Remedial Action Plan

127 Cosgrove Road, South Strathfield, NSW

Flower Power Group
2 February 2017

16110

Quality Management

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Executive Summary

The Flower Power Group (Flower Power) has engaged Zoic Environmental Pty Ltd (Zoic) to prepare this Remedial Action Plan (RAP) for use within the proposed construction of the Flower Power site at 127 Cosgrove Road, South Strathfield, NSW ('the site'). The site currently comprises a disused warehouse (former tarpaulin shed) and a mound (referred to as Mount Enfield (Mt Enfield)) and is part of a larger site (the Intermodal Logistics Centre at Enfield (ILC at Enfield)).

A development application (DA no. 2016/132) has been submitted to Strathfield Council (Council) for the proposed use as a garden centre with ancillary café, fruit and vegetable shop, pool shop, pet store and at grade parking area and loading bays. The proposed development will include cut and fill of material. The majority of the cut will be within the eastern flank of Mt Enfield and the filling will be required to construct the at grade parking area.

The overall objective of the remediation is to render the site suitable for the proposed commercial use as a garden centre with ancillary café, fruit and vegetable shop, pool shop, pet store and at grade parking area and loading bays, which is consistent with the definition of a commercial/industrial landuse in the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) 2013.

The objective of this RAP is to outline the remediation/management strategy and validation plan for the proposed construction of the Flower Power garden centre at the site.

This RAP has been prepared in general accordance with the existing RAP for the ILC Enfield site (Coffey, 2009b) and NSW OEH (2011) Guidelines for Consultants Reporting on Contaminated Sites.

Based on the available site characterisation data which indicated the presence of asbestos containing materials (as both friable and fragments) the extent of remediation required includes:

- Surface soil within the northern lean-to buildings adjacent to the main Tarpaulin Factory
- The eastern portion of Mt Enfield requiring cut and fill to accommodate carparking

The options chosen for the remediation of known contamination within the site are as follows:

- The northern part of Tarpaulin Factory – consolidation and isolation of soil by containment within ILC at Enfield site.
- Mt Enfield material requiring cut – Consolidation, isolation and containment of soil by relocation and reinstatement within ILC at Enfield site.

The RAP provides a validation criteria and plan following remediation works. The RAP also provides site management requirements during remediation.

A Validation Report will be required following completion of remediation and validation works.

Based on the remedial strategy recommended in this RAP, it would be expected that a long term environmental management plan will be required following completion of the RAP. The long term EMP (LTEMP) will need to cover the management of residual contamination at the site (which is anticipated to be material within Mt Enfield and beneath carpark (if any). The LTEMP will need to be prepared by a suitably qualified environmental consultant, in accordance with the NSW Ports (2016) OEMP, as well as relevant guidelines.

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Appendices

1. Introduction

The Flower Power Group (Flower Power) has engaged Zoic Environmental Pty Ltd (Zoic) to prepare this Remedial Action Plan (RAP) for the proposed construction of the Flower Power site at 127 Cosgrove Road, South Strathfield, NSW ('the site'). The site currently comprises a disused warehouse (former tarpaulin shed) and a portion of a mound (referred to as Mount Enfield (Mt Enfield)) and is part of a larger site (the Intermodal Logistics Centre at Enfield (ILC at Enfield)).

For the purpose of this report, the site requiring remediation is defined to be the proposed Flower Power development as shown in Figures 1 and 2. A current project approval is available for the entire ILC Enfield site. While the RAP only covers the proposed Flower Power development, the project approval allows for material movement within the ILC Enfield site.

LJB Urban Planning (LJB) has been appointed to oversee the site development.

Site location plan is provided in Figure 1, Appendix A and the site layout is provided in Figure 2, Appendix A.

1.1 Site Background

The site is located within the ILC Enfield site managed by NSW Ports, which is covered under the Project Approval for Section 75J of the Environmental Planning and Assessment Act 1979, Application No. 05_0147, File No. 9037344, 5 September 2007 which includes the construction of an intermodal terminal, rail sidings, warehousing, containers storage facilities, light industrial/commercial areas, internal roads, administration buildings, fuelling facilities, container washdown area, vehicle maintenance shed, and community and ecological areas.

The site is located within the southern part of the ILC Enfield site, comprising a former Tarpaulin Factory building on the eastern portion and Mt Enfield on the western part. Investigations had been undertaken on the Tarpaulin Factory building and the areas surrounding the building, as summarised in Section 4.1.1. Mt Enfield comprises asbestos and petroleum hydrocarbon impacted material from the redevelopment of the ILC Enfield site, which has been capped with validated material. This is further discussed in Section 4.1.2.

LJB Urban Planning is acting on behalf of Flower Power, who will lease the site from NSW Ports. A development application (DA no. 2016/132) has been submitted to Strathfield Council (Council) for the proposed use as a garden centre with ancillary café, fruit and vegetable shop, pool shop, pet store and at grade parking area and loading bays. The proposed development will include cut and fill, with the majority of cut will be required on the eastern flank of Mt Enfield and the majority of filling will be required to construct the at grade car parking area. Council has issued a letter in response to the DA submission flagging outstanding items in order to obtain a development approval. The item related to contamination is as follows:

3. **Contamination**

Given the historical uses of the subject site and the extent of proposed excavation works within a known area of contamination, in accordance with the requirements of State Environmental Planning Policy No. 55 – Remediation of Land a detailed Environmental Site Assessment prepared by a suitably qualified environmental consultant in accordance with the SEPP 55 - Planning Guidelines is required. Such an investigation is to be specific to the proposed development and include testing, a RAP (if required) and methodology for the reshaping of the Mount Enfield portion of the site.

Significant contamination assessments have been undertaken at the site, and it is considered that there is adequate information to prepare a RAP (this document) to satisfy the Council requirement above.

It is noted that the majority of areas within the ILC Enfield was subject to a site audit. audit reports (SARs) and site audit statements (SAS) have been issued by Environ which conclude that the sites are suitable for the proposed landuses. This also includes the fenced footpath running north-south at the central part of Mt Enfield. The site subject to this RAP is located outside the areas where SAR/SAS has been finalised.

It is further noted that while SAR/SAS has not been prepared for the site, much of the validation work has been undertaken by the validation consultant for NSW Ports (Coffey Environments Australia Pty Ltd (Coffey)). NSW Ports has requested Coffey to provide the available reports and data to Zoic, which were used to prepare this RAP. This RAP will also cover the capping work that was undertaken at Mt Enfield, in order to document the site condition prior to further cut and fill proposed at Mt Enfield. This RAP has been prepared to also consider the overarching RAP prepared by Coffey (2009b) for the ILC Enfield site.

It is noted that Zoic's project manager (Cheryl Halim) was involved with the project during her previous employment at Coffey. Some of the findings reported in this report are also based on her observations and assessments during her employment at Coffey, as well as a recent site inspection conducted on 23 November 2016.

1.2 Objective

The overall objective of the remediation is to render the site suitable for the proposed landuse as a garden centre with ancillary café, fruit and vegetable shop, pool shop, pet store and at grade parking area and loading bays, which is consistent with the definition of a commercial/industrial landuse in the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) 2013.

The objective of this RAP is to outline the remediation/management strategy and validation plan for the proposed construction of the Flower Power garden centre at the site. The RAP covers:

- The known impacts at the site (comprising asbestos in the northern part of the Tarpaulin Factory)
- The proposed movement of contaminated material within Mt Enfield
- Data gaps identified during data review
- Unexpected finds protocol for potential unexpected finds encountered during construction work

1.3 Scope of Works

To achieve the objective of the RAP, the following items are covered:

- Review of available historical environmental investigation reports, correspondence, and validation data for Mt Enfield;
- Identification of data gaps and assessment of additional investigations required to address data gaps;
- Selection of appropriate a remediation/management method from available remediation options;
- Development of validation criteria;
- Remediation and validation procedures required to achieve the remediation objective; and
- Site control, occupational health and safety and environmental measures required for the remediation/management works.

1.4 Guidelines

The following guidelines have been considered during the preparation of this report:

- NSW EPA (1995) Contaminated Sites: Sampling Design Guidelines. NSW EPA, Sydney.
- NSW DEC (2006) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition). NSW DEC, Sydney.
- NSW OEH (2011) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites. NSW OEH, Sydney.
- NEPC (1999) National Environment Protection (Assessment of Site Contamination) Measure, Schedule A and Schedules B(1)-B(9). National Environment Protection Council, Adelaide as amended in April 2013 [referred to herein as NEPM (2013)].
- WA DoH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

1.5 Heritage

It is noted that the Tarpaulin Factory structure and the Pillar Water Tank are heritage items listed on NSW Ports' Section 170 Register under the Heritage Act 1977. This RAP does not cover the management of heritage items. Based on the information provided to Zoic, specialist advice has been sought from a heritage consultant regarding this matter.

1.6 Geotechnical Advice

The proposed cut and fill of Mt Enfield may cause stability issues. This RAP does not cover geotechnical advice for the proposed cutting and filling at Mt Enfield. It is recommended that specialist advice be obtained from suitably qualified geotechnical consultants.

2. Site Identification and Description

2.1 Site Identification

The site location is shown in Figure 1 and the site layout is provided in Figure 2. The site identification and land use details include:

Table 2.1: Site Identification

Title	Details
Street Address:	127 Cosgrove Road, South Strathfield, NSW
Property Description:	Part Lot 19 in DP1183316
Current Site Ownership:	Port Botany Lessor, with NSW Ports being the Head Lessee
Geographical Coordinates: (GDA MGA 56 centre of site)	E: 151°04"38.89" E N: 33°54'20.38" S
Property Size:	Approximately 3.1ha (comprising approximately 1.7ha of Mt Enfield, 0.55ha of Tarpaulin Factory, and 0.85ha of the remainder area outside Tarpaulin Factory) The area which will be developed for Flower Power comprises approximately 2.1ha (including the retaining wall).
Local Government Area:	Strathfield Council
Zoning – Existing:	General Industrial 1N1 and Private Recreational RE2 (Strathfield Council Local Environmental Plan 2012)
Zoning – Previous:	Special Uses (Railways)

2.2 Surrounding Land Use

The site is located in a predominantly light industrial area with immediate adjoining land uses described as follows:

Table 2.2: Immediate Site Surrounds

Title	Details
North:	The remainder of ILC Enfield site, light industrial properties, a wetland (referred to as the Frogs Ponds), and Noise Mounds
East:	Cosgrove Road, and low density residential beyond
South:	Punchbowl Road, and low density residential and railway lines beyond
West:	The remainder of ILC Enfield site and railway lines beyond

2.3 Site Condition

2.3.1 Prior to Demolition and Remediation of ILC Enfield

The site layout prior to demolition and remediation of ILC Enfield is provided in Figure 3 and historical landuses in 1912 at the time of purchase of the site by CCRT NSW is provided in Figure 4. Prior to demolition and remediation of ILC Enfield, the site comprised of the former Tarpaulin Factory and Mt Enfield. It is understood that the extent of Mt Enfield was smaller (laterally and vertically). Mt Enfield was also previously known as Stockpile No. 4. Figure 4 shows that a former residence was present to the south-west of Tarpaulin Factory and a former railway line ran parallel to the western boundary of Tarpaulin Factory.

The Frog Ponds (a wetland area which is a potential Green and Golden Bell Frog habitat) and Noise Mounds were present north of Mt Enfield.

2.3.2 Current

Zoic project manager (an experienced environmental engineer) undertook a site walkover on 23 November 2016. Zoic project manager also undertook several site walkovers of the site between July 2013 and February 2014 during her previous employment at Coffey. The findings of the site walkovers are outlined below.

No significant work has been undertaken for the Tarpaulin Factory during the remediation of ILC Enfield. The ground within the Tarpaulin Factory building comprises bare ground (soil) with no floor covering. It is understood that a timber floor was previously present and was removed. Wall cladding has also been removed from the northern lean-to buildings. The area south of the building comprises concrete hardstand and grass. The area to the west, north and east of the building are predominantly grassed.

Based on the information provided by NSW Ports and Zoic's site walkover, the railway lines to the west of Tarpaulin Factory have been removed. The railway lines to the west of Mt Enfield were removed at the time of remediation of ILC Enfield.

Mt Enfield has increased significantly in size following placement of fill from the ILC Enfield redevelopment into Mt Enfield and capped. The surface of Mt Enfield is grassed. A fenced footpath has been constructed from Punchbowl Road to the top of Mt Enfield. A site audit report and site audit statement has been issued for the footpath by Environ[1].

High-pressure gas lines run north-south to the east of Mt Enfield. Based on the information provided by BN Group, who is the architect for the site, they have undertaken consultation with Qenos, who is the owner of the gas lines. The gas lines may be raised to maintain a standard depth of 1m. A pressure relief system for the gas is present to the north of Mt Enfield.

2.3.3 Proposed

The proposed drawings accompanying the DA are provided in Appendix A. The proposed development is as follows:

[1] Environ (2016) 'Site Audit Report - Mt Enfield Viewing Area, Intermodal Logistics Centre at Enfield', Ref: AS120873, 16 May 2016.

- Retaining the main Tarpaulin Factory building (galvanised iron construction) and the north-eastern wing of the Tarpaulin Factory, with some new translucent roofs and skylights proposed to be installed and repairs to building structures proposed.
- Demolition of the northern lean-to buildings (timber construction).
- Construction of decks with roof replacing the northern-lean-to buildings.
- Construction of access road with entry via Cosgrove Road north of Tarpaulin Factory.
- Construction of carpark to the west of the Tarpaulin Factory building. The carpark will extend to the eastern flank of Mt Enfield, which will require cut of some material from the eastern flank of Mt Enfield. It is further understood that retaining walls will need to be placed along the eastern flank of Mt Enfield following removal of the material. The retaining walls comprising imported rocks will be placed in tiers. Emergency access into the ILC Enfield will also be retained north of the carpark and north of Mt Enfield
- Outdoor concrete bulk goods area and a small shed will be constructed in the northern portion of the site north of the access road.
- Based on the information provided by BN Group, the majority of the site will be paved. The type of pavement is not finalised, and may include a combination of bitumen, concrete and/or hydropavers.
- Small landscaped areas are proposed to the south-east and north-west of the Tarpaulin Factory and will comprise grassed areas with potted plants. Planting will also be established across the perimeter of the site (to the west and south of the car park).

A proposed cut and fill diagram for the site is provided in Sparks & Partners (2016) attached in Appendix A. Based on this plan, it proposes:

- Approximately 6,000m^3 to 10,000m^3 of cut will be generated from the eastern flank of Mt Enfield and the area to the south of the Tarpaulin Factory. It is understood that the cut material will be placed at other locations within the ILC Enfield site, as agreed with NSW Ports, however, priority (i.e. as much as possible) will be given to placement within the site.
- Approximately 3,200m^3 to 8,000m^3 of fill will be required to fill the area between Mt Enfield and Tarpaulin Factory and the south-western corner of the Tarpaulin Factory. The proposed source of the fill is not yet known, but may be a combination of cut material, imported material and material considered suitable for use onsite (including from the remainder of ILC Enfield).

2.4 Topography, Geology, Hydrogeology and Hydrogeology

Detailed descriptions of the topography, geology and hydrogeology of the site are presented in reports by Egis (2001 & 2002) and summarised below.

2.4.1 Topography

The ILC at Enfield site slopes to the south-east towards Punchbowl Road/Cosgrove Road intersection.

2.4.2 Geology and Soil

Based on CH2MHill (1999a), the geology at the ILC Enfield comprises Bringelly Shale in the north, Minchinbury Sandstone through the central section, and Ashfield Shales in the southern portion (where the site lies). The Ashfield Shales uncomformably overly the Mittagong Formation. Intrusive basaltic dykes in the Ashfield Shale are comparatively fresh and unweathered.

Chapman and Murphy (1989) describe the soils in the area as Blacktown, Birrong, or disturbed terrain type soils. The soils range from moderately deep (50-150cm) to deep (>250cm). On the

crests, upper slopes and well drained areas the soils are typically red and brown podzolic soils. On the lower slopes, the soils are typically yellow podzolic soils grading to soloths in areas of poor drainage. In areas of disturbed terrain, the soils are typically turfed fill areas commonly capped with sandy loam or compacted clay overlying fill or waste materials. The soils typically have a low permeability and poor drainage.

Based on previous investigations, the ILC Enfield site was covered with fill comprising imported clay and ash. The ash was reported to have originated from steam locomotives, which were stored at the ILC Enfield site. The fill extended to depths ranging from 2m below ground surface (bgs) to 4mbgs within the ILC Enfield site. Some of the fill within the ILC Enfield contained asbestos, as well as hydrocarbon impact associated with the ash. Some of this fill had been placed within Mt Enfield (as further discussed in Section 4.1.2). The fill across the ILC Enfield site is underlain by 0.2m to 6m of natural clay, which is underlain by moderately weathered shale.

The cross sections of the fill in the vicinity of the site are provided in Figures 10, 11 and 14 of CH2MHill (1999a) presented in Appendix A. These indicate:

- The northern part of the site comprises fill containing gravel, sand and sandy clay to about 1mbgs, which is underlain by natural sandy clay and silty clay. The southern part of the site comprises silty clay. Previous investigations by Douglas Partners (1993a)[2] indicate that fill to the north and immediately west of Tarpaulin Factory comprises up to 0.9mbgs of sand with some ash and clay. Fill to the south of Tarpaulin Factory was encountered to a depth of 0.9mbgs and comprises a mixture of gravel, sand, clay, with anthropogenic materials (brick rubble, metal strips, metal pipes). The area to the north of Mt Enfield comprises topsoil and ash to a depth of 0.8mbgs, underlain by natural silty clay and clay. The area to the west of Mt Enfield contains sandy topsoil with anthropogenic materials (railway sleepers, brick rubble, metals), clay to a depth of 1.4mbgs, underlain by sandy clay fill with ash and anthropogenic materials (railway sleepers).
- The original Mt Enfield (Stockpile 4) prior to remediation works comprised sandy/sandy clay loam to a depth of 2mbgs, clay fill with silty clay and ashy lenses to a depth of 8mbgs, sandy clay fill to a depth of 15mbgs, and underlain by black sandy heterogeneous clay fill. Additional fill was subsequently added to Mt Enfield throughout the remediation process, which was subsequently capped, as further discussed in Section 4.1.2.

2.4.3 Hydrogeology and Hydrology

Perched groundwater exists in the fill material above the natural clay material at a depth of 2mbgs to 3mbgs, although it does not have a significant hydraulic gradient and has a low potential for movement (Egis, 2001 & 2002). The perched groundwater was also considered to have little flow or migration and that movement of perched water would likely follow the boundary between fill material and natural clay (Egis, 2001 & 2002).

The direction of the natural groundwater flow was reported in Egis (2001 & 2001) as easterly in general, with localised flow directions varying from north-easterly to south-easterly. The additional groundwater assessment conducted by Coffey (2009c) indicated that groundwater flows in a south-easterly direction. Observations and measurements by Egis (2001 & 2002) and Coffey (2009c) indicated that the fill material within the ILC Enfield site was of low permeability. The previous assessments noted that monitoring wells screened in ash took considerable time to recharge during development. The measured levels of the perched water were highly variable and there was no indication, under dry weather conditions at the time, that these bodies of

[2] See borehole logs in Appendix D

perched water were either hydraulically connected or drained through conduits on the ILC Enfield site. In particular, previous assessments indicated that there was no correlation found between the perched groundwater levels and the former drainage channels which traverse the subsurface of the site. However, it was considered possible that some of the perched water bodies could be hydraulically connected when infiltration causes the perched water(s) to flow into other perched waters, particularly in wet weather periods.

Coxs Creek drainage channel is present near the Frogs Ponds to the north of the site. The nearest receptor is Cooks River or its tributaries located approximately 300m east of the site. Stormwater from drains/channels at the site ultimately flow into Cooks River Channel.

The previous reports indicated that groundwater abstraction and use is not expected because of low quantity and poor (saline) quality.

A search of the NSW Natural Resource Atlas undertaken by Zoic on 18 November 2016 did not identify any bores within 500m radius of the site. The nearest groundwater bore was located approximately 950m to the north-west. It was installed in shale and sandstone to 8.8mbs and was registered for monitoring purposes.

2.5 Acid Sulfate Soil

According to the Department of Land and Water Conservation (DLWC) Acid Sulfate Soil Risk Map, the area immediately north of the site (located in Coxs Creek Channel lies within an area designated as having a low probability of acid sulfate soils (at >3mbgs). For these areas, land management was considered not required for acid sulfate soils (DLWC 1997).

It is understood that acid sulfate soil was not encountered during the excavation works at the ILC Enfield. No ASS is expected to be encountered as part of works outlined in this RAP.

3. Previous Investigations

3.1 Previous Investigation Reports

Numerous soil and groundwater assessments have been conducted at the ILC Enfield site. A number of these assessment reports have been audited by Dames and Moore and Environ. Details of previous contamination assessments are presented in the Site Audit Reports (Environ, 2002; Dames & Moore, 1999). The following table includes a list of relevant audit reports as well as a list of the assessment reports that were subject to these audits. While not all these reports were specifically prepared for the ILC Enfield site, some of the information is considered relevant as the fill from across the ILC Enfield site was placed within the Mt Enfield. Additional reports following the completion of the site audits by Environ and Dames and Moore are also provided. It is noted that Zoic does not have access of the majority of the documents provided in the site audits, but rely on the summary provided in the Coffey (2009b) RAP.

Table 3.1: Summary of Works Completed

Site Audit Report	Documents Reviewed
Dames & Moore (1999) Summary Site Audit Report Enfield Marshalling Yard. Dames & Moore Pty Ltd. Document Reference: 30306-006-070	CH2M Hill (1998) Enfield Marshalling Yards – Part A Contamination Assessment – Sampling and Analysis Plan. CH2M Hill Australia Pty Ltd
	CH2M Hill (1999) Sydney Ports Corporation/Rail Estate Marshalling Yards Part A – Environmental Contamination Assessment – Volume 1. CH2M Hill Australia Pty Ltd
	CH2M Hill (1999) Sydney Ports Corporation/Rail Estate Enfield Marshalling Yards Part A – Environmental Contamination Assessment – Volume 2 Appendices. CH2M Hill Australia Pty Ltd
	CH2M Hill (1999) Sydney Ports Corporation/Rail Estate Marshalling Yards Part B – Environmental Contamination Assessment – Volume 1 Draft. CH2M Hill Australia Pty Ltd
	CH2M Hill (1999) Sydney Ports Corporation/Rail Estate Enfield Marshalling Yards Part B – Environmental Contamination Assessment – Volume 1 Final. CH2M Hill Australia Pty Ltd
	CH2M Hill (1999) Sydney Ports Corporation/Rail Estate Marshalling Yards Part B – Environmental Contamination Assessment – Volume 1 Final Report Revision. CH2M Hill Australia Pty Ltd
	CH2M Hill (1999) Sydney Ports Corporation/Rail Estate Enfield Marshalling Yards Part B – Environmental Contamination Assessment – Volume 2 Appendices. Draft, April 1999, partly revised May 1999 and Appendix F, dated August 1999, CH2M Hill Australia Pty Ltd
Site Audit Report Delec Depot, Enfield, for Sydney Ports Corporation (Environ 2002) Ref: 31-0022	Egis (2001) Delec Depot Enfield – Contamination Assessment: Sampling, Analytical and Quality Plan. Egis Consulting Australia Pty Ltd
	Egis (2001) Delec Depot Enfield – Contamination Assessment: Sampling, Analytical and Quality Plan. Egis Consulting Australia Pty Ltd
	Egis (2001) Detailed Contamination Assessment – Delec Depot Enfield (Draft). Egis Consulting Australia Pty Ltd
	Egis (2001) Detailed Contamination Assessment – Delec Depot Enfield, Version 1 Final. Egis Consulting Australia Pty Ltd
	CMPS (1991) Audit Enfield Delec Report. CMPS Environmental Pty Ltd
	Dames and Moore (1992) State Rail Authority Metropolitan Freight Terminal Environmental Report. Dames and Moore Pty Ltd
	Groundwater Technology (1993) Environmental Assessment Locomotive Maintenance

Site Audit Report	Documents Reviewed
	Centre, Cosgrove Road, Enfield. Groundwater Technology Australia Pty Ltd
	Groundwater Technology (1994) Phase 2 Environmental Assessment Locomotive Maintenance Centre, Cosgrove Road Enfield. Groundwater Technology Australia Pty Ltd
	SKM (1996) DELEC Locomotive Maintenance Centre Preliminary Findings and Options. Sinclair Knight Merz Pty Ltd
	EPNPC (1996) Value Management Study Report Enfield Locomotive Maintenance Centre. Environmental Protection National Project Consultants
	EPVMI (1996) Risk Identification Study Enfield Locomotive Maintenance Centre. Environmental Protection, Value Management International
	SKM (1996) Enfield Locomotive Maintenance Centre, Environmental Protection Study, Water Quality Testing. Sinclair Knight Merz Pty Ltd
	ADI (1998) Independent Review for FreightCorp, Enfield Locomotive Maintenance Centre, Cosgrove Road; Enfield NSW. ADI Limited
	OTEK (1998) Enfield Locomotive Maintenance Centre Fuelling Facility Pressure Testing of Pollution Control Pipework. OTEK Australia Pty Ltd
	OTEK (*not dated*) Enfield Locomotive Maintenance Centre Fuelling Facility Contamination Assessment. OTEK Australia Pty Ltd
	CH2M Hill (1999a) 'Enfield Marshalling Yards Part A - Environmental Contamination Assessment', March 2009)
	CH2M Hill (1999b) 'Enfield Marshalling Yards Part B - Environmental Contamination Assessment', March 2009)
	SKM (2001) Phase 1 Environmental Audit Report. Sinclair Knight Merz Pty Ltd
Documents not included in the above site audits and are considered relevant for the site	Douglas Partners (1993a) 'Report on Site Investigation Enfield Intermodal Terminal', Douglas Partners Pty Ltd, Ref: Project 19109
	Noel Arnold & Associates (2008) 'Hazardous Materials Survey Report, Sydney Ports Corporation, Tarpaulin Factory - Cosgrove Road, Enfield NSW', Ref: SS0074 : 64566-02, April 2008
	Coffey Environments (2009b) 'Remediation Action Plan for Known Soil Contamination Intermodal Logistics Centre @ Enfield', Ref: ILC - CO - D&R - ENVIRHOD00634AA-R002, June 2009
	Coffey Environments (2009c) 'Additional Groundwater Assessment', Ref: ILC – CO – D&R – ENVIRHOD00634AA-R031RevA, 25 November 2009
	Coffey (2014a) 'Visual Assessment of the Tarpaulin Factory and Contamination Assessment of the Area South of the Tarpaulin Factory, Cosgrove Road, Enfield, NSW', Ref: ENAURHOD04419AD-L01, 17 March 2014

A summary of the reports considered to be pertinent for this RAP is provided below.

Table 3.2. Summary of Relevant Reports

Report	Summary
Douglas Partners (1993a) 'Report on Site Investigation Enfield Intermodal Terminal', Douglas Partners Pty Ltd, Ref: Project 19109	This report provides geotechnical and contamination investigations of the ILC Enfield site for the proposed construction of freight handling and transfer facilities. The scope of the work included: • Drilling of sixteen test bores to a depth between 1.2mbgs and 8.95mbgs • Excavation of 25 test pits to a depth between 0.3mbgs and 3.2mbgs • Excavation of six excavation trenches to a depth between 3mbgs and 5.5mbgs • Installation of 17 groundwater wells • Laboratory analysis for heavy metals (arsenic, cadmium, chromium, copper, nickel,

Report	Summary
	lead, mercury, zinc, tin, cobalt, antimony), total petroleum hydrocarbon (TPH), polycyclic aromatic hydrocarbon (PAH), organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs). Sampling locations are provided in Appendix B, summary results tables are provided in Appendix C, borehole logs are provided in Appendix D. Sampling locations TP101, TP102, TP103, TP104, TP125, TP201 and TP202 were conducted within the site. The outcomes of the report are as follows (with respect to contamination and sampling locations at the site): • Groundwater depth is between 0.7mbgs and 7.6mbgs. • ACM was identified in the southern part of the site (in Mt Enfield). The ACM was considered to be in a stable condition. • Hydrocarbons were identified in one soil sample from DELEC area (far north of the site) and surface hydrocarbons were identified. Remediation of hydrocarbon was considered required. • Heavy metal concentrations in soil were considered not requiring remediation. • Petroleum hydrocarbon and chromium were detected at the site. The hydrocarbon concentration was considered to not be migrating from the site. Chromium concentration was not considered significant. • PAHs, OCPs and PCBs were not detected. The outcomes of the investigation with respect of the site are discussed in more detail in Section 4.
CH2M Hill (1999a) 'Enfield Marshalling Yards Part A - Environmental Contamination Assessment', March 2009)	This report provides historical review and initial limited soil/groundwater contamination assessment of the ILC Enfield site. The scope of work included: • Review of land title records • Review of NSW EPA and Council records • Aerial photograph review • Site walkover inspection • Interviews of SRA/FreightCorp employees • Shallow soil sampling across the ILC Enfield site • Installation and sampling at eight groundwater monitoring wells • Laboratory analysis of soil samples for targeted COPCs within each area. Samples from Tarpaulin Factory (BH3 and BH34) were analysed for heavy metals, TPH, BTEX, PAH/phenolics, OCPs, OPPs. One sample from the rail line (BH31) was analysed for heavy metals, TPH, BTEX, PAH, OCP and OPP. Samples from Stockpile 4 were analysed for heavy metals. • Laboratory analysis of groundwater samples for cations/anions, heavy metals, ferrous iron, nitrate, OCP/OPP, TPH BTEX, PAHs, phenols. The outcomes of the investigation included: • No soil contamination was detected at the administration building, the Tarpaulin Factory, the gas store, the north and south car parks, the building in the vicinity of the former north signal box, the Toll Holdings lease area, the area covered by the former marshalling yards or Stockpiles 2, 4 or 5 that exceed the site criteria. • No pesticide/arsenic contamination was detected exceeding site criteria where arsenic trioxide, dieldrin and DDT may have been historically applied. • No heavy metal, TPH or PAH was detected at levels that my potentially pose a threat to the environment or human health, including from samples with ash. • Elevated concentrations for a number of contaminants were encountered above background levels but not above criteria for arsenic, cadmium, zinc, OCPs, lead and heavy metals. • Copper was detected within the wagon repair shed above criteria. • Large pockets of fill exceeding 10m depth were encountered along drainage lines (in the areas north of the site). • TPH impact was encountered at MW05 and MW06 in Ashfield Shale.

Report	Summary
	• Stockpile 4 (Mt Enfield) is homogeneous in geotechnical structure. Fill was encountered to 13mbgs. Test pits SP4A to SP4H were excavated within Stockpile 4.
CH2M Hill (1999b) 'Enfield Marshalling Yards Part B - Environmental Contamination Assessment', March 2009)	The objective of the report was to delineate the contamination identified during the Part A investigations to assess the extent of material requiring remediation and the costs involved. The scope of work included: • Undertake soil sampling at targeted areas of concern, including within Tarpaulin Factory • Install and sample eight deep and five shallow groundwater wells • Resample the eight wells installed in CH2MHill (1999a) • Laboratory analysis of samples. Samples from Tarpaulin Factory were analysed heavy metals, TPH, BTEX, OCPs, OPPs, PCB, phenols, PAHs. • Estimate the extent of soil/groundwater contamination • Estimate contaminated soil volumes and indicative remediation costings The outcomes of the report were: • There is no significant large scale contamination across the site that may pose a threat to the environment or human health. However, hotspots of contamination requiring remediation (based on TPH concentration and asbestos) were encountered. • There is no soil contamination associated with Stockpiles 1, 2, 3, 4 or 5 that poses a potential threat to the environment or human health. CH2MHill considers the material can be retained onsite or disposed of offsite. • Fill in the drainage lines does not pose a potential threat to environment or human health. • The contamination levels encountered above background levels at BH2, BH5, BH27, BH30, the administration building, Tarpaulin Factory and eastern boundary identified in CH2MHill (1999a) are considered not to pose a potential risk to the environment or human health. • There are two groundwater aquifers within the site: Aquifer A located in the Ashfield Shales and Aquifer B comprising perched aquifer within the fill material. These aquifers are not hydrologically linked. Heavy metals are greater in the deeper aquifer. Trace levels of TPH C14-C28 were detected in the majority of wells across the site. CH2MHill considers biodegradation of TPH is likely. CH2MHill considers that groundwater at the site does not pose a significant risk of harm.
Noel Arnold & Associates (2008) 'Hazardous Materials Survey Report, Sydney Ports Corporation, Tarpaulin Factory - Cosgrove Road, Enfield NSW', Ref: SS0074 : 64566-02, April 2008	The report presents findings of a hazardous materials survey at Tarpaulin Factory. The scope of work included a visual inspection of representative construction materials and the collection and analysis of suspected asbestos-containing materials. Hazardous materials assessed included asbestos, synthetic mineral fibre (SMF), polychlorinated biphenyls containing capacitors and lead containing paint. The outcomes of the report included: • Asbestos containing materials were identified in the northeast and northwest annexe, wall and roof, throughout the electrical switchboard backing, north hall (Adjacent to the western roller door), central passageway, northwest and west annexe, west hall. • SMF was not identified. • PCB-containing capacitors were suspected throughout the light fittings • Lead containing paint was identified throughout window frames. NAA recommends removal of asbestos and PCB containing capacitors and management strategy for lead containing paint.
Coffey Environments (2009b) 'Remediation Action Plan for Known Soil Contamination Intermodal Logistics Centre @	The objective of this report is to describe a remediation strategy and validation plan to render the ILC Enfield site suitable for commercial/industrial landuse by addressing known contamination on the ILC Enfield site and potential contamination in areas not previously assessed. The RAP also provides results of targeted sampling in some areas. A human health risk assessment is provided to establish risk based levels (RBLs) for TPH C10-C36. The RAP provides several remediation strategies depending on the nature and extent of

Report	Summary
Enfield', Ref: ILC - CO - D&R - ENVIRHOD00634A A-R002, June 2009	contamination, including: • Excavation and offsite disposal of material in excess of the remediation acceptance criteria (RAC) • Ex-situ containment onsite of material in excess of RAC • In-situ containment of material in excess of RAC The RAP recommends: • The site soils are subjected to remediation and validation strategy as proposed in RAP • Additional contamination identified during site works undergoes risk assessment or remediation • Further groundwater assessment works to address Site Auditor's concern regarding TPH (and potential migration offsite) and the presence of copper • Develop a long term site environmental management plan to manage the retained contamination in capped area and containment cells.
Coffey Environments (2009c) 'Additional Groundwater Assessment', Ref: ILC – CO – D&R – ENVIRHOD00634A A-R031RevA, 25 November 2009	The objectives of the report were to: • Broadly assess the current groundwater quality compared to the historical assessment work, particularly for TPH C10-C36 and copper • Assess the condition of groundwater where there is TPH contamination in soil at depths greater than 2m and where high copper concentrations were found in soil • Delineate the extent of TPH and copper contamination, if present, and assess potential offsite migration and potential risk of harm to human health and/or the environment • Assess whether additional groundwater assessment/management is required at the site The scope of works included: • Review of previous reports and data related to groundwater contamination • Assessment of appropriateness, serviceability and usability of existing groundwater monitoring wells • Drilling and installation of eight new groundwater monitoring wells • Two rounds of groundwater monitoring events for seven existing and eight new monitoring wells and laboratory analysis of samples for TRH, heavy metals, cations, anions, bicarbonate, carbonate, TDS. The outcomes of the report included: • Groundwater flow direction is confirmed to the south-east. • The groundwater results in relation to TPH and copper were generally comparable with that reported by Egis in 2001. • No exceedance of TPH C10-C36 occurred above the groundwater criteria. Coffey also states that residual TPH identified in the soil at TP10 and BH61 did not impact the groundwater quality. • Copper concentrations exceeded site criteria in all wells and were considered to be consistent with background concentrations. • Coffey considers that there was no evidence suggesting TPH and copper in groundwater originated from the site soil or activities. Coffey recommends that no additional groundwater assessment/management.
Coffey (2011) 'Spoil Management Plan for Reuse of Unsuitable Engineering Fill at Mt Enfield Intermodal Logistics Centre at Enfield', Ref: ENVIRHOD00634A E-R01, 28 June 2011	The objectives of this report were to: • Assess options for managing potential contamination issues of unsuitable engineering material generated at the site and proposed to be reused at Mt Enfield • Outline a testing regime for the unsuitable engineering material to be placed in the Mt Enfield area for commercial/industrial landuse from a contamination perspective. This document recommends placement of at least 100mm thick layer of asbestos free material as capping (due to the presence of asbestos in some of the unsuitable engineering material) and development of a long term EMP.
Douglas Partners (2011) 'Report on Baseline	The objective of the report was to provide a baseline contamination assessment for the area to be used as a compound by Downer Edi Works (DEW) for the storage of material,

Report	Summary
Contamination Assessment Downer EDi Works Compound Off Cosgrove Road Enfield', Ref: 72469.00, 10 August 2011	vehicle access, car parking and site sheds. The scope of works included: • Site inspection • Excavation of seven test pits (TP1 to TP7) to between 0.5mbgs and 1.7mbgs • Collection of soil samples and laboratory analysis for BTEX, TPH, PAH, heavy metals, total phenols, OCP, OPP, PCB, asbestos • Analysis of two fibre cement samples identified at the site for asbestos • Collection of three samples (S1 to S3) from stockpile located on the north-western portion of the DEW site (northern portion of the site within this RAP) and laboratory analysis for heavy metals, PAH, TPH, BTEX, OCP, PCB, total phenols, asbestos and subsampling from stockpile sample S1 for further analysis of arsenic, and TCLP analysis for waste classification purpose • Preparation of report and waste classification of stockpile The outcomes of the report included: • TPH, BTEX, PCB, OCP, OPP and phenols were below the LOR. Heavy metals were below HIL for commercial/industrial landuse. Asbestos was not detected in the soil samples analysed. • Asbestos was detected in the fibre cement fragments analysed. • The stockpile was classified as restricted solid waste (non-putrescible).
Coffey (2014a) 'Visual Assessment of the Tarpaulin Factory and Contamination Assessment of the Area South of the Tarpaulin Factory, Cosgrove Road, Enfield, NSW', Ref: ENAURHOD04419 AD-L01, 17 March 2014	The objectives of the report were to: • Obtain sufficient site contamination information (within the Tarpaulin Factory) to facilitate the site audit process • Address the identified data gaps as required by the auditor • Assess if the site (Tarpaulin Factory) is suitable for the proposed commercial/industrial landuse The scope of work included: • Site walkover of Tarpaulin Factory • Collection of some fragments potentially containing asbestos within Tarpaulin Factory • Collection of three surface soil samples (TAR-SS1, TAR-SS2, TAR-SS3) in the unpaved area to the south of Tarpaulin Factory and laboratory analysis of the samples for heavy metals, TRH, BTEX, PAH, OCP, OPP, asbestos • Undertaking asbestos abatement work (emu picking) within the Tarpaulin Factory and the area to the north and north-west of the building The outcomes of the report included: • Following asbestos abatement work, visible asbestos containing materials had been removed from the ground surface. However, ACM are still present on the building structure (including other hazardous materials (lead and PCBs)). Coffey recommended removal of hazardous materials during any work in the building. • The area to the south of Tarpaulin Factory does not contain contamination warranting remediation and is considered to be suitable for the proposed landuse.
Coffey (2014b) 'Asbestos Status Report for Tarpaulin Factory, Cosgrove Road Enfield NSW', Ref: ENVIRHOD00634A G-L02, 25 June 2014	Coffey was engaged to undertake a clearance inspection following removal of asbestos materials. A clearance inspection was not granted as asbestos products and remnants were still present at the site. The document provides documentation of asbestos status of the site and recommends further removal of asbestos.
Coffey (2014c) 'Validation of the Former Stockpile Footprint at Tarpaulin Shed, South Strathfield,	The objective of the report was to assess if the stockpile encountered by Douglas Partners (2011) had been adequately removed and whether there is evidence of residual contamination within the former stockpile footprint. No observation was conducted on the stockpile removal and it is not known who removed the stockpile. The scope of work included a site walkover. Coffey initially intended to collect some samples but the site walkover indicated that the site surface had been paved with chip

Report	Summary
NSW', Ref: ENVIRHOD00634A G-L03, 2 December 2014	seal and large concrete blocks had been placed in the area. Coffey considers that the area of the former stockpile footprint is suitable with respect to land contamination for the proposed commercial/industrial landuse based on the site walkover observations, the concentrations of contaminants detected in the stockpile generally below the RAC for commercial/industrial land use, and the area of the former stockpile being paved.
Coffey (2015) 'Waste Classification Assessment - Surface Soil of the Northern End of the Tarpaulin Shed, ILC@Enfield, Cosgrove Road, South Strathfield', Ref: ENVIRHOD00634A G-L05, 13 August 2015	This document provides waste classification for the north-western and north-eastern wings (northern lean-to buildings) which may be demolished in the future. The waste classification was based on the assessment results reported in CH2MHill (1999a) and the asbestos assessments undertaken by Coffey in 2015. Based on the assessment, the surface soil (up to 100mm) on the footprint of the north-western and north-eastern lean-to buildings at the northern end of the Tarpaulin Shed are classified as general solid waste – non-putrescible containing waste (asbestos waste).
Coffey (2016b) 'Asbestos Report - Asbestos Validation Certificate Enfield Tarpaulin Factory 127 Cosgrove Road (Corner of Punchbowl and Cosgrove Roads Enfield, NSW 2136)', Ref: ENVIRHOD00634A G-L06, 6 May 2016	The report provides asbestos clearance following removal of asbestos stored within the Tarpaulin Factory building and remaining on the structures and the accessible areas (comprising gravel access surface, exterior building to the west side of the Tarpaulin Factory, and south side vacant ground) following removal of asbestos by Enviropacific. The report concludes "*It is the opinion of the consultant that the surfaces of the structural areas, within the former Tarpaulin Factory, have been observed, and remediated to a satisfactory standard.*" And "*Based on our previous assessment asbestos may be present on ground surface or subsurface in the northern part of the site and may require to be remediated or managed prior the site being made suitable for the proposed landuse.*"
NSW Ports (2016) 'Enfield ILC Overarching Operational Environmental Management Plan', 30 August 2016	The OEMP provides an overarching framework for the environmental management of operations of the ILC Enfield site, including activities of tenants and areas managed and maintained by NSW Ports. The OEMP recommends that specific OEMPS are required to be prepared by tenants. The objectives of this OEMP are to: • Ensure that relevant environmental aspects and risks are addressed, assessed and appropriate safeguards and controls implemented on-site; • Describe how site activities are managed effectively to minimise adverse impacts on the environment; • Identify key environmental roles, responsibilities and governance arrangements; • Identify suitable environmental emergency preparedness and response procedures; • Provide details of complaints management procedures; • Provide details of incident notification and management procedures; • Meet all requirements of relevant environmental legislation and provide for compliance with the Project Approval; and • Outline the process to achieve continual environmental improvement.

Summary of the investigations relevant to the site are discussed in subsequent sections.

3.2 Site History

Site history assessment was undertaken in CH2MHill (1999a) and additional information gathered is summarised below.

- **Pre-1916** - The site was predominantly used for agricultural uses prior to 1916. Between 1903 and 1914 parts of the site may have been used as poultry farms, market gardens, brick works or owned by timer merchant and omnibus proprietor. CH2MHill (1999a) considers that potential organic contamination (TPH/BTEX, nutrients, hormones) arising from landuses prior to 1916 would likely have attenuated over time and the extent of inorganic (heavy metal) contamination is not expected to be widespread.
- **1916 to 1993** - In 1916 the ILC Enfield site was developed as a locomotive depot and goods siding as part of the Enfield Marshalling Yard. Based on the information by a historian, no significant maintenance or refuelling activities were conducted at the site, as most maintenance was undertaken at the Chullora marshalling yards. All refuelling was located at the DELEC depot located north of the site. The marshalling yards originally formed part of the Campsie to Flemington Goods Line. By 1917 the ILC Enfield site comprised a series of transfer and shunting sidings, two roundhouses and the Enfield Locomotive Depot. By mid 1920s the majority of the railway tracks and buildings/structures present prior to the remediation of the ILC Enfield site appeared to have been constructed, with the main structures comprising the wagon repair shed, Tarpaulin Factory and north and south signal boxes. Only the Tarpaulin Factory is located within the site and is further discussed below.

  The Tarpaulin Factory was brought to the site from Central Railway Station in 1924. Construction of the factory was completed in 1925 at which time sidings to and from the factory and a 10,000-gallon water tank were also constructed. The factory was operated continuously until 1991. The building is listed under the National Heritage Act for its unique columns and lattice cross-member work. The Tarpaulin Factory was used to produce tarpaulins/canvas linen bags from rolls of canvas, and repair ripped/torn tarpaulins. SRA Heritage personnel indicated that no treatment or production of canvas occurred at the site, and as such, no chemicals or equipment associated with the production/preservation of canvas were stored within the factory. CH2MHill (1999a) discussed that the potential for operations of Tarpaulin Factory to contribute to soil/groundwater contamination to be minimal. However, given the factory was predominantly constructed of wood, and the floor was mounted on peers, CH2MHill (1999a) considers that the use of pesticides and impregnation of arsenic into woodwork were likely.

  The majority of the railway tracks, sidings and associated structures were constructed in the early 1920s, including within the site. CH2MHill (1999a) states that no information was available on the presence of above ground storage tanks (ASTs) and underground storage tanks (USTs). Information provided by SRA employees indicates that herbicide/pesticide were used to minimise vegetation growth up until 1972.

- **Early 1990s** - In early 1990s, Mt Enfield, which was approximately 200m long, 80m wide and 25m high, was separated into five stockpiles. Information from SRA employees and previous environmental report indicates that Mt Enfield was a man-made stockpile containing reworked Ashfield/Bringelly Shales and Minchinbury Sandstone, building rubble, ash, slag, ballast, and general debris from the majority of the railway yards in the Sydney metropolitan area. Mt Enfield may have included material excavated from the foundations of the former roundhouses and locomotive depot. During the redevelopment of the ILC Enfield site, the material contained within Mt Enfield was redistributed to a series of five stockpiles (Stockpiles 1 to 5) across the site according to its engineering/geological properties. The

location of the current Mt Enfield was the location of Stockpile 4. Stockpiles 3, 4 and 5 were deemed unsuitable for engineering work.

- **Between 1993 and 2009** – Since the cessation of operations as an active marshalling yard in 1993 and the continued development of the stockpiles during the construction of the new marshalling yard, the site was vacant.
- **Between 2009 and Current** – The ILC Enfield Site was remediated from 2009, as further discussed in Section 4. No significant work has been undertaken within the Tarpaulin Factory area, with the exception of removal of timber floor and hazardous materials from the building structure. Materials considered unusable for engineering purposes at the ILC Enfield site, including asbestos contaminated material, was placed within Mt Enfield. The surface of Mt Enfield was capped following completion of fill placement. A footpath was recently constructed running from the south to the top of Mt Enfield. Railway lines within the site had been recently removed by NSW Ports. The intermodal terminal has been constructed to the north of the site.

4. Summary of Previous Investigations Results and Other Works

The results for previous investigation results completed at the site and presented in Douglas Partners (1993a), CH2MHill (1999a), CH2MHill (1999b), Douglas Partners (2011) and Coffey (2014a) are summarised below. Refer to Appendix A and C for sample locations and analytical result summary tables.

4.1 Soil Analytical Results

4.1.1 Area Outside Mt Enfield

Summary of soil results outside Mt Enfield area, including within the Tarpaulin Factory, are presented in Table 4.1. These include:

- Samples from TP101, TP102, TP103, TP104, TP125, TP201 and TP202 in Douglas Partners (1993a)
- Samples from BH31, BH33, BH34 in CH2MHill (1999a)
- Samples from Tarpaulin Factory in CH2MHill (1999b)
- Samples from TP1 to TP7 in Douglas Partners (2011)
- Samples TAR-SS01 to TAR-SS03 in Coffey (2014a)

The results are compared with the remediation acceptance criteria provided in the Coffey (2009b) RAP, as well as NEPM (2013) criteria, which are discussed in Section 5.3.1.

Table 4.1: Summary of Soil Results – Area Outside Mt Enfield (mg/kg)

Constituents	No of Samples	Max Result	Criteria in Coffey (2009b) RAP (mg/kg)	NEPM (2013) HIL D/HSL D[1]	NEPM (2013) EIL/ESL commercial/ industrial[2]	NEPM (2013) Management Limit	No. Samples > Criteria (Exceedance)
Arsenic	36	330	500	3,000	160	-	2 (TP2/0.1-0.2=330[5], TP3/0.4-0.5=190[5])
Cadmium	42	11	100	900	-	-	0
Chromium	42	50	500	3,600	320	-	0
Copper	42	979	5000	240,000	160	-	2 (TP3/0.1=979, TP5/0.1=410, TP2/0.1-0.2=170[5])
Lead	42	15,200	1500	1,500	1,800	-	3 (TP5/0.1=1,580, TP9/0.1=1,530, TP15/0.1=15,200)
Mercury	15	0.3	75	730	-	-	0
Nickel	42	290	3000	6,000	60	-	1 (TP2/0.1-0.2=290[5])
Zinc	42	2,520	35000	400,000	480	-	7 (ranging

Constituents	No of Samples	Max Result	Criteria in Coffey (2009b) RAP (mg/kg)	NEPM (2013) HIL D/HSL D[1]	NEPM (2013) EIL/ESL commercial/ industrial[2]	NEPM (2013) Management Limit	No. Samples > Criteria (Exceedance)
							between 490 and 2,520)
Benzo(a)pyrene	32	1	5	40[3]	1.4	-	0
Naphthalene	32	??[8]	-	NL	370	-	0
Polycyclic Aromatic Hydrocarbons (PAH)	32	24.3	100	4,000	-	-	0
TPH C_6-C_9	32	90	65	0-<1m: 260[4] 1-<2m: 370[4] 2-<4m: 630[4] 4m+: NL[4]	215[4]	700[4]	0
TPH C_{10}-C_{14}	32	57	18,642	NL[5]	170[5]	1,000[5]	0
TPH C_{15}-C_{28}	32	1,220	13,953	-	1,700[6]	3,500[6]	1 (TP5/0.1=2,330)
TPH C_{29}-C_{36}	13	1,110	13,953	-			
Benzene	30	<0.1	1	3	75	-	0
Toluene	30	<0.1	1.4	NL	135	-	0
Ethylbenzene	30	<0.1	3.1	NL	165	-	0
Xylene	30	<0.2	14	0-<1m: 230 1m+: NL	180	-	0
OCPs	38	0.49	-	-	-	-	0
OPP	29	0.32[7]	-	-	-	-	0
Total Phenol	32	5.2	42500	240,000	-	-	0
Polychlorinated Biphenyls (PCB)	11	0.05[7]	50	7	-	-	0
Asbestos	10	ND	0.001% w/w asbestos for fibrous asbestos and asbestos fines 0.05% w/w asbestos for ACM	0.001% w/w asbestos for fibrous asbestos and asbestos fines 0.05% w/w asbestos for ACM	-	-	Although no asbestos was detected in the samples, ACM fragments were encountered in the northern lean-to buildings of the Tarpaulin Factory, as discussed in the text following the table.

Notes:

1 HIL D/HSL D: NEPM (2013) health investigation level and health screening level for commercial/industrial landuse
2 EIL/ESL commercial/industrial: NEPM (2013) ecological investigation level/ecological screening level for commercial/industrial landuse
3 BaP TEQ
4 Criteria for TRH C6-C10 or F1 have been presented.
5 Criteria for TRH >C10-C16 or F2 have been presented
6 Criteria for TRH >C16-C34 have been presented
7 The values were reported in Table 12.3 and Table 12.9 of CH2MHill (1999a) do not have "<" sign for values less than LOR. Zoic does not have access to the laboratory reports and cannot check the actual values reported in the laboratory reports. For values reported above the LOR, we have listed the values reported in these tables. For values reported at LOR, we have presented the values as <LOR, assuming that CH2MHill had omitted the "<" sign. Note that the presentation of the data does not change the outcome of our assessment.
8 Some naphthalene results are not reported, but total PAHs are generally below criteria for naphthalene.
NL Non Limiting
LOR Limit of reporting
ND Not detected

The results of the previous investigations indicate:

- Limited investigation has been undertaken in the area outside the Tarpaulin Factory. In total the area outside Tarpaulin Factory comprises approximately 0.85ha. The NSW EPA (1995) recommends a minimum number of 20 sampling locations. A total of 18 sampling locations had been sampled across this area. While the density is marginally below the number recommended by NSW EPA (1995), the results indicate that fill is generally shallow (up to 0.9mbgs) and the results are generally below RAC recommended in the Coffey (2009b). However, Zoic notes that arsenic, copper and nickel exceeded the NEPM (2013) EILs in the shallow samples north of Tarpaulin Factory. Zoic considers that given that this area will be paved, the exceedances are unlikely to affect plant growth for the proposed development. Based on the results, Zoic considers that the area outside the Tarpaulin Factory can be managed by implementation of unexpected finds protocol (see Section 8) during the proposed development.
- The area of the Tarpaulin Factory is approximately 0.55ha. The NSW EPA (1995) recommends a minimum number of 14 locations. A total of 24 sampling locations had been sampled across the Tarpaulin Factory and is considered adequate for the purpose of the investigation. The results indicate that high lead concentrations exceeding the remediation acceptance criteria (RAC) were detected at several locations within the Tarpaulin Factory building. The 95% upper confidence limit (UCL) of lead (with the exception of the hotspot of 15,200mg/kg at one location (T15/0.1) was 512mg/kg, which is below the site criteria. CH2MHill (1999b) reanalysed the sample at T15/0.1, which indicated lead concentration of 175mg/kg, which is well below the criteria. CH2MHill (1999b) also undertook six sub-samples from T15/0.1, which provided lead concentrations ranging between 175mg/kg and 2,230mg/kg, with an average concentration of 1,129mg/kg, which is below the adopted criteria. Additionally, CH2MHill (1999b) undertook delineation of sampling in a 2m grid from the original sample location. The 95% UCL of all the lead concentrations was 484mg/kg, which is below the adopted criteria (using the average concentration of lead from T15/0.1). Leachability test (with toxicity characteristic leaching procedure (TCLP)) undertaken on lead in sample T15/0.1 indicates that lead was not leachable in the sample. CH2MHill (1999b) concluded that the high lead concentration is of very limited extent and does not warrant further action. CH2M Hill (1999b) further concluded that no further investigation or remediation is required within the Tarpaulin Factory building. Zoic considers that this is appropriate, given that the Tarpaulin Factory building will be paved and there will be no risk of exposure or potential for the fill to leach as there will no surface water infiltration
  Other contaminants of potential concern (COPCs) were not detected above the Coffey (2009b) RAC. However, Zoic notes that TPH C15-C36 exceeded the NEPM (2013) ESL in one location

within the Tarpaulin Factory. Zoic considers that this is unlikely to affect plant growth given the indoor location and that the area will be paved.

- During inspection by Coffey, ACM fragments were encountered in the northern lean-to buildings adjacent to the main Tarpaulin Factory (Coffey, 2014a; Coffey, 2014b). Coffey (2016b) provides clearance certificate for asbestos on the Tarpaulin building structure and ground surface following removal of asbestos on the building structures and ACM fragments encountered on the ground surface. This document notes that asbestos may be present within subsurface soil in the northern lean-to buildings adjacent to the main Tarpaulin Factory. Zoic considers that remediation of potential asbestos impact should be undertaken during or prior to the proposed development. Based on discussion with NSW Ports at the time, removal of potentially asbestos impacted surface soil is to be undertaken during the proposed construction of the Tarpaulin Factory by future lessee.
- Other hazardous materials such as PCB-containing capacitors, and lead containing paint identified within the Tarpaulin Factory building by Noel Arnold & Associates (2008) may still be present within the site and should be removed during or prior to the proposed development.

4.1.2 Mt Enfield

Background

Mt Enfield was historically present at the site prior to the remediation and was also referred to as Stockpile No. 4. Limited assessment has been undertaken on Mt Enfield by CMPS&F (1996) and CH2MHill (1999a & 1999b). CH2MHill (1999b) concluded that "*there is no contamination associated with Stockpiles 1, 2, 3, 4 or 5 that poses a potential threat to the environment or to human health under the proposed land use scenario*" and concluded that the "*material could be retained on site and used for landscaping purposes to further level/reclaim areas on the site*". Zoic notes that no asbestos assessment was undertaken of the material. The original Stockpile was covered with dense vegetation.

Summary of heavy metal soil results from Mt Enfield (Stockpile 4) are presented in Table 4.2. These include results from CH2MHill (1999a) (samples SP4A to SP4H). The results are compared with the remediation acceptance criteria provided in the Coffey (2009b) RAP, as well as NEPM (2013) criteria, which are discussed in Section 5.3.1.

Table 4.2: Summary of Soil Results – Mt Enfield (mg/kg)

Constituents	No of Samples	Max Result	Criteria in Coffey (2009b) RAP (mg/kg)	NEPM (2013) HIL D/HSL D[1]	NEPM (2013) EIL/ESL commercial/ industrial[2]	NEPM (2013) Management Limit	No. Samples > Criteria (Exceedance)
Arsenic	18	97	500	3,000	160	-	0
Cadmium	18	4	100	900	-	-	0
Chromium	18	29	500	3,600	320	-	0
Copper	18	220	5000	240,000	160	-	2 (SP4A9.0=220, SP4A9.0=205)
Lead	18	523	1500	1,500	1,800	-	0
Mercury	18	0.4	75	730	-	-	0

Constituents	No of Samples	Max Result	Criteria in Coffey (2009b) RAP (mg/kg)	NEPM (2013) HIL D/HSL D[1]	NEPM (2013) EIL/ESL commercial/ industrial[2]	NEPM (2013) Management Limit	No. Samples > Criteria (Exceedance)
Nickel	18	33	3000	6,000	60	-	0
Zinc	18	432	35000	400,000	480	-	0

Notes:
1 HIL D/HSL D: NEPM (2013) health investigation level and health screening level for commercial/industrial landuse
2 EIL/ESL commercial/industrial: NEPM (2013) ecological investigation level/ecological screening level for commercial/industrial landuse
NL Non Limiting

The results indicate that the material meets the adopted criteria for the site (but Zoic notes only heavy metals had been tested for).

Coffey subsequently prepared a spoil management plan (SMP), which provides a strategy of placement of material from other parts of the site, which includes unsuitable engineering material from cut and fill activities and other stockpiles, into Mt Enfield. This is documented in the following document which was endorsed by the site auditor for the ILC Enfield site (Environ):

- Coffey Environments (2011) 'Spoil Management Plan for Reuse of Unsuitable Engineering Fill at Mt Enfield Intermodal Logistics Centre at Enfield', Ref: ENVIRHOD00634AE-R01, 28 June 2011

The above SMP provides the following strategies for placement of materials within Mt Enfield:

- Removal of obviously contaminated material (oil soaked, drums, heavily stained, strong odour, asbestos containing materials) for further assessment
- Testing frequency, analytical schedule, and quality control/quality assurance requirements of unsuitable engineering fill placed within Mt Enfield
- The SMP considered it prudent not to bury significant quantities of green waste within Mt Enfield. Where green waste or rail sleepers require burial, the SMP recommended burial at shallow depths (at a depth of 0.5mbgs).
- The SMP recommended that asbestos impacted unsuitable engineering material be placed into Mt Enfield to a level that is at least 100mm less than the final design levels and a 100mm layer of asbestos free material be placed as surface covering, should asbestos containing material is placed within Mt Enfield.
- Unexpected finds protocol during the work.
- Validation requirement. The SMP requires that "If *soil sourced from site is used to form the surface layer of Mt Enfield, the final surface of the reformed Mt. Enfield area should be validated to demonstrate that the surface soils are suitable for the proposed commercial and industrial use*."

Placement of Unsuitable Engineering Material

Unsuitable engineering fill was placed above the original Stockpile No. 4 material and extended to the south. Original surface and vegetation of the original Stockpile No. 4 material remains on the northern and north-eastern and south-eastern flanks of Mt Enfield.

Coffey undertook a review of various documents provided by the contractor undertaking the remediation (Leighton) during validation of the remainder of the ILC Enfield site. Some of these

documents are related to material which may have been placed within Mt Enfield. The documents and summary of Coffey's review are provided in other validation reports for the site, including Coffey (2016a) 'Validation Report for Portion of Validation Area 2 (Footpath and Viewing Areas to Mt Enfield), ILC at Enfield, NSW', Ref: ENVIRHOD00634AG-R02, 2 May 2016. A summary of review of the documents undertaken by Coffey and the documents related to Mt Enfield are reproduced in Appendix E. Based on review of it is considered that assessment of materials placed on Mt Enfield had been generally undertaken as per the SMP.

Placement of Capping

Mt Enfield was progressively capped with natural clay material from the site (from Stockpiles SP1 and SP2). Note that capping was not placed in the northern, north-western, and north-eastern flanks of Mt Enfield, which is the original surface of Mt Enfield, with the exception of an area in the western batter (approximately 900m^2), where additional contaminated material was placed following the completion of Mt Enfield, and capped.

Assessment of the capping materials were undertaken in the following documents summarised Appendix E:

- Item 2t (for the majority of Mt Enfield material, with the exception of the western batter). The Coffey Environments (2012a) assessment (Item 2t) stated "*the material in SP1 and SP2 is suitable for commercial/industrial land-use in accordance with the Stockpile Management Plan as capping material in an area that will be vegetated with grass*." The area where capping had been placed was sprayed with grass seeds to allow for vegetation growth, to minimise capping erosion.
- Items 32c to 32g (for the western batter). An email from Coffey to NSW Ports dated 5 May 2016 states "*We have reviewed the Alliance Geotechnical (2015) 'Soil Assessment Report', Ref: 1857-ER-1-1, 4 May 2015. We note that there soil samples have reported low concentrations of some PAH compounds albeit, marginally above the respective LORs and Alliance has noted the presence of minor amount anthropogenic materials mixed with the soil. Whilst it may be possible for trace quantities of anthropogenic materials to mix with soil that is VENM during excavation or handling, it would be quite uncommon for PAHs even at trace levels to be detected in VENM sourced from around the Sydney area. These suggest that there isn't an adequate basis to consider that that the material comprises only virgin excavated natural material (VENM).*
  Notwithstanding the above, we agree that the material meets the criteria for the proposed landuse onsite. The auditor has advised that he is willing to consider the material use onsite if the material is considered to be suitable for the proposed landuse. However, the auditor stated that he will need to make a note in the site audit report (SAR) that this material may contain material other than VENM. We will make a similar conclusion in our Validation Report for the site."

Survey of the capping thickness is provided in Appendix F, which shows that the minimum capping thickness on Mt Enfield was 0.11m, which exceeds the SMP requirement of 0.1m. Typically the capping thickness is well in excess of 0.2m and ranges up to 0.53m.

Coffey (2016a) states that based on the observations during their site visits, capping was generally placed at a thickness of more than 0.1m within the surface of Mt Enfield and that the capping material comprised of clay with no visual evidence of contamination. No evidence of anthropogenic material was observed on the capping (outside the area of the additional capping

on the western batter[3]) during the site visits. Following completion of Mt Enfield, the area had been sprayed with Ecoblanket and grass was observed to be present during Zoic's site visit on 23 November 2016.

The contamination beneath capping of Mt Enfield is managed by the NSW Ports (2016) 'Enfield ILC Overarching Operational Environmental Management Plan'.

Zoic's Assessment

Based on the documents provided by Coffey and Zoic's observations during site walkover, Mount Enfield comprises material containing asbestos and has been capped with clean fill (at least 0.1m).

4.2 Groundwater Analytical Results

Summary of the latest groundwater monitoring results by Coffey (2009c) are provided in Table 4.3. Note that these results are from the groundwater wells across the ILC Enfield site, and not only of the site. Zoic notes that the Coffey (2009c) investigation only addresses TPH and copper, which were the COPCs previously identified to be present above background levels (for TPH) or above site criteria (for copper). Other COPCs were reported below criteria or background levels during previous investigations. The results are compared with ANZECC (2000) trigger levels for the protection of fresh water ecosystem, as listed in the Coffey (2009c) report.

Table 4.3: Summary of Groundwater Results (µg/L) (Coffey, 2009c)

Constituents	Fresh Water[1]	Minimum	Maximum
Arsenic	24	<1	11
Cadmium	0.1	<0.1	5.9
Chromium[3]	1	<1	2
Copper	1.4	<5	27
Lead	3.4	<1	2
Mercury	0.1	<0.1	<0.5
Nickel	11	<1	88
Zinc	8	43	2,300
TPH C_{10}-C_{14}	600	<100	<100
TPH C_{15}-C_{28}		<200	<200
TPH C_{29}-C_{36}		<500	<500

Notes:
1 ANZECC (2000) 95% Limit of Protection and Low Reliability Criteria

[3] Some anthropogenic materials were encountered in the capping for the additional contaminated material at the western batter. Based on the assessment provided by Coffey stated in an email dated 5 May 2016, the material is considered to be suitable for the proposed landuse onsite.

NL No Limit
- No Guideline

The Coffey (2009c) concluded:

- Groundwater flow direction is confirmed to the south-east.
- The groundwater results in relation to TPH and copper were generally comparable with that reported by Egis in 2001.
- No exceedance of TPH C10-C36 occurred above the groundwater criteria. Coffey also states that residual TPH identified in the soil at TP10 and BH61 did not impact the groundwater quality.
- Copper concentrations exceeded site criteria in all wells and were considered to be consistent with background concentrations.
- Other heavy metals (cadmium, chromium, nickel and zinc) also exceeded the adopted criteria. Coffey considers that zinc concentrations (which exceeded the criteria in all wells located upgradient or downgradient) were considered to be representative of background concentrations. Coffey considers that zinc concentration at MW9 (an upgradient well which had significantly high zinc detection than other wells) was attributed to an offsite source. Coffey also suggests that cadmium and nickel were detected in six of the 16 wells (in upgradient and downgradient wells) and were considered to be attributed by background concentrations or offsite source. No discussion has been provided on chromium exceedance, but Zoic notes that chromium concentration just exceeded the LOR and appears to be consistent across the wells.
- Coffey considers that there was no evidence suggesting TPH and copper in groundwater were originated from the site soil or activities. Coffey recommends that no additional groundwater assessment/management.

Given the findings above and that the Coffey (2009c) findings have been endorsed by the site auditor for the ILC Enfield, Zoic does not consider assessment/management of groundwater or requirement of duty to report in this RAP.

4.3 Conceptual Site Model

Based on the site history, available information, and the available results, the conceptual site model is provided in Table 4.4. These are generally consistent with the information provided in CH2MHill (1999a) and Coffey (2009b) RAP.

Table 4.4: Conceptual Site Model

Area	Potential Source of Contamination	Potential Contaminants	Potential Exposure Pathway	Potential risk
Entire Site	Uncontrolled Filling	Heavy metals, TRH, PAH, OCPs, OPPs, PCB, asbestos	Future commercial/industrial workers, visitors: direct contact, inhalation Intrusive maintenance workers and construction workers: direct contact, inhalation	Future commercial/industrial workers, visitors: Very low given the low concentrations Intrusive maintenance workers and construction workers: Low given the low concentrations
Tarpaulin Factory	Weathering of building structures, use of pesticides beneath buildings, use of arsenic in timber structures, use of lead paint application	Heavy metals, asbestos, PCB, OCPs, OPPs	Future commercial/industrial workers, visitors: direct contact, inhalation Intrusive maintenance workers and construction workers: direct contact, inhalation	Future commercial/industrial workers, visitors: Very low given the low concentrations and the majority of the area around the building will be paved. Intrusive maintenance workers and construction workers: Low to medium given the low concentrations of chemicals and presence of asbestos in the northern lean-to buildings. While no significant asbestos impact has not been encountered within the main Tarpaulin Factory building and fragments of ACM, when encountered, had been removed, ACM may still be potentially present and encountered during the proposed development. The potential risk of ACM is low, particularly as the concrete slab will be erected within the building footprint.
Mt Enfield	Buried fill containing hydrocarbon, heavy metals and asbestos	Heavy metals, TRH, PAH, asbestos	Intrusive maintenance workers and construction workers: direct contact, inhalation	Intrusive maintenance workers and construction workers: Low to medium given the low concentrations of chemicals and presence of asbestos in the fill.
Railway tracks	Spills and leaks, use of pesticides, fill placement, ballast, weathering of asbestos containing brake pads	Heavy metals, TRH, PAHs, OCPs, OPPs, asbestos	Intrusive maintenance workers and construction workers: direct contact, inhalation	Intrusive maintenance workers and construction workers: Low given the low concentrations of chemicals.
Groundwater	Leaching of contaminants or migration from upgradient location	TRH, metals	Exposure pathway is not complete given the very low concentrations	Potential risk is considered to be very low

5. Remedial Action Plan

The remedial action plan below is developed to be consistent with the endorsed Coffey (2009b) RAP with due consideration of the NSW OEH (2011) Guidelines for Consultants Reporting on Contaminated Sites.

5.1 Remediation Goal

The remediation goal for the site is to remediate areas containing unacceptable levels of contamination in soil to levels acceptable for the proposed commercial/industrial landuse.

5.2 Key Stakeholders

The following stakeholders are expected to be involved in the remediation associated with the proposed development.

Table 5.1: Roles and Organisation

Role	Organisation
Site owner/ILC Enfield Site Development Manager	Port Botany Lessor, with NSW Ports being the Head Lessee
Site lessee	Flower Power Group
Development Project Manager	LJB Urban Planning
Architect	BN Group Pty Ltd
Remediation/Construction Contractor	To be advised
Council	Strathfield Council
Environmental Consultant	Zoic Environmental Pty Ltd

5.3 Remediation Acceptance Criteria

5.3.1 Soil Remediation Acceptance Criteria

The majority of the investigations were completed prior to 2013, when the amended NEPM (2013) was introduced. Therefore, the Coffey (2009b) RAP provided the following criteria:

- NEPM (1999) health investigation levels (HIL) for the proposed commercial/industrial landuse
- NSW EPA (1994) Contaminated Sites: Guidelines for Assessing Service Station Sites – for TPH C6-C9. It should be noted that this guideline has since been revoked by NSW EPA.
- Human health risk-based site specific criteria for TPH C10-14, C15-C28 and C29-C36 (Coffey, 2009a)
- WA DoH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia – for asbestos
- Aesthetic considerations (i.e. visible free product or surface staining)

Coffey (2009b) notes that the risk of human health impact as a result of TPH is relatively low, and is associated with:

- Low risk associated with dermal contact with soils containing these fractions of TPH
- Vapour inhalation of TPH C10-C14 in areas to be overlain with slabs and open space areas

Zoic considers that the criteria presented in the Coffey (2009b) are relevant to this RAP, given that the Coffey (2009b) RAP is overarching RAP for the remediation of the entire ILC Enfield site, including the site covered in this RAP. Additionally, the proposed landuse for the site is not inconsistent with the proposed landuse (commercial/industrial) covered by the Coffey (2009b) RAP. For completion, Zoic also considers the criteria presented in NEPM (2013), which include:

- HIL D for commercial/industrial landuse
- HSL D for commercial/industrial landuse – sand soil type, which is considered appropriate for the general fill at the site
- EIL for commercial/industrial landuse[4]
- ESL for commercial/industrial landuse – coarse soil type
- HSL for commercial/industrial landuse for asbestos, which is consistent with WA DoH (2009) criteria for asbestos adopted in Coffey (2009b) RAP
- NEPM Management Limits for commercial/industrial landuse for a coarse soil.

It is noted that the criteria adopted in the Coffey (2009b) RAP are generally more conservative than those in NEPM (2013). Zoic notes that the Coffey (2009b) RAP considers that soil phytotoxicity assessment is not required given the commercial/industrial landuse at the site, provided that the site landuse remains as commercial/industrial landuse. However, consistent with the NEPM (2013 the EIL/ESL for commercial/industrial landuse must be considered or justification provided for their omission.

A summary of the criteria is presented in Table 5.2.

Table 5.2: Soil Remediation Acceptance Criteria

Contaminant	Criteria in Coffey (2009b) RAP (mg/kg)	NEPM (2013) HIL D/HSL D	NEPM (2013) EIL/ESL commercial/ industrial	NEPM (2013) Management Limit
Arsenic	500	3,000	160	-
Cadmium	100	900	-	-
Chromium	500	3,600	320	-
Copper	5000	240,000	160	-
Lead	1500	1,500	1,800	-
Mercury	75	730	-	-
Nickel	3000	6,000	60	-
Zinc	35000	400,000	480	-
Benzo(a)pyrene	5	-	1.4	-
BaP TEQ	-	40	-	-
Naphthalene	-	NL	370	NL

[4] No soil property data was collected for assessment of EILs. We have used the following conservative assumptions based on the soil encountered within the site: pH of 6, cation exchange capacity of 5cmolc/kg dwt, organic carbon content of 1%, clay content of 1%, high traffic condition, aged soil. Therefore, the EIL/ESL values are indicative only.

Contaminant	Criteria in Coffey (2009b) RAP (mg/kg)	NEPM (2013) HIL D/HSL D	NEPM (2013) EIL/ESL commercial/ industrial	NEPM (2013) Management Limit
Polycyclic Aromatic Hydrocarbons (PAH)	100	4,000	-	-
TPH C_6-C_9	65	-	-	-
TPH C_{10}-C_{14}	18,642 and no visible free product or staining on the surface	-	-	-
TPH C_{15}-C_{28}	13,953 and no visible free product or staining on the surface	-	-	-
TPH C_{29}-C_{36}	13,953 and no visible free product or surface staining	-	-	-
TRH C6-C10	-	-	-	700
F1 (TRH C6-C10 minus BTEX)	-	0-<1m: 260 1-<2m: 370 2-<4m: 630 4m+: NL	215	-
TRH >C10-C16	-	-	170	1,000
F2 (TRH >C10-C16 minus naphthalene)	-	NL	-	-
TRH >C16-C34	-	-	1,700	3,500
TRH >C34-C40	-	-	3,300	10,000
Benzene	1	3	75	-
Toluene	1.4	NL	135	-
Ethylbenzene	3.1	NL	165	-
Xylene	14	0-<1m: 230 1m+: NL	180	-
Aldrin + Dieldrin	50	45	-	-
Chlordane	250	530	-	-
DDT + DDD + DDE	1000	3,600	640 (DDT)	-
Heptachlor	50	50	-	-
Total Phenol	42500	240,000	-	-
Polychlorinated Biphenyls (PCB)	50	7	-	-

Contaminant	Criteria in Coffey (2009b) RAP (mg/kg)	NEPM (2013) HIL D/HSL D	NEPM (2013) EIL/ESL commercial/ industrial	NEPM (2013) Management Limit
Asbestos	0.001% w/w asbestos for fibrous asbestos and asbestos fines 0.05% w/w asbestos for ACM	0.001% w/w asbestos for fibrous asbestos and asbestos fines 0.05% w/w asbestos for ACM	-	-

NL: Non limiting

5.3.2 Waste Classification

Waste classification will be conducted in accordance with NSW EPA (2014c) Waste Classification Guidelines: Part 1: Classifying Waste.

5.3.3 Imported Material

Imported material must include materials approved by NSW EPA, including virgin excavated natural material (VENM), excavated natural material (ENM) or other materials considered suitable for importation as outlined in the waste regulations. VENM must meet definition of VENM in accordance with the Protection of the Environment Operations Act (POEO) 1997. ENM must meet criteria presented in the Excavated Natural Material Order 2014.

Other imported material should meet site criteria (Section 5.3.1) or criteria or in accordance to NSW EPA exemptions.

5.4 Approach and Extent of Remediation Required

The Coffey (2009b) RAP remediation approach was generally based on targeting known horizontal and vertical extents of contamination, with additional data collected following demolition works at the site. Based on the previous investigations within the site summarised in Sections 3 and 4, the following known contamination is present and will require remediation and/or management to render the site suitable for the proposed development:

Table 5.3: Extent of Remediation

Area	Extent of Remediation/Management Required
The northern part of Tarpaulin Factory	Surface soil within the northern lean-to buildings adjacent to the main Tarpaulin Factory (at least 100mm)
Mt Enfield	The eastern portion of Mt Enfield requiring cut and fill to accommodate carparking, which is provided in a survey plan in Appendix F

The extent of the above areas is provided in Figure 5.

Additionally, contamination may also be present in other areas of the site, as discussed in the conceptual site model (Section 4.3) and may include:

- Uncontrolled fill across the site
- Potential contamination within the railway tracks
- Any other unexpected finds

The potential contamination listed above will be treated as unexpected finds and will be managed during development in accordance with the unexpected finds protocol (Section 8).

5.5 Remediation Options Assessment

The NEPM (2013) provides the preferred hierarchy of options for site clean-up and/or management, which is outlined as follows:

- on-site treatment of the contamination, so that it is destroyed or the associated risk is reduced to an acceptable level; and
- off-site treatment, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which soil is returned to the site; or,

  if the above are not practicable,
- consolidation and isolation of the soil onsite by containment with a properly designed barrier; and
- removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material;

  or,
  where the assessment indicates remediation would have no net environmental benefit of would have a net adverse environmental effect, implementation of an appropriate management strategy.

Zoic's assessment of the remediation options provided in the NEPM (2013) is as follows.

Table 5.4: Remediation Options Assessment

Option	Assessment
On-site treatment	This option is not considered to be feasible as the contamination identified in the areas requiring remediation comprises asbestos and the volume of material requiring cut and fill from Mt Enfield is significant.
Off-site treatment, followed by reuse onsite	This option is not considered to be feasible as the contamination identified in the areas requiring remediation comprises asbestos and the volume of material requiring cut and fill from Mt Enfield is significant.
Consolidation and isolation of soil by containment	This option is considered to be appropriate for material cut from Mt Enfield, which is consistent with the remedial option for the remainder of Mt Enfield. This option is also considered to be appropriate for remediation of surface soil within Tarpaulin Factory.
Removal of contaminated material to an approved site or facility	This option is not considered to be feasible for material from Mt Enfield due to the significant volume requiring removal. This option is considered to be appropriate for remediation of surface soil within Tarpaulin Factory due to the small volume requiring remediation. However, onsite containment will be preferred as this material would not be inconsistent with material from Mt Enfield.
Implementation of appropriate management strategy	The NSW Ports (2016) OEMP is available for managing contamination across the ILC Enfield site, including the site. Given that residual contamination will be present within the site following remediation (and will at least include contamination within Mt Enfield), the OEMP will still be required to manage the site following remediation.

The remediation options chosen for the remediation of known contamination within the site are as follows:

- The northern part of Tarpaulin Factory – consolidation and isolation of soil by containment within the site, where practicable, with excess material to be contained elsewhere within the ILC Enfield site.
- Mt Enfield material requiring cut – Consolidation and isolation of soil by containment within the site, where practicable, with excess material to be contained elsewhere within the ILC Enfield site.

Flower Power will relocate and cap as much of the cut material from Mt Enfield within the site as possible. Surplus material shall be relocated and capped within the Enfield ILC site in accordance with the requirements of NSW Ports' RAP and Site Management Plans. The final locations of the cut material shall be surveyed and registered within the Long Term Environmental Management Plan(s) for the site(s).

With regards to the potential asbestos impact on surface soil within the northern part of Tarpaulin Factory, should pavement be proposed in this area, the asbestos impact may not require relocation, but can be retained beneath pavement. The location of the potential asbestos impact must be surveyed and registered within the Long Term Environmental Management Plan for the site.

5.6 Proposed Remediation Methodologies

5.6.1 Site Establishment and Access

Prior to works commencing at the site, appropriate hoarding and/or fencing and warning signs shall be established around the perimeter of the site. Specific fencing and warning signs shall be erected around the remediation area to inform that asbestos may be present. Access to remediation area shall be limited to authorised personnel only.

A specific area shall be provided for decontamination of vehicles, equipment, or clothing.

Given the presence of asbestos, air monitoring will be required in accordance with Section 6.6. Air monitoring shall be undertaken at the perimeter of the area being excavated and the area where asbestos containing material is being placed, and at a site boundary, in locations determined by a suitably qualified licenced asbestos assessor.

Work involving potentially asbestos contaminated material shall be conducted by a licenced asbestos removalist. Appropriate environmental controls will be required (e.g. mist sprays at boundary fences and within work areas).

5.6.2 Proposed Methodology for Cut and Fill of Mt Enfield

Geotechnical advice must be sought from a suitably qualified geotechnical consultant to ensure the proposed cut and fill of Mt Enfield will not create stability issues. Advice may also be required for the design of retaining walls, proposed compaction, requirement for drainage (if any), and reinstatement of cut fill and capping.

The proposed methodology for cut and fill of Mt Enfield was prepared in consideration of the Coffey (2009b) RAP, Coffey (2011) Spoil Management Plan and NSW Ports (2016) OEMP.

Excess cut material is to be contained elsewhere within the ILC Enfield site (subject to meeting requirements of the Coffey (2009b) RAP as well as this RAP). Relocation of any excess cut material will require an update of the NSW Ports (2016) OEMP.

Proposed methodology for cut and fill of material from Mt Enfield is as follows:

- The extent of area requiring cut will be delineated on the ground. The approximate extent of the area requiring cut is provided in the figure attached in Appendix A (and shown in Figure 5).
- If grass cutting/slashing is required, it may be necessary to ensure the cuttings are free of asbestos fragments prior to disposal. In accordance with the Coffey (2011) SMP, placement of green waste within Mt Enfield should be minimised.
- The excavation area shall be kept moist to prevent dust generation and migration (including potentially asbestos containing dust).
- The material will be excavated and either stockpiled temporarily onsite or placed in trucks for placement within destination location.
- The excavation shall be undertaken to allow for placement of adequate capping (as detailed below) following excavation.
- Material at destination location shall be kept moist at all times and capped as soon as practicable. Where capping is not undertaken immediately (within 24 hours), material shall be kept moist and/or be covered.
- Given the potential presence of asbestos in the cut material, it would be preferable to place the cut material in future paved areas to minimise potential exposure.
- Material placed within Mt Enfield has generally been assessed against the criteria within the RAP and therefore placement of material from Mt Enfield is considered to be suitable in areas outside Mt Enfield, provided that adequate capping is reinstated to minimise exposure to potentially asbestos impacted material. Therefore, no further contaminant testing is required for placement in areas outside Mt Enfield (including the remainder of the ILC Enfield site), unless there is evidence of significant contamination encountered during excavation work (which will be treated as an unexpected find – refer to Section 8).
- Surface capping may include:

    - At least of 100mm of validated material (see Sections 7.4 and 7.5) for material placed within Mt Enfield
    - At least 100mm of appropriate quality subgrade and pavement where surface comprises engineered hard stand pavement, e.g. asphalt, pavers, concrete, etc., for material placed beneath paved surfaces (within the site or the greater ILC Enfield site).
    - At least 1000mm of validated material for material placed in open space areas of the proposed garden centre, other than Mt Enfield[5]

    Note that hydropaver is not preferable capping material.
- In the area of proposed service trenches, at least 1m buffer shall be provided between the potentially contaminated material and the service trench. Geotextile fabrics shall be placed on the potentially contaminated material and the trench shall be backfilled with suitable backfill material (see Sections 7.4 and 7.5). In accordance with the WA DoH (2009), geo-textile fabrics should meet the following conditions:

    - Water permeable
    - High visibility
    - Rot-proof and chemically inert
    - High-tensile strength
    - Provide coverage of contaminated area
    - Parallel sheets to be fixed together or overlap by 20cm

[5] This is consistent with WA DoH (2009) requirement for open space areas.

- Prior to placement of retaining walls, the cut surface of Mt Enfield shall be capped. Capping shall be constructed to minimise potential exposure of potentially contaminated material beneath the capping. The capping shall be able to withstand erosion. Examples of capping may be a combination of the following:

  - Geotextile fabrics; or
  - Concover (e.g. spray applied sealant)

  and

  - At least 100mm pavement (hard stand pavement, e.g. asphalt, pavers, concrete, etc.);
  - At least 100mm of validated material (if deemed to have enough stability to withstand erosion).

- Validation of capping shall be undertaken as per Section 7.1.

5.6.3 Proposed Methodology for Remediation of the Northern Part of Tarpaulin Factory

Remediation of the asbestos impacted surface soil in the northern part of Tarpaulin Factory can be undertaken prior to or after demolition of the structures of the northern lean-to buildings adjacent to the Tarpaulin Factory.

Proposed methodology remediation of the asbestos impacted surface soil in the northern part of Tarpaulin Factory will be as follows:

- Should the area requiring remediation be paved for the proposed development, the material can remain beneath pavement, which will act as capping.
- Surface capping may include:

  - At least of 100mm of validated material (see Sections 7.4 and 7.5) for material placed within Mt Enfield
  - At least 100mm of appropriate quality subgrade and pavement where surface comprises engineered hard stand pavement, e.g. asphalt, pavers, concrete, etc., for material placed beneath paved surfaces (within the site or the greater ILC Enfield site).
  - At least 1000mm of validated material for material placed in open space area other than Mt Enfield[6]

  Note that hydropaver is not preferable capping material.
- In the area of proposed service trenches, at least 1m buffer shall be provided between the potentially contaminated material and the service trench. Geotextile fabrics shall be placed on the potentially contaminated material and the trench shall be backfilled with suitable backfill material (see Sections 7.4 and 7.5). In accordance with the WA DoH (2009), geo-textile fabrics should meet the following conditions:

  - Water permeable
  - High visibility
  - Rot-proof and chemically inert
  - High-tensile strength
  - Provide coverage of contaminated area
  - Parallel sheets to be fixed together or overlap by 20cm

[6] This is consistent with WA DoH (2009) requirement for open space areas.

- Should pavement not be proposed in the area requiring remediation, excavation will be conducted to remove the potentially asbestos impacted material. The excavation area shall be kept moist to prevent dust migration (including potentially asbestos containing dust).
- At least 100mm surface soil from this area shall be scraped. The scraped material will be temporarily stockpiled or placed in trucks for placement at destination location.
- The remediation shall be conducted in the presence of a licenced asbestos removalist, who shall provide advice on the required depth of excavation. Excavation shall be completed when there is no visual evidence of ACM and validation samples meet RAC.
- Validation shall be undertaken as per Section 7.2.
- Excavated material can be placed together with the cut material from Mt Enfield as per the strategy in Section 5.6.2. Material placed within Mt Enfield must be assessed in accordance with Coffey (2011) SMP attached in Appendix G and as summarised in Section 7.5. Material placed in the remainder of ILC Enfield site shall be assessed against the criteria adopted by Coffey (2009b) RAP.
- Material at destination location shall be kept moist at all times and capped as soon as practicable. Where capping is not undertaken immediately (within 24 hours), material shall be kept moist and/or be covered.
- Material capping shall be undertaken as per Section 5.6.2.

5.7 Stockpile Management

Stockpile management shall be handled appropriately. Proposed stockpile management procedures should include:

- "Asbestos impacted" and "asbestos free" stockpiles will need to be stockpiled separately.
- It is preferable that "asbestos impacted" material be loaded directly into trucks immediately after excavation for placement at the destination location.
- If "asbestos impacted" material requires stockpiling onsite, the area beneath the stockpile is to be lined with plastic liner or the stockpile footprint be scraped following removal of stockpile. "Asbestos impacted" stockpile is to be covered with plastic to minimise dust emission if left for over 24 hours.
- Stockpile height is to be less than 3m, unless otherwise approved by Council.
- Stockpiles are to be kept away from site boundary.
- Where stockpile is placed on unpaved area, at least 50mm to 100mm of soil beneath the stockpile shall be scraped and removed with the stockpile. Stockpile footprint shall be validated in accordance with Section 7.3.

5.8 Waste Classification

Any material disposed of offsite shall be assessed in accordance with NSW EPA (2014c) Waste Classification Guidelines Part 1: Classifying Waste. Waste classification shall be conducted by a suitably qualified environmental consultant prior to offsite disposal. This assessment shall include:

- A visual observation of the stockpile
- Collection and laboratory analysis of representative samples of the stockpile material

Stockpiles shall be given a stockpile identifier in accordance to the Remediation Contractor's stockpile tracking system, as nominated in the Construction Environmental Management Plan (CEMP).

Soil samples shall be collected a frequency of one sample per 25m^3 of soil, with a minimum of four samples. This sampling frequency may be adjusted, depending on the stockpile volume and the homogeneity of the stockpile material. The soil samples shall be submitted to a NATA accredited laboratory for the following minimum analysis in accordance with Coffey (2009b) RAP:

Table 5.5: Stockpile Analysis for Waste Disposal

COPC	Quantity of Samples
Heavy metals	100%
PAHs	50%
TRH C6-C36	100%
Asbestos	50%

Note that the above sampling and analysis regime are minimum requirement. The range of COPCs and the quantity of samples requiring analysis may need to be increased, depending on the environmental consultant's understanding of the site history of the area and visual observations of the material. Quality assurance and quality control of waste classification assessment shall be conducted in accordance with Section 9 of this RAP.

Note that a waste classification (Coffey, 2015) is available for the surface soil (up to 100mm) from the northern part of Tarpaulin Factory.

5.9 Backfilling, Fill Importation and Site Restoration

Following the completion of excavation works, excavations shall be backfilled to specification with appropriately validated soils, if required. Backfill material expected for the proposed development may include:

- Fill from Mt Enfield
- Imported material used for fill or capping
- Material from other parts of ILC Enfield site

Validation for imported material and material from other parts of ILC Enfield site is presented in Section 7.4 and.7.5, respectively.

Advice on compaction rates shall be outlined by the appointed geotechnical consultant.

5.10 Material Tracking

Material movement within, from and to the site shall be adequately tracked by the Remediation Contractor. At a minimum, the following information is required (where applicable):

- Date
- Source of material (given the size of the site, the site may be divided into grids to provide source location of the material)
- Material volume
- Waste classification reference and waste classification (if applicable)
- Placement location (temporary for stockpile and permanent; given the size of the site, the site may be divided into grids to provide placement location of the material)
- Offsite disposal location

- Waste transporter
- Waste dockets
- VENM/ENM certificates

Copies of the waste disposal dockets and material tracking data shall be provided for inclusion into the Validation Report.

6. Site Management

The Remediation Contractor will be responsible for site management during remediation works, in accordance with their contractual arrangements with Flower Power.

6.1 Construction Environmental Management Plan

The Remediation Contractor shall prepare a site-specific construction environmental management plan (CEMP), which shall address the following issues in accordance with the NSW Ports (2016) CEMP:

- Soil management
- Stockpile management
- Management of asbestos related works
- Material tracking
- Stormwater management
- Dust control
- Air monitoring
- Noise management
- Odour management
- Waste management
- Incident response
- Licences and approvals
- Contact personnel

6.2 Health and Safety Plans

The Remediation Contractor shall prepare a site-specific occupational health and safety plan for the proposed work. The occupational health and safety plan shall include safe work method statements for each activity at the site.

Contractors engaged by the Remediation Contractor shall also prepare relevant safe work method statements for the work undertaken at the site.

6.3 Remediation Schedule

Remediation schedule is to be confirmed.

6.4 Hours of Operation

Hours of operation shall be conducted as per DA approval and provided in the CEMP.

6.5 Licences and Approvals

The State Environmental Planning Policy No. 55 (SEPP 55) – Remediation of Land defines the regulations for Category 1 and Category 2 remediation works. The remedial works to be undertaken at the site constitutes Category 1 works, which requires consent, including the

submission of a RAP to be submitted with the DA. Remedial works may only commence upon approval of the RAP by Council and in accordance with any conditions of consent granted.

Asbestos removal work shall be undertaken in accordance with Safe Work Australia (2011a) How to Manage and Control Asbestos in the Workplace and Safe Work Australia (2011b) How to Safely Remove Asbestos Code of Practice.

Given that the majority of the remedial work will involve asbestos impacted soil or potentially asbestos impacted soil, a Class A licenced asbestos removalist will be required. A licenced asbestos assessor will be required to conduct:

- Air monitoring
- Clearance inspections
- Issuing clearance certificates
- Implement appropriate environmental controls

Notification of asbestos removal work shall be provided to SafeWork NSW at least five working days before licenced asbestos removal work is commenced.

Other licences and approval requirements shall be detailed in the CEMP.

6.6 Air Monitoring

Air monitoring shall be undertaken on a daily basis when there is intrusive work of asbestos impacted material and if asbestos impacted material (such as stockpile) is being exposed. The locations of air monitoring will be determined by a licenced asbestos assessor, in consideration of active work areas, weather conditions and adjoining residential areas. Air monitoring shall be undertaken in accordance with the NOHSC (2005) Guidance Note on the Membrane Filter Method of Estimating Airborne Asbestos Fibres, 2nd edition, NOHSC:3003 (2005). Proposed action levels for monitoring are as follows.

Table 6.1: Proposed Action Level for Air Monitoring

Action level (fibres/mL)	Proposed Action
<0.01	Continue with the existing control measures
Between 0.01 and 0.02	Review control measures, investigate cause of elevated reading, implement revised control measures
≥0.02	Stop work with asbestos containing material. Licenced asbestos removalist shall immediately notify SafeWork NSW. Investigate cause of elevated reading, review control measures, implement revised control measures.

7. Validation Plan

7.1 Validation of Capping

Validation of Mt Enfield capping depth shall be conducted in accordance with Coffey (2011) SMP provided in Appendix G and shall include:

- Validation of capping depth – A minimum of 100mm capping depth is required for Mt Enfield. Validation shall be undertaken by comparison of surveyed levels before and after placement of capping across the cut area and in the area where Mt Enfield material was placed. Survey shall be undertaken in at least 5m x 5m grid.
- Validation of capping material in accordance with Section 7.4 and/or 7.5.

Validation of capping within the carpark shall include:

- Validation of capping depth – A minimum of 150mm of capping is required. Validation shall be undertaken by comparison of surveyed levels before and after placement of capping in the area where Mt Enfield material was placed and on the cut surface of Mt Enfield. Survey shall be undertaken in at least 10m x 10m grid.
- Validation of capping material (in accordance with Section 7.4)
- Validation of capping adequacy and buffer within service trenches – A suitably qualified environmental consultant shall observe if capping has been undertaken in accordance with Section 5.6.2.

7.2 Validation of the Northern Part of Tarpaulin Factory

Validation of the northern part of Tarpaulin Factory shall be undertaken as follows:

- Observation of the area of excavation and at least within 5m radius of the area of excavation by a licenced asbestos assessor
- Collection of validation samples. Validation samples shall comprise at least 7 samples across the footprint of the northern lean-to buildings adjacent to the main Tarpaulin Factory. Each sample shall comprise 500mL soil samples placed in ziplocked bag and analysed for asbestos fines (AF) in accordance with WA DoH (2011) Guidance Note on Recommended Procedures for Laboratory Analysis of Asbestos in Soil. The WA DoH (2009) recommends 14 samples[7] where there is suspect likelihood of asbestos and 7 samples where there is possible likelihood of asbestos. Given that scraping of surface soil will have been undertaken at this location, and the potential source of asbestos is from weathering of building material (so that the potential of asbestos presence deeper than 0.1mbgs is considered to be low), we consider that the lower number of samples would be appropriate.
- Should the visual observation by the licenced asbestos assessor indicate that no ACM is present on the soil surface and sampling results are below the RAC, a clearance certificate will be provided by the licenced asbestos assessor indicating that this part of the site is validated for the purpose of asbestos.

[7] Based on 0.55ha site, which is the size of the northern part of the Tarpaulin Factory

7.3 Validation of Stockpile Footprint

Where stockpile is placed on unpaved area, validation of stockpile footprint shall be conducted following removal of the stockpile. Validation shall comprise:

- Observation by a licenced asbestos assessor or a suitably qualified environmental consultant on asbestos stockpile footprint. The observation shall indicate that the stockpile has been adequately removed, the stockpile footprint has been adequately scraped, and no evidence of ACM is present.
- Collection of validation samples for stockpile containing contamination with potential leaching into the underlying material. The COPCs shall be determined based on the COPCs identified in the stockpile. Validation samples shall be collected at a rate of approximately 1 sample per $50m^2$.

7.4 Validation of Imported Fill

Imported fill must comprise validated VENM or ENM or other approved material (e.g. material with NSW EPA exemptions)

VENM must be accompanied with VENM certificate, which must contain information such as the history of the source site, type of material and analytical results (if considered required).

ENM must be accompanied with ENM assessment in accordance with NSW EPA (2014a) Excavated Natural Material Exemption and NSW EPA (2014b) Excavated Natural Material Order.

A suitably qualified environmental consultant must assess the materials delivered to the site to check that the material appears consistent with the source and that there is no evidence of potential contamination such as suspicious staining, odours, and/or anthropogenic materials.

The Remediation Contractor will be responsible for tracking of materials that are imported to the site. Copies of dockets pertaining to imported fill will be retained by the contractor to confirm the source, type and quantities of the material

7.5 Material from the Remainder of ILC Enfield Site

This site is located within the ILC Enfield site, however a separate DA is being lodged for this development. Due to the requirement for a separate DA, the definition of a “site” with respect to the POEO Act may require clarification from NSW EPA regarding the movement and placement of waste materials.

In principle, material from the ILC Enfield site can be placed within the site as fill, provided that it meets site criteria outlined in Section 5.3.

8. Unexpected Finds Protocol

8.1 Types of Unexpected Finds

Unexpected finds of potential contamination may be identified by visual (appearance or staining) and/or olfactory (odour) evidence during earthworks. Potential unexpected finds which could be reasonably encountered based on site history and previous investigations at the site include (but not limited to):

- Ground conditions encountered that differ from the expected conditions described in Section 2.
- Buried infrastructure such as underground storage tanks and associated pipe work.
- Groundwater that exhibits hydrocarbon (or oily) sheen or odour
- Asbestos containing materials, in locations other than already identified in this RAP (within Mt Enfield and the northern portion of Tarpaulin Factory)
- Olfactory evidence of contamination such as chemical odour, hydrocarbon odour, sulfur (rotten egg) odour, acidic odour, ammonia odour, caustic odour, solvent odour)
- Soil staining
- Significant presence of anthropogenic materials

8.2 Procedure in the Event of an Unexpected Find

Should unexpected finds of contamination or potential contamination be found onsite, the following procedure shall be adopted:

1. Stop work as soon as it is safe to do so and move to a designated meeting point.
2. Assess the potential risk to human health posed by the unexpected find and assess if evacuation needs to be conducted or emergency services need to be contacted.
3. Delineate an exclusion zone around the unexpected find with appropriate barrier and signage.
4. Contact a suitably qualified environmental consultant, who should provide advice for:
    - Immediate management controls to minimise potential immediate health or environmental risk
    - What further assessment and/or remediation works required and how such work should be conducted
    - Requirement for an updated RAP (if required) and associated validation works
    - Requirement of reporting to regulatory bodies (Council, NSW EPA, etc.)
5. Works shall not recommence in the area of the unexpected find until an environmental consultant provides advice that the unexpected find has been adequately managed/remediated.
6. Assessment and/or validation of the unexpected find shall be provided in the Validation Report for the site.

8.3 Records and Reporting

The Remediation Contractor shall prepare a list of unexpected finds. The Validation Report shall document:

- Details of the unexpected finds encountered during development work (if any)
- Details of actions undertaken to address the unexpected finds
- Assessment results (if any)
- Results of remediation and validation (if any)
- Recommendations for further assessment as a result of the unexpected find (if any)
- Requirement of ongoing monitoring as a result of the unexpected find (if any)

9. Quality Assurance and Quality Control

9.1 Data Quality Objectives

Data quality objectives (DQOs) for validation activities outlined below were developed in general accordance with Coffey (2009b), NSW DEC (2006) and NEPM (2013):

Table 9.1: Data Quality Objectives

Step	DQO
Step 1: State the problem	The known soil contamination issues to be addressed in this RAP was: • Buried fill containing asbestos within Mt Enfield which will be cut to accommodate carparking • Asbestos impacted surface soil in the northern portion of Tarpaulin Factory • Potential unexpected finds across the site encountered during the proposed development
Step 2: Identify the decisions/goal of the study	The remedial goal is to remediate areas containing unacceptable levels of contamination in soil to levels acceptable for the proposed commercial/industrial landuse. The decisions are: • Is the data suitable for assessing whether the site is suitable for the proposed landuse? • Is the site suitable for the proposed landuse?
Step 3: Identify information inputs	• Previous investigation results, including site history, field observations and laboratory results • Validation data, including field observations and laboratory results • Remediation Acceptance Criteria in Section 5.3 • Applicable guidelines
Step 4: Define the study boundaries	Horizontal boundaries are defined in Figure 2. Vertical boundaries are defined as: • The proposed depth of cut in Mt Enfield • The depth of asbestos impact in the northern part of Tarpaulin Factory • The depth of excavation or depth of unexpected finds encountered in the remainder of the site
Step 5: Develop the analytical approach or decision rule	• The results of the QA/QC assessment meet this RAP • In the area Mt Enfield area: - Capping material shall meet the requirements of this RAP, based on observations and appropriate assessments. - Capping depth meets the requirement of this RAP and the Coffey (2011) SMP (attached in Appendix G), based on surveyed levels and observations. - Additional material placed from other parts of the site shall meet the requirements of this RAP and the Coffey (2011) SMP (attached in Appendix G), based on assessment results and observations. • In the northern portion of Tarpaulin Factory: - A clearance certificate provided by a licenced asbestos assessor indicates no presence of ACM on the base of excavation after removal of surface soil. - Validation samples collected did not indicate the presence of

Step	DQO
	AF/FA exceeding the adopted site criteria. • In the area of unexpected finds: - Validation of unexpected finds shall meet the requirements of this RAP.
Step 6: Specify the performance or acceptance criteria	Remediation acceptance criteria are provided in Section 5.3. A 95% confidence level is adopted for the laboratory results.
Step 7: Optimise the design for obtaining data	Validation sampling plan is provided in Section 7.

9.2 Fieldwork and Laboratory QA/QC

9.2.1 Fieldwork QA/QC and Methodology

Fieldwork methodology is as follows.

Table 9.2: Fieldwork Methodology

Item	Methodology
Soil sampling procedure	Samples will be collected using a decontaminated stainless steel trowel, hand auger, or placed directly into laboratory supplied containers with Teflon lined lids using fresh pair of nitrile gloves. The containers will be labelled with sample identification, sample depth, date, project number. Samples for asbestos analysis may comprise: • Approximately 40g sample in ziplocked bag for asbestos identification • Approximately 500mL sample in ziplocked bag for asbestos fines analysis • Approximately 10L sample in a sealed plastic bag for ACM/fibrous asbestos analysis
Decontamination procedure	Non-disposable sampling equipment will be decontaminated between sampling by scrubbing with a brush, washing in Decon 90 solution and rinsing with water.
Sample handling and preservation procedures	Samples will be placed into ice-chilled esky and transported to a NATA accredited laboratory under chain of custody analysis.
Field calibration and screening protocols	A subsample from each sample will be placed into ziplocked bag for field screening, if volatile organic compound is considered to be a COPC, using a calibrated photoionisation detector.
Duplicates	Duplicates will be undertaken at a rate of 5% for intralaboratory and interlaboratory duplicates, respectively.
Rinsate blank	Rinsate blank will be prepared to check the effectiveness of decontamination procedure of non-disposable equipment.
Trip spike and trip blank	Trip spike and trip blank will be collected to check potential volatile loss, if VOC is considered to be a COPC.

9.2.2 Laboratory QA/QC and Data Quality Indicators

Samples will be analysed in NATA accredited laboratory(s) which will provide analysis in accordance with NEPM (2013). The data quality will be checked against the acceptance targets for: method blank, laboratory duplicates, matrix spikes, laboratory control samples, surrogates.

Data quality indicators (DQIs) for blanks, duplicates, and spikes are provided in Table 9.3, which are in general accordance with the Coffey (2009b) RAP.

Table 9.3: Data Quality Indicators

QA/QC Sample	Acceptance Target
Duplicate	Relative percentage difference (RPD) within 50% for soil and 30% for groundwater
Spikes	Recoveries within the following ranges: • 70% - 130% for inorganics/metals • 60% - 140% for organics • Or as determined by the laboratory
Blanks	Analytes not detected above LOR

10. Contingency Plan

Contingency Plan for the remediation is as follows.

Table 10.1 Contingency Plan

Item	Contingency
Material cannot be placed within Mt Enfield	Material disposed of offsite
Significant depth of asbestos impact in the northern part of the Tarpaulin Factory	A suitably qualified environmental consultant shall provide an updated remedial strategy, which may require update of this RAP.

11. Validation Report

At the completion of the remediation and validation of the site, a validation report shall be prepared in general accordance with the NSW OEH (2011) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites and NEPM (2013). The validation report shall provide elements required in the above guidelines, including (but not limited to):

- Summary of remediation activities
- Unexpected finds management
- Validation sampling and analysis
- Material tracking and waste disposal information, including waste disposal dockets
- Ongoing site monitoring requirement
- Statement of site suitability

12. Long Term Environmental Management Plan

Based on the remedial strategy recommended in this RAP, it would be expected that a long term environmental management plan will be required following completion of the RAP. The NSW Ports (2016) OEMP provides an overarching long term EMP for the ILC Enfield site, which requires each tenant to prepare a site specific EMP for their property.

Subject to the confirmation of the boundary of the lease area, a long term EMP (LTEMP) will be required to manage contamination that falls within the lease boundary. The LTEMP will need to be prepared by a suitably qualified environmental consultant, in accordance with the NSW Ports (2016) OEMP, as well as relevant guidelines, including (but not limited to):

- NSW EPA (2004) Guidelines for the Preparation of Environmental Management Plans
- NEPM (2013)

13. Other Relevant Information

This report has been prepared for use by Flower Power who commissioned the works in accordance with the project brief only, and has been based in part on information obtained from Flower Power and other parties. The findings of this report are based on the scope of work outlined in Section 1. The report has been prepared specifically for Flower Power for the purposes of the commission, and use by any nominated third party in the agreement between Zoic and Flower Power. No warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party (other than where specifically nominated in an agreement with Flower Power).

This report relates to only this project and all results, conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose. This report should not be reproduced without prior approval by Flower Power, or amended in any way without prior approval by Zoic.

Subject to the scope of work, Zoic's assessment was limited strictly to identifying typical environmental conditions associated with the subject property area and does not include evaluation of any other issues.

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 report are based on the information obtained at the time of the investigation.

This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work conducted for Flower Power.

The absence of any identified hazardous or toxic materials on the site should not be interpreted as a guarantee that such materials do not exist on the site.

All conclusions regarding the site are the professional opinions of the Zoic personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Zoic assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Zoic, or developments resulting from situations outside the scope of this project.

Zoic is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Flower Power acknowledges that this report is for its exclusive use.

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Hibbs & Associates. (2013r). *Gate E11 Stockpile, Area Y & Z Batter and Stockpile No.2A-US Sampling 120313 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW.*

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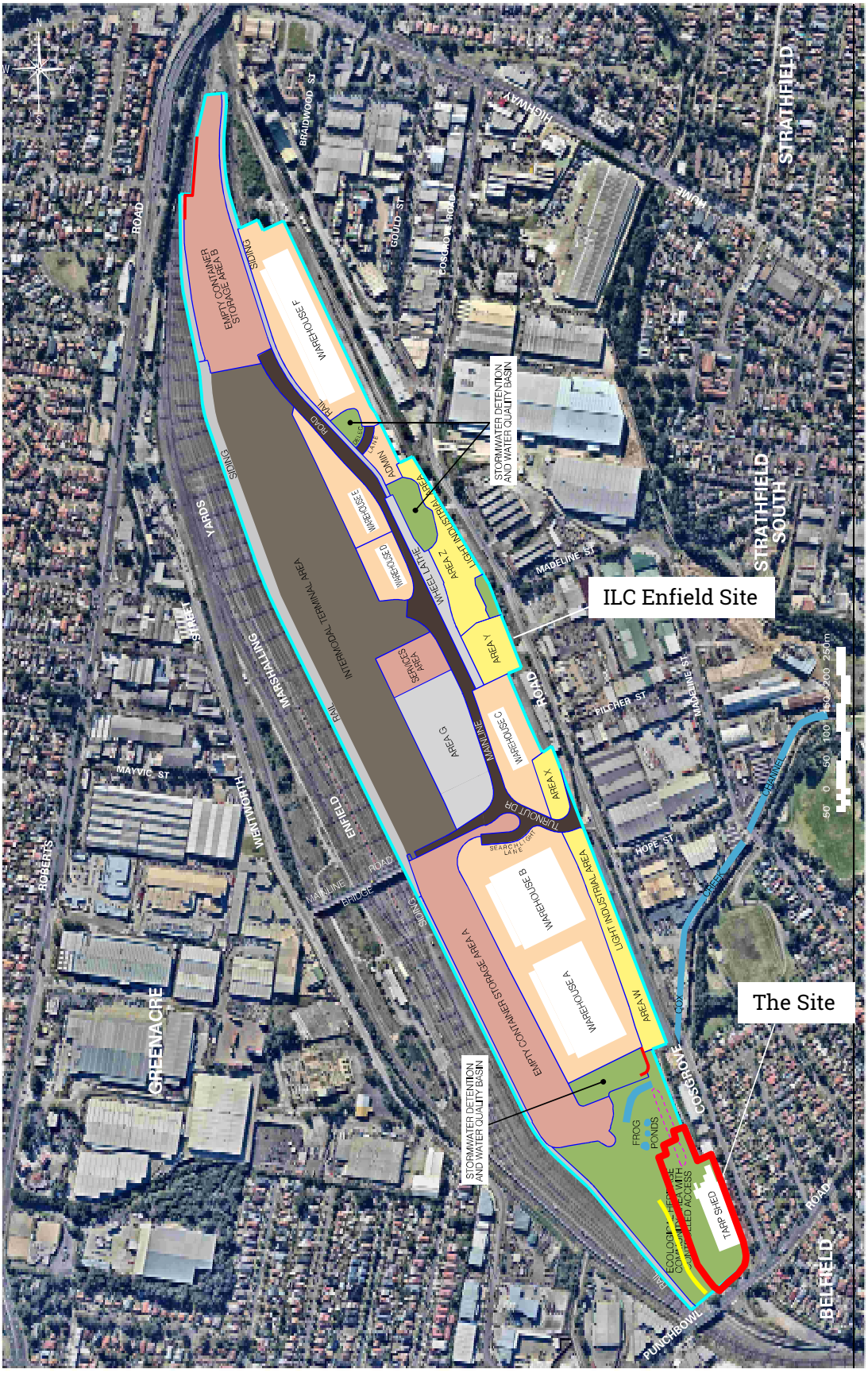
Figures



LEGEND:

Site Boundary

Fenced footpath is excluded from the Site

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Google Maps

Scale

0 100m

Flower Power Group

December 2016

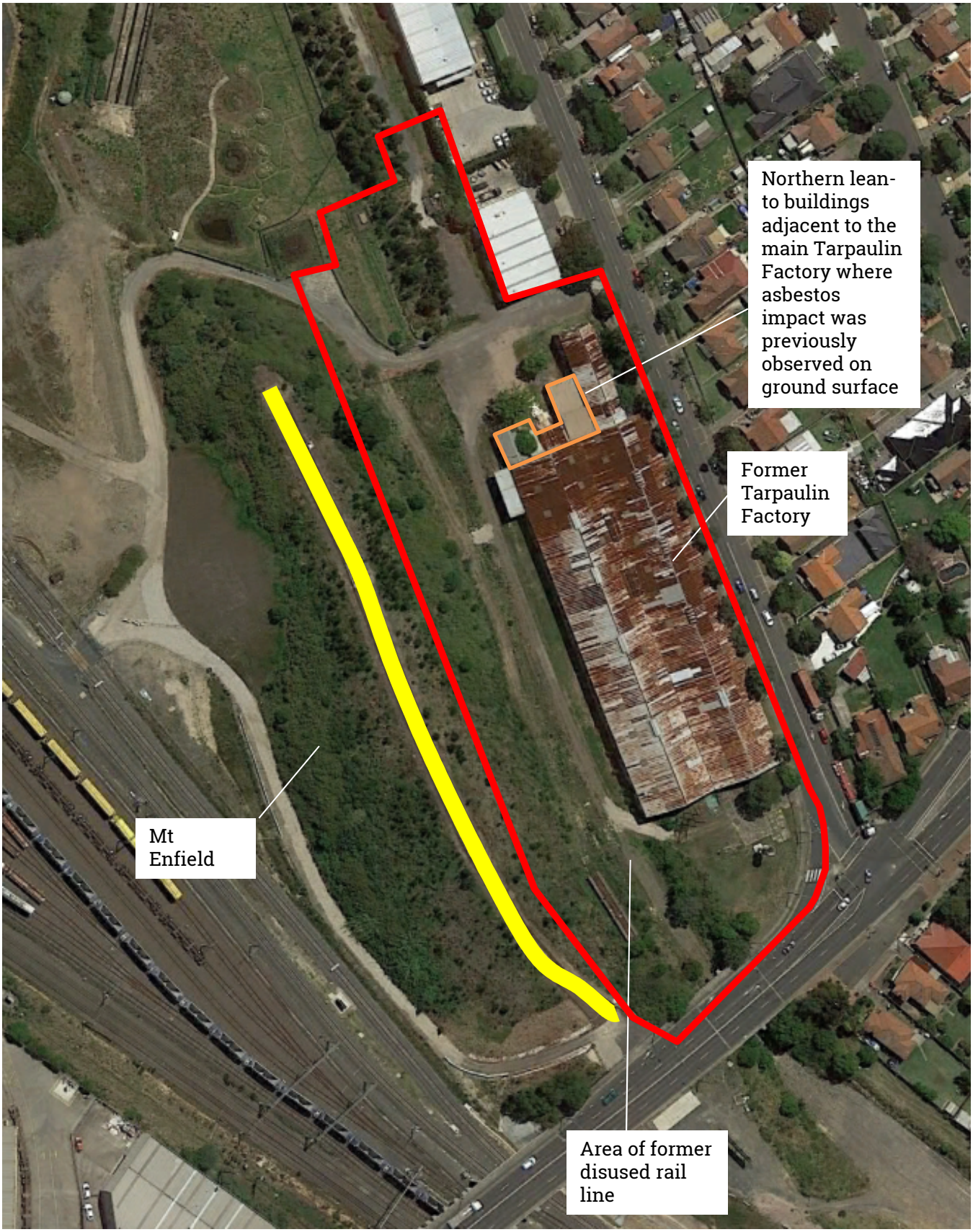
16110

FIGURE 1

Site Location Plan

Proposed Flower Power Development
127 Cosgrove Rd, South Strathfield, NSW

ZOIC



LEGEND:

Site Boundary

Fenced footpath is excluded from the Site

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Google Maps

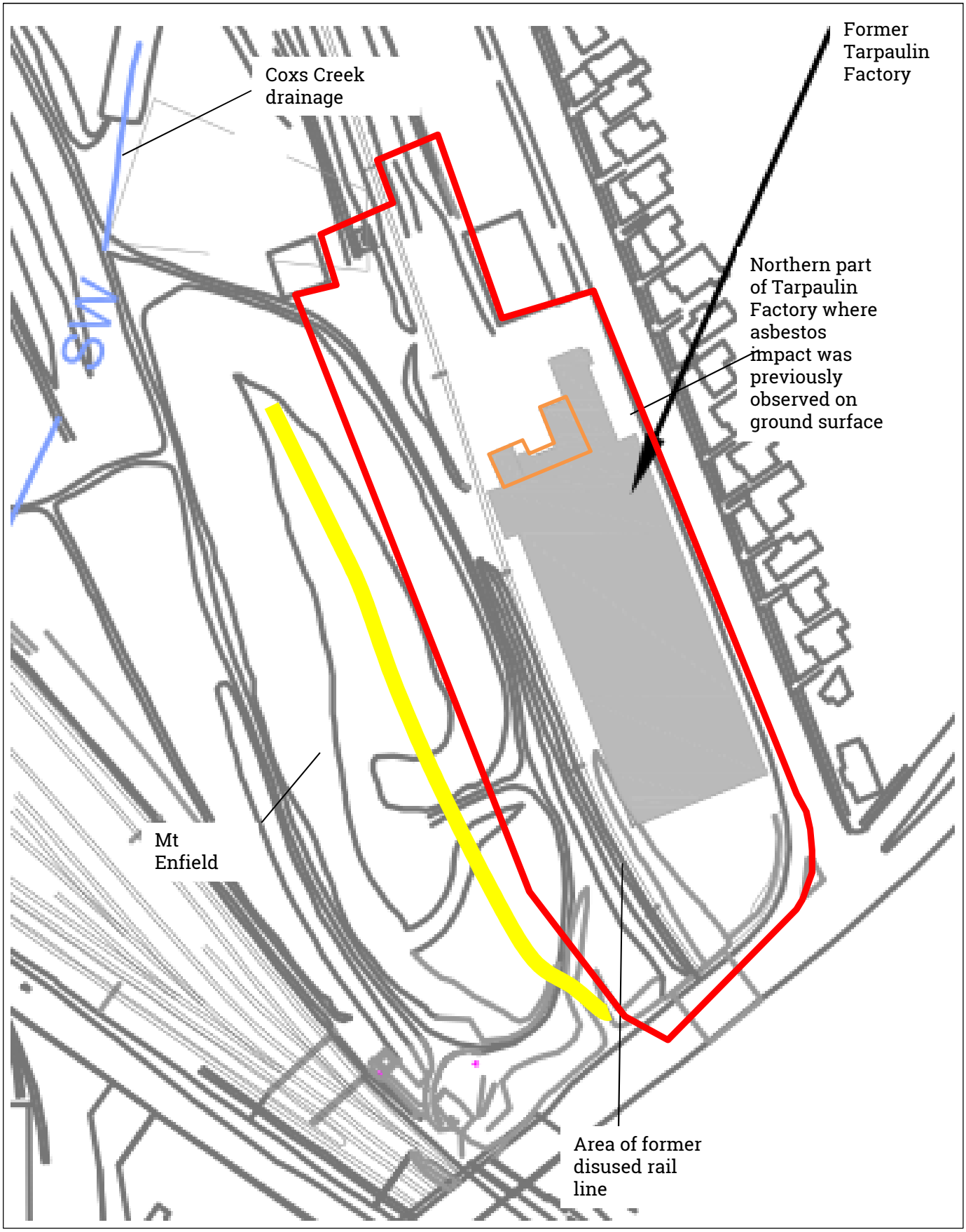
Scale

0 20m

Flower Power Group
December 2016
16110

FIGURE 2
Site Layout Plan
Proposed Flower Power Development
127 Cosgrove Rd, South Strathfield, NSW

ZOIC



LEGEND:

Site Boundary

Fenced footpath is excluded from the Site

Source: Sydney Ports Corporation (SPC) Drawing SEDP079B

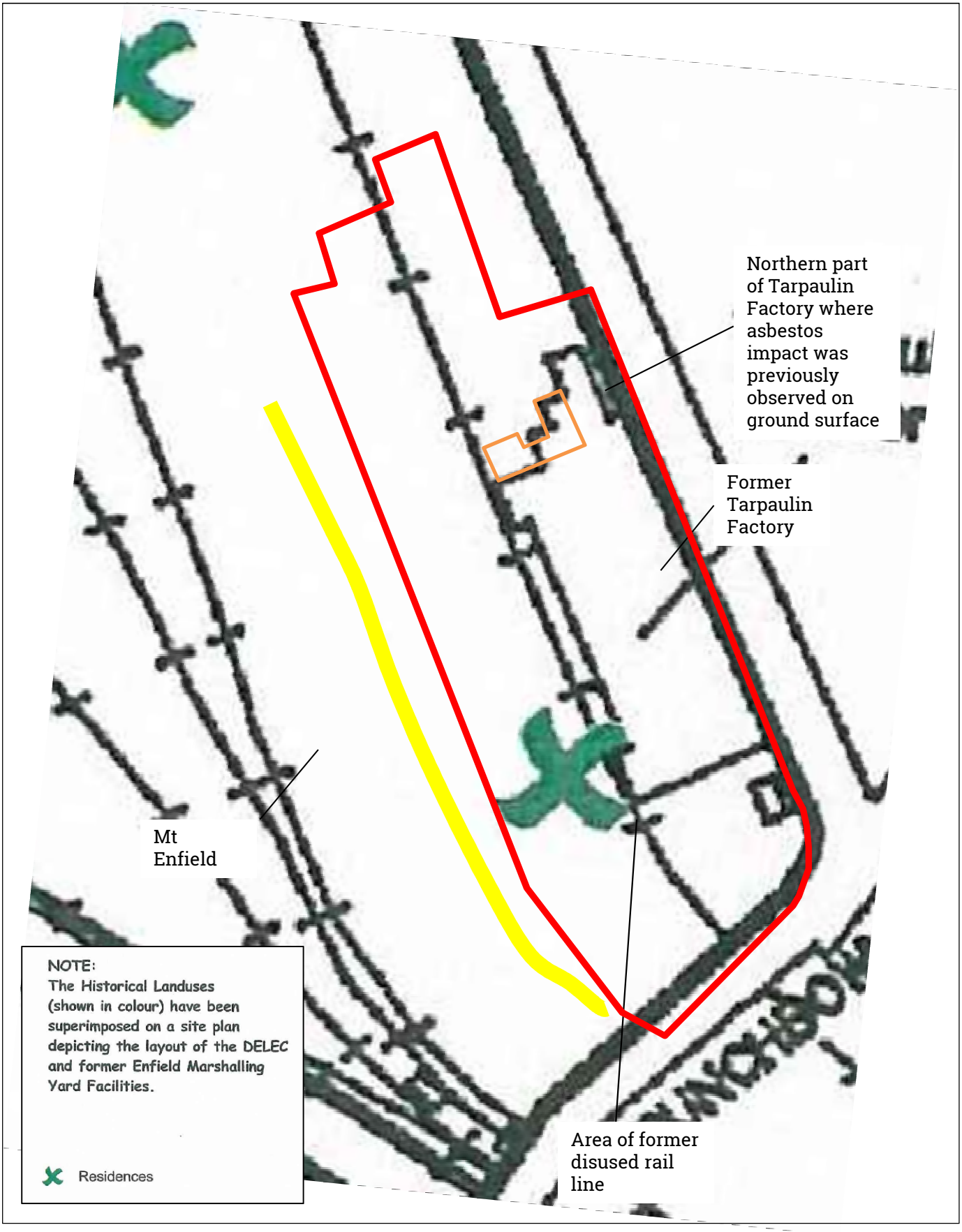
Scale

0 20m

Flower Power Group
December 2016
16110

FIGURE 3
Site Layout Prior to Remediation of ILC Enfield
Proposed Flower Power Development
127 Cosgrove Rd, South Strathfield, NSW

ZOIC



LEGEND:

Site Boundary

Fenced footpath is excluded from the Site

Source: CHRM Hill, 1999A

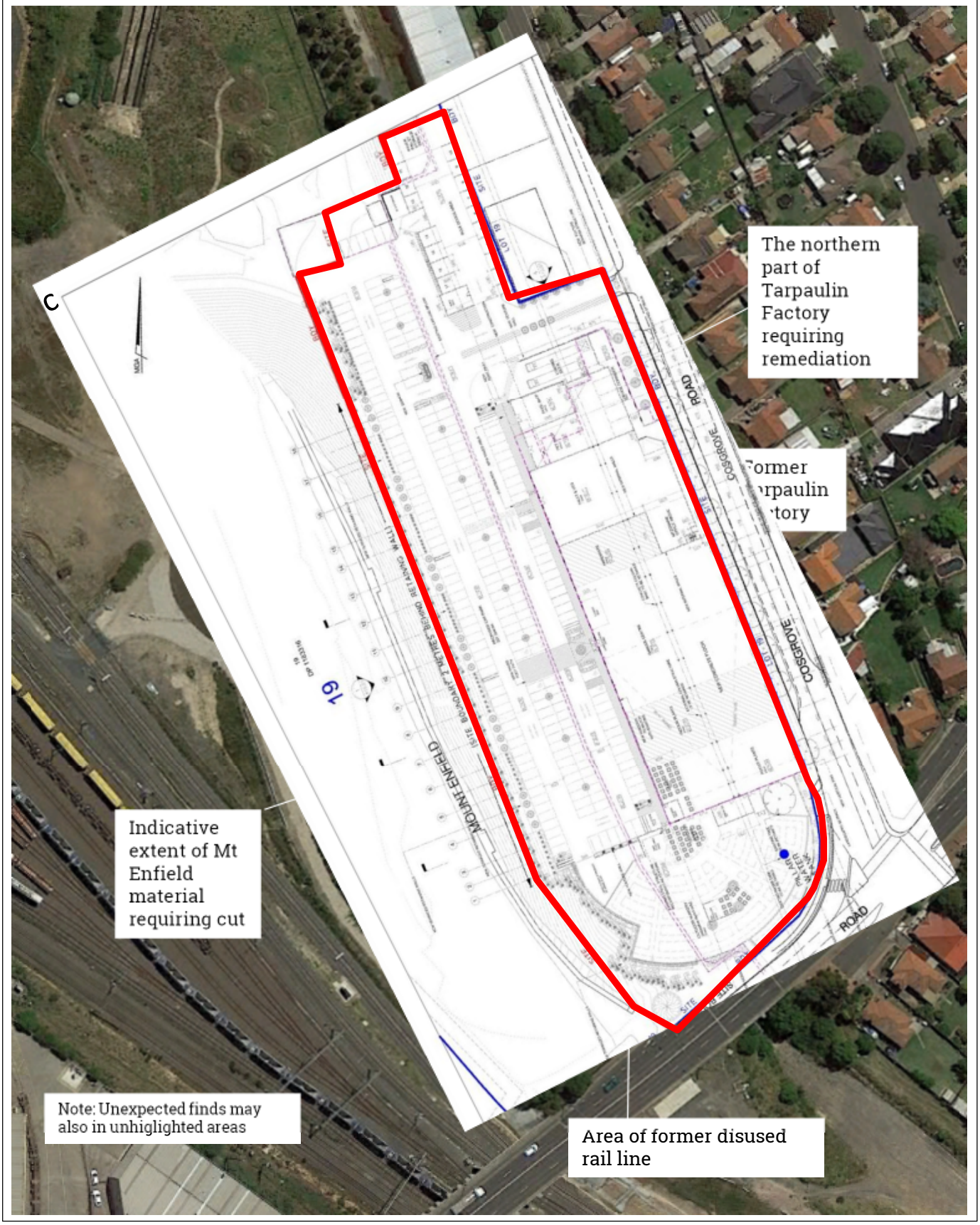
Scale

0 20m

Flower Power Group
December 2016
16110

FIGURE 4
Historical Land Uses in 1912 at the Time of Purchase by CCRT NSW
Proposed Flower Power Development
127 Cosgrove Rd, South Strathfield, NSW

ZOIC



LEGEND:

- Site Boundary
- Fenced footpath is excluded from the Site
- Area requiring remediation/managemen t
- Area with potential contamination

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Google Maps

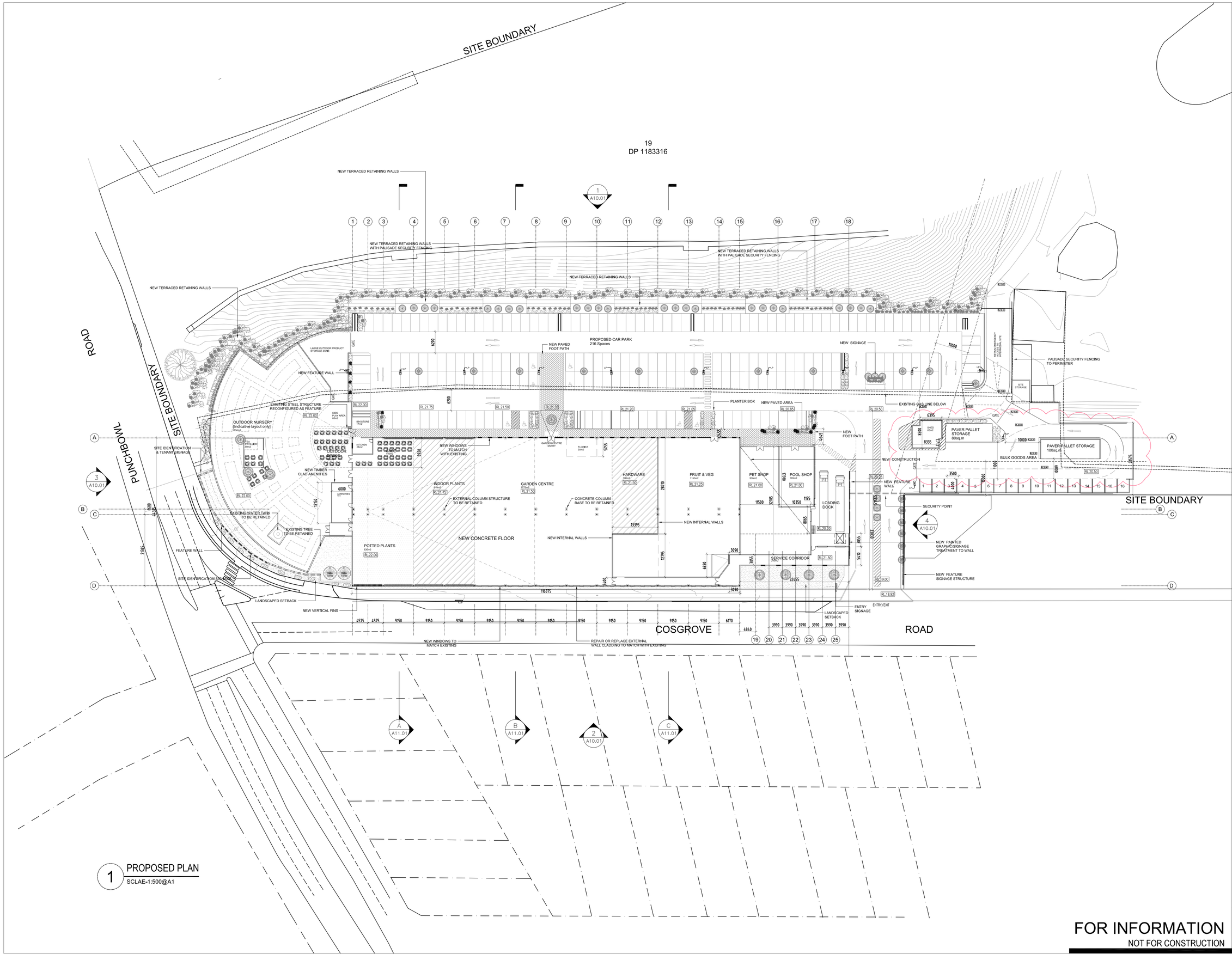
Flower Power Group
December 2016
16110

Scale
0 20m

FIGURE 5
Remediation Extent
Proposed Flower Power Development
127 Cosgrove Rd, South Strathfield, NSW

ZOIC

Appendix A DA Drawings



1 PROPOSED PLAN
SCLAE-1:500@A1

FOR INFORMATION
NOT FOR CONSTRUCTION

TRUE NORTH

NOTE:
SIGNAGE SUBJECT TO SEPARATE DEVELOPMENT APPLICATION.

DA-P7	17-11-2016	BULK GOODS AREA ADJUSTED
DA-P6	17-06-2016	FOR REVIEW
DA-P5	24-03-2016	FOR REVIEW
DA-P4	29-02-2016	FOR REVIEW
DA-P3	04-02-2016	FOR REVIEW
DA-P2	29-09-2015	FOR REVIEW
DA-P1	09-03-2015	FOR REVIEW

Coordinated Reference Drawings

Discipline	Company
SURVEY	
STRUCTURE	
CIVIL	
MECHANICAL	
HYDRAULIC	
ELECTRICAL	
LANDSCAPE	
FIRE	

Client

Project Manager

Architect

BN
Architecture
Urban Design
Masterplanning
Graphics
Interiors

BN Group Pty Ltd
82 Alexander Street
Crows Nest, NSW 2065
ABN 43 092 960 499

T +61 2 9437 0511
F +61 2 9437 0522
www.bngrouponline.com
sydney@bngrouponline.com

Project

GARDEN CENTRE, ENFIELD

127 COSGROVE ROAD SOUTH
STRATHFIELD NSW

Sheet name

PROPOSED PLAN

Scale @ A1: 1 : 500
Project No.: S1523
Drawn By: IP Checked By: MF

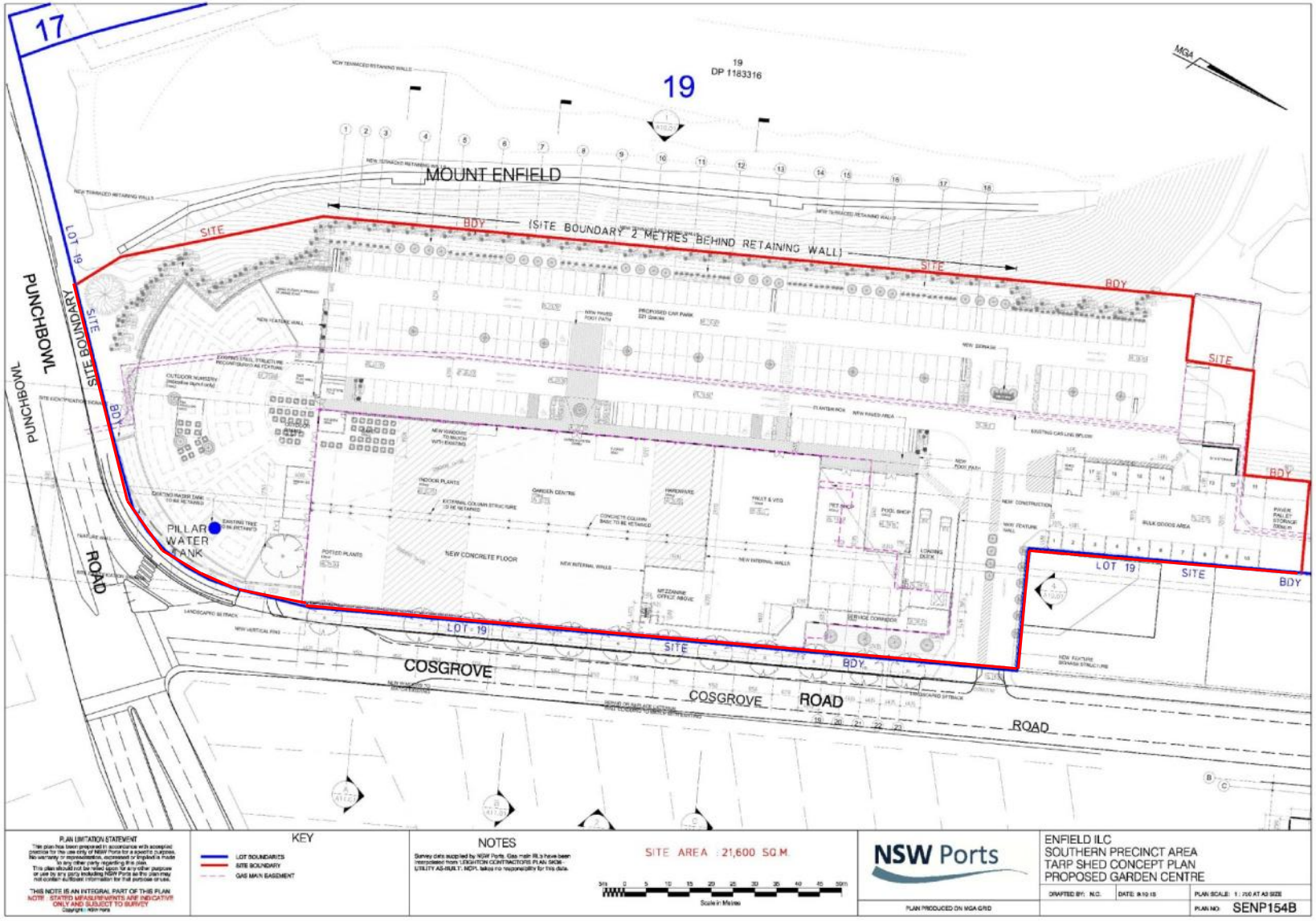
A00 SERIES - INFORMATION & ANALYSIS

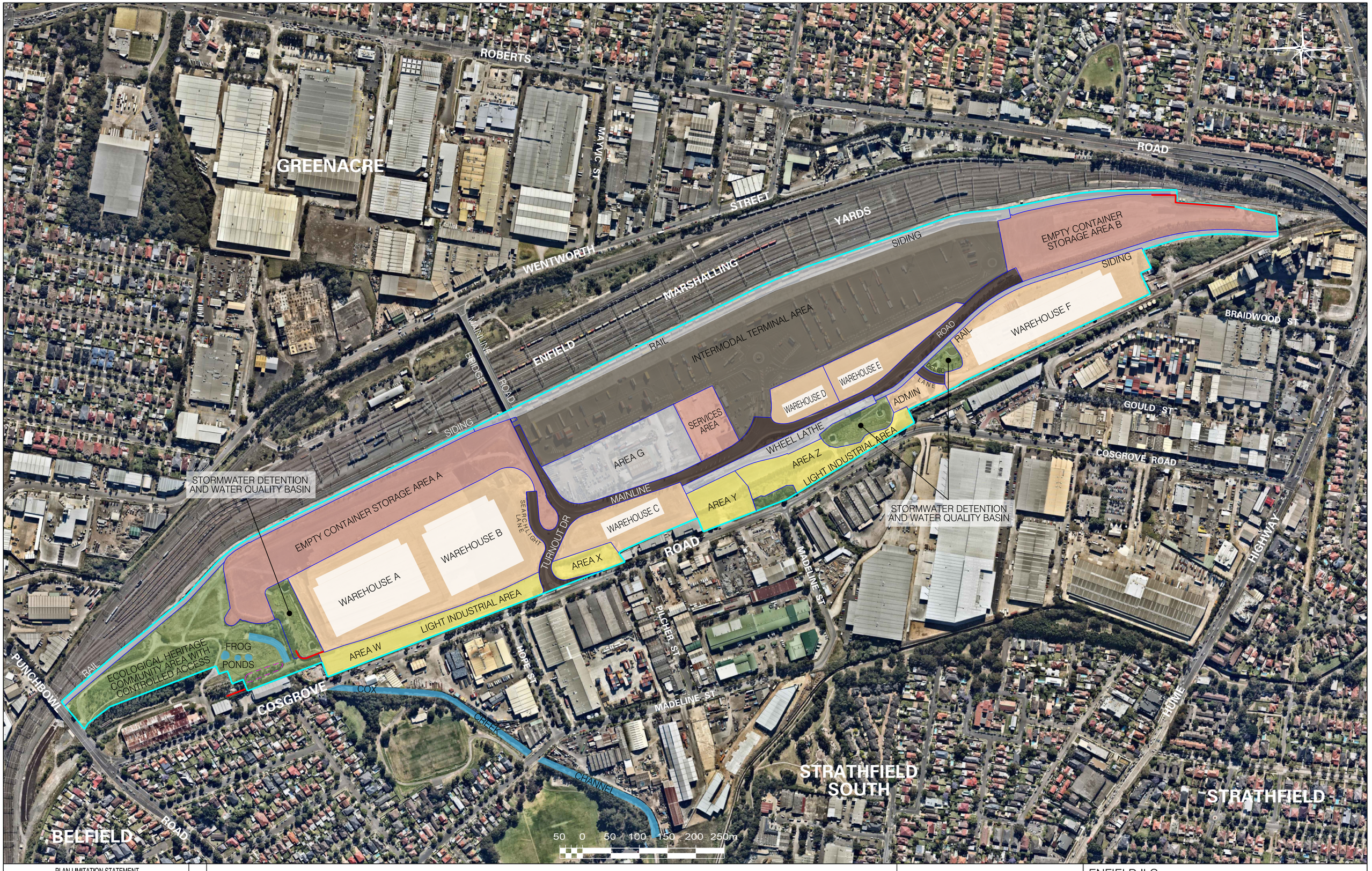
Drawing No. A06.01

Stage - Rev DA-P7

PRINTED:

ANNEXURE A


17
19
DP 1183316
MOUNT ENFIELD
SITE BOUNDARY
(SITE BOUNDARY 2 METRES BEHIND RETAINING WALL)
SITE
BDY
LOT 19
PUNCHBOWL
ROAD
PILLAR
WATER
TANK
NEW CONCRETE FLOOR
COSGROVE
ROAD
MGA
KEY
LOT BOUNDARIES
SITE BOUNDARY
GAS MAIN EASEMENT
NOTES
SITE AREA : 21,600 SQ.M.
Scale in Metres
NSW Ports
ENFIELD ILC
SOUTHERN PRECINCT AREA
TARP SHED CONCEPT PLAN
PROPOSED GARDEN CENTRE
PLAN PRODUCED ON MGA GRID
PLAN NO: SENP154B



PLAN LIMITATION STATEMENT

This plan has been prepared in accordance with accepted practice for the use only of NSW Ports for a specific purpose. No warranty or representation, expressed or implied is made to any other party regarding this plan. This plan should not be relied upon for any other purpose or use by any party including NSW Ports as the plan may not contain sufficient information for that purpose or use.

THIS NOTE IS AN INTEGRAL PART OF THIS PLAN

NOTE : STATED MEASUREMENTS ARE INDICATIVE ONLY AND SUBJECT TO SURVEY

KEY

NSW PORTS BOUNDARY

NOISE BUFFER/MOUNDING

NOISE WALL

NSW Ports

ENFIELD ILC
CONCEPT LAYOUT DESIGN
DECEMBER 2016

PLAN SCALE: 1 : 6000 AT A3 SIZE

PLAN PRODUCED ON MGA GRID

DRAFTED BY: N.C. DATE : 16.12.16

PHOTOGRAPHY DATE : 15.7.16

PLAN NO:
SEDP065J

PLAN LIMITATION STATEMENT

This plan has been prepared in accordance with accepted practice for the use only of NSW Ports for a specific purpose. No warranty or representation, expressed or implied is made to any other party regarding this plan. This plan should not be relied upon for any other purpose or use by any party including NSW Ports as the plan may not contain sufficient information for that purpose or use.

THIS NOTE IS AN INTEGRAL PART OF THIS PLAN

NOTE : STATED MEASUREMENTS ARE INDICATIVE ONLY AND SUBJECT TO SURVEY

KEY

- NSW PORTS BOUNDARY
- NOISE BUFFER/MOUNDING
- NOISE WALL

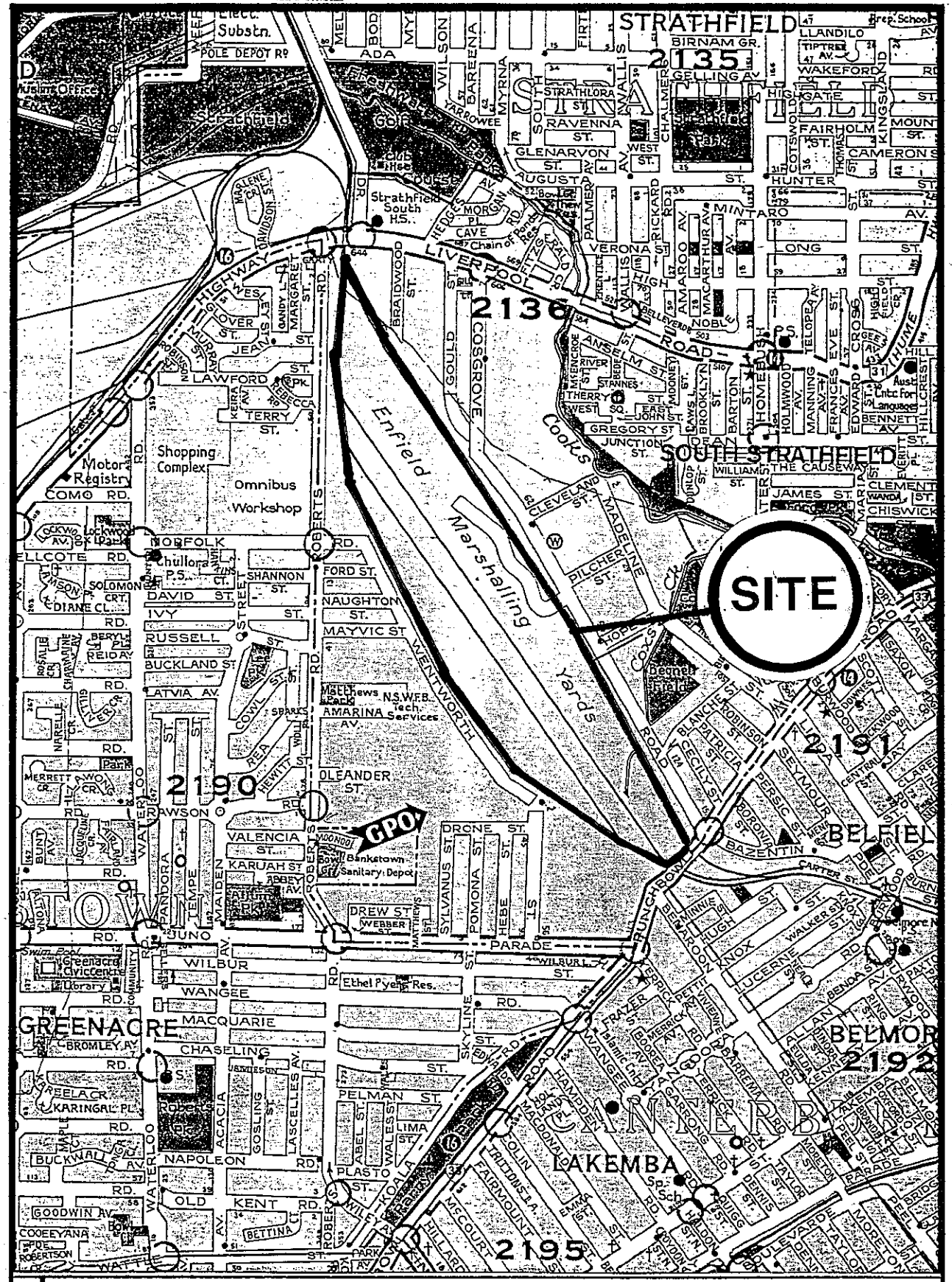
NSW Ports

ENFIELD ILC
CONCEPT LAYOUT DESIGN
OCTOBER 2016

PLAN SCALE: 1 : 6000 AT A3 SIZE	DRAFTED BY: N.C. DATE : 17.10.16	PLAN NO: SEDP065I
PLAN PRODUCED ON MGA GRID	PHOTOGRAPHY DATE : 15.7.16	

Appendix B Previous Investigations Figures

Douglas Partners (1993a) Figures



D.J. DOUGLAS & PARTNERS PTY. LTD. Geotechnical Consultants

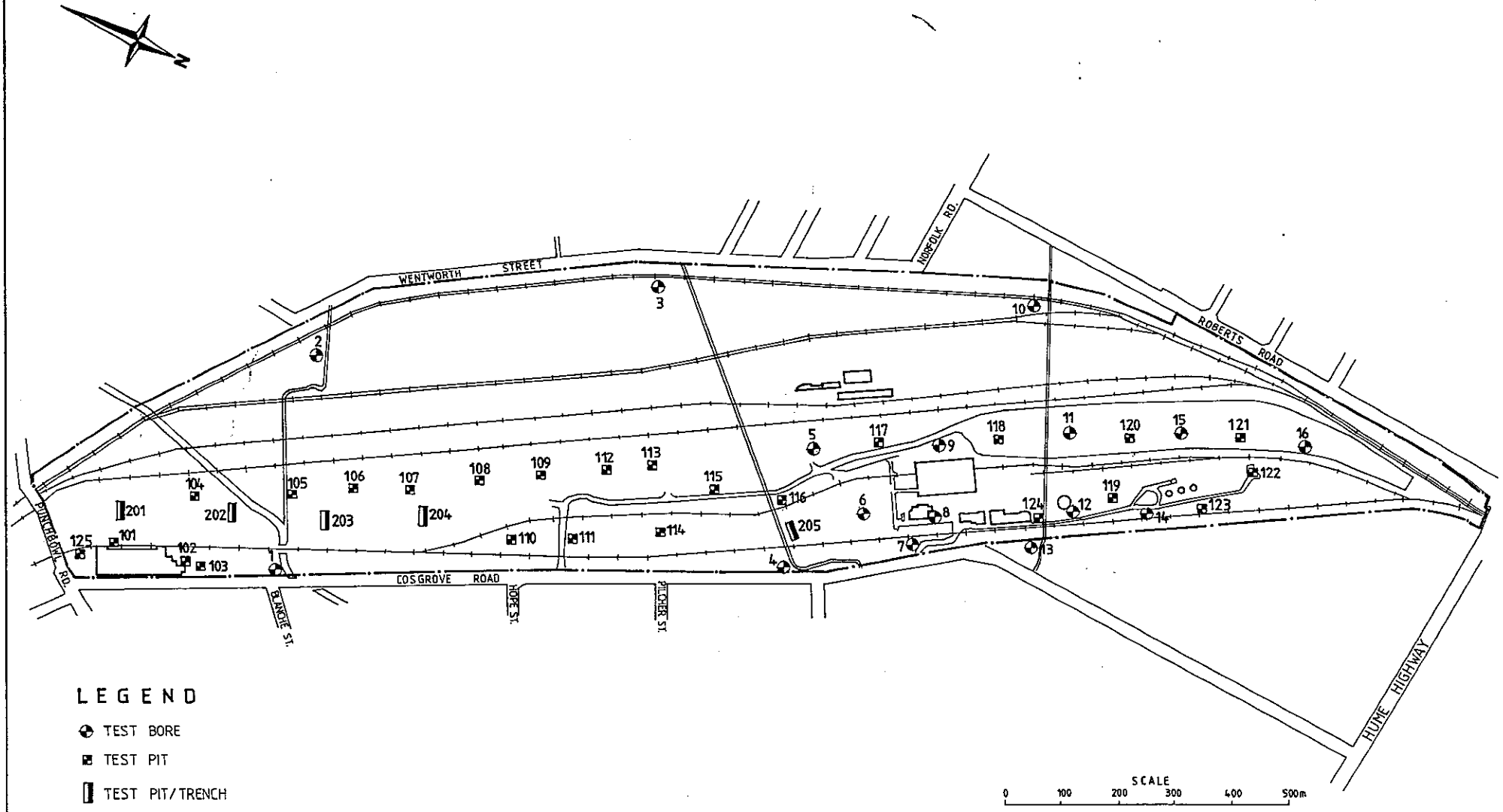
Sydney Melbourne Brisbane Newcastle Townsville Tuggerah Singleton Gold Coast

TITLE: Locality Plan

ENFIELD INTERMODAL TERMINAL

CLIENT: National Rail Corporation Ltd

DRAWN BY: —	SCALE: —	PROJECT No: 19109	OFFICE: SYDNEY
APPROVED BY:	DATE: 20.1.1993	DRAWING No: 1	



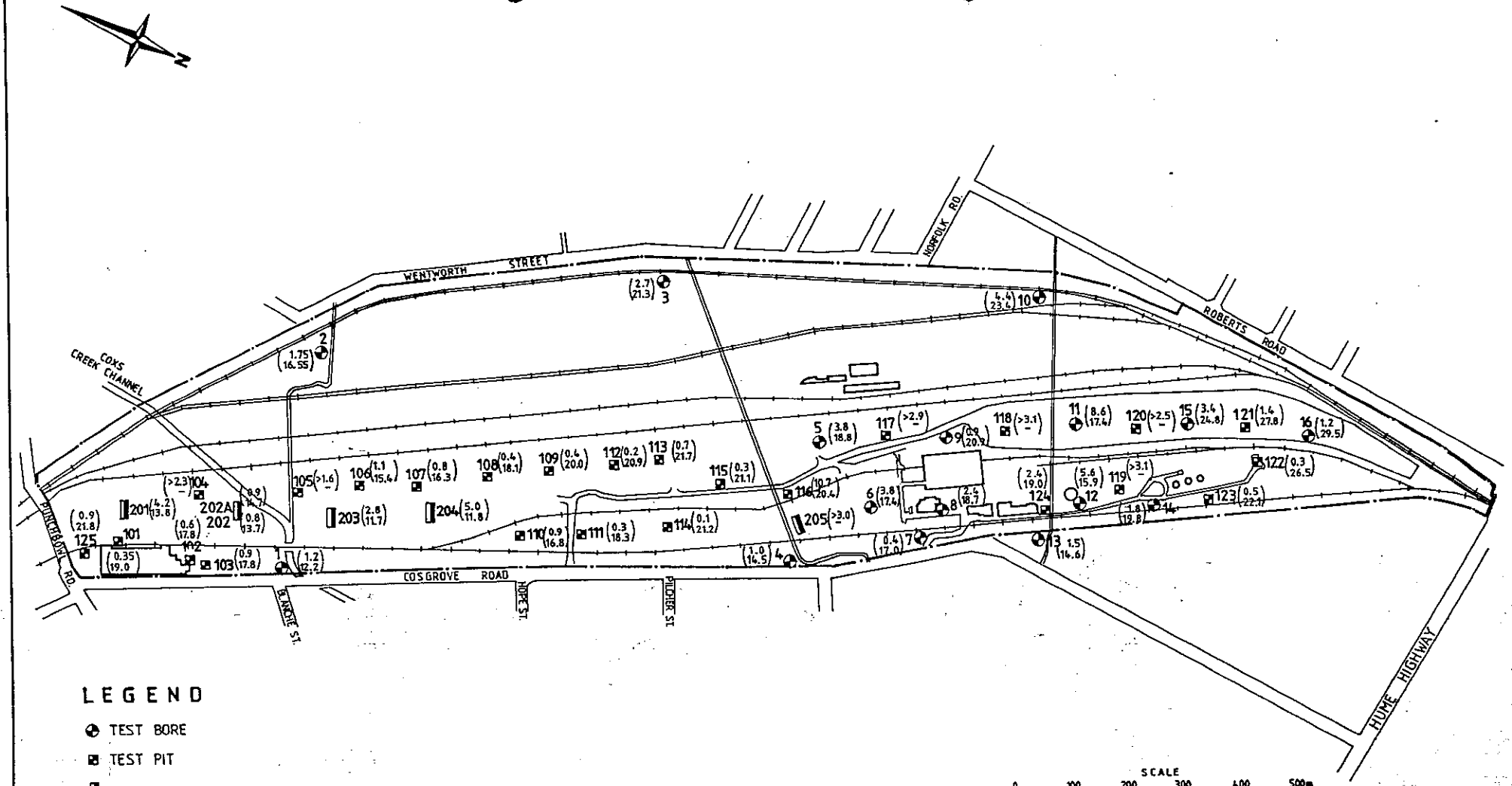
LEGEND

- TEST BORE
- TEST PIT
- TEST PIT/TRENCH

D.J. DOUGLAS & PARTNERS PTY. LTD.
Geotechnical Consultants
Sydney Melbourne Brisbane Newcastle Townsville Tuggerah Singleton Gold Coast

TITLE:
Location of Tests
Site Investigation
ENFIELD INTERMODAL TERMINAL

CLIENT: National Rail Corporation		PROJECT No: 19109
DRAWN BY: P.SCH.	SCALE: As shown	DRAWING No: 2
APPROVED BY:	DATE: 12.1.1993	OFFICE: SYDNEY



LEGEND

- TEST BORE
- TEST PIT
- TEST PIT/TRENCH

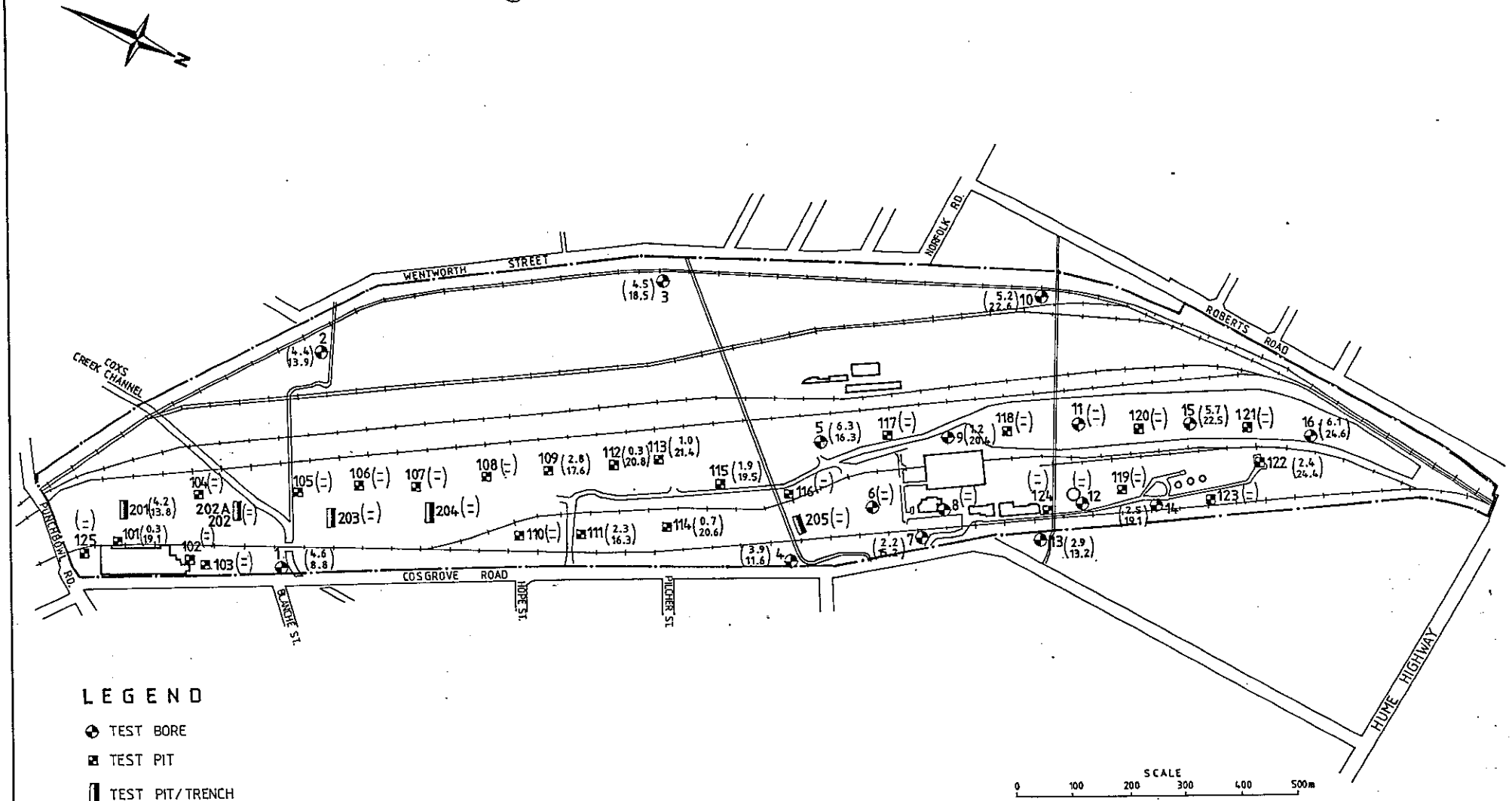
(4.2 / 13.8) DEPTH OF FILLING / RL TOP OF NATURAL STRATA

(>1.6 / –) INDICATES THE MAXIMUM DEPTH OF TEST AND THAT NATURAL STRATA WAS NOT ENCOUNTERED

D.J. DOUGLAS & PARTNERS PTY. LTD.
Geotechnical Consultants
Sydney Melbourne Brisbane Newcastle Townsville Tuggerah Singleton Gold Coast

TITLE:
Filling – Depth and RL of Natural Strata
Site Investigation
ENFIELD INTERMODAL TERMINAL

CLIENT: National Rail Corporation		PROJECT No:	19109
DRAWN BY: P.SCH.	SCALE: As shown	DRAWING No:	3
APPROVED BY:	DATE: 12.1.1993	OFFICE:	SYDNEY



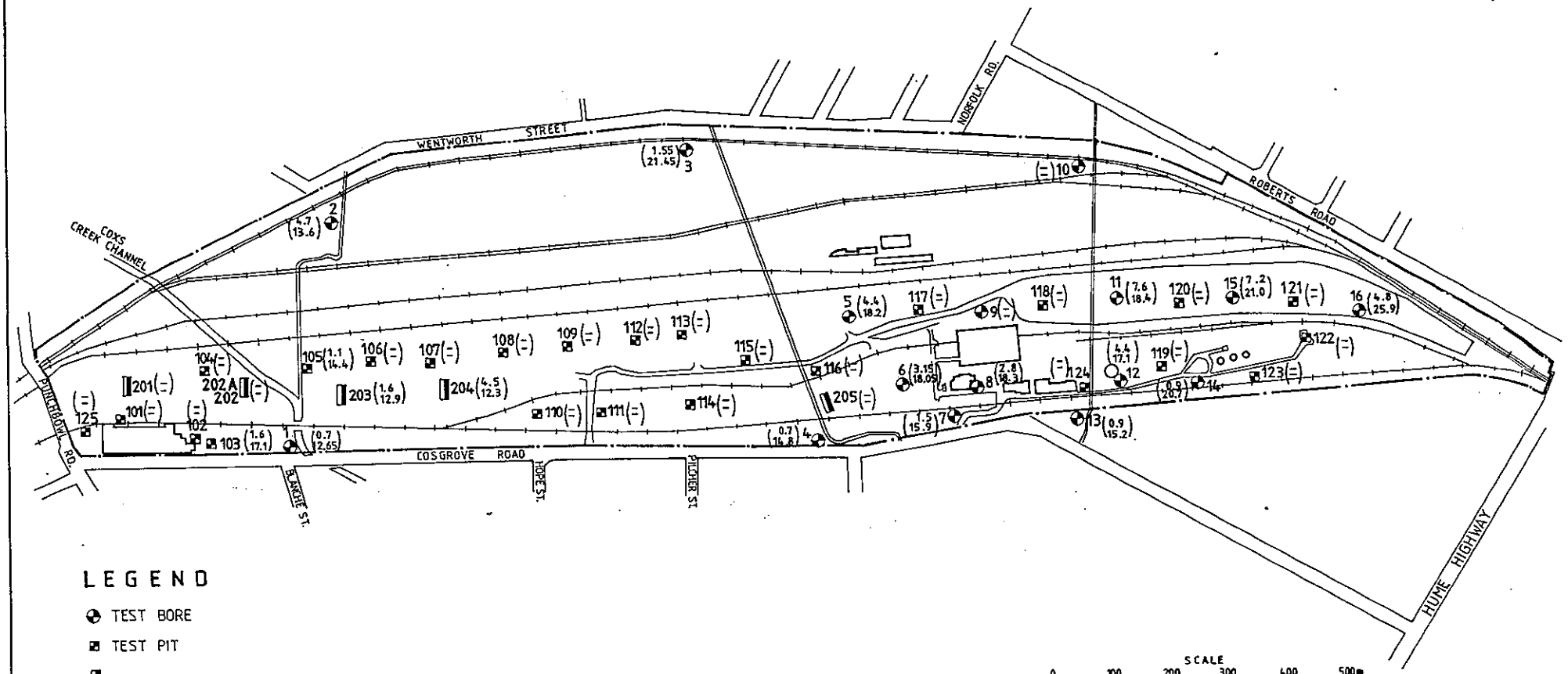
LEGEND

- TEST BORE
- TEST PIT
- TEST PIT/TRENCH
- (4.2 / 13.8) DEPTH TO ROCK / RL TOP OF ROCK
- (-) INDICATES THAT ROCK WAS NOT ENCOUNTERED

D.J. DOUGLAS & PARTNERS PTY. LTD.
Geotechnical Consultants
Sydney Melbourne Brisbane Newcastle Townsville Tuggerah Singleton Gold Coast

TITLE:
Rock - Depth & RL of Top of Rock
Site Investigation
ENFIELD INTERMODAL TERMINAL

CLIENT: National Rail Corporation		PROJECT No: 19109
DRAWN BY: P.SCH.	SCALE: As shown	DRAWING No: 4
APPROVED BY:	DATE: 12.1.1993	OFFICE. SYDNEY



LEGEND

- TEST BORE
- TEST PIT
- TEST PIT/TRENCH

(5.5) DEPTH TO GROUNDWATER
(7.9) RL OF GROUNDWATER AS MEASURED ON 19.1.1993

(=) INDICATES NO FREE GROUNDWATER ENCOUNTERED

D.J. DOUGLAS & PARTNERS PTY. LTD.
Geotechnical Consultants
Sydney Melbourne Brisbane Newcastle Townsville Tuggerah Singleton Gold Coast

TITLE:
Groundwater - Depth & RL
Site Investigation
ENFIELD INTERMODAL TERMINAL

CLIENT: National Rail Corporation		PROJECT No	19109
DRAWN BY: P.SCH.	SCALE As shown	DRAWING No	5
APPROVED BY:	DATE: 12.1.1993	OFFICE.	SYDNEY

CH2MHill (1999a) Figures

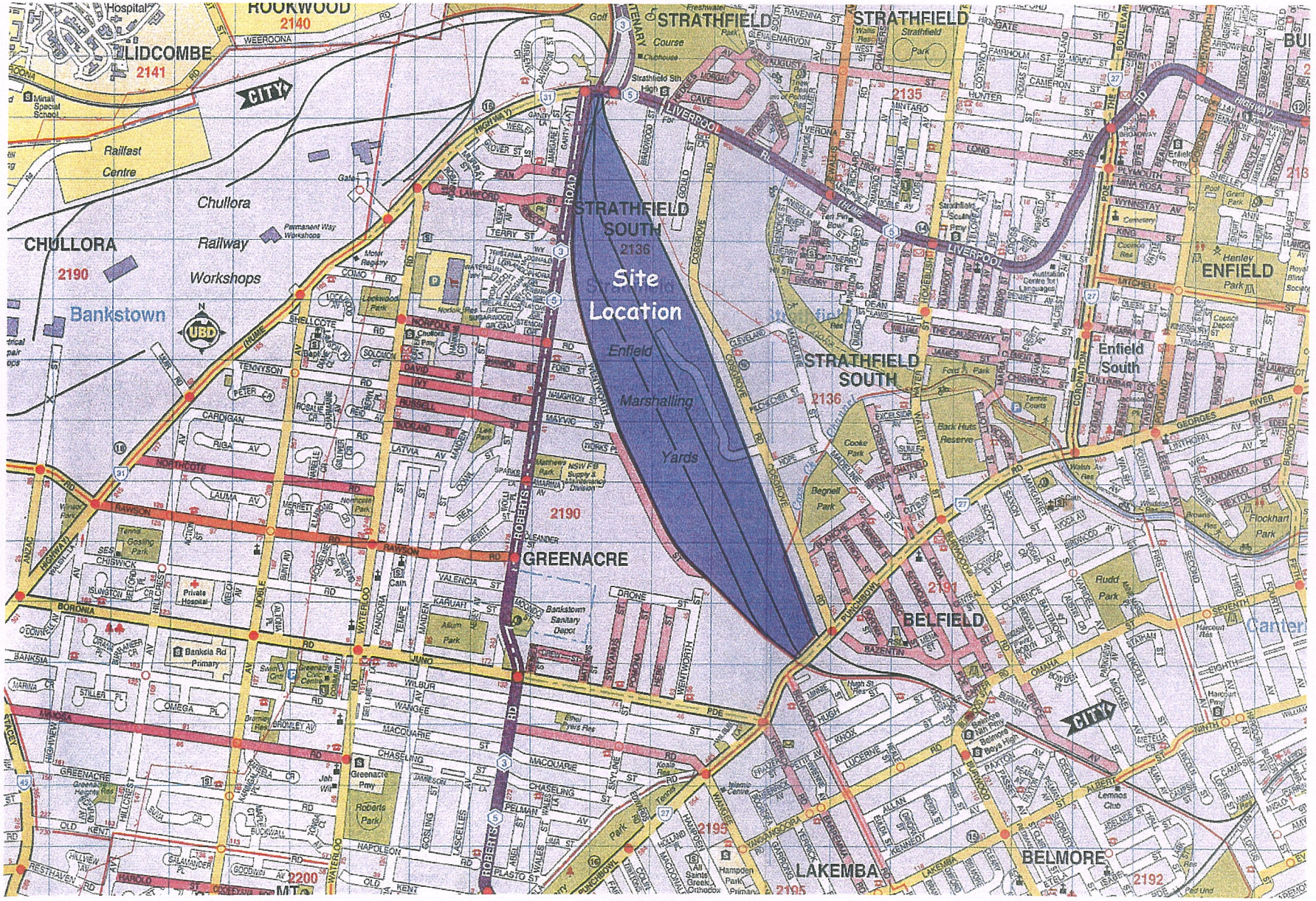
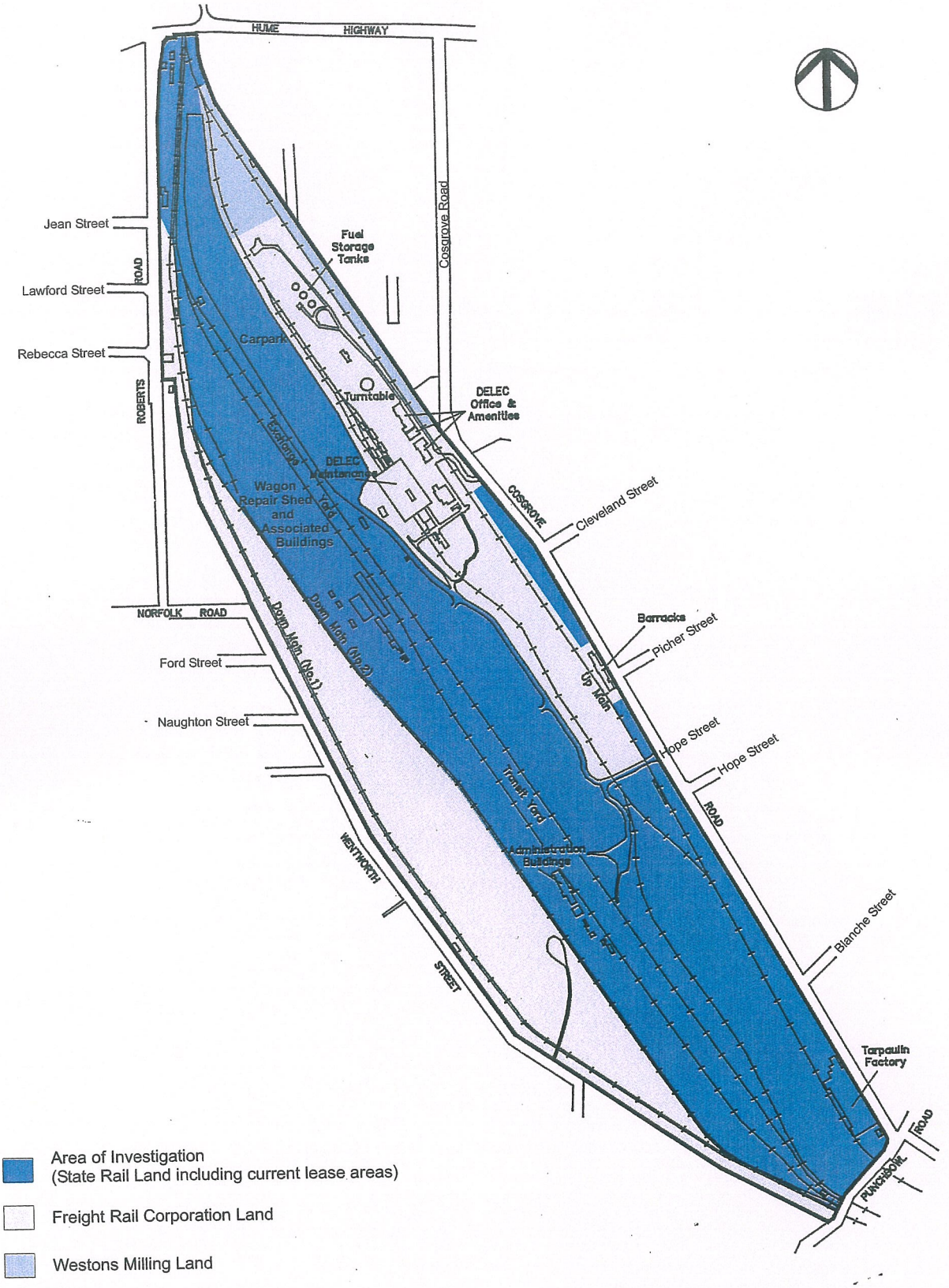


Figure 1
SITE LOCATION
Enfield Marshalling Yards
Part A - Contamination Assessment

CH2M HILL

Rev: B Date: 3.2.99 Project No: 101598 File: 1598-002.cdr

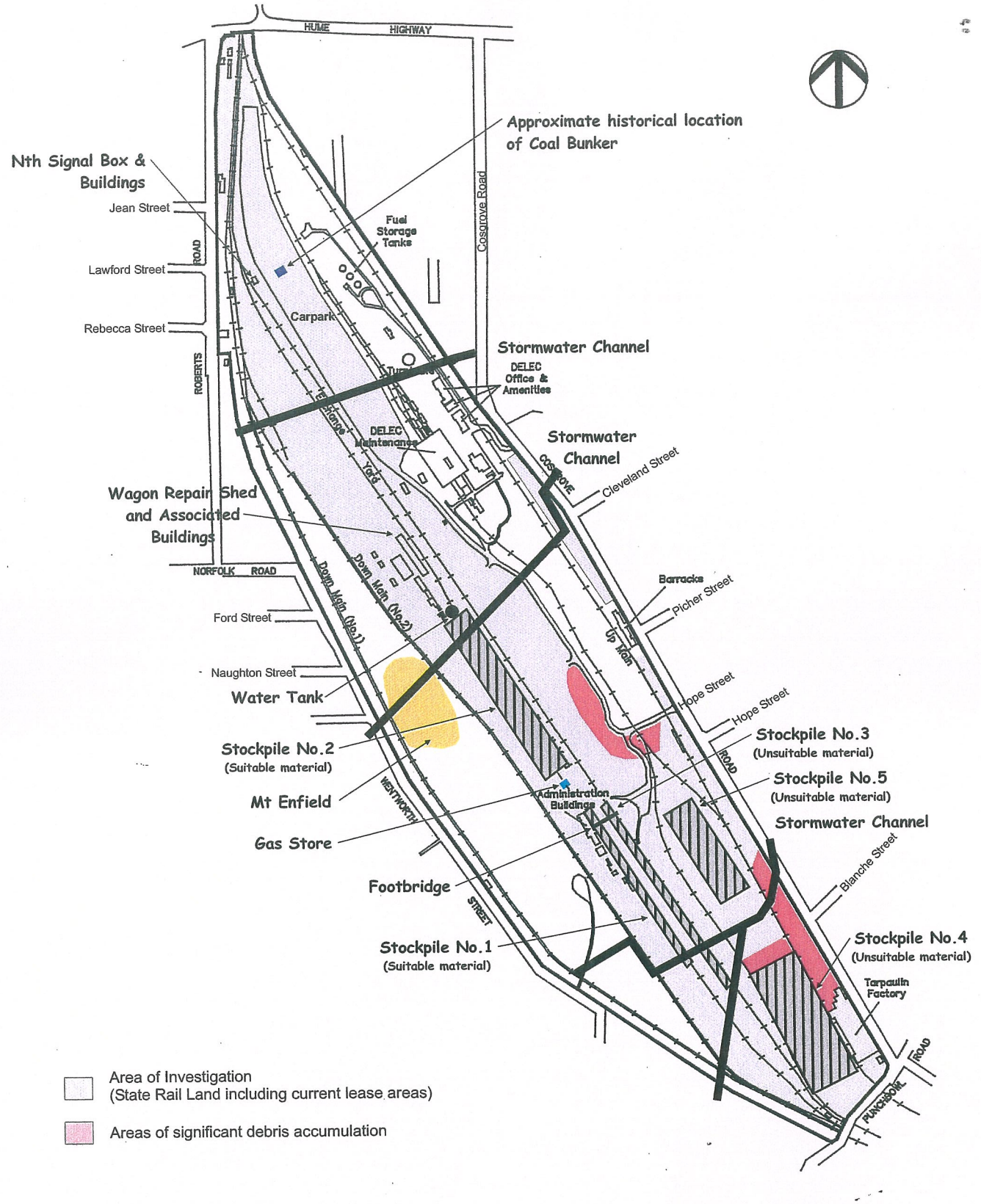


Source: Dames & Moore 1992

CH2M HILL

Figure 2
AREA OF INVESTIGATION
Enfield Marshalling Yards
Part A - Contamination Assessment

Rev: B Date: 17.3.99 Project No: 101598 File: 1598-003.cdr

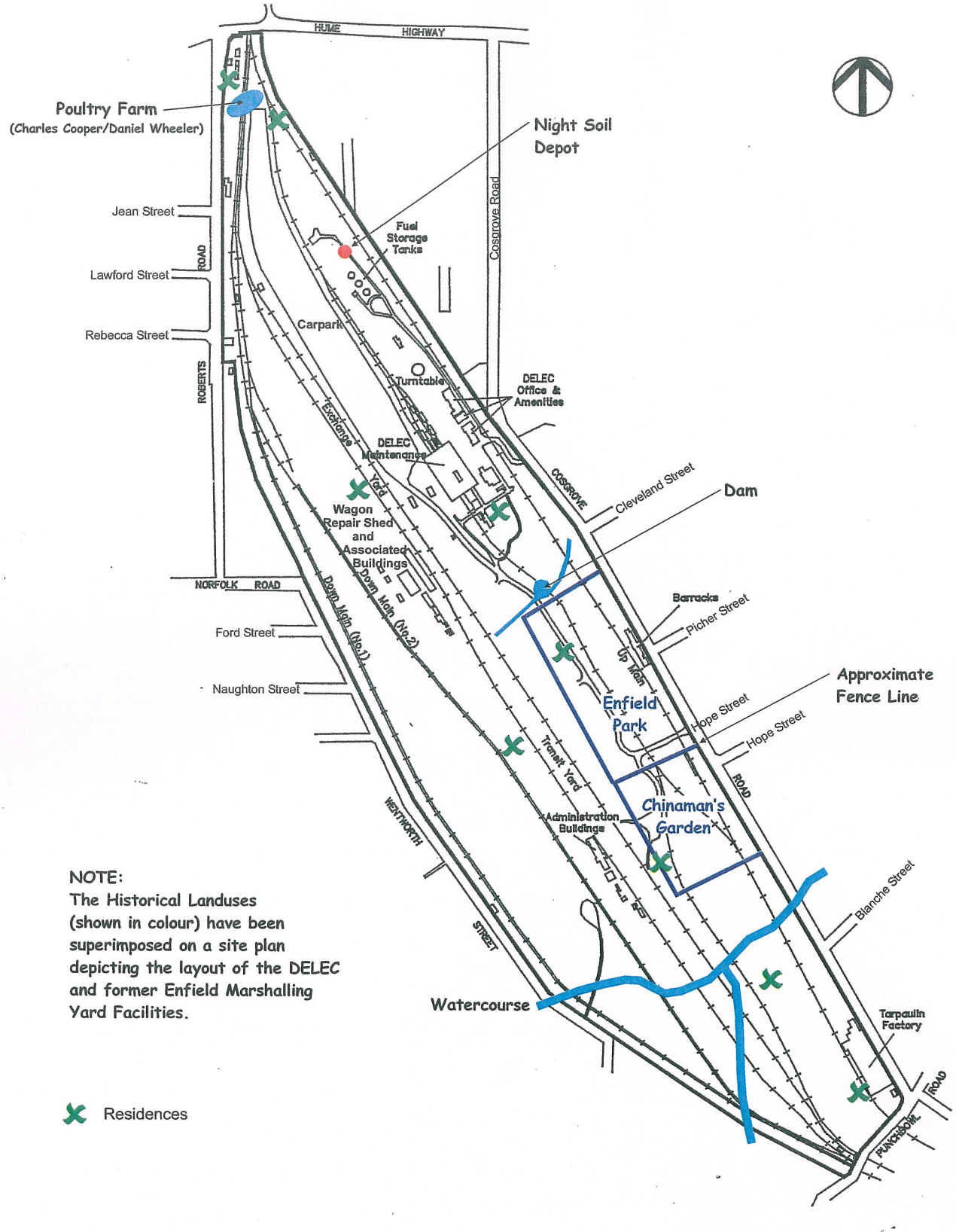


Source: Dames & Moore 1992

CH2M HILL

Figure 3
SITE LAYOUT PLAN
Enfield Marshalling Yards
Part A - Contamination Assessment

Rev: B Date: 17.3.99 Project No: 101598 File: 1598-006.cdr



Source: Dames & Moore 1992

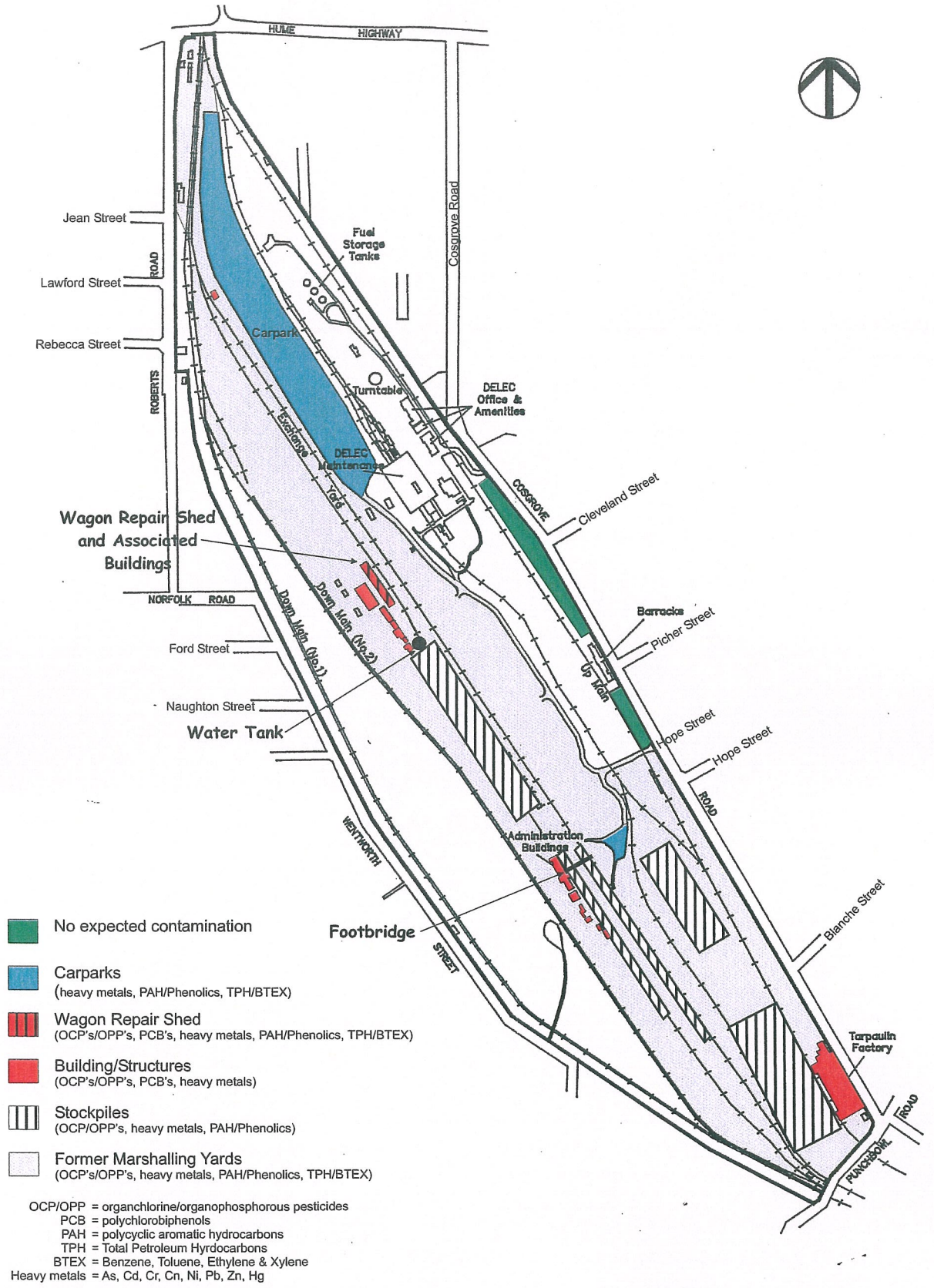
CH2M HILL

Figure 4

APPROXIMATE LOCATIONS OF HISTORIC LAND USES IN 1912 AT THE TIME OF PURCHASE BY CCRT NSW

Enfield Marshalling Yards
Part A - Contamination Assessment

Rev: B Date: 17.3.99 Project No: 101598 File: 1598-004.cdr



Source: Dames & Moore 1992

CH2M HILL

Figure 5
TARGETED AREAS OF POTENTIAL CONTAMINATION
Enfield Marshalling Yards
Part A - Contamination Assessment

Source: Dames & Moore 1992

Rev: B Date: 17.3.99 Project No: 101598 File: 1598-005.cdr

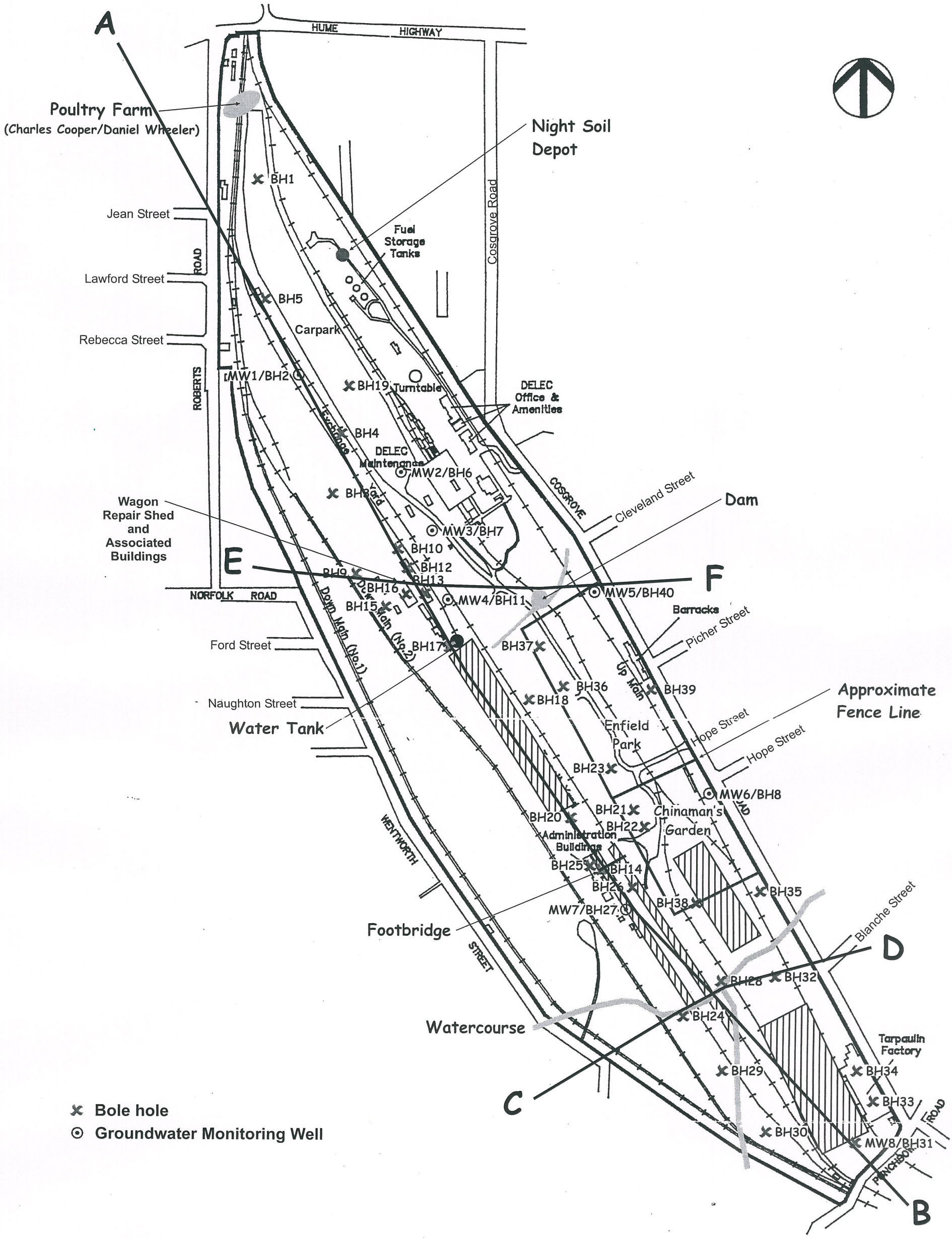


Figure 6
TARGETED SAMPLE LOCATIONS - CURRENT INVESTIGATION

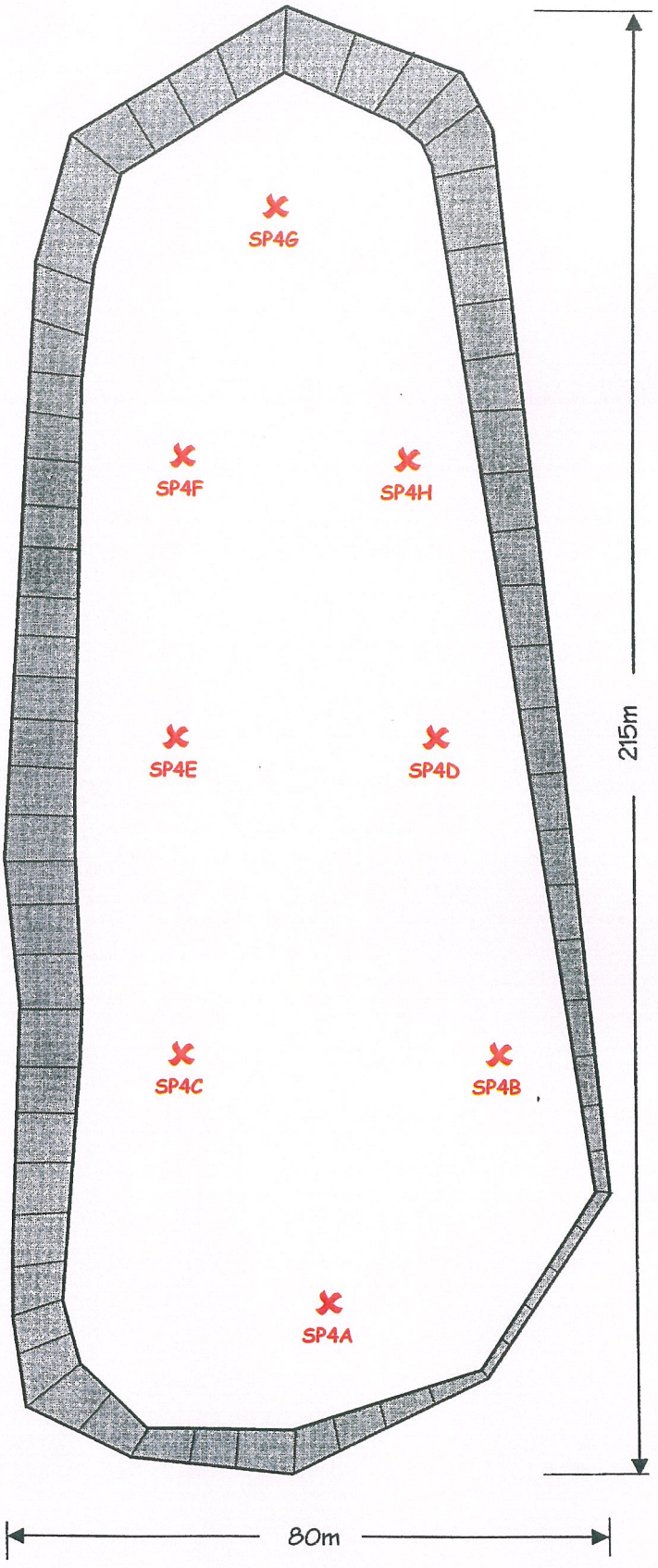
Enfield Marshalling Yards
Part A - Contamination Assessment

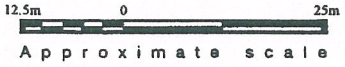
CH2M HILL

Rev: A Date: 3.2.99 Project No: 101598 File: 1598-009.cdr

Approximate Area
17 200m^2

Approximate Volume
172 000m^3

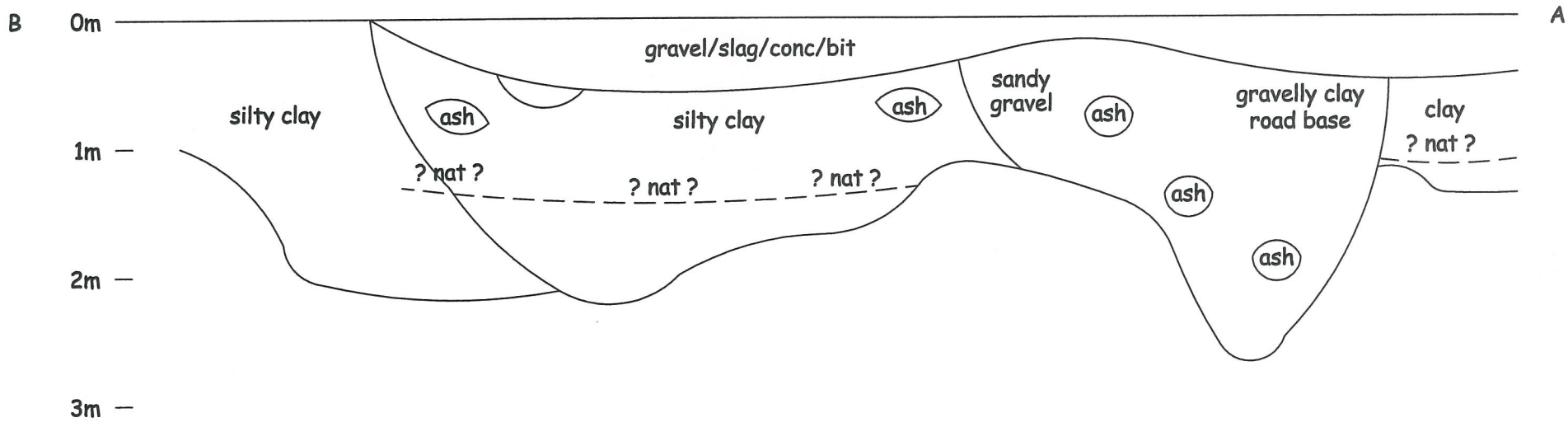




Source: CMPS&F Environmental

CH2M HILL

Figure 8
Stockpile No.4
Enfield Marshalling Yards
Part A - Contamination Assessment



NOT TO SCALE

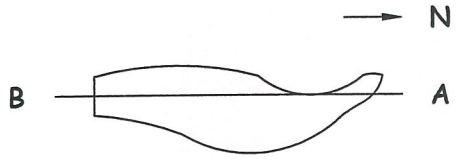
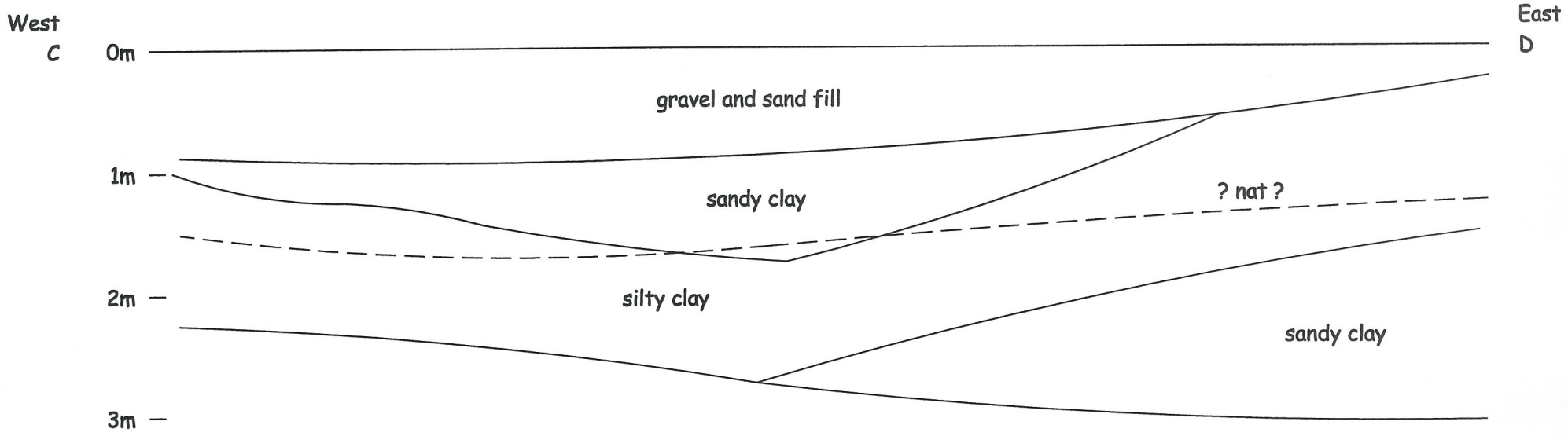


Figure 10
ENTIRE SITE- SUBSURFACE SOIL PROFILE
Enfield Marshalling Yards
Part A – Contamination Assessment

CH2M HILL



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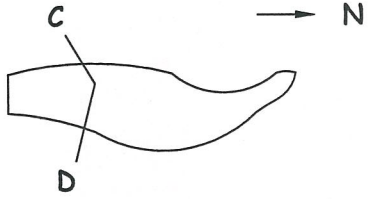
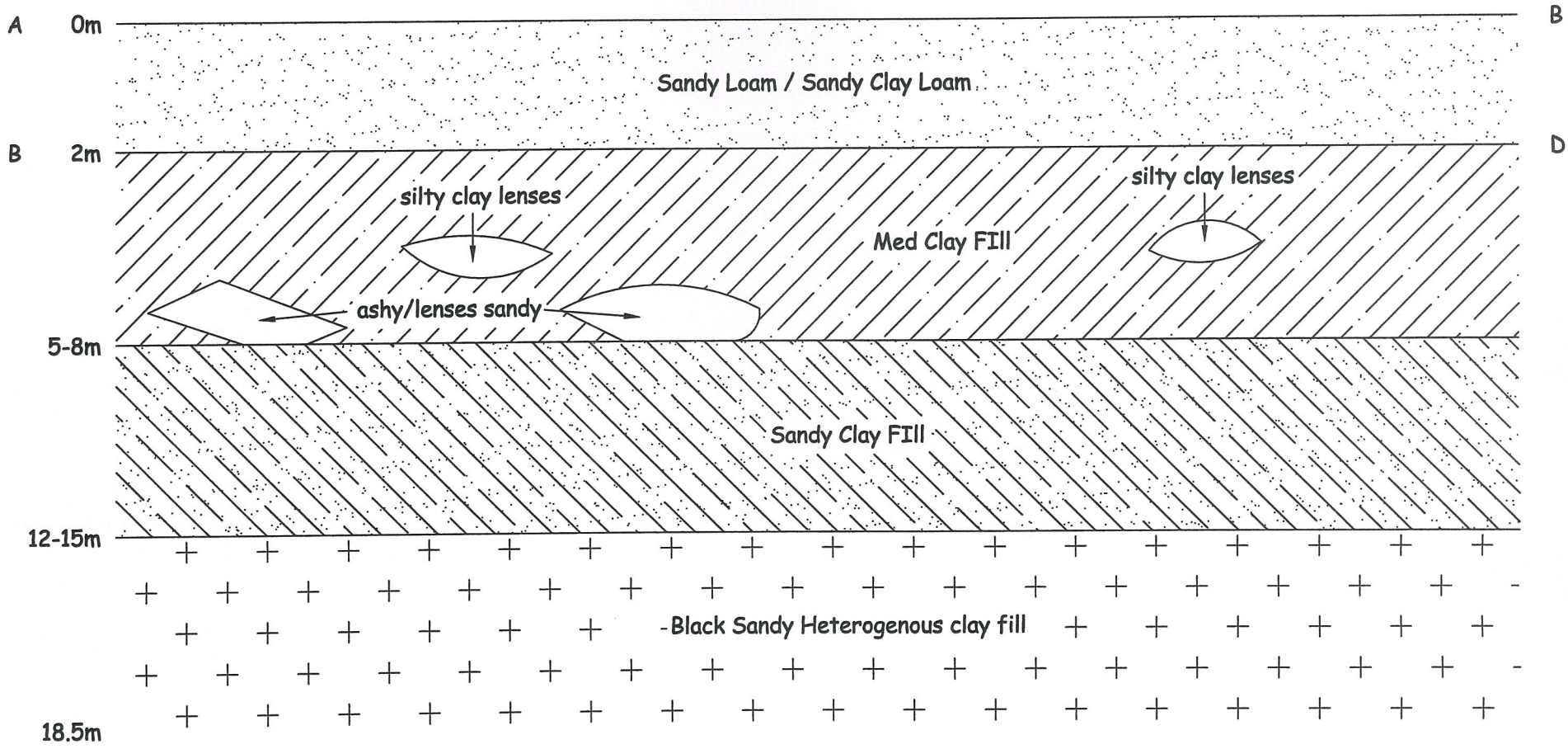


Figure 11
ENTIRE SITE- SUBSURFACE SOIL PROFILE
Enfield Marshalling Yards
Part A – Contamination Assessment

CH2M HILL



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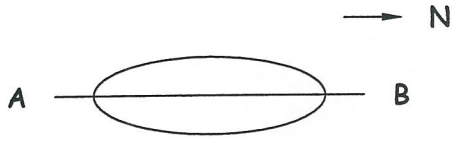
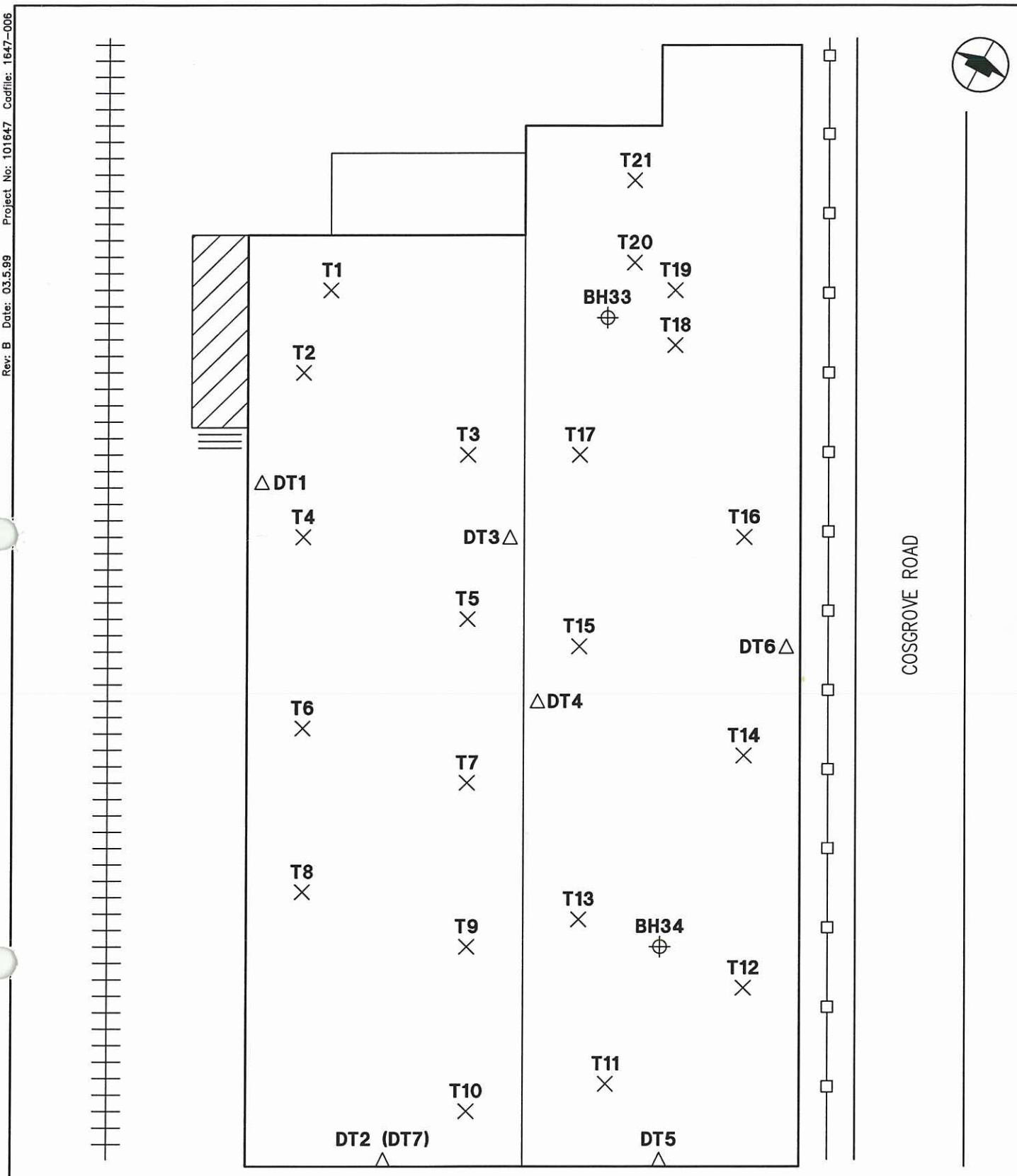


N-S
E-W
} Transets are the same

Figure 14
STOCKPILE 4 - SUBSURFACE SOIL PROFILE
Enfield Marshalling Yards
Part A – Contamination Assessment

CH2M HILL

CH2MHill (1999b) Figures



⊕ Borehole – Part A Investigation

× Borehole – Current Investigation

△ Dust Swab

Fence Line

Railway Track

Approximate Area
5 500m²

Figure 6
TARGETED SAMPLE LOCATIONS
TARPAULIN FACTORY
CURRENT INVESTIGATION
Enfield Marshalling Yards
Part B Contamination Assessment

CH2M HILL

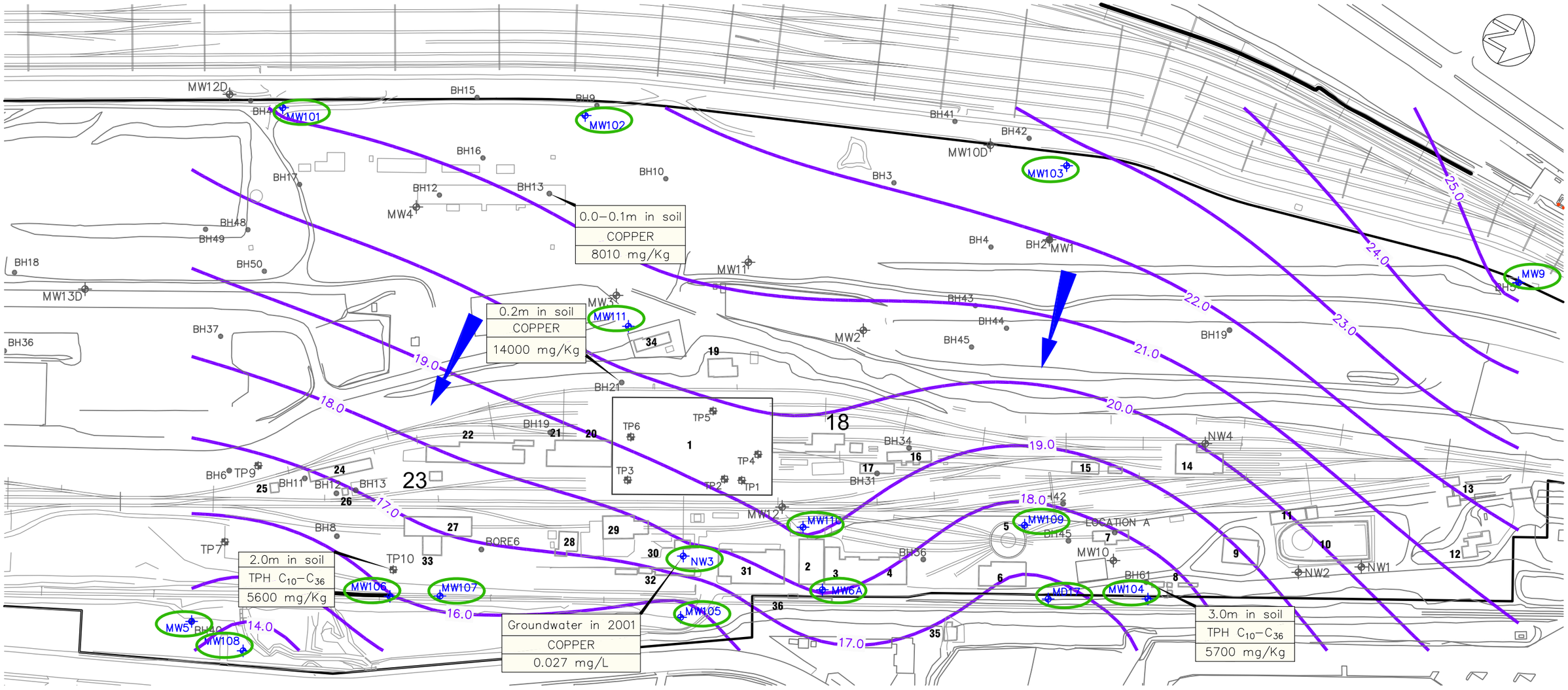
0 25m
Approximate Scale

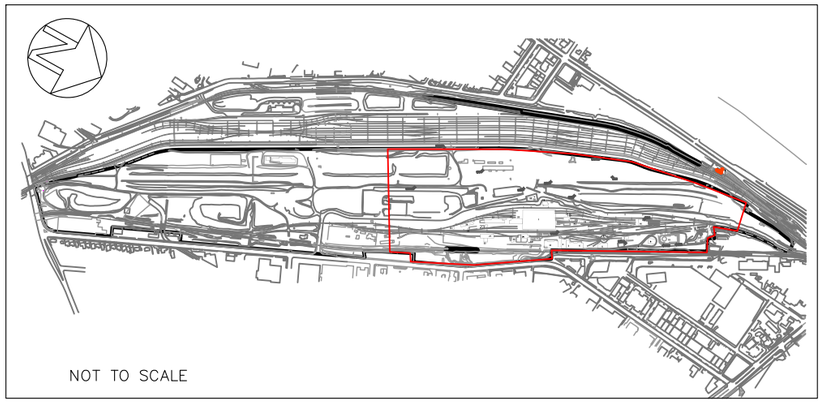
Coffey (2009c) Figures

SOURCE: CITY LINK STREET DIRECTORY
SYDNEY, NEW SOUTH WALES
20TH EDITION, 2008, MAP: 252 & 253

0 200 400 600 800 1000
SCALE 1:20 000 METRES

drawn	MV	coffey environments SPECIALISTS IN LIVING AND WORKING PLACES	client: SYDNEY PORTS CORPORATION	
approved			project: ILC ENFIELD DEMOLITION AND REMEDIATION	
date	09.10.09			
scale	AS SHOWN	SYDNEYPORTS FIRST PORT, FUTURE PORT	title: SITE LOCALITY PLAN	
original size	A4		project no: ENVIRHOD00634AA-R031	figure no: FIGURE 1





LEGEND

- EXTRACT BOUNDARY
- SITE BOUNDARY
- RAIL TRACKS
- MW — MONITORING WELL LOCATIONS
- BH — BOREHOLE LOCATIONS (PREVIOUS COFFEY INVESTIGATION) BY OTHER CONSULTANTS
- MW — GROUNDWATER MONITORING WELLS IN ADDITIONAL GROUNDWATER ASSESSMENT
- TP — TEST PIT LOCATIONS
- 1.550 — INFERRED GROUNDWATER ELEVATION CONTOUR (mAHD) (AUGUST 2009)

1. LOCOMOTIVE MAINTENANCE SHED
2. MAIN ADMINISTRATION BUILDING
3. CANTEEN
4. STAFF AMENITIES BUILDING
5. TURNTABLE
6. COMPONENT DISTRIBUTION CENTRE
7. LOAD BOX
8. EFFLUENT TREATMENT PLANT
9. LMCE TRAINING CENTRE
10. MAIN FUEL STORAGE AREA
11. FUEL ROAD RECEIVAL AREA
12. MAINTENANCE FILTER
13. SAND PLANT
14. LOCOMOTIVE FUELLING POINT
15. FUELLERS AMENITIES
16. OLD LOAD BOX
17. LOCOMOTIVE WASH BAYS
18. ELECTRONICS WORKSHOP
19. ELECTRICAL SUBSTATION
20. A/C WORKSHOP AND PLUMBERS
21. DANGEROUS GOODS STORAGE COMPOUND
22. FLYING GANG AREA
23. GAS BOTTLE STORAGE COMPOUND
24. YARD STAFF AMENITIES
25. SMART ASH BURNER
26. MIXED LIQUID WASTE TANK AREA
27. WHEEL LATHE
28. STORAGE ROOMS
29. OLD WHEEL LATHE
30. BULK OIL STORAGE AREA
31. TRAIN CREWING ADMIN BUILDING
32. STAFF AND VISITORS CAR PARK
33. WHEEL SET STORAGE
34. DISUSED OFFICE BUILDING
35. OILY WATER SEPARATOR
36. OLD TRAIN STATION

revision	description	drawn	approved	date

0 20 40 60 80 100
SCALE 1:2000 (A3) METRES

drawn	MV
approved	
date	09.10..09
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

SYDNEYPORTS
FIRST PORT, FUTURE PORT

client: SYDNEY PORTS CORPORATION

project: ILC ENFIELD DEMOLITION AND REMEDIATION

title: SITE PLAN SHOWING SAMPLING LOCATIONS

project no: ENVIRHOD00634AA-R031

figure no: FIGURE 2

1	2
0.0001	<0.0001
0.003	0.003
0.014	0.006
0.076	0.052

1	2
<0.0001	<0.0001
0.005	<0.001
0.002	0.007
0.13	0.043

1	2
<0.0001	<0.0001
0.005	0.009
0.002	0.003
0.06	0.078

1	2
<0.0001	<0.0001
0.005	0.027
0.002	0.002
0.07	0.15

1	2
0.0059	0.0058
0.012	0.019
0.5	0.47
2.3	2.1

0.0–0.1m in soil
COPPER
8010 mg/Kg

0.2m in soil
COPPER
14000 mg/Kg

1	2
<0.0001	<0.0001
0.011	0.01
<0.001	0.002
0.075	0.1

2
<0.0001
0.003
0.006
0.14

1	2
<0.0001	<0.0001
0.004	0.002
<0.001	<0.001
0.051	0.07

1	2
0.0021	0.0004
0.003	0.011
0.017	0.018
0.37	0.16

1	2
0.0001	0.0004
0.005	0.004
0.065	0.088
0.26	0.35

2.0m in soil
TPH C_{10}–C_{36}
5600 mg/Kg

1	2
<0.0005	<0.0001
<0.005	0.003
0.039	0.055
0.12	0.15

1	2
<0.0001	<0.0001
0.004	<0.001
<0.001	<0.001
0.06	0.072

Groundwater in 2001
COPPER
0.027 mg/L

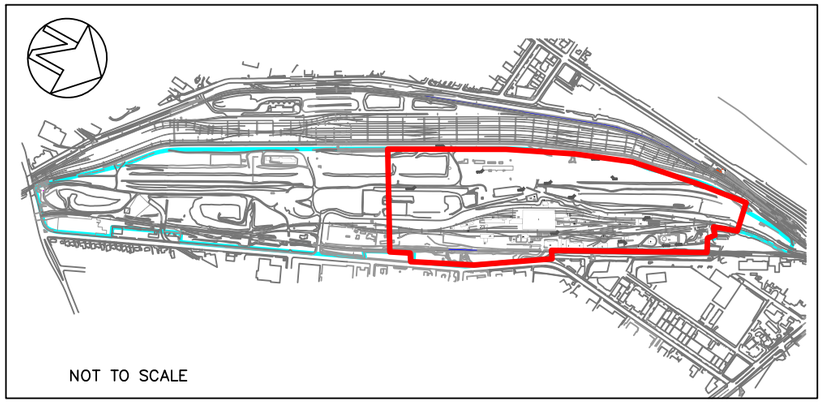
1	2
0.0002	0.0002
0.009	0.008
0.04	0.022
0.23	0.17

1	2
<0.0001	<0.0001
0.005	0.008
<0.001	<0.001
0.063	0.11

1	2
0.0001	<0.0001
0.006	0.005
0.002	0.003
0.077	0.091

1	2
0.0004	0.0003
0.006	0.006
0.013	0.017
0.13	0.14

3.0m in soil
TPH C_{10}–C_{36}
5700 mg/Kg



LEGEND

- INFERRED GROUNDWATER FLOW DIRECTION
- EXTRACT BOUNDARY
- SITE BOUNDARY
- RAIL TRACKS
- MW — MONITORING WELL LOCATIONS
- BH — BOREHOLE LOCATIONS
- MW — GROUNDWATER MONITORING WELLS IN ADDITIONAL GROUNDWATER ASSESSMENT
- TP — TEST PIT LOCATIONS

12 — VALUES INDICATE CONCENTRATIONS ABOVE NOMINATED CRITERIA

GROUNDWATER ASSESSMENT EVENT
CADMIUM Cd
COPPER Cu
NICKEL Ni
ZINC Zn

1. LOCOMOTIVE MAINTENANCE SHED
2. MAIN ADMINISTRATION BUILDING
3. CANTEEN
4. STAFF AMENITIES BUILDING
5. TURNTABLE
6. COMPONENT DISTRIBUTION CENTRE
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35. OILY WATER SEPARATOR
36. OLD TRAIN STATION

revision	description	drawn	approved	date

0 20 40 60 80 100
SCALE 1:2000 (A3) METRES

drawn	MV
approved	
date	09.10..09
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

SYDNEYPORTS
FIRST PORT, FUTURE PORT

client: SYDNEY PORTS CORPORATION

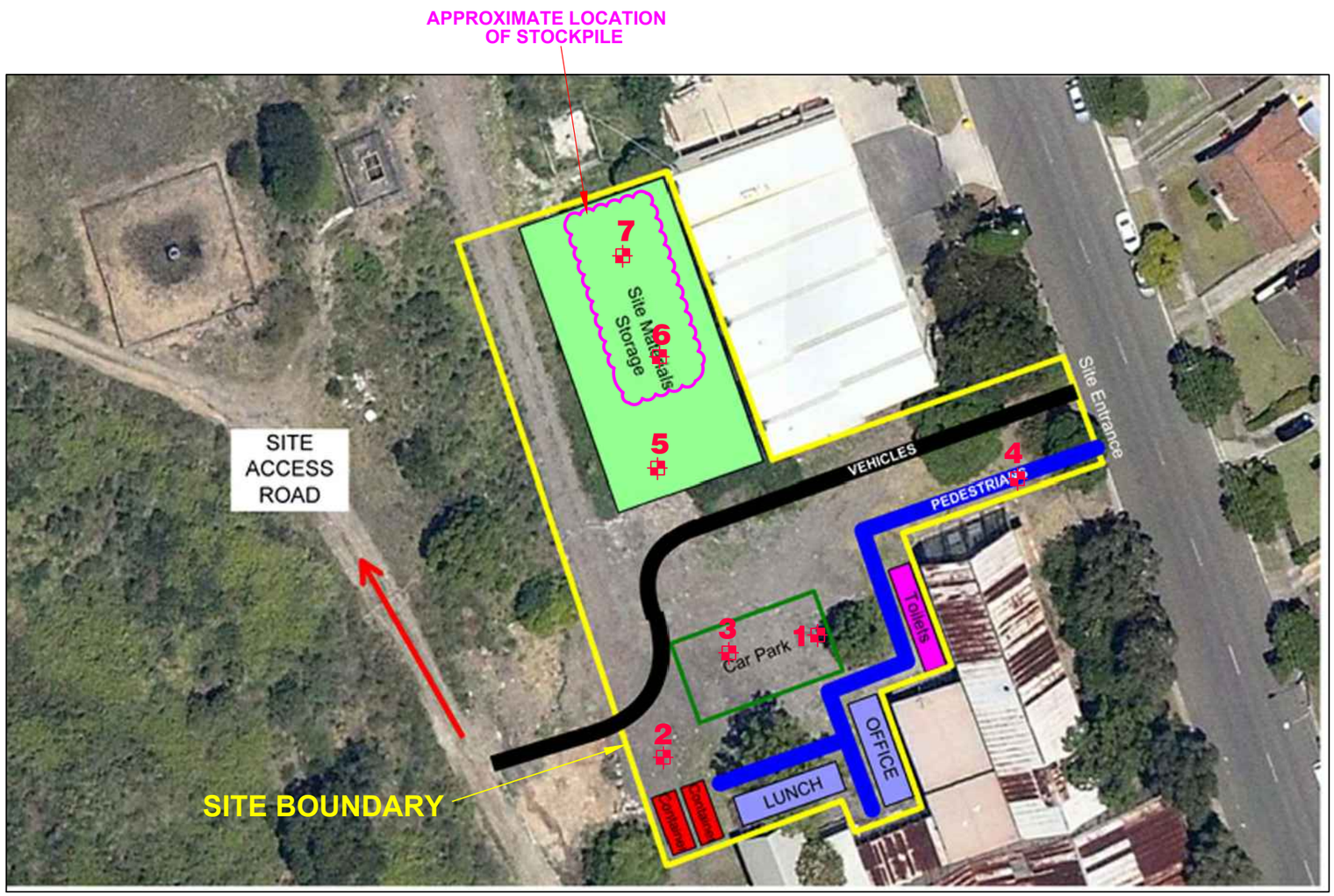
project: ILC ENFIELD DEMOLITION AND REMEDIATION

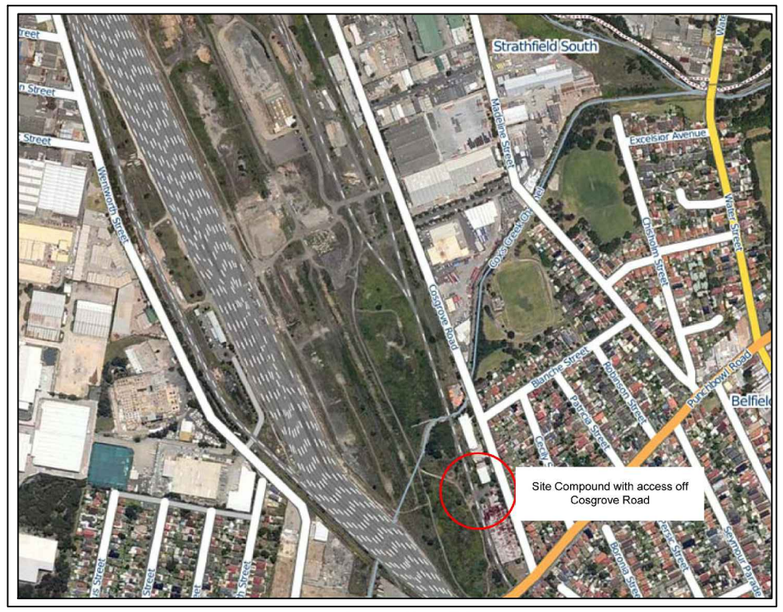
title: SITE PLAN SHOWING SAMPLING LOCATIONS EXCEEDANCE DURING ASSESSMENT

project no: ENVIRHOD00634AA-R031

figure no: FIGURE 3

Douglas Partners (2011) Reports





Locality Plan

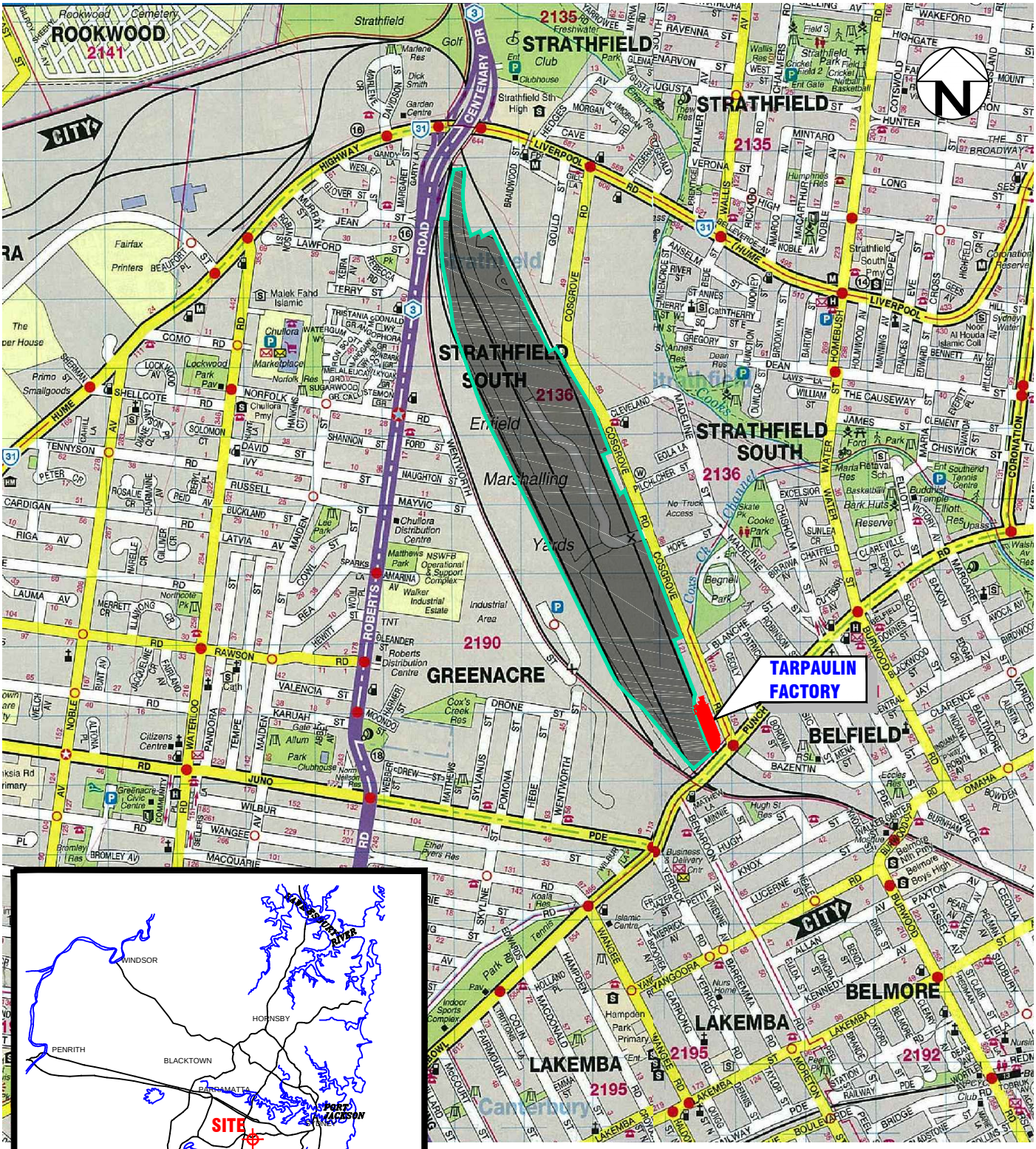
LEGEND

Test Pit Location

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Downer EDi Works Pty Ltd	TITLE: **Location of Tests** **Baseline Contamination Assessment** **Compound, Off Cosgrove Road, ENFIELD**	PROJECT No: 72469
	OFFICE: Sydney DRAWN BY: PSCH		DRAWING No: 1
	SCALE: N.T.S. DATE: 9.8.2011		REVISION: A

P:\72469.00 ENFIELD, Baseline Contamination Assessment STE\Drawings\72469-1.dwg, 10/08/2011 10:16:20 AM

Coffey (2014b) Figures



SOURCE: UBD STREET DIRECTORY GREGORYS SYDNEY, NEW SOUTH WALES 47TH EDITION, 2012, MAP: 252 & 253

200 0 200 600 1000

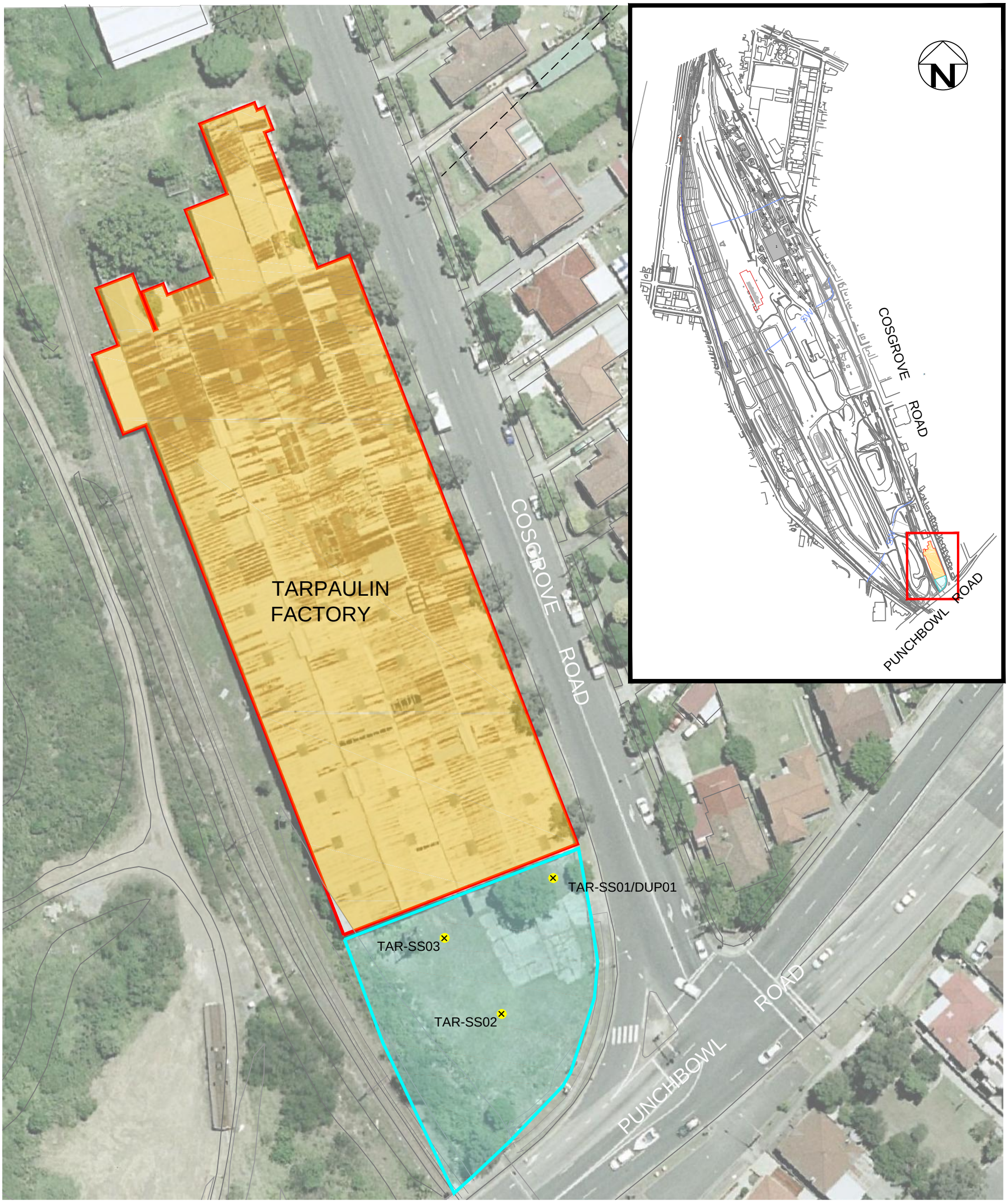
Scale (metres) 1:20,000

drawn	MV
approved	SG
date	23/10/13
scale	AS SHOWN
original size	A4

coffey

client:	NSW PORTS
project:	ASSESSMENT OF TARPAULIN FACTORY AND THE AREA TO THE SOUTH OF TARPAULIN FACTORY COSGROVE ROAD, ENFIELD, NSW
title:	SITE LOCATION PLAN
project no:	ENAURHOD04419AD
figure no:	1

PLOT DATE: 23/10/2013 4:09:46 PM DWG FILE: F:\ENV\PROJECTS\ENAURHOD\ENAURHOD04 GOVINDI\ENAURHOD04400-04499\ENAURHOD04419 SYDNEY PORTS ENFIELD\ENAURHOD04419AD TARPAULIN SHED\DRAWINGS\ENAURHOD04419AD-D01.DWG



LEGEND

TARPAULIN FACTORY BOUNDARY

THE AREA SOUTH OF TARPAULIN FACTORY

TAR-SS SURFACE SAMPLE LOCATION

BASE DRAWING SOURCE: SPC DRAWING SEDP079B

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 6.6.2.6613
AERIAL IMAGE ©: 2012 SINCLAIR KNIGHT MERZ
2012 WHEREIS SENSIS PTY LTD

8 0 8 24 40
Scale (metres) 1:800

drawn	MV
approved	SG
date	23/10/13
scale	AS SHOWN
original size	A3

coffey

client: NSW PORTS

project: ASSESSMENT OF TARPAULIN FACTORY AND THE AREA TO THE SOUTH OF TARPAULIN FACTORY COSGROVE ROAD, ENFIELD, NSW

title: SAMPLING LOCATIONS

project no: ENAURHOD04419AD

figure no: 2

PLOT DATE: 23/10/2013 4:01:44 PM DWG FILE: F:\ENV\PROJECTS\ENAURHOD\ENAURHOD04 GOVIND\ENAURHOD04400-04499\ENAURHOD04419 SYDNEY PORTS ENFIELD\ENAURHOD04419AD TARPAULIN SHED\DRAWINGS\ENAURHOD04419AD-D01.DWG

Appendix C Previous Investigation Results

Douglas Partners (1993a) Results

PART 3 - CONTAMINATION

7. LABORATORY RESULTS

7.1 Laboratory Results - Contamination

Laboratory testing for all contaminants, except heavy metals, was carried out on the sample collected into glass jars.

7.1.1 PID screening.

Initial testing comprised PID screening, (in the field or in the laboratory) using a portable organic vapour analyser to measure concentrations of Total Organic Vapour. Measured concentrations ranged from 0 to 100 ppm with all values reported on the Test Bore logs.

7.1.2 Heavy metal analysis.

Measurement of heavy metal concentrations was carried out on forty-two samples. All of these samples were analysed for copper, lead, zinc, nickel, chromium and cadmium while four were analysed for these elements as well as arsenic, mercury, tin, cobalt and antimony.

Detailed results are presented in Appendix B with the results summarised in the table below.

Table 1. Summary of Heavy Metal Analyses.

	Soil Samples				Water Samples			
			ANZECC Guidelines				Clean Waters Act 1990	
Element	No of tests	Range mg/kg (ppm)	1	2	No of tests	Range mg/L (ppm)	3	4
Copper (Cu)	25	<5 - 2100	60	7	17	<00.5 - 0.35	1.0	0
Lead (Pb)	25	<10 - 580	300	1	17	<0.05 - 0.05	0.05	0
Nickel (Ni)	25	<5 - 35	60	0	17	<0.05 - 0.1	0.1 **	0
Zinc (Zn)	25	<5 - 290	200	6	17	<0.05 - 0.55	5	0
Cadmium (Cd)	25	<1 - 2	3	0	17	<0.01	0.01	0
Chromium (Cr)	25	<5 - 43	50	0	17	<0.05 - 0.4	0.05	1
Arsenic (As)	4	<10 - 11	20	0				
Mercury (Hg)	4	0.1 - 0.4	1	0				
Tin (Sn)	4	<10	50	0				
Cobalt (Co)	4	<5 - 6	50*					
Antimony (Sb)	4	0.2 - 1.9	20	0				

* Dutch B Level
** Dutch C Level

1. ANZECC guideline
2. No. of tests exceeding ANZECC guidelines.
3. Clean Waters Act 1990
4. No. of tests exceeding Clean Waters Act.

7.1.3 Total Petroleum Hydrocarbon (TPH) Analysis.

26 samples were analysed for Total Petroleum Hydrocarbon (TPH) concentrations with the detailed results presented in Appendix B. Table 2 summarised these results.

Table 2. Summary of Total Petroleum Hydrocarbon (TPH) Analysis.

Soil Samples			Water Samples		
No. of tests	Hydrocarbon Fraction (ppm) C_6-C_9 C_{10}-C_{14} C_{15}-C_{28}	No of tests exceeding NSW EPA accepted values.	No of tests	Hydrocarbon Fractions (mg/L) C_6-C_9 C_{10}-C_{14} C_{15}-C_{28}	No. of tests exceeding NSW Water Board
25	<2 <20 to 156 <50 to 1118	0	15	<0.2 to 4.6 <0.2 <0.5	0
SPCC values accepted by NSW EPA	500 1000 5000		NSW Water Board * 10 mg/L allowable into stormwater ** 30 mg/L allowable into sewer		

7.1.4 Polynuclear Aromatic Hydrocarbon (PAH) Analysis.

Polynuclear aromatic hydrocarbon analysis were carried out on a total of seventeen samples comprising ten analyses on soil/filling samples and seven on water samples. Table 3 presents a summary of the units analysed for as well as the soil and water detection limits of each unit.

Only nine measurements were recorded above the detection limits, all within soil samples, with a maximum total PAH value of 0.7 mg/kg, well below accepted guidelines.

No measurements greater than the detection limits were recorded for the water samples.

7.1.5 Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs).

Eighteen samples were analysed for organochlorine pesticides and ten samples for polychlorinated biphenyls. Analysis comprised a broad spectrum screen for the compounds listed in Table 4. Detailed results are included in Appendix B.

Only one measurement above the detection limits was recorded for all the samples analysed. That measurement was a reading of 0.1 mg/kg (ppm) in a soil sample from Test Pit 123. No detectable PCB's were measured.

Table 3. Summary of Polynuclear Aromatic Hydrocarbon (PAH) Analyses.

Unit	Detection Limits	
	Soil mg/kg	Water µg/L
Naphthalene	<0.1	<0.5
Acenaphthylene	<1.0	<0.5
Acenapthene	<0.1	<0.5
Fluorene	<0.1	<0.5
Phenanthrene	<0.1	<0.5
Anthracene	<0.1	<0.5
Fluoranthene	<1.0	<0.5
Pyrene	<0.1	<0.5
Benzo (a) anthracene	<0.1	<0.5
Chrysene	<0.1	<0.5
Benzo (b) fluorathene	<0.1	<0.5
Benzo (k) fluorathene	<0.1	<0.5
Benzo (a) pyrene	<0.1	<0.5
Dibenzo (ah) anthracene	<0.1	<0.5
Benzo (ghi) anthracene	<0.1	<0.5
Indeno (1,2,3-cd) pyrene	<0.1	<0.5

ANZECC guidelines suggest for soils, a concentration of 20 mg/kg (with 1 mg/kg of benzo-a-pyrene) as necessitating further investigation while for water, the Dutch B level is quoted as 10 µg/L (10 pp billion).

Table 4. Summary of Organochlorine Pesticide and Polychlorinated Biphenols (PCBs) Analyses

Units	Detection Limits	
	Soil (mg/kg)	Water (µg/L)
a-BHC	<0.1	<0.1
HBC	<0.1	<0.1
Lindane	<0.1	<0.1
Heptichlor	<0.1	<0.1
Aldrin	<0.1	<0.1
Heptachlor Epoxide	<0.1	<0.1
Oxychlordane	<1.0	<0.1
DDE	<0.1	<0.2
Dieldrin	<0.1	<0.2
Endrin	<0.1	<0.2
DDD	<0.1	<0.2
DDT	<0.1	<0.2
Fenitrothion	<0.1	<0.2
Chlorpyriphos	<0.1	<0.2
Bromophosethyl	<0.1	<0.2
Ethion	<0.1	<0.2
Aroclor 1016	<0.2	<0.1
Aroclor 1221	<0.2	<0.1
Aroclor 1232	<0.2	<0.1
Aroclor 1242	<0.2	<0.1
Aroclor 1248	<0.2	<0.1
Aroclor 1254	<0.2	<0.1
Aroclor 1260	<0.2	<0.1

The ANZECC guidelines for PCB's (total, soil) is 1 mg/kg.

ANZECC guidelines suggest limits for environmental investigation of 0.2 mg/kg for Dieldrin while Dutch B levels (Total Organic Chlorinated Pesticides) for soil and water are 1 mg/kg and 0.5 µg/L respectively.

D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-1	4180-2	4180-3	4180-4	4180-5
Your Reference	B1, GW	B2, GW	B3, GW	B4, GW	B5,GW
Sample Type	WATER	WATER	WATER	WATER	WATER
Units	mg/L	mg/L	mg/L	mg/L	mg/L
Copper, Cu	<0.05	<0.05	<0.05	<0.05	<0.05
Lead, Pb	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel, Ni	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc, Zn	0.10	<0.05	<0.05	0.10	<0.05
Cadmium, Cd	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium, Cr	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic, As	-	-	-	-	-
Mercury, Hg	-	-	-	-	-
Tin, Sn	-	-	-	-	-
Cobalt, Co	-	-	-	-	-
Antimony, Sb	-	-	-	-	-

D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-6	4180-7	4180-9	4180-10	4180-11
Your Reference	B5, 2.5M	B6, GW	B6, 3.0M	B6,4.0M	B7, GW
Sample Type	SOIL	WATER	SOIL	SOIL	WATER
Units	mg/kg	mg/L	mg/kg	mg/kg	mg/L
Copper, Cu	14	<0.05	460	12	<0.05
Lead, Pb	11	<0.05	53	11	<0.05
Nickel, Ni	17	<0.05	8	<5	0.10
Zinc, Zn	110	<0.05	260	7	0.15
Cadmium, Cd	<1	<0.01	1.5	<1	<0.01
Chromium, Cr	10	<0.05	43	17	<0.05
Arsenic, As	-	-	<10	-	-
Mercury, Hg	-	-	0.4	-	-
Tin, Sn	-	-	<10	-	-
Cobalt, Co	-	-	<5	-	-
Antimony, Sb	-	-	0.3	-	-

REPORT NO. 4180

D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-12	4180-14	4180-15	4180-18	4180-19
Your Reference	B8, 0.5M	B11, GW	B12, GW	B13, GW	B14, GW
Sample Type	SOIL	WATER	WATER	WATER	WATER
Units	mg/kg	mg/L	mg/L	mg/L	mg/L
Copper, Cu	60	<0.05	<0.05	<0.05	0.15
Lead, Pb	22	<0.05	<0.05	<0.05	<0.05
Nickel, Ni	14	<0.05	<0.05	<0.05	0.10
Zinc, Zn	140	0.10	<0.05	<0.05	0.55
Cadmium, Cd	<1	<0.01	<0.01	<0.01	<0.01
Chromium, Cr	10	<0.05	<0.05	<0.05	0.40
Arsenic, As	-	-	-	-	-
Mercury, Hg	-	-	-	-	-
Tin, Sn	-	-	-	-	-
Cobalt, Co	-	-	-	-	-
Antimony, Sb	-	-	-	-	-

D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-20A	4180-21	4180-22	4180-23	4180-24
Your Reference	B14, 0.5M	B15, GW	B16, GW	B17, GW	B18, GW
Sample Type	SOIL	WATER	WATER	WATER	WATER
Units	mg/kg	mg/L	mg/L	mg/L	mg/L
Copper, Cu	11	<0.05	<0.05	0.35	0.10
Lead, Pb	22	<0.05	<0.05	<0.05	<0.05
Nickel, Ni	<5	<0.05	<0.05	<0.05	<0.05
Zinc, Zn	25	<0.05	<0.05	<0.05	<0.05
Cadmium, Cd	<1	<0.01	<0.01	<0.01	<0.01
Chromium, Cr	21	<0.05	<0.05	<0.05	<0.05
Arsenic, As	-	-	-	-	-
Mercury, Hg	-	-	-	-	-
Tin, Sn	-	-	-	-	-
Cobalt, Co	-	-	-	-	-
Antimony, Sb	-	-	-	-	-

D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-25	4180-28	4180-29	4180-31	4180-36	4180-36 RPT
Your Reference	DRAIN, GW	101, 0.5M	103, 0.2M	105, 0.5M	107,0.5M	107, 0.5M
Sample Type	WATER	SOIL	SOIL	SOIL	SOIL	SOIL
Units	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper, Cu	<0.05	9	68	47	51	53
Lead, Pb	<0.05	<10	150	130	170	180
Nickel, Ni	<0.05	<5	9	7	17	7
Zinc, Zn	<0.05	56	270	270	190	150
Cadmium, Cd	<0.01	<1	2.0	<1	<1	<1
Chromium, Cr	<0.05	<5	11	12	18	11
Arsenic, As	-	-	-	-	11	-
Mercury, Hg	-	-	-	-	0.3	-
Tin, Sn	-	-	-	-	<10	-
Cobalt, Co	-	-	-	-	6	-
Antimony, Sb	-	-	-	-	0.8	-

REPORT NO. 4180

D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-38	4180-40	4180-40 RPT	4180-44	4180-47	4180-49
Your Reference	109, 0.5M	110, 0.5M	110, 0.5M	115, 0.5M	117, 1.5M	118, 0.7M
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper, Cu	14	110	110	10	2100	25
Lead, Pb	12	78	79	13	210	15
Nickel, Ni	<5	9	9	<5	22	<5
Zinc, Zn	15	81	80	16	290	12
Cadmium, Cd	<1	<1	<1	<1	<1	<1
Chromium, Cr	15	7	7	14	14	14
Arsenic, As	-	-	-	-	-	-
Mercury, Hg	-	-	-	-	-	-
Tin, Sn	-	-	-	-	-	-
Cobalt, Co	-	-	-	-	-	-
Antimony, Sb	-	-	-	-	-	-

D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-51	4180-54	4180-58	4180-59	4180-59 RPT	4180-60
Your Reference	119, 1.4M	120, 1.6M	124, 0.2M	124, 1.5M	124, 1.5M	125, 0.5M
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper, Cu	19	120	190	17	17	33
Lead, Pb	11	41	70	<10	<10	280
Nickel, Ni	<5	9	11	<5	<5	<5
Zinc, Zn	18	69	230	5	5	130
Cadmium, Cd	<1	<1	<1	<1	<1	<1
Chromium, Cr	11	9	8	<5	5	11
Arsenic, As	-	-	<10	<10	<10	-
Mercury, Hg	-	-	0.1	0.2	-	-
Tin, Sn	-	-	<10	<10	<10	-
Cobalt, Co	-	-	6	<5	<5	-
Antimony, Sb	-	-	1.9	0.2	-	-

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D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-60 RPT	4180-61	4180-62	4180-63	4180-64	4180-64 RPT
Your Reference	125, 0.5M	126, 0.75M	201, 1.0M	201, 3.0M	203, 1.0M	203, 1.0M
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper, Cu	31	<5	20	50	54	63
Lead, Pb	260	<10	110	84	200	190
Nickel, Ni	<5	<5	7	5	14	13
Zinc, Zn	130	<5	160	120	150	150
Cadmium, Cd	<1	<1	<1	<1	<1	<1
Chromium, Cr	10	6	9	14	22	21
Arsenic, As	-	-	-	-	-	-
Mercury, Hg	-	-	-	-	-	-
Tin, Sn	-	-	-	-	-	-
Cobalt, Co	-	-	-	-	-	-
Antimony, Sb	-	-	-	-	-	-

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D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-65	4180-66	4180-67
Your Reference	203, 1.6W	204, 1.5M	204, 2.2M
Sample Type	WATER	SOIL	SOIL
Units	mg/L	mg/kg	mg/kg
Copper, Cu	<0.05	46	28
Lead, Pb	<0.05	170	580
Nickel, Ni	<0.05	15	35
Zinc, Zn	<0.05	280	90
Cadmium, Cd	<0.01	<1	<1
Chromium, Cr	<0.05	18	26
Arsenic, As	-	-	-
Mercury, Hg	-	-	-
Tin, Sn	-	-	-
Cobalt, Co	-	-	-
Antimony, Sb	-	-	-

D.J. DOUGLAS

Project No. 19109

Polynuclear Aromatic Hydrocarbons

Our Reference	4180-1	4180-2	4180-3	4180-4	4180-11	4180-18
Your Reference	B1, GW	B2, GW	B3, GW	B4, GW	B7, GW	B13, GW
Sample Type	WATER	WATER	WATER	WATER	WATER	WATER
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Naphthalene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (a) anthracene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (b) fluoranthene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (k) fluoranthene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (a) pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo (ah) anthracene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (ghi) perylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno (1,2,3-cd) pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

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Polynuclear Aromatic Hydrocarbons

Our Reference	4180-26	4180-62	4180-63	4180-65	4180-67
Your Reference	101, 0.1M	201, 1.0M	201, 3.0M	203, 1.6W	204, 2.2M
Sample Type	SOIL	SOIL	SOIL	WATER	SOIL
Units	mg/kg	mg/kg	mg/kg	µg/L	mg/kg
Naphthalene	<0.1	<0.1	<0.1	<0.5	<0.1
Acenaphthylene	<1.0	<1.0	<1.0	<0.5	<1.0
Acenaphthene	<0.1	<0.1	<0.1	<0.5	<0.1
Fluorene	<0.1	<0.1	<0.1	<0.5	<0.1
Phenanthrene	<0.1	<0.1	<0.1	<0.5	<0.1
Anthracene	<0.1	<0.1	<0.1	<0.5	<0.1
Fluoranthene	<1.0	<1.0	<1.0	<0.5	<1.0
Pyrene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (a) anthracene	0.1	<0.1	<0.1	<0.5	<0.1
Chrysene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (b) fluoranthene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (k) fluoranthene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (a) pyrene	0.1	<0.1	<0.1	<0.5	0.1
Dibenzo (ah) anthracene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (ghi) perylene	<0.1	<0.1	<0.1	<0.5	<0.1
Indeno (1,2,3-cd) pyrene	<0.1	<0.1	<0.1	<0.5	<0.1

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Polynuclear Aromatic Hydrocarbons

Our Reference	Blank (Soil)	Recovery
Your Reference		
Units	mg/kg	%
Naphthalene	<0.1	105
Acenaphthylene	<1.0	100
Acenaphthene	<0.1	110
Fluorene	<0.1	95
Phenanthrene	<0.1	98
Anthracene	<0.1	130
Fluoranthene	<1.0	120
Pyrene	<0.1	110
Benzo (a) anthracene	<0.1	115
Chrysene	<0.1	85
Benzo (b) fluoranthene	<0.1	80
Benzo (k) fluoranthene	<0.1	95
Benzo (a) pyrene	<0.1	88
Dibenzo (ah) anthracene	<0.1	85
Benzo (ghi) perylene	<0.1	92
Indeno (1,2,3-cd) pyrene	<0.1	120

D.J. DOUGLAS

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OC Pesticides & PCB's

Our Reference	4180-1	4180-2	4180-3	4180-4	4180-11
Your Reference	B1, GW	B2, GW	B3, GW	B4, GW	B7, GW
Sample Type	WATER	WATER	WATER	WATER	WATER
Units	µg/L	µg/L	µg/L	µg/L	µg/L
α-BHC	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	<0.1	<0.1	<0.1	<0.1	<0.1
Oxychlordane	<0.1	<0.1	<0.1	<0.1	<0.1
DDE	<0.2	<0.2	<0.2	<0.2	<0.2
Dieldrin	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	<0.2	<0.2	<0.2	<0.2	<0.2
DDD	<0.2	<0.2	<0.2	<0.2	<0.2
DDT	<0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos	<0.2	<0.2	<0.2	<0.2	<0.2
Bromophosethyl	<0.2	<0.2	<0.2	<0.2	<0.2
Ethion	<0.2	<0.2	<0.2	<0.2	<0.2
Aroclor 1016	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	<0.1	<0.1	<0.1	<0.1	<0.1

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OC Pesticides & PCB's

Our Reference	4180-18	4180-25	4180-62	4180-65	4180-66
Your Reference	B13, GW	DRAIN, GW	201, 1.0M	203, 1.6W	204, 1.5M
Sample Type	WATER	WATER	SOIL	WATER	SOIL
Units	µg/L	µg/L	mg/kg	µg/L	mg/kg
α-BHC	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	<0.1	<0.1	<0.1	<0.1	0.45*
Heptachlor Epoxide	<0.1	<0.1	<0.1	<0.1	<0.1
Oxychlordane	<0.1	<0.1	<0.1	<0.1	<0.1
DDE	<0.2	<0.2	<0.1	<0.2	<0.1
Dieldrin	<0.2	<0.2	<0.1	<0.2	<0.1
Endrin	<0.2	<0.2	<0.1	<0.2	<0.1
DDD	<0.2	<0.2	<0.1	<0.2	<0.1
DDT	<0.2	<0.2	<0.1	<0.2	<0.1
Fenitrothion	<0.2	<0.2	<0.1	<0.2	<0.1
Chlorpyriphos	<0.2	<0.2	<0.1	<0.2	<0.1
Bromophosethyl	<0.2	<0.2	<0.1	<0.2	<0.1
Ethion	<0.2	<0.2	<0.1	<0.2	<0.1
Aroclor 1016	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1221	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1232	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1242	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1248	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1254	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1260	<0.1	<0.1	<0.2	<0.1	<0.2

* The Aldrin has very similar retention time as Chlorpyriphos, and its concentration is too low for the GC/MS. If it is thought necessary the GC conditions can be changed to see if they can be resolved.

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OC Pesticides & PCB's

Our Reference	Blank (Soil)	Recovery
Your Reference		
Units	mg/kg	%
α-BHC	<0.1	75
HCB	<0.1	82
Lindane	<0.1	95
Heptachlor	<0.1	75
Aldrin	<0.1	72
Heptachlor Epoxide	<0.1	-
Oxychlordane	<0.1	85
DDE	<0.1	95
Dieldrin	<0.1	80
Endrin	<0.1	70
DDD	<0.1	75
DDT	<0.1	75
Fenitrothion	<0.1	-
Chlorpyriphos	<0.1	-
Bromophosethyl	<0.1	-
Ethion	<0.1	-
Aroclor 1016	<0.2	-
Aroclor 1221	<0.2	-
Aroclor 1232	<0.2	-
Aroclor 1242	<0.2	-
Aroclor 1248	<0.2	-
Aroclor 1254	<0.2	80
Aroclor 1260	<0.2	-

D.J. DOUGLAS

Project No. 19109

Petroleum Hydrocarbons

Our Reference	4180-1	4180-2	4180-3	4180-4	4180-5
Your Reference	B1, GW	B2, GW	B3, GW	B4, GW	B5, GW
Sample Type	WATER	WATER	WATER	WATER	WATER
Units	mg/L	mg/L	mg/L	mg/L	mg/L
Hydrocarbons, C_6-C_9	<0.2	<0.2	0.7	<0.2	4.6
Hydrocarbons, C_{10}-C_{14}	<0.2	<0.2	<0.2	<0.2	<0.2
Hydrocarbons, C_{15}-C_{28}	<0.5	<0.5	<0.5	<0.5	<0.5

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Petroleum Hydrocarbons

Our Reference	4180-6	4180-7	4180-8	4180-9	4180-10
Your Reference	B5, 2.5M	B6, GW	B6, 2.0M	B6, 3.0M	B6, 4.0M
Sample Type	SOIL	WATER	SOIL	SOIL	SOIL
Units	mg/kg	mg/L	mg/kg	mg/kg	mg/kg
Hydrocarbons, C_6-C_9	<20	<0.2	<20	<20	<20
Hydrocarbons, C_{10}-C_{14}	<20	<0.2	156	<20	<20
Hydrocarbons, C_{15}-C_{28}	<50	<0.5	1118	<50	<50

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Petroleum Hydrocarbons

Our Reference	4180-11	4180-12	4180-13	4180-14	4180-15
Your Reference	B7, GW	B8, 0.5M	B10, 2.8M	B11, GW	B12, GW
Sample Type	WATER	SOIL	SOIL	WATER	WATER
Units	mg/L	mg/kg	mg/kg	mg/L	mg/L
Hydrocarbons, C_6-C_9	<0.2	<20	<20	<0.2	<0.2
Hydrocarbons, C_{10}-C_{14}	<0.2	<20	<20	<0.2	<0.2
Hydrocarbons, C_{15}-C_{28}	<0.5	<50	<50	<0.5	<0.5

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Petroleum Hydrocarbons

Our Reference	4180-16	4180-17	4180-18	4180-19	4180-20B
Your Reference	B12, 4.0M	B12, 5.5M	B13, GW	B14, GW	B14, 1.0M
Sample Type	SOIL	SOIL	WATER	WATER	SOIL
Units	mg/kg	mg/kg	mg/L	mg/L	mg/kg
Hydrocarbons, C_6-C_9	<20	<20	<0.2	<0.2	<20
Hydrocarbons, C_{10}-C_{14}	<20	<20	<0.2	<0.2	<20
Hydrocarbons, C_{15}-C_{28}	<50	<50	<0.5	<0.5	<50

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Petroleum Hydrocarbons

Our Reference	4180-23	4180-24	4180-30	4180-62	4180-65
Your Reference	B17, GW	B18, GW	103, 1.6W	201, 1.0M	203, 1.6W
Sample Type	WATER	WATER	WATER	SOIL	WATER
Units	mg/L	mg/L	mg/L	mg/kg	mg/L
Hydrocarbons, C_6-C_9	<0.2	<0.2	<0.2	<20	<0.2
Hydrocarbons, C_{10}-C_{14}	<0.2	<0.2	<0.2	<20	<0.2
Hydrocarbons, C_{15}-C_{28}	<0.5	<0.5	<0.5	<50	<0.5

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Petroleum Hydrocarbons

Our Reference	4180-66	Blank		Recovery
Your Reference	204, 1.5M			
Sample Type	SOIL	SOIL	WATER	
Units	mg/kg	mg/kg	mg/L	%
Hydrocarbons, C_6-C_9	<20	<20	<0.2	94
Hydrocarbons, C_{10}-C_{14}	<20	<20	<0.2	80
Hydrocarbons, C_{15}-C_{28}	<50	<50	<0.5	95

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DOUGLAS PARTNERS

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Petroleum Hydrocarbons

Our Reference	4139-1	4139-3	4139-4	4139-6	4139-8
Your Reference	TP101	TP104	TP106	TP108	TP111
Depth (M)	0.5	1.5	0.5	0.5	0.5
Units	ppm	ppm	ppm	ppm	ppm
Hydrocarbons, C_6-C_9	<20	<20	<20	<20	<20
Hydrocarbons, C_{10}-C_{14}	<20	<20	<20	<20	<20
Hydrocarbons, C_{15}-C_{28}	<50	<50	<50	<50	<50

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DOUGLAS PARTNERS

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Petroleum Hydrocarbons

Our Reference	4139-9	4139-11	4139-13	4139-14	4139-14 RPT
Your Reference	TP113	TP117	TP118	TP119	TP119
Depth	0.5	0.5	0.7	0.2	0.2
Units	ppm	ppm	ppm	ppm	ppm
Hydrocarbons, C_6-C_9	<20	<20	<20	<20	<20
Hydrocarbons, C_{10}-C_{14}	<20	<20	<20	<20	<20
Hydrocarbons, C_{15}-C_{28}	<50	<50	<50	<50	<50

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DOUGLAS PARTNERS

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Petroleum Hydrocarbons

Our Reference	4139-15	4139-17	4139-18	4139-20	4139-21
Your Reference	TP119	TP120	TP122	TP124	TP125
Depth	1.4	0.8	0.5	0.2	0.5
Units	ppm	ppm	ppm	ppm	ppm
Hydrocarbons, C_6-C_9	<20	<20	<20	<20	<20
Hydrocarbons, C_{10}-C_{14}	<20	<20	<20	<20	<20
Hydrocarbons, C_{15}-C_{28}	<50	<50	<50	<50	<50

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Petroleum Hydrocarbons

Our Reference	Blank	Spike Concentration in 10g Soil	Recovery
Your Reference			
Depth			
Units	ppm	ppm	%
Hydrocarbons, C_6-C_9	<20	45 ppm as C_8	97
Hydrocarbons, C_{10}-C_{14}	<20	45 ppm as C_{12}	74
Hydrocarbons, C_{15}-C_{28}	<50	45 ppm as C_{22} & C_{28}	93

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Polynuclear Aromatic Hydrocarbons

Our Reference	4139-1	4139-5	4139-7	4139-12	4139-16
Your Reference	TP101	TP107	TP110	TP117	TP119
Depth (M)	0.5	0.5	0.5	1.5	2.5
Units	ppm	ppm	ppm	ppm	ppm
Naphthalene	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	<0.1	<0.1	<0.1	0.1	<0.1
Anthracene	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (a) anthracene	<0.1	<0.1	<0.1	0.1	<0.1
Chrysene	<0.1	<0.1	<0.1	0.1	<0.1
Benzo (b) fluoranthene	<0.1	<0.1	<0.1	0.1	<0.1
Benzo (k) fluoranthene	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (a) pyrene	<0.1	<0.1	<0.1	0.1	<0.1
Dibenzo (ah) anthracene	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (ghi) perylene	<0.1	<0.1	<0.1	0.1	<0.1
Indeno (1,2,3-cd) pyrene	<0.1	<0.1	<0.1	0.2	<0.1

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Polynuclear Aromatic Hydrocarbons

Our Reference	4139-20	Blank	Spike Concentration in 10g Soil	Recovery
Your Reference	TP124			
Depth (M)	0.2			
Units	ppm	ppm	ppm	%
Naphthalene	<0.1	<0.1	1.0	108
Acenaphthylene	<1.0	<1.0	1.0	97
Acenaphthene	<0.1	<0.1	1.2	99
Fluorene	<0.1	<0.1	0.3	104
Phenanthrene	<0.1	<0.1	0.2	128
Anthracene	<0.1	<0.1	0.1	139
Fluoranthene	<1.0	<1.0	0.6	116
Pyrene	<0.1	<0.1	0.6	176
Benzo (a) anthracene	<0.1	<0.1	0.3	153
Chrysene	<0.1	<0.1	0.3	198
Benzo (b) fluoranthene	<0.1	<0.1	0.3	138
Benzo (k) fluoranthene	<0.1	<0.1	0.3	126
Benzo (a) pyrene	<0.1	<0.1	0.3	178
Dibenzo (ah) anthracene	<0.1	<0.1	0.3	117
Benzo (ghi) perylene	<0.1	<0.1	0.3	156
Indeno (1,2,3-cd) pyrene	<0.1	<0.1	0.3	128

REPORT NO. 4139

DOUGLAS PARTNERS

PROJECT NO : 19109

OC Pesticides

Our Reference	4139-1	4139-2	4139-6	4139-7	4139-10	4139-11
Your Reference	TP101	TP104	TP108	TP110	TP114	TP117
Depth (M)	0.5	0.5	0.5	0.5	0.5	0.5
Units	ppm	ppm	ppm	ppm	ppm	ppm
α-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Oxychlordane	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDD	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDT	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

REPORT NO. 4139

DOUGLAS PARTNERS

PROJECT NO : 19109

OC Pesticides

Our Reference	4139-18	4139-19	Blank	Spike Concentration in 10g Soil	Recovery
Your Reference	TP122	TP123			
Depth (M)	0.5	0.5			
Units	ppm	ppm	ppm	ppm	%
α-BHC	<0.1	<0.1	<0.1	0.2	108
HCB	<0.1	<0.1	<0.1	0.2	110
Lindane	<0.1	<0.1	<0.1	0.2	108
Heptachlor	<0.1	<0.1	<0.1	0.2	106
Aldrin	<0.1	<0.1	<0.1	0.2	110
Heptachlor Epoxide	<0.1	<0.1	<0.1	0.2	-
Oxychlordane	<0.1	<0.1	<0.1	0.2	-
DDE	<0.1	<0.1	<0.1	0.2	110
Dieldrin	<0.1	0.1	<0.1	0.2	110
Endrin	<0.1	<0.1	<0.1	0.2	116
DDD	<0.1	<0.1	<0.1	0.2	112
DDT	<0.1	<0.1	<0.1	0.2	88

REPORT NO. 4139

CH2MHill (1999a) Results

Table 12.2: Targeted Sampling Location – Administration Building

Sample Number	Sample Depth (m)	Sample Date	Metals								PCB (mg/kg)	OCPs (mg/kg)	OPP (mg/kg)	TPH		BTEX				Total Phenols (mg/kg)	Total PAHs (mg/kg)	Benzo (a)pyrene (mg/kg)
			As (mg/kg)	Cd (mg/kg)	Cr (Mg/kg)	Cu (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Hg (mg/kg)				C6-C9 (mg/kg)	C10-C36 (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)			
PQL			**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0.1**	**0.1**	**0.1**	**0.1**	**2**	**250**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.05**	**0.05**
BH25	0.2	1/8/99	9	0.5	22	176	60	251	997	0.05	0.05	1.18	0.32	1	<250	0.1	0.1	0.1	0.2	0.325	0.1	0.1
Criteria			500	100	500	5000	3000	1500	35000	75	50	10	10	65	1000	1	1.4	3.1	14	42500	100	5

Table 12.3: Targeted Sampling Location – Tarpaulin Factory

Sample Number	Sample Depth (m)	Sample Date	Metals								PCB (mg/kg)	OCPs (mg/kg)	OPP (mg/kg)	TPH		Total Phenols (mg/kg)	Total PAHs (mg/kg)	Benzo (a)pyrene (mg/kg)
			As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Hg (mg/kg)				C6-C9 (mg/kg)	C10-C36 (mg/kg)			
PQL			**1**	**0.5**	**1**	**1**	**1**	**1**	**1**	**0.1**	**0.05**	**0.1**	**0.1**	**1**	**250**	**0.05**	**0.05**	**0.05**
BH33	0-0.15	1/8/99	7	0.5	31	55	1	176	212	0.2	0.05	0.29	0.32	1	<250	0.325	0.07	0.07
BH34	0-0.15	1/8/99	6	0.5	16	6	0.5	24	17	0.05	0.05	0.29	0.32	1	<250	0.325	0.08	0.08
Criteria			500	100	500	5000	3000	1500	35000	75	50	10	10	65	1000	42,500	100	5

Table 12.4: Targeted Sampling Location – Gas Store

Sample Number	Sample Depth (m)	Sample Date	Metals								OCPs (mg/kg)	OPP (mg/kg)	TPH		BTEX				Total Phenols (mg/kg)	Total PAHs (mg/kg)	Benzo (a)pyrene (mg/kg)
			As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Hg (mg/kg)			C6-C9 (mg/kg)	C10-C36 (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)			
PQL			**1**	**0.5**	**1**	**1**	**1**	**1**	**1**	**0.1**			**1**	**250**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.05**	**0.05**
BH20	0-0.15	1/7/99	108	0.5	6	72	13	24	60	0.05	0	0	1	<250	0.1	0.1	0.1	0.2	0.65	0.05	0.05
Criteria			500	100	500	5000	3000	1500	35000	75	10	10	65	1000	1	1.4	3.1	14	42,500	100	5

Table 12.9: Targeted Sampling Location – Former Marshalling Yards

Sample Number	Sample Depth (m)	Sample Date	Metals										TPH		BTEX				Total Phenols (mg/kg)	Total PAHs (mg/kg)	Benzo (a)pyrene (mg/kg)
			As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Hg (mg/kg)	OCPs (mg/kg)	OPP (mg/kg)	C6-C9 (mg/kg)	C10-C36 (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)			
PQL			**1**	**0.5**	**1**	**1**	**1**	**1**	**1**	**0.1**	**0.1**	**0.1**	**2**	**250**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.05**	**0.05**
BH01	0-0.1	1/6/99	24	0.5	14	81	37	34	102	0.05	0	0	1	339	----	----	----	----	3	0.25	0.25
BH02	0-0.1	1/6/99	327	0.5	7	99	10	104	143	0.05	0	0	1	560	----	----	----	----	0.65	0.5	0.5
BH03	0-0.15	1/7/99	101	0.5	7	55	13	47	123	0.2	0.29	0.32	1	125	0.1	0.1	0.1	0.2	0.65	0.05	0.05
BH03	0-0.15D	1/7/99	103	0.5	8	52	13	37	110	0.3	0	0	1	125	0.1	0.1	0.1	0.2	0.65	0.05	0.05
BH04	0.3-0.5	1/7/99	14	0.5	5	65	20	84	78	0.05	0.05	0	1	125	0.1	0.1	0.1	0.2	0.65	0.05	0.05
BH07	0-0.1	1/6/99	9	0.5	13	164	8	38	53	0.05	0	0	1	125	----	----	----	----	0.65	0.05	0.05
BH09	0-0.1	1/6/99	15	0.5	10	49	21	23	115	0.05	0	0	1	125	----	----	----	----	0.65	0.05	0.05
BH10	0-0.15	1/6/99	17	0.5	10	20	3	27	46	0.05	0	0	1	125	0.1	0.1	0.1	0.2	0.65	0.05	0.05
BH14	0.3-0.5	1/7/99	71	0.5	10	206	15	110	335	0.1	0	0	1	125	0.1	0.1	0.1	0.2	0.65	0.05	0.05
BH15	0-0.1	1/7/99	58	0.5	4	46	15	18	232	0.05	0	0	1	125	0.1	0.1	0.1	0.2	0.65	0.05	0.05
BH18	0-0.15	1/7/99	68	0.5	13	214	19	446	1680	0.05	0.35	0.32	1	188	0.1	0.1	0.1	0.2	0.65	0.2	0.2
BH23	0-0.2	1/7/99	13	0.5	13	29	1	20	35	0.05	0	0	1	125	0.1	0.1	0.1	0.2	0.65	0.05	0.05
BH24	0-0.1	1/6/99	186	4	15	304	22	200	426	0.1	0.29	0.32	1	281	0.1	0.1	0.1	0.2	0.65	0.9	0.9
BH26	0-0.1	1/7/99	125	0.5	8	62	12	68	184	0.05	0	0	1	216	0.1	0.1	0.1	0.2	0.65	0.9	0.9
BH27	0-0.1	1/7/99	176	39	54	708	40	590	1410	0.8	0.3	0.32	1	536	0.1	0.1	0.1	0.2	0.65	0.2	0.2
BH28	0.3-0.5	1/6/99	19	0.5	8	89	13	70	149	0.05	0	0	1	125	0.1	0.1	0.1	0.2	0.65	0.2	0.2
BH29	0.3-0.5	1/6/99	133	0.5	5	88	5	19	43	0.05	0	0	1	125	----	----	----	----	0.65	0.05	0.05
BH30	0-0.1	1/6/99	257	0.5	6	332	16	35	522	0.2	0.29	0.32	1	125	----	----	----	----	0.65	0.05	0.05
BH31	0-0.1	1/7/99	11	0.5	6	42	16	39	85	0.05	0	0	1	125	0.1	0.1	0.1	0.2	0.65	0.05	0.05
BH32	0-0.1	1/6/99	12	0.5	11	30	4	42	144	0.05	0	0	1	125	----	----	----	----	0.65	0.05	0.05
BH38	0-0.1	1/6/99	8	0.5	8	31	10	31	52	0.05	0	0	1	584	----	----	----	----	0.65	0.2	0.2
Count			21	21	21	21	21	21	21	21	21	21	21	21	13	13	13	13	21	21	21
Maximum			327	39	54	708	40	590	1680	1	0	0	1	584	0	0	0	0	3	1	1

Table 12.9: Targeted Sampling Location – Former Marshalling Yards

Sample Number	Sample Depth (m)	Sample Date	Metals										TPH		BTEX				Total Phenols (mg/kg)	Total PAHs (mg/kg)	Benzo (a)pyrene (mg/kg)
			As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Hg (mg/kg)	OCPs (mg/kg)	OPP (mg/kg)	C6-C9 (mg/kg)	C10-C36 (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)			
PQL			**1**	**0.5**	**1**	**1**	**1**	**1**	**1**	**0.1**	**0.1**	**0.1**	**2**	**250**	**0.1**	**0.1**	**0.1**	**0.2**	**0.05**	**0.05**	**0.05**
Minimum			8.00	0.50	4.00	20.00	1.00	18.00	35.00	0.05	0.00	0.00	1.00	125.00	0.10	0.10	0.10	0.20	0.65	0.05	0.05
Average			83.19	2.50	11.19	131.71	14.90	99.14	288.90	0.12	0.07	0.08	1.00	212.10	0.10	0.10	0.10	0.20	0.76	0.19	0.19
SD			90.17	8.40	10.31	159.67	9.79	147.32	438.74	0.17	0.13	0.14	0.00	156.83	0.00	0.00	0.00	0.00	0.51	0.26	0.26
ta=0.05, n-0			1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.78	1.78	1.78	1.78	1.72	1.72	1.72
95% UCL			117.13	5.66	15.07	191.81	18.59	154.59	454.03	0.18	0.12	0.13	1.00	271.12	0.10	0.10	0.10	0.20	0.95	0.29	0.29
Criteria			500	100	500	5000	3000	1500	35000	75	10	10	65	1000	1	1.4	3.1	14	42,500	100	5
Proc B			0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 12.11: Targeted Sampling Location – Stockpile 4										
Sample Number	Sample Depth (m)	Sample Date	Metals							
			As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Hg (mg/kg)
PQL			1	1	1	1	1	1	1	0.1
SP4A9.0	8.8-9	1/13/99	21	4	13	220	15	173	422	0.05
SP4A9.0	8.8-9	1/13/99	20	4	16	205	15	169	432	0.05
SP4A13.0	12.8-13	1/13/99	34	0.5	29	95	10	146	150	0.4
SP4B1.5	1.3-1.5	1/13/99	17	0.5	13	57	11	57	99	0.05
SP4B7.5	7.3-7.5	1/13/99	38	0.5	11	141	10	523	181	0.05
SP4C1.5	1.3-1.5	1/13/99	97	0.5	13	94	33	63	149	0.05
SP4C14.5	14.3-14.5	1/13/99	44	0.5	26	106	16	79	161	0.05
SP4D0.1	0-0.1	1/13/99	9	0.5	16	17	1	23	20	0.05
SP4D6.0	5.8-6	1/13/99	34	0.5	20	74	9	62	61	0.05
SP4E0.1	0-0.1	1/13/99	7	0.5	14	10	1	13	13	0.05
SP4E4.5	4.3-4.5	1/13/99	21	0.5	15	40	25	27	131	0.05
SP4F10.5	10.3-10.5	1/13/99	41	0.5	22	88	11	97	139	0.05
SP4F3.0	2.8-3	1/13/99	8	0.5	14	58	10	62	60	0.05
SP4F3.0	2.8-3	1/13/99	8	0.5	14	54	6	53	53	0.05
SP4G10.5	10.3-10.5	1/13/99	33	0.5	18	94	12	192	156	0.05
SP4G3.0	2.8-3	1/13/99	10	0.5	12	19	2	24	38	0.05
SP4H12.0	11.8-12	1/13/99	49	1	20	120	16	162	219	0.05
SP4H18.0	17.8-18	1/13/99	31	0.5	19	62	14	89	159	0.05
Count			18	18	18	18	18	18	18	18
Maximum			97	4	29	220	33	523	432	0
Minimum			7.00	0.50	11.00	10.00	1.00	13.00	13.00	0.05
Average			29.00	0.92	16.94	86.33	12.06	111.89	146.83	0.07
SD			21.73	1.13	4.94	58.12	7.91	117.42	117.83	0.08
ta=0.05, n-0			1.74	1.74	1.74	1.74	1.74	1.74	1.74	1.74
95% UCL			37.91	1.38	18.97	110.16	15.30	160.03	195.15	0.10
Criteria			500	100	500	5000	3000	1500	35000	75
Proc B			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CH2MHill (1999b) Results

8.2 INVESTIGATION RESULTS

The results for the laboratory analysis of samples collected during both Part A and Part B assessments from the targeted areas of concern are presented below. The chain-of-custody documentation and laboratory analytical reports are presented in **Appendices D and E**.

Task 1: Tarpaulin Factory

The results of the laboratory analysis of the soil and dust samples collected from beneath the Tarpaulin Factory are presented in **Table 8.1** to **Table 8.6** respectively.

The soil analytical results indicate that the 95% UCL data for all analytes are below the respective site criteria, except for Pb (2,035 mg/kg), which exceeds the criteria of 1,500 mg/kg (see **Table 8.1**). Furthermore, the concentration of Pb in sample T15/0.1 (15.2 g/kg) exceeds the criteria by more than 2.5 times and is therefore a hotspot. On this basis, this sample location may warrant remediation. It is apparent from the range of data for Pb within the tarpaulin factory that this hotspot is skewing the data set, thereby artificially inflating the 95% UCL for the data set. By removing the hotspot from the data set, a more realistic assessment of the 95% UCL average concentration of and beneath the tarpaulin factory is obtained. When the data is re-analysed without the hotspot, the 95% UCL for lead decreases from 2,035 mg/kg to 512 mg/kg, which is below the site criteria (see **Table 8.2**).

To assess the nature of the lead hotspot identified at T15, sample T15/0.1 was reanalysed for lead. The results indicated a concentration of 175 mg/kg (see **Table 8.3**). This concentration is less than the site criteria, and significantly below the concentration of 15.2 g/kg. This finding indicates a degree of heterogeneity in the matrix and chemical composition of the sample. The high concentration of 15.2 g/kg may indicate that a piece of lead metal was included in the first analysis. In an attempt to further clarify the heterogeneity identified above, sample T15/0.1 was re-homogenised, and six sub-samples (T15/0.1 1_CHK to T15/0.1 6_CHK) analysed for lead. The analytical results indicated lead concentrations ranging from 175 mg/kg to 2,230 mg/kg with an average concentration of 1,129 mg/kg (see **Table 8.3**). At this level, the average concentration of lead within the sample is elevated above background levels but nonetheless, is less than the investigation criteria of 1,500 mg/kg.

Table 8.1: Targeted Sampling Location - Tarpaulin Factory - Repeat Analysis of Sample T15/0.1

Analysis Sequence	Sample No.	Pb mg/kg	Analysis Sequence	Sample No.	Pb mg/kg
Initial	T15/0.1	15,200	Check	T15/0.1 3_CHK	1190
Check	T15/0.1	175	Check	T15/0.1 4_CHK	2230
Check	T15/0.1 1_CHK	175	Check	T15/0.1 5_CHK	1320
Check	T15/0.1 2_CHK	702	Check	T15/0.1 6_CHK	2110
Mean = 1,129 ; Standard Deviation = 838					

* Mean excludes the initial result of 15.2 g/kg

Table 8.2: Targeting Sampling Location - Tarpaulin Factory

Sample Number	Sample Depth (m)	Sample Date	Metals								PCB	OCPs	OPP	TPH		BTEX				Total Phenols	Total PAHs	Benzo (a)pyrene
			As mg/kg	Cd mg/kg	Cr mg/kg	Cu mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Hg mg/kg	mg/kg	mg/kg	mg/kg	C6-C9 mg/kg	C10-C36 mg/kg	Benzene mg/kg	Toluene mg/kg	Ethylene mg/kg	Xylene mg/kg	mg/kg	mg/kg	mg/kg
PQL			1	1	1	1	1	1	1	0.1	1	0.58	0.64	2	250	0.2	0.2	0.2	0.2	1	2.1	0.1
BH33	0-0.15	8/01/99	7	nd	31	55	1	176	212	0.2	nd	nd	nd	nd	nd	N/A	N/A	N/A	N/A	1.625	2.17	0.07
BH34	0-0.15	8/01/99	6	nd	16	6	nd	24	17	nd	nd	nd	nd	nd	nd	N/A	N/A	N/A	N/A	1.625	2.18	0.08
T1/0.1	0-0.1	26/03/99	13	2	22	90	8	607	741	N/A	N/A	nd	nd	nd	231	nd	nd	nd	nd	0.1	8.7	0.5
T2/0.1	0-0.1	26/03/99	38	10	32	979	29	1150	1880	N/A	N/A	0.33	nd	nd	423	nd	nd	nd	nd	0.9	16.1	nd
T3/0.1	0-0.1	26/03/99	16	3	24	113	12	540	1250	N/A	N/A	0.07	nd	nd	274	nd	nd	nd	nd	0.2	6.7	0
T4/0.1	0-0.1	26/03/99	10	nd	27	12	2	55	102	N/A	N/A	nd	nd	nd	107	nd	nd	nd	nd	nd	nd	nd
T5/0.1	0-0.1	26/03/99	36	11	50	410	29	1580	2520	N/A	N/A	0.49	nd	7	2130	nd	nd	nd	nd	5.2	24.3	1
T6/0.1	0-0.1	26/03/99	10	3	26	157	8	567	1090	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.3	0.1
T7/0.1	0-0.1	26/03/99	6	nd	32	21	5	60	77	N/A	N/A	nd	nd	3	nd	nd	nd	nd	nd	nd	nd	nd
T8/0.1	0-0.1	26/03/99	5	nd	16	14	1	14	20	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T9/0.1	0-0.1	26/03/99	25	3	29	146	14	1530	1080	N/A	N/A	0.09	nd	nd	654	nd	nd	nd	nd	0.8	21.2	0.8
T10/0.1	0-0.1	26/03/99	10	nd	18	21	1	29	53	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T11/0.1	0-0.1	26/03/99	5	nd	33	25	5	46	99	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T12/0.1	0-0.1	26/03/99	6	nd	30	23	3	54	37	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T13/0.1	0-0.1	26/03/99	12	1	48	63	6	539	272	N/A	N/A	nd	nd	9	146	nd	nd	nd	nd	0.7	2.4	nd
T14/0.1	0-0.1	26/03/99	8	nd	40	32	3	165	137	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	0.2	nd	nd
T15/0.1	0-0.1	26/03/99	8	1	29	71	3	**15,200**	210	N/A	N/A	bd	nd	nd	nd	nd	nd	nd	nd	nd	0.4	nd
T16/0.1	0-0.1	26/03/99	3	nd	25	24	3	219	21	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T17/0.1	0-0.1	26/03/99	7	nd	40	30	5	65	53	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.3	0.1
T18/0.1	0-0.1	26/03/99	7	nd	39	20	4	41	31	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.5	0.1
T19/0.1	0-0.1	26/03/99	6	nd	38	23	4	67	78	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T20/0.1	0-0.1	26/03/99	6	nd	37	34	6	183	141	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	10.3	0.6
T21/0.1	0-0.1	26/03/99	4	1	13	18	3	99	179	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T22/0.1	0-0.1	26/03/99	7	nd	19	14	4	77	71	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.2	nd
Count			24	24	24	24	24	24	24	2	2	24	24	24	24	22	22	22	22	24	24	24
Maximum			38	11	50	979	29	15200	2520	0	1	1	0	9	2355	0	0	0	0	6	26	1
Minimum			3	1	13	6	1	14	17	0	1	0	0	1	125	0	0	0	0	1	1	0
Average			11	2	30	100	7	962	432	0	1	0	0	2	330	0	0	0	0	1	5	0
SD			9	3	10	206	8	3068	664	0	0	0	0	2	497	0	0	0	0	1	4	0
ta=0.05, n-1			2	2	2	2	2	2	2	6	6	2	2	2	2	2	2	2	2	2	2	2
95% UCL			14	3	33	172	9	**2035**	665	1	1	0	0	2	504	0	0	0	0	2	8	0
Criteria			500	100	500	5,000	3,000	1,500	35,000	75	50	10	10	65	1,000	1	1	3	14	42,500	100	5
Proc B			0	0	0	0	0	202	0	0	0	0	0	0	3	0	0	0	0	0	0	0

N/A - Not analysed

Table 8.3: Targeted Sampling Location - Tarpaulin Factory (Without Hotspot)

Sample Number	Sample Depth (m)	Sample Date	Metals								PCB	OCPs	OPP	TPH		BTEX				Total Phenols	Total PAHs	Benzo (a)pyrene
			As mg/kg	Cd mg/kg	Cr mg/kg	Cu mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Hg mg/kg	mg/kg	mg/kg	mg/kg	C6-C9 mg/kg	C10-C36 mg/kg	Benzene mg/kg	Toluene mg/kg	Ethylene mg/kg	Xylene mg/kg	mg/kg	mg/kg	mg/kg
PQL			1	0.5	1	1	1	1	1	0.1	0.05			2	250	0.2	0.2	0.2	0.2	0.05	0.05	0.05
BH33	0-0.15	8/01/99	7	nd	31	55	1	176	212	0.2	nd	nd	nd	nd	nd	N/A	N/A	N/A	N/A	1.625	2.17	0.07
BH34	0-0.15	8/01/99	6	nd	16	6	nd	24	17	nd	nd	nd	nd	nd	nd	N/A	N/A	N/A	N/A	1.625	2.18	0.08
T1/0.1	0-0.1	26/03/99	13	2	22	90	8	607	741	N/A	N/A	nd	nd	nd	231	nd	nd	nd	nd	0.1	8.7	0.5
T2/0.1	0-0.1	26/03/99	38	10	32	979	29	1150	1880	N/A	N/A	0.33	nd	nd	423	nd	nd	nd	nd	0.9	16.1	nd
T3/0.1	0-0.1	26/03/99	16	3	24	113	12	540	1250	N/A	N/A	0.07	nd	nd	274	nd	nd	nd	nd	0.2	6.7	0
T4/0.1	0-0.1	26/03/99	10	nd	27	12	2	55	102	N/A	N/A	nd	nd	nd	107	nd	nd	nd	nd	nd	nd	nd
T5/0.1	0-0.1	26/03/99	36	11	50	410	29	1580	2520	N/A	N/A	0.49	nd	7	2130	nd	nd	nd	nd	5.2	24.3	1
T6/0.1	0-0.1	26/03/99	10	3	26	157	8	567	1090	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.3	0.1
T7/0.1	0-0.1	26/03/99	6	nd	32	21	5	60	77	N/A	N/A	nd	nd	3	nd	nd	nd	nd	nd	nd	nd	nd
T8/0.1	0-0.1	26/03/99	5	nd	16	14	1	14	20	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T9/0.1	0-0.1	26/03/99	25	3	29	146	14	1530	1080	N/A	N/A	0.09	nd	nd	654	nd	nd	nd	nd	0.8	21.2	0.8
T10/0.1	0-0.1	26/03/99	10	nd	18	21	1	29	53	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T11/0.1	0-0.1	26/03/99	5	nd	33	25	5	46	99	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T12/0.1	0-0.1	26/03/99	6	nd	30	23	3	54	37	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T13/0.1	0-0.1	26/03/99	12	1	48	63	6	539	272	N/A	N/A	nd	nd	9	146	nd	nd	nd	nd	0.7	2.4	nd
T14/0.1	0-0.1	26/03/99	8	nd	40	32	3	165	137	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	0.2	nd	nd
T16/0.1	0-0.1	26/03/99	3	nd	25	24	3	219	21	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T17/0.1	0-0.1	26/03/99	7	nd	40	30	5	65	53	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.3	0.1
T18/0.1	0-0.1	26/03/99	7	nd	39	20	4	41	31	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.5	0.1
T19/0.1	0-0.1	26/03/99	6	nd	38	23	4	67	78	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T20/0.1	0-0.1	26/03/99	6	nd	37	34	6	183	141	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	10.3	0.6
T21/0.1	0-0.1	26/03/99	4	1	13	18	3	99	179	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T22/0.1	0-0.1	26/03/99	7	nd	19	14	4	77	71	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.2	nd
Count			23	23	23	23	23	23	23	2	2	23	23	21	23	21	21	21	21	23	23	23
Maximum			38	11	50	979	29	1580	2520	0	0	0	0	9	2355	0	0	0	0	6	26	1
Minimum			3	1	13	6	1	14	17	0	0	0	0	1	125	0	0	0	0	1	1	0
Average			11	2	30	101	7	343	442	0	0	0	0	2	340	0	0	0	0	1	6	0
SD			9	3	10	210	8	472	677	0	0	0	0	2	507	0	0	0	0	1	7	0
ta=0.05, n-1			2	2	2	2	2	2	2	6	6	2	2	2	2	2	2	2	2	2	2	2
95% UCL			14	3	33	177	10	512	684	0	0	0	0	3	517	0	0	0	0	2	8	0
Criteria			500 1'	100	500	5,000	3,000	1,500	35,000	75	50	10	10	65	1,000	1	1	3	14	42,500	100	5
Proc B			0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0

N/A not analysed

To delineate the extent of the area of elevated lead contamination identified in sample T15/0.1, four additional locations (T15A, T15B, T15C and T15D) were sampled on a 2 m grid on a north-south-east-west orientation from the original sample location. Additional samples were collected from the surface soils (i.e., 0-0.1m) at each location and analysed for lead. The analytical results for these additional analyses are presented in **Table 8.4** with the other samples collected from within the tarpaulin factory. The data set also includes the average concentration of lead from the re-analysis of T15/0.1 (see **Table 8.3**). It is evident that the 95% UCL for lead (484 mg/kg) is below the criteria for lead (1,500 mg/kg). Further, there are no sample concentrations exceeding the site criteria by greater than 250 percent. In addition, the Procedure B value indicates sufficient characterisation of the area. On the basis of these results no further investigation is warranted.

A leachability test was undertaken on sample T15/0.1 to quantify the potential mobility of lead from particulate contaminants into the surrounding clay soils. The analytical results of the TCLP test are presented in **Table 8.5**. The result of the TCLP test indicates that the concentration of lead in the leachate is 0 mg/L. This concentration is less than the inert waste criteria (0.5 ng/L) detailed in Table A3 of the NSW EPA Environmental Guidelines: *Assessment, Classification and Management of Non-Liquid Wastes* (1998).

0-3mg/L.

Table 8.4: Targeted Sampling Location - Tarpaulin Factory - Additional Samples

Sample Number	Sample Depth (m)	Sample Date	Metals								PCB			TPH		BTEX				Total	Total	Benzo
			As	Cd	Cr	Cu	Ni	Pb	Zn	Hg	mg/kg	OCPs	OPP	C6-C9	C10-C36	Benzene	Toluene	Ethylene	Xylene	Phenols	PAHs	(a)pyrene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PQL			1	0.5	1	1	1	1	1	0.1	0.05			2	250	0.2	0.2	0.2	0.2	0.05	0.05	0.05
BH33	0-0.15	8/01/99	7	nd	31	55	1	176	212	0.2	nd	nd	nd	nd	nd	N/A	N/A	N/A	N/A	1.625	2.17	0.07
BH34	0-0.15	8/01/99	6	nd	16	6	nd	24	17	nd	nd	nd	nd	nd	nd	N/A	N/A	N/A	N/A	1.625	2.18	0.08
T1/0.1	0-0.1	26/03/99	13	2	22	90	8	607	741	N/A	N/A	nd	nd	nd	231	nd	nd	nd	nd	0.1	8.7	0.5
T2/0.1	0-0.1	26/03/99	38	10	32	979	29	1150	1880	N/A	N/A	0.33	nd	nd	423	nd	nd	nd	nd	0.9	16.1	nd
T3/0.1	0-0.1	26/03/99	16	3	24	113	12	540	1250	N/A	N/A	0.07	nd	nd	274	nd	nd	nd	nd	0.2	6.7	0
T4/0.1	0-0.1	26/03/99	10	nd	27	12	2	55	102	N/A	N/A	nd	nd	nd	107	nd	nd	nd	nd	nd	nd	nd
T5/0.1	0-0.1	26/03/99	36	11	50	410	29	1580	2520	N/A	N/A	0.49	nd	7	2130	nd	nd	nd	nd	5.2	24.3	1
T6/0.1	0-0.1	26/03/99	10	3	26	157	8	567	1090	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.3	0.1
T7/0.1	0-0.1	26/03/99	6	nd	32	21	5	60	77	N/A	N/A	nd	nd	3	nd	nd	nd	nd	nd	nd	nd	nd
T8/0.1	0-0.1	26/03/99	5	nd	16	14	1	14	20	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T9/0.1	0-0.1	26/03/99	25	3	29	146	14	1530	1080	N/A	N/A	0.09	nd	nd	654	nd	nd	nd	nd	0.8	21.2	0.8
T10/0.1	0-0.1	26/03/99	10	nd	18	21	1	29	53	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T11/0.1	0-0.1	26/03/99	5	nd	33	25	5	46	99	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T12/0.1	0-0.1	26/03/99	6	nd	30	23	3	54	37	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T13/0.1	0-0.1	26/03/99	12	1	48	63	6	539	272	N/A	N/A	nd	nd	9	146	nd	nd	nd	nd	0.7	2.4	nd
T14/0.1	0-0.1	26/03/99	8	nd	40	32	3	165	137	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	0.2	nd	nd
T16/0.1	0-0.1	26/03/99	3	nd	25	24	3	219	21	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T17/0.1	0-0.1	26/03/99	7	nd	40	30	5	65	53	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.3	0.1
T18/0.1	0-0.1	26/03/99	7	nd	39	20	4	41	31	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.5	0.1
T19/0.1	0-0.1	26/03/99	6	nd	38	23	4	67	78	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T20/0.1	0-0.1	26/03/99	6	nd	37	34	6	183	141	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	10.3	0.6
T21/0.1	0-0.1	26/03/99	4	1	13	18	3	99	179	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
T22/0.1	0-0.1	26/03/99	7	nd	19	14	4	77	71	N/A	N/A	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.2	nd
Count			23	23	23	23	23	27	23	23	23	23	23	21	23	21	21	21	21	23	23	23
Maximum			38	11	50	979	29	1580	2520	0	0	0	0	9	2355	0	0	0	0	6	26	1
Minimum			3	1	13	6	1	14	17	0	0	0	0	1	125	0	0	0	0	0	0	0
Average			11	2	30	101	7	340	442	0	0	0	0	2	319	0	0	0	0	1	5	0
SD			9	3	10	210	8	441	677	0	0	0	0	2	488	0	0	0	0	1	8	0
ta=0.05, n-1			2	2	2	2	2	2	2	6	6	2	2	2	2	2	2	2	2	2	2	2
95% UCL			14	3	33	177	10	484	684	1	0	0	0	3	494	0	0	0	0	1	8	0
Criteria			500	100	500	5,000	3,000	1500	35,000	75	50	10	10	65	1,000	1	1	3.1	14	42,500	100	5
Proc B			0	0	0	0	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0

N/A not analysed

Table 8.5: Targeted Sampling Location - Tarpaulin Factory – TCLP T15/0.1	
Soil	1,129 mg/kg
Leachate	0 mg/L 0.3
Inert Waste*	**0.5 mg/L**

* Table A3 NSW EPA Guidelines: *Assessment, Classification and Management of Non-Liquid Wastes* (1996)

The analytical results for the dust swab samples are presented in **Table 8.6**. Chemical analysis of the dust swab samples indicates concentrations of heavy metals and mid chain TPHs (C15-C28) at detectable levels. Qualitative assessment of the results by Mr Phil Cantrel of WorkCover Australia, indicates that these values are indicative of the levels encountered in inner Sydney city resulting from atmospheric fallout.

Table 8.6: Targeted Sampling Location - Tarpaulin Factory - Dust Swabs (ug/100cm2)

Sample Number	Sample Date	Metals							TPH			Total Phenols	Total PAHs	Benzo (a)pyrene
		As	Cd	Cr	Cu	Ni	Pb	Zn	C10-C14	C15-C28	C29-C36			
PQL		1	0.1	0.1	0.1	0.1	1	1	50	100	100	1.3	2.1	1
DT1	26/03/99	11	55	99	734	92	540	30400	nd	340	130	nd	nd	nd
DT2	26/03/99	3	26	68	242	48	617	1610	nd	3260	1100	nd	nd	nd
DT3	26/03/99	12	241	174	787	118	1150	8800	nd	830	293	nd	nd	nd
DT4	26/03/99	6	11	10	43	81	861	1150	nd	205	nd	nd	nd	nd
DT5	26/03/99	9	16	126	658	108	1100	2150	nd	139	nd	nd	nd	nd
DT6	26/03/99	15	32	238	875	209	6840	4400	169	4860	2270	nd	nd	nd
DT7	26/03/99	9	26	167	818	286	1800	3350	nd	1550	332	nd	nd	nd

Task 2: Wagon Repair Shed

The results of the laboratory analysis of the samples collected from beneath, and adjacent to, the sealed surface of the Wagon Repair Shed are presented in **Table 8.7**. The results indicate that the 95% UCL data for all analytes are below the respective site criteria.

However, the results indicate that the concentration of TPH C10-C36 in sample WRS2/0.1 (16,166 mg/kg) exceeds the site criteria by more than 2.5 times, and therefore is identified as a hotspot. On this basis, sample location WRS2/0.1 may warrant remediation.

In addition, concentrations of TPH C10-C36 elevated above background levels, and above the sensitive land use criteria of 1,000 m/kg were identified in samples WRS21/0.1 (3,470 mg/kg), WRS24/0.1 (2,400 mg/kg), WRS3/0.1 (2,093 mg/kg) and in samples WRS7/0.1, WRS17/0.1, WRS19/0.1, WRS22/0.1, and WRS32/0.1 at concentrations ranging from 1,096 mg/kg to 1,244 mg/kg.

It is apparent from the range of data for TPH C10-C36 that WRS2/0.1 is a statistical outlier (hotspot). The outlier skews the data set, thereby artificially inflating the 95% UCL value for the data set. By removing the hotspot WRS2/0.1 from the data set a more realistic assessment of the 95% UCL average concentration beneath the Wagon Repair Shed is obtained. When the data is reanalysed without the hotspot the revised 95%UCL for TPH C10-C36 drops from 1,914mg/kg to 1,048mg/kg (see **Table 8.8**).

Laboratory analysis of the subsurface (natural) soil samples collected from the hotspot and elevated TPH locations (WRS2/0.1, WRS21/0.1 and WRS24/0.1), indicates that samples

Coffey (2009c) Results

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Table 1 - Groundwater Result Summary Table – First Round of Assessment

Field_ID	MW101	MW102	MW103	MW104	MW105	MW106	MW107	MW108	MW110	MW111	MD17	MW5	MW6A	MW9	NW3
LocCode	MW101	MW102	MW103	MW104	MW105	MW106	MW107	MW108	MW110	MW111	MD17	MW5	MW6A	MW9	NW3
Sampled_Date-Time	19/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009	16/06/2009	16/06/2009	16/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009
SDG	SE70074	SE70074	SE70074	SE70074	SE70074	SE70044	SE70044	SE70044	SE70074	SE70074	SE70074	SE70074	SE70074	SE70074	SE70074
Matrix_Type	water	water	water	water	water	water	water	water	water	water	water	water	water	water	water

Method_Type	ChemName	Units	EQL	ANZECC 2000 Freshwater 95%															
TRH in Water (Semi Volatile)	TPH C 6 - C 9 Fraction	µg/L	40		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TPH C10 - C14 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	TPH C15 - C28 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
	TPH C29-C36 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
ESDAT Combined Compounds	TPH+C10 - C36 (Sum of total)	µg/L		**600**	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]
Trace HM (ICP-MS)-Dissolved	Arsenic	mg/L	0.001	**0.024**	<0.001	0.001	<0.001	<0.001	<0.001	0.004	0.002	<0.005	<0.001	<0.001	0.001	0.011	0.001	0.003	<0.001
	Cadmium	mg/L	0.0001	**0.0002**	0.0001	<0.0001	<0.0001	**0.0004**	**0.0002**	<0.0001	<0.0001	**<0.0005**	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	**0.0059**	**0.0021**
	Chromium (III+VI)	mg/L	0.001	**0.001**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper	mg/L	0.001	**0.0014**	**0.003**	**0.005**	**0.005**	**0.006**	**0.009**	**0.004**	**0.004**	**<0.005**	**0.011**	**0.005**	**0.006**	**0.005**	**0.005**	**0.012**	**0.003**
	Lead	mg/L	0.001	**0.0034**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.005**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Nickel	mg/L	0.001	**0.011**	**0.014**	0.002	0.002	**0.013**	**0.04**	<0.001	<0.001	**0.039**	<0.001	0.002	0.002	**0.065**	<0.001	**0.5**	**0.017**
	Zinc	mg/L	0.001	**0.008**	**0.076**	**0.13**	**0.07**	**0.13**	**0.23**	**0.06**	**0.051**	**0.12**	**0.075**	**0.06**	**0.077**	**0.26**	**0.063**	**2.3**	**0.37**
	Mercury (Filtered)	mg/L	0.0001	**0.0001**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cations	Calcium	mg/L	0.1		28	41	23	46	-	44	50	110	-	7.7	12	45	2.3	49	9.2
	Magnesium	mg/L	0.1		78	57	86	230	-	32	18	710	-	13	28	510	2.8	500	48
	Potassium	mg/L	0.2		6.1	9.7	5.4	9	-	5	5.5	19	-	2.1	3.2	21	1.8	36	3.2
	Sodium	mg/L	0.1		1100	850	140	2800	-	110	57	5200	-	490	710	3600	39	3500	880
Anions in water	Chloride	mg/L	0.08		1300	650	27	3700	-	76	44	8400	-	200	560	5900	19	6200	1300
Inorganics	Bicarbonate	mg/L	2		560	790	480	380	-	350	240	300	-	520	650	72	30	40	140
	Carbonate	mg/L	2		<2	<2	<2	<2	-	<2	<2	<2	-	<2	<2	<2	<2	<2	<2
	TDS	mg/L	5		3700	2300	640	7600	-	510[#3]	310[#3]	17000[#3]	-	1300	1600	11000	480	11000	2800

Comments
#1 ESDAT Combined with Non-Detect Multiplier of 0.5.
#2 ESDAT Combined.
#3 mg/L

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Table 2. Groundwater Result Summary Table – Second Round of Assessment

Field_ID	MD17	MW101	MW102	MW103	MW104	MW105	MW106	MW107
LocCode	MD17	MW101	MW102	MW103	MW104	MW105	MW106	MW107
Sampled_Date-Time	25/08/2009	26/08/2009	26/08/2009	26/08/2009	25/08/2009	25/08/2009	24/08/2009	24/08/2009
SDG	SE71739	SE71739	SE71739	SE71739	SE71739	SE71739	SE71662A	SE71662A
Matrix_Type	water	water	water	water	water	water	water	water

Method_Type	ChemName	Units	EQL	ANZECC 2000 Freshwater 95%								
TRH in Water (Semi Volatile)	TPH C 6 - C 9 Fraction	µg/L	40		-	-	-	-	-	-	-	-
	TPH C10 - C14 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100
	TPH C15 - C28 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200	<200
	TPH C29-C36 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200	<200
	TPH+C10 - C36 (Sum of total)	µg/L		**600**	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]
Trace HM (ICP-MS)-Dissolved	Arsenic	mg/L	0.001	**0.024**	0.003	<0.001	0.01	0.001	0.001	<0.001	0.003	0.002
	Cadmium	mg/L	0.0001	**0.0002**	<0.0001	<0.0001	<0.0001	<0.0001	**0.0003**	**0.0002**	<0.0001	<0.0001
	Chromium (III+VI)	mg/L	0.001	**0.001**	0.002	0.001	0.001	0.002	0.001	0.001	<0.001	<0.001
	Copper	mg/L	0.001	**0.0014**	**0.005**	**0.003**	<0.001	**0.027**	**0.006**	**0.008**	<0.001	**0.002**
	Lead	mg/L	0.001	**0.0034**	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001
	Nickel	mg/L	0.001	**0.011**	0.003	0.006	0.007	0.002	**0.017**	**0.022**	<0.001	<0.001
	Zinc	mg/L	0.001	**0.008**	**0.091**	**0.052**	**0.043**	**0.15**	**0.14**	**0.17**	**0.072**	**0.07**
	Mercury	mg/L	0.0005	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Anions	Chloride	mg/L	0.05		610	1500	560	33	3600	1500	74	52
Cation	Calcium	mg/L	0.1		10	19	35	19	37	13	39	47
	Magnesium	mg/L	0.1		32	97	57	73	180	42	26	17
	Potassium	mg/L	0.2		3.2	5.4	9.7	4.8	8.1	5.4	4.4	4.8
	Sodium	mg/L	0.1		940	1500	880	170	2400	1200	100	52
Inorganics	Alkalinity (Bicarbonate)	mg/L	2		760	680	830	400	390	71	340	260
	Alkalinity (total) as CaCO3	mg/L	2		<2	<2	<2	<2	<2	<2	<2	<2
	TDS	mg/L	5		1800	4100	2000	-	6600	3200	450	330

Comments

#1 ESDAT Combined.

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Table 2. Groundwater Result Summary Table – Second Round of Assessment

Field_ID	MW108	MW110	MW111	MW5	MW6A	MW9	NW3
LocCode	MW108	MW110	MW111	MW5	MW6A	MW9	NW3
Sampled_Date-Time	25/08/2009	26/08/2009	26/08/2009	25/08/2009	25/08/2009	25/08/2009	25/08/2009
SDG	SE71739	SE71739	SE71739	SE71739	SE71662A	SE71739	SE71662A
Matrix_Type	water	water	water	water	water	water	water

Method_Type	ChemName	Units	EQL	ANZECC 2000 Freshwater 95%							
TRH in Water (Semi Volatile)	TPH C 6 - C 9 Fraction	µg/L	40		-	-	-	-	-	-	-
	TPH C10 - C14 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100
	TPH C15 - C28 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200
	TPH C29-C36 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200
	TPH+C10 - C36 (Sum of total)	µg/L		**600**	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]
Trace HM (ICP-MS)-Dissolved	Arsenic	mg/L	0.001	**0.024**	0.003	<0.001	<0.001	0.009	0.001	0.002	0.001
	Cadmium	mg/L	0.0001	**0.0002**	<0.0001	<0.0001	<0.0001	**0.0004**	<0.0001	**0.0058**	**0.0004**
	Chromium (III+VI)	mg/L	0.001	**0.001**	0.003	<0.001	<0.001	0.002	<0.001	0.002	<0.001
	Copper	mg/L	0.001	**0.0014**	**0.003**	**0.01**	**0.009**	**0.004**	**0.008**	**0.019**	**0.011**
	Lead	mg/L	0.001	**0.0034**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Nickel	mg/L	0.001	**0.011**	**0.055**	0.002	0.003	**0.088**	<0.001	**0.47**	**0.018**
	Zinc	mg/L	0.001	**0.008**	**0.15**	**0.1**	**0.078**	**0.35**	**0.11**	**2.1**	**0.16**
	Mercury	mg/L	0.0005	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Anions	Chloride	mg/L	0.05		7400	50	130	5300	37	5600	1400
Cation	Calcium	mg/L	0.1		57	1.7	5.8	33	0.8	42	3.1
	Magnesium	mg/L	0.1		660	4.1	9.7	430	2.4	430	41
	Potassium	mg/L	0.2		16	0.93	1.8	17	0.8	35	2.9
	Sodium	mg/L	0.1		4400	170	480	3000	61	3200	850
Inorganics	Alkalinity (Bicarbonate)	mg/L	2		240	230	500	54	66	34	200
	Alkalinity (total) as CaCO3	mg/L	2		<2	<2	<2	<2	<2	<2	<2
	TDS	mg/L	5		15000	480	1100	11000	540	10000	6700

Comments

#1 ESDAT Combined.

Douglas Partners (2011) Results

Douglas Partners
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Table C1: Results of Soil Analysis for Test Pit Samples (All results in mg/kg unless otherwise stated)

Sample ID	Depth (m bgl)	Sampling Date	Soil Type	Heavy Metals								Polycyclic Aromatic Hydrocarbons (PAH)		Total Petroleum Hydrocarbons (TPH)		Monocyclic Aromatic Hydrocarbons (BTEX)				Total Polychlorinated Biphenyls (PCB)	Organochlorine Pesticides (OCP)[3]	Phenols	Asbestos
				Arsenic	Cadmium	Chromium[3]	Copper	Lead	Mercury	Nickel	Zinc	Benzo(a)pyrene	Total PAH[4]	C6-C9	C10-C36	Benzene	Toluene	Ethyl- benzene	Total Xylene				
TP1	0.4-0.5	8/06/2011	Fill	69	1.3	23	12	240	0.3	7	220	<0.05	1.55	<25	<250	<0.2	<0.5	<1	<3	<0.1	<0.1	<5	NAD
TP2	0.1-0.2	8/06/2011	Natural	330	5.6	23	170	320	0.2	290	440	0.21	3.71	<25	<250	<0.2	<0.5	<1	<3	<0.1	<0.1	<5	NAD
TP3	0.4-0.5	8/06/2011	Fill	190	1.2	10	63	250	<0.1	14	460	0.22	2.62	<25	<250	<0.2	<0.5	<1	<3	<0.1	<0.1	<5	NAD
TP4	0.2-0.3	8/06/2011	Fill	78	5.6	10	94	57	<0.1	10	490	0.09	1.59	<25	<250	<0.2	<0.5	<1	<3	<0.1	<0.1	<5	NAD
TP5	0.3-0.5	8/06/2011	Fill	<4	<0.5	3	15	15	<0.1	2	12	<0.05	1.55	<25	<250	<0.2	<0.5	<1	<3	<0.1	<0.1	<5	NAD
TP6	0.6-0.8	8/06/2011	Fill	12	<0.5	13	32	36	<0.1	25	80	<0.05	1.55	<25	<250	<0.2	<0.5	<1	<3	<0.1	<0.1	<5	NAD
TP7	1.2-1.4	8/06/2011	Fill	<4	<0.5	6	25	22	<0.1	13	49	<0.05	1.55	<25	<250	<0.2	<0.5	<1	<3	<0.1	<0.1	<5	NAD
Practical Quantitation Limits																							
				4	0.5	1	1	1	0.1	1	1	0.05	0.1	25	250	0.5	0.5	1	3	0.1	0.1	5	NAD
Site Assessment Criteria																							
SILs for Commercial / Industrial land use[1]				500	100	600000	5000	1500	75	3000	35000	5	100	-	-	-	-	-	-	50	50/250/1000/50[5]	42500	NAG
NSW EPA Service Station Guidelines[2]				-	-	-	-	-	-	-	-	-	-	65	1000	1	1.4	3.1	14	-	-	-	-
Background																							
ANZECC & NHMRC[6]				0.2-30	0.04-2	0.5-110	1-190	<2-200	0.001-0.1	2-400	2-180	-	0.95-5.0	650	<250	0.05-1.0	0.1-1	-	-	0.02-0.1	<0.001-0.05	0.03-0.5	NAD

Notes

1	NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme: Appendix II Soil Investigation Levels for Urban Development Sites in NSW Column 4 - Commercial / Industrial Land Use
2	NSW EPA (1995) Guidelines for Assessing Service Station Sites: Table 3 Threshold Concentrations for Sensitive Land Use - Soils
3	All Chromium are assumed to exist in the stable Cr(III) oxidation state, as Cr(VI) will be too reactive and unstable under the normal environment
4	All PQLs are 0.1, with the exception of benzo(b+k)fluoranthene where PQL is 0.2
5	Aldrin+Dieldrin/Chlordane/ DDD+DDE+DDT/Heptachlor
6	ANZECC & NHMRC (1992) Australia and New Zealand Guidelines for the Assessment and Management of Contaminated Sites: Table 2 Environmental Soil Quality Guidelines
-	Not Tested
NAD	No Asbestos Detected at the reporting limit of 0.1g/kg
NAG	No asbestos at the ground surface
BOLD	Exceedence of the Site Assessment Criteria

Douglas Partners
Geotechnics - Environment - Groundwater

Table C2: Results of Laboratory Analysis - Stockpile Samples

Sample ID	Stockpile / In-situ	Heavy Metals														PAH				TPH										
		As	As (TCLP)	Cd	Cd (TCLP)	Cr [1]	Cr (TCLP)	Cu	Pb	Pb (TCLP)	Hg	Hg (TCLP)	Ni	Ni (TCLP)	Zn	Total PAH [2]	Total PAH (TCLP)	Benzo(a) Pyrene	Benzo(a) pyrene (TCLP)	C6-C9	C10-C36	Benzene	Toluene	Ethyl-Benzene	Total Xylene	Total Phenols	PCB	OCP	Asbestos
S1	Stockpile	**550**	0.5	0.7	NT	17	NT	72	220	NT	<0.1	NT	12	NT	190	1.56	NT	0.06	NT	<25	<250	<0.2	<0.5	<1	<3	<5	<0.1	<0.1	ND
S1-repeat	Stockpile	**540**	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
S1-repeat-dup	Stockpile	**540**	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
S1-repeat2-dup	Stockpile	420	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
S2	Stockpile	68	NT	1.1	NT	18	NT	56	210	NT	<0.1	NT	17	NT	340	7.25	NT	0.65	NT	<25	<250	<0.2	<0.5	<1	<3	<5	<0.1	<0.1	ND
S3	Stockpile	150	0.1	0.6	NT	12	NT	43	140	NT	<0.1	NT	5	NT	260	1.56	NT	0.06	NT	<25	<250	<0.2	<0.5	<1	<3	<5	<0.1	<0.1	ND
Waste Classification Criteria [3]																													
General Solid Waste CT1 (mg/kg)		100	-	20	-	100	-	-	100	-	4	-	40	-	-	-	-	0.8	-	-	-	10	288	600	1000	288	-	-	-
Restricted Solid Waste CT2 (mg/kg)		400	-	80	-	400	-	-	400	-	16	-	120	-	-	-	-	3.2	-	-	-	40	1152	2400	4000	1152	-	-	-
Criteria for Waste Classification - with TCLP testing																													
General Solid Waste SCC1 and TCLP1 (mg/kg)		500	5	100	1	1900	5	-	1500	5	50	0.2	1050	2	-	200	-	10	0.04	650	10000	NA	NA	NA	NA	NA	<50	<50	-
Restricted Solid Waste SCC2 and TCLP2 (mg/kg)		2000	20	400	4	7600	20	-	6000	20	200	0.8	4200	8	-	800	-	23	0.16	10000	40000	NA	NA	NA	NA	NA	<50	<50	-

Notes:

1	All Chromium are assumed to exist in the stable Cr(III) oxidation state, as Cr(VI) will be too reactive and unstable in normal environmental conditions
2	Concentrations of individual compounds less than PQL have been assumed equal to PQL
3	NSW DECC *Waste Classification Guidelines* (Table 2) April 2008, updated 2009
4	Concentrations less than PQL are assumed equal to PQL
ND	Not detected at reporting limit of 0.1g/kg
NT	Not Tested
-	Not analysed / Not applicable
BOLD	Exceeds General Solid Waste Criteria

Coffey (2014b) Figures

TABLE LR1
Soil Analytical Results

Field_ID	TAR-SS01	TAR-SS02	TAR-SS03	FRAG01	FRAG02	FRAG03
LocCode						
Sample Depth	0-0.1	0-0.1	0-0.1			
Date	8/10/2013	8/10/2013	8/10/2013	8/10/2013	8/10/2013	8/10/2013
Matrix	SOIL	SOIL	SOIL	FRAGMENT	FRAGMENT	FRAGMENT

Method_Type	ChemName	Units	EQL	Criteria as per the RAP						
Volatile	Benzene	mg/kg	0.1	**1**	<0.1	<0.1	<0.1	-	-	-
	Toluene	mg/kg	0.1	**1.4**	<0.1	<0.1	0.4	-	-	-
	Ethylbenzene	mg/kg	0.1	**3.1**	<0.1	<0.1	<0.1	-	-	-
	Xylene (m & p)	mg/kg	0.2		<0.2	<0.2	0.4	-	-	-
	Xylene (o)	mg/kg	0.1		0.1	<0.1	<0.1	-	-	-
	Xylene Total	mg/kg	0.3	**14**	<0.3	<0.3	0.4	-	-	-
Heavy Metal	Arsenic	mg/kg	2	**500**	14	8.2	9.5	-	-	-
	Cadmium	mg/kg	0.4	**100**	0.9	0.6	1.4	-	-	-
	Chromium	mg/kg	5		23	9.7	16	-	-	-
	Copper	mg/kg	5	**5000**	53	23	39	-	-	-
	Lead	mg/kg	5	**1500**	270	55	88	-	-	-
	Mercury	mg/kg	0.05	**75**	0.09	<0.05	<0.05	-	-	-
	Nickel	mg/kg	5	**3000**	7.3	<5	8.4	-	-	-
	Zinc	mg/kg	5	**35000**	370	84	190	-	-	-
OCP	4,4-DDE	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	a-BHC	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Aldrin	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	b-BHC	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Chlordane	mg/kg	0.1	**250**	<0.1	<0.1	<0.1	-	-	-
	d-BHC	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	DDD	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	DDT	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Dieldrin	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Endosulfan I	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Endosulfan II	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Endosulfan sulphate	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Endrin	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Endrin aldehyde	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Endrin ketone	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	g-BHC (Lindane)	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Heptachlor	mg/kg	0.05	**50**	<0.05	<0.05	<0.05	-	-	-
	Heptachlor epoxide	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Hexachlorobenzene	mg/kg	0.05		<0.05	<0.05	<0.05	-	-	-
	Methoxychlor	mg/kg	0.2		<0.2	<0.2	<0.2	-	-	-
	Toxaphene	mg/kg	1		<1	<1	<1	-	-	-
OPP	Azinophos methyl	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Chlorpyrifos	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Coumaphos	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Demeton (total)	mg/kg	1		<1	<1	<1	-	-	-
	Diazinon	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Dichlorvos	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Dimethoate	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Disulfoton	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Ethoprop	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Fenitrothion	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Fensulfothion	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Fenthion	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Malathion	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Methyl parathion	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Mevinphos (Phosdrin)	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Monocrotophos	mg/kg	10		<10	<10	<10	-	-	-
	Parathion	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Phorate	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Profenofos	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Prothiofos	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Ronnel	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Stirophos	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Trichloronate	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
PAH	Acenaphthene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Acenaphthylene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Anthracene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Benzo(a)anthracene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Benzo(a)pyrene	mg/kg	0.5	**5**	<0.5	<0.5	<0.5	-	-	-
	Benzo(g,h,i)perylene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Benzo(k)fluoranthene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Chrysene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Benzo[b+j]fluoranthene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Dibenz(a,h)anthracene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Fluoranthene	mg/kg	0.5		0.6	<0.5	<0.5	-	-	-
	Fluorene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Naphthalene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Phenanthrene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	Pyrene	mg/kg	0.5		0.6	<0.5	<0.5	-	-	-
	Benzo(a)pyrene TEQ	mg/kg	0.5		0.6	0.6	0.6	-	-	-
	Total PAHs	mg/kg	1	**100**	1.2	<0.5	<0.5	-	-	-
TRH (NEPM 2013)	Naphthalene	mg/kg	0.5		<0.5	<0.5	<0.5	-	-	-
	TRH C6-C10 less BTEX (F1)	mg/kg	20		<20	<20	<20	-	-	-
	TRH >C10-C16 less Naphthalene (F2)	mg/kg	50		<50	<50	180	-	-	-
	TRH C6 - C10	mg/kg	20		<20	<20	<20	-	-	-
	TPH >C10 - C16	mg/kg	50		<50	<50	190	-	-	-
	TRH >C16 - C34	mg/kg	100		190	<100	500	-	-	-
	TRH >C34 - C40	mg/kg	100		100	<100	<100	-	-	-
TRH	TRH C6 - C9	mg/kg	20	**65**	<20	<20	<20	-	-	-
	TRH C10 - C14	mg/kg	20	**18,642**	<20	<20	57	-	-	-
	TRH C15 - C28	mg/kg	50	**13,953**	90	<50	550	-	-	-
	TRH C29 - C36	mg/kg	50	**13,953**	160	<50	90	-	-	-
	TRH C10 - C36 (Sum of total)	mg/kg	50	**1000**	250	<50	700	-	-	-
Asbestos	Asbestos				ND	ND	ND	ND	Chrysotile	ND

LOR: limit of reporting
ND: not detected

Appendix D Borelogs

Douglas Partners (1993a) Logs

PART 3 - CONTAMINATION

7. LABORATORY RESULTS

7.1 Laboratory Results - Contamination

Laboratory testing for all contaminants, except heavy metals, was carried out on the sample collected into glass jars.

7.1.1 PID screening.

Initial testing comprised PID screening, (in the field or in the laboratory) using a portable organic vapour analyser to measure concentrations of Total Organic Vapour. Measured concentrations ranged from 0 to 100 ppm with all values reported on the Test Bore logs.

7.1.2 Heavy metal analysis.

Measurement of heavy metal concentrations was carried out on forty-two samples. All of these samples were analysed for copper, lead, zinc, nickel, chromium and cadmium while four were analysed for these elements as well as arsenic, mercury, tin, cobalt and antimony.

Detailed results are presented in Appendix B with the results summarised in the table below.

Table 1. Summary of Heavy Metal Analyses.

	Soil Samples				Water Samples			
			ANZECC Guidelines				Clean Waters Act 1990	
Element	No of tests	Range mg/kg (ppm)	1	2	No of tests	Range mg/L (ppm)	3	4
Copper (Cu)	25	<5 - 2100	60	7	17	<00.5 - 0.35	1.0	0
Lead (Pb)	25	<10 - 580	300	1	17	<0.05 - 0.05	0.05	0
Nickel (Ni)	25	<5 - 35	60	0	17	<0.05 - 0.1	0.1 **	0
Zinc (Zn)	25	<5 - 290	200	6	17	<0.05 - 0.55	5	0
Cadmium (Cd)	25	<1 - 2	3	0	17	<0.01	0.01	0
Chromium (Cr)	25	<5 - 43	50	0	17	<0.05 - 0.4	0.05	1
Arsenic (As)	4	<10 - 11	20	0				
Mercury (Hg)	4	0.1 - 0.4	1	0				
Tin (Sn)	4	<10	50	0				
Cobalt (Co)	4	<5 - 6	50*					
Antimony (Sb)	4	0.2 - 1.9	20	0				

* Dutch B Level
** Dutch C Level

1. ANZECC guideline
2. No. of tests exceeding ANZECC guidelines.
3. Clean Waters Act 1990
4. No. of tests exceeding Clean Waters Act.

7.1.3 Total Petroleum Hydrocarbon (TPH) Analysis.

26 samples were analysed for Total Petroleum Hydrocarbon (TPH) concentrations with the detailed results presented in Appendix B. Table 2 summarised these results.

Table 2. Summary of Total Petroleum Hydrocarbon (TPH) Analysis.

Soil Samples			Water Samples		
No. of tests	Hydrocarbon Fraction (ppm) C_6-C_9 C_{10}-C_{14} C_{15}-C_{28}	No of tests exceeding NSW EPA accepted values.	No of tests	Hydrocarbon Fractions (mg/L) C_6-C_9 C_{10}-C_{14} C_{15}-C_{28}	No. of tests exceeding NSW Water Board
25	<2 <20 to 156 <50 to 1118	0	15	<0.2 to 4.6 <0.2 <0.5	0
SPCC values accepted by NSW EPA	500 1000 5000		NSW Water Board * 10 mg/L allowable into stormwater ** 30 mg/L allowable into sewer		

7.1.4 Polynuclear Aromatic Hydrocarbon (PAH) Analysis.

Polynuclear aromatic hydrocarbon analysis were carried out on a total of seventeen samples comprising ten analyses on soil/filling samples and seven on water samples. Table 3 presents a summary of the units analysed for as well as the soil and water detection limits of each unit.

Only nine measurements were recorded above the detection limits, all within soil samples, with a maximum total PAH value of 0.7 mg/kg, well below accepted guidelines.

No measurements greater than the detection limits were recorded for the water samples.

7.1.5 Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs).

Eighteen samples were analysed for organochlorine pesticides and ten samples for polychlorinated biphenyls. Analysis comprised a broad spectrum screen for the compounds listed in Table 4. Detailed results are included in Appendix B.

Only one measurement above the detection limits was recorded for all the samples analysed. That measurement was a reading of 0.1 mg/kg (ppm) in a soil sample from Test Pit 123. No detectable PCB's were measured.

Table 3. Summary of Polynuclear Aromatic Hydrocarbon (PAH) Analyses.

Unit	Detection Limits	
	Soil mg/kg	Water µg/L
Naphthalene	<0.1	<0.5
Acenaphthylene	<1.0	<0.5
Acenapthene	<0.1	<0.5
Fluorene	<0.1	<0.5
Phenanthrene	<0.1	<0.5
Anthracene	<0.1	<0.5
Fluoranthene	<1.0	<0.5
Pyrene	<0.1	<0.5
Benzo (a) anthracene	<0.1	<0.5
Chrysene	<0.1	<0.5
Benzo (b) fluorathene	<0.1	<0.5
Benzo (k) fluorathene	<0.1	<0.5
Benzo (a) pyrene	<0.1	<0.5
Dibenzo (ah) anthracene	<0.1	<0.5
Benzo (ghi) anthracene	<0.1	<0.5
Indeno (1,2,3-cd) pyrene	<0.1	<0.5

ANZECC guidelines suggest for soils, a concentration of 20 mg/kg (with 1 mg/kg of benzo-a-pyrene) as necessitating further investigation while for water, the Dutch B level is quoted as 10 µg/L (10 pp billion).

Table 4. Summary of Organochlorine Pesticide and Polychlorinated Biphenols (PCBs) Analyses

Units	Detection Limits	
	Soil (mg/kg)	Water (µg/L)
a-BHC	<0.1	<0.1
HBC	<0.1	<0.1
Lindane	<0.1	<0.1
Heptichlor	<0.1	<0.1
Aldrin	<0.1	<0.1
Heptachlor Epoxide	<0.1	<0.1
Oxychlordane	<1.0	<0.1
DDE	<0.1	<0.2
Dieldrin	<0.1	<0.2
Endrin	<0.1	<0.2
DDD	<0.1	<0.2
DDT	<0.1	<0.2
Fenitrothion	<0.1	<0.2
Chlorpyriphos	<0.1	<0.2
Bromophosethyl	<0.1	<0.2
Ethion	<0.1	<0.2
Aroclor 1016	<0.2	<0.1
Aroclor 1221	<0.2	<0.1
Aroclor 1232	<0.2	<0.1
Aroclor 1242	<0.2	<0.1
Aroclor 1248	<0.2	<0.1
Aroclor 1254	<0.2	<0.1
Aroclor 1260	<0.2	<0.1

The ANZECC guidelines for PCB's (total, soil) is 1 mg/kg.

ANZECC guidelines suggest limits for environmental investigation of 0.2 mg/kg for Dieldrin while Dutch B levels (Total Organic Chlorinated Pesticides) for soil and water are 1 mg/kg and 0.5 µg/L respectively.

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Project No. 19109

Heavy Metals

Our Reference	4180-1	4180-2	4180-3	4180-4	4180-5
Your Reference	B1, GW	B2, GW	B3, GW	B4, GW	B5,GW
Sample Type	WATER	WATER	WATER	WATER	WATER
Units	mg/L	mg/L	mg/L	mg/L	mg/L
Copper, Cu	<0.05	<0.05	<0.05	<0.05	<0.05
Lead, Pb	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel, Ni	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc, Zn	0.10	<0.05	<0.05	0.10	<0.05
Cadmium, Cd	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium, Cr	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic, As	-	-	-	-	-
Mercury, Hg	-	-	-	-	-
Tin, Sn	-	-	-	-	-
Cobalt, Co	-	-	-	-	-
Antimony, Sb	-	-	-	-	-

D.J. DOUGLAS

Project No. 19109

Heavy Metals

Our Reference	4180-6	4180-7	4180-9	4180-10	4180-11
Your Reference	B5, 2.5M	B6, GW	B6, 3.0M	B6,4.0M	B7, GW
Sample Type	SOIL	WATER	SOIL	SOIL	WATER
Units	mg/kg	mg/L	mg/kg	mg/kg	mg/L
Copper, Cu	14	<0.05	460	12	<0.05
Lead, Pb	11	<0.05	53	11	<0.05
Nickel, Ni	17	<0.05	8	<5	0.10
Zinc, Zn	110	<0.05	260	7	0.15
Cadmium, Cd	<1	<0.01	1.5	<1	<0.01
Chromium, Cr	10	<0.05	43	17	<0.05
Arsenic, As	-	-	<10	-	-
Mercury, Hg	-	-	0.4	-	-
Tin, Sn	-	-	<10	-	-
Cobalt, Co	-	-	<5	-	-
Antimony, Sb	-	-	0.3	-	-

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Heavy Metals

Our Reference	4180-12	4180-14	4180-15	4180-18	4180-19
Your Reference	B8, 0.5M	B11, GW	B12, GW	B13, GW	B14, GW
Sample Type	SOIL	WATER	WATER	WATER	WATER
Units	mg/kg	mg/L	mg/L	mg/L	mg/L
Copper, Cu	60	<0.05	<0.05	<0.05	0.15
Lead, Pb	22	<0.05	<0.05	<0.05	<0.05
Nickel, Ni	14	<0.05	<0.05	<0.05	0.10
Zinc, Zn	140	0.10	<0.05	<0.05	0.55
Cadmium, Cd	<1	<0.01	<0.01	<0.01	<0.01
Chromium, Cr	10	<0.05	<0.05	<0.05	0.40
Arsenic, As	-	-	-	-	-
Mercury, Hg	-	-	-	-	-
Tin, Sn	-	-	-	-	-
Cobalt, Co	-	-	-	-	-
Antimony, Sb	-	-	-	-	-

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Heavy Metals

Our Reference	4180-20A	4180-21	4180-22	4180-23	4180-24
Your Reference	B14, 0.5M	B15, GW	B16, GW	B17, GW	B18, GW
Sample Type	SOIL	WATER	WATER	WATER	WATER
Units	mg/kg	mg/L	mg/L	mg/L	mg/L
Copper, Cu	11	<0.05	<0.05	0.35	0.10
Lead, Pb	22	<0.05	<0.05	<0.05	<0.05
Nickel, Ni	<5	<0.05	<0.05	<0.05	<0.05
Zinc, Zn	25	<0.05	<0.05	<0.05	<0.05
Cadmium, Cd	<1	<0.01	<0.01	<0.01	<0.01
Chromium, Cr	21	<0.05	<0.05	<0.05	<0.05
Arsenic, As	-	-	-	-	-
Mercury, Hg	-	-	-	-	-
Tin, Sn	-	-	-	-	-
Cobalt, Co	-	-	-	-	-
Antimony, Sb	-	-	-	-	-

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Heavy Metals

Our Reference	4180-25	4180-28	4180-29	4180-31	4180-36	4180-36 RPT
Your Reference	DRAIN, GW	101, 0.5M	103, 0.2M	105, 0.5M	107,0.5M	107, 0.5M
Sample Type	WATER	SOIL	SOIL	SOIL	SOIL	SOIL
Units	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper, Cu	<0.05	9	68	47	51	53
Lead, Pb	<0.05	<10	150	130	170	180
Nickel, Ni	<0.05	<5	9	7	17	7
Zinc, Zn	<0.05	56	270	270	190	150
Cadmium, Cd	<0.01	<1	2.0	<1	<1	<1
Chromium, Cr	<0.05	<5	11	12	18	11
Arsenic, As	-	-	-	-	11	-
Mercury, Hg	-	-	-	-	0.3	-
Tin, Sn	-	-	-	-	<10	-
Cobalt, Co	-	-	-	-	6	-
Antimony, Sb	-	-	-	-	0.8	-

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Heavy Metals

Our Reference	4180-38	4180-40	4180-40 RPT	4180-44	4180-47	4180-49
Your Reference	109, 0.5M	110, 0.5M	110, 0.5M	115, 0.5M	117, 1.5M	118, 0.7M
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper, Cu	14	110	110	10	2100	25
Lead, Pb	12	78	79	13	210	15
Nickel, Ni	<5	9	9	<5	22	<5
Zinc, Zn	15	81	80	16	290	12
Cadmium, Cd	<1	<1	<1	<1	<1	<1
Chromium, Cr	15	7	7	14	14	14
Arsenic, As	-	-	-	-	-	-
Mercury, Hg	-	-	-	-	-	-
Tin, Sn	-	-	-	-	-	-
Cobalt, Co	-	-	-	-	-	-
Antimony, Sb	-	-	-	-	-	-

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Heavy Metals

Our Reference	4180-51	4180-54	4180-58	4180-59	4180-59 RPT	4180-60
Your Reference	119, 1.4M	120, 1.6M	124, 0.2M	124, 1.5M	124, 1.5M	125, 0.5M
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper, Cu	19	120	190	17	17	33
Lead, Pb	11	41	70	<10	<10	280
Nickel, Ni	<5	9	11	<5	<5	<5
Zinc, Zn	18	69	230	5	5	130
Cadmium, Cd	<1	<1	<1	<1	<1	<1
Chromium, Cr	11	9	8	<5	5	11
Arsenic, As	-	-	<10	<10	<10	-
Mercury, Hg	-	-	0.1	0.2	-	-
Tin, Sn	-	-	<10	<10	<10	-
Cobalt, Co	-	-	6	<5	<5	-
Antimony, Sb	-	-	1.9	0.2	-	-

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Heavy Metals

Our Reference	4180-60 RPT	4180-61	4180-62	4180-63	4180-64	4180-64 RPT
Your Reference	125, 0.5M	126, 0.75M	201, 1.0M	201, 3.0M	203, 1.0M	203, 1.0M
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Copper, Cu	31	<5	20	50	54	63
Lead, Pb	260	<10	110	84	200	190
Nickel, Ni	<5	<5	7	5	14	13
Zinc, Zn	130	<5	160	120	150	150
Cadmium, Cd	<1	<1	<1	<1	<1	<1
Chromium, Cr	10	6	9	14	22	21
Arsenic, As	-	-	-	-	-	-
Mercury, Hg	-	-	-	-	-	-
Tin, Sn	-	-	-	-	-	-
Cobalt, Co	-	-	-	-	-	-
Antimony, Sb	-	-	-	-	-	-

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Heavy Metals

Our Reference	4180-65	4180-66	4180-67
Your Reference	203, 1.6W	204, 1.5M	204, 2.2M
Sample Type	WATER	SOIL	SOIL
Units	mg/L	mg/kg	mg/kg
Copper, Cu	<0.05	46	28
Lead, Pb	<0.05	170	580
Nickel, Ni	<0.05	15	35
Zinc, Zn	<0.05	280	90
Cadmium, Cd	<0.01	<1	<1
Chromium, Cr	<0.05	18	26
Arsenic, As	-	-	-
Mercury, Hg	-	-	-
Tin, Sn	-	-	-
Cobalt, Co	-	-	-
Antimony, Sb	-	-	-

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Project No. 19109

Polynuclear Aromatic Hydrocarbons

Our Reference	4180-1	4180-2	4180-3	4180-4	4180-11	4180-18
Your Reference	B1, GW	B2, GW	B3, GW	B4, GW	B7, GW	B13, GW
Sample Type	WATER	WATER	WATER	WATER	WATER	WATER
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Naphthalene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (a) anthracene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (b) fluoranthene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (k) fluoranthene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (a) pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo (ah) anthracene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo (ghi) perylene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno (1,2,3-cd) pyrene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

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Project No. 19109

Polynuclear Aromatic Hydrocarbons

Our Reference	4180-26	4180-62	4180-63	4180-65	4180-67
Your Reference	101, 0.1M	201, 1.0M	201, 3.0M	203, 1.6W	204, 2.2M
Sample Type	SOIL	SOIL	SOIL	WATER	SOIL
Units	mg/kg	mg/kg	mg/kg	µg/L	mg/kg
Naphthalene	<0.1	<0.1	<0.1	<0.5	<0.1
Acenaphthylene	<1.0	<1.0	<1.0	<0.5	<1.0
Acenaphthene	<0.1	<0.1	<0.1	<0.5	<0.1
Fluorene	<0.1	<0.1	<0.1	<0.5	<0.1
Phenanthrene	<0.1	<0.1	<0.1	<0.5	<0.1
Anthracene	<0.1	<0.1	<0.1	<0.5	<0.1
Fluoranthene	<1.0	<1.0	<1.0	<0.5	<1.0
Pyrene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (a) anthracene	0.1	<0.1	<0.1	<0.5	<0.1
Chrysene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (b) fluoranthene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (k) fluoranthene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (a) pyrene	0.1	<0.1	<0.1	<0.5	0.1
Dibenzo (ah) anthracene	<0.1	<0.1	<0.1	<0.5	<0.1
Benzo (ghi) perylene	<0.1	<0.1	<0.1	<0.5	<0.1
Indeno (1,2,3-cd) pyrene	<0.1	<0.1	<0.1	<0.5	<0.1

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Polynuclear Aromatic Hydrocarbons

Our Reference	Blank (Soil)	Recovery
Your Reference		
Units	mg/kg	%
Naphthalene	<0.1	105
Acenaphthylene	<1.0	100
Acenaphthene	<0.1	110
Fluorene	<0.1	95
Phenanthrene	<0.1	98
Anthracene	<0.1	130
Fluoranthene	<1.0	120
Pyrene	<0.1	110
Benzo (a) anthracene	<0.1	115
Chrysene	<0.1	85
Benzo (b) fluoranthene	<0.1	80
Benzo (k) fluoranthene	<0.1	95
Benzo (a) pyrene	<0.1	88
Dibenzo (ah) anthracene	<0.1	85
Benzo (ghi) perylene	<0.1	92
Indeno (1,2,3-cd) pyrene	<0.1	120

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OC Pesticides & PCB's

Our Reference	4180-1	4180-2	4180-3	4180-4	4180-11
Your Reference	B1, GW	B2, GW	B3, GW	B4, GW	B7, GW
Sample Type	WATER	WATER	WATER	WATER	WATER
Units	µg/L	µg/L	µg/L	µg/L	µg/L
α-BHC	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	<0.1	<0.1	<0.1	<0.1	<0.1
Oxychlordane	<0.1	<0.1	<0.1	<0.1	<0.1
DDE	<0.2	<0.2	<0.2	<0.2	<0.2
Dieldrin	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	<0.2	<0.2	<0.2	<0.2	<0.2
DDD	<0.2	<0.2	<0.2	<0.2	<0.2
DDT	<0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos	<0.2	<0.2	<0.2	<0.2	<0.2
Bromophosethyl	<0.2	<0.2	<0.2	<0.2	<0.2
Ethion	<0.2	<0.2	<0.2	<0.2	<0.2
Aroclor 1016	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	<0.1	<0.1	<0.1	<0.1	<0.1

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OC Pesticides & PCB's

Our Reference	4180-18	4180-25	4180-62	4180-65	4180-66
Your Reference	B13, GW	DRAIN, GW	201, 1.0M	203, 1.6W	204, 1.5M
Sample Type	WATER	WATER	SOIL	WATER	SOIL
Units	µg/L	µg/L	mg/kg	µg/L	mg/kg
α-BHC	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	<0.1	<0.1	<0.1	<0.1	0.45*
Heptachlor Epoxide	<0.1	<0.1	<0.1	<0.1	<0.1
Oxychlordane	<0.1	<0.1	<0.1	<0.1	<0.1
DDE	<0.2	<0.2	<0.1	<0.2	<0.1
Dieldrin	<0.2	<0.2	<0.1	<0.2	<0.1
Endrin	<0.2	<0.2	<0.1	<0.2	<0.1
DDD	<0.2	<0.2	<0.1	<0.2	<0.1
DDT	<0.2	<0.2	<0.1	<0.2	<0.1
Fenitrothion	<0.2	<0.2	<0.1	<0.2	<0.1
Chlorpyriphos	<0.2	<0.2	<0.1	<0.2	<0.1
Bromophosethyl	<0.2	<0.2	<0.1	<0.2	<0.1
Ethion	<0.2	<0.2	<0.1	<0.2	<0.1
Aroclor 1016	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1221	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1232	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1242	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1248	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1254	<0.1	<0.1	<0.2	<0.1	<0.2
Aroclor 1260	<0.1	<0.1	<0.2	<0.1	<0.2

* The Aldrin has very similar retention time as Chlorpyriphos, and its concentration is too low for the GC/MS. If it is thought necessary the GC conditions can be changed to see if they can be resolved.

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OC Pesticides & PCB's

Our Reference	Blank (Soil)	Recovery
Your Reference		
Units	mg/kg	%
α-BHC	<0.1	75
HCB	<0.1	82
Lindane	<0.1	95
Heptachlor	<0.1	75
Aldrin	<0.1	72
Heptachlor Epoxide	<0.1	-
Oxychlordane	<0.1	85
DDE	<0.1	95
Dieldrin	<0.1	80
Endrin	<0.1	70
DDD	<0.1	75
DDT	<0.1	75
Fenitrothion	<0.1	-
Chlorpyriphos	<0.1	-
Bromophosethyl	<0.1	-
Ethion	<0.1	-
Aroclor 1016	<0.2	-
Aroclor 1221	<0.2	-
Aroclor 1232	<0.2	-
Aroclor 1242	<0.2	-
Aroclor 1248	<0.2	-
Aroclor 1254	<0.2	80
Aroclor 1260	<0.2	-

D.J. DOUGLAS

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Petroleum Hydrocarbons

Our Reference	4180-1	4180-2	4180-3	4180-4	4180-5
Your Reference	B1, GW	B2, GW	B3, GW	B4, GW	B5, GW
Sample Type	WATER	WATER	WATER	WATER	WATER
Units	mg/L	mg/L	mg/L	mg/L	mg/L
Hydrocarbons, C_6-C_9	<0.2	<0.2	0.7	<0.2	4.6
Hydrocarbons, C_{10}-C_{14}	<0.2	<0.2	<0.2	<0.2	<0.2
Hydrocarbons, C_{15}-C_{28}	<0.5	<0.5	<0.5	<0.5	<0.5

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Petroleum Hydrocarbons

Our Reference	4180-6	4180-7	4180-8	4180-9	4180-10
Your Reference	B5, 2.5M	B6, GW	B6, 2.0M	B6, 3.0M	B6, 4.0M
Sample Type	SOIL	WATER	SOIL	SOIL	SOIL
Units	mg/kg	mg/L	mg/kg	mg/kg	mg/kg
Hydrocarbons, C_6-C_9	<20	<0.2	<20	<20	<20
Hydrocarbons, C_{10}-C_{14}	<20	<0.2	156	<20	<20
Hydrocarbons, C_{15}-C_{28}	<50	<0.5	1118	<50	<50

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Petroleum Hydrocarbons

Our Reference	4180-11	4180-12	4180-13	4180-14	4180-15
Your Reference	B7, GW	B8, 0.5M	B10, 2.8M	B11, GW	B12, GW
Sample Type	WATER	SOIL	SOIL	WATER	WATER
Units	mg/L	mg/kg	mg/kg	mg/L	mg/L
Hydrocarbons, C_6-C_9	<0.2	<20	<20	<0.2	<0.2
Hydrocarbons, C_{10}-C_{14}	<0.2	<20	<20	<0.2	<0.2
Hydrocarbons, C_{15}-C_{28}	<0.5	<50	<50	<0.5	<0.5

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Petroleum Hydrocarbons

Our Reference	4180-16	4180-17	4180-18	4180-19	4180-20B
Your Reference	B12, 4.0M	B12, 5.5M	B13, GW	B14, GW	B14, 1.0M
Sample Type	SOIL	SOIL	WATER	WATER	SOIL
Units	mg/kg	mg/kg	mg/L	mg/L	mg/kg
Hydrocarbons, C_6-C_9	<20	<20	<0.2	<0.2	<20
Hydrocarbons, C_{10}-C_{14}	<20	<20	<0.2	<0.2	<20
Hydrocarbons, C_{15}-C_{28}	<50	<50	<0.5	<0.5	<50

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Petroleum Hydrocarbons

Our Reference	4180-23	4180-24	4180-30	4180-62	4180-65
Your Reference	B17, GW	B18, GW	103, 1.6W	201, 1.0M	203, 1.6W
Sample Type	WATER	WATER	WATER	SOIL	WATER
Units	mg/L	mg/L	mg/L	mg/kg	mg/L
Hydrocarbons, C_6-C_9	<0.2	<0.2	<0.2	<20	<0.2
Hydrocarbons, C_{10}-C_{14}	<0.2	<0.2	<0.2	<20	<0.2
Hydrocarbons, C_{15}-C_{28}	<0.5	<0.5	<0.5	<50	<0.5

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Petroleum Hydrocarbons

Our Reference	4180-66	Blank		Recovery
Your Reference	204, 1.5M			
Sample Type	SOIL	SOIL	WATER	
Units	mg/kg	mg/kg	mg/L	%
Hydrocarbons, C_6-C_9	<20	<20	<0.2	94
Hydrocarbons, C_{10}-C_{14}	<20	<20	<0.2	80
Hydrocarbons, C_{15}-C_{28}	<50	<50	<0.5	95

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Petroleum Hydrocarbons

Our Reference	4139-1	4139-3	4139-4	4139-6	4139-8
Your Reference	TP101	TP104	TP106	TP108	TP111
Depth (M)	0.5	1.5	0.5	0.5	0.5
Units	ppm	ppm	ppm	ppm	ppm
Hydrocarbons, C_6-C_9	<20	<20	<20	<20	<20
Hydrocarbons, C_{10}-C_{14}	<20	<20	<20	<20	<20
Hydrocarbons, C_{15}-C_{28}	<50	<50	<50	<50	<50

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DOUGLAS PARTNERS

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Petroleum Hydrocarbons

Our Reference	4139-9	4139-11	4139-13	4139-14	4139-14 RPT
Your Reference	TP113	TP117	TP118	TP119	TP119
Depth	0.5	0.5	0.7	0.2	0.2
Units	ppm	ppm	ppm	ppm	ppm
Hydrocarbons, C_6-C_9	<20	<20	<20	<20	<20
Hydrocarbons, C_{10}-C_{14}	<20	<20	<20	<20	<20
Hydrocarbons, C_{15}-C_{28}	<50	<50	<50	<50	<50

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Petroleum Hydrocarbons

Our Reference	4139-15	4139-17	4139-18	4139-20	4139-21
Your Reference	TP119	TP120	TP122	TP124	TP125
Depth	1.4	0.8	0.5	0.2	0.5
Units	ppm	ppm	ppm	ppm	ppm
Hydrocarbons, C_6-C_9	<20	<20	<20	<20	<20
Hydrocarbons, C_{10}-C_{14}	<20	<20	<20	<20	<20
Hydrocarbons, C_{15}-C_{28}	<50	<50	<50	<50	<50

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Petroleum Hydrocarbons

Our Reference	Blank	Spike Concentration in 10g Soil	Recovery
Your Reference			
Depth			
Units	ppm	ppm	%
Hydrocarbons, C_6-C_9	<20	45 ppm as C_8	97
Hydrocarbons, C_{10}-C_{14}	<20	45 ppm as C_{12}	74
Hydrocarbons, C_{15}-C_{28}	<50	45 ppm as C_{22} & C_{28}	93

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Polynuclear Aromatic Hydrocarbons

Our Reference	4139-1	4139-5	4139-7	4139-12	4139-16
Your Reference	TP101	TP107	TP110	TP117	TP119
Depth (M)	0.5	0.5	0.5	1.5	2.5
Units	ppm	ppm	ppm	ppm	ppm
Naphthalene	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	<0.1	<0.1	<0.1	0.1	<0.1
Anthracene	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (a) anthracene	<0.1	<0.1	<0.1	0.1	<0.1
Chrysene	<0.1	<0.1	<0.1	0.1	<0.1
Benzo (b) fluoranthene	<0.1	<0.1	<0.1	0.1	<0.1
Benzo (k) fluoranthene	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (a) pyrene	<0.1	<0.1	<0.1	0.1	<0.1
Dibenzo (ah) anthracene	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo (ghi) perylene	<0.1	<0.1	<0.1	0.1	<0.1
Indeno (1,2,3-cd) pyrene	<0.1	<0.1	<0.1	0.2	<0.1

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Polynuclear Aromatic Hydrocarbons

Our Reference	4139-20	Blank	Spike Concentration in 10g Soil	Recovery
Your Reference	TP124			
Depth (M)	0.2			
Units	ppm	ppm	ppm	%
Naphthalene	<0.1	<0.1	1.0	108
Acenaphthylene	<1.0	<1.0	1.0	97
Acenaphthene	<0.1	<0.1	1.2	99
Fluorene	<0.1	<0.1	0.3	104
Phenanthrene	<0.1	<0.1	0.2	128
Anthracene	<0.1	<0.1	0.1	139
Fluoranthene	<1.0	<1.0	0.6	116
Pyrene	<0.1	<0.1	0.6	176
Benzo (a) anthracene	<0.1	<0.1	0.3	153
Chrysene	<0.1	<0.1	0.3	198
Benzo (b) fluoranthene	<0.1	<0.1	0.3	138
Benzo (k) fluoranthene	<0.1	<0.1	0.3	126
Benzo (a) pyrene	<0.1	<0.1	0.3	178
Dibenzo (ah) anthracene	<0.1	<0.1	0.3	117
Benzo (ghi) perylene	<0.1	<0.1	0.3	156
Indeno (1,2,3-cd) pyrene	<0.1	<0.1	0.3	128

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OC Pesticides

Our Reference	4139-1	4139-2	4139-6	4139-7	4139-10	4139-11
Your Reference	TP101	TP104	TP108	TP110	TP114	TP117
Depth (M)	0.5	0.5	0.5	0.5	0.5	0.5
Units	ppm	ppm	ppm	ppm	ppm	ppm
α-BHC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Oxychlordane	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDD	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDT	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

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OC Pesticides

Our Reference	4139-18	4139-19	Blank	Spike Concentration in 10g Soil	Recovery
Your Reference	TP122	TP123			
Depth (M)	0.5	0.5			
Units	ppm	ppm	ppm	ppm	%
α-BHC	<0.1	<0.1	<0.1	0.2	108
HCB	<0.1	<0.1	<0.1	0.2	110
Lindane	<0.1	<0.1	<0.1	0.2	108
Heptachlor	<0.1	<0.1	<0.1	0.2	106
Aldrin	<0.1	<0.1	<0.1	0.2	110
Heptachlor Epoxide	<0.1	<0.1	<0.1	0.2	-
Oxychlordane	<0.1	<0.1	<0.1	0.2	-
DDE	<0.1	<0.1	<0.1	0.2	110
Dieldrin	<0.1	0.1	<0.1	0.2	110
Endrin	<0.1	<0.1	<0.1	0.2	116
DDD	<0.1	<0.1	<0.1	0.2	112
DDT	<0.1	<0.1	<0.1	0.2	88

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Coffey (2009c) Logs

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

Table 1 - Groundwater Result Summary Table – First Round of Assessment

Field_ID	MW101	MW102	MW103	MW104	MW105	MW106	MW107	MW108	MW110	MW111	MD17	MW5	MW6A	MW9	NW3
LocCode	MW101	MW102	MW103	MW104	MW105	MW106	MW107	MW108	MW110	MW111	MD17	MW5	MW6A	MW9	NW3
Sampled_Date-Time	19/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009	16/06/2009	16/06/2009	16/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009	19/06/2009
SDG	SE70074	SE70074	SE70074	SE70074	SE70074	SE70044	SE70044	SE70044	SE70074	SE70074	SE70074	SE70074	SE70074	SE70074	SE70074
Matrix_Type	water	water	water	water	water	water	water	water	water	water	water	water	water	water	water

Method_Type	ChemName	Units	EQL	ANZECC 2000 Freshwater 95%															
TRH in Water (Semi Volatile)	TPH C 6 - C 9 Fraction	µg/L	40		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TPH C10 - C14 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	TPH C15 - C28 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
	TPH C29-C36 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
ESDAT Combined Compounds	TPH+C10 - C36 (Sum of total)	µg/L		**600**	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]	<500[#2]
Trace HM (ICP-MS)-Dissolved	Arsenic	mg/L	0.001	**0.024**	<0.001	0.001	<0.001	<0.001	<0.001	0.004	0.002	<0.005	<0.001	<0.001	0.001	0.011	0.001	0.003	<0.001
	Cadmium	mg/L	0.0001	**0.0002**	0.0001	<0.0001	<0.0001	**0.0004**	**0.0002**	<0.0001	<0.0001	**<0.0005**	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	**0.0059**	**0.0021**
	Chromium (III+VI)	mg/L	0.001	**0.001**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper	mg/L	0.001	**0.0014**	**0.003**	**0.005**	**0.005**	**0.006**	**0.009**	**0.004**	**0.004**	**<0.005**	**0.011**	**0.005**	**0.006**	**0.005**	**0.005**	**0.012**	**0.003**
	Lead	mg/L	0.001	**0.0034**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**<0.005**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Nickel	mg/L	0.001	**0.011**	**0.014**	0.002	0.002	**0.013**	**0.04**	<0.001	<0.001	**0.039**	<0.001	0.002	0.002	**0.065**	<0.001	**0.5**	**0.017**
	Zinc	mg/L	0.001	**0.008**	**0.076**	**0.13**	**0.07**	**0.13**	**0.23**	**0.06**	**0.051**	**0.12**	**0.075**	**0.06**	**0.077**	**0.26**	**0.063**	**2.3**	**0.37**
	Mercury (Filtered)	mg/L	0.0001	**0.0001**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cations	Calcium	mg/L	0.1		28	41	23	46	-	44	50	110	-	7.7	12	45	2.3	49	9.2
	Magnesium	mg/L	0.1		78	57	86	230	-	32	18	710	-	13	28	510	2.8	500	48
	Potassium	mg/L	0.2		6.1	9.7	5.4	9	-	5	5.5	19	-	2.1	3.2	21	1.8	36	3.2
	Sodium	mg/L	0.1		1100	850	140	2800	-	110	57	5200	-	490	710	3600	39	3500	880
Anions in water	Chloride	mg/L	0.08		1300	650	27	3700	-	76	44	8400	-	200	560	5900	19	6200	1300
Inorganics	Bicarbonate	mg/L	2		560	790	480	380	-	350	240	300	-	520	650	72	30	40	140
	Carbonate	mg/L	2		<2	<2	<2	<2	-	<2	<2	<2	-	<2	<2	<2	<2	<2	<2
	TDS	mg/L	5		3700	2300	640	7600	-	510[#3]	310[#3]	17000[#3]	-	1300	1600	11000	480	11000	2800

Comments
#1 ESDAT Combined with Non-Detect Multiplier of 0.5.
#2 ESDAT Combined.
#3 mg/L

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Table 2. Groundwater Result Summary Table – Second Round of Assessment

Field_ID	MD17	MW101	MW102	MW103	MW104	MW105	MW106	MW107
LocCode	MD17	MW101	MW102	MW103	MW104	MW105	MW106	MW107
Sampled_Date-Time	25/08/2009	26/08/2009	26/08/2009	26/08/2009	25/08/2009	25/08/2009	24/08/2009	24/08/2009
SDG	SE71739	SE71739	SE71739	SE71739	SE71739	SE71739	SE71662A	SE71662A
Matrix_Type	water	water	water	water	water	water	water	water

Method_Type	ChemName	Units	EQL	ANZECC 2000 Freshwater 95%								
TRH in Water (Semi Volatile)	TPH C 6 - C 9 Fraction	µg/L	40		-	-	-	-	-	-	-	-
	TPH C10 - C14 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100	<100
	TPH C15 - C28 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200	<200
	TPH C29-C36 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200	<200
	TPH+C10 - C36 (Sum of total)	µg/L		**600**	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]
Trace HM (ICP-MS)-Dissolved	Arsenic	mg/L	0.001	**0.024**	0.003	<0.001	0.01	0.001	0.001	<0.001	0.003	0.002
	Cadmium	mg/L	0.0001	**0.0002**	<0.0001	<0.0001	<0.0001	<0.0001	**0.0003**	**0.0002**	<0.0001	<0.0001
	Chromium (III+VI)	mg/L	0.001	**0.001**	0.002	0.001	0.001	0.002	0.001	0.001	<0.001	<0.001
	Copper	mg/L	0.001	**0.0014**	**0.005**	**0.003**	<0.001	**0.027**	**0.006**	**0.008**	<0.001	**0.002**
	Lead	mg/L	0.001	**0.0034**	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001
	Nickel	mg/L	0.001	**0.011**	0.003	0.006	0.007	0.002	**0.017**	**0.022**	<0.001	<0.001
	Zinc	mg/L	0.001	**0.008**	**0.091**	**0.052**	**0.043**	**0.15**	**0.14**	**0.17**	**0.072**	**0.07**
	Mercury	mg/L	0.0005	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Anions	Chloride	mg/L	0.05		610	1500	560	33	3600	1500	74	52
Cation	Calcium	mg/L	0.1		10	19	35	19	37	13	39	47
	Magnesium	mg/L	0.1		32	97	57	73	180	42	26	17
	Potassium	mg/L	0.2		3.2	5.4	9.7	4.8	8.1	5.4	4.4	4.8
	Sodium	mg/L	0.1		940	1500	880	170	2400	1200	100	52
Inorganics	Alkalinity (Bicarbonate)	mg/L	2		760	680	830	400	390	71	340	260
	Alkalinity (total) as CaCO3	mg/L	2		<2	<2	<2	<2	<2	<2	<2	<2
	TDS	mg/L	5		1800	4100	2000	-	6600	3200	450	330

Comments

#1 ESDAT Combined.

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Table 2. Groundwater Result Summary Table – Second Round of Assessment

Field_ID	MW108	MW110	MW111	MW5	MW6A	MW9	NW3
LocCode	MW108	MW110	MW111	MW5	MW6A	MW9	NW3
Sampled_Date-Time	25/08/2009	26/08/2009	26/08/2009	25/08/2009	25/08/2009	25/08/2009	25/08/2009
SDG	SE71739	SE71739	SE71739	SE71739	SE71662A	SE71739	SE71662A
Matrix_Type	water	water	water	water	water	water	water

Method_Type	ChemName	Units	EQL	ANZECC 2000 Freshwater 95%							
TRH in Water (Semi Volatile)	TPH C 6 - C 9 Fraction	µg/L	40		-	-	-	-	-	-	-
	TPH C10 - C14 Fraction	µg/L	100		<100	<100	<100	<100	<100	<100	<100
	TPH C15 - C28 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200
	TPH C29-C36 Fraction	µg/L	200		<200	<200	<200	<200	<200	<200	<200
	TPH+C10 - C36 (Sum of total)	µg/L		**600**	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]	<500[#1]
Trace HM (ICP-MS)-Dissolved	Arsenic	mg/L	0.001	**0.024**	0.003	<0.001	<0.001	0.009	0.001	0.002	0.001
	Cadmium	mg/L	0.0001	**0.0002**	<0.0001	<0.0001	<0.0001	**0.0004**	<0.0001	**0.0058**	**0.0004**
	Chromium (III+VI)	mg/L	0.001	**0.001**	0.003	<0.001	<0.001	0.002	<0.001	0.002	<0.001
	Copper	mg/L	0.001	**0.0014**	**0.003**	**0.01**	**0.009**	**0.004**	**0.008**	**0.019**	**0.011**
	Lead	mg/L	0.001	**0.0034**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Nickel	mg/L	0.001	**0.011**	**0.055**	0.002	0.003	**0.088**	<0.001	**0.47**	**0.018**
	Zinc	mg/L	0.001	**0.008**	**0.15**	**0.1**	**0.078**	**0.35**	**0.11**	**2.1**	**0.16**
	Mercury	mg/L	0.0005	**0.0006**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Anions	Chloride	mg/L	0.05		7400	50	130	5300	37	5600	1400
Cation	Calcium	mg/L	0.1		57	1.7	5.8	33	0.8	42	3.1
	Magnesium	mg/L	0.1		660	4.1	9.7	430	2.4	430	41
	Potassium	mg/L	0.2		16	0.93	1.8	17	0.8	35	2.9
	Sodium	mg/L	0.1		4400	170	480	3000	61	3200	850
Inorganics	Alkalinity (Bicarbonate)	mg/L	2		240	230	500	54	66	34	200
	Alkalinity (total) as CaCO3	mg/L	2		<2	<2	<2	<2	<2	<2	<2
	TDS	mg/L	5		15000	480	1100	11000	540	10000	6700

Comments

#1 ESDAT Combined.

Appendix E Documents on Mt Enfield

Table E1. Summary of Reviewed Documents

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
Mount Enfield				
2a	Hibbs & Associates (2012m) 'Stockpile No. 2 - Unsuitable Materials Stockpile Sampling ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L43 Rev 1, 21 September 2012	The report presents findings of soil sampling of Stockpile No. 2 – Unsuitable Materials Stockpile (approximately 1,200m^3), comprising materials from Stockpile No. 2 that was considered to have unsuitable engineering properties for placement beneath paved areas onsite, for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	
2b	Hibbs & Associates (2012o) 'SP2-UM Stockpile Sampling ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L48, 13 November 2012	The report presents findings of soil sampling of SP2-UM Stockpile (approximately 1,000m^3), comprising materials from Stockpile No. 2 that was considered to have unsuitable engineering properties for placement beneath paved areas onsite, for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	
2c	Hibbs & Associates (2012r) 'ECSA B Batter Stockpile Sampling ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L54, 14 December 2012	The report presents findings of soil sampling of the Empty Container Storage Area (ECSA) B Batter Stockpile (approximately 1,800m^3) for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	
2d	Hibbs & Associates (2013e) 'Materials Movement Summary Report for: Materials Relocated to Stockpile No. 4 and Asbestos Impacted Materials May to October 2012 ILC Enfield 71-73 Cosgrove Road Enfield NSW', Ref: S6840 L55 Rev3, 12 February 2013	See Item 1b	See Item 1b	Yes
2e	Hibbs & Associates (2013a) 'Punchbowl Road (Sand & Clay) Stockpile Sampling 071212 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L58 RW1, 30 January 2013	The report presents findings of soil sampling of stockpiles referred to as Punchbowl Road (sand) stockpile (approximately 50m^3) and Punchbowl Road (clay) stockpile (approximately 50m^3) from the excavation within the abutment adjacent to Punchbowl Road the southern rail connection on the southern portion of ILC Enfield site for placement within Mt Enfield. As asbestos cement sheeting was	Coffey considers that report is acceptable.	

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
		identified in the sample, material in the Punchbowl Road (sand) stockpile was considered acceptable for placement within Mt Enfield, allowing for a 100mm thick layer of asbestos free material to be placed over this material. Based on the results, material in the Punchbowl Road (clay) stockpile was considered acceptable for placement within Mt Enfield to any depth.		
2f	Hibbs & Associates (2013c) 'WHC Unsuitable Stockpile Sampling, ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L59 Rev 1, 4 February 2013	The report presents findings of soil sampling of the WHC Unsuitable Stockpile (approximately 120m^3), collected from where Warehouse C is proposed to be built from the excavation of Warehouse C and Area X along the eastern boundary of the central section of the site, for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	
2g	Hibbs & Associates (2013d) 'Punchbowl Road (Clay & Asphalt) In-situ Sampling 121212 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L60 Rev 1, 4 February 2013	The report presents findings of in-situ soil sampling of clay (approximately 50m^3) and asphalt material (approximately 2 to 4m^3) at the Punchbowl Road southern rail abutment for placement within Mt Enfield. Based on the findings, clay and asphalt material from Punchbowl Road southern rail abutment was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	
2h	Hibbs & Associates (2013k) 'ULX Sed Basin 2 Stockpile Sampling 070213 ILC Enfield, 71-71 Cosgrove Road, Enfield, NSW', Ref: S6840 L63, 22 March 2013	The report presents findings of soil sampling of ULX Sed Basin 2 stockpile excavated from the ULX crossing of the DI Downer rail line approximately 25m south of the EDI Downer Maintenance shed and adjacent to the site access road in the northern section of the site (approximately 80m^3) for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No
2i	Hibbs & Associates (2013j) 'ULX Area F Stockpile Sampling 070213 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L64, 22 March 2013	The report presents findings of soil sampling of ULX Area F stockpile excavated from the previously capped area Capping Area F in the northern section of the site (approximately 2m^3) for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No
2j	Hibbs & Associates (2013f) 'Containment Cell A Stockpile Sampling 070213 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L65, 22 March 2013	The report presents findings of soil sampling of Containment Cell A stockpile excavated from the previously constructed Containment Cell A (approximately 50m^3) for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
2k	Hibbs & Associates (2013l) 'Gate E11 & RTR Vegetation Stockpile Sampling 210213 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L70, 25 March 2013	The report presents findings of soil sampling of Gate E11 stockpile (approximately 60m^3), which was relocated from the previous location adjacent to Gate E11 in the central section of the site (information about source of this materials is not available), and RTR Vegetation stockpile (approximately 20m^3), which was sourced from an area being excavated for a rail through road (RTR), for placement within Mt Enfield. As asbestos cement sheeting was identified in the sample, material in the Gate E11 stockpile was considered acceptable for placement within Mt Enfield, allowing for a 100mm thick layer of asbestos free material to be placed over this material. Based on the results, material in the RTR Vegetation stockpile was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No
2l	Hibbs & Associates (2013m) 'Area F (Mixed Sands) Stockpile Sampling 050313 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L73, 19 April 2013	The report presents findings of soil sampling of Area F (mixed sands) stockpile excavated from Area F where a concrete pit containing an asbestos cement pipe was identified (approximately <5m^3) for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No
2m	Hibbs & Associates (2013n) 'Area F (DELEC Crossing) & Area Y (Mixed) Stockpile Sampling 060313 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L74, 20 April 2013	The report presents findings of soil sampling of Area F (DELEC Crossing) stockpile (approximately 260m^3), which comprised material excavated from within Area F for the DELEC crossing at the existing railway (information about source of this materials is not available), and Area Y (mixed) stockpile (approximately 200m^3), which comprised material from the surface of Area Y, for placement within Mt Enfield. Based on the findings, the materials were considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No
2n	Hibbs & Associates (2013o) 'MC30 & Area Y Batter Stockpile Sampling 080313 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L75, 20 April 2013	The report presents findings of soil sampling of CM30 stockpile (approximately 40m^3), which comprised material excavated from within the MC30 internal site road (information about source of this materials is not available), and Area Y Batter stockpile (approximately 80m^3), which comprised material from the Area Y batter, for placement within Mt Enfield. Based on the findings, the materials were considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No
2o	Hibbs & Associates (2013r) 'Gate E11 Stockpile, Area Y & Z Batter and Stockpile No.2A-US Sampling 120313	The report presents findings of soil sampling of Gate E11 stockpile (approximately 30m^3), which was located adjacent to Gate E11, Area Y & Z batter (approximately <2,000m^3), which was collected insitu from	Coffey considers that report is acceptable.	No

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
	ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', S6840 L77, 21 April 2013	Area Y & Z batter, and Stockpile No. 2A-US (approximately 1,800m^3), which comprised unsuitable material excavated from Stockpile 2A, for placement within Mt Enfield. Based on the results, the above materials were considered acceptable for placement within Mt Enfield to any depth.		
2p	Hibbs & Associates (2013q) 'External Utilities (Mixed) Sampling 140313 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L78, 21 April 2013	The report presents findings of soil sampling of External Utilities Mixed) stockpile (approximately 30m^3), which comprised material from excavation of areas for utilities installation. As asbestos was detected in one sample, Hibbs & Associates recommended that the material be capped with at least 100mm thick layer of asbestos free material	NSW Ports made a comment on the pdf version of the document (the final version of the document was not made available to Coffey) that NSW Ports has chosen to treat the material as asbestos contaminated and place it under a cap. Coffey considers that this conclusion does not differ to the conclusion made in the original document and therefore considers that the report is acceptable.	No
2q	Hibbs & Associates (2013t) 'RTR (Mixed) Stockpile Sampling 140313 ILC Enfield, 71-72 Cosgrove Road, Enfield, NSW', Ref: S6840 L79, 21 April 2013	The report presents findings of soil sampling of RTR (mixed) stockpile excavated from a rail through road (RTR) between the south-western end of Empty Container Storage Area A and the main site boundary with the rail network (approximately 120m^3) for placement within Mt Enfield. One sample had a benzo(a)pyrene concentration exceeding the remediation acceptance criteria of 5.0mg/kg at 5.9mg/kg. However, the 95% upper confidence level (UCL) of benzo(a)pyrene was calculated to be below 5mg/kg. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	The actual value for 95% UCL was not provided. However, Coffey undertook 95% UCL assessment of the data and the result was below 5mg/kg (note that there are only limited data comprising 5 data, which limits the accuracy of the UCL calculation). Coffey considers that report is acceptable.	No
2r	Environ (2012c) 'Email Correspondence: Re: ILC - SCM - E - Organic Materials Taken to Mt Enfield Email to Site Auditor Final V1.0 8 October 2012', Ref: ENVIRON - CADV - 000001, dated 25 October 2012 (original Coffey email not available)	Methane generation potential of degraded vegetation mixed soil	The auditor reviewed the document and considered that the degraded materials did not appear to have significant methane generation potential and that methane generation should not be an issue for Mt Enfield while it is retained as an open space area. Unless a low permeability cap is installed, the auditor considered that there should not be potential for migration of methane from the site to nearby properties. The auditor considers that it may be	Yes

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
			worthwhile to do some post-construction surface monitoring of methane under the EMP.	
2s	Environ (2012a) 'Email Correspondence: Re: ILC - SCM - E - North and South Rail Connections Material Proposal', Ref: ENVIRON - RTCLF - 000001, dated 4 October 2012	This document presents a chain of email between NSW Ports and the auditor regarding proposal for the excavation and removal of materials from the North and South Rail Connections and placement in the main ILC Enfield site. This includes a proposal to excavate and place excavated material from the Southern Abutment and immediately adjacent track alignment, and the Northern Connection track alignment, directly into Mt Enfield. The proposal also requests approval for the ex-situ sampling regime of the Southern Abutment material, which has not been sampled, for placement into Mt Enfield.	The auditor reviewed the document (Environ, 2012a) and provides general agreement with the proposed strategy. The auditor notes that the reduced sampling density (1 in 1,000m^3 with a minimum of 5 samples) must be accompanied by documentation that confirms that the samples are representative of the material and that the samples should be analysed at a minimum for PAHs, OCPs, metals, TPH, and asbestos, and volatiles(if there are any indications of volatiles). Coffey notes that the complete proposal was not available for review.	Yes
2t	Coffey Environments (2012a) 'Contamination Assessment of Stockpiled Material at ILC Enfield, Cosgrove Road, Strathfield South, NSW', Ref: ENVIRHOD00634AF SP1 and SP2 Assessment, 20 September 2012	The report presents findings of contamination assessment of stockpiles SP1 (approximately 600m^3) and SP2 (approximately 4,000m^3), which comprised material from the excavation of Area 2B-3, north of the bridge in the Intermodal Terminal Area at a depth of approximately 1.0m below ground level (bgl), for placement within Mt Enfield. Based on the findings, the materials were considered suitable to be used as capping material in an area that will be vegetated with grass.	None	No
2u*	Hibbs & Associates (2012f) 'Stockpile No. 4 (Mount Enfield) Soil Sampling ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L24, 17 May 2012	This report presents soil sampling program carried out on the southern side of Stockpile No. 4 to assess if the material presents a health risk for future worker undertaking work in the area. The assessment indicated that asbestos cement fragments were visually observed and these were removed through hen-picking. Asbestos fibre bundles or respirable asbestos fibres were not identified in any of the samples. Other COPCs were considered to be at a level that does not present an elevated health risk for workers. Hibbs & Associates recommended good personal hygiene practices, appropriate dust control measures, and appropriate PPE when working on Stockpile No. 4.	Coffey considers that report is acceptable.	No

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
2v*	Hibbs & Associates (2012i) 'Visual Inspection - Stockpile No. 4 Eastern Batter, ILC Enfield', Ref: S6840 L38, 2 August 2012	This document presents assessment (comprising visual inspection and sampling) of the Eastern Batter of Stockpile No. 4 (surface was approximately 1,500m^2, length was approximately 110m, and height was approximately 8m) to verify the suitability of the material (with respect to asbestos only) as capping on the reformed Stockpile No. 4. The visual in section identified fragments of asbestos cement products, brake shoes, and other material suspected to contain asbestos on the exposed ground surface. Laboratory analysis of some of the identified materials confirmed that the materials contained asbestos. The report did not provide any recommendation. Based on clarification sought to Leighton, the eastern batter of Stockpile 4 has since been capped as per the Spoil Management Plan.	Coffey considers that the report is acceptable. Leighton confirmed that capping had been placed on the eastern batter.	No
2w*	Hibbs & Associates (2012j) 'Visual Inspection - Temporary Haul Road Stockpile No. 5 to Stockpile No. 4, ILC Enfield',	This document presents visual inspection of the temporary haul road from Stockpile No. 5 to Stockpile No. 4 after the completion of cleaning of the roadway (by scraping of surface soil), following the movement of asbestos contaminated material. The visual inspection indicated that ACM was not observed in the subject area. Based on that, Hibbs & Associates concluded that there was a negligible asbestos health risk associated with the recommencement of unrestricted use of the inspection section of the haul road.	Coffey considers that document is acceptable.	No
2x*	Hibbs & Associates (2013p) 'Basin B Trial Pit Sampling 090313 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L76, 21 April 2013	The report presents findings of soil sampling of material from Basin B through trial pitting for placement within Mt Enfield. The volume of material to be excavated was up to, but no more than 14,000m^3. Based on the results, the above materials were considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that document is acceptable.	No
2y*	Hibbs & Associates (2013s) 'Lot 2B3 (Clay) Stockpile Sampling 150313 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L80 Rev1A, 21 April 2013	The report presents findings of soil sampling of Area F (mixed sands) Lot 2B3 (clay) stockpile excavated from Lot 2B3 in the Northern Intermodal Terminal area (approximately 2,000m^3) for placement within Mt Enfield. Based on the findings, the material was considered acceptable for use as a capping layer on Mt Enfield.	Coffey has made some comments (Coffey, 2013b) about the assessment based the outcome of our inspection of the stockpile. The surface of the stockpile appeared to be different based on our assessment and based on the information provided by NSW Ports, the vegetation on appearing the report had been removed. Coffey considered that the soil in the stockpile is suitable to be used as a capping material on Mt Enfield and recommends that during movement of soil	Yes

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
			from the stockpile and spreading it on Mt Enfield, observations of the material quality is undertaken to confirm that the material is as described in the Hibbs & Associates (2013s) report.	
2z*	Hibbs & Associates (2013v) 'ULX Southern Rail Corridor Stockpile Sampling 030513 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L83, 14 June 2013	The report presents findings of soil sampling of ULX Southern Rail Corridor stockpile (approximately 900m^3), which comprised material excavated from the ULX Southern Rail Corridor approximately 30m south of the EDI Downer Maintenance Shed, for placement within Mt Enfield. As asbestos was identified in three of the samples, the material was considered acceptable for placement within Mt Enfield, allowing for a 100mm thick layer of asbestos free material to be placed over this material.	Coffey considers that document is acceptable. The document version reviewed had comments from NSW Ports. The comment is not considered to impact the content of the report.	No
2aa*	Hibbs & Associates (2013x) 'Warehouse B Mixed (Asphalt/Soil) Stockpile Sampling 240513 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L86, 28 June 2013	The report presents findings of soil sampling of Warehouse B mixed (asphalt/soil) stockpile excavated from the car park to the east of the EDI Downer Maintenance Facility (approximately 30m^3) for placement within Mt Enfield. Based on the findings, the material was considered acceptable for use as a capping layer on Mt Enfield. Hibbs & Associates further notes that if the asphalt material was separated from the soil material within the stockpile, the asphalt would be appropriate for reuse as general fill.	Coffey considers that document is acceptable.	No
2ab*	Hibbs & Associates (2013z) 'D+E Trench & Stockpile Sampling 06-13 September 2013 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L07, 11 October 2013	The report presents findings of soil sampling of stockpile (approximately 500m^3), which comprised material excavated from the area D + E trench (located on the south-western end of Empty Container Storage Area A), for placement within Mt Enfield. Based on the findings, the materials were considered acceptable for placement within Mt Enfield to any depth.		
8. Excavation of Capped Area for 900SCL Watermain Relocation Works				
8a	Hibbs & Associates (2012k) 'Classification Sampling - Stockpiles 900SCL & WHB East ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L30 Final Revision 1, 5 September 2012	The report presents findings of soil sampling of 900SCL stockpile (approximately 260m^3) located to the west of the Downer EDI maintenance sheds in the central east of the site, and WHB East stockpile (approximately 200m^3) located to the south of Gate E11 and the north-east of Stockpile No. 5 (no information of source location was available), for placement within Mt Enfield. As ACM was observed in one sample from 900SCL stockpile and two samples from the WHB East stockpile, the materials were considered acceptable for	Coffey considers that document is acceptable.	No

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
		placement within Mt Enfield, allowing for a 100mm thick layer of asbestos free material to be placed over this material.		
8b	Hibbs & Associates (2012n) '900SCL Repackage, ILC Enfield', Ref: S6840 L42 Rev1, 27 September 2012	This document presents further works information regarding the 900SCL Line area as well as a summary of work undertaken in the area, including: • Classification of the 900SCL stockpile • Material tracking of the 900SCL stockpile (see other documents below) • Conclusion that the new 900SCL line had been completed and the excavation backfilled. Proposed works in and around the 900SCL Line area, including development of the MC10 and MC40 internal site roads and various service trenches. Hibbs & Associates states that any proposals to undertake work throughout the 900SCL Line area or any part of the Capped Area D/E will first be submitted to the site auditor.	Environ (2012b) reviewed the document and was satisfied with the information provided.	Yes
	Hibbs & Associates (2012a) 'Asbestos Visual Inspection & Bulk Sample Analysis - 900SCL Line, ILC Enfield', Ref: S6840 L04 Revised, 31 January 2012	This document presents assessment (comprising visual inspection of the base of excavation and soil sampling) of an area of approximately 600m^2 for the 900 SCL Line following removal of fill material containing small amounts of asbestos cement sheeting and asbestos fibres within the soil. Visual inspection of the base of excavation (natural clay) indicated that ACM was identified during visual inspection. Soil sampling from the walls of excavation (collected from the fill) indicated that asbestos was present at various concentrations on the wall. Asbestos cement fragments in the walls of excavation were subsequently removed. At the completion of excavation of asbestos removal, a geomembrane layer was placed over the exposed surface of the fill material. Hibbs & Associates considered that asbestos remedial works had been undertaken to acceptable industry standard and the subject area within the site is considered acceptable for its intended purpose.	Coffey considers that document is acceptable.	Assumed Yes (based on comment on Hibbs & Associates (2012n)
	Hibbs & Associates (2012c) 'Asbestos Visual Inspection & Bulk Sample Analysis - 900SCL Line, ILC Enfield', Ref: S6840 L09, 7 February 2012	This document presents assessment (comprising visual inspection and soil sampling) of the northern wall of the 900SCL Line following additional excavation works. Visual assessment indicated that ACM was not observed o the northern wall. Soil sampling from the northern wall of excavation did not indicate the present of ACM. At the completion of excavation of asbestos removal, a geomembrane layer	Coffey considers that document is acceptable.	Assumed Yes (based on comment on Hibbs & Associates

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
		was placed over the exposed surface of the fill material. Hibbs & Associates considered that asbestos remedial works had been undertaken to acceptable industry standard and the subject area within the site is considered acceptable for its intended purpose.		(2012n)
	Hibbs & Associates (2012g) 'Interim Tracking of Materials - 900SCL Stockpile, ILC Enfield', Ref: S6840 L36 Revised, 26 July 2012	This document presents material tracking information for the 900SCL stockpile (approximately 300m^3), which states that all material was transported to Stockpile No. 5 Restricted Asbestos Zone.	Coffey considers that document is acceptable.	Assumed Yes (based on comment on Hibbs & Associates (2012n)
	Hibbs & Associates (2012h) 'Visual Inspection - Base of 900SCL Stockpile & Truck Loading Area, ILC Enfield', 31 July 2012	This document presents results of visual observations of the base of the 900SCL stockpile and truck loading area (approximately 1,000m^2 in area) following removal of the stockpile. The assessment indicated that ACM was not identified on exposed ground surface. No soil sampling was undertaken.	Photos of inspection are not provided. Coffey is relying on Hibbs & Associates' letter for their conclusion. Given that the area is to be paved, Coffey considers that this is unlikely to affect the validation of the site.	Assumed Yes (based on comment on Hibbs & Associates (2012n)
11. Light Industrial Area Unexpected Contamination				
11b	Hibbs & Associates (2012e) 'Unsuitable Engineering Fill Sampling ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L21 Revision, 15 April 2012	This report presents findings of soil sampling from unsuitable engineering fill excavated from various locations from the site (Vegetation Stockpile – Green Waste (18,000m^3), Vegetation Stockpile – Unsuitable Concrete (2,000m^3), Area Y & Z – Green Waste (1,000m^3), Area Y & Z – Contaminated (300m^3), Warehouse C (100m^3), Empty Container Storage B (500m^3)), for placement within Mt Enfield. As ACM was identified in the samples from Vegetation Stockpile – Green Waste, Area Y & Z – Green Waste, and Area Y & Z - Contaminated, these materials were considered acceptable for placement within Mt Enfield, allowing for a 100mm thick layer of asbestos free material to be placed over this material. Based on the results, materials in the remaining stockpiles were considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No
11c	Hibbs & Associates (2012d) 'Inspection of Trenches and Surface of Material Along Batter in Area Y & Z, ILC Enfield, Cosgrove Road, Enfield NSW 2136', Ref: S6840 L16, 9 March	This document presents observations of the visual identification of ACM fragments on the surface and within trenches dug into the fill materials along the batter of area Y and Z. The observations indicated fill materials along the batter contain ACM fragments and Hibbs & Associates considered that the entire volume of fill materials within	Coffey considers that report is acceptable.	No

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
	2012	the batter should be removed.		
	Hibbs & Associates (2012l) 'Waste Classification Assessment - Area Y & Z, 71-73 Cosgrove Road, ILC Enfield, NSW', Ref: S6840 L44, 5 September 2012	This document presents waste classification assessment for unsuitable engineering fill in Area Y and Z. The result indicates that the sample concentrations are below the concentrations specified for general solid waste based on NSW EPA 'Waste Classification Guidelines Part 1: Classifying Waste' and that Hibbs & Associate classified the material as Special (Asbestos) Waste.	Coffey considers that report is acceptable.	No
	Hibbs & Associates (2012p) 'Trial Pitting and Inspection of Batter Material in Area Y & Z, ILC Enfield, Cosgrove Road, Enfield NSW 2136', Ref: S6840 L46 Rev2.3, 15 November 2012	This document presents observations during trial pitting at four locations along the batter of Area Y & Z. Previous investigations on the Area Y & Z batter identified the fill materials covering this batter contained ACM. Three phases of vegetation and material stripping of the Area Y & Z batter, with the fill material disposed to an offsite facility or transported to Stockpile No. 5 Restricted Asbestos Zone. The observations during trial pitting indicated that asbestos cement fragments were observed in all test pits up to a depth of 1.0mbgl or more. The lateral extent of asbestos impacted fill on the western side of the batter could not be determined. The clay materials underlying the fill appear unimpacted by ACM and Hibbs & Associates stated that this may be appropriate to use in other unrestricted earthworks onsite.	Coffey considers that report is acceptable.	No
	Enviropacific (2012) 'Email Correspondence: ILC Enfield Light Industrial Area X and Y', 15 November 2012	Enviropacific (2012) commented on the above documents and recommended to relocate the fill in the area, which was heavily impacted with demolition waste and asbestos, under asbestos conditions to a suitable emplacement area. The material in the top layer, which is highly impacted with foreign matter and asbestos fragments, would not be suitable for general earthworks unless capped with all other asbestos impacted fill onsite.	Coffey considers that comment is acceptable.	No
13b. Gabion Wall and Drainage Works Impacting Cell A Adjacent to the Existing DELEC Siding				
13b.i	Hibbs & Associates (2013k) 'ULX Sed Basin 2 Stockpile Sampling 070213 ILC Enfield, 71-71 Cosgrove Road, Enfield, NSW', Ref: S6840 L63, 22 March 2013	See Item 2h	See Item 2h	No

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
13b.ii	Hibbs & Associates (2013j) 'ULX Area F Stockpile Sampling 070213 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L64, 22 March 2013	The report presents findings of soil sampling of ULX Area F stockpile excavated from the previously capped area Capping Area F in the northern section of the site (approximately 2m^3) for placement within Mt Enfield. Based on the findings, the material was considered acceptable for placement within Mt Enfield to any depth.	Coffey considers that report is acceptable.	No
13b.iii	Hibbs & Associates (2013f) 'Containment Cell A Stockpile Sampling 070213 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L65, 22 March 2013	See Item 2j	See Item 2j	No
13b.iv	Enviropacific E11108_WP23.1 – open cut ULX	Based on information from Leighton, this contains Work Procedure for the work, which is not relevant to the Validation report.	This is considered not relevant for the Validation report.	No
13b.v	Hibbs & Associates (2013y) 'Materials Movement Summary Report for: Materials Relocated to Stockpile No. 4 and Asbestos Impacted Materials November 2012 - April 2013', Ref: S6840 L87 Rev3, August 2013	See Item 1c	See Item 1c	Yes
21. Stockpile Material for General Fill				
21a*	Hibbs & Associates (2012q) '11kVa (Sand) Stockpile ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L47, 10 December 2012	The report presents findings of soil sampling of the 11kVa (sand) stockpile, which comprised spoil from excavation of utilities (approximately 120m^3) for use as general fill. Asbestos (in the form of fibre bundle attached to a bitumen fragment) was detected at a very low concentration in one duplicate soil sample. Hibbs & Associates considered that the stockpile material was suitable for use as general fill.	Coffey considers that the document is acceptable.	No
21b*	Hibbs & Associates (2012s) 'External Utilities (Clay) Stockpile ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L50, 14 December 2012	The report presents findings of soil sampling of the External Utilities (Clay) stockpile, which comprised spoil from excavation of utilities (approximately 70m^3) for use as general fill. Based on the results, Hibbs & Associates considered that the stockpile material was suitable for use as general fill.	Coffey considers that the document is acceptable.	No
21c*	Hibbs & Associates (Hibbs & Associates, 2012b) 'External Utilities (Mixed & Asphalt) Stockpile	The report presents findings of soil sampling of the External Utilities (mixed) (approximately 50m^3) and External Utilities (asphalt) (approximately 10m^3) stockpiles, which comprised spoil from	Coffey considers that the document is acceptable.	No

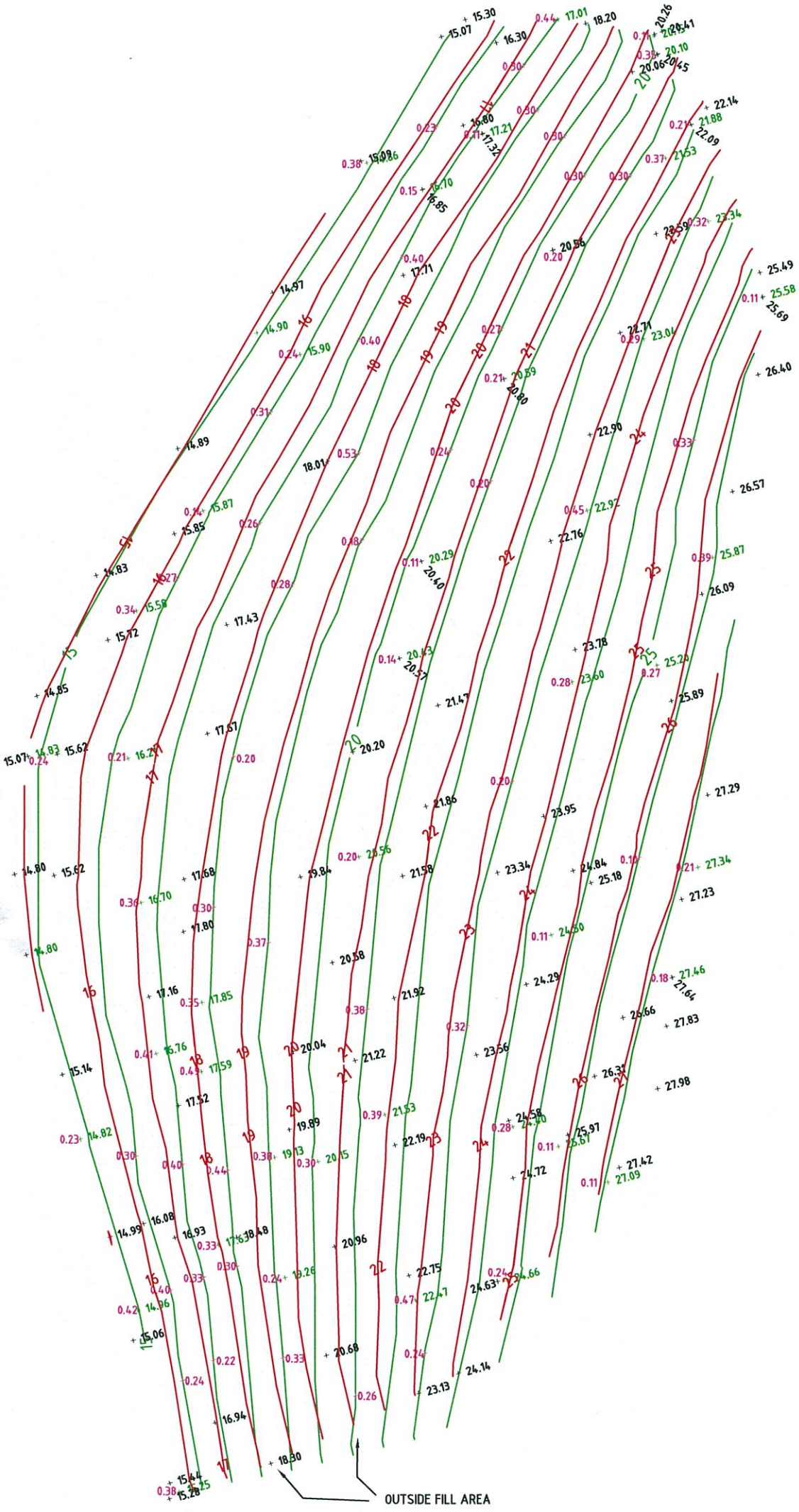
Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
	Sampling ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L56, 4 February 2012	excavation of utilities for use as general fill. Based on the results, Hibbs & Associates considered that the stockpile materials were suitable for use as general fill.		
21d*	Hibbs & Associates (2013b) 'External Utilities (Mixed) Stockpile Sampling 261112 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW ',Ref: S6840 L57, 4 February 2013	The report presents findings of soil sampling of the External Utilities (mixed) stockpile, which comprised spoil from excavation of utilities (approximately 120m^3) for use as general fill. Based on the results, Hibbs & Associates considered that the stockpile material was suitable for use as general fill.	Coffey considers that the document is acceptable.	No
21e*	Hibbs & Associates (2013i) 'External Utilities (Sand) Stockpile 250113 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW, Ref: S6840 L62, 22 March 2013	The report presents findings of soil sampling of the External Utilities (mixed) stockpile, which comprised spoil from excavation of utilities (approximately 60m^3) for use as general fill. Based on the results, Hibbs & Associates considered that the stockpile material was suitable for use as general fill.	Coffey considers that the document is acceptable.	No
21f*	Hibbs & Associates (2013g) 'External Utilities (Asphalt) Stockpile Sampling 120213 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L67, 22 March 2013	The report presents findings of soil sampling of the External Utilities (asphalt) stockpile, which comprised spoil from excavation of utilities (approximately 25m^3) for use as general fill. Based on the results, Hibbs & Associates considered that the stockpile material was suitable for use as general fill.	Coffey considers that the document is acceptable.	No
21g*	Hibbs & Associates (2013h) 'External Utilities (Mixed Sands) Sampling 280213 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L71, 22 March 2013	The report presents findings of soil sampling of the External Utilities (mixed sands) stockpile, which comprised spoil from excavation of utilities (approximately 20m^3) for use as general fill. Based on the results, Hibbs & Associates considered that the stockpile material was suitable for use as general fill.	Coffey considers that the document is acceptable.	No
21h*	Hibbs & Associates (2013u) 'External Utilities (Mixed) Stockpile 100413 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L81, 29 April 2013	The report presents findings of soil sampling of the External Utilities (mixed) stockpile, which comprised spoil from excavation of utilities (approximately 40m^3) for use as general fill. Based on the results, Hibbs & Associates considered that the stockpile material was suitable for use as general fill.	Coffey considers that the document is acceptable.	No
21i*	Hibbs & Associates (Hibbs & Associates, 2013w) 'Asphalt Area B Stockpile Sampling 210513 ILC Enfield, 71-73 Cosgrove Road, Enfield, NSW', Ref: S6840 L85, 21 June 2013	The report presents findings of soil sampling of the Asphalt Area B stockpile, which comprised spoil from excavation of the car park located to the east of the EDI Downer Maintenance Facility (approximately 150m^3) for use as general fill. Based on the results, Hibbs & Associates considered that the stockpile material was suitable for use as general fill or placed at Mt Enfield to any depth.	Coffey considers that the document is acceptable.	No

Item No	Report Reference	Scope and Conclusion	Coffey's Review Comments and/or Auditor's Comments (if Available)	Site Auditor Approval obtained
21j*	Coffey Environments (2013a) 'Assessment of Area F Stockpile (SPF) and Stockpile SP2B4 ILC @ Enfield, Cosgrove Road, Strathfield South, NSW (Draft)', Ref: ENVIRHOD00634AF-L06b, 24 January 2013	The report presents findings of soil sampling of stockpile SPF (approximately 3,000m^3), which was sourced from excavation in area F, and stockpile SP2B4 (approximately 1,500m^3), which was sourced from excavation in Lot 2B4. Based on the results, Coffey considered that stockpiles SPF and SP2B4 were suitable for beneficial reuse on the site in an open space land use scenario.	This report was only in draft form and never finalised.	No

Appendix F Mt Enfield Survey

SURVEYED 25/11/2014
MAJOR CONTOUR
MINOR CONTOUR

DIFFERENCE BETWEEN 2 SURFACES
SURVEYED 09/03/2015
MAJOR CONTOUR



UNDATED SURVEY ON 09/03/2015

NOTE:
- COORDINATES AND AZIMUTH ARE IN MGA TAKEN FROM SSM69335 AND SSM141431. ORIGIN OF DATUM IS PM43710 (RL=13.045 AHD)
- SSM69335, E=322082.693, N=6247270.779 AND SSM141431 E=321991.673, N=6247505.70
- THIS DRAWING IS SUBJECT TO COPYRIGHT. IT MUST NOT BE REPRODUCED IN WHOLE OR PART WITHOUT PRIOR WRITTEN CONSENT OF *METRO SURVEYS Pty. Ltd.*

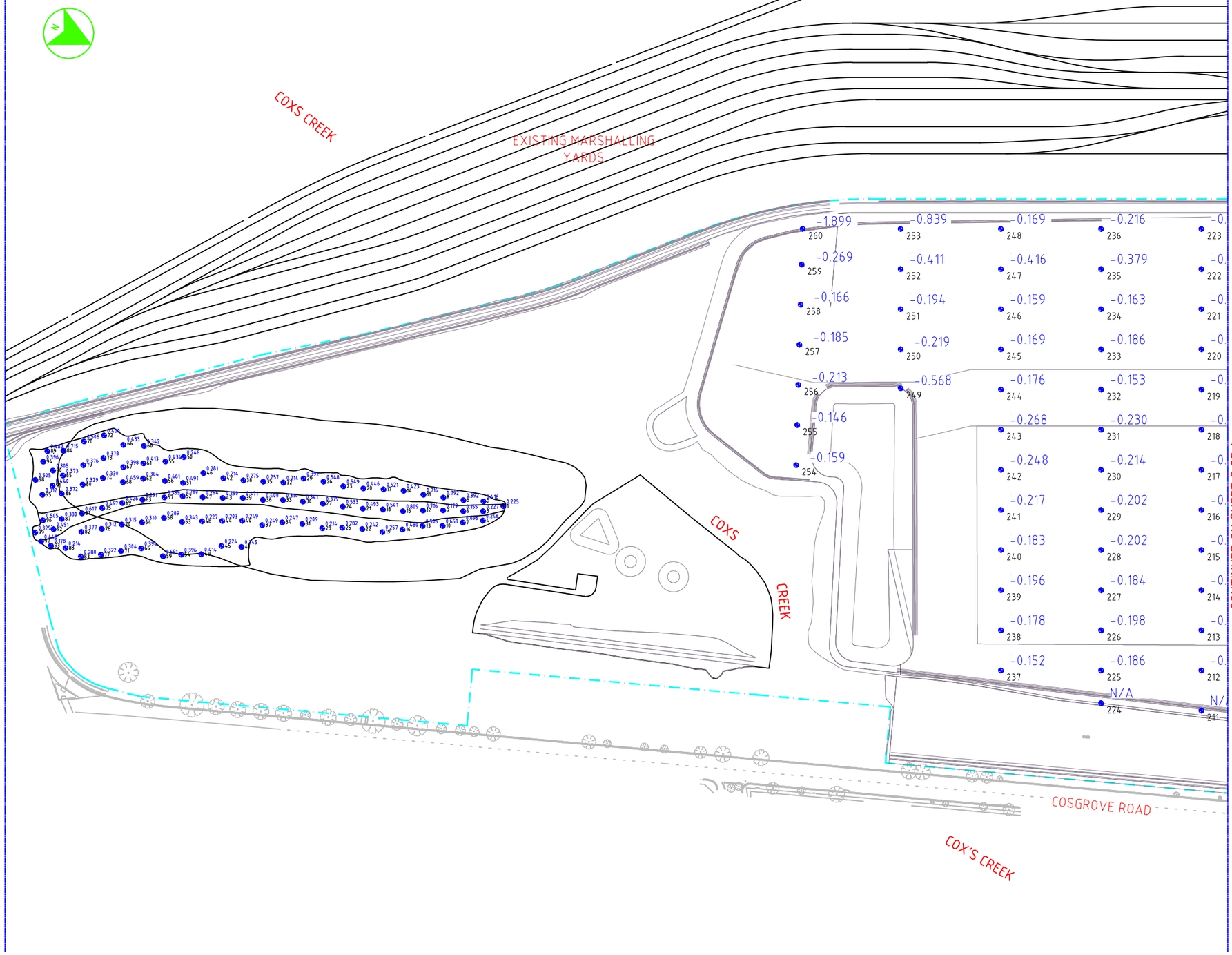
0 2 4 6 8 10 12
1:200

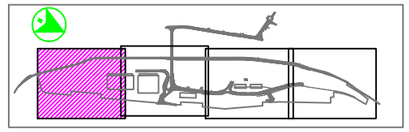
REFERENCE No: C05 REDUCTION RATIO 1:200 ON A2 CALCULATE: 21.02.2015 BY P. Y. FOR: CHRISTIE CIVIL	PLAN SHOWING LEVEL DIFFERENCES BETWEEN THE TWO SURFACES SURVEYED ON 25/11/2014 & 03/02/2015 IN NSW PORT, AT COSGROVE ROAD, STRATHFIELD SOUTH	METRO SURVEYS Pty. Ltd. A.C.N. 083 533 484 112 KINGHORNE RD. BONNYRIGG HEIGHTS NSW 2177 TELEPHONE: (02) 8786 0486

Capping Depth in Western Batter

17 Oct 13 - 17:30

A3





KEY PLAN
N.T.S

LEGEND:

-0.999	DEPTH FROM FINISHED SURFACE LEVEL TO TOP OF CONTAMI NATED MATERIAL
100	POINT REFERENCE NUMBER
-0.999	DEPTH FROM FINISHED SURFACE LEVEL TO TOP OF CAPPING MATERIAL PLACED PRIOT TO LCPL COMMENCEMENT
100	POINT REFERENCE NUMBER

NOTES:

1. THE INFORMATION SHOWN ON THIS PLANE IS TAKEN FROM THE AS-BUILT CONSTRUCTION SURVEY.
2. THE INFORMATION CONTAINED WITHIN THE ATTACHED DRAWINGS IS INTENDED TO PROVIDE ADVICE AS TO THE DEPTH OF CONTAMINATED MATERIAL FROM ON THE SURFACE LEVEL AT THE COMPLETION OF LEIGHTON CONTRACTORS SCOPE OF WORK.
3. IN AREAS OUTSIDE OF THE INTERMODAL TERMINAL AND SITE ROADS. PERMANENT PAVEMENT CONSTRUCTION HAS NOT BEEN UNDERTAKEN.
4. IN AREAS WHERE PERMANENT PAVEMENT HAS NOT BEEN CONSTRUCTED AS PART OF LEIGHTON CONTRACTORS SCOPE THE CONTAMINATED MATERIAL HAS BEEN COVERED WITH A CAPPING LAYER.
5. ON THE ATTACHED DRAWING IF THE DEPTH IS SHOWN AS N/A THE POINT IS LOCATED OUTSIDE OF THE CONTAMINATED MATERIAL AREA.

PLAN
NOT TO SCALE

No.	BY	DATE	DESCRIPTION	APPD
03	I.G	17.12.2013	WH D and E Depths amended	I.G
02	I.G	06.11.2013	ECSA A and WH A and B Depths added	I.G
01	I.G	17.10.2013	INFORMATION	I.G

Scales:

THE INFORMATION SHOWN ON THIS DRAWING IS FOR THE PURPOSES OF THE ILC AT ENFIELD PROJECT ONLY.
NO WARRANTY IS GIVEN OR IMPLIED AS TO ITS SUITABILITY FOR ANY OTHER PURPOSE.
APPROVED ORIGINAL OF THIS DRAWING SIGNED & DATED AS INDICATED BELOW

	PREPARED	CHECKED	PROJECT MANAGER APPROVED
DESIGN	M.Labour	N/A	J.Pearson
DRAFTING	I.Gasson	N/A	DATE 17.10.2013

ALL DRAWINGS ARE TO BE PRINTED IN COLOUR AND MAY BE INCOMPLETE IF COPIED IN BLACK & WHITE

PREPARED BY
LEIGHTON CONTRACTORS PTY LTD
71-73 COSGROVE ROAD
STRATHFIELD SOUTH
NSW 2136
ph: 02 9035 5686
www.leightoncontractors.com.au

NOT FOR CONSTRUCTION

Project Title: ILC AT ENFIELD

Drawing Title: CONTAMINATED MATERIAL DEPTH BELOW FINISHED SURFACE

SHEET 1 OF 4

Status	Drg No	Rev
AS-BUILT	SK-SKETCH-SK33	03

Plot Date: 18 Dec 2013 @ 08:25:04 Login Name: igasson
Cad File: I:\W953 ILC\SE - Services\SE - 99 Miscellaneous AutoCAD files\Design Sketches\SK33 - CONTAMINATED MATERIAL DEPTH_Bound.dwg

Capping Depth Prior to Placement of Additional Material in Western Batter

Appendix G Coffey (2011) SMP

coffey environments
SPECIALISTS IN ENVIRONMENTAL,
SOCIAL AND SAFETY PERFORMANCE

SPOIL MANAGEMENT PLAN FOR REUSE OF UNSUITABLE ENGINEERING FILL AT MT ENFIELD
INTERMODAL LOGISTICS CENTRE AT ENFIELD

Prepared for:

Sydney Ports Corporation
Level 4
20 Windmill Street
WALSH BAY NSW 2000

Report Date: 28 June 2011
Project Ref: ENVIRHOD00634AE

Written/Submitted by:

Nalin De Silva
Senior Associate

Reviewed by:

Sam Gunasekera
Principal

Coffey Environments Australia Pty Ltd ABN 65 140 765 902
Level 1, 3 Rider Boulevard Rhodes NSW 2138 Australia
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ENVIRHOD00634AE-R01

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

28 June 2011

Sydney Ports Corporation
Level 4
20 Windmill Street
WALSH BAY NSW 2000

Attention: Mr. Bruce Royds

Dear Bruce

RE: Spoil Management Plan - ILC @ Enfield

Coffey Environments Australia Pty Ltd (Coffey) is pleased to present the Spoil Management Plan for the works involving the reforming of Mt. Enfield. Could you please review and provide comments for incorporation into the final spoil management plan?

If you have any queries, please do not hesitate to contact the undersigned on 02 8083 17600.

For and on behalf of Coffey Environments Australia Pty Ltd

Nalin De Silva
Senior Associate

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RECORD OF DISTRIBUTION

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
1 pdf copy	ENVIRHOD00634AE-R01	FINAL	28 June 2011	Sydney Ports Corporation	NDS
1 pdf copy	ENVIRHOD00634AE-R01	FINAL	28 June 2011	Coffey Environments Pty Ltd	NDS

CONTENTS

CONTENTS

ABBREVIATIONS

BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
COC	Contaminants of concern
HRA	Health Risk Assessment
ID	Identification
LOR	Limit of Reporting
NATA	National Association of Testing Authorities
NSW EPA	Environment Protection Authority of New South Wales
OCP	Organochlorine Pesticide
OPP	Organophosphorous Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector
RAC	Remediation acceptance criteria
RAP	Remedial Action Plan
SAS	Site Audit Statement
SMP	Site Management Plan
TPH	Total Petroleum Hydrocarbon
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1 INTRODUCTION

Coffey Environments Australia Pty Ltd (Coffey) was engaged by Sydney Ports Corporation (Sydney Ports) to prepare a spoil management plan in relation to the use at Mt Enfield (located at the southern part of the ILC site, and also known as Stockpile 4) of unsuitable engineering fill excavated within the ILC site as part of the construction works at the Intermodal Logistics Centre (ILC) on Cosgrove Road, Strathfield South, NSW (the site).

This spoil management plan provides the framework for managing the excess spoil (unsuitable engineering fill) to be generated from construction activities to be undertaken at the site and which is proposed to be relocated to the southern part of the site (at and around Mt Enfield). This proposal is subject to a Section 75W Modification Application under Part 3A of the Environmental Planning and Assessment Act (EP&A Act).

1.1 Background

The site contamination was assessed and remediation works were conducted at the site in 2009 and 2010. The remediation works were conducted in accordance with the Remediation Action Plan prepared by Coffey (Coffey Environments, 2009[1]).

The remediation works were validated by Coffey (Coffey Environments, 2010[2]). The Site Auditor accredited under the Contaminated Land Management Act 1997 issued an Interim Advice Letter (Environ, 23 July 2010[3]) in response to the Validation Report. The Auditor concluded that "the remediation conducted to date had been generally in accordance with the RAP" and that "the validation results confirm that the site has been adequately remediated". It was considered that the site will be suitable for the proposed commercial and industrial land use following the completion of the ILC construction work, given that the concrete slab and asphalt paving and the sub-grade acting as a cap or a barrier, minimising potential for site occupants contacting any residual site contamination.

A long term Site Management Plan (SMP) will be prepared to provide management measures for Sydney Ports and its tenants and operators to appropriately manage the identified contamination retained within the Site.

Coffey understands that:

- the development works is expected to generate up to 60,000 m3 of unsuitable engineering material from the site grading works. It is expected that majority of unsuitable engineering fill will be obtained from the existing Stockpile 5. This material requires management on site. As indicated above, it is proposed to relocate this material to the southern part of the ILC site at and around Mt Enfield,

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[1] **Coffey Environments 2009**, *'Remediation Action Plan for Known Soil Contamination – Intermodal Logistics Centre @ Enfield'*, dated 23 June 2009, ref: ILC-CO-D&R-ENVIRHOD00634AA-R002

[2] **Coffey Environments 2010**, *'Validation Report for Separable Portions 2,3,4 and5', Intermodal Logistics Centre, Enfield, NSW'*, dated 13 April 2010, ref: ILC-CO-D&R-ENVIRHOD00634AA-R036

[3] **Environ 2010.** Interim Advice Letter - Implementation of Remedial Action Plan for Separable Portions 2, 3, 4 and 5 Intermodal Logistics Centre @ Enfield, dated 23 July 2010.

subject to the approval of the Department of Planning and Infrastructure (DP&I) under a Section 75W modification of the existing approval;

- the development works commencing on the site is expected to generate a significant quantity of green waste (estimated to be up to 5000m^3 excluding soil), and requires management on site;
- there is an estimated 2000 m^3 of unusable railway sleepers that requires management onsite; and
- five stockpiles[4] are located at the southern portion of the Site, and that the stockpiles comprise soils, boulders and sleepers. Stockpile 4 is referred to in this document as Mt. Enfield. The unsuitable engineering material from stockpiles 1, 2, 3 and 5 will require management onsite. Stockpile 4 will not be excavated. Recent feedback from the construction contractor indicates that most of the unsuitable engineering fill will be sourced from Stockpile 5.

1.2 Reforming of Mount Enfield

Coffey understands that:

- Sydney Ports is proposing to relocate unsuitable engineering material (up to 60,000m^3) generated from cut and fill activities at the ILC to the southern part of the site to raise and extend Mt. Enfield south towards Punchbowl Road. Mt Enfield will not be excavated;
- Unsuitable engineering fill from other stockpiles will also be placed on to Mt. Enfield, although the majority will be originated at Stockpile 5;
- The re-formed Mt. Enfield area will be completed as an open space area within the overall industrial/commercial land use of the ILC@Enfield site. The area will be fenced off with no regular access for site workers. Guided tours through the Mt. Enfield area may be conducted for visitors on occasion. However, the area will not be available for recreation use including sitting, picnicking and sports. As such, the land use within the Mt. Enfield area is considered to be commercial/industrial;
- Sydney Ports require a Site Audit Statement (SAS) declaring that Mt. Enfield area is suitable for commercial/industrial land use with limited public access as discussed above. Testing of soil to be reused at Mt. Enfield is required to assess the suitability of Mt. Enfield for commercial/industrial land use.

1.3 Purpose and Scope

The purpose of this spoil management plan is to:

- Assess options for managing potential contamination issues of unsuitable engineering material generated at the site and proposed to be reused at Mt Enfield; and

[4] The location of the five stockpiles is shown in CMPS&F (June 1996) and CH2MHill (1999a&b). The nature and quality of the stockpiles is documented in CMPS&F (June 1996) and CH2MHill (1999a&b). Soils in the stockpiles were validated CH2MHILL (1999a&b) to be below the adopted soil assessment criteria, which was generally that of a commercial/industrial land use.

- Outline a testing regime for the unsuitable engineering material to be placed in the Mt. Enfield area for commercial and industrial land use from a contamination perspective.

This document does not outline remediation action for contaminated soils or other contamination that may be encountered during construction and is not intended to serve as a remediation action plan. A remediation action plan for the site is already in place (Coffey, 2009) and will be implemented, in conjunction with the Contamination Management Plan for Construction (Coffey, Nov 2009), if any unexpected contaminated soils and/or other contamination is identified on site.

1.4 Work Conducted

This spoil management plan is based on the following work that was conducted by Coffey:

- Discussions with Sydney Ports representatives to gain an appreciation of the proposed works on the Mt. Enfield area and to the objectives of this spoil management plan;
- Initial discussions with the site auditor regarding the testing of the spoil and assessing suitability of Mt. Enfield area for commercial and industrial land use;
- Review of Coffey Environments (2009) Health Risk Assessment [5] (HRA) to assess if the risk based assessment levels derived in the HRA is applicable to assess contamination risk of spoil within Mt. Enfield area;
- Review of previous reports pertaining to the contamination status of stockpiles proposed to be placed onto the Mt. Enfield area. The previous reports reviewed include:
  - **CMPS&F 1996**, 'Enfield Marshalling Yard Soil Validation Report'
  - **CH2MHill, 1999a,** 'Enfield Marshalling Yard – Part A, Environmental Contamination Report' and
  - **CH2MHill, 1999b,** 'Enfield Marshalling Yard – Part B, Environmental Contamination Report'.
- Developing the spoil management procedures in consultation with Sydney Ports

[5] **Coffey Environments 2009**, *'Onsite Health Risk Assessment Risk Based Level Development, Intermodal Logistics Centre, Enfield, NSW'*, dated 10 March 2009, ref: ILC-CO-D&R-ENVIRHOD00634AA-R005

2 EXPECTED COMPOSITION OF SPOIL TO BE REUSED AT MT ENFIELD

2.1 Green Waste

Clearing of weeds from the site surface is expected to generate approximately 10,000m^3 of green waste mixed with soil. Sydney Ports estimates that approximately up to half of this will be attributable to soil mixed into the green waste. At this stage, Coffey understands that Sydney Ports wishes to bury this green waste within Mt. Enfield.

2.2 Railway Sleepers

Coffey understands that approximately 2000m^3 of railway sleepers will require management onsite. Sydney Ports have indicated that the sleepers are intended to be placed within or around Mt. Enfield.

2.3 Unsuitable Engineering Material

Coffey understands that unsuitable engineering material from site grading works and stockpiles 1, 2, 3 and particularly stockpile 5 will require management on site. This material is deemed unsuitable from an engineering characteristics point of view to be retained below slabs and pavement.

2.3.1 Spoil from Site Grading

The site grading works will require soil relocation within the site to varying depths. Some unsuitable engineering material may be found from the grading works and may be relocated to the southern part of the site to raise and extend Mt. Enfield.

The site contains fill material to varying depths, from 1m to more than 6m below ground level. The fill material encountered across the site was significantly variable in composition and was mainly a reworked sandy clayey material mixed in with varying levels of ash, construction rubble and some oversized materials such as cobbles. Assessments and validation work by Coffey Environments has indicated that the fill material typically contains low level contaminants such as heavy metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX), polyaromatic hydrocarbons (PAH) and asbestos. Drain pipes, and sumps containing contaminated sediment, asbestos pipes and underground storage tanks have been encountered during previous earthworks and assessments. As indicated in Section 1.1, the site remediation works were undertaken in 2009/10 as reported in Coffey's Validation Report (April 2010) and the Site Auditor's Interim Advice Letters (23 July 2010 and 25 November 2010).

2.3.2 Spoil from Existing Stockpiles

Unsuitable engineering materials from stockpiles 1, 2, 3 and 5 will also be placed onto Mt. Enfield (stockpile 4). The construction contractor has indicated that the majority of unsuitable engineering fill to be relocated to Mt Enfield will be sourced from stockpile 5.

CMPS&F (1996) indicates that the material from the five stockpiles originally came from a large stockpile located in the RailCorp Marshalling Yard. CH2MHill (1999a) indicates that the large stockpile contains shale, sandstone, building rubble, ash, slag, ballast and general debris sourced from various railway yards in Sydney Metropolitan area. It is also understood that the stockpiles may include material from the foundations of the former roundhouses and locomotive depot formerly located within the FRC Land. Re-development activities undertaken at the RailCorp Marshalling Yard in the mid 1990s

necessitated the dismantling and redistribution of the large stockpile to various locations including the 5 stockpiles at the ILC site.

Previous assessments by CMPS&F (1996) and CHM2Hill (1999 a & b) concluded that spoil within the five stockpiles had contaminant concentrations less than the adopted site criteria and that there was no significant contamination in any of the five stockpiles on site. CH2M Hill (1999b) concluded that "there is no contamination associated with Stockpiles 1, 2, 3, 4 or 5 that poses a potential threat to the environment or to human health under the proposed land use scenario" and concluded that the "material could be retained on site and used for landscaping purposes or to further level/reclaim areas on the site". Although CH2MHill (1999a) indicated that the contaminants of concern include metals, PAH, Coffey notes that previous assessments (including CH2MHill (1999a)) have limited the laboratory analysis to heavy metals. Five samples from stockpile 1 (which came from the same source as other stockpiles) were also analysed for TPH and BTEX, and the results were below adopted criteria.

Coffey notes that CH2MHill (1999a&b) screened samples in the stockpiles for volatile organic compounds (e.g., BTEX) with a PID. CH2MHill does not elevated PID readings, suggesting that significant volatile contamination of the stockpiled material is unlikely. The TPH and BTEX results of the five samples from stockpile 1 (which came from the same source as other stockpiles) were below the criteria. The stockpiles have been at the current location for the last 17 years, with no potential contaminating activities occurring on the stockpiles since then[6]. It is possible that readily degradable organic contamination that may have been present in the stockpiles may have broken down over this period of time.

Notwithstanding the above, Coffey considers that additional soil sampling of material proposed for reuse at Mt Enfield, particularly in regards to asbestos and to a lesser extent PAH, TPH and BTEX, should be undertaken as discussed in this document.

[6] As indicated by Sydney Ports

3 CONTAMINATION CONDITIONS ON THE ILC@ENFIELD PROJECT

3.1 Remediation works Undertaken

The remediation and validation activities undertaken within the site were in general accordance with the RAP prepared by Coffey Environments (Coffey Environments, 2009). The remediation and validation activities were undertaken between February 2009 and early 2010.

Based on the Coffey Environments (2009) RAP and subsequent assessments and site observations, remediation was conducted in the following areas:

- Isolated contamination hotspots (TPH and metals) in the shallow soils identified within the DELEC area;
- Asbestos fibre bundles, randomly distributed in the near surface soils across the DELEC area;
- Asbestos fibre bundles in the shallow soils across the footprint of the Wagon Repair Shed; and
- Two underground storage tanks (USTs) identified between Buildings 29 and 30.

The remediation objective was to remediate identified soil contamination to an acceptable risk level commensurate with the proposed commercial/industrial land use, where the site will be covered over by pavements and slabs that provide a suitable barrier between any contamination that may be left behind and site users of the ILC. The site remediation acceptance criteria were developed for a specific set of conditions and the remediation strategy of onsite containment was based on the proposed development design for the site. Low levels of contamination below the adopted site specific remediation acceptance criteria were retained on the site. It was considered that the site will be suitable for the proposed commercial and industrial land use following the completion of the ILC construction work, given that the concrete slab and asphalt paving and the base and sub-base acting as a cap or a barrier, minimising potential for site occupants contacting any residual site contamination. During construction works, any identified contaminated soils (including those that are retained in the containment cells and the capping areas) and any unexpected contamination aspects must be managed in accordance with the "*Contamination Management Plan for Construction*" (Coffey Environments, 2010[7]).

The remediation works were validated by Coffey (Coffey Environments, 2010), and it was considered that the site will be suitable for the proposed commercial and industrial land use following the completion of the ILC construction work. The site auditor has provided in principle agreement with the findings of the Coffey Environments (2010) validation report. However, the final site audit statement will only be completed following the completion of the construction works.

A long term Site Management Plan (SMP) will be prepared by Coffey Environments to provide management measures for Sydney Ports and its tenants and operators to appropriately manage the identified contamination retained within the Site. The SMP for the Site will be reviewed and approved by the Site Auditor prior to implementation.

[7] **Coffey Environments 2010**, '*Contamination Management Plan for Construction'* dated 2 December 2010, ref: ILC-CO-D&R-ENVIRHOD00634AA-R034.

3.2 Contaminants of Concern

For the purpose of assessment, remediation and validation works conducted to date at the ILC@Enfield, Coffey (Coffey Environments, 2009) considered the contaminants of concern (COCs) at the site include:

- Heavy metals (As, Cr, Cd, Cu, Hg, Ni, Pb, Zn);
- Total petroleum hydrocarbons and benzene, toluene, ethylbenzene, xylene (TPH/BTEX);
- Polyaromatic hydrocarbons (PAH); and
- Asbestos.

Coffey considers that these COC are applicable for the assessment of unsuitable engineering material that is proposed to be reused at the Mt. Enfield.

3.3 Site Acceptance Criteria

Remediation acceptance criteria (RAC) used for remediation and validation of Separable Portions SP2, SP3, SP4 and SP5, which were approved by the Site Auditor, are specified in the RAP (Coffey Environments, 2009) and the Validation Report (Coffey Environments, 2010), and are reproduced below.

Contaminant	Human Health Based Criteria (mg/kg)
Arsenic	500
Cadmium	100
Chromium	500
Copper	5000
Lead	1500
Mercury	75
Nickel	3000
Zinc	35000
Benzo(a)pyrene	5
Polycyclic Aromatic Hydrocarbons (PAH)	100
Total Petroleum Hydrocarbons (C_6-C_9)	65
Total Petroleum Hydrocarbons (C_{10}-C_{14})	18,642 and no visible free product or staining on the surface
Total Petroleum Hydrocarbons (C_{15}-C_{28})	13,953 and no visible free product or staining on the surface
Total Petroleum Hydrocarbons (C_{29}-C_{36})	13,953 and no visible free product or surface staining
Benzene	1
Toluene	1.4

Contaminant	Human Health Based Criteria (mg/kg)
Ethylbenzene	3.1
Xylene	14
Asbestos	No asbestos in the top 100mm of soil

In a report dated 4 May 2011, Coffey [8] considered that the above RAC are appropriate for assessing the suitability of spoil to be placed onto the Mt. Enfield area[9]. As such, these threshold concentrations for contaminants of concern will be adopted as assessment criteria for the assessment of suitability of spoil to be placed onto Mt. Enfield area.

[8] **Coffey Environments 2011**, Applicability of the Risk Based Assessment Levels in Coffey Environments (2009) HRA for Validating the Works Within the Proposed Mt. Enfield Open Area; Dated 4 May 2011; ref: ENVIRHOD00634AE-L01_Rev3

[9] This report is currently under review by the Site Auditor. The RACs will be deemed appropriate for assessing the Mt. Enfield area, pending the Site Auditor's approval of this report.

4 MANAGEMENT OF SPOIL

4.1 General Requirements

As discussed above, there is the possibility that some of the spoil generated from grading works across the site and from the stockpiles 1, 2, 3 and 5 could contain contaminants at low concentrations. Given the potential for some contamination, handling of this spoil should be done with due care, in accordance with the requirements of an appropriate Health and Safety Plan prepared by the contractor. Potential for generation of dust should also be minimised.

Records should be kept of movement and relocation of material to Mt. Enfield during the earthworks.

4.2 Unsuitable Engineering Fill Characterisation and Separation

If any material that looks obviously contaminated material (oil soaked, drums, heavily stained, strong odour, asbestos containing materials) is encountered during the proposed earthworks, that material should not be mixed with other unsuitable engineering material, and should be separated for assessment by an environmental professional..

Unsuitable engineering material proposed to be placed into Mt. Enfield area should be tested to assess suitability for with respect to contamination (for the proposed commercial and industrial land use). Any material that fails the assessment criteria listed above will be stored separately for appropriate management following consultation with the environmental consultant and the site auditor.

4.2.1 Testing Frequency of Unsuitable Engineering Fill to Mt Enfield

At this stage, the works methodology, staging of the works and the form in which the material will be available for testing are not known. As such, Coffey considers that the testing regime proposed in this Spoil Management Plan should be flexible to account for different sources of spoil and different volumes of material that may be available in one location for testing. Coffey considers the following scenarios are likely for spoil testing:

- Testing of material that has been excavated under observation for gross contamination and formed into a new stockpile;
- Testing of material in situ in old stockpiles; or
- Testing of materials that have already been moved into Mt. Enfield area.

The testing regime for these scenarios is outlined below.

Source of Spoil to Mt. Enfield	Sampling frequency	Rational and Comments
Material excavated under observation with any material showing evidence of gross contamination being formed into a separate stockpile and excluded for separate assessment	One sample per 2000m^3 with a minimum of five samples from any volume of material sampled.	The excavation of material has been observed by the contractor to separate out visibly identifiable gross contamination such as oil saturated soils, tar, drums and containers and separable quantities of asbestos containing materials. The material is also likely to undergo some degree of mixing during the excavation and stockpiling process. As such the proposed sampling density is considered adequate to identify significant contamination.
Material in an old stockpile to be validated in situ	1 sample per 1000m^3 with a minimum of five samples from any volume of material sampled	Previous assessments by CMPS&F (1996) and CHM2Hill (1999 a & b) conclude that spoil within the five stockpiles had contaminant concentrations less than the adopted site criteria. However, as discussed in Section 2.3.2, further characterisation of the stockpiles' unsuitable fill material to be reused at Mt Enfield is recommended. Coffey considers that the existing stockpiles require testing at a greater frequency to assess for potential pockets of significant contamination.

Source of Spoil to Mt. Enfield	Sampling frequency	Rational and Comments
Material already placed into final location within Mt. Enfield area	Number of sample locations as per NSW EPA (1995) Sampling Design Guidelines. At each sample location, samples will be collected at the surface (0-0.1m) and at 0.5m.	If spoil has already been placed into the final destination within Mt. Enfield, it is likely that significant gross contamination, if present, would have been identified and separated out. From a site suitability perspective, the surface and near surface soils should be demonstrated to not pose a risk to human health, and the overall Mt. Enfield area, including deeper soils, to not pose a risk to the environment (namely groundwater contamination). The surface soils can be assessed for suitability through the proposed testing regime. If required, the potential for significant groundwater contamination from the material placed into Mt. Enfield area can be assessed from the existing groundwater quality information for the areas from which the material was sourced.

4.2.2 Analytical Schedule

Collected soil samples should be screened for volatile organic compounds using a photo-ionisation detector. Soil samples should be analysed as per the schedule below.

Contaminant of Concern	Analysis Frequency
Total petroleum hydrocarbons (TPH)	100% of all samples collected to be analysed
Benzene, toluene, ethylbenzene, xylene (BTEX)	
Asbestos (ID and quantification to LOR of 0.001% w/w)	
Polyaromatic hydrocarbons (PAH)	50% of all samples collected to be analysed
Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)	20% of all samples collected to be analysed

4.2.3 Quality Control/Quality Assurance

The following field quality control samples should be collected:

Quality Control Sample Type	Sample Frequency
Intra-laboratory field duplicates	1 sample per 10 primary samples
Inter-laboratory field duplicates	1 sample per 20 primary samples
Trip spike samples	1 per batch of sampling
Trip blank samples	1 per batch of sampling
Wash Blanks	1 per day when re-usable equipment used to collect samples

Soil sampling should be conducted by a qualified field scientist or a technician trained in contaminated soil sampling, handling and decontamination procedures. The collected soil samples should be preserved and transported in accordance with industry protocols.

4.3 Management of Spoil

4.3.1 Green Waste

Coffey understands that Sydney Ports has considered the following options for the management of green waste:

- Bury within Mt. Enfield; and
- Spread on top of Mt. Enfield.

Coffey considers that burial of organic matter such as green waste could generate methane through anaerobic degradation, if placed where there is limited oxygen entrainment. Methane gas is not only a potent greenhouse gas, but can also pose an explosive risk under certain circumstances.

Care should be taken to minimise the mixing of green waste with unsuitable engineering material that is proposed to be placed into Mt. Enfield.

Due to the potential for generating methane, Coffey considers it prudent not bury significant quantities green waste within Mt. Enfield. However, if green waste requires burial within Mt. Enfield, Coffey considers that burial at shallow depths (at a depth of 0.5m below surface) may reduce the potential for anaerobic degradation due to the higher potential for entrainment of atmospheric air. The thickness of the layer of green waste should not exceed 0.5m in order to increase potential for air entrainment throughout the layer of green waste. However, Coffey notes that the extent of air entrainment is dependent on many factors including the soil type covering the green waste layer and the degree of compaction the cover material and the green waste layers are subjected to. It is important to note that predicting the rates of air entrainment and degradation of green waste are difficult based on the available information and models available and was beyond scope of this document.

Recent discussions with Sydney Ports have indicated that placing the green waste on top of Mt. Enfield is one of the options considered by Sydney Ports for managing green waste on site. Coffey considers this option is acceptable from a contamination perspective, if significant quantities of untested soil mixed with the green waste, is not spread across the surface together with the green waste. Coffey understands that Sydney Ports is separately considering the potential for weed regrowth on Mt. Enfield if this option were to be adopted.

4.3.2 Sleepers

Coffey understands that Sydney Ports also considered burying the 2000 m^3 of railway sleepers mentioned above, within the proposed Mt. Enfield area. Coffey considers that similar to green waste discussed above, burial of sleepers could also generate methane though anaerobic degradation. Although the rate degradation, and hence the generation of methane, will likely be much slower than that of green waste buried within Mt. Enfield, Coffey notes that sleepers, if allowed to undergo anaerobic degradation, it will occur over a much longer period and hence will likely generate methane over much longer period compared to green waste.

Care should be taken to minimise the mixing of sleepers with unsuitable engineering material that is proposed to be placed into Mt. Enfield. Due to the potential for generating methane, Coffey considers it prudent not bury the sleepers within Mt. Enfield. The sleepers could potentially be used for landscaping, retaining walls, pathways and fencing. However, if sleepers require burial within Mt. Enfield, Coffey considers that burial at shallow depths (at a depth of 0.5m below surface) may reduce the potential for

anaerobic degradation due to the higher potential for entrainment of atmospheric air. The thickness of the layer of sleepers should not exceed 0.5m in order to increase potential for air entrainment throughout the layer of sleepers.

4.3.3 Unsuitable Engineering Material

Unsuitable engineering material tested and deemed appropriate with respect to contamination suitable to be retained onsite may be reused in the reforming of Mt. Enfield.

Coffey notes that there is a moderate likelihood that fibrous asbestos will be identified in some of unsuitable engineering material. It is possible that some material may fail the site criteria for asbestos. Should this be the case, Coffey recommends that asbestos impacted unsuitable engineering material be placed into Mt. Enfield area to a level that is at least 100mm less than the final design levels. This would allow the asbestos impacted material to be retained under a 100mm thick layer of asbestos free material. This material could be sourced from the site or imported virgin excavated natural material (VENM).

4.4 Potential Unexpected Contamination Aspects

Unexpected contamination aspects that could be encountered during construction include (but not limited to):

- Underground storage tanks and associated underground fuel infrastructure, including fill lines and breather lines;
- Drainage pipes and sumps, potentially blocked with or containing contaminated sediment;
- Buried drums and waste containers;
- Free product or phase separated hydrocarbon (PSH); and
- Buried asbestos or other material at concentrations above the remediation criteria (Coffey, 2009a).

Management measures will need to be implemented by the construction contractor, in accordance with the Coffey (2010) Contamination Management Plan for Construction, if unexpected contamination sources are encountered during construction to minimise potential impact to human health or the environment or potential for cross contamination. Consistent with the Contamination Management Plan for Construction, the following general approach for managing unexpected contamination may be adopted:

- immediately notify Sydney Ports of the identified or suspected contamination;
- an appropriately qualified environmental professional should be engaged to carry out an assessment of the nature and extent of the unexpected contamination, which may include sampling, laboratory analysis and reporting;
- liaise with the Site Auditor;
- carry out any required remediation work in accordance with the remediation acceptance criteria specified in the RAP (Coffey, 2009) and site auditor requirements to remove or contain the identified contamination;
- carry out any required validation work to demonstrate that the identified contamination has been adequately remediated or managed; and

- report the works conducted to a standard suitable for review by an accredited site auditor.

Odorous or stained soils could also be encountered during proposed Mt. Enfield works. Whilst these soils may meet the site specific remediation acceptance criteria, any odorous or stained soils are not suitable for use on the top 0.5m of Mt. Enfield.

4.5 Environmental and Health and Safety Management

The contractor should implement adequate measures to manage environmental impacts (dust generation, sediment runoff etc) and worker and public safety during the works, which may require handling of contaminated soil impacted with asbestos and other contaminants.

5 VALIDATION AND DOCUMENTATION

5.1 Observations During Spoil Generation and Placement

The works associated with spoil generation, handling and placement within Mt. Enfield area should be monitored by the environmental consultant or an experienced environmental professional at regular intervals to ensure that the soils placed in that area are suitable for the proposed land use from a contamination perspective. Observations should be made and recorded.

Works that are conducted without the fulltime presence of and observation by the environmental professional should be recorded on a daily basis by the earthworks contractor. Information on the following aspects should be recorded and made available to the environmental professional for validation purposes:

- Where spoil is generated from;
- Physical characteristics of the spoil;
- Any evidence of contamination;
- Any material that is separated out due to suspected contamination; and
- Where the material is placed. This information should be of sufficient accuracy to be able to trace the location of any portion of spoil that is placed into Mt. Enfield.

5.2 Validation of Reformed Mt. Enfield

If soil sourced from the site is used to form the surface layer of Mt. Enfield, the final surface of the reformed Mt. Enfield area should be validated to demonstrate that the surface soils are suitable for the proposed commercial and industrial land use. Coffey proposes that the surface soils (0 to 0.1m) be assessed with the number of sample points determined in accordance with the minimum number of sample locations for a specific area, specified in NSW EPA (1995) Sample Design Guidelines.

Samples should be collected at the surface (0 to 0.1m) at each of the sampling points. The samples should be analysed for asbestos (ID and quantification to an LOR of 0.001% w/w).

6 REPORTING

The results of the soil testing and observations should be reported in a validation report for the Mt. Enfield Area. The report should be prepared in general accordance with the NSW EPA (1997) Guidelines for Consultants Reporting on Contaminated Site. The report should include information on testing conducted, analytical results, and observations made.

The validation report will need to be reviewed and approved by a site auditor if a site audit statement is required for the Mt. Enfield Area.

7 LIMITATIONS

This spoil management plan has been prepared with the information available to Coffey at the time of preparation, for the purpose of assessing and managing spoil that is to be placed into Mt. Enfield area. Whilst soil acceptance criteria have been provided for the purpose of assessment, this spoil management plan does not serve the purpose of a remediation action plan. A remediation action plan should be prepared if remediation is deemed to be required based on the testing proposed in this document.

A validation report will be required for the Mt. Enfield area if a site audit statement is required.

8 REFERENCES

Coffey Environments 2009, 'Remediation Action Plan for Known Soil Contamination – Intermodal Logistics Centre @ Enfield', dated 23 June 2009, ref: ILC-CO-D&R-ENVIRHOD00634AA-R002

Coffey Environments 2009, *'Remediation Action Plan for Known Soil Contamination – Intermodal Logistics Centre @ Enfield'*, dated 23 June 2009, ref: ILC-CO-D&R-ENVIRHOD00634AA-R002

Coffey Environments 2010, '*Contamination Management Plan for Construction'* dated 2 December 2010, ref: ILC-CO-D&R-ENVIRHOD00634AA-R034

Coffey Environments 2011, *'Applicability of the Risk Based Assessment Levels in Coffey Environments (2009) HRA for Validating the Works Within the Proposed Mt. Enfield Open Area'*, dated 2 May 2011, ref: ENVIRHOD00634AE-L01_Rev 1.

NSW EPA (1995) Sampling Design Guidelines. ISBN 0-7310-3756-1.