensitive of landuses was the one identified by the consultant, and hence the requirements of the site audit were met.

Information relating to hydrogeology did not meet the requirements of the recently released Groundwater Guidelines (DEC 2007), however, the assessment and audit were commenced prior to the release of the guidelines, hence the requirements of the site audit were met.

3 Site History

3.1 Site History Information Sources

The consultant (DLA 2007) reviewed historical data provided in previous investigation reports prepared for the site and from supplementary sources:

- *Phase 1 Environmental Site Assessment – St John of God, Henry Street, Morisset Park, NSW,* PPK Environment and Infrastructure, August 2001 (PPK 2001);
- *Phase 2 Environmental Site Assessment – St John of God, Henry Street, Morisset Park, NSW,* Parsons Brinkerhoff Pty Ltd, February 2005 (PB 2005);

Historical information made available in the abovementioned reports and from supplementary sources were sourced from the following:

- Historical aerial photographs (1950, 1961, 1965, 1969, 1979, 1983, 1987, 1990, 1993 and 1996);
- Historical title deeds search dating back to 1875;
- Council information (review of s149 certificate); and
- Anecdotal recollections of site history from a former caretaker at the site.

3.2 Summary Site History

A summary of the reported site history is provided in **Table 3.1**.

Table 3.1 Summary Site History

Year	Site Use / Observations
1875-1948	The site was owned by various private landholders. The exact nature of the use of the site during this period is unknown.
1948 - 1969	The site was owned by the St Vincent De Paul Society, at which point in time the site had become developed as a monastery . Information from the aerial photographs indicates that the site was progressively cleared and numerous buildings constructed.
1969 – 1990s	Ownership was transferred to the brothers of St John of God in 1969, and it assumed the use of the site continued as a monastery, comprising a church premises, cemetery, orchards, effluent ponds, cattle grazing paddocks and cattle loading yard.
Mid 1990s	In the mid to late 1990s, the original monastery building was demolished and replaced with a new residential building.
Mid 1990s	Anecdotal recollections of filling in the northern part of the site along the foreshore area.
1997	UST decommissioning.
2003	A small number of graves in the cemetery were exhumed and reportedly backfilled with validated fill materials.
2004	On-site wastewater treatment plant was pumped dry.
2006	Site closure and site demolition works commenced, following sale of the land to Kendall Grange Properties.

3.3 Site Interviews

The consultant (PB 2004) interviewed a former caretaker at the site, Mr Laurie Gough, who provided the following anecdotal information regarding the history of the site:

- Cattle grazing occurred until 2004;
- The effluent ponds were pumped dry in 2004;
- Approximately 15,000 tonnes of fly ash and fill material from the construction of a nearby roadway were reportedly brought onto the site in the mid to late 1990s to fill the northern portion of the site and the bank reclamation area, however this was reported to have occurred prior to the arrival of Mr Gough to the site;

- The demolition rubble from the former monastery building were reported to have been buried in a trench excavated along the eastern paddock of the site;
- The UST was located beneath the carport at the site was reportedly decommissioned in the late 1990s.

3.4 Audit Findings

Limited site history information was obtained by the consultants (PB and DLA), resulting in a number of gaps in the understanding of the precise activities conducted at the site, particularly in relation to:

- Anecdotal recollections of filling along the northern portion of the site with fly ash;
- Potential demolition rubble buried in the eastern part of the site associated with the removal of the former monastery; and
- Details relating to the above and underground tanks.

The site history information provided by the consultants (PPK 2001, PB 2005 and DLA 2007) has been checked against, and only partially meets the requirements of, EPA 1997. Neither of the consultants obtained any detailed information from council records, DECC or WorkCover and the historical aerial photograph review concluded (1996)at the time when a number of changes to the site were reportedly undertaken (mid 1990s).

A search of the NSW DECC's contaminated land database was not undertaken by the consultant. It is noted that the Auditor completed a review of the NSW DECC's contaminated land database, which did not reveal any records of land contamination issues being regulated by the DECC within the site or the immediate vicinity.

As such, the site history information is considered only partially complete and, as a result, only partially meets the requirements of the site audit. Adequate consideration is required to be given in the sampling analytical program to account for the limited site history information in order to meet the requirements of the audit.

4 Potential Contamination Issues

4.1 Potential Contamination Issues

Based on the site history review and site inspection, the consultants (PPK 2001, PB 2004 and DLA 2007) identified that the following potential contamination issues at the site:

- Effluent ponds, which may include nutrients and heavy metals;
- Orchards, which may include pesticides, herbicides and metals;
- Cattle grazing, which may include pesticides used on the paddocks;
- Cattle loading yard, which may include heavy metals;
- Bank reclamation using suspected fly ash materials, which may include heavy metals and PAHs;
- Demolition rubble from the former monastery, which may include heavy metals, asbestos and PCBs;
- Former above ground and underground storage tanks, which may include metals, TPH/BTEX and PAHs;
- Former site buildings, which may include asbestos and heavy metals.

4.2 Potentially Contaminated Media

The consultant (DLA 2007) identified the potentially impacted media as:

- Imported fill materials;
- Natural soils at the site; and
- Sediment build up in the base of the effluent settlement ponds.

The consultant (DLA 2007) did not consider groundwater to be a potentially impacted media given the absence of groundwater encountered during the removal of the underground storage tanks to a maximum depth of 3.5m below ground level, in addition to the absence of any visual or olfactory indication of contamination within the walls and floor of the tank pit excavation.

4.3 Audit Findings

The consultants (PPK 2001, PB 2005 and DLA 2007) identified a number of potential contamination issues based on the findings of the site history review and the site inspection conducted as part of the works. Each of the consultants omitted a number of particular potential contamination issues which they each discussed as part of their site history / site inspection components of their respective reports. However, the site sampling and analytical program, as discussed in **Section 5**, did account for these discrepancies.

It is noted that actual or potential acid sulphate soils have not been formally identified as a contaminant of concern at the site. In addition, analysis of samples for actual or potential acidity was not undertaken during site validation works.

5 Sampling Analytical and Quality Program

Sampling and analysis of environmental media at the site for contaminants of potential concern has been undertaken by the consultant (DLA 2007), as discussed in the following sections.

5.1 Sampling /Analytical Regime

The sampling and analysis plan implemented by the consultant (DLA 2007) is summarised in **Table 5.1**. Plans showing the sampling locations are provided in **Appendix D**.

Table 5.1 Summary of Sampling / Analytical Schedule (DLA 2007)

Media	Area	No. Sampling Locations	General Depth Intervals (m)	Sampling Regime	No. Analyses (excl QA/QC)
Soil	Asbestos Bulk Sampling	10	0-0.3	Grid Based	Asbestos - 10
	Low Density Sampling Area -	27	0-0.3	Grid based	BTEX - 14 TPH - 14 PAH - 27 PCB - 14 OCP - 14 OPP - 14 Metals - 27
	Medium Density Sampling Area	44	0-0.3	Grid based	BTEX - 22 TPH - 22 PAH - 44 PCB - 22 OCP - 22 OPP - 22 Metals - 44
	High Density Sampling Area	UST – 10 and sewerage area - 30	Surface 0-0.1 and deep up to 3m	Not stated	BTEX - 17 TPH - 17 PAH - 47 PCB - 24 OCP - 24 OPP - 24 Metals - 47

5.2 Sampling Methodology

Soil samples were reportedly collected by the consultant (DLA 2007) during the site validation works using a either a hand auger or spade. It is noted in order to collect depth validation samples from the tankpit excavation, the consultant (DLA 2007) would have been required to enter the open excavation.

The consultant reported that during the remediation and validation works, samples were collected according to the following procedure (DLA 2007):

- All sampling equipment was decontaminated between each sampling location;
- Soil samples were immediately placed in to unpreserved acid washed glass jars with Teflon lids which were sealed tight and immediately placed into appropriate coolers for transport to the analytical laboratories;
- Soil samples were classified, the details of which were recorded on sample logs completed for each sampling location; and
- Duplicate samples were collected by compositing procedures.

5.3 Laboratory Methods

The consultant (DLA 2007) also used laboratories which were NATA accredited for the chemical analyses undertaken. LabMark Australia Pty Ltd of Asquith and Envirolab Services Pty Ltd of Willoughby were the primary analytical laboratory and SGS Australia Pty Ltd of Alexandria was the secondary (check) laboratory. It is noted that validation samples collected for asbestos were submitted to Australian Safer Environment Technology of Hornsby Northgate.

The methods used by the primary laboratory as part of the site validation program are shown in **Table 5.2**.

Table 5.2 Laboratory Methods Used in Site Validation (DLA 2007)

	Limit of Reporting	Laboratory Method
METALS	Soil (mg/kg)	
Arsenic	1-3	ICP-MS
Cadmium	0.1 - 1	ICP-MS
Chromium (Total)	0.3-1	ICP-MS
Copper	0.5-2	ICP-MS
Nickel	0.5-1	ICP-MS
Lead	1-2	ICP-MS
Zinc	0.3-5	ICP-MS
Mercury (inorganic)	0.05-0.1	CV-ICP-MS or FIMS
PETROLEUM HYDROCARBONS		
C_6 – C_9 Fraction	10-25	Purge Trap-GC/FID
C_{10} – C_{36} Fraction	50-100	Purge Trap-GC/FID
BTEX		
BTEX	0.2-2	Purge Trap-GC/MS
POLYCYCLIC AROMATIC HYDROCARBONS		
PAH's	0.05-0.5	GC/MS-SIM
ORGANOCHLORINE PESTICIDES		
(individual OCPs)	0.05-0.1	GC/dual ECD
ORGANOPHOSPHATE PESTICIDES		
(individual OPPs)	0.1-0.5	GC/MSD
PCBs		
PCBs (total)	0.1-0.5	GC/dual ECD
OTHER		
Asbestos	Presence	PLM / Dispersion Staining

Notes:
DCM extraction is undertaken for soil analysis for PAHs and TPH C_{10}-C_{36}

5.4 Quality Assurance / Quality Control (QA/QC)

Both a field and laboratory quality assurance/quality control (QA/QC) program was conducted during the site remediation and validation works. Field QA/QC for the investigation in the field consisted of the following procedures:

- Preparation and analysis of inter- and intra-laboratory duplicate samples for soil samples collected within the medium and low density sampling areas;
- Preparation and analysis of intra-laboratory duplicate samples for soil samples collected within the high density sampling areas. It was noted no inter-laboratory duplicate samples for soil from this area were collected;
- Decontamination of non-disposable sampling equipment during soil sampling;

- Preparation and analysis of a rinsate blank during the validation sampling program within the low and medium density sampling areas. It was noted that no rinsate samples were collected during the validation sampling within the high density sampling areas;
- Preparation and analysis of one trip blank and trip spike during the validation sampling program within the low and medium density sampling areas. It was noted that no trip blank or trip spike accompanied samples to the laboratory during the validation sampling within the high density sampling area; and
- Transporting samples in ice-cooled chests, under chain of custody conditions, to a laboratory that is a NATA accredited for the analysis performed.

Laboratory QA/QC consisted of the following procedures:

- Analysis and reporting of laboratory duplicate samples;
- Analysis and reporting of laboratory method blank samples;
- Analysis and reporting of laboratory control samples or certified control samples;
- Analysis and reporting of laboratory control spikes, matrix spikes and surrogate spikes for organic contaminants.

The QA/QC undertaken by the consultant (DLA 2007) has been reviewed and is summarised in **Table 5.3** against the PARCC parameters (precision, accuracy, representativeness, comparability and completeness).

Table 5.3 Validation QA/QC summary (DLA 2007)

Quality Indicator	Reported results	Meets the requirements of Site Audit?
Precision		
Intra-laboratory (blind) duplicates	Frequency = 15/111 primary soil samples RPDs = 0% – 200% Results for volatiles (BTEX and TPH C_6-C_9) may be considered indicative only due to procedure used to split samples. Samples were mixed and then split which increases the loss of volatiles.	Partial[1]
Inter-laboratory (split) duplicates	Frequency = 4/111 primary soil samples RPDs = 0% – 66.7% Results for volatiles (BTEX and TPH C_6-C_9) may be considered indicative only due to procedure used to split samples. Samples were mixed and then split which increases the loss of volatiles.	No[1]
Laboratory duplicates	1 / 10 samples (0-200% RPD)	Yes
Accuracy		
Matrix spike	59% - 130%	Yes[1]
Laboratory Control Sample	80% - 117%	Yes
Surrogate spikes	78% - 130%	Yes
Representativeness		
Sampling appropriate for media and analytes	Samples were reportedly collected using appropriate methods (i.e., from a hand auger or spade).	Yes
Rinsate blanks	Only analysed for PAHs and only collected during soil sampling within the low and medium density sampling areas, all results <LOR	Partial[1]
Trip spike	One trip spike was collected during the validation sampling within the low and medium density sampling areas results were within acceptable limits.	Partial[1]
Trip blank	<LOR. It is noted however that a trip blank was only collected during the soil sampling within the low and medium density sampling areas.	Partial[1]
Laboratory blanks	<LOR	Yes
Samples extracted and analysed within holding times.	Generally extracted and analysed within holding times.	Yes
Comparability		
Standard operating procedures used for sample collection and handling	Suitable description of sampling procedures provided	Yes
Standard analytical methods used for all analyses	Analytical methods were referenced and NATA Accredited	Yes
Consistent field conditions, sampling staff and laboratory analysis	Project team were identified and however two primary laboratories were used without explanation	Partial[1]
Limits of reporting appropriate and consistent	Reporting limits less were than the appropriate site criteria	Yes
Completeness		
Soil logs completed and appropriate	Complete & appropriate sample register and logs provided in report. High Density sampling area samples are missing from the log in Appendix 4.	Partial[1]
Appropriate & complete COC documentation	Complete & appropriate COCs in report	Yes
Satisfactory frequency and result for QC samples	The frequency of intra-laboratory duplicate samples collected is in accordance with AS4482.1. However the inter-laboratory duplicate frequency is not in accordance with AS4482.1. It is noted that inter-laboratory duplicate samples were not collected during the sampling of the high density sampling area. Additionally, while rinsate, trip blank and trip spike samples were collected during the low and medium density sampling none were collected and analysed from within the high density sampling area.	Partial[1]
Data from critical samples valid	Critical sample data is considered valid	Yes

1. See discussion in Section 5.5.

5.5 Audit Findings

The validation sampling methodology employed by the consultant (DLA 2007) has provided sufficient coverage to enable site validation and was considered appropriate for the potential contaminants of concern identified as part of the site history review.

The site was divided into three different areas depending on the sampling density utilised, low, medium and high (i.e., a stratified sampling program based on potential contamination risks). The report stipulates that sample numbers were calculated using NSW EPA *Sampling Design Guidelines* 1994 Section 4, incorporating Procedure B. However, the report does not discuss the size of each of the sampling areas in relation to selected grid size and the number of samples collected. Furthermore, within the high density sampling area incorporating tank pits and a former sewerage treatment plant, validated pit dimensions were not discussed in relation to sample collection.

The sample intervals within the low and medium density sampling areas targeted surface soil conditions only (i.e., 0-0.3m). This is considered appropriate as the aim of these sample locations was to target the upper soil profile only. Samples were collected at depth within the high density sampling areas when targeting a specific area of concern for example the tank pits after underground storage tank removal.

The auditor considers that the validation sampling methodology employed by the consultant (DLA 2007) in regards to asbestos, has provided sufficient coverage to enable site validation.

The analytical schedule is considered appropriately complete given the site history and the identified potential contamination issues. Nutrients were not included in the validation of the effluent treatment ponds, however, with consideration to the time elapsed between their last reported use and the time of the investigations, is not considered to materially affect the suitability of the site for the proposed residential use.

A log of the sample geology is provided for the low and medium density sampling areas however no log has been provided for the soil samples collected within the high density sampling area.

Groundwater was not assessed as part of the validation program. However, the consultant (DLA 2007) confirmed that there was no groundwater encountered during the removal of the underground storage tanks to a maximum depth of 3.5m below ground level; and confirmed the absence of any visual or olfactory indication of contamination within the walls and floor of the tank pit excavation, which was supported by the laboratory results from the tank pit validation samples.

While intrusive groundwater investigations would have been the auditor's preferred approach to support the validation of the site, the actions adopted by the consultant were consistent with the requirements of EPA 1994, which explicitly state, "if the excavation and chemical testing of the tank pits…shows there has been no migration of contaminants, there may be no need to drill monitoring wells."

The primary laboratories (Labmark and EnviroLab) and the secondary laboratory (SGS) employed for the chemical analyses used analytical methods which were considered appropriate for the identified contaminants of concern at the site and were NATA accredited. The laboratory methods employed for the asbestos analysis by the primary asbestos testing laboratory (Australian Safer Environment Technology) were also NATA accredited. It was noted that two different primary laboratories for used, Labmark for the High density sampling area and Envirolab for the low and medium density sampling areas.

It is noted that some of the laboratory detection limits reported by the consultant (DLA 2007) were incorrect. Based on this, the Auditor has reviewed the laboratory reports and has tabulated the correct detection limits (refer to **Table 5.2**). It is noted that the laboratory detection limits are below the nominated site validation criteria.

A review of the signed COCs shows them to be complete.

The consultant reported that duplicate samples were collected following compositing procedures. Compositing of samples increases the potential loss of volatiles and is not considered a suitable method for sample splitting. The consultant (DLA 2007) did not consider the potential loss of volatiles during sample splitting. It is noted that this method of sample splitting does not conform with the recommended approach as stated in the Australian Standards AS4482.1 *Guide to the Sampling and Investigation of Potentially Contaminated Soil*. Based on this, and with consideration to the volatile data obtained from the duplicate pairs are considered semi-quantitative data only.

The RPDs calculated for both the intra and inter laboratory duplicates were generally within the DQI of 50%. However, a number of RPDs exceeded the acceptable DQI range of 50%. These exceedances are noted to be based on analyte levels close to the laboratory detection limits. Given that the reported concentrations of these potential contaminants were below the adopted investigation levels, the higher than expected RPDs are not considered to affect the overall reliability of the analytical data.

It is noted that across all the sampling areas (low, medium and high density) the frequency of inter-laboratory duplicates is below the AS4482.1-2005 requirements of 1 split duplicate in 20 primary samples. Inter-laboratory samples were not collected within the high density sampling areas.

The frequency of inter-laboratory duplicates collected for the validation soil sampling program were marginally less than a desired amount (i.e., two samples). Even though the frequency of duplicates collected does not meet the DQI requirements, it is considered that the data available for the existing duplicates (volatile data aside) is sufficient for the purposes of the QA/QC program and is considered to meet the requirements of the site audit.

As part of the validation soil sampling program, the consultant collected one rinsate blank (PAHs only), one trip blank and one trip spike during the low and medium density sampling program. The number and analysis of these quality control samples is not in accordance to the AS4482.1 which indicates that a rinsate should be collected for each sampling day and each different piece of sampling equipment. Furthermore the AS4482.1 stipulates that the rinsate should be analysed for the full suite of analytes.

The results of the rinsate blank, trip blank and trip spike summarised by the consultant (DLA 2007) indicated that concentrations of analytes were not detected above the laboratory limit of reporting for the rinsate (PAHs only) and trip blank. While the consultant (DLA 2007) reported the trip spikes as mg/kg in fact the laboratory reports these as percentage recovery. The Auditor considers these recoveries acceptable for the low and medium density sampling area.

The consultant (DLA 2007) did not collect inter-laboratory duplicates, rinsate blanks, trip blanks or trip spikes as part of the high density sampling works. Based on the absence of these QA/QC samples during the high density sampling program the precision and representative of the data cannot be assessed fully and it is considered that the high density sampling data can only be considered as semi quantitative. No discussion was

provided by the consultant in relation to the absence of these samples it is considered that the absence of these results within the high density sampling areas, the areas within the site that have the potential to generate the higher concentrations, only serves to detract from the overall reliability of data and ultimate certainty in relation to conclusions drawn from the validation activities.

Laboratory QA/QC data was found to be within the laboratory QA/QC limits with the exception of matrix spike recoveries in two samples from the low and medium density sampling areas that could not be reported for lead and zinc due to significant background levels. Metals interference within soil samples can be expected occasionally due to natural back ground levels. These two results do not detract from the laboratory analytical program achieving an acceptable level of precision and accuracy.

Based on the assessment of the QA/QC program, the soil data generated from this assessment is considered adequate and meets the requirements of the site audit.

6 Assessment Criteria

6.1 Soil Criteria

The proposed use of the site is residential with accessible soils.

The soil validation criteria used by the consultant during the validation (DLA 2006) are presented in **Table 6.1**.

Table 6.1 Soil Criteria (DLA 2006)

Substance	Health-Based Criteria[1] (mg/kg)	Provisional Phytotoxicity Based Criteria (mg/kg)
Arsenic	100	20
Cadmium	20	3
Chromium	100	400
Copper	1000	100
Lead	300	600
Mercury (inorganic)	15	1
Nickel	600	60
Zinc	7000	200
TPH C_6 – C_9	65[2]	-
TPH C_{10} – C_{36}	1000[2]	-
Benzene	1[2]	1[2]
Toluene	130[2]	1.4
Ethyl benzene	50[2]	3.1[2]
Xylene	25[2]	14[2]
Benzo (a) pyrene	1	-
Total PAHs	20	-
Total PCBs	10	-
Aldrin+Dieldrin	10	-
Chlordane (cis and trans)	50	-
DDT+DDD+DDE	200	-
Asbestos	No asbestos in soil	-

Note 1: Health Based Investigation Levels for Residential Use - Gardens & Accessible Soil (Column 1, DEC 2006)
Note 2: Threshold Concentrations for Sensitive Landuse (Table 3, EPA 1994)
Note 3: Provisional Phytotoxicity Based Investigation Levels (Column 5, DEC 2006)

6.2 Audit Findings

The soil criteria adopted by the consultant are endorsed by the DEC and are considered appropriate for investigating the suitability of the site for the proposed residential use with gardens and accessible soil.

The same soil investigation levels were also used as the validation (i.e., clean up) criteria. While the use of the investigation levels for validation purposes may result in an overly conservative remediation outcome, the use of investigation criteria as validation criteria was only required for asbestos. Given that the criterion for asbestos was "no asbestos in soil", the use of such a criterion for the purposes of site validation is considered adequately conservative and consistent with current (limited) regulatory guidance.

As such, the soil investigation criteria are considered appropriate for assessing the suitability of the site for the proposed landuse (residential with gardens and accessible soil) and meet the requirements of the site audit.

7 Site Investigation and Validation Results

7.1 Remediation Objectives

The consultant (DLA 2007) reported that the site is to be redeveloped for residential uses. The consultant (DLA 2007) has stated that the remediation objective was to remediate and validate the site to a level enabling the proposed residential development as defined in Column 1 (NEHF-A) DEC 2006; and to remove unacceptable limits to human health and the environment.

7.2 Remediation Approach

In accordance with ANZECC/NHMRC 1992, soil remediation and management was implemented in the following preferred order:

1. "on site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level
2. off site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level
3. removal of contaminated soil to an appropriate site or facility, followed where necessary by replacement with clean fill
4. consolidation and isolation of the soil on-site by containment within a properly designed barrier."

The consultant (DLA 2007) identified removal of the potentially contaminated materials and infrastructure, validation of these areas and reinstatement with either material which had been sampled and classified as inert waste in accordance to NSW EPA 1999 *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* and validated on site, or material imported onto the Site.

7.3 Remediation Works Completed

The remediation works completed at the site by the consultant (DLA 2007) between August to October 2006 and are summarised below:

- Provision of Asbestos Clearance Assessment and Certification for the areas where asbestos removal and demolition had previously been undertaken;
- Dismantling of Plant equipment and subsequent excavation of Bio-solids associated with the Sewage Treatment System;
- Importation of fill materials to backfill trenches left during remedial works;
- Sampling of an area that had effluent sludge laid out on it to determine it suitability for reuse;
- Removal, remediation and validation of USTs;
- During the removal of the USTs excess materials were stockpiled. The consultant (DLA 2007) sampled these stockpiles, SP1-South 80m^3 and SP2-North 70m^3, to assess its suitability for reuse;
- Staged Validation of identified areas of concern including the UST area and Sewage Treatment Plant areas utilizing high density sampling strategy;

- Final Validation including previous areas of concern and identified areas of moderate and low risk employing a medium and low density sampling strategy were conducted to confirm the Site was in compliance with the requirements of NEPM 1999, Table 5a, Column A – *Residential with Access to Soils;*

Upon successful completion of the remediation and validation activities, the consultant (DLA 2007) completed a validation report in accordance with the requirements of EPA 1997.

7.4 Validation Results

7.4.1 Field Observations

Observations made by the consultant (DLA 2007) during the site validation undertaken in September and October 2006 and January 2007 included:

- Soils within the UST pits (high density sampling area) consisted of an A horizon of dark brown sandy loams to a depth of 0.2 metres. Underlying were yellow orange grained sands used as fill for the tank pits overlying yellow/brown sandy gravely clays;
- Soils in the area of the Effluent Treatment system tank pits (high density sampling area) consisted of very moist dark brown, medium grained silty sand topsoil to a depth of 20mm. Underlying this were light brown, fine-grained silty sands that contain angular fine gravel to a depth of 250mm. Below 250mm were dark brown silty sandy clays with grey orange mottling. Sands were fine grained and clays had medium plasticity;
- Appendix 4 in the consultants (DLA 2007) report indicates that during the low and medium density sampling conducted on 19th January 2007 the soils sampled consisted of one of the following: brown silty soil, grey compacted sandy soils, black wet clay soils, brown/grey sandy soil, fill material (black soil with gravel fragments or black/grey sandy soils with gravel intermixed), brown black soils, compacted gravel road, hard compact clay, orange clays,
- A small section on the western edge of the high density sampling contained two stockpiles of material from the site, they appeared to consist of gravel soil and rubble materials with an approximate volume of 4m^3 and 3 m^3; and
- On the 19th of January 2007 the low and medium density sampling areas were scraped back to bare soils and clays with all demolition debris removed. The consultant (DLA 2007) noted that no visible asbestos was present at the site inspection on this day.

7.4.2 Soil Validation Results

The consultant (DLA 2007) provided summary results tables (**Appendix E**) in addition to detailed laboratory reports and chain of custody documentation. The results are discussed in the following sections.

Low and Medium Density Sampling Areas

These areas incorporated the surface soils across the entire Site, 71 soil samples were collected in total and samples were analysed as per **Table 5.1.** Results are as follows:

- Thirty six (36) soil samples were analysed for TPH (C_6-C_9 and C_{10}-C_{36}) and BTEX compounds, the reported concentrations were all either below the assessment criteria or the laboratory limits of reporting (LOR);
- All seventy one (71) soil samples were analysed for PAH compounds including BaP the concentrations were all either below the assessment criteria or the laboratory LOR;
- All seventy one (71) soil samples were analysed for Heavy Metals (As, Cd, Cr, Cu, Hg, Ni, Pb and Zn) the reported concentrations, were all either below the assessment criteria, including the Provisional Phytotoxicity threshold levels or were below the laboratory LOR;
- Thirty six (36) soil samples were analysed for OCPs, OPPs and PCBs the reported concentrations, were all either below the assessment criteria or below the laboratory LOR;
- A thorough asbestos visual inspection was conducted across the entire Site once the surface soils were scraped back and then ten (10) bulk soil samples were collected and analysed for asbestos. One sample TP-A1 reported chrysotile asbestos as detected. The consultant (DLA 2007) reported that upon investigation of this area and review of the analytical sample description it was considered to contain an isolated fragment of asbestos containing fibro plaster material. Due to this result further remediation was recommended in the form of "hen" picking in order to eliminate the possibility of further fragments contaminating a soil sample; and
- Remediation of the area surrounding TP-A1 involved the removal of approximately ten fragments and two shovel volumes of soil containing smaller fragments. Following the remediation, a clearance and validation was undertaken in the form of an additional bulk soil sample. The results of this additional sample (Sample #1) reported no asbestos detected.

<u>High Density Sampling Area</u>

This area incorporated the following sub-areas:

- The tank pit after UST removal;
- The stockpiled material resulting from the Tank Pit excavations; and
- The sewage effluent treatment system, which included the following:
    - Imported Fill materials (IF);
    - Sludge removed from the ponds (S);
    - An area on the north eastern peninsula that had effluent sludge laid out on it (SP3);
    - The transpiration area which had been sprayed with the re-irrigation water produced from the effluent treatment system (TA); and
    - Three effluent pits results from the removal and remediation of the sewage effluent treatment system area (ST1, ST2 and ST3).

Forty (40) soil samples were collected in total from the above listed area and samples were analysed as per **Table 5.1.** Results are as follows:

- The tank pits had a total of ten (10) soil samples collected and analysed as follows:
    - All samples were analysed for PAHs and heavy metals; and
    - MP-1S, MP-1E, MP-B1, MP-2N and MP2W only were also analysed for TPH (C_6-C_9 and C_{10}-C_{36}), BTEX, OCP, OPP and PCB.

    All results were either reported below the assessment criteria or below the laboratory LOR within the effluent pits. The consultant (DLA 2007) deemed this area to require no further remediation.
- During the removal of the USTs excess materials were stockpiled. The consultant (DLA 2007) sampled these stockpiles, SP1-South 80m^3 and SP2-North 70m^3. Four samples were collected and analysed as follows:
    - All samples were analysed for PAHs, heavy metals and TCLP metals; and
    - MP-SP1S-1, MP-SP1S-2, MP-SP2N-2 only were also analysed for TPH (C_6-C_9 and C_{10}-C_{36}), BTEX, OCP, OPP and PCB.

    All results were either reported below the assessment criteria or below the laboratory LOR within the sludge. The consultant (DLA 2007) deemed this material suitable for re-use onsite.
- Imported fill material consisted of approximately 500m^3 of material imported onsite to fill the trenches left by the removal and remediation of the sewage effluent treatment system area. Four samples were collected and analysed as follows:
    - All IF samples were analysed for PAHs and heavy metals; and
    - TP-IF-4 only was also analysed for TPH (C_6-C_9 and C_{10}-C_{36}), BTEX, OCP, OPP and PCB.

    All results were either reported below the assessment criteria or below the laboratory LOR within the imported fill. The consultant (DLA 2007) deemed this material suitable for use onsite.
- Sludge removed during the remediation of the ponds associated with the sewerage effluent treatment system was approximately 75m^3. Three samples were collected and analysed as follows:
    - All sludge samples were analysed for PAHs and heavy metals; and
    - TP-S-3 only was analysed for TPH (C_6-C_9 and C_{10}-C_{36}), BTEX, OCP, OPP and PCB.

    All results were either reported below the assessment criteria or below the laboratory LOR within the sludge. The consultant (DLA 2007) deemed this material suitable for re-use onsite.
- The excavated material and sludge originating from the evaporation pond located on the north eastern peninsula was stockpiled adjacent to the pond and consisted of approximately 100m^3 of material. Two samples were collected and analysed for PAHs, heavy metals, TPH (C_6-C_9 and C_{10}-C_{36}), BTEX, OCP, OPP and PCBs. All results were either reported below the assessment criteria or below the laboratory LOR within this material. The consultant (DLA 2007) deemed this material suitable for re-use onsite.

- The transpiration area consisted of land that had previously been sprayed or immersed in re-irrigation water from the sewage effluent treatment system. Two samples were collected and analysed for PAHs, heavy metals, OCP, OPP and PCBs. All results were either reported below the assessment criteria or below the laboratory LOR. The consultant (DLA 2007) deemed this area to require no further remediation.
- The three effluent pits had a total of fifteen (15) soil samples collected and analysed as follows:
  - All samples were analysed for PAHs and heavy metals; and
  - TP-ST1-7, TP-ST1-8 and TP-ST3-5 only were also analysed for OCP, OPP and PCB.

  All results were either reported below the assessment criteria or below the laboratory LOR within the effluent pits. The consultant (DLA 2007) deemed this area to require no further remediation.

7.5 Long Term Site Management

Based on the remediation and validation activities undertaken at the site, the consultant did not recommend any long term site management provisions.

7.6 Audit Findings

The consultant (DLA 2007) provided tables which adequately summarised the soil laboratory results. The site plans provided by the consultant contained an approximate scale and adequately identified the sampling locations relevant to the main site features such as buildings, boundaries and street frontage.

The reported concentrations of contaminants by the consultant (DLA 2007) were checked against, and found to be consistent with, those reported by the laboratory. There were some minor transcription errors as follows:

- TP-V6 – TPH C10-14 concentration is reported as 80mg/kg;
- Samples called Dup5 in laboratory report however not reported in the tables;
- TP-Dup8a – TPH C29-C36 concentration is reported as 50mg/kg;
- The LOR for BaP within the Low and Medium Density Sampling area should be <0.5mg/kg;
- TP-VL13 – BaP concentration is reported as 1.1mg/kg, which is above the assessment criteria;
- The LOR for OPPs within the Low and Medium Density Sampling area should be <0.5mg/kg;
- The LOR for PCBs within the Low and Medium Density Sampling area should be <0.5mg/kg;
- The LOR for ethylbenzene within the tank pit should be <1.0mg/kg;
- The following lead concentrations are as reported by the laboratory MP-B1 (9.4mg/kg), MP-B2 (15mg/kg), MP-1N (3.4mg/kg), MP-2N (3.9mg/kg) and MP-1W (7.4mg/kg);

- The TCLP PAH results for stockpiles SP1-South and SP2-North have not been tabulated within the report. All results are below the waste classification guidelines (NSW EPA, 1999);
- The LORs for both OPPs and PCBs within the samples collected from the imported fill samples, transpiration area, sludge and effluent pits should be <0.5mg/kg;
- TP-TA-2a – lead concentration is reported as 6mg/kg; and
- Table 8ac – TCLP Metals in Soil should be in ug/L and the criteria specified as mg/L. In its current state the TCLP Metals results in the sludge and effluent pits appears to be above the assessment criteria. However all results are in fact below the assessment criteria.

The minor errors presented above do not influence the consultants (DLA 2007) conclusion that no further soil remediation re required for the site to be considered suitable for a residential land use. While the BaP results detected TP-VL13 is above the criterion (1mg/kg) it is only marginally above and were it included in the 95% UCL calculations the results would likely only increase the site 95% UCL only slightly.

The laboratory procedures were appropriate for the identified contaminants of concern and the adopted site assessment criteria against which the results were compared.

All of the soil validation results presented by the consultant confirm that the remediation works were successful in rendering the site suitable for the proposed residential use.

Overall, the conclusions reached by the consultant in relation to the validation of the remediation works undertaken to render the site suitable for the intended residential use are considered appropriate and meet the requirements of the site audit.

8 Evaluation of Landuse Suitability

In assessing the suitability of a site for an existing or proposed landuse in an urban context, the decision process for assessing urban redevelopment sites should be followed (Page 50 and 51, DEC 2006), as discussed in the following sections.

For the purposes of this assessment, the proposed land use of the site is standard residential with gardens and accessible soil.

8.1 Reporting in accordance with EPA requirements

The documents provided by the consultants have been checked against, and (overall) meet the requirements of, EPA 1997. As such, the reporting of the site investigation process meets the requirements of the site audit.

8.2 Aesthetic issues have been addressed

The consultant gave adequate consideration to odours and soil discolouration during the remediation and validation works, as evidenced in both the site description information provided in the report (DLA 2007) and also detailed soil descriptions provided in the sampling logs (DLA 2007). There were no aesthetic issues identified which influenced the assessment of site suitability. As such, aesthetic issues are considered to have been adequately addressed and the requirements of the site audit have been met.

8.3 Soils have been assessed against the appropriate investigation levels

The criteria adopted by the consultant for the site validation process have been checked against, and are consistent with, appropriate criteria endorsed by the DECC for the proposed residential landuse with gardens and accessible soil. As such, the requirements of the site audit have been met.

8.4 Background soil concentrations have been adequately addressed

The consultant (DLA 2007) undertook sampling at the site to a depth that provided sufficient penetration into natural formations to a give clear indication and representation of local natural soil profiles. The chemical concentrations in soil for the natural soil profile were below the appropriate soil criteria and within published background ranges (NEPC 1999). As such, background soil concentrations are considered to have been adequately addressed and the requirements of the site audit have been met.

8.5 All impacts of chemical mixtures have been assessed

No issues relating to chemical mixtures in relation to the identified contaminants of concern were identified or expected and, as such, the requirements of the site audit have been met.

8.6 The site management strategy is appropriate

No ongoing site management was proposed by the consultant. Since the remediation and validation activities conducted indicate that no further management of contamination issues is required, the requirements of the site audit in relation to the site management strategy have been met.

8.7 Contaminant migration (actual or potential) has been addressed

The consultant gave adequate consideration to the potential for contaminant migration, as evidenced by the reported absence of any visual or olfactory indications of contamination in the tank pit excavation, the reported absence of groundwater in the tank pit excavation and the TCLP test results conducted on selected samples which showed a low potential for contaminant migration.

On this basis, it is unlikely that there are any unacceptable risks posed to either on-site or off-site receptors arising from contamination which may have migrated via groundwater. As such, the consideration of potential migration of contamination from the site is considered to have met the requirements of the site audit.

9 Audit Summary Opinion

On the basis of the findings of the Site Audit, and subject to the limitations in **Section 10**, the following conclusions are made:

- The remediation and validation are considered to have met the requirements of the Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition) (DEC 2006);
- The site is considered suitable for the proposed residential land-use with gardens and accessible soil, as defined in Table 6-A Schedule B(7B) (NEPC 1999);
- The suitability of the site for residential use is not subject to any ongoing management or monitoring of land contamination issues; and
- There is unlikely to be migration of contaminants from the site which may result in any unacceptable risks to surrounding human or ecological receptors.

10 Limitations

This audit was conducted with a reasonable level of scrutiny, care and diligence on behalf of the client for the purposes outlined in s.47(1) of the *Contaminated Land Management Act 1997.* The data used to support the conclusions reached in this audit was obtained by other consultants and the limitations which apply to the consultant's report(s) apply equally to this audit report.

Every reasonable effort has been made to identify and obtain all relevant data, reports and other information that provide evidence about the condition of the site, and those that were held by the client and the client's consultants, or that were readily available. No liability can be accepted for unreported omissions, alterations or errors in the data collected and presented by other consultants. Accordingly, the data and information presented by others are taken and interpreted in good faith.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations reviewed, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which was not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this audit are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS Environmental Pty Ltd and the Site Auditor reserve the right to review the report in the context of the additional information.

Appendix A

Guidelines made or approved by the DECC

Guidelines made or approved by the DECC (s.105 CLM Act 1997)

Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites, Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council, 1992 (ANZECC/NHMRC 1992)

Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Paper No 4, 2000 (ANZECC/ARMCANZ 2000)

Australian Drinking Water Guidelines, National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand, 2004 (NHMRC/NRMMC 2004)

Composite Sampling, Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, (NEHF 1996)

Contaminated Sites: Guidelines for Assessing Service Station Sites, NSW EPA, 1994 (EPA 1994)

Contaminated Sites: Sampling Design Guidelines, NSW EPA, 1995 (EPA 1995)

Contaminated Sites: Guidelines for the Vertical Mixing of Soil on Former Broad-Acre Agricultural Land, NSW EPA, 1995 (EPA 1995b)

Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, NSW EPA, 1997 (EPA 1997)

Contaminated Sites: Guidelines for Assessing Banana Plantation Sites, NSW EPA, 1997 (EPA 1997b)

Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition), NSW DEC, 2006 (DEC 2006)

Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report, NSW EPA, 1999 (EPA 1999)

Contaminated Sites: Guidelines for Assessing Former Orchards and Market Gardens, NSW EPA, 2005 (EPA 2005)

Environmental Guidelines: Assessment, Classification & Management of Liquid and Non-Liquid Wastes, NSW DEC, 2004 (DEC 2004)

Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia, June 2002 (EnHealth 2002)

Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental, February 1996 (NSW Agr. 1996)

Guidelines for the Assessment and Management of Groundwater Contamination, NSW DEC, March 2007 (NSW DEC 2007)

National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, 1999 (NEPC 1999)

Appendix B

Audit Correspondence

NSW Site Auditor Scheme
SITE AUDIT NOTIFICATION

Department of
Environment and Conservation (NSW)

Section 53C of the* Contaminated Land Management Act 1997 *requires auditors to notify the EPA of proposed statutory site audits within seven days of their being commissioned.

Proposed site audit details

Site audit no. 0503-0615

This proposed site audit is a **statutory audit/**~~non statutory audit~~* within the meaning of the *Contaminated Land Management Act 1997 (see s.47(2))*.

Site auditor details (as accredited under the *Contaminated Land Management Act 1997*)

Name	**Andrew Lau**	Company	**JBS Environmental Pty Ltd**
Address	**PO Box 940**		
	MASCOT **NSW**	Postcode	**1460**
Phone	**02 8338 1011**	Fax	**02 8338 1700**

Site details

Address	**59 Lakeview Road**		
	MORISSET PARK **NSW**	Postcode	**2264**

Property description *(attach a list if several properties are included in the site audit)*

Lot 38 DP1076099

…….

Local Government Area **Lake Macquarie**

Area of Site (eg. hectares)	**17.3 Ha**	Current zoning	**2(1) Residential & 6(2) Tourism & Recreation**

To the best of my knowledge, the site ~~is~~**/is not*** the subject of a declaration, order, agreement or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*.

Declaration/Order/Agreement/Notice* no(s) ……N/A……

……..

**** Strike out as appropriate***

Site audit commissioned by

Name	**Craig Shepherd**		Company	**Johnson Property Group Pty Ltd**	
Address	**C/O: J W Planning Pty Ltd**				
	PO BOX 3252	**VALENTINE NSW**		Postcode	**2280**
Phone	**(02)9899 1888**		Fax	**-**	

Name and phone number of contact person (if different from above)

……..

……..

Purpose of site audit

☑ A. To determine land use suitability *(please specify intended use[s])*

Residential with Gardens and Accessible Soil and Parks/Open Space Use

OR

☐ ~~B. (i) To determine the nature and extent of contamination, and/or~~

☐ ~~B. (ii) To determine the appropriateness of an investigation/remedial action/management plan*, and/or~~

☐ ~~B. (iii) To determine if the land can be made suitable for a particular use or uses by implementation of a specified remedial action plan/management plan* (*please specify intended use[s]*)~~

……

Nature of statutory requirement(s) (not applicable for non-statutory audits)

☐ ~~Requirement(s) under the *Contaminated Land Management Act 1997* (e.g. remediation order) *(please specify, including date of issue)*~~

……...

……...

☐ ~~Requirement(s) imposed by an environmental planning instrument (please specify, including date of issue)~~

…..……..

☑ Development consent requirement(s) under the *Environmental Planning and Assessment Act 1979* (please specify consent authority and date of issue)

DA/3010/2004

☐ ~~Requirement(s) under other legislation *(please specify, including date of issue)*~~

…..……...

……....

**** Strike out as appropriate***

Overall comments

……..

……..

……..

……..

……..

……..

Auditor's declaration

I certify that the information supplied in this form and any attached pages is to the best of my knowledge true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed:  **15 September 2006**

Please send completed forms to:

Department of Environment and Conservation (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
Fax: (02) 9995 5930

Appendix C

Site Plan

PLAN FORM 2

Plan Drawing only to appear in this space

DP1107753

Registered 31-1-2007

C.A: SEE CERTIFICATE

Title System: TORRENS

Purpose: SUBDIVISION

Ref. Map: 4527-24#

Last Plan: DP1076099

PLAN OF SUBDIVISION OF LOT 38 DP 1076099.

Lengths are in metres. Reduction Ratio 1 : 2000

L.G.A.: LAKE MACQUARIE

Suburb/Locality: MORISSET PARK

Parish: MORISSET

County: NORTHUMBERLAND

This sheet 1 of my plan in sheets (Delete if inapplicable)

Survey Certificate
Surveying Regulation 2006

I, STEPHEN J LAWLER

of SURDEVEL PTY LTD
PO BOX 300 SWANSEA NSW 2281

a surveyor registered under the Surveying Act, 2002 hereby certify that the survey represented in this plan is accurate and has been made in accordance with the Surveying Regulation 2006 and was completed on 15 SEP 2006

The survey relates to LOTS 1

(here specify the land actually surveyed or specify any land shown in the plan that is not the subject of this survey)

Datum Line: 'X'~'Y'

Zone: Urban/Rural

Signature

Surveyor registered under the Surveying Act 2002

Plans used in preparation of survey/~~compilation~~.
DP 1076099
DP 1090979
DP 1101147

PANEL FOR USE ONLY for statements of intention to dedicate public roads, to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants

SIGNATURES, SEALS AND STATEMENTS of intention to dedicate public roads or to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants.

EXECUTED BY TRUSTEES OF HOSPITALLER BROTHERS OF ST JOHN OF GOD ABN 11 435 026 358 BY ITS DULY AUTHORISED ATTORNEY:

KEITH NORMAN JOHNSON
SOLE DIRECTOR AND SOLE SECRETARY
KENDALL GRANGE PROPERTIES PTY LTD
BOOK 4480 No 607

EXECUTED by BANK OF WESTERN AUSTRALIA LTD ACN 050 454 454 by its Attorneys:

Signature

Name and Title (please print)

and

Signature

Name and Title (please print)

by its Attorneys:

BANK OF WESTERN AUSTRALIA LTD

An Officer of the Bank

Department of Lands Approval

I ..... in approving this plan certify that all necessary approvals in regard to the allocation of the land shown hereon have been given.

Signature: .....

Date: .....

File Number: .....

Office: .....

Subdivision Certificate

I certify that the provisions of s.109J of the Environmental Planning and Assessment Act 1979 have been satisfied in relation to the proposed Subdivision set out herein
*(insert "subdivision" or "new road")

C. Field
* Authorised Person/~~General Manager~~/Accredited Certifier

Consent Authority: Lake Macquarie City Council

Date of Endorsement: 27 November 2006

Accreditation No. : .....

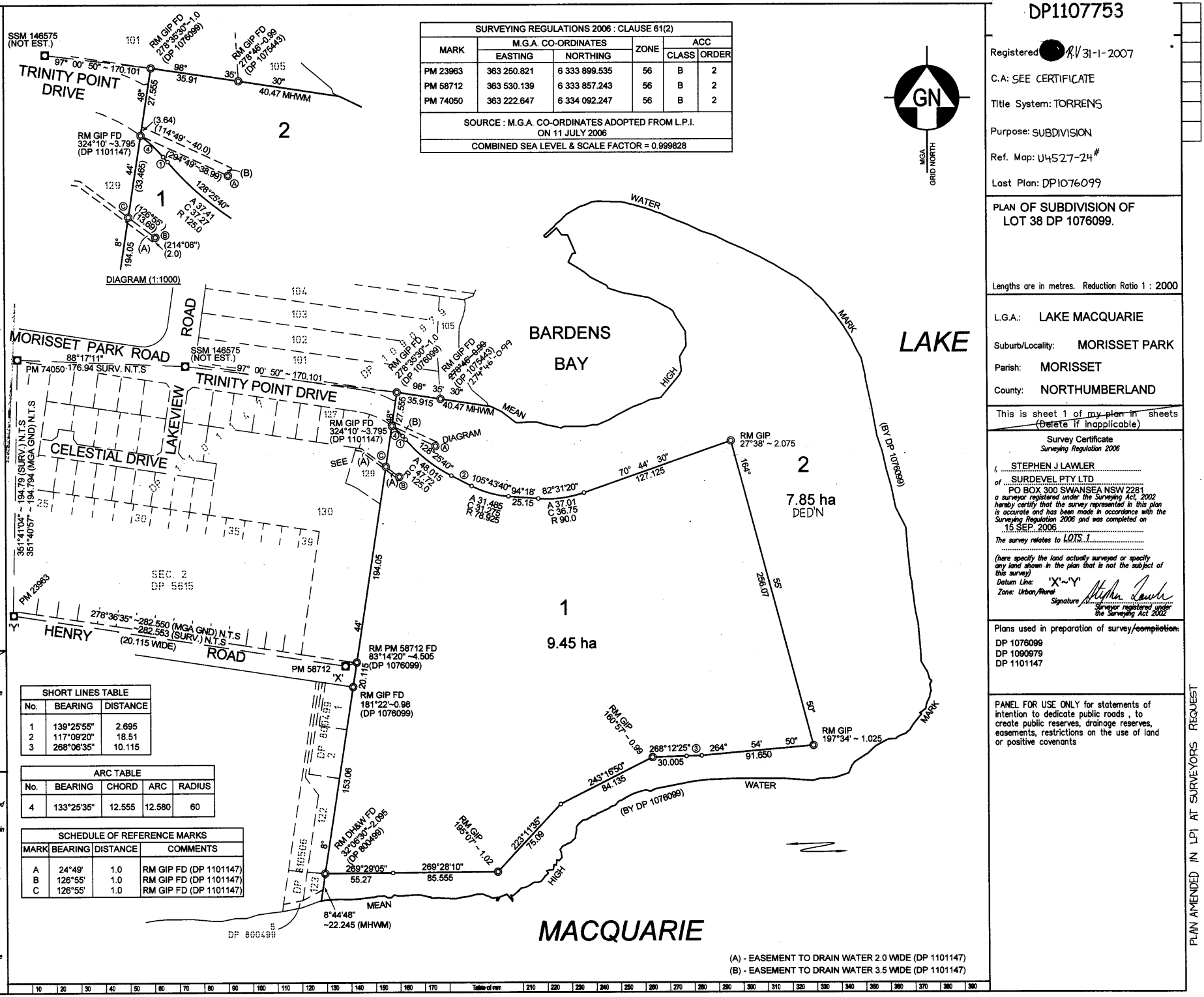
Subdivision Certificate No. 124/2006

File No. : DA/2136/2005

Note :
When the plan is to be lodged electronically in the Land Titles Office it should include a signature in an electronic or digital format approved by the Registrar-General.

* Delete whichever is inapplicable

SURVEYING REGULATIONS 2006 : CLAUSE 61(2)					
MARK	M.G.A. CO-ORDINATES		ZONE	ACC	
	EASTING	NORTHING		CLASS	ORDER
PM 23963	363 250.821	6 333 899.535	56	B	2
PM 58712	363 530.139	6 333 857.243	56	B	2
PM 74050	363 222.647	6 334 092.247	56	B	2
SOURCE : M.G.A. CO-ORDINATES ADOPTED FROM L.P.I. ON 11 JULY 2006					
COMBINED SEA LEVEL & SCALE FACTOR = 0.999828					



SHORT LINES TABLE		
No.	BEARING	DISTANCE
1	139°25'55"	2.695
2	117°09'20"	18.51
3	268°06'35"	10.115

ARC TABLE				
No.	BEARING	CHORD	ARC	RADIUS
4	133°25'35"	12.555	12.580	60

SCHEDULE OF REFERENCE MARKS			
MARK	BEARING	DISTANCE	COMMENTS
A	24°49'	1.0	RM GIP FD (DP 1101147)
B	126°55'	1.0	RM GIP FD (DP 1101147)
C	126°55'	1.0	RM GIP FD (DP 1101147)

(A) - EASEMENT TO DRAIN WATER 2.0 WIDE (DP 1101147)
(B) - EASEMENT TO DRAIN WATER 3.5 WIDE (DP 1101147)

PLAN AMENDED IN LPI AT SURVEYORS REQUEST

SURVEYOR'S REFERENCE : 1320 'CHECKLIST'

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

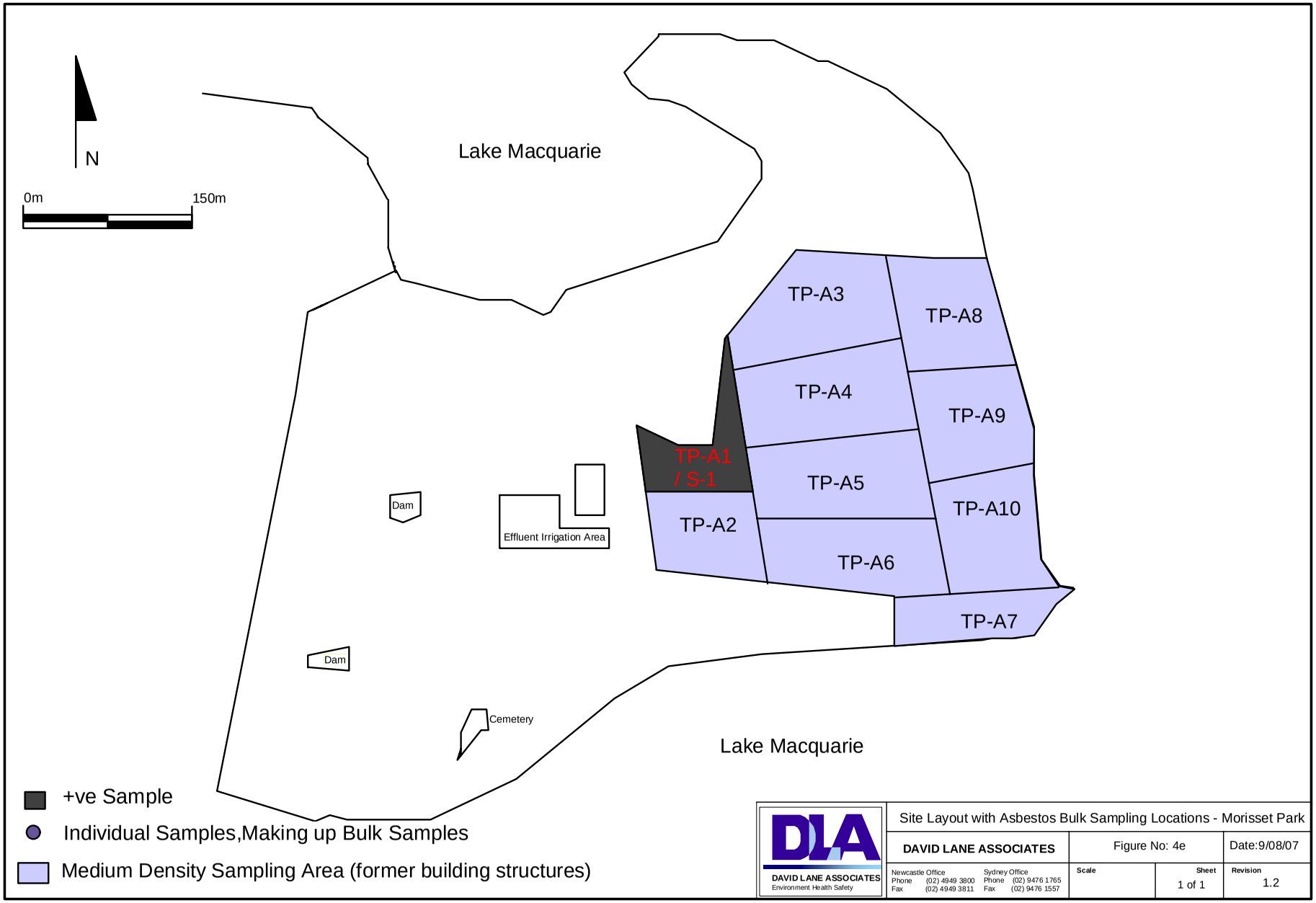
Filename : 1320-1A.dwg

Appendix D

Consultants Figures

DAVID LANE ASSOCIATES Environment Health Safety "Ayrfield" Lot 18 Old North Road - Rothbury	**DESIGNED:** DLA	SITE LOCATION	
	COMPILED: DUO	**CLIENT:** Johnson Property Group	**DRAWING:** 21/03/07
	PROJ. No.	**LOCATION:** Site Validation, 59 Lakeview Road, Trinity Pt, Morisset Park	**FIGURE:** 1

DAVID LANE ASSOCIATES Environment Health Safety 2b / 30 Leighton Place Hornsby, NSW	**DESIGNED:** DLA	**Title**	Site Layout - 59 Lakeview Road Morisset Park
	Ver: 1	**CLIENT:**	Johnson Property Group Pty Ltd — **Date:** 18/08/2007
	PROJ. No. 1779	**LOCATION:**	Morisset Park - Trinity Point — **FIGURE:** 3



Site Layout with Asbestos Bulk Sampling Locations - Morisset Park

DAVID LANE ASSOCIATES

Figure No: 4e

Date:9/08/07

DAVID LANE ASSOCIATES
Environment Health Safety

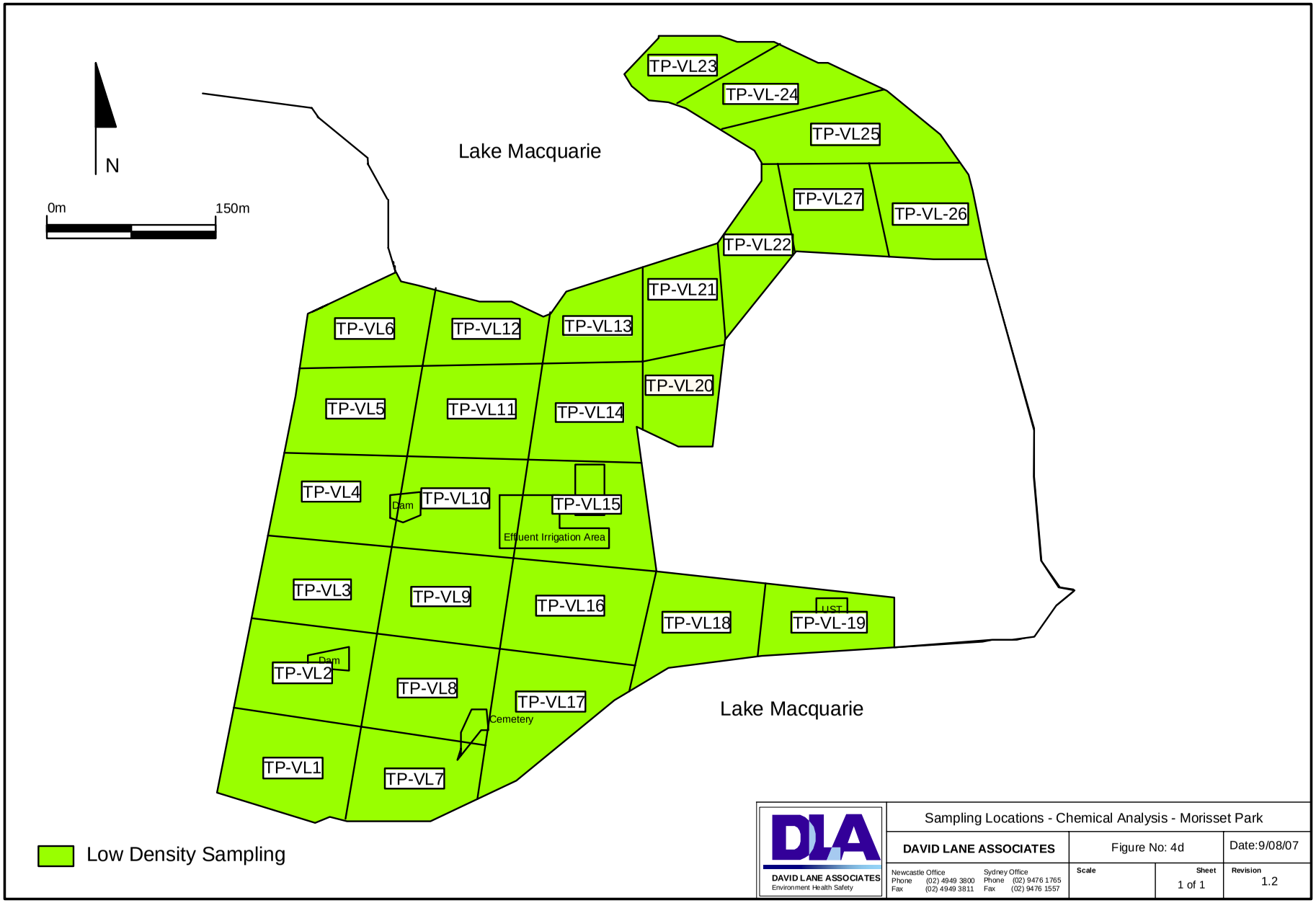
Newcastle Office
Phone (02) 4949 3800
Fax (02) 4949 3811

Sydney Office
Phone (02) 9476 1765
Fax (02) 9476 1557

Scale

Sheet
1 of 1

Revision
1.2



Sampling Locations - Chemical Analysis - Morisset Park

DAVID LANE ASSOCIATES

Figure No: 4d

Date:9/08/07

DAVID LANE ASSOCIATES
Environment Health Safety

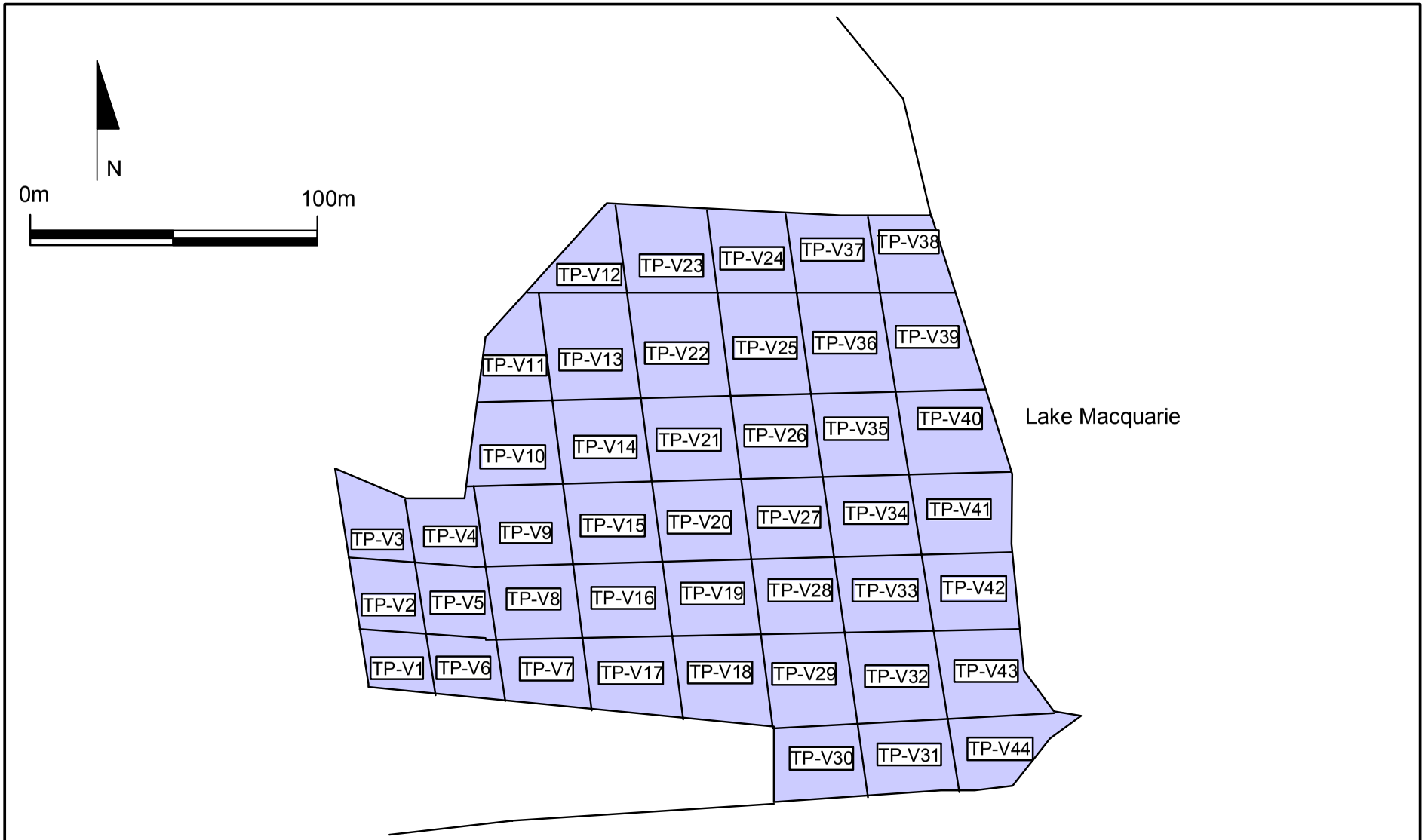
Newcastle Office
Phone (02) 4949 3800
Fax (02) 4949 3811

Sydney Office
Phone (02) 9476 1765
Fax (02) 9476 1557

Scale

Sheet
1 of 1

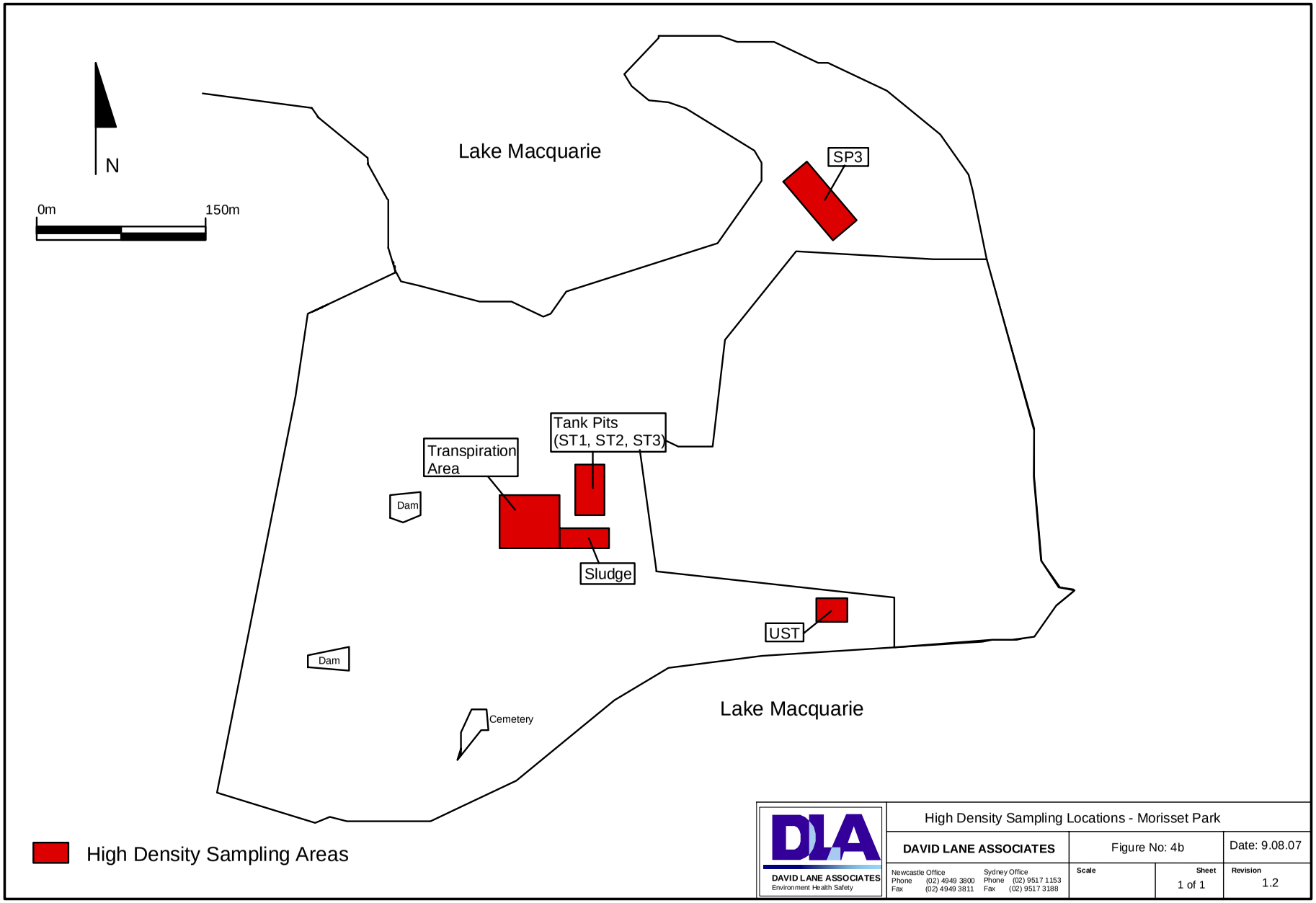
Revision
1.2



DAVID LANE ASSOCIATES
Environment Health Safety

Sampling Locations - Chemical Analysis - Morisset Park

DAVID LANE ASSOCIATES	Figure No: 4c		Date: 9/08/07
Newcastle Office Phone (02) 4949 3800 Fax (02) 4949 3811 / Sydney Office Phone (02) 9476 1765 Fax (02) 9476 1557	Scale	Sheet 1 of 1	Revision 1.2



High Density Sampling Locations - Morisset Park

DAVID LANE ASSOCIATES

Figure No: 4b

Date: 9.08.07

DAVID LANE ASSOCIATES
Environment Health Safety

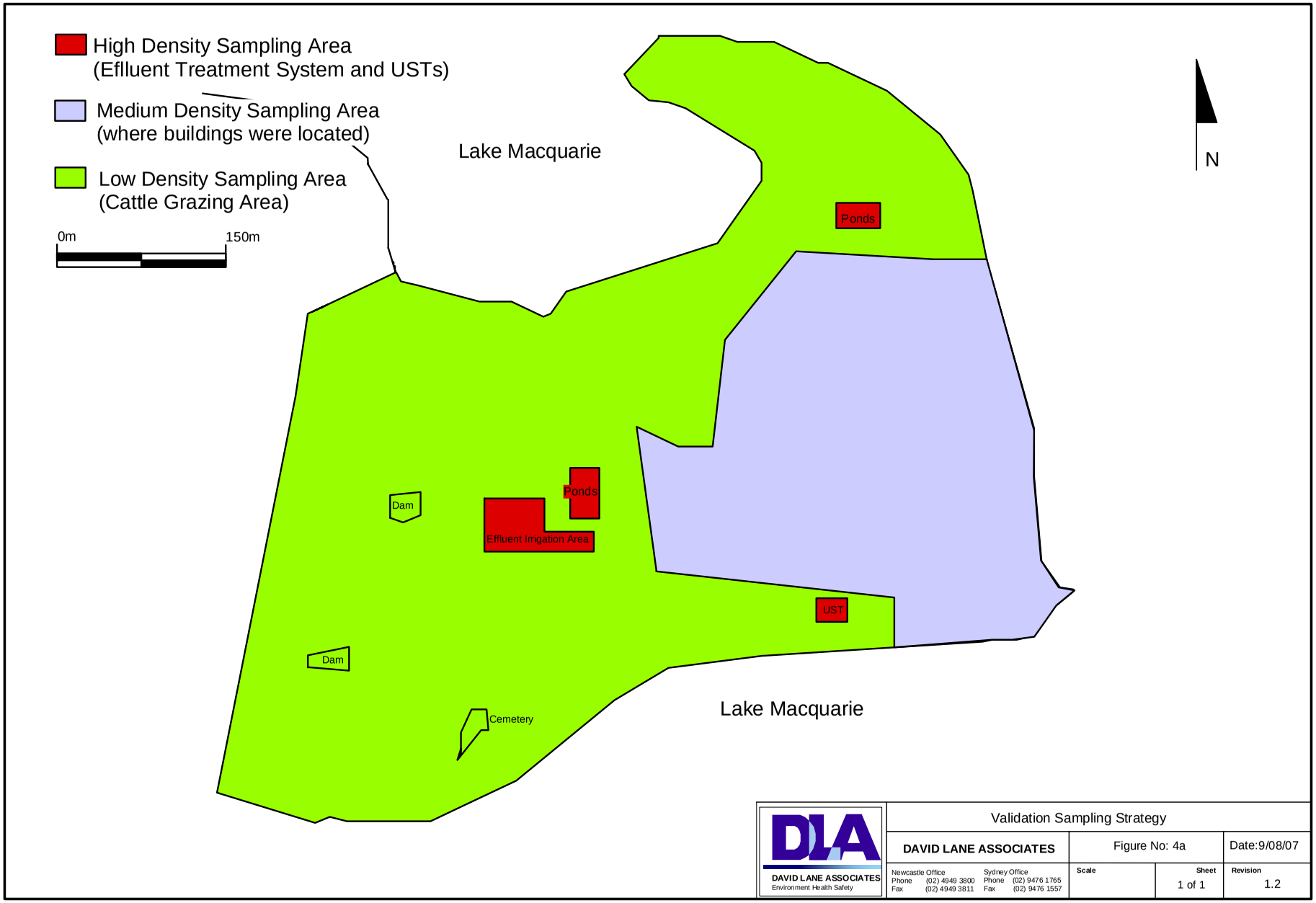
Newcastle Office
Phone (02) 4949 3800
Fax (02) 4949 3811

Sydney Office
Phone (02) 9517 1153
Fax (02) 9517 3188

Scale

Sheet
1 of 1

Revision
1.2



DAVID LANE ASSOCIATES
Environment Health Safety

Validation Sampling Strategy

DAVID LANE ASSOCIATES	Figure No: 4a	Date:9/08/07

Newcastle Office Phone (02) 4949 3800 Fax (02) 4949 3811
Sydney Office Phone (02) 9476 1765 Fax (02) 9476 1557

Scale	Sheet	Revision
	1 of 1	1.2

Appendix E

Consultants Summary Tables

Table 8a – TPH in Soil (mg/kg)

Sample ID & Depth* (m)	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
TP-V1	<10	<50	<100	<100	ND
TP-V3	<10	<50	<100	180	180
TP-V5	<10	<50	<100	100	100
TP- V6 (Dup 2)	<10	70	<100	<100	70
TP-V7	<10	<50	<100	<100	ND
TP-V9	<10	60	<100	120	180
TP-V11	<10	120	160	250	530
TP-V13	<10	<50	<100	<100	ND
TP-V14 (Dup 4)	<10	<50	<100	<100	ND
TP-V16	<10	<50	<100	<100	ND
TP-V18	<10	<50	<100	<100	ND
TP-V20	<10	<50	<100	<100	ND
TP-V22	<10	<50	<100	<100	ND
TP-V24	<10	<50	200	100	300
TP-V26	<10	<50	<100	<100	ND
TP-V28	<10	<50	<100	<100	ND
TP-V29 (Dup 3)	<10	<50	<100	<100	ND
TP-V30	<10	<50	<100	<100	ND
TP-V32	<10	<50	<100	<100	ND
TP-V34	<10	<50	<100	<100	ND
TP-V36	<10	<50	<100	<100	ND
TP-V38	<10	<50	<100	<100	ND
TP-V40	<10	<50	<100	<100	ND
TP-V42	<10	<50	<100	<100	ND
TP-V44	<10	<50	<100	170	170
TP-VL1	<10	80	160	180	420
TP-VL2 (Dup 1)	<10	<50	<100	<100	ND
TP-VL3	<10	<50	<100	170	170
TP-VL4 (Dup 6)	<10	<50	<100	<100	ND
TP-VL5	<10	<50	<100	<100	ND
TP-VL7	<10	<50	<100	<100	ND
TP-VL9	<10	<50	<100	140	140

Table 8a Cont'd

Sample ID & Depth* (m)	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
TP-VL10 (Dup 7)	<10	<50	<100	<100	ND
TP-VL11	<10	<50	<100	<100	ND
TP-VL13	<10	<50	<100	220	220
TP-VL14	<10	<50	<100	<100	ND
TP-VL15	<10	<50	<100	<100	ND
TP-VL17	<10	60	<100	110	170
TP-VL18 (Dup 8)	<10	<50	<100	<100	ND
TP-VL19	<10	<50	<100	<100	ND
TP-VL21	<10	<50	<100	170	170
TP-VL23	<10	<50	<100	<100	ND
TP-VL25	<10	<50	<100	<100	ND
TP-VL27	<10	<50	<100	<100	ND
TP-Dup2a	<20	40	68	88	196
TP-Dup3a	<20	<20	<50	<50	ND
TP-Dup6a	<20	<20	<50	<50	ND
TP-Dup8a	<20	<20	<50	<50	ND
Criteria	**65**	**-**	**-**	**-**	**1000**

ND – Not Detected. * All samples are representative of soils between 0 and 300mm.

Table 8b – BTEX in Soil (mg/kg)

Sample ID & Depth* (m)	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
TP-V1	<0.2	<0.5	<0.5	<0.5
TP-V3	<0.2	<0.5	<0.5	<0.5
TP-V5	<0.2	<0.5	<0.5	<0.5
TP-V7	<0.2	<0.5	<0.5	<0.5
TP-V9	<0.2	<0.5	<0.5	<0.5
TP-V11	<0.2	<0.5	<0.5	<0.5
TP-V13	<0.2	<0.5	<0.5	<0.5
TP-V16	<0.2	<0.5	<0.5	<0.5
TP-V18	<0.2	<0.5	<0.5	<0.5
TP-V20	<0.2	<0.5	<0.5	<0.5
TP-V22	<0.2	<0.5	<0.5	<0.5
TP-V24	<0.2	<0.5	<0.5	<0.5
TP-V26	<0.2	<0.5	<0.5	<0.5
TP-V28	<0.2	<0.5	<0.5	<0.5
TP-V30	<0.2	<0.5	<0.5	<0.5
TP-V32	<0.2	<0.5	<0.5	<0.5
TP-V34	<0.2	<0.5	<0.5	<0.5
TP-V36	<0.2	<0.5	<0.5	<0.5
TP-V38	<0.2	<0.5	<0.5	<0.5
TP-V40	<0.2	<0.5	<0.5	<0.5
TP-V42	<0.2	<0.5	<0.5	<0.5
TP-V44	<0.2	<0.5	<0.5	<0.5
TP-VL1	<0.2	<0.5	<0.5	<0.5
TP-VL3	<0.2	<0.5	<0.5	<0.5
TP-VL5	<0.2	<0.5	<0.5	<0.5
TP-VL7	<0.2	<0.5	<0.5	<0.5
TP-VL9	<0.2	<0.5	<0.5	<0.5

Table 8b Cont'd

Sample ID & Depth* (m)	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
TP-VL11	<0.2	<0.5	<0.5	<0.5
TP-VL13	<0.2	<0.5	<0.5	<0.5
TP-VL15	<0.2	<0.5	<0.5	<0.5
TP-VL17	<0.2	<0.5	<0.5	<0.5
TP-VL19	<0.2	<0.5	<0.5	<0.5
TP-VL21	<0.2	<0.5	<0.5	<0.5
TP-VL23	<0.2	<0.5	<0.5	<0.5
TP-VL25	<0.2	<0.5	<0.5	<0.5
TP-VL27	<0.2	<0.5	<0.5	<0.5
TP-Dup1	<0.2	<0.5	<0.5	<0.5
TP-Dup2	<0.2	<0.5	<0.5	<0.5
TP-Dup2a	<0.5	<0.5	<0.5	<1.5
TP-Dup3	<0.2	<0.5	<0.5	<0.5
TP-Dup3a	<0.5	<0.5	<0.5	<1.5
TP-Dup4	<0.2	<0.5	<0.5	<0.5
TP-Dup5	<0.2	<0.5	<0.5	<0.5
TP-Dup6	<0.2	<0.5	<0.5	<0.5
TP-Dup6a	<0.5	<0.5	<0.5	<1.5
TP-Dup7	<0.2	<0.5	<0.5	<0.5
TP-Dup8	<0.2	<0.5	<0.5	<0.5
TP-Dup8a	<0.5	<0.5	<0.5	<1.5
Criteria	**1**	**1.4[a]/130[b]**	**3.1[c]/50[d]**	**14[e]/25[d]**

[a b c d e] * – As outlined in Table 8a.

Table 8c – PAH in Soil (mg/kg)

Sample ID and Depth* (m)	Contaminant	
	BaP	Total PAH
TP-V1	<0.05	ND
TP-V2	<0.05	ND
TP-V3	<0.05	ND
TP-V4	<0.05	ND
TP-V5	<0.05	ND
TP-V6	<0.05	ND
TP-V7	<0.05	ND
TP-V8	<0.05	ND
TP-V9	<0.05	6.1
TP-V10	<0.05	ND
TP-V11	<0.05	ND
TP-V12	<0.05	ND
TP-V13	<0.05	ND
TP-V14	<0.05	ND
TP-V15	<0.05	ND
TP-V16	<0.05	ND
TP-V17	<0.05	ND
TP-V18	<0.05	ND
TP-V19	<0.05	ND
TP-V20	<0.05	ND
TP-V21	<0.05	ND
TP-V22	<0.05	ND
TP-V23	<0.05	ND
TP-V24	<0.05	ND
TP-V25	<0.05	ND
TP-V26	<0.05	ND
TP-V27	<0.05	ND
TP-V28	<0.05	ND
TP-V29	<0.05	ND

Table 8c Cont'd

Sample ID and Depth* (m)	Contaminant	
	BaP	Total PAH
TP-V30	<0.05	ND
TP-V31	<0.05	ND
TP-V32	<0.05	ND
TP-V33	<0.05	ND
TP-V34	<0.05	ND
TP-V35	<0.05	ND
TP-V36	<0.05	ND
TP-V37	<0.05	ND
TP-V38	<0.05	ND
TP-V39	<0.05	ND
TP-V40	<0.05	ND
TP-V41	<0.05	ND
TP-V42	<0.05	ND
TP-V43	<0.05	ND
TP-V44	<0.05	ND
TP-VL1	<0.05	ND
TP-VL2	<0.05	ND
TP-VL3	<0.05	ND
TP-VL4	<0.05	ND
TP-VL5	<0.05	ND
TP-VL6	<0.05	ND
TP-VL7	<0.05	ND
TP-VL8	<0.05	ND
TP-VL9	<0.05	ND
TP-VL10	<0.05	ND
TP-VL11	<0.05	ND
TP-VL12	<0.05	ND
TP-VL13	0.9	8.6
TP-VL14	<0.05	ND

Table 8c Cont'd

Sample ID and Depth* (m)	Contaminant	
	BaP	Total PAH
TP-VL15	<0.05	ND
TP-VL16	<0.05	ND
TP-VL17	<0.05	ND
TP-VL18	<0.05	ND
TP-VL19	<0.05	2.1
TP-VL20	<0.05	ND
TP-VL21	<0.05	ND
TP-VL22	<0.05	ND
TP-VL23	<0.05	ND
TP-VL24	<0.05	ND
TP-VL25	<0.05	ND
TP-VL26	<0.05	ND
TP-VL27	<0.05	ND
TP-Dup1	<0.05	ND
TP-Dup2	<0.05	ND
TP-Dup2a	<0.05	ND
TP-Dup3	<0.05	ND
TP-Dup3a	<0.05	ND
TP-Dup4	<0.05	0.5
TP-Dup5	<0.05	ND
TP-Dup6	<0.05	ND
TP-Dup6a	<0.05	ND
TP-Dup7	<0.05	ND
TP-Dup8	<0.05	ND
TP-Dup8a	<0.05	ND
Acceptance Criteria	**1**	**20**

ND – Not Detected * All samples are representative of soils between 0 and 300mm.

Table 8d – Organics in Soil (mg/kg)

Sample ID and Depth* (m)	Contaminant		
	OCP	OPP	PCB
TP-V1	<0.05	<0.05	<0.05
TP-V3	<0.05	<0.05	<0.05
TP-V5	<0.05	<0.05	<0.05
TP- V6 (Dup 2)	<0.05	<0.05	<0.05
TP-V7	<0.05	<0.05	<0.05
TP-V9	<0.05	<0.05	<0.05
TP-V11	<0.05	<0.05	<0.05
TP-V13	<0.05	<0.05	<0.05
TP-V14 (Dup 4)	<0.05	<0.05	<0.05
TP-V16	<0.05	<0.05	<0.05
TP-V18	<0.05	<0.05	<0.05
TP-V20	<0.05	<0.05	<0.05
TP-V22	<0.05	<0.05	<0.05
TP-V24	<0.05	<0.05	<0.05
TP-V26	<0.05	<0.05	<0.05
TP-V28	<0.05	<0.05	<0.05
TP-V29 (Dup 3)	<0.05	<0.05	<0.05
TP-V30	<0.05	<0.05	<0.05
TP-V32	<0.05	<0.05	<0.05
TP-V34	<0.05	<0.05	<0.05
TP-V36	<0.05	<0.05	<0.05
TP-V38	<0.05	<0.05	<0.05
TP-V40	<0.05	<0.05	<0.05
TP-V42	<0.05	<0.05	<0.05
TP-V44	<0.05	<0.05	<0.05
TP-VL1	<0.05	<0.05	<0.05
TP-VL2 (Dup 1)	<0.05	<0.05	<0.05
TP-VL3	<0.05	<0.05	<0.05
TP-VL4 (Dup 6)	<0.05	<0.05	<0.05
TP-VL5	<0.05	<0.05	<0.05

Table 8d Cont'd

Sample ID and Depth* (m)	Contaminant		
	OCP	OPP	PCB
TP-VL7	<0.05	<0.05	<0.05
TP-VL9	<0.05	<0.05	<0.05
TP-VL10 (Dup 7)	<0.05	<0.05	<0.05
TP-VL11	<0.05	<0.05	<0.05
TP-VL13	<0.05	<0.05	<0.05
TP-VL15	<0.05	<0.05	<0.05
TP-VL17	<0.05	<0.05	<0.05
TP-VL18 (Dup 8)	<0.05	<0.05	<0.05
TP-VL19	<0.05	<0.05	<0.05
TP-VL21	<0.05	<0.05	<0.05
TP-VL23	<0.05	<0.05	<0.05
TP-VL25	<0.05	<0.05	<0.05
TP-VL27	<0.05	<0.05	<0.05
TP-Dup2a	<0.1	<0.1	<0.1
TP-Dup3a	<0.1	<0.1	<0.1
TP-Dup6a	<0.1	<0.1	<0.1
TP-Dup8a	<0.1	<0.1	<0.1
Acceptance Criteria	**10**	**-**	**10**

ND – Not Detected. * All samples are representative of soils between 0 and 300mm.

Table 8e - Metals in Soil (mg/kg)

Sample ID and Depth* (m)	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-V1	2	<0.1	14	9	7	<0.05	11	34
TP-V2	3	<0.1	12	22	21	0.06	21	100
TP-V3	2	0.2	11	8	72	0.15	2	140
TP-V4	1	0.2	8	8	22	0.07	2	160
TP-V5	1	0.1	4	5	14	0.05	1	96
TP-V6	3	0.1	8	9	15	0.05	2	72
TP-V7	<1	0.1	4	3	15	0.05	<1	51
TP-V8	<1	<0.1	4	<2	3	<0.05	<1	<5
TP-V9	2	0.2	6	15	40	0.13	2	87
TP-V10	2	<0.1	13	7	7	<0.05	12	31
TP-V11	1	<0.1	6	7	16	0.06	3	50
TP-V12	2	<0.1	14	3	12	<0.05	<1	84
TP-V13	3	<0.1	13	5	24	<0.05	2	53
TP-V14	2	<0.1	11	4	8	<0.05	1	46
TP-V15	2	0.2	7	10	39	0.11	2	140
TP-V16	1	<0.1	4	<2	3	<0.05	<1	5
TP-V17	1	0.3	6	4	11	0.05	1	53
TP-V18	2	<0.1	9	11	23	0.11	1	47
TP-V19	2	<0.1	11	3	10	0.08	<1	20
TP-V20	<1	<0.1	5	<2	3	<0.05	<1	9
TP-V21	<1	<0.1	5	<2	5	<0.05	<1	8
TP-V22	2	<0.1	9	7	22	0.05	2	56
TP-V23	3	<0.1	11	6	11	0.07	2	21
TP-V24	3	0.2	8	8	18	0.09	2	30
TP-V25	7	0.2	10	10	44	0.1	1	62
TP-V26	3	<0.1	14	3	9	<0.05	<1	28
TP-V27	2	<0.1	12	2	8	<0.05	<1	20
TP-V28	3	<0.1	12	7	15	<0.05	3	90
TP-V29	3	<0.1	12	4	12	<0.05	1	40
TP-V30	3	<0.1	15	6	13	0.05	<1	95

Table 8e Cont'd

Sample ID and Depth* (m)	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-V31	3	<0.1	17	2	7	<0.05	<1	29
TP-V32	1	0.1	5	6	19	0.05	1	47
TP-V33	1	<0.1	11	<2	4	<0.05	<1	6
TP-V34	1	<0.1	6	4	9	0.05	<1	18
TP-V35	4	<0.1	8	2	8	0.06	3	10
TP-V36	4	<0.1	6	5	10	0.11	1	50
TP-V37	2	<0.1	11	6	11	0.09	<1	33
TP-V38	4	0.2	5	4	10	0.06	5	25
TP-V39	1	0.2	5	6	13	0.06	1	45
TP-V40	1	<0.1	4	6	8	<0.05	1	27
TP-V41	3	<0.1	10	7	24	<0.05	1	160
TP-V42	2	<0.1	11	3	9	<0.05	1	26
TP-V43	2	0.1	5	11	20	0.13	2	63
TP-V44	2	0.1	4	5	13	0.12	1	30
TP-VL1	<1	<0.1	3	3	7	0.12	<1	17
TP-VL2	<1	<0.1	4	2	6	0.05	<1	9
TP-VL3	1	0.2	7	6	18	0.09	1	27
TP-VL4	<1	<0.1	4	<2	3	<0.05	<1	5
TP-VL5	2	<0.1	3	2	5	0.05	<1	10
TP-VL6	<1	<0.1	4	<2	4	<0.05	<1	6
TP-VL7	1	<0.1	4	2	5	<0.05	<1	8
TP-VL8	1	<0.1	7	3	8	0.05	<1	19
TP-VL9	1	<0.1	8	3	7	0.05	<1	19
TP-VL10	<1	<0.1	5	59	8	0.06	<1	25
TP-VL11	<1	<0.1	4	2	5	0.05	<1	11
TP-VL12	2	<0.1	11	6	11	0.05	2	61
TP-VL13	2	0.2	9	13	15	0.05	9	79
TP-VL14	2	0.1	7	13	20	0.06	1	81
TP-VL15	<1	0.1	5	4	19	0.06	<1	26

Table 8e Cont'd

Sample ID and Depth* (m)	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-VL16	1	<0.1	7	9	12	0.05	<1	16
TP-VL17	1	<0.1	7	2	9	0.1	<1	23
TP-VL18	<1	0.2	7	4	8	<0.05	<1	25
TP-VL19	2	0.1	6	5	51	0.11	<1	51
TP-VL20	1	0.1	4	9	26	0.06	<1	64
TP-VL21	3	<0.1	12	8	10	0.06	2	31
TP-VL22	1	0.1	3	3	6	0.06	1	17
TP-VL23	<1	0.1	2	3	6	<0.05	<1	12
TP-VL24	<1	0.2	3	3	5	<0.05	<1	13
TP-VL25	<1	0.2	4	3	6	<0.05	<1	18
TP-VL26	2	<0.1	4	3	4	<0.05	2	11
TP-VL27	2	0.1	3	3	5	<0.05	1	12
TP-Dup1	1	<0.1	6	2	7	0.05	<1	10
TP-Dup2	4	0.1	10	10	15	0.06	3	79
TP-Dup2a	4	0.2	6.9	8.3	13	<0.05	2.3	73
TP-Dup3	3	<0.1	15	5	11	0.05	1	45
TP-Dup3a	3	0.2	13	5.1	12	<0.05	1.1	63
TP-Dup4	2	<0.1	13	3	7	<0.05	<1	23
TP-Dup5	3	<0.1	13	4	12	<0.05	<1	90
TP-Dup6	<1	<0.1	4	<2	3	<0.05	<1	5
TP-Dup6a	<3	<0.1	3.4	1.0	4	<0.05	<0.5	6.5
TP-Dup7	<1	<0.1	6	28	8	0.05	<1	24
TP-Dup8	<1	0.2	6	5	9	0.05	<1	29
TP-Dup8a	<3	0.3	4.7	4.9	8	<0.05	0.6	39
Acceptance Criteria	**100[1]**	**20[1]**	**100[1]**	**1000[1]**	**300[1]**	**15[1]**	**600[1]**	**7000[1]**
	20[2]	**3[2]**	**400[2]**	**100[2]**	**600[2]**	**1[2]**	**60[2]**	**200[2]**

[1] NEHF A Criteria [2] NSW EPA Phytotoxicity Criteria

* All samples are representative of soils between 0 and 300mm.

Table 8f

Summary – Site Validation Data

59 Lakeview Drive, Morisset Park, NSW

(Column A – Residential with Access to Soils)

	Contaminant														
Parameter	**BTEX**	**TPH (C_6-C_9)**	**TPH (C_{10}-C_{36})**	**PAH**	**BaP**	**OCP/OPP**	**PCBs**	**As**	**Cd**	**Cr**	**Cu**	**Hg**	**Ni**	**Pb**	**Zn**
Number	46	46	44	79	79	44	44	79	79	79	79	79	79	79	79
Minimum	ND	ND	25	0.25	0.25	ND	ND	0.5	0.05	2	1	0.025	0.5	3	2.5
Maximum	ND	ND	530	8.6	1.1	ND	ND	7	0.3	17	59	0.15	21	72	160
Mean	-	-	81.93	0.46	0.26	-	-	1.76	0.09	7.67	6.2	0.054	1.69	13.27	41.78
Median	-	-	25	0.25	0.25	-	-	2	0.05	7	4	0.05	1	10	29
StDev	-	-	111.7	1.16	0.1	-	-	1.19	0.06	3.7	7.5	0.032	3	11.4	36.2
CV	-	-	1.363	2.53	0.38	-	-	0.68	0.69	0.481	1.21	0.59	1.78	0.86	0.87
95 % UCL	**<0.5**	**<10**	**155.3**	**1.02**	**0.3**	**<0.05**	**<0.05**	**2.3**	**0.12**	**9.5**	**9.9**	**0.069**	**3.2**	**15.2**	**49.1**
Assessment Criteria	**≈ 1.0**	**65**	**1000**	**20**	**1**	**OCP: 10 OPP: –**	**10**	**100**	**20**	**100**	**1000**	**15**	**600**	**300**	**7000**

Note: ***NSW EPA Sample Design Guideline Procedure D 1995*** **was utilised for the statistical analysis at the Morisset Park site where the CV was below 1.2 and Procedure G was utilised where the CV exceeded 1.2 to normalise the data set.**

8.2.2 Soil Final Validation Asbestos Results.

Prior to the validation assessment being assumed by David Lane Associates, an area of the Trinity Point, Morisset Park site was identified to have asbestos contamination, and remediated. David Lane Associates conducted an inspection on this area and produced an Asbestos Clearance Certificate on October 2006, stating '*the inspections indicate the previously conducted asbestos contamination removal from the property has been successfully undertaken and created a safe environment for both access and future planned works*.'

For the validation of the entire site, a thorough visual inspection was conducted on the 59 Lakeview Road, Morisset Park site. At the time of inspection the area of the former demolition and asbestos removal was scraped back to bare soils and clays with all demolition debris removed. The results are summarised below in **Table 8g**. A total of eleven (11) bulk soil samples were collected from the Morisset Park site and sent to ASET for analysis, the results are summarised in **Table 8h**.

Refer to **Appendix 9** *Clearance Certification*.

Table 8g – Visual Inspection Details

Visual Inspection		
Date	**Location**	**Result**
19th Jan 2007	Low Density Sample Area	**No visible asbestos was present at the time of the site inspection**
19th Jan 2007	Medium Density Sample Area	**No visible asbestos was present at the time of the site inspection**

Table 8h - Asbestos in Soil

Asbestos Analysis		
Sample	**Description**	**Result**
TP-A1	The sample consisted of a mixture of sandy clayish soil, stones, plant matter, fragments of plaster and brick.	**Chrysotile Asbestos Detected**
TP-A2	The sample consisted of a mixture of sandy soil, stones, plant matter and fragments of plaster.	**No Asbestos Detected**
TP-A3	The sample consisted of a mixture of sandy clayish soil, stones and plant matter.	**No Asbestos Detected**
TP-A4	The sample consisted of a mixture of clayish sandy soil, stones and plant matter.	**No Asbestos Detected**
TP-A5	The sample consisted of a mixture of soil, stones and plant matter.	**No Asbestos Detected**
TP-A6	The sample consisted of a mixture of sandy clayish soil, stones and plant matter.	**No Asbestos Detected**
TP-A7	The sample consisted of a mixture of sandy clayish soil, stones, organic fibre like fibres, plant matter and fragments of plaster.	**No Asbestos Detected**
TP-A8	The sample consisted of a mixture of soil, stones, plant matter and fragments of plaster.	**No Asbestos Detected**
TP-A9	The sample consisted of a mixture of soil, stones, plant matter and fragments of plaster.	**No Asbestos Detected**
TP-A10	The sample consisted of a mixture of sandy clayish soil, stones, plant matter, organic fibre like fibres and fragments of plaster.	**No Asbestos Detected**

One (1) location failed the soil samples for asbestos analysis, with Chrysotile asbestos being present.

Refer to **Figure 4e** *Asbestos Sample Locations.*

Upon investigation of this area and review of the analytical sample description and verified by discussion with the laboratory, TP-A1 was considered to contain an isolated fragment of asbestos containing fibro plaster material. As such further remediation was recommended in the form of hen picking in order to eliminate the possibility of further fragments contaminating a soil sample. Remediation involved the removal of approximately ten (10) fragments and two (2) shovel volumes of soil containing smaller fragments. Following the remediation, a clearance and validation was undertaken in the form of a further bulk soil sample collection to ensure all contaminated materials had been removed.

Airborne asbestos monitoring was not conducted during the remedial works due the minor nature of the materials and the time frame involved (less than 20 minutes) in conducting the works, this prevented compliance sampling requirements. Results for asbestos analysis are summarised below in **Table 8i-8j.**

Table 8i – Visual Inspection Details

Visual Inspection		
Date	**Location**	**Result**
1st May 2007	TP-A1	**No visible asbestos was present at the time of the site inspection**

Table 8j – Asbestos in Soil

Asbestos Analysis		
Sample	**Description**	**Result**
Sample #1	The sample consisted of a mixture of clayish sandy soil, stones, plant matter and fragments of plaster.	**No Asbestos Detected**

Refer to **Figure 4e** - *Asbestos Sample Locations* for sample locations.

the USTs removal was conducted according to the appropriate guidelines and no contamination resulted, validation samples were collected from the tank pit areas immediately following excavation. Statistical analysis was limited due the high number of non detections and the low number of samples collected, however, it can be determined that the standard deviation is well below 50% of the assessment criteria threshold value and no sample exceed 250% of the assessment criteria threshold value.

Table 8k – TPH in Soil (mg/kg)

Sample ID & Depth	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
MP-1S - 2.5m	<25	<50	<100	<100	ND
MP-1E- 2.5m	<25	<50	<100	<100	ND
MP-1Ea- 2.5m	<25	<50	<100	<100	ND
MP-B1 – 3m	<25	<50	<100	<100	ND
MP-2N- 2.5m	<25	<50	<100	<100	ND
MP-2W- 2.5m	<25	<50	<100	<100	ND
MP2Wa- 2.5m	<25	<50	<100	<100	ND
Criteria	**65**	**-**	**-**	**-**	**1000**

Table 8l – BTEX in Soil (mg/kg)

Sample ID	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
MP-1S - 2.5m	<1.0	<1.0	<0.1	ND
MP-1E- 2.5m	<1.0	<1.0	<0.1	ND
MP-1Ea- 2.5m	<1.0	<1.0	<0.1	ND
MP-B1 – 3m	<1.0	<1.0	<0.1	ND
MP-2N- 2.5m	<1.0	<1.0	<0.1	ND
MP-2W- 2.5m	<1.0	<1.0	<0.1	ND
MP2Wa- 2.5m	<1.0	<1.0	<0.1	ND
Criteria	**1**	**1.4[a]/130[b]**	**3.1[c]/50[d]**	**14[e]/25[d]**

[a b c d e] – As outlined in Table 7a.

Table 8m – PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
MP-1S – 2.5m	<0.05	ND
MP-2S– 2.5m	<0.05	ND
MP-1E– 2.5m	<0.05	ND
MP-1Ea– 2.5m	<0.05	ND
MP-2E– 2.5m	<0.05	ND
MP-B1 – 3m	<0.05	ND
MP-B2 – 3m	<0.05	ND
MP-1N– 2.5m	<0.05	ND
MP-2N– 2.5m	<0.05	ND
MP-1W– 2.5m	<0.05	ND
MP-2W– 2.5m	<0.05	ND
MP-2Wa– 2.5m	<0.05	ND
Acceptance Criteria	**1**	**20**

Table 8n – Organics in Soil (mg/kg)

Sample ID	Contaminant		
	OCP	OPP	PCB
MP-1S - 2.5m	<0.1	<0.1	<0.1
MP-1E- 2.5m	<0.1	<0.1	<0.1
MP-1Ea- 2.5m	<0.1	<0.1	<0.1
MP-B1 – 3m	<0.1	<0.1	<0.1
MP-2N- 2.5m	<0.1	<0.1	<0.1
MP-2W- 2.5m	<0.1	<0.1	<0.1
MP2Wa- 2.5m	<0.1	<0.1	<0.1
Acceptance Criteria	**10**	**-**	**10**

Table 8o - Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
MP-1S – 2.5m	<4.0	<1.0	17	5.9	6.1	<0.10	2.2	8.7
MP-2S– 2.5m	6.3	<1.0	11	8.0	15	<0.10	2.3	22
MP-1E– 2.5m	<4.0	<1.0	10	7.2	4.3	<0.10	1.8	9.2
MP-1Ea– 2.5m	<4.0	<1.0	10	4.1	4.0	<0.10	1.4	6.0
MP-2E– 2.5m	<4.0	<1.0	13	3.8	4.8	<0.10	1.8	7.4
MP-B1 – 3m	<4.0	<1.0	1.7	1.8	1.8	<0.10	<1.0	7.9
MP-B2 – 3m	<4.0	<1.0	6.9	6.8	6.8	<0.10	1.6	16
MP-1N– 2.5m	<4.0	<1.0	10	7.1	7.1	<0.10	2.3	11
MP-2N– 2.5m	<4.0	<1.0	7.7	3.0	3.0	<0.10	<1.0	3.4
MP-1W– 2.5m	<4.0	<1.0	16	4.8	4.8	<0.10	1.2	8.8
MP-2W– 2.5m	<4.0	<1.0	11	4.0	5.4	<0.10	<1.0	3.6
MP-2Wa– 2.5m	<4.0	<1.0	13	4.5	4.9	<0.10	<1.0	4.2
Acceptance Criteria	**100[1]**	**20[1]**	**100[1]**	**1000[1]**	**300[1]**	**15[1]**	**600[1]**	**7000[1]**
	20[2]	**3[2]**	**400[2]**	**100[2]**	**600[2]**	**1[2]**	**60[2]**	**200[2]**

[1] NEHF A Criteria [2] NSW EPA Phytotoxicity Criteria

Total Petroleum Hydrocarbons:

Concentrations of Total Petroleum Hydrocarbon (TPH) compounds above the Service Station Guidelines (most sensitive) of 1000 mg/kg were not detected in any of the samples taken from the tank pit located on the 59 Lakeview Road, Morisset Park Site.

Monocyclic aromatic hydrocarbons (C_6 – C_9 and BTEX fractions), associated with petrol contamination, were not detected above the associated guidelines in any of the samples collected.

Polycyclic Aromatic Hydrocarbons (PAH):

A total of twelve (12) Tank Pit soil samples were submitted for analysis of PAH compounds. PAHs are generally associated with ash material used as fill. No samples collected from the Morisset Park site returned detectable limits of PAHs. Benzo(a)Pyrene (BaP) concentrations were non-detect for all twelve (12) samples collected.

Table 8p – Organics in Soil (mg/kg)

Sample ID	Contaminant		
	OCP	OPP	PCB
MP-SP1S-1	<0.1	<0.1	<0.1
MP-SP1S-2	<0.1	<0.1	<0.1
MP-SP1Sa	<0.1	<0.1	<0.1
MP-SP2N-2	<0.1	<0.1	<0.1
Acceptance Criteria	**10[1]**	**-**	**10[1]**
			2[2]

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8q – TPH in Soil (mg/kg)

Sample ID	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
MP-SP1S-1	<25	<50	<100	<100	ND
MP-SP1S-2	<25	<50	<100	<100	ND
MP-SP1Sa	<25	<50	<100	<100	ND
MP-SP2N-2	<25	<50	<100	<100	ND
Acceptance Criteria	**65[1]**				**1000[1]**
	650[2]				**5000[2]**

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8r – BTEX in Soil (mg/kg)

Sample ID	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
MP-SP1S-1	<1.0	<1.0	<1.0	<3.0
MP-SP1S-2	<1.0	<1.0	<1.0	<3.0
MP-SP1Sa	<1.0	<1.0	<1.0	<3.0
MP-SP2N-2	<1.0	<1.0	<1.0	<3.0
Acceptance Criteria	**1**	**1.4[a]/130[b]**	**3.1[c]/50[d]**	**14[e]/25[d]**
	18[2]	**518[2]**	**1080[2]**	**1800[2]**

[a b c d e] – As outlined in Table 7a.
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8s – PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
MP-SP1S-1	<0.05	ND
MP-SP1S-2	<0.05	ND
MP-SP1Sa	<0.05	ND
MP-SP2N-1	<0.05	ND
MP-SP2N-2	<0.05	ND
Acceptance Criteria	**1**	**20[1]**
	1[2]	**200[2]**

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8t – TCLP PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
MP-SP1S-1	<0.001	ND
MP-SP1S-2	<0.001	ND
MP-SP1Sa	<0.001	ND
MP-SP2N-1	<0.001	ND
MP-SP2N-2	<0.001	ND
Acceptance Criteria	**0.004**	**N/A**

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8u - Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
MP-SP1S-1	<4.0	<1.0	9.1	9.5	11	<0.10	6.4	35
MP-SP1S-2	<4.0	<1.0	11	13	30	<0.10	3.8	56
MP-SP1Sa	<4.0	<1.0	12	9.2	9.8	<0.10	4.0	18
MP-SP2N-1	<4.0	<1.0	7.5	4.5	4.7	<0.10	1.3	7.9
MP-SP2N-2	<4.0	<1.0	19	12	120	<0.10	4.5	96
Acceptance Criteria	**100[1]**	**20[1]**	**100[1]**	**1000[1]**	**300[1]**	**15[1]**	**600[1]**	**7000[1]**
	500[2]	**100[2]**	**1900[2]**		**1500[2]**	**50[2]**	**1050[2]**	

NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8v - TCLP Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
MP-SP1S-1	<0.05	<0.01	<0.01	<0.01	<0.03	<0.0005	<0.02	0.14
MP-SP1S-2	<0.05	<0.01	<0.01	<0.01	<0.03	<0.0005	<0.02	0.14
MP-SP1Sa	<0.05	<0.01	<0.01	<0.01	<0.03	<0.0005	<0.02	0.11
MP-SP2N-1	<0.05	<0.01	<0.01	0.01	<0.03	<0.0005	<0.02	0.13
MP-SP2N-2	<0.05	<0.01	<0.01	<0.01	<0.03	<0.0005	<0.02	0.38
Criteria	**0.5**	**0.1**	**0.5**	**NA**	**0.5**	**0.02**	**0.2**	**NA**

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Stockpiled Material SP1-South, and SP2-North

Stockpiled materials identified as Stockpile SP1-South, and Stockpile SP2-North contained approximately 80m^3 and 70m^3 of material respectively. This material was subjected to a total of five (5) samples being collected and sent to NATA registered laboratories for a range of analysis.

Stockpiled Material identified as SP1-South and SP2-North was identified as in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*. Therefore the stockpiled material was suitable for the proposed end land use and beneficially re-used on the 59 Lakeview Road, Morisset Park site.

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria) where applicable.

Table 8w – TPH in Soil (mg/kg)

Sample ID	Total Petroleum Hydrocarbons				
	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total
TP-IF-4 0-0.1m	<10	<50	<100	<100	ND
TP-IF-4a 0-0.1m	<10	<50	<100	<100	ND
TP-S-3 0-0.1m	<10	70	<100	<100	70
TP-S-3a 0-0.1m	<10	<50	<100	100	100
TP-SP3-1 0-0.1m	<10	<50	<100	150	150
TP-SP3-2 0-0.1m	<10	<50	<100	310	310
Acceptance Criteria	**65**[1]				**1000**[1]
	650[2]				**5000**[2]

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8x – BTEX in Soil (mg/kg)

Sample ID	BTEX			
	Benzene	Toluene	Ethylbenzene	Total Xylene
TP-IF-4 0-0.1m	<0.2	<0.5	<0.5	ND
TP-IF-4a 0-0.1m	<0.2	<0.5	<0.5	ND
TP-S-3 0-0.1m	<0.2	<0.5	<0.5	ND
TP-S-3a 0-0.1m	<0.2	<0.5	<0.5	ND
TP-SP3-1 0-0.1m	<0.2	<0.5	<0.5	ND
TP-SP3-2 0-0.1m	<0.2	<0.5	<0.5	ND
Acceptance Criteria	**1**	**1.4**[a]**/130**[b]	**3.1**[c]**/50**[d]	**14**[e]**/25**[d]
	18[2]	**518**[2]	**1080**[2]	**1800**[2]

[a b c d e] – As outlined in Table 7a.
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8y – PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
TP-IF-1 0-0.1m	<0.5	ND
TP-IF-2 0-0.1m	<0.5	ND
TP-IF-3 0-0.1m	<0.5	ND
TP-IF-4 0-0.1m	<0.5	ND
TP-IF-4a 0-0.1m	<0.5	ND
TP-TA-1 0-0.3m	<0.5	ND
TP-TA-2 0-0.3m	<0.5	ND
TP-TA-2a 0-0.3m	<0.5	ND
TP-S-1 0-0.1m	<0.5	ND
TP-S-2 0-0.1m	<0.5	ND
TP-S-3 0-0.1m	<0.5	ND
TP-S-3a 0-0.1m	<0.5	ND
TP-SP3-1 0-0.1m	<0.5	ND
TP-SP3-2 0-0.1m	<0.5	ND
TP-ST1-4	<0.5	ND
TP-ST1-5	<0.5	ND
TP-ST1-6	<0.5	ND
TP-ST1-7	<0.5	ND
TP-ST1-8	<0.5	ND
TP-ST2-9	<0.5	ND
TP-ST2-10	<0.5	ND
TP-ST2-11	<0.5	ND
TP-ST2-12	<0.5	ND
TP-ST2-13	<0.5	ND
TP-ST3-1	<0.5	ND
TP-ST3-2	<0.5	ND
TP-ST3-3	<0.5	ND
TP-ST3-4	<0.5	ND
TP-ST3-5	<0.5	ND
TP-ST3-5a	<0.5	ND
Acceptance Criteria	**1**	**20[1]**
	1[2]	**200[2]**

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8z - TCLP PAH in Soil (mg/kg)

Sample ID	Contaminant	
	BaP	Total PAH
TP-S-1	<1	ND
TP-S-2	<1	ND
TP-S-3	<1	ND
TP-S-3a	<1	ND
TP-SP3-1	<1	ND
TP-SP3-2	<1	ND
Acceptance Criteria	**0.004**	**N/A**

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8aa – Organics in Soil (mg/kg)

Sample ID	Contaminant		
	OCP	OPP	PCB
TP-IF-4	<0.05	<0.05	<0.05
TP-IF-4a	<0.05	<0.05	<0.05
TP-TA-1	<0.05	<0.05	<0.05
TP-TA-2	<0.05	<0.05	<0.05
TP-TA-2a	<0.05	<0.05	<0.05
TP-S-3	<0.05	<0.05	<0.05
TP-S-3a	<0.05	<0.05	<0.05
TP-SP3-1	<0.05	<0.05	<0.05
TP-SP3-2	<0.05	<0.05	<0.05
TP-ST1-7	<0.05	<0.05	<0.05
TP-ST1-8	<0.05	<0.05	<0.05
TP-ST3-5	<0.05	<0.05	<0.05
TP-ST3-5a	<0.05	<0.05	<0.05
Acceptance Criteria	**10[1]**	**-**	**10[1]**
			2[2]

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8ab - Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-IF-1	3	<0.1	18	10	20	<0.05	<1	170
TP-IF-2	4	<0.1	20	<2	5	<0.05	<1	6
TP-IF-3	3	<0.1	12	7	21	<0.05	<1	180
TP-IF-4	3	<0.1	21	<2	6	<0.05	<1	11
TP-IF-4a	3	<0.1	21	2	7	<0.05	<1	24
TP-TA-1	<1	<0.1	3	<2	6	<0.05	<1	9
TP-TA-2	<1	<0.1	3	<2	6	0.05	<1	9
TP-TA-2a	<1	<0.1	2	<2	5	<0.05	<1	8
TP-S-1	12	0.1	30	32	10	0.12	2	59
TP-S-2	7	<0.1	15	13	7	0.22	<1	20
TP-S-3	6	<0.1	12	<2	4	<0.05	<1	5
TP-S-3a	4	<0.1	8	<2	3	<0.05	<1	5
TP-SP3-1	3	<0.1	9	9	6	0.06	<1	22
TP-SP3-2	3	<0.1	9	10	7	0.08	<1	32
TP-ST1-4	18	<0.1	17	<2	4	<0.05	<1	<5
TP-ST1-5	5	<0.1	11	2	4	<0.05	<1	<5
TP-ST1-6	10	<0.1	13	<2	3	<0.05	<1	<5
TP-ST1-7	12	<0.1	28	<2	5	<0.05	<1	<5
TP-ST1-8	<1	<0.1	4	<2	2	<0.05	<1	<5
TP-ST2-9	8	<0.1	12	<2	4	<0.05	<1	<5
TP-ST2-10	4	<0.1	11	<2	4	<0.05	<1	<5
TP-ST2-11	4	<0.1	10	<2	4	<0.05	<1	<5
TP-ST2-12	13	<0.1	17	<2	7	<0.05	<1	6
TP-ST2-13	2	<0.1	9	<2	2	<0.05	<1	<5
TP-ST3-1	2	<0.1	9	3	5	<0.05	<1	6
TP-ST3-2	2	<0.1	8	2	3	<0.05	<1	6
TP-ST3-3	3	<0.1	22	2	75	<0.05	<1	10
TP-ST3-4	2	<0.1	2	<2	3	<0.05	<1	<5
TP-ST3-5	2	<0.1	7	2	3	<0.05	<1	9
TP-ST3-5a	1	<0.1	6	3	3	<0.05	<1	9
Acceptance Criteria	**100[1]** **500[2]**	**20[1]** **100[2]**	**100[1]** **1900[2]**	**1000[1]**	**300[1]** **1500[2]**	**15[1]** **50[2]**	**600[1]** **1050[2]**	**7000[1]**

[1] NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*
[2] Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Table 8ac - TCLP Metals in Soil (mg/kg)

Sample ID	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP-S-1	<10	1	<50	<50	<10	<1	<50	720
TP-S-2	<10	1	<50	<50	<10	<1	<50	680
TP-S-3	<10	<1	<50	<50	<10	<1	<50	<50
TP-S-3a	<10	<1	<50	<50	<10	<1	<50	<50
TP-SP3-1	<10	<1	<50	<50	<10	<1	<50	390
TP-SP3-2	<10	<1	<50	<50	<10	<1	<50	450
Criteria	**0.5**	**0.1**	**0.5**	**NA**	**0.5**	**0.02**	**0.2**	**NA**

Table A4 - *Assessment, Classification & Management of Liquid & Non-liquid Wastes* (INERT Criteria)

Imported Fill (IF):

Imported fill material consisted of approximately 500m^3 of material imported on site to fill in the trenches left by the removal and remediation of the sewage effluent treatment system area. This material was subjected to a total of five (5) samples being collected and sent to LabMark, a NATA registered laboratory for a range of analysis.

The Imported Fill material imported on site to 59 Lakeview Road, Morisset was identified as in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*, and therefore deemed suitable for use on site.

Sludge (S):

Sludge removed during the remediation of the ponds associated with the sewage effluent treatment system, contained approximately 75m^3. Four (4) soil samples collected from this material were sent to LabMark for a range of analysis.

The Sludge removed from the sewage effluent treatment system ponds during remediation was found to be in compliance with NEPM 1999, Table 5a, Column A - *Residential with Access to Soils*, and therefore deemed suitable for beneficial re-use on site.

Document Status

Rev No.	Author	Reviewed / Approved for Issue		
		Name	Signature	Date
0	Andrew Lau	Andrew Lau		3/09/2007